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EMPIRICAL ASSESSMENT OF PATTERNS AND GUIDELINES FOR WEB DESIGN

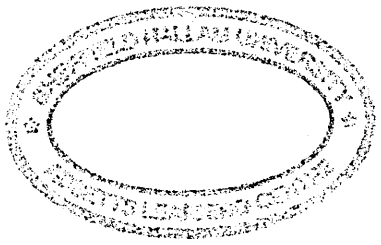
Konstantinos Koukouletsos

A thesis submitted in partial fulfilment of the requirements of the

Sheffield Hallam University

for the degree of Doctor of Philosophy

July 2008



Declaration

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Abstract

The phenomenal and explosive growth of the internet makes the need for proven, dependable approaches to interaction and interface design more important. Efficient and effective design methods are needed, complete with appropriate techniques and tools that support designers in developing and delivering usable systems. Knowledge and experience significantly contribute to producing better design products. Traditionally, design knowledge and experience is conveyed in the form of guidelines. In recent years, there has been a growing interest in design patterns as an effective way of capturing and communicating design knowledge.

This thesis contributes to the ongoing debate concerning the benefits of patterns, as they are contrasted to another form of design guidance in the field of web design. The thesis investigates the effect of patterns and guidelines in the development of skills of students acting as novice designers. The aim is to empirically test how patterns and guidelines affect novice designers in creating and evaluating a web site. Its motivation is to advance the understanding of how novices employ and value patterns and guidelines after being introduced to usability issues with the help of these tools. Moreover, this study also highlighted participants' attitudes and preferences towards patterns and guidelines.

Three experiments were conducted for the purposes of this research. Each experiment contributed significantly to the understanding of how the next experiment should be carried out, and the findings and lessons learned at each stage have extensively influenced the next stage. Both quantitative and qualitative methods were used to collect and analyze data. Detailed descriptions of the experimental procedures are provided and give insights into the use of patterns and guidelines by novices.

The results indicate that patterns and guidelines can successfully communicate usability principles and knowledge to novice designers and can affect the design and evaluation skills of participants.

The difference in the overall scores in the design task between the two groups, using subjective and objective metrics, is statistically significant with the patterns group performing better. Results from the design task and the interviews suggest that compound patterns are inferior to simple patterns and do not create a clear picture of all the usability issues involved to novice designers. There is no significant difference between the performances of the two groups in the evaluation task. However, if a comparison is made using difficult to identify errors the patterns group perform significantly better than the guidelines group.

The overwhelming preference for a particular format in presenting guidance is patterns even by the participants trained with guidelines. Links to other patterns within the pattern collection and pattern names are not appreciated by participants, although guideline titles are considered to provide useful information and guidance. Patterns are considered by participants as better tools to introduce design principles to novices while guidelines are perceived as tools for more experienced designers. At the same time patterns are suggested as a useful pedagogic tool for teaching.

Overall the study represents an important fist step towards comparing patterns with another similar tool for providing guidance to designers. Development of original experimental designs was required since no similar studies have been conducted. The work of this thesis can serve as a starting point for more thorough assessment of design patterns and their potential benefits in designing more usable interfaces and in education as a tool for knowledge transfer and training.

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Konstantinos Koukouletsos
July 2008

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Chapter 1

Introduction

1.1 Introduction to the study

As the field of human-computer interaction (HCI) matures, the need for proven, dependable approaches to interface design becomes apparent. Efficient and effective design methods are needed, complete with appropriate techniques and tools that support designers in developing and delivering usable systems.

Knowledge and experience significantly contribute to producing more usable interfaces. Traditionally, design knowledge and experience is conveyed in the form of guidelines. In recent years, there has been a growing interest in design patterns as an effective way of capturing and communicating design knowledge in an effective way to support the design process (Dearden and Finlay, 2006). The pattern format is gaining wider acceptance with big company names starting to document knowledge in the form of patterns (SAP Info, 2006; Yahoo!, 2005).

Guidelines are well established and widely used tools that have proven to be valuable in the hands of practitioners and designers. Guidelines are presented in a compact prescriptive way and describe rules to follow. The format of a guideline consists of a guideline title, usually a short sentence, followed by the guideline itself where the title is detailed. After this, there may be comments about the application of the guideline. These comments may refer to the rationale of the guideline and issues related to the application. Examples may be included, although not always, and are used to clarify and illustrate the guideline.

Design patterns for the Web articulate and communicate experience into practical problem/solution pairs. Patterns describe the problem and discuss the context in which the pattern should be used. The rationale for the solution, the tradeoffs a designer should consider, and techniques of how to apply the solution are presented and explained in a section altogether. Finally, a short statement of the solution is given. Patterns capture good design practice, therefore examples are essential parts of patterns. There is one example, usually after the pattern name and more examples after the solution section of the pattern. Examples highlight key issues and portray application of the pattern solution as can be seen in artefacts. Pattern names can be part of a vocabulary which can be used to discuss design problems and their solutions. Patterns are linked to other patterns and form a pattern language, a set of interlinked patterns for a specific domain. Higher level patterns may use lower lever patterns in describing a solution.

Patterns may employ guidelines in the body of solution, whereas guidelines quite often include elements of a pattern, like rationale, links and examples (van Duyne et al., 2002). The author takes the view that that patterns and guidelines complement each other and are just two different formats serving as practical tools to present guidance to designers and practitioners about how to build better artefacts.

There are patterns and guidelines that address the same problems presenting the same solution at the same level of abstraction. A guideline like "Provide Printing Options" (Koyani et al., 2003) to allow visitors to print a web page is presented in two widely known pattern languages as: (1) a "Printer Friendly Page" pattern (van Welie, 2001-2007), and (2) "Printable Pages" pattern (van Duyne et al., 2002). However, matched pairs of guidelines and patterns are not very common in existing collections.

Patterns are characterised by a number of features that make them different and, it is claimed (Mahemoff and Johnston, 2001; van Welie et al., 2000), better than guidelines. Their advantages as they are perceived by researchers lie mainly in their structure. The lack of empirical evidence as to the benefit of using them in actual design practice is one of the weaknesses of patterns (Dearden and Finlay, 2006). Examining the use of patterns in actual activities while employed by designers is essential to demonstrate any benefits of patterns and pattern languages. Additionally, improving understanding about patterns and guidelines will help the research community towards developing new methods, tools and approaches employing them.

This thesis presents a comprehensive comparative study of patterns with guidelines. The effectiveness of patterns and guidelines is empirically assessed in two areas: design of a new web site and evaluation of an existing one. There are three

aspects that differentiate this study from others. The first aspect is that the focus is on students acting as novice designers. The intention of using students as participants was to try to leave out most of the web design knowledge that a designer may have from previous work and experience. At the same time, usability issues are considered to be an important topic to be taught to the future web designers and any findings on successfully introducing usability issues to novices are valuable. The second differentiating aspect of this study is that the comparison is as close to a real design activity as possible. In the experiments, participants produced concrete web sites, rather than any form of prototype, using a widely accepted authoring tool. The third aspect is that using existing patterns and guidelines a balanced set of patterns and guidelines was formed, i.e. two sets that in essence present the same advice and knowledge. After the initial training in web design using authoring tools, students learned about usability and usability principles using balanced sets of patterns and guidelines. Finally, the two groups of novice designers were engaged in two common activities that real designers are involved in, that is, designing and evaluating web sites.

1.2 Research aim and objectives

Web systems represent the largest application of user interface principles today (White, 2002) and poor design of web pages affects more and more people. Despite the great investment made in web design, poor usability remains a major problem. Numerous studies and research point to this fact. For example, Forrester Research (2007) points out that, although sites have been improved in comparison to sites back in 2001, it is still hard for visitors to find value and there is vast room for improvement.

While several authors highlight the advantages of patterns over guidelines and suggest that a pattern-based design will lead to better designed products, there has been little empirical evidence of their practical use in design projects (Chung et al., 2004; Dearden and Finlay, 2006; Seffah and Javahery, 2002). The advantages and benefits that a pattern-based approach can offer to the design process and to what degree it contributes to the quality of the final product are not clear. In response to that, recent research has been directed towards the use and the evaluation of patterns (Chung et al., 2004; Dearden et al., 2002a, 2002b; Finlay et al.; 2002; Saponas et al., 2006). Nevertheless, formal research evaluating the effectiveness of the patterns in a practical setting is very limited. This study intends to evaluate patterns and pattern languages for web interface design by comparing them with guidelines.

At the same time, it is envisaged that teaching and discussing the application of patterns and guidelines with many novice designers will help to discover the strengths and weaknesses of these two tools. The value and importance of this research is that the empirical work done will allow to assess the effectiveness and impact of patterns and guidelines using as criteria the attitude and preference of inexperienced designers towards them. The study will look into enhancements than can facilitate and improve the understanding of the principles conveyed by patterns and guidelines and will explore whether the available body of patterns and guidelines can also be adopted to teach usability principles and provide advice and help to novice or inexperienced designers.

The two main specific objectives of the study are:

- **Objective 1**: Assess the effectiveness of guidelines and patterns in the design activities of novice designers.

Patterns and guidelines encompass experience and usability principles. By measuring the application of patterns and guidelines in sites designed by novice designers will show any differences in the impact patterns and guidelines have on the usability and on the design habits of novice designers.

- **Objective 2**: Assess the effectiveness of guidelines and patterns on the evaluation skills of novice designers.

This objective aims to assess the evaluation skills of novice designer and how patterns and guidelines affect them. By measuring the performance designers had in evaluating a web site and identifying errors and existing usability violations will demonstrate any differences in the impact patterns and guidelines have on novice designers.

The focus of the two main objectives is to provide empirical evidence about how patterns and guidelines affect novice designers, to examine whether a pattern or a guideline-based approach leads to higher and better performance in designing and evaluating web sites, and to evaluate the advantages and drawbacks of patterns and guidelines as a design aid for novice designers.

There are also two other objectives that are to be addressed by this study. These are:

- **Objective 3:** Examine attitude towards patterns and guidelines to convey usability principles, improve the abilities and to provide help to novice designers.

Attitude also includes appreciation for patterns and guidelines and intention to adopt them in future projects. Students, having used patterns and guidelines as design and evaluation aids will express their opinion about them.

- **Objective 4:** Investigate students' preference towards the format and structure of patterns and guidelines and identify specific advantages and disadvantages of them.

This objective seeks to establish any strengths and shortcomings of both tools after being used by the participants.

Any useful conclusions will be used to improve patterns/guidelines and the impact they have on novice designers. The study will also examine shortcomings and advantages of pattern languages and possible usage by inexperience users. To address the above research objectives a series of studies that form the experimental part of the research were conducted.

The research started with an "exploratory study", followed by the "first study", and finally by the "main study". The labels exploratory, first, and main are chosen in this thesis in order to imply the nature, the completeness, and the importance of each experiment. The exploratory study served as a preliminary study for subsequent experiments. The exploratory study was followed by a first study which, though successful in giving valuable data towards the objectives of the research, it had to be refined and focused even further to formulate the final main study. The three studies were carried out during three subsequent academic semesters, and each study informed the conduct of the next one. A balanced set of patterns and guidelines was formed and used; this set was evolved through the studies. Finally, to establish validity, the methodological triangulation of qualitative and quantitative approaches was implemented (Denzin, 1978; Golafshani, 2003; Guion, 2002).

1.3 Justification of the study

During the last few years, research has focused on discovering and documenting patterns and pattern languages and on demonstrating the use of patterns by developing pattern-based approaches used to design or redesign web sites (Borchers, 2001; Frizell and Hubscher, 2002; Javahery, 2003; Graham, 2003a; van Duyne et al., 2002). Several authors and proponents of the pattern-based approach to design suggest that patterns help designers and improve the final product; however, there is little empirical data to support these claims.

Seffah and Javahery (2002) confirm that very little is known about "developer experiences with pattern languages and the development of pattern-oriented designs" and express the need for more formal usability testing to measure "...both the user and the developers' satisfaction, productivity and performance using patterns". Also Dearden and Finlay (2006) observe that research so far has focused on generating patterns and developing pattern languages, and suggest that "...significant effort is now required to examine the use of these languages in actual design (e.g. via empirical and observational studies) to demonstrate what benefits might be gained from a patterns approach".

Furthermore, web design consists of two main parts: the code that the software development team of programming engineers develops and the visual interface that the user sees and interacts with. Although these two elements are strongly interrelated, web developers and designers are rarely trained in the design or the evaluation of the interface. Sometimes the coverage of such topics is restricted and their importance is not emphasised. Very often users experience poorly designed interfaces that sometimes do not follow even simple usability rules. A teaching framework intended for training novice designers that presents usability principles, in the form of guidelines and/or patterns, is essential.

In conclusion, there is very little practical and empirical evaluation of the patterns and very little, if any, research into the use of patterns and the extent that patterns help in improving the usability of the final product.

This research will try to shed light towards this direction by focusing on the differences between a pattern training approach and guideline training approach to design and the degree to which these two tools contribute to the final product. In this way, the role of patterns and guidelines will become clearer for successful implementation by novice web designers. The research will reveal the strengths and weaknesses of each tool and suggest improvements pertinent to their format, presentation and their scope for effective implementation by novice designers.

1.4 Potential contribution to knowledge

Design patterns have been proposed as a very promising tool for capturing experience and knowledge (Appleton, 1998; Hobart, 2001; Pemberton, 2000), offering the designer the best solutions available in design problems.

This research will present valuable results gained by comparing design patterns with guidelines as means of capturing and presenting knowledge and experience. Using

patterns and guidelines in a large scale research with experimental data is the most certain way to identify advantages and drawbacks for each tool in helping designers create solutions of high quality and improved usability. Furthermore, the study will provide evidence about the use of patterns and guidelines as evaluation tools for web pages.

The strengths of patterns and guidelines can be used to advance the skills of future web designers. During this study patterns and guidelines will be used to present to novice designers usability principles and best practices for web design. Patterns and guidelines can provide a mechanism to communicate design principles to students. A further contribution of this study will be to establish the best and more effective approach to training novice designers and improving their skills for the practice of their profession.

Finally, a by-product of this study will be a teaching guide for better web sites/pages. It is envisaged that the extensive experience of teaching design patterns and the assessment of the student participants' design and evaluation of web pages will contribute to the development of a teaching framework as a basis for a good usability course.

1.5 Dissertation outline

Chapter 1 of the thesis provides a brief introduction to the study and the concepts of patterns and guidelines for design. It states the research objectives, and presents the justification for the research. Finally, the potential contribution, which the study is expected to make to knowledge, is discussed.

Chapter 2 provides an overview of usability as an essential component of web design and discusses how the issue of usability affects web pages and web sites more than anything else. Patterns and guidelines are two formats of capturing advice and knowledge about usability, and the chapter presents a brief history of their development, their characteristics and their advantages and drawbacks. Existing empirical research into the use of patterns is summarised, highlighting the gap in research relating to the comparison of patterns with other existing approaches, such as guidelines in web design activities.

Chapter 3 details the research methodology used, firstly by describing the research methodologies and strategies. The two employed strategies, the experimental and the survey, are introduced and justified. The methods of data collection are presented followed by a detailed description of the validity and reliability pertaining to

the adopted methodology and approaches. Considerations involving the experimental design and the sampling techniques employed are presented to ensure comparable groups of novice designers. Finally, ethical issues related to the research are discussed.

Chapter 4 presents the exploratory and the first study. The setting of both studies is presented, followed by details of the selection of participants, the teaching approach taken, the sets of patterns and guidelines employed for the experiment and the collection of data. The problems and issues in teaching web design and employing patterns and guidelines to highlight usability principles are raised. Analysis of the compilations of the results gained from observations, questionnaires, interviews and experimental tests are presented wherever applicable. Limitations of the study are discussed.

Chapter 5 describes in detail the improvements made to the design of the experiment, the set of patterns and guidelines used in the main study and the set of metrics used by the evaluators to rate the application of usability principles on web pages. Both sets have evolved through the exploratory study and the first study and have been improved to better accommodate the requirements of the test and to facilitate quick and accurate rating.

Chapter 6 describes the procedures associated with the experiment for the main study. The setting of the study is presented, followed by the steps taken for the selection of participants and the teaching approach. Details of how previous studies, presented in Chapter 4, have informed the main study are described and how stricter and improved procedures were followed in the collection of data. Statistical tests are presented exploring the relationship between each training approach, one using guidelines and one patterns, and the performance of the participants in order to test the hypotheses related to the research objectives. Finally, the analysis of the data gained through the questionnaire and in the interviews is presented and a comparison of the perceived advantages and drawbacks of patterns and guidelines is presented.

Chapter 7 provides a discussion of the findings in terms of each of the research objectives. The results of the tests, related to the impact that patterns and guidelines have on the design and evaluation tasks of students, are discussed. The chapter continues with the findings about the students' preferences for and attitudes towards patterns and guidelines. The discussion indicates that patterns have a stronger impact on participants than guidelines and also that they are the preferred format for presenting usability principles and design advice. Finally, issues concerning the validity and reliability of the study are presented and also the limitations of the research method that should be taken into account.

Chapter 8 examines in more detail the patterns and the guidelines used in the study. Patterns and guidelines were presented in such way as to communicate, to a great extent, the same information. Most of the patterns were formed by converting existing guidelines. The chapter assesses the study patterns and guidelines and compares them with patterns and guidelines from existing, widely accepted and validated collections.

Chapter 9 provides an overview of the problem and the experimental approach. Conclusions concerning the research problem are presented. Implications of the research for training novice designers, presenting and capturing usability principles and experience with patterns are considered. Finally the contributions of the research to the body of knowledge are presented and the chapter concludes with potential areas for further research and work.

Chapter 2

Literature Review

2.1 Introduction

In building a web site developers have used traditional techniques, methods and practices that were borrowed from software development, software engineering and HCI. After the early years of the web it was evident, with the simple, everyday user being the target of a web site, that user-centred and usability engineering approaches were the key elements of a successful web experience. Usability can benefit from tools that capture knowledge and experience; guidelines and patterns are two such tools.

This chapter starts with a discussion of usability and how, with the tremendous growth of the internet, it affects more and more people, especially those that buy and sell on the web. Guidelines and patterns are briefly presented in Section 2.3. An introduction to patterns is given in Section 2.4, followed by a discussion about the origin of patterns and a presentation of several definitions and the main attributes and characteristics. The same section describes the format of patterns in HCI and reviews several pattern-based approaches that have been proposed. The use of patterns as a didactic tool is examined at the end of the section. Section 2.5 presents a brief history of guidelines, their format, and their drawbacks as they have been identified by relevant research. Section 2.6 discusses the way guidelines have been contrasted with patterns. The chapter finishes with a review of the existing empirical research into the use of patterns and guidelines in HCI and web design.

2.2 Usability

The aim of usability is to make a web site more efficient and enjoyable for average users to experience and is about making sure a person of average or even lower ability can use the site as intended without getting frustrated (Krug, 2000). The same writer puts the essence of usability more succinctly in one sentence: "Don't Make Me Think". This statement suggests that designers should avoid making users think too much while using and exploring a web site and that the flow of interaction should be as easy as possible without any effort and difficulty.

2.2.1 Definitions and dimensions of usability

One of the most widely cited definitions of usability is by the International Standards Organisation (1998). Usability is defined as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use." Effectiveness relates to "the accuracy and completeness with which users achieve specified goals"; efficiency relates to "the resources expended in relation to the accuracy and completeness with which users achieve goals"; and satisfaction is said to have the two components of "comfort and acceptability of use".

Shackel (1986, 1991) identifies four dimensions of usability: effectiveness, learnability, flexibility, and user attitude. Shackel considers utility and usability to be parameters of the acceptance of a model, with utility referring to how the functionality of the product meets the users' needs and usability to the user being able to use this functionality. Nielsen (1993) also makes a distinction between usability and utility, and considers that usability together with utility form the usefulness of the product. Usefulness in turn is said to contribute to the acceptance of the product. Nielsen states that "...utility is the question of whether the functionality of the system in principle can do what is needed, and usability is the question of how well users can use that functionality". Nielsen describes usability in terms of five attributes: learnability, efficiency, memorability, error recovery and satisfaction.

Preece et al. (2002) conceptualise usability in terms of the goals usability seeks to achieve: effectiveness, efficiency, safety, utility, learnability and memorability.

In the context of the World Wide Web, usability refers to the quality of the interaction with a web page. Keevil (1998) considers information the central point of a web site and describes usability as the extent to which users not only can find the information they want but also appreciate and use the information presented on a web

site. Brinck et al. (2002) point out that to achieve usability on the web the designer has to balance conflicting design objectives within the requirements and the context of the design. Usability affects the user and the extent to which they can carry out required tasks. The web design product should be all of the following: functionally correct, efficient to use, easy to learn, easy to remember, error tolerant and subjectively pleasing (Brinck et al., 2002).

Numerous other, similar or different, approaches to what is usability are to be found in the literature, depending on the perspective from which usability is examined. Other criteria and factors, apart from those already mentioned, are used to define or describe usability; such criteria are: attitude (Booth, 1989), usableness and usefulness (Gluck, 1997), likeability (Kengeri et al., 1999), control, helpfulness and adaptability (Oulanov and Pajarillo, 2002), and interactivity (Karoulis and Pombortsis, 2005).

The US Department of Health and Human Services (2006) adopts and extends Nielsen's (1993) view of usability to present a definition that accommodates recent technological developments: "Usability is the measure of the quality of a user's experience when interacting with a product or system – whether a Web site, a software application, mobile technology, or any user-operated device."

2.2.2 Growth of web and e-commerce

During the last decade there has been a phenomenal and explosive growth of the internet. Web-related applications have now assumed a central role in the life of people. Starting from simple sites with a few hyperlinked static documents, web pages are now the interface of large-scale web applications for e-commerce, banking, distribution of information, entertainment, collaborative working, education and several other activities (Offutt, 2002).

Web systems represent the largest application of user interface principles today (White, 2002). Statistics (Netcraft, 2007) show that as of May 2007 there were more than 118 million sites worldwide. The growth rate in 2007, so far, is similar to the growth in 2006 when a record 30.9 million sites were added to the internet. Apparently the growth rate in 2006 was almost double the growth rate during 2005 (17.5 million sites), which is mainly attributed to blogs and small business web sites. In three and a half years, from July 2003 to Feb of 2007, there was a 254% increase in the number of sites. These figures refer to the overall growth of the web. Indicative of the number of e-commerce sites and the growth of online trading and services is the number of Secure Socket Layer (SSL) sites. There were more than 660,000 SSL web sites in April 2007

compared with 3,282 sites in 1996, an average compound growth of 65% per year (Netcraft, 2007).

Figure 2.1 depicts the growth of the web during the last decade.

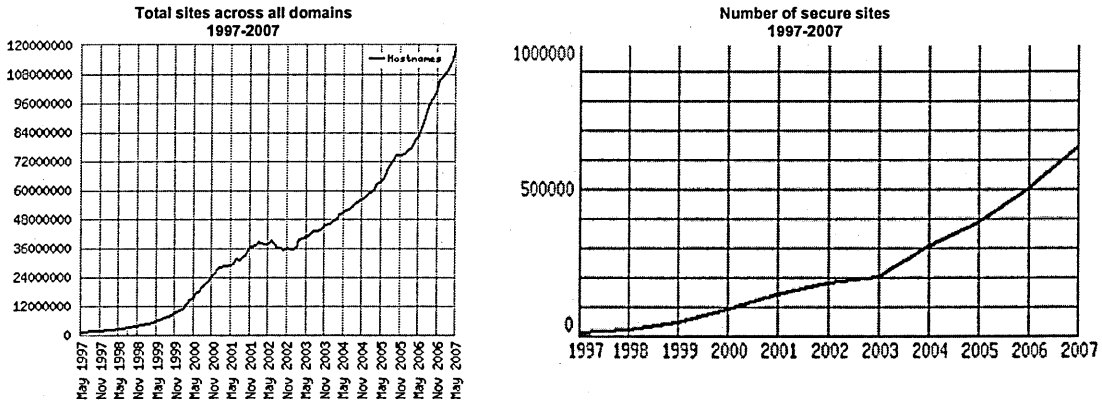


Figure 2.1: Growth of the internet (adapted from Netcraft, 2007)

The graph on the left shows the number of sites and the one on the right the number of SSL sites worldwide for the period 1997-2007.

2.2.3 Growth of online shopping

E-Commerce has been at the centre of the World Wide Web (WWW) explosion. Online shopping figures for the UK reveal a dramatic recovery from the 2000 dotcom crash. The internet market has increased by more than 350% in just five years from 2000-2005. Meanwhile, Britons spent £8.2 billion online in 2005 – an increase of 29% over the previous year 2004 (Verdict Research, 2006).

British consumers spent £7.66 billion online in the ten-week period to Christmas 2006; this is 54% more than the £5 billion spent online during 2005, and more than double the £3.33 billion recorded for Christmas 2004 (IMRG, 2007).

The increasing level of broadband penetration and the improved online security has boosted confidence in internet shopping. Consumers are more comfortable buying goods over the internet although internet spending is still relatively small and the great increase forecast is yet to come in the next few years. It is predicted that the amount of money spent online will reach a cumulative £40 billion for the year 2007, which represents 15% of all UK retail sales (Moneynews, 2007). The number is set to rise to £162 billion by 2020, accounting for almost 40% of total UK retail sales.

2.2.4 Importance and benefits of usability

Usability has been identified as an important factor for web sites by many researchers and the way a web site is designed can assist or hinder visitors (Ivory and Megraw,

2005). However, usability more that anything else affects visitors and potential buyers of online sites.

Usability and e-commerce are closely linked (Barnard and Wesson, 2003). Visitors will leave a web site if it is too difficult to use; they think that it takes too much effort to navigate; they can not find easily what they are looking for; long downloading times are required; or the home page fails to supply the necessary information (Nielsen, 2003). Scapin et al. (2000) point out that usability is widely considered not only an important requirement for user acceptance but becomes critical for e-commerce web sites competing to attract and keep customers. Nielsen (2000a) claims that usability is essential for survival on the internet and emphasises the fact that competition or the next shop is only "one click" away.

Mayhew (2003) strongly supports the view that usability in web business ensures good or great customer service and summarises the benefits and the risks of investing in web usability for a business as follows:

- Customers can find what they want to buy and sales are not lost.
- Customers will return to shop again and not search for alternative sources.
- Reduced cost in fixing and correcting usability problems.
- Satisfaction from user, little confusion and less time taken to accomplish desired goals.
- Customers are motivated to use online shopping, ensuring return of investment for the site and reduced costs for the business.

Nielsen (2000a) indicates that the usability of a web site directly impacts sales and the level of market capture. He illustrates this by explaining that the reason why usability is more important for the internet and the internet economy is that in product or software design users experience usability, bad or good, once they pay and buy the product, whereas on the web users experience usability first and consider buying the product later.

2.2.5 Lack of usability

An important question might be to what extent usability problems exists. Despite the growth of the internet and the great investment made in web design, poor usability remains a major problem. There are numerous summaries and statistics available about the benefits of good web design and the cost or the implication of bad web design, published by a variety of sources or based on research projects. Some of these are

quoted below to illustrate the impact that usability can have on a web site (Nall, 2005; Rauterberg, 2003).

- Most sites will waste between $1.5 million and $2.1 million on redesigns in 1999.
- A dollar spent on advertising during the 1998 holiday season produced $5 in total revenue, while a dollar spent on customer experience improvements yielded more than $60.
- 50% of sales are lost because visitors can not easily find content.
- 40% of visitors do not return due to a previous negative experience.
- 85% of visitors abandon a new site due to poor design.
- 62% of web shoppers gave up looking for the item they wanted to buy online.
- 39% of test shoppers failed in their buying attempts because sites were too difficult to navigate. Additionally, 56% of search attempts failed.
- It is quite normal for e-commerce sites to increase sales by 100% or more as a result of their usability.
- While internet sales continue to soar, recent surveys indicate that between 27 and 66% of users abandoned their shopping carts.

Forrester Research (2003), which specialises in business research data and analysis, after examining 375 sites between November 1999 and July 2003 for customer experience estimates that 60% of sites score below zero on a scale from -50 to +50. More specifically, the research examined 125 sites between March 2002 and July 2003. The review estimates that,

- 78% failed to provide comprehensive and precise search results.
- 66% failed to provide an in-depth overview of site contents on the home page.
- 64% did not used space effectively in page layout.
- 50% used text that was not legible.

Forrester Research (2005) evaluated the customer experience on 20 major commercial sites in the USA in four major industries: retail, media, auto, and travel. Basic design flaws were found even on the best of the sites. The best site scored 25 points on a scale from -50 to +50, while five sites earned a negative overall evaluation. Again it was estimated that only 58% succeeded in navigation and only 56% on presentation.

A recent evaluation of the four largest Australian banks shows that all four sites contained major usability flaws (Forrester Research, 2006). As a result of this the banks are losing money because customers are using more expensive call centres, bank branches or even switching to another bank. It is estimated that each bank could save more than $7 million a year by improving the sites and making them more user-friendly.

In its latest report published this year, Forrester Research (2007) admits that, although scores have increased since 2001 when only 3% of the sites received pass scores, sites now provide better user experience but it is still hard for visitors to find value within a site and there is vast room for improvement.

All these reviews are focused on developed countries (USA, UK, EU, etc.) where the internet has taken off and designers have learned from their mistakes and have become more knowledgeable. In other countries it is expected that usability errors are more common and severe. To a frequent and experienced user of the Internet the above figures may seem overestimations; however, such users have already become accustomed to their favourite sites or have adjusted they preferences and visiting habits to sites that they like or find easy to use.

2.3 Patterns and guidelines

Given the tremendous growth in the number of web sites (implying demand for accelerated design processes) and the existing level of poor usability (implying demand for improvement), several researchers indicate that not only methodologies and processes are needed (Ivory, 2001; van Duyne et al., 2002) but also tools and techniques to help with design. The following are some of the available tools and techniques in design: principles (Dix et al., 2004; Norman, 1988; van Duyne et al., 2002), standards (International Standards Organisation, 1998), golden rules (Shneiderman, 1998), style guides (Apple Computer, 1996; Microsoft Corporation, 2001), heuristics (Nielsen, 1993; Nielsen, 1994), guidelines (Mayhew, 1992; Nielsen and Tahir, 2002; Smith and Mosier, 1986) and design patterns (Tidwell, 2002, 2005; van Duyne et al., 2002; van Welie, 2001-2007). Such tools should be based not only on theory but also on existing knowledge and experience.

It is widely accepted that design knowledge and experience contribute significantly to the design of more usable systems. Guidelines are a traditional format for capturing knowledge and experience and presenting advice about interaction design. Although guidelines can be useful in guiding the designer to take the right decision and prevent errors in interface design, several authors have argued about the shortcomings

of guidelines (Borchers, 2001; Mahemoff and Johnston, 1998; Griffiths and Pemberton, n.d.; van Welie et al., 2000). According to these authors, guidelines are too simplistic or too abstract and sometimes difficult to interpret. Additionally, guidelines may offer contradictory advice and do not discuss the context to which they apply or the problem they address.

In recent years, there has been a growing interest in design patterns as an effective way of capturing and communicating design knowledge. A pattern describes a successful solution to a design problem within a certain context (Tidwell, 1999). Patterns communicate insights of the solution to a design problem, the forces involved in the problem, the rationale for a solution and the trade-offs in applying the solution. One or more diagrams of pictures are included presenting examples of the application of the pattern. A pattern contains links to both higher and lower-level patterns forming in this way a pattern language, a set of interlinked patterns for a specific domain.

Patterns are different from guidelines in a number of ways (Chung et al., 2004). First, guidelines focus mostly on small detailed issues of design while patterns provide more generic design guidance. Second, patterns are generative, helping designers create solutions by providing much richer information than guidelines. Third, patterns provide links to other patterns, helping designers address both high-level design issues and low-level problems.

2.3.1 Brief history of patterns

Design patterns were first introduced by Christopher Alexander and his colleagues in the domain of architecture (Alexander, 1979; Alexander et al., 1977). According to Alexander (Alexander, 1979, p. 247), "each pattern is a three-part rule, which expresses a relation between a certain context, a problem and a solution". His pattern language is a set of 253 patterns organised hierarchically, with high-level patterns addressing design issues for cities, followed by patterns for parts of the community, down to low-level patterns for houses and rooms. There are links in each pattern pointing to both higher and lower-level patterns in the hierarchy. By traversing the hierarchy of patterns using these links, a set of patterns will be collected that will help to generate a physical design. A designer can start using patterns to build and plan towns. These patterns are linked to patterns for neighbourhoods, which are using patterns to design houses, and patterns for houses are using more patterns about room design, etc.

Patterns do not prescribe a certain design approach with predictable or similar results. Designers can use the patterns in many different ways. According to Alexander,

"Each pattern describes a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice" (Alexander et al., 1977, p. x). Erickson (2000) highlights this further, explaining that, "perhaps the most common misconception about pattern languages is that they are sets of templates that are rigidly applied to situations. This is not the case".

Patterns are used in software engineering to present and communicate design solutions to common problems (Gamma et al., 1994; Rising, 1998). The pattern captures the structure of the software components and their static and dynamic behaviour (Schmidt, 1995). The solution is presented in terms of suggested code structures (Dearden and Finlay, 2006).

Since gaining wide acceptance and success in the software engineering community, patterns have been the focus of interest in HCI. Borchers (2000) argues that patterns in architecture describe aspects of the environment people interact with while interface designers create artefacts users interact with. The shared focus on interaction of architectural design and interface design make HCI and architecture have much more in common than architecture and software engineering (Borchers 2000). This relationship suggests that the advantages of developing and using patterns may be even greater in HCI than in Software Engineering (Finlay et al., 2002).

Patterns, apart from general interaction design patterns, have been developed in a wide range of HCI areas as identified by Dearden and Finlay (2006): ubiquitous computing, safety-critical interactive systems, multimedia exhibits, hypertext and hypermedia, personal digital assistants, socio-technical systems, and games design.

More domain specific patterns, to name a few, include patterns for online newspapers, learning management systems, business modelling, cooperative interaction, e-books, interaction patterns for musical applications, personal authoring systems, e-shop environments, e-learning design patterns, web-based educational systems, interaction design patterns for cooperative work, security patterns for web applications, patterns for groupware applications, and patterns for visualisation design.

Patterns have expanded into the domain of teaching and education. Fincher and Utting (2002) examined pedagogical patterns and presented functional and non-functional requirements of pattern languages necessary to gain widespread acceptance. Pedagogical patterns present solutions stating recommended courses of action, organisation of resources and activities to solve problems in pedagogy (Kotze et al.,

2006b). Sharp et al. (2003) suggest use of pedagogical patterns to capture and disseminate the essence of practice in a compact way easily accessible to instructors.

While patterns capture good practice anti-patterns on the other hand document solutions that look like a good idea but go wrong when applied. Anti-patterns describe solutions that should be avoided. The use of anti-patterns for knowledge transfer may have negative effects (Kotze et al., 2006a; van Biljon et al., 2004).

2.3.2 Definitions and characteristics of patterns

There is no formal and universally accepted definition of a design pattern. Dearden and Finlay (2006) point out that there is a consensus that, "a pattern is a structured description of an invariant solution to a recurrent problem in context" and comment that although this approach is not universal, it reflects Alexander's problem oriented approach.

Borchers (2000) suggests that pattern languages should be a starting point for defining HCI patterns. Lea (1994, cited by Dearden and Finlay, 2006) notes that Alexander does not provide a formal definition of patterns and later points out that the mantra "a solution to a problem in a context'' is acceptable but may cause confusion (Lea, 2000).

Alexander and several other researchers have offered and suggested different descriptions of patterns (Dearden and Finlay, 2006).

In order to better illustrate the concept of pattern, some frequently presented definitions in the pattern literature are repeated here:

> Each pattern describes a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice (Alexander et al., 1977, p. x).

> A pattern is the abstraction from a concrete form which keeps recurring in specific non-arbitrary contexts (Riehle and Zullighoven, 1996, p. 3).

> Each pattern is a three-part rule, which expresses a relation between a certain context, a problem, and a solution (Alexander, 1979, p. 247).

> A pattern is a named nugget of insight which conveys the essence of a proven solution to a recurring problem within a certain context amidst competing concerns (Appleton, 1998, p. 2).

Fincher (1999a, 2000a) states that there is not a general definition of what constitutes a pattern definition and presents five characteristics of patterns and pattern languages as

functional requirements that distinguish them from other forms or mechanisms of knowledge transfer:

- **Capture of Practice**: A pattern captures a specific practice and presents it in a problem-solution pair.
- **Abstraction**: The pattern represents an abstraction of the practice.
- **Value System**: A pattern encompasses and carries values to the target audiences.
- **Structuring Principle**: Patterns are organised in a pattern language or a catalogue.
- **Presentational Form**: Patterns are presented in a uniform way.

Winn and Calder (2002) argue that a definition that "captures the pattern concept is neither worthwhile nor possible". Instead of a definition, Winn and Calder, following a similar approach to Fincher (1999a, 1999b), suggest and document nine essential characteristics of patterns as "a means of clarifying and developing our understanding of the concept and thus our ability to identify and use patterns" (Winn and Calder, 2002). These characteristics can be summarised as follows:

1) A pattern implies an artefact: The best way to present the artefact is a picture or a graphical representation that helps designers acquire a "big-picture understanding" of the pattern. This understanding is used to adapt the pattern to their specific needs and situations.

2) A pattern bridges many levels of abstraction: A pattern links high abstract levels of design or vague ideas to intermediate levels and low implementation details. For example, a teaching pattern for a programming course includes a general design paradigm together with the algorithm and the sample code.

3) A pattern is both functional and non-functional: The functional issues of a pattern refer to the presentation of a solution to a problem while the non-functional aspects of the pattern refer to its feasibility, the rationale behind the solution and how conflicting forces are balanced. The non-functional issues help designers adapt the documented solution to another context.

4) A pattern is manifest in a solution: A pattern is identifiable in the developed artefact. Although the pattern may capture an abstract idea, the pattern's manifestation is identifiable because a pattern combines a design process and a design structure. Winn and Calder point out that this is true in software engineering patterns. It is also true for HCI designs where patterns in well-designed sites are clear and visible.

5) A pattern captures system hot-spots: A solution to a problem should accommodate modifications as the developed system changes or evolves. Winn and Calder explain that a pattern captures not only the invariant elements of a good design but also its "hot spots", i.e. the parts of the solution that are possible to change or be modified. In this way, a pattern provides a mechanism for controlling the interaction between invariant and changing elements of a system.

6) A pattern is part of a language: The notion of a pattern language was a strong point in Alexander's argument for patterns. A pattern is supported by other patterns and all patterns form a pattern language. In this way a pattern language as a whole is more worthy than all the patterns in the language.

7) A pattern is validated by use: Patterns are validated only through practical usage and a pattern proves its usefulness through widespread evidence of its existence and its successful application within existing systems. Known examples are an indispensable part of the format that patterns are presented. Only when there is evidence of the pattern and the pattern has been applied on numerous occasions has it been validated. This characteristic relates to Appleton's idea that "...a pattern is a proven solution to a recurring problem" (Appleton, 1998).

8) A pattern is grounded in a domain: Patterns are associated with a specific domain and usually have no value or even could be confusing outside the domain. Moreover, patterns within a pattern language share a common domain.

9) A pattern captures a big idea: Patterns do not focus on trivial problems, and every solution does not warrant a pattern. A pattern presents a solution to a crucial, important and difficult problem. If the problem is trivial or insignificant the value of the pattern is diminished.

These characteristics are focused on software design patterns; however, they reflect attributes and dimensions of HCI patterns as well. Dearden and Finlay (2006) point out that some of these attributes, such as system hotspots, are not considered important for HCI patterns. Also, they point out that others, such as the levels of abstraction (pattern characteristic 2) are implied through the pattern's generic solution and the specific examples, while the focus on the artefact (pattern characteristic 1) is made apparent through the notions of generativity and construction.

To the above list of nine characteristics four more can be added that have been discussed by other researchers in the field of HCI (Dearden and Finlay, 2006):

10) Patterns support a 'lingua franca': Patterns should serve as a common language, allowing people of different background, designers and users, to talk together about design issues.

11) Different patterns deal with problems at different scales: Patterns can describe high-level design issues (task structure, business issues, etc.) while others focus on small details and problems of interaction design and interface.

12) Patterns reflect design values: Patterns reflect design values depending on the priorities, motivation and judgment of the writer. Patterns encompass values which are important to users, other designers and society (Fincher, 1999a).

13) Patterns capture design practice: This characteristic is similar to Winn and Calder's characteristic (4) and (7) but is focused and refers to the process of identifying and developing patterns.

The list of 13 characteristics is used to identify the extent to which each characteristic has been, implicitly or explicitly, indicated by several authors in their position towards patterns.

Table 2.1: Characteristics of patterns (adapted from Dearden and Finlay, 2006)

Characteristic	Winn and Calder, 2002	Bayle et al., 1998	van Welie et al., 2000	Granlund et al., 2001	Borchers, 2000	Finlay et al, 2002	Fincher and Utting, 2002	Ericsson, 2000	van Duyne et al., 2002	Tidwell, 1999
1. A pattern implies an artefact	●		?	?	●	?	?	?	●	?
2. A pattern bridges many levels of abstraction	●						?		?	
3. A pattern includes its rationale (functional and non-functional)	●	?	●	?	●	?	?	?	●	?
4. A pattern is manifest in a solution	●									
5. A pattern captures system hot spots	●									
6. A pattern is part of a language	●		?	●	●	●	●	●	●	?
7. A pattern is validated by use	●	?	●	?		●		?		●
8. A pattern is grounded in a domain	●	?	?	●	●	?		●	●	
9. A pattern captures a big idea	●						●			
10. Patterns support a 'lingua franca'		●	?	?	●	●	●	●	?	●
11. Different patterns deal with problems at different 'scales'		●	●	●	●	?	?	●	●	●
12. Patterns reflect design values		●	?		●	●	●	●	?	●
13. Patterns capture design practice		●	●	?	?	?	●		●	?

Table 2.1 (adapted from Dearden and Finlay, 2006) shows how each one of the different characteristics has been adopted by researchers in HCI; a bullet indicates an explicit statement while a question mark indicates an implied agreement through the use of patterns. Dearden and Finlay, using their table, conclude that features such as level of abstraction and focus on design are implied by HCI authors while the most commonly agreed on characteristics in the field of HCI are the use of patterns as lingua franca, that patterns support a pattern language, that patterns address problems at different scales and that patterns capture design practice.

2.4 Patterns in HCI

In recent years, HCI researchers have started to explore the potential of design patterns as a vehicle for user interface design. It was suggested that designing interfaces is closer to architecture (Borchers and Thomas, 2001) than any other design discipline, implying that the concept of patterns could be easily adopted and explored by the HCI community. At the INTERACT '99 workshop, a "user centred" description was given, stating the intended use and aims of an HCI pattern language: "The goals of an HCI pattern language are to share successful HCI design solutions among professionals, and to provide a common language for HCI design to anyone involved in the design development, evaluation, or use of interactive systems" (Borchers and Thomas, 2001).

This study is focused on patterns that address interaction and interface design issues and more specifically patterns about web interface design. Interaction design patterns are patterns where "a problem is stated in the domain of human interaction issues and the solution is stated in terms of suggested perceivable interaction behaviour" (Dearden and Finlay, 2006). See Appendix 2.1 and Appendix 2.2 for two design patterns, taken from different pattern collections.

A number of pattern languages (Laakso, 2003; The Brighton Usability Group, 2003; Tidwell, 2002; van Welie, 2001a) for user interface have been developed, starting with Tidwell's pattern language (Tidwell, 1999). Lately, with the exponential growth of the internet, the focus and interest of research has shifted towards web interface design.

A number of books (Graham, 2003a; Tidwell, 2005; van Duyne et al., 2002) have been published containing patterns for web design interface, while several web sites (Graham, 2003b; Irons, 2003; van Welie, 2001-2007; Web Patterns, 2006; Yahoo!, 2005) present patterns and pattern languages.

Yahoo! (2005) published a set of patterns in order to reduce design time for design teams, to enhance usability, and to communicate the latest standards and trendy

solutions in web design. Patterns, 27 of them, are presented with links to other related patterns and to related programming code, thus making it easier for designers to implement the patterns in their design code.

Another big company that introduced and documents knowledge about user interface in pattern format is SAP (SAP Info, 2006; Latzina, 2003; von Udo, 2004; Waloszek and Eberleh, 2003). Although no available pattern language is known up to now, there are rumours that patterns are widely used within the development teams of the company.

A presentation of a pattern language on the internet offers several advantages:

- The pattern language is accessible by a wider range of people, serving as a practical guide to designers, practitioners and developers of web-based systems.
- The web site, apart from being a pattern repository, is a forum to exchange ideas and make comments on existing patterns, thus refining the existing pattern language.
- It is easier to enrich the set of patterns with more patterns, having several researchers and designers contributing patterns encompassing new ideas and "best practices" of their profession.

2.4.1 Format and structure of patterns

Patterns in a pattern language are presented using the same format. It has been suggested that it is this format that is particularly suitable for representing aspects of HCI and that makes patterns easier to understand and more attractive to use (Borchers, 1999; Borchers, 2000; Pemberton, 2000). At the CHI2003 workshop, the Pattern Language Markup Language (PLML) was proposed as a standard format of HCI pattern languages (Fincher, 2003).

Alexander's pattern format consists of the following: the name of the pattern; a ranking of its validity; a picture as an example of its application; the context in which it is used with links to higher-level patterns that may implement the present pattern; a short problem statement; a detailed problem description; the solution of the problem and the forces that may constrain or suggest alternative solutions; a diagram illustrating the application of a pattern; and finally links to lower-level patterns that may be needed to realise the present pattern. Although other more recent pattern languages have adopted a different format, the key attributes of the pattern remain the same.

There are patterns that follow: 1) an "Alexandrian form", 2) patterns that include elements from software design patterns, and 3) patterns that depart from the "Alexandrian" problem-solution format (Fincher, 2000b). Patterns that belong in the first category are patterns from Van Duyne et al. (2002), Graham (2003a, 2003b), Chung et al. (2004) and Saponas et al. (2006). Patterns that belong to the second category are patterns from Tidwell (1999) and van Welie (2001-2007). Patterns in the third category are from Tidwell (2005). Yahoo! (2005) patterns are described by Fincher (2000b) as hybrid and include elements from many other pattern formats. See Figure 2.2 for a pattern from Chung et al. (2004) following the Alexandrian format.

C6 • PRIVACY-SENSITIVE ARCHITECTURES

Figure 1. Just as the architecture of a building can influence how it is perceived and used, the architecture of a ubiquitous computing system can influence how people's perceptions of privacy, and consequently, how they use the system.

• BACKGROUND

FAIR INFORMATION PRACTICES (C1), RESPECTING SOCIAL ORGANIZATIONS (C2), and BUILDING TRUST AND CREDIBILITY (C3). This pattern, together with REASONABLE LEVEL OF CONTROL (C4) and APPROPRIATE PRIVACY FEEDBACK (C5), forms the basis for designing and building privacy-sensitive systems.

• PROBLEM

How should ubiquitous computing systems be built to ensure that a reasonable level of privacy is maintained?

• SOLUTION

One way of building a privacy-sensitive architecture is KEEPING PERSONAL DATA ON PERSONAL DEVICES (C15). This way, only the user's personal device contains personal information. This is a decentralized approach that often requires an infrastructure that supports this kind of architecture, such as a *location-support* system with beacons that can tell individual devices where they are. (This is in contrast to *location-tracking* systems where the user's device chirps out its location to others.)

Encryption is another way to ensure that no eavesdroppers can see data they are not authorized to see. A trusted computing base can also be used to make sure that data is handled properly, though there are few established standards in this area yet. A trusted computing base can be useful in guaranteeing that any mechanisms developed for a REASONABLE LEVEL OF CONTROL (C4) and for APPROPRIATE PRIVACY FEEDBACK (C5) are correct and have not been circumvented.

Privacy can also be implemented in the physical layer, by deploying sensors only in places that are appropriate. Doing so creates PHYSICAL PRIVACY ZONES (C8) separating where people are being monitored from where they are not.

• RELATED PATTERNS

Some of the control and feedback mechanisms that need software and hardware support for privacy include LIMITED ACCESS TO PERSONAL DATA (C10), LIMITED DATA RETENTION (C12), NOTIFICATION ON ACCESS OF PERSONAL DATA (C13), and PARTIAL IDENTIFICATION (C7).

Figure 2.2: A Pattern from Chung et al. (2004)

Although the key attributes in the presentation of the pattern languages have remained the same, the diversity of presenting a pattern is one of the drawbacks of patterns and might cause some confusion between practitioners (who could possibly

want to get advice from more than one language). Despite attempts to standardise the presentation of the patterns, and while patterns have emerged in HCI for almost a decade now, there is no universally accepted format and most of the well-known pattern languages follow different layouts. The need for a standardisation of the pattern format is essential in order to help patterns to be widely adopted by the design practitioners, although such standardisation may require a substantial effort. See Table 2.2 for the format of design patterns that are widely available, including the format adopted in other experiments with patterns and the format adopted in this study for patterns and guidelines.

2.4.2 Pattern-based approach to design and supporting tools

Several researchers have proposed specific approaches, models or frameworks based on the use of patterns to help with the design of artefacts.

Granlund et al. (2001) present a pattern-supported approach that uses patterns even before the actual design. The approach tries to link patterns to a User Centred Design lifecycle. Five types of patterns are used: Business Domain Patterns provide an entry to the system; Process Patterns and Task Patterns help with the definition and conceptual design; finally, Navigation Design Patterns and GUI Design Patterns are used for the actual user interface design of the system. Each set of patterns starting from the first one points to the next set, helping to define and suggest the patterns that will be used at the next stage.

Borchers (2001) describes how patterns can be employed within the development process, covering all stages of the development life cycle, from user requirements and system definition, through the UI design and evaluation. His approach uses pattern languages describing HCI, software design and application domain concepts to present an interdisciplinary pattern framework. Using Nielsen's (1993) usability engineering lifecycle model, Borchers explains the use of patterns at each stage of the process. During the initial stage of the lifecycle the development process can help in the creation of new patterns. Later, patterns can be used as common language between users and design teams or between design teams. In this way patterns can help generate design solutions. Patterns can also support the evaluation of the design by providing direct or alternative design ideas. During the process of evaluation, new patterns will be created and old ones will be refined.

Table 2.2: Elements used to describe patterns in several pattern collections.
The last two rows present the Koyani guidelines format and the pattern format used in this study

Alexander et al., (1977)	▪Pattern Name and validity ranking	▪Example	▪Background to the pattern and links to other patterns	▪Problem ▪Body of problem and forces	▪Solution Statement	▪Diagram	▪Links to other patterns
Tidwell, (2005)	▪Pattern Name	▪Example	▪What	▪Use When (with links to other patterns)	▪Why ▪How (both with links to other patterns)	▪Examples	
Tidwell, (1999)	▪Pattern Name	▪Examples (text)	▪Context (with links to other patterns)	▪Problem ▪Forces	▪Solution	▪Example	▪Resulting Context (with links to other patterns)
van Welie, (2001-2007)	▪Pattern Name	▪Problem statement	▪Solution ▪Example	▪Use When (with links to other patterns)	▪How ▪Why	▪More Examples	
van Duyne et al., (2002)	▪Pattern Name and pattern code or classification label	▪Example with explanatory notes	▪Background	▪Problem ▪Body of problem and forces, guidelines, comments, examples	▪Solution Statement	▪Diagram	▪Consider these other patterns
Yahoo!, (2005)	▪Pattern Name	▪Problem summary ▪Example	▪Use When		▪Solution ▪Rationale ▪Accessibility issues	▪Links with Examples ▪Links to examples as used on Yahoo! ▪Links to code examples	▪Links to other related patterns
Graham, (2003a, 2003b)	▪Name and rating ▪List of alternative names	▪Image	▪Context including other related pattern names	▪Problem	▪Solution-Therefore		▪Resultant context (with links to other patterns) ▪Contributors and sources
Chung et al., (2004)	▪Name	▪Example	▪Background	▪Problem	▪Solution		▪References to relevant research or related patterns
Saponas et al., (2006)	▪Name	▪Example	▪Synopsis ▪Background	▪Problem	▪Solution (with links to other patterns) ▪Forces		▪Evidence (examples in text) ▪Literature with relevant references
Koyani et al., (2003)	▪Heading-title ▪Strength of evidence and relative importance				▪Guideline ▪Comments about the guideline, background, how to apply it	▪Examples (sometimes with captions)	▪Sources and references
Adopted format of study	▪Pattern Name	▪Example	▪Use When	▪Problem ▪Body of problem and forces, guidelines, comments	▪Solution	▪Other patterns to consider	▪ More Examples

Note: Each row displays the pattern elements of a pattern collection. Each bulleted item represents a pattern element. Elements along a row (and from top down in each cell) are in the order of presentation within a pattern. Columns represent similar elements, although that was not always possible

Borchers' (2001) framework reflects an ideal situation which requires multiple pattern languages to be used during the process. These languages should be well-refined and structured in order to be accessible by the design teams involved in the development process. However, pattern languages at the moment are not optimised to that degree of excellence.

Van Duyne et al. (2002) are focused on developing a web site for commercial purposes, using a framework of principles, processes, and patterns. They present a pattern language for web site design that addresses various design aspects, including site genres, site architecture and navigation, home pages, and page layouts. A significant number of patterns in their language address issues and concepts regarding e-commerce sites, such as building trust and credibility or optimising the "customer experience". They extend the traditional user-centred design approach, which they claim is focused on usability goals, and present a customer-centred approach paying special attention to business and marketing goals. It is suggested that patterns should be easily incorporated within the development process of a web site. An iterative design is considered an ongoing cycle of design, prototype and evaluation throughout the development process and patterns can be used in each step of the iterative process. Van Duyne et al. (2002) explain that patterns can be used during the design approach: abstract and high-level patterns should be used at the early stages of the design process while low-level patterns are used at the later stage to add more detailed design features.

Patterns have been used not only as tools supporting design but have also been implemented as a means to provide an evaluation of museum sites (van Welie and Klaasse, 2004), and to provide usability rules and the desired functionality in a usability evaluation process of e-commerce sites (Sartzetaki et al., 2003) and general web-based systems (Georgiakakis et al., 2007; Psaromilingos and Retalis, 2004).

Sometimes in these approaches, tools to assist and support the use of the patterns are suggested. Such tools supporting the use of patterns can be employed by different groups of users in multiple ways (Fincher et al., 2003) but can mainly be employed by designers and developers. It is envisaged that a tool can provide guidance and help in using patterns to inform the product from the early stages of development throughout the design lifecycle.

Sinning et al. (2004) employ patterns in a model-based development approach for interactive applications with the help of various tools. Patterns are used as building blocks in order to create the models required for this approach.

UPADE (Seffah and Javahery, 2002) is a tool that facilitates the process of browsing, searching and editing a set of HCI patterns stored in a database. Patterns can be modified and combined to design more complex systems while the designer can use the tool to create new patterns.

Damask (Lin and Landay, 2002, 2003) is a tool to support the early-stage design of multi-device user interfaces, such as PCs, PDAs and mobile phones. The designer will sketch a user interface for one device using patterns and the tool will generate user interfaces optimised for other devices in an automatic way. The tool uses a model-based user interface approach to abstract a user interface and create a prototype that will be further modified. The tool incorporates design patterns from Van Duyne et al.'s (2002) pattern language. Damask allows the designer to create his own patterns or share patterns with other designers. The tool, very innovative in its conception, needs further development in order to include more domains, apart from e-commerce patterns. One direction that could be taken is to associate semantics with the design objects (Ivory and Megraw, 2005) in order to help designers.

Gaffar et al. (2003) propose MOUDIL, an integrated pattern environment providing tool support. The environment will be used to collect, edit, navigate and view patterns. Frizell and Hubscher (2002), in order to support a pattern language for web-based instruction, suggest a design tool that can help the designer in the selection of patterns, taking into account the learners and the objectives of the course.

Despite the extensive work on and research into tools using or supporting the use of patterns, these tools are still in prototype form and need extensive development to be of any practical use.

Advocates of a pattern-based approach to design, with or without tool support, suggest that patterns can support a design methodology and process. Patterns can cover all aspects of the development life cycle, from identifying user requirements and conceptualising the system through to UI design and evaluation.

Although tools may help designers incorporate patterns in the development process and the design artefacts, the use of patterns does not necessitate a tool-based approach or a complex formal development process. Patterns can be used at any stage, provided the designer takes into account all the forces described in the pattern. Alexander's advice in using patterns is to form an initial set of patterns related to the purpose of the design (Alexander et al., 1977). The same approach is suggested and used by several developers of pattern languages for web sites (Graham, 2003a; Montero et al., 2002; van Duyne et al., 2002): Starting from an initial point, select all the lower-

order patterns or all the patterns that are linked to the present pattern. Repeat the same for each newly added pattern until all the patterns related to your design have been selected. At the end, scan the language and select patterns that can be of interest. All the selected patterns in the set are candidates for the design although the final product may not contain all of them. Some of the initial patterns may be discarded at a later stage of the process.

2.4.3 Patterns as a didactic tool in HCI

Patterns have been used not only to document experience and knowledge but also as a teaching aid to introduce design concepts and good design practices to students.

Borchers (2001, p. 361) recognises the educational power of patterns and states that "Alexandrian patterns are, above all, a didactic medium for human readers". The same author (Borchers, 2002), having used patterns to teach two HCI design courses, suggests that patterns can lead to above average retention of design values. Borchers concludes that patterns have great potential since they are not just interesting as a topic, but also useful as a tool and format to teach basic HCI design principles.

Seffah (2003) considers patterns useful not only as a design tool but also as a learning resource, part of an educational framework for effective training and improving developers' skills in Human Centred Design. In particular, user interface design patterns are considered useful for teaching students to master visual information design, including screen layout and interaction design.

Griffiths and Pemberton (2003) used patterns as a means for teaching the interaction design of software systems. Three different approaches were used in their study: teaching about patterns, teaching through patterns and discovering patterns. The first approach was not practical while the third one, on which their study was focused on, proved to be very difficult mainly due to the fact that high-level skills are required for discovering new patterns. Regarding the second approach, teaching through patterns, the authors informally report that their impression is of an improved quality of discussion within the design teams and an improved final product; however, they also express the need to verify this impression more formally.

Laakso et al. (2000) used their teaching experience of user interface courses to develop a collection of 25 user interface patterns and pattern candidates. Some of these patterns were adapted from existing patterns for their own needs. Subsequently the patterns were used as a tool and learning aid for user interface designers. They point out that initial designs have consistently improved and in some cases the students were

producing high quality interface designs in a very short time. Laakso et al. (2000) conclude that they do not yet have sufficient experience of the overall effect patterns have on actual projects. Their study, however, is based on observations where students trained with patterns are compared with students who did not have any other form of training to balance the pattern training effect. Moreover, no further details are given as to what aspects of design were improved.

2.5 Guidelines

Guidelines are a traditional format for capturing knowledge and experience, and presenting advice about design in general and interaction design in particular. Guidelines can be useful in guiding the designer to take the right decision and prevent errors in interface design from the early stages of the development. During the late stages of the design process guidelines can be used as a check list to assess the design.

Guidelines may be based on design principles about human-computer interaction and interface design, on cognitive psychology and/or on practical experience. Sometimes guidelines express conventions and standards. Ivory et al. (2001) state that most of the guidelines are based on anecdotal, observational evidence and that are usually not empirically validated.

The first comprehensive set of guidelines for user interface design is by Smith and Mosier (1986). Many computer companies and organisations have presented their own detailed usability and interface guidelines (Apple Computer, 1996; Apple Computer, 2003; Microsoft Corporation, 2001; Open Software Foundation, 1991).

Newman and Lamming (1995) point out that guidelines play four major roles in the design process:

- Raising awareness of concepts.
- Assisting in design choices.
- Offering strategies for solving design problems.
- Supporting evaluation in the form of heuristics or applied as usability checklists.

The growth of the internet has effected more collections of guidelines to appear addressing design and usability problems of web design and web interfaces (Borges et al., 1996; Comber, 1995; Farkas and Farkas, 2000; Ivory and Hearst, 2002; Ivory et al., 2001; Koyani et al., 2004; Lengel, 2002; Levine, 1996; Lynch and Horton, 2002; Nielsen, 2000a; Preece et al., 2002; Shneiderman and Plaisant, 2005; Sklar, 2003; US

Department of Health and Human Services, 2006; Yale C/AIM, 1997). Furthermore, international computer or smaller web development companies may have developed and used their own particular set of guidelines for web design (IBM, 1999; Sun Microsystems, n.d.). Apart from collections of general purpose guidelines, smaller sets of guidelines addressing problems for particular type of sites (e-commerce sites, home pages, etc.) or with specific design aims (enhancing trust, enhancing search engines, enhancing web accessibility) are available on the internet or published in book form (Nielsen and Tahir, 2002; Nielsen Norman Group Report, 2000a, 2000b, 2001; World Wide Web Consortium, 1999).

2.5.1 Brief history and format of guidelines

The Smith and Mosier (1986) guidelines are a comprehensive corpus of 944 user interface guidelines, part of a USA Air Force project (see Figure 2.3). These guidelines are presented in six sections, in a military style manual.

2.2 DATA DISPLAY: Data Forms
2.2/8 + Distinctive Label Format

Ensure that labels are distinctive in format/positioning to help users distinguish them from data and other display features.

Example: Labels might be capitalized when data are displayed in mixed case, or might be dim when data are bright, or might perhaps be displayed in a different font where that capability exists.

Example: See sample displays in this section.

Reference:
EG 3.2.3
MS 5.15.3.1.10.c 5.15.4.3.5

See also: 4.0/8

2.2 DATA DISPLAY: Data Forms
2.2/10 + Labeling Units of Measurement

Include the units of measurement for displayed data either in the label or as part of each data item.

Example:
```
| DISTANCE (KM): __ __ __ |
          or
| DISTANCE: __ __ __ KM |
```

Reference:
BB 1.8.8
MS 5.15.4.3.10

See also: 1.4/21

Figure 2.3: Two Smith and Mosier (1986) guidelines

Each guideline is given a unique code number and a short title indicating the particular "subject matter" that the guideline addresses. Following that, each guideline is stated as a single sentence. In many instances a guideline will be explained by one or more examples. Good and bad examples are given, but they are usually narrative. If a particular example refers to a computer output then the example is a textual output of the screen. In quite a few guidelines in the example section there is no example but only the sentence "See sample displays in this section" and the reader is advised to see other

examples included in the section. Where applicable, examples may be followed by notable exemptions referring to cases where the guideline should not be applied. There are supplementary sections of comments when further explanation of the guideline is needed, presenting the reasoning behind a guideline or clarifying other important points. References are given to other collections of design guidelines and research relevant to the guideline. Finally, the reader is presented with cross-references to other guidelines by stating the code number of guidelines relevant to the current. The Smith and Mosier guidelines are one of the oldest set of guidelines that have survived up to now.

Apple Computer (1996) presents a set of 75 web design guidelines arranged in 12 sections, from general guidelines about the site, in a section about planning a site, down to small tips about HTML tags. Apple Computer uses a narrative format to present each guideline, consisting of a title, a do this or don't do this sentence, followed by an explanation of the guideline. There are no graphic examples accompanying the guidelines, although occasionally examples are given in the form of "...for example if ....". Apple Computer (2003) uses the same format to present guidelines for Human Interface Design. This time graphic examples of user interface are included, but only when necessary. This manual is intended mostly for developers building applications for the Mac OS.

Most recent collections of web design guidelines do not follow a specific format. Each guideline is presented in a narrative form and only occasionally a picture accompanies the text to illustrate the principle and the application of the guideline. Most of the time guidelines are not well organised and their presentation and typography do not follow a particular style. Guidelines, when presented in books, are usually embedded within text (Brinck et al., 2002; Nielsen, 2000a). Sometimes guidelines are presented as a collection of guidelines serving as a general purpose checklist or as recommended body of features and reference for functionality to be included on a web page (Brinck et al., 2002; Nielsen and Tahir, 2002). In another, more recent book, Nielsen and Loranger (2006) use a greater number of illustrative pictures but again guidelines remain embedded within the text or sometimes are shown as paragraph headings.

While there have been efforts to structure and establish some format in presenting guidelines, still the vast majority of guidelines found in books and on the internet are in a narrative form, with few illustrative examples and few explanations or comments.

2.5.2 Latest guideline developments

In an effort to improve the usability of web sites and taking into account the increasing level of use by the public, a recent and very comprehensive catalogue of guidelines for web design has been compiled by a group of researchers on a project sponsored by the US Government (Koyani et al., 2003; Koyani et al., 2004). These guidelines are referred to henceforth as "Koyani guidelines". A set of more than 537 guidelines from well-known sources was initially compiled and after eliminating duplicates, insignificant, and conflicting guidelines, a final set of 187 guidelines was formed. The improved version of these guidelines consists of 209 guidelines (US Department of Health and Human Services, 2006).

2.5.2.1 Format of the Koyani guidelines

The Koyani guidelines address a wide range of web design issues, starting from the development process down to small widget details and the presentation and typography of content. The presentation adopted (see Figure 2.4) for these guidelines is as follows:

- Heading-title of the guideline, usually a "do this" or "don't do this" sentence.
- Guideline itself, a lengthier presentation of the guideline, usually explaining the heading-title of the guideline.
- Comments about the guideline, stating the background that justifies the use of the guideline and sometimes what means can be used to apply the guideline.
- Examples that help designers understand the meaning of the guideline and strongly depict the guideline in a positive (good example) or a negative way (bad example). Most times captions accompany the examples that further clarify the application of the guideline and illustrate its practical use by highlighting the good and bad points in the example or explain what more they offer or deny the user.
- Sources where references are given about research that has been conducted relevant to the guideline for further reading and advice.
- Strength of evidence and relative importance of each guideline is given, with ratings based on the opinion of web designers, usability specialists and researchers.

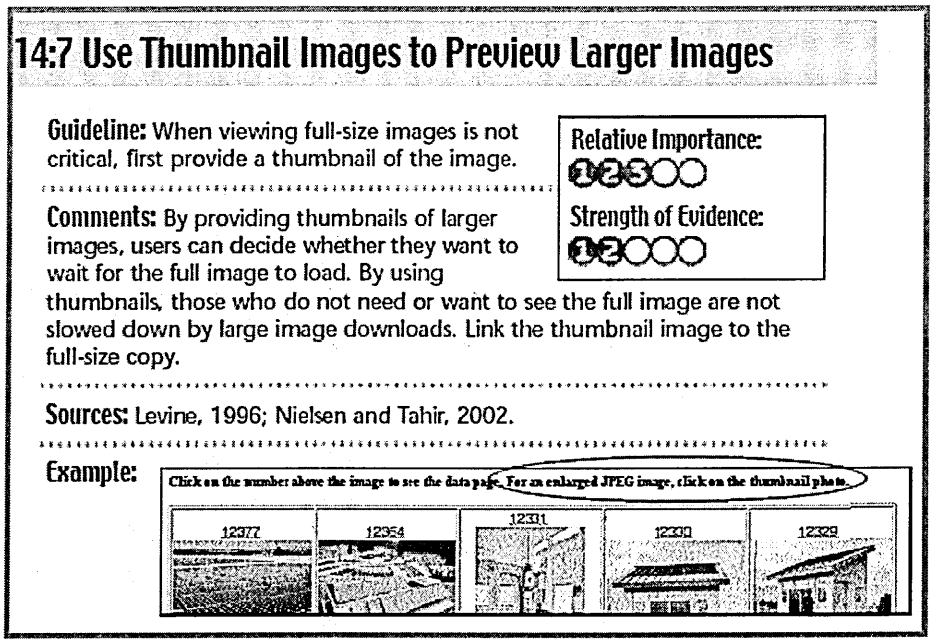


Figure 2.4: A Koyani guideline (Koyani et al., 2003)

This format of presenting guidelines borrows much from the format in which patterns are presented. There is a comment for each guideline stating the background that justifies the use of the guideline. The comments section reflects two sections of the pattern format: the context section and the section where the problem and the solution are described. Also, this guideline format includes multiple examples and illustrations in a similar way that suggests the influence of patterns. The two ratings given to each guideline, strength of evidence and relative importance is reminiscent of the ranking of validity that Alexander gives to each pattern, in the form of 1 to 3 stars (Alexander et al., 1979). Furthermore, there are instances, admittedly few, where a guideline is linked to other guidelines in a similar way that patterns are linked to other patterns in a pattern language. Finally, the typography, headings and the general style in which a guideline is presented, adhering to a carefully chosen template, reflects the format of a pattern. Evidently, this format is intended to make the greatest impact on designers and practitioners and it goes beyond the typical narrative format of guidelines. Koyani et al. (2004) advocate that guidelines should be presented with "justification and examples", highlighting the similarity of this presentation to the pattern format. Justification that mirrors the "Why" section of a pattern and the inclusion of at least one or more examples brings the Koyani guidelines very close to the patterns.

2.5.3 Drawbacks of guidelines

Several researchers have identified shortcomings and weaknesses of guidelines. Ivory and Megraw (2005) indicate that historically designers have had difficulties in applying design guidelines.

Koyani et al. (2003) report that a team of experts had to scrutinise a set of approximately 500 guidelines, collected from the current literature, in order to identify those guidelines that conflicted with each other and to clarify those that were ambiguous and problematic.

Skogseid and Spring (1995) identify three reasons why principles and guidelines are not being extensively used by specialists: their large number makes it difficult to choose one in a given situation; they do not work well across members of a design team; they are very specific, and with the technology changing or advancing they lose their applicability. Technological changes affect not only guidelines but patterns as well, and there is a need to review and improve both guidelines and patterns.

Ivory and Megraw (2005) offer several comments about the application of guidelines in a number of studies. In a series of experiments (Chevalier and Ivory, 2003a, 2003b), designers, both novice and professional, had difficulties in applying guidelines effectively. In another survey (Ivory et al., 2003), only 36% of designers always used guidelines when designing web sites.

2.6 Patterns compared with guidelines

Although it is not denied that guidelines can be useful in guiding the designer to take the right decision and prevent errors in interface design, proponents of patterns have quite often used the drawbacks of guidelines to promote the use of patterns in HCI. The debate about patterns and guidelines is more than a decade old.

Van Welie et al. (2000) argue that the main problem of guidelines is that they do not state the context in which they apply – in contrast to patterns – and summarise the limitations of guidelines as follows:

- Guidelines are often too simplistic or too abstract.
- Guidelines can be difficult to select and difficult to interpret.
- Guidelines can conflict with each other.
- Guidelines often have authority issues concerning their validity.

Mahemoff and Johnston (2001) point out that guidelines can be conflicting while a pattern presents a solution by demonstrating how conflicting forces in a design can be

resolved. Furthermore, guidelines have no interrelation structure, while with a pattern language a design can be generated by following the links between patterns, solving high-level problems with low-level patterns.

Griffiths and Pemberton (n.d.) discuss the advantages of design patterns in comparison to guidelines. They suggest that design patterns are presented in a canonical form, provide much richer information than guidelines and draw the attention to the problem that is solved in the context of the design by putting the emphasis on the design process and not on the product. Furthermore, they point out that patterns are "engaging and lively in a way that guidelines are not", and the hierarchical structure of design patterns provides a way of navigating all the design rules and guidelines that a pattern incorporates. Finally, they state that design patterns, serving as a communication tool, can possibly involve users in the design process.

Despite their shortcomings, guidelines remain the most widely accepted form of presenting experience and knowledge. The vast majority of textbooks about web design – several dozen today – present design advice and usability principles and practices in the form of guidelines. At the same time, the web is the repository of a huge number of collections of guidelines. Guidelines are used throughout the development process of a web site to support designers in their decisions. Guidelines are also used for the evaluation of design products, when usability inspection methods are employed. Collections of guidelines about user interface design far exceed the pattern languages presented up to now. Furthermore, the durability and endurance of guidelines is remarkable. Nielsen (2005) reports that general guidelines built 20 years ago are still up to 70% valid and applicable, while 78% of guidelines from the early days of the web continue to be valid and relevant.

Some authors classify patterns as guidelines (for example, Ivory and Megraw, 2005), probably by overlooking any other differences and considering them both forms for providing prescriptive advice to designers. Other research (van Biljon et al., 2004) uses guidelines, in positive and negative formats, instead of patterns and anti-patterns, claiming that any differences between the two formats of guidelines should be manifested in patterns and anti-patterns as well.

This study takes a more moderate stance towards guidelines and patterns. It purports that guidelines and patterns are two forms of presenting experience and knowledge. Patterns should not be considered as a substitute replacing guidelines but as an alternative approach, complementing guidelines. Patterns reproduce much of the information given in existing guidelines and the goals of both these approaches are the

same (Henninger, 2001). Patterns tend to be more oriented towards a problem-solution presentation. Van Welie et al. (2000) indicate that "compared to guidelines, patterns contain more complex design knowledge and often several guidelines are integrated in one pattern". Henninger (2001) uses guidelines and patterns together, as part of a tool and a process, to apply design ideas early in the development process. Patterns and guidelines are simply two different forms of guidance serving as practical tools for designers and practitioners to build better artefacts (Chung et al., 2004).

Considering patterns and guidelines equally valuable for designers, this study aims to explore and compare their use by novice designers.

Claims and Patterns

Other efforts, such as claims (Sutcliffe, 2000; Sutcliffe and Carroll, 1999), to reuse design knowledge and deliver knowledge to designers can be also compared with patterns and guidelines (Dearden and Finlay, 2006). Claims are small pieces of knowledge that express usability arguments for an artefact (Sutcliffe and Dimitrova, 1999). Claims have upsides and downsides to present the usability arguments based on a design rationale and are generated by using task analysis to evaluate an artefact.

The format of presenting a claim has many similarities with the format of a pattern format. Claims consist of a title, description, upsides and downsides that accompany the description, scenarios, theories and artefacts that support the description (Payne et al., 2003). However, claims provide design advice based on specific scenarios and examples, which limits their generality although generalisation can be made (Sutcliffe, 2000). Claims have not yet met widespread acceptance as patterns and guidelines; they are no known libraries available to designers and the number of studies about employing claims is limited.

2.7 Research into evaluation and use of patterns and guidelines

Research about the usefulness of patterns in the domain of HCI is not extensive. However, recently there have been a few studies examining the use of patterns in real design settings and investigating the problems of applying patterns in practice. In this section the few research efforts toward the evaluation and use of patterns in practical settings are presented.

A group of researchers (Dearden et al., 2002a; Dearden et al., 2002b; Finlay et al., 2002), conducted a series of studies and investigated the use of a pattern language as a tool to support the participatory design of web-based systems, experimenting with three different types of web sites: a travel web site where users book and buy online tickets to

travel, an online learning web site, and a medical web portal offering advice and information for users contemplating cosmetic treatment. In those studies the pattern language is used in a fashion that Alexander suggested and intended for his architectural pattern language: empowering users to participate in the design process together with designers. The researchers demonstrated that a pattern language can benefit a participatory design approach and can help users generate artefacts in a prototype form.

Chung et al. (2004) evaluated the effectiveness of using patterns with designers in developing applications in the emerging field of ubiquitous computing. They claim that their study is the first examining the use of patterns with designers. A pattern language for ubiquitous computing was developed and used in their experiment. The designers were asked to design a location-enhanced application. One group of designers had access to the set of patterns while the other did not. Participants expressed positive opinions about patterns and felt that patterns helped them with the present design and that it could also be of help with future work. The final designs were judged by three evaluators. Another factor that was examined was the experience the designers had in designing. The study concluded that experienced designers without patterns performed better than novice designers with patterns, i.e. patterns can not substitute for experience, although a comparison of expert designers showed that those who used patterns were rated higher.

Saponas et al. (2006) investigated the use of patterns during the early design activities with designers building a digital home application. For this purpose, a body of 48 patterns was developed. The participants, 22 pairs of designers, were split randomly into two groups and asked to perform the same design task. Only one group was given access to the set of patterns with the help of a tool within a web browser. The use of patterns, time of studying a pattern, number of times a pattern was visited, etc. was monitored in the patterns group. The study concluded that team members employed the patterns productively to generate new ideas and as means of exchanging design ideas with each other. Furthermore, the designs of both groups were judged by expert evaluators, performing a heuristic evaluation using purposely developed heuristics. The designs of the pattern group had a lower mean number of heuristic violations than the control group, implying that the use of patterns resulted in higher quality design products.

Wesson and Cowley (2003) evaluated an e-commerce web site using a comprehensive set of guidelines and a set of patterns. The web site was chosen among five e-commerce sites to be the most efficient site for finding information. They

concluded that guidelines presented several advantages compared to patterns as an evaluation tool. This result, however, is based on subjective opinion and at the same time the evaluation, one time using patterns and the next time guidelines, was performed by the same people.

Cowley and Wesson (2005) compared patterns and guidelines based on the opinions of two groups of students, one using guidelines and the other patterns, to investigate the usefulness of patterns in the design process. The authors concluded that designers consider patterns useful for design and an effective and efficient design tool for students. Both patterns and guidelines groups felt equally positive about their intention to use them in future projects as design aids. Cowley and Wesson's study used a set of patterns from two pattern collections (van Duyne et al., 2002; van Welie, 2001-2007) and a set of guidelines based on those by Nielsen et al. (2001) about e-commerce and online shopping. Those patterns and guidelines are high-level and complex, and may provide similar information, but they are not balanced, i.e. not the same information was given to the students. Furthermore, the performance of the groups in the design, redesign and evaluation tasks was not assessed and the artefacts produced using patterns and guidelines were not compared. The results were based on comparisons made using qualitative and quantitative data regarding the participants' opinions and attitudes towards patterns and guidelines and the perceived characteristics of the design aids used.

Dearden and Finlay (2006) emphasised the limitations of the work to date by indicating that studies have not attempted to compare patterns with any other form for design guidance and that only simulated design activities have been investigated.

In summary, while numerous patterns and several pattern languages have been presented and the perceived advantages of using patterns are many, there has been little empirical evidence of their practical use in web design projects. That is to say, several authors highlight the advantages of patterns over guidelines and suggest that a pattern-based design will lead to better designed products. The proposed pattern-based approaches did not evaluate the actual benefits, if any, that patterns may offer to the final design artefact by comparing patterns with similar tools and approaches to design.

This work extends previous research efforts into new ground and contrasts patterns, an emerging and widely promoted approach, with guidelines, an established and traditional method that has been criticised for some drawbacks and shortcomings. However, this study is focused on comparing rather than simply evaluating the use of patterns and deliberately seeks to:

- Identify a relationship between patterns and guidelines.
- Establish the relative strengths of each of the two formats to capture knowledge.
- Highlight an improved approach employing patterns or guidelines to teach usability principles to novice designers, considering the time restrictions of a relevant course.

It is intended, by taking a bottom-up approach, to first investigate the practical aspects of patterns and then to consider how and where they will fit into a wider design context. The author's position is that once a considerable practical experience with the use of patterns and guidelines is gained through several research efforts, it will be more advantageous to propose a framework for the development of web interface design for implementation.

Finally, this study is unique in several ways compared to previous studies described in the literature related to the use of patterns/guidelines. They are as follows:

- Participants have no previous knowledge of design and usability.
- Web pages and sites are used for the final outcome instead of prototypes.
- A widely accepted authoring tool is used instead of a prototyping tool.
- An extensive set of patterns or guidelines are employed.
- The time taken to train and prepare the participants for the experiment is a full course of teaching students web design.

2.8 Summary

This chapter has provided a review of the relevant literature on the use of patterns and guidelines. The importance of usability for the internet and the WWW was highlighted. The greatest impact of usability is on e-commerce systems where one click may increase sales on an e-commerce site. Usability can benefit from tools such as patterns and guidelines. Previous research has identified a number of issues in using and applying guidelines. At the same time patterns have been proposed as an alternative medium of capturing knowledge without the drawbacks of guidelines and with characteristics that could help designers produce artefacts of improved quality. Following this, the chapter has given a short account of patterns and guidelines, a brief history, and a description of their format and the latest developments regarding use and presentation.

Previous research into patterns has taken two directions: firstly towards presenting patterns and frameworks of using patterns, and secondly exploring the use of patterns and pattern languages by designers mainly in new and emerging fields of HCI. Several researchers suggest that patterns, after providing a detailed analysis of their characteristics and highlighting at the same time the shortcomings of guidelines, have great potential for design. However, there is no empirical research evaluating patterns with similar tools and approaches to design. In order to validate patterns, and what a pattern-based approach offers, this study will compare patterns and guidelines. The setting of the comparison employs novice designers without any previous knowledge of design and usability.

The next chapter presents the research methodology and the specific strategies adopted for the study.

Chapter 3

Research Methodology

3.1 Introduction

This chapter focuses on the research methodology, research design and research procedures considered appropriate and adopted in the work described in this thesis.

Initially, an overview of the research design is presented. The overview includes a discussion of the quantitative and qualitative research methodology. The chapter also reviews the mixed methodologies (triangulation) approach used in this study and highlights the importance of combining different methods for this research; the advantages of a triangulation technique are presented and this approach is established as a suitable choice to achieve the objectives of the study. After that the research strategies are examined: two strategies, experimental and survey, are the strategies used in the current study.

This is followed by details of the experimental design and the issues involved in the formation of the two groups, the sampling procedures, the qualitative and quantitative data collection methods and the treatment and the analyses of data. The focus of the experimental design was to ensure that students with similar initial skills and knowledge concerning the variables under investigation were assigned to two different treatment groups. After that issues of reliability and validity are discussed.

The last sections of this chapter present an overview of the three studies and a summary.

3.2 Empirical research

The investigation carried out in this study is empirical. Empirical research can be defined as an investigation based on the observation of actual practice on which to base a theory or answer a question and derive a conclusion in science (Burns, 1997; Fenton and Pfleeger, 1996). Empirical research methods are part of the scientific method (Wiersma, 2000) that requires all evidence to be empirical or empirically based, as opposed to theoretical methods that are based on existing theories and explanations. Empirical methods are used extensively in many disciplines including HCI and software engineering.

Wohlin et al. (2003, 2006) propose that both qualitative and quantitative methods are appropriate and should complement each other in empirical research in the field of software and web engineering, and highlight four research strategies in an empirical study: experiment, case study, survey, and post-mortem analysis. Creswell (2005) identifies the six steps that characterise an empirical study, either qualitative or quantitative:

- Identification of a research problem
- Review of the existing literature
- Specification of a research purpose
- Collection of research data
- Analysis and interpretation of data
- Reporting on and evaluating research.

The empirical work of the present thesis, as stated in Chapter 1, focuses on comparing patterns and guidelines and seeks to assess them in actual implementation by novice designers.

3.3 Research methodology

Research methodology refers to the "overall approach to the research process, from the theoretical underpinning to the collection and analysis of data" (Hussey and Hussey, 1997, p.5). Methodology is a wider concept than methods, in that methods refer only to the various means by which data can be collected and analysed, whereas methodology refers to the overall approach to the research process (Creswell, 1994).

There are two major approaches or methodologies to research: quantitative, which is related to positivism or the scientific paradigm (Glesne and Peshkin, 1992) and qualitative, which is based on interpretivism (interpretative epistemological position)

(Bryman, 1992; Saunders et al., 2000). Quantitative and qualitative approaches are also referred as deductive and inductive respectively. Both research approaches will be adopted to conduct this study by employing triangulation.

3.3.1 Quantitative methodology

Quantitative research can be defined as a methodology that primarily seeks to express information numerically, in term of counts or measurements (Remenyi et al., 1998). The quantitative approach is objective in nature and concentrates on measuring phenomena; it involves collecting numerical data, analysing them and using statistical tests (Maxim, 1999). The numerical data provide answers to countable questions, such as "how much", "how often", "how many" and to "what extent".

Research in the quantitative mode employs deductive logic, moving from the general to the specific, i.e., from theory to experience. Quantitative methodologies are based on theories, use variables, develop research hypotheses and test them; data is collected by means of surveys or experiments, rather than individual cases in order to succeed in generalising the data, thus demonstrating external validity (Hussey and Hussey, 1997).

3.3.2 Qualitative methodology

Qualitative research allows the researcher to get inside a person's experiences, perceptions, attitudes and values to identify and understand what problem they face, how they will react when they face it, and what enables them to react (Denzin and Lincoln, 1998).

The purpose of a qualitative study is a greater understanding of the world as seen from the unique viewpoint of the people being studied. The qualitative approach is subjective in nature and involves identifying, examining, and reflecting on perceptions in order to gain an understanding (Gordon and Langmaid, 1988) through inductive analysis, moving from specific observation to the general. It focuses on studying things (phenomena) deeply, in all of their complexity, in their natural settings, and generally through observation without intervention or manipulation.

Qualitative research seeks to answer questions such as "why", "how", and "what matters" to those involved in the research. Seaman (1999) emphasises that "the principal advantage of using qualitative methods is that they force the researcher to delve into the complexity of the problem" rather than abstracting from it, thus resulting

in richer and more informative findings. Qualitative research helps the researcher understand the process as well as the results.

3.3.3 Triangulation

This study implements a research design that employs the methodological triangulation of qualitative and quantitative methodologies, or referred as mixed methods approach (Creswell, 2003; Denzin, 1978; Golafshani, 2003; Guion, 2002; Saunders et al., 2000). Triangulation is increasingly encouraged and suggested as an important part of the design process (Denzin and Lincoln, 2000). Neuman (2003) describes the triangulation approach as the process of using multiple methods of research to provide a more comprehensive study by bringing together the complementary strengths of each. The advantages of triangulation are highlighted by several authors. Triangulation can be used to gain a deeper understanding of the study under investigation and increase the confidence in the results and the conclusions drawn from them (Patton, 2002; Saunders et al., 2000). Data is obtained from a wide range of sources, using a variety of methods with particular emphasis on the confirmation and completeness of the results (Arksey and Knight, 1999; Denzin and Lincoln, 2000).

Denzin (1978) argues that triangulation leads to greater validity and reliability than a single methodological approach and suggests four types of triangulation: *data triangulation*, which uses multiple data sources for the study; *methodological triangulation*, which employs different research methods or strategies for the study; *investigator triangulation*, which uses different researchers; and finally *theory triangulation*, which uses different theoretical perspectives to look at the same data.

The adoption and benefits of a framework for triangulation in HCI is discussed by Mackay and Fayard (1997). Seaman (1999) observes that the mixture of technical and human behavioural aspects in software engineering suggests the use of a combination of qualitative and quantitative methods.

It is common to use multiple triangulation within a single study in which the researcher combines different types of triangulation (Denzin, 1989). This research used data and methodological triangulation in order to achieve the diverse objectives of the study.

Data triangulation was applied by using different data sources. Two ways of collecting and analysing data were used:

- Quantitative data gained through the design tests, the results from the participants performing an expert review of a web site, and the questionnaires that participants filled out.
- Qualitative data gained though interviews and observations of the participants.

The findings from the evaluation of the design artefacts were compared with the data collected through the questionnaires and the data collected through the interviews. These findings are expected to contribute to the enhancement of the validity of this study. Responses from the participants obtained in the interviews, where possible, were compared to the evaluating results (e.g. a student's perception of patterns/guidelines in the objective judgements of the evaluators). Finally, general themes emerging from all methods of data collection were considered.

With regards to methodological triangulation, two kinds of strategies were used to carry out the study: experiment and survey. However, it should be noted that in the present study, while both quantitative and qualitative methods are used, they remain relatively independent until the interpretation stage (Tashakkori and Teddlie, 1998).

3.4 Research design and strategies

The research design is a general plan of how to proceed answering the research questions and will be based on the researcher's questions and on his meeting his objectives (Saunders et al., 2007). According to Zikmund (2003), a research design covers strategic decisions concerning the choice of data collection methods and more tactical decisions regarding measurement and scaling procedures, questionnaires, samples, and data analysis. Therefore any research needs an integrated design or a complete structure before data is collected.

Bryman (2001) points out that the decision to adopt a particular research methodology (qualitative or quantitative or both) is not the only requirement for doing research. Two other key decisions have to be made: a choice of the adopted research strategy or strategies along with a choice regarding the methods of data collection and analysis (or tactics).

A strategy reflects the priority given to the many dimensions of the research process and provides a framework according to which the design is placed. The methods of data collection and analysis are concerned with the details of these particular issues and involve the specific instruments implemented for data collection and the data analysis techniques employed.

Selecting an appropriate research design is not an easy task and a number of issues need to be considered. Bryman (2001) emphasised that not only is the choice of an a priori research paradigm or even of the methodology (quantitative or qualitative) important, but also the purpose of the research and the extent to which the purpose is in line with the research design. Likewise, Fellows and Liu (1997) maintain that the research problem, and therefore the research objectives have a major impact on the adopted methodology and research design, on the methods of data collection and analysis, and finally on the research findings and conclusions.

3.4.1 Adopted research strategies

A researcher can choose from a number of strategies suitable for a particular study. Considering the objectives and having a deep understanding of the context of the present research, it is clear that a mixed methods research design is the most appropriate to be followed to achieve the research objectives.

The strategies used (adopted) in this research are the experimental strategy (or experiment) and the survey.

Both strategies are widely employed in a study of any type and of course in HCI (Dix et al., 2004; Preece et al., 2002) and other closely related sciences or disciplines including software engineering (Basili, 1993; Juristo and Moreno, 2001; Kitchenham et al., 2002). In the following two sections these strategies will be described.

3.5 Experiment

It is generally accepted that the experiment as a design strategy offers rigour to a study by permitting researchers to establish and assess causal relationships from results (Saunders et al., 2000). An experimental study is based on positivist principles more than any other research strategy (Neuman, 1994).

An experiment is a form of empirical study where the researcher has control over some of the conditions under which the study takes place and over the independent variables being studied (Bryman, 2001). An experiment allows researchers to determine how selected variables influence an outcome variable (De Vaus, 2001).

Essentially, in its simplest form, an experiment examines the effect of one variable on another variable. The effect is measured by comparing the results obtained by two groups which ideally should be identical except for the variable whose effect is being tested: an experimental group against a control group. Such experiments are

referred to as controlled experiments: all factors that can affect the outcome are controlled except for the variable to be tested.

Robson (2002, p.100) uses the term *variable* as a measurable "defined property or characteristic of a person, thing, group or situation". *Treatment or condition* refers to the key factor that is compared or evaluated: a product, a technique, or a method. A precise description of the independent variable is crucial to every experimental design. The *independent* variable is the variable that is manipulated by the researcher, and takes the form of an experimental treatment, which is either present or not present. This setting, where the treatment is present or not, describes a conventional model when the researcher compares two conditions: what happens when the treatment is present and when it is not. However, instead of one treatment, two treatments can be used: in this case treatments are compared with each other. *Subjects* are the people, the participants (not the researchers) involved in the experiment, while *objects* refer to the entities under investigations and to which the treatment is applied (a project, a program, a product, etc.). The subjects are assigned to *groups*, one experimental (given the experimental treatment) and one the "control group" which is given no treatment. In a two-treatment comparison, the two groups are designated as experimental group 1 and experimental group 2. *Dependent* variables in experimental research represent the factors that are expected to change in response to the application of the treatment. *Extraneous* variables are the factors that can affect the dependent variable but that are of no interest. These variables should be controlled by the experimental design to have no effect on the outcome. However, in the opposite case, if an extraneous variable influences the dependent variable, due to a weak design, the variable is considered to be a *confounding* variable. Finally, *criteria* and *metrics* for judging and measuring changes in the dependent variable should be defined.

Summarising, an experimental research strategy involves (Robson, 2002) the following:

1) The assignment of participants to different groups, preferably randomly.
2) A hypothesis for a causal relationship.
3) Each group receives different treatment where one or more independent variables are manipulated.
4) Control of all other variables.
5) Measurements of the effect of manipulation of the dependent variable.

Fenton and Pfleeger (1996) distinguish the following stages in carrying out an experiment:

- **Conception**: The objectives of the study are defined. These objectives are formulated in a question that should be clearly stated.
- **Design**: Based on the objectives and the research question, the hypothesis to be tested is formulated. All the components of the experiment (treatment, experimental objects and participants, experimental factors-variables that influence the experiment and those that are expected to be affected) are defined and stated. A detailed plan of how the experiment will be conducted is presented. Finally, the criteria for measuring and judging effects are defined.
- **Preparation**: The participants for the experiment are prepared. This may involve several procedures and actions: training, lab preparation, and probably a dry run of the experiment.
- **Execution**: The treatment is applied to the participants according to the prescribed plan. Treatment and measurements should be applied in a consistent way.
- **Analysis**: The analysis stage starts with a review of the collected data to ensure they are valid and useful. Following that, data are analysed employing the appropriate statistical techniques to test the hypothesis.
- **Dissemination and decision making**: The conclusions and all the important aspects of the research are documented so that the experiment could be duplicated.

3.5.1 Experimental group design – true experiments and quasi-experiments

The most preferred type of an experimental design is the true experimental design. Randomly assigning participants to experimental group/s and control group/s respectively is the most important characteristic of true experiments. Any differences between the groups will be randomly distributed and therefore the control and experimental groups are equivalent (Gill and Johnson, 2002). This random assignment provides a degree of certainty that changes in the dependent variable between groups are the result of the treatment and not due to some other reason. The random assignment of participants to groups minimises threats to internal validity. Another requirement of a true experiment is the ability of the researcher to have full control over the independent variable or even the experiment to take place under conditions that reflect the generalisation of the experimental hypothesis. In the real world these requirements may

not be fully satisfied. As an alternative to a true experiment the researcher can employ a type of experiment that is often referred to as *quasi-experiment*, since it is a variation on the true experimental design.

3.6 Quasi-experiments

A quasi-experimental design may be the only suitable alternative when random assignment of participants is not possible (Cook and Campbell, 1979) or when intact groups are involved as happens often in the educational world (Wiersma, 2000).

Although randomised experiments are always preferred to quasi-experiments, the latter allow the search for knowledge and the examination of causality in situations in which complete control is inappropriate or not possible (Neuman, 1994). This makes quasi-experiments, according to many researchers, a second-best choice. Some researchers are even sceptical about the advantages of true experiments in certain situations and recommend consideration of design options that may involve non-random grouping (Robson, 2002). In a quasi-experimental design the researcher may select participants rather than randomly assign them to a treatment; or a quasi-experimental design often allows researchers to select random samples from the population, but does not require the random assignment of individuals to the comparison groups (Nachmias and Nachmias, 2000). From a wide collection of quasi-experimental designs that have developed over time, the researcher should choose the most appropriate one that is feasible for his research.

This study has used a quasi-experimental research design using "equivalent groups through matching" (Robson, 2002) in order to investigate the effect of two conditions, one using patterns and the other using guidelines to present and transfer knowledge to novice designers. Considerations regarding the experiments and the reasons for employing the particular type of quasi-experiment will be described in the next sub-sections.

3.6.1 Considerations of the quasi-experiment for the study

In each experiment the following factors were regarded as requiring a careful approach and attention: the setting and the environment of the experiments, the number of participants, the sampling and selection of the participants, and finally the extraneous variables affecting the groups.

3.6.1.1 Experimental setting and environment

All the experiments in this research were set within an educational institute. This particular setting sometimes creates more considerations about the experimental design than will be presented here.

There are several factors to consider mainly related to the learning environment and the personal learning style of each individual. The learning environment includes factors such as teacher's attitude, general skill, and specific knowledge. The personal learning factors include factors such as gender, age, academic ability, race, and experience but also the group of the students and the relations between students.

3.6.1.2 Number of students

The assignment of an individual to either of the two groups, as was underlined above, should be random whenever possible. Given a sufficient number of participants, randomisation helps to ensure that two groups are comparable or equivalent in terms of any characteristics which could affect any observed differences in post-treatment scores. In the experiments in the present study the final number of students eligible to participate in the test was smaller than anticipated, that is, the drop-out rate was high, resulting in a small number of participants. Even in the final study, despite groups being of average size (20 students), the number of participants is still considered low, taking into account the assumptions and requirements of sample size of several statistical methods. One problem resulting from a small number of participants, while measuring learning effects in educational experiments, is that two groups might not necessarily be the same before any instruction takes place, differing in important ways that influence the progress they are able to make. Randomisation in small sizes can be compromised since the smaller the number of participants, the smaller the probability of randomisation to provide balanced or representative groups for the experiment. This study used rank sampling and stratified sampling techniques for allocating participants to groups in order to avoid such problems.

3.6.1.3 Sampling and selection considerations

Two forms of sampling were employed for the purposes of the study: convenient and purposive. These two sampling methods were employed in order to collect the initial group for each experiment.

Convenient sampling: Due to the nature of the experiment involving students, simple random sampling could not possibly be employed for this research. The entire population of the students were not available for selection. The experiments were based

on volunteers and that involves the risk of self-selection for the participant groups. It is possible that only the best students are willing to participate. The use of "convenient sampling" is likely to produce results that are not representative (Bryman and Bell, 2003; Carver et al., 2003; Robson, 2002).

Purposive sampling: This is another sampling technique classified as a non-probabilistic method of sampling (Cohen et al., 2000). The method allows the researcher to form a sample with a purpose in mind in order to satisfy specific needs in a project. This method is subjective, using as criterion the researcher's judgement or interest in specific subjects (Robson, 2002). Purposive sampling was used in the main study when, due to limited resources available and in order to improve the experimental design, the first 45 best performing members of the initial group were selected. This purposive sampling does not put any limitations on the research: Although the experiment was placed within a higher educational institute, the main purpose of the experiment was not about education but about learning and adopting techniques by novice designers with the help of patterns and guidelines. By using purposive sampling and choosing the best of the students, the participants were closer to representing novice designers capable and willing to produce higher quality artefacts; the purposive sampling helped in eliminating students with low technical abilities, trying to cope with the requirements of the tests or indifferent to the produced artefacts.

3.6.1.4 Groups and extraneous variables

The study employed two groups to receive different treatments. Even a small difference in the two groups could make the groups not comparable, and any observed differences in outcomes could be due to extraneous factors or pre-existing differences (Cohen et al., 2000). Cook and Campbell (1979) suggest that a weakness in all experiments is that the assumption of initial equivalence between the groups is possibly violated. These problems are especially severe when differences between the two groups exceed one-half standard deviation (0.5 SD) on relevant criterion measures (Nachmias and Nachmias, 2000).

A good design should take into consideration any extraneous variables that may influence the independent variable by controlling for them. Controlling these variables, usually through randomisation, eliminates systematic bias due to them and increases the internal validity of the experiment (Wiersma, 2000). However, as discussed above, there is no certainty about this, especially in experiments with a small number of participants (Christensen, 1997).

3.7 Group allocation

The two groups should be equivalent or balanced regarding the factors and the characteristics that conceivably affect the variables in the experiments. Taking into account the considerations outlined in previous sections, a random selection of the participants could not be implemented in this study. One approach, in order to have similar and comparable groups that would ensure high precision in a study, is to match the two groups of students on a significant variable or variable to the results in the study

Robson (2002, p. 139) suggests an "*equivalent groups through matching*" method by using one or more matching variables to select the groups. The same author draws attention to the fact that this approach is different to a matched-pairs design, used in many experimental designs (Cook and Campbell, 1979), where individuals are matched to form a pair and then each member of the pair is randomly assigned to each group. Creswell (2003) indicates that a matched-pairs design is expensive, takes time and could possibly result in incomparable groups if some of the participants choose to leave the experiment. Instead of matched-pairs, a rank sampling and a stratified sampling technique was used to strengthen the assumption that the two groups are initially equivalent.

The main concern involved in grouping students was that the two groups should be similar, that is, that two equivalent comparison groups were matched on characteristics such as ability, skills and knowledge to design. To this effect, preliminary assignments or tests were used to help the allocation of participants to the two groups. In the exploratory study the test was a simple general knowledge quiz about HCI principles. In the other two experiments students were asked to perform an assignment before the group formation and the treatment. The assignment was along similar lines with what the final test was about.

Sometimes it is also advisable to take extra measurements of the participants in the groups in order to ensure that there is no substantial difference between the two groups (Pallant, 2001). In the main study, as an extra measure to ensure that the two groups were equivalent, the academic scores of the participants in relevant courses and their reported experience in the use of computers were taken into account. Statistical analysis showed that there was no significant difference between the two groups.

A problem with matching is the accuracy with which matching between two individuals will take place. To address this issue two methods have been used and are presented in the following sections.

3.7.1 Rank sampling

The first approach that was employed makes use of the ranking of all students on the basis of their scores (Cohen et al., 2000). Each consecutively ranked two students form a pair. Each member of the pair is assigned randomly to a group. An alternative way of allocating participants to each group, which was employed in this study, is to reverse the order of allocation to a group after each pair. According to this scheme for a group of four students, ranked 1, 2, 3 and 4, students 1 and 4 would form the first group while students 2 and 3 form the second group. Therefore, students ranked 1, 4, 5, 8, 9, 12, 13.... are allocated to the first group while students ranked 2, 3, 6, 7, 10, 11, 14... are allocated to the second group. It should be noted that in this way when the number of students in each group is even the sum of the ranks in both groups is the same; also note that although pairs were formed for the purpose of allocation, there was no comparison between the participants of each pair but between the two groups as a whole.

Rank sampling was used in the exploratory study and the first study. For the final study stratified sampling was used.

3.7.2 Stratified sampling

The second approach to forming the two groups employs another technique used for sampling in statistics (Black, 1999; Robson, 2002). Stratification is the formation of categories or strata from a population. Every member of the population is assigned to only one stratum that is relatively homogenous with regards to the characteristic or attributes forming the stratum (Black, 1999). Then random or systematic sampling is applied within each stratum to form the experimental groups. The advantage of this approach is that each stratum is represented equally within each experimental group. Robson (2002) points out that, in certain cases, stratified random sampling can be better than random sampling due to the fact that the means of the stratified samples are more likely to be closer to the mean of the population. Most frequently stratified sampling is used as a method which guarantees that members of all strata, even the smaller ones, of a certain population are included in the groups to their real extent to which they are found in the population; this allows a comparison with all the strata included in the groups.

Using stratified random sampling, the two groups in the main study were balanced for expected ability, measured by the percentage of points each student received in the preliminary before the treatment assignment. Participants were placed into four groups of similar ability – adequate, medium, good and excellent – and then the members of

each of these groups assigned to the two experimental groups in a random fashion. Finally, from the two experimental groups, one group was randomly selected to be exposed to the patterns treatment and the other to the guidelines. Participants did not know the details of the treatment or any features of patterns and guidelines until the post-test interviews and questionnaires.

3.8 Survey

A survey is frequently an investigation carried out in retrospect and therefore the researcher does not have any control and cannot manipulate any variables as with an experiment (Fenton and Pfleeger, 1996). Surveys provide information for the research from the participant's point of view. Surveys are used to depict features and characteristics, behaviours and practices, attitudes and feelings, opinions and views of a group. Surveys can be employed for any type of study: exploratory, descriptive or explanatory, and usually are associated with the deductive approach (Saunders et al., 2000). Interviews, questionnaires, and a range of observational techniques are the primary methods of collecting data from surveys. Data can be either qualitative or quantitative. Interviews and questionnaires are two methods of data collection that rely on the participants to provide the actual information. Observation complements interviews and questionnaires, since it can help close the gap between stated behaviour, what they say they do or like, and actual behaviour (Bryman, 2004).

Kitchenham et al. (2002) write that surveys have certain advantages, such as making use of already existing experience, while common statistical techniques can be used for the analysis; at the same time they point out the drawbacks, explaining that surveys can only establish associations and no causal relationships, and that they can be biased if there are differences between those who respond and those that do not.

3.9 Methods of data collection and analysis

In the previous sections the research methodology and the research strategies were presented. In this section the methods of data collection and analysis are discussed.

There are several methods used to collect and analyse data. Robson (2002) explains that a researcher in order to collect data can watch, ask, and search for any other available evidence. Watching involves observation; asking implies interviews, use of questionnaires, and conducting tests; and other evidence is collected through methods such as content, documentary or archival analysis (Robson, 2002). Interviews, questionnaires, observations, and tests are extensively employed during the

requirements gathering and evaluation of a product in HCI (Dix et al., 2004; Preece et al., 2002).

The data in this inquiry were collected in various ways by using means of qualitative and quantitative tools: focus groups, individual interviews, questionnaires, observations, and finally of assessing participants in the tests that were conducted by employing independent evaluators. The tests and the data collected through them will be discussed in the relevant chapters together with the analysis of the results. A short overview of the other methods is given below.

3.9.1 Questionnaires

Questionnaires can be used to generate quantitative data of a large number of participants in order to test theories or hypotheses advanced in the study. A questionnaire is generally easier to administer than interviews, it produces a large amount of data in a short period of time, does not require a trained interviewer, and all it entails is the cost of planning and sampling (Oppenheim, 1992). Furthermore, a questionnaire as a method for eliciting data gives respondents more time to consider their answers and answer them at their leisure.

This method was used to elicit data from the participants regarding their preferences, their intentions concerning using patterns/guidelines, and how they value each format that they have used. The general format of the questionnaires was consistent, but each questionnaire used in this research was tailored for the study and the participating groups.

3.9.2 Interviews

An interview is a "conversation with a purpose" (Kahn and Cannell, 1957, cited in Preece et al., 2002) between the researcher and one or more persons. The interview is a flexible method of finding things out. Interviews are commonly distinguished as fully structured, semi-structured, and unstructured based on the degree of structure and the formality of the interview. Robson (2002) comments that each type of interview is related, to some extent, to the depth of the expected answer. Structured interviews usually produce data for quantitative analysis while the other two types provide qualitative data.

Depending on the goals of the researcher, interviews can be used to seek new insights and to understand what is happening, to identify general patterns, and to appreciate relationships between variables (Saunders et al., 2007). Generally they are

conducted on a one-to-one basis or one-to-many or may even involve more than one researcher. The interviews are usually recorded for future analysis and review.

This research benefited from the advantages of using interviews and questionnaires to collect data together with the quantitative data collected through the evaluation and design tests.

3.9.3 Focus groups

A focus group is a method of eliciting participants' perceptions, attitudes, and opinions and generates qualitative data (Krueger and Casey, 2000). The group consists of a small number of people who together with the researcher discuss selected topics, in order to explore the participants' perceptions and attitudes. The researcher facilitates the discussion by asking questions. The focus of the discussion is clearly defined and this distinguishes a focus groups from a group interview (Saunders et al., 2007).

3.9.4 Observation

Observational methods involve collecting information about people, by listening and watching, in their natural work environment or under controlled laboratory conditions and to record their behaviour and actions (Preece et al., 2002). Taking notes, audio and video recording are used as tools in observational studies to document the data. Observational techniques provide information which cannot be collected by any other technique. This information can be compared and contrasted with information collected by another method. Observational techniques can be employed in both qualitative and quantitative research (Joppe, 2001).

Observations, as methods of collecting data, were used at several stages of the experiment, but mainly at critical points where information was needed to gain more knowledge about the activities of the participants, the way in which they responded to the requirements of the tests, and the problems they encountered during the tutorials and the tests. These observations were made mostly in an unstructured way by taking notes and compiling them soon afterwards. Observations during the exploratory and the first study helped improve the way in which the main study was conducted by using more refined and robust procedures.

3.10 Overview of the research design

In this section an overview of the approach taken in the experiments conducted is presented. The experimental part of the research started with an exploratory study, followed by the first study, where certain limitations of the experiments were exposed,

and finally the main study. Each of the studies took place in a different higher educational institute.

Guidelines and patterns were compared using two groups of novice designers by exposing them to two different training approaches: A pattern-based approach and a guideline-based approach. By choosing novice designers, an effort was made to eliminate any effect of experience and knowledge a designer might have acquired from their previous practice in designing as professionals.

The effectiveness of the guidelines and patterns was assessed by suggesting to novice designers that they use them in two activities: design and evaluation of web sites. The designing skills of the participant groups were assessed by measuring the application of usability principles during a design task. The web pages designed by each participant were evaluated by judges employing specific metrics developed for this purpose. Participants were also asked to evaluate a number of web pages and their performance was measured by the number of errors identified.

For the purpose of the experiment, two groups of students, representing novice designers, enrolled in a relevant course were recruited. A preliminary test before the treatment was used to divide the participant students into two equivalent groups. A more detailed account of the metrics, the criteria, and the setting of the experiment will be discussed in subsequent chapters.

Apart from the tests, observations and interviews as methods of collection of data were also employed.

Observations were used during the tutorials and design sessions in order to identify the way in which students work, how patterns and guidelines are being employed, and how patterns and guidelines affect the design process. For this purpose two observers took notes, during the treatment and the design assignment, on the progress of each student, the problems and questions raised by the students, the time taken to complete a task, and any difficulties that were encountered during these sessions. An alternative method would have been to use a video camera to record the sessions; however, the resources needed for such an approach would be considerable. In retrospect, the use of detailed recordings would have added no further information to the observations and notes taken during the design tests.

The data collected through the observations helped to establish the following: the extent to which patterns/guidelines were adopted and used; the degree to which they helped the design development; identified any issues with the format and the presentation; whether they confused designers and hindered their creativity as designers;

if there were any specific designs issues that can be addressed better using guidelines or using patterns.

Following the completion of the design test, students participating in the experiment were interviewed in order to gather as much information as possible concerning their experiences. The aim of this interview was to establish how often and effectively patterns and guidelines were used; the degree by which guidelines or patterns affected the design process and their decisions; and the perceived usefulness and qualities of the guidelines or patterns. The interviews were of the structured and semi-structured types.

Finally, after the completion of the tests, all students were asked to fill in a questionnaire and rate the usefulness of design patterns and guidelines in the evaluation and design of web pages; the extent to which they helped them in these activities; their intentions of getting to know more about patterns/guidelines; and whether they planned to use them in future projects.

In conclusion, a mixed methods research approach was used in this study employing qualitative and quantitative techniques, which is a widely accepted and popular approach taken by researchers in information systems and web design research (Barnes and Vidgen, 2005; Fitzpatrick, 1999; Khazaei, 1990), HCI (Dix et al., 2004; Preece et al., 2002), and the recent investigations and research into guidelines and patterns (Chung et al., 2004; Cowley and Wesson, 2005; Saponas et al., 2006).

3.11 Statistical methods of analysis

Several statistical methods were employed to analyse the quantitative data gathered in the experiment. Descriptive statistics were used to describe and summarise data, and more complex techniques, parametric and non-parametric, were used to make inferences and test the hypotheses that address the research objectives.

3.11.1 Parametric and non-parametric

The choice of the appropriate statistical technique requires consideration of several factors, including the following: the type of question being addressed, the type of items and scales chosen, the nature of the data, and finally the assumptions required for each particular technique (Pallant, 2001).

Parametric tests require assumptions about the format of the data, and usually normality is assumed for the data. Parametric tests rely on estimating and testing values of parameters. In contrast, a non-parametric test, also called distribution free-test, does

not require any assumption about the distribution of the data (Clark-Carter, 2004). However, each particular test, even a non-parametric one, requires certain criteria to be met. The main advantage of non-parametric tests is that they can be used for small samples where there is no information about the distribution of the sample available (Cohen et al., 2000). Non-parametric tests are less powerful than parametric tests and also less sensitive in that they may not detect differences although they actually exist (Walliman, 2005).

The particular techniques employed in this study are: T-test, ANOVA, chi-square and Mann-Whitney. Consideration and details about these tests will be given in the relevant section where the results of a specific test are presented.

3.12 Ethical issues

In any experimental research ethical considerations are a significant issue (Neuman, 2003; Saunders et al., 2007). This is even more important in the current study since all the experiments took place within an academic environment.

Every ethical and legal issue involved in this research, such as obtaining participants' consent and academic approval, and conforming to educational principles were appropriately considered beforehand. The ethical issues that are relevant in the study (Carver et al., 2003; Saunders et al., 2007) are outlined below:

- Prior to the start of each experiment the appropriate academic authorities were informed. In some cases, in order to proceed with the study and have access to the resources of the academic institution, the approval of the Faculty Board of Directors was required.
- In all cases the performance of the students had no effect on the academic evaluation and grading of the participants in any course; furthermore, participation did not contribute to any course credit. In the last two experiments the courses were specifically set up for the purposes of the experiment and were set apart from any other academic course.
- Participation was voluntarily and individuals had the right to withdraw at any moment. This resulted in significant drop-out rates for the first two experiments, but it was possible to control this factor much better in the last experiment while still maintaining the voluntary participation of the students.
- All participants were informed of the programme requirements, the procedures and the tests that were to be conducted. Possible benefits and also drawbacks were also highlighted. However, details of the purpose of the research were not

given in order not to affect the performance and behaviour of the participants and distort the findings. Finally, participants were informed of how the data was to be collected and used.

- Confidentiality and anonymity were offered to the participants. This is especially recommended in interviews in order to encourage them to be more sincere and open (Hussey and Hussey, 1997).
- Finally, the customarily pedagogical considerations and code of practice, according to university regulations, were adhered to. All the researchers involved were academics with many years' teaching experience.

3.13 Validity and reliability of research

All research studies are concerned with the issue of credible findings (Saunders et al., 2007), that is, with the quality and trustworthiness of the research study and the results obtained. The criteria that address such important issues are validity and reliability (Neuman, 2003; Robson, 2002). Validity and reliability concern not only a research study or a method, but also tests, scales, instruments and measurements; depending on the item they refer to, validity and reliability have multiple meanings and interpretations (Neuman, 2003).

Reliability is the extent to which a particular item (test, scale, or instrument) applied repeatedly to the same object yields the same results each time under a similar methodology (Babbie, 2004; Howell, 2001). Validity is the extent to which an item measures what it was intended to measure (Preece et al., 2002).

There are several kinds of validity: *internal*, *external* and *construct validity* are the most general and important kinds. Other kinds of validity, such as face, criterion-related, concurrent validity, etc., are applicable to certain types of studies, methods, or instruments. These specific kinds of validity will be discussed, if applicable, in the appropriate section where the results are presented.

While the criteria of reliability and validity are applicable to both quantitative and qualitative research (Robson, 2002), some proponents of qualitative research (Lincoln and Guba, 1985; Yin, 1994) prefer terminology more related to a qualitative approach. Therefore they adopt criteria such as credibility, transferability, dependability and confirmability, which correspond to internal validity, external validity, reliability, and objectivity.

Since the study employs an experimental design approach, the threats to validity and reliability in an experiment are briefly discussed in the following two subsections.

3.13.1 Internal validity in experiments

Researchers have described a number of factors that may limit and threaten the validity of an experiment. Such limitations are related to the internal and external validity of the research and are more serious in the case of a quasi-experiment (Cohen et al., 2000). Internal validity in an experimental design refers to the researcher's ability to control or eliminate factors that will affect the dependent variables. Variables, other than the treatment, are threats to internal validity and cloud the true effect of the independent variable (Neuman, 1994).

Several potential threats to internal validity have been identified (Cohen et al., 2000; Neuman, 1994; Robson, 2002), such as the following:

- **History** – Events other than the treatment occurring between pre-test and post-test which affect the dependent variable.
- **Testing** – Taking a pre-test alters the results of the post-test, probably due to practice effects or alerting participants to the purpose of the experiment.
- **Maturation** – Changes occur in the participants, from growing older to becoming more skilful, more knowledgeable and wiser, more experienced, etc., during the study. These changes often take place in longitudinal educational studies.
- **Instrumentation** – The measuring instrument is unreliable and introduces error, or the instrument is changed between pre-testing and post-testing.
- **Differential selection of participants** – Participants in the experimental and control groups have different characteristics that affect the dependent variable differently.
- **Mortality** – Different participants drop out of the study in different numbers, altering the composition of the treatment groups and confounding the effect of the independent variables.
- **Statistical regression** – Participants with extremely high or extremely low scores produce results that tend to regress to the mean on retesting.
- **Diffusion of treatments** – One group receives information and/or part of the treatment meant for another group.

Another type of validity, related to internal validity, is conclusion validity. This type of validity is concerned with matters on the statistical analysis and also refers to the degree to which a conclusion about the relationships in the data is credible (Wohlin et al., 2000; Trochim and Donnelly, 2007). Conclusion validity only examines if there is a

relationship between the variables under examination. The difference between conclusion and internal validity is that conclusion validity is only concerned whether there is a relationship; it is not concerned whether the relationship is a cause-effect relationship (Howell et al., 2005).

3.13.2 External validity in experiments

External validity or generalisability depends on whether the observed behaviour or measurement is representative of the people, the surrounding conditions and the treatments given (Cohen et al., 2000; Neuman, 1994; Robson, 2002). External validity can limit the degree to which the results of the research can be generalised to other populations or settings.

There are many potential threats that can jeopardise external validity. Mainly the threats belong to two types of external validity: *population validity*, referring to the extent to which one can generalise from the specific study sample, and *ecological validity*, the extent of generalisation due to the set of environment created for the study. Some of the threats to external validity are the same as threats to internal validity, or are related to them. A number of potential threats are summarised below (Cohen et al., 2000; Neuman, 1994; Robson, 2002):

- Explicit description of the experiment – Sufficient description is required so that feature replication is possible.
- Specificity of variables – Poorly operationalised variables make it difficult to identify the setting and procedures to which the variables can be generalised.
- Reactive effects – The fact of being in a study affects participants, in a negative or positive way from their normal behaviour (Hawthorne effect).
- Multiple treatment interference – When participants receive more than one treatment, the effect of prior treatment can affect or interact with later treatments, limiting generalisation.
- Pre-test-treatment interaction – The pre-test sensitises participants to aspects of the treatment and thus influences post-test scores.
- Selection-treatment interaction – The non-random or volunteer selection of participants limits the generalisability of the study.

An experiment with internal validity may or may not have external validity but without internal validity an experiment is not externally valid (Cohen et al., 2000).

All the above threats to validity were considered in the present study and the necessary steps were taken to ensure that the results of the study have not been violated by any of the above threats.

3.14 Measurement issues concerning research variables

In the previous section reliability and validity were highlighted with reference to a research design. However, as was pointed out, reliability and validity are relevant to a wide range of activities and instruments (Howell et al., 2005). In this section reliability and validity are examined in relation to the quality of measurement. Within this framework, whereas reliability indicates consistency of results from the same measurement process, validity means that the produced results accurately reflect the concept being measured (Babbie, 2004).

3.14.1 Validity

Validity is an essential characteristic of measurement and reflects the degree to which an instrument measures what it is supposed – and attempts – to measure (Wiersma, 2000). Pallant (2001) indicates that there is no straightforward indicator of the validity of an instrument. One approach to determine validity is through logical analysis and another is through an empirical analysis using a standard criterion for measurement (Wiersma, 2000). The conventional types of validity are: face, content, criterion and construct validity (Clark-Carter, 2004).

Face validity: This refers to the extent the measure appears to succeed in measuring what it is supposed to measure. According to Bryman and Bell (2003), this is the minimum expected from a new measure. One way of establishing face validity is by asking experts about the measure. Face validity of the measures in this study were confirmed by experts in the first study before the test was administered. Actually, one of the experts participated in structuring the design tests so as to be close to real web design requirements. The face validity of the evaluation test was assured by taking a web site and reconstructing it so that it would be fully functional while it was being examined for usability errors. Face validity was greatly improved in the main study since both tests were improved after having been tried with the participants during the first study.

Construct validity: Construct validity is directly related to the question of what the instrument is in fact measuring, i.e. what construct or concept is behind someone's performance or score on a measure (Churchill, 1979). Construct validity assumes that

there is a causal relationship between intervention and outcome and is concerned with the extent to which the study manipulates what it claims to manipulate, and whether it measures what it claims to be measuring (Gray and Salzman, 1998). Patterns and guidelines were manipulated for the purposes of the present study and tests were conducted in order to measure the application of patterns and guidelines. Construct validity is discussed in Chapter 7 where the validity and reliability of the study are assessed.

Content validity: The extent to which the content of the test represent all facets of a concept or an intended domain (Babbie, 2004; Clark-Carter, 2004). The key to content validity rests in the development of the instrument and the procedures employed to cover all aspects of the concept.

This study started by defining the domain of the concepts under investigation. Content validity was to some extent limited in the experiments of this study by the restrictions imposed by the selection of the sets of patterns and guidelines (as explained in the relevant section below). Despite this, content validity was kept as high as possible by systematically selecting every possible item that represents a large area of the domain which the scale is intended to measure.

Criterion validity: The extent to which the outcome of the test is in agreement with an existing (referred to as concurrent validity) or predicted (referred to as predictive validity) criterion external to the test (Pallant, 2001; Wiersma, 2000).

3.14.2 Reliability

Reliability refers to a scale's dependability. If one has a reliable scale or measure, consistent results are produced each time the same thing is measured over similar subjects in a similar context (Cohen et al., 2000). There are four key aspects of reliability (Cohen et al., 2000; Wiersma, 2000): *Stability reliability* examines the stability of the results over time; *equivalence reliability* is achieved when an instrument produces the same outcomes with another equivalent instrument; *internal reliability* (consistency) is particularly important in connection with multiple-item scales and assesses the degree by which the items of a scale measure the same concept (Bryman and Cramer, 2005); and *inter-rater reliability* is the extent of consistency and agreement among researchers using the same measures (Neuman, 2003).

Some of the above types of reliability require two administrations of the same test to be carried out in order to obtain an estimate of the reliability. The reliability across

several researchers or evaluators, called inter-rater reliability, is of particular interest to this study since several evaluators were employed to score the designs of the students.

3.14.2.1 Inter-rater reliability

The results of the independent evaluators were assessed as to the degree of agreement between them by calculating inter-rater reliability (Garson, 1998). Inter-rater reliability was used as a further line of validation for the rating method and the grading scheme.

Inter-rater reliability reflects the consistency of the results of several evaluators employing an assessment method. A high inter-rater reliability shows an agreement among the evaluators and reflects the consistency of implementing a rating method (Howell et al., 2005; Marques and McCall, 2005). For subjective measures, Kitchenham et al. (2002) suggest that a measure of inter-rater reliability, such as the kappa statistic or the intra-class correlation coefficient for continuous measures, be presented.

3.14.2.2 Measuring inter-rater reliability

Intra-class correlation (ICC) coefficient is used to measure inter-rater reliability for two or more raters. ICC may be conceptualised as the ratio of between-groups variance to total variance. Shrout and Fleiss (1979) present guidelines to be followed for selecting the proper coefficient to estimate inter-rater reliability. They distinguish, by using three models and two versions for each model, six kinds of ICC reliability coefficient. Three models take into account the way each subject is rated: by different group of raters, by randomly selected raters or by all raters. For each model there are two versions of reliability, one where reliability is to be calculated on a single measurement and another one where reliability is calculated by taking the average of the raters (Garson, 1998).

In this study each participant was assessed by every rater, and the raters are the only raters of interest. SPSS, the statistical package used to analyse the ICC, produces both forms of ICC, one for the single measure, and one for the average measure.

In order to interpret the ICC, Shrout and Fleiss (1979) suggest that an ICC >= 74 is considered excellent inter-rater reliability, an ICC = .60 to .74 good reliability, an ICC = .40 to .59 fair reliability, while an ICC of <.40 is considered poor reliability.

First study

Two evaluators examined and rated the designs. However, it turned out that the grading scheme was not very strict and the evaluators had differences in their scores resulting in low inter-rate reliability. One reason for this was that the errors of the students were not predictable and it was not possible to provide some grading scheme or give guidance for

all the errors. Thus the evaluators had to rely on their personal judgement in order to rate several aspects of the design.

Main study

Inter-rater reliability in the final study was improved by operationalising a more precise grading scheme and by carefully modifying the tests in order to avoid areas that proved to cause large disagreement among the raters with regards to their grades.

Custer et al., (2001) report low inter-rated reliability in introducing and using a model to assess student performance in technological design activities. In order to improve inter-rater reliability, the authors suggest training of the raters that includes post-rating discussion of rating differences.

In the final study three raters were used. The two raters that were used in the first study were also employed. These raters were considered to be experienced with the particular rating scheme and procedure. The third rater was introduced and trained in the rating procedure, using the grading scheme on a number of web designs of the previous exploratory study. Training consisted of an orientation to the design tasks, a walkthrough analysis of the grading scheme, a small briefing that included problems encountered during the rating sessions, a short explanation on how to use tabbed browsers, and finally suggestions that help reduce grading time.

3.15 Overview of the studies

Three experiments were conducted for the purposes of this research: the exploratory study, the first study, and finally the main study. The following Table 3.1 gives an overview of the reported studies, showing the number and profile of the participating students, the parts of each study, and the methods used. Each experiment contributed significantly to the understanding of how the next experiment should be carried out, and the findings and lessons learned at each stage have considerably influenced the next and contributed to the success of the final experiment, which is the main study. The table also shows the modifications, the differences between the studies, and how each study informed the next.

Table 3.1: Overview of the studies

Exploratory Study

Students' profile: Undergraduates following an HCI module in the second year of a Computing course, Sheffield Hallam University, UK, during March - May 2005.

Shortcomings

- Erratic attendance of students
- Patterns and guidelines not balanced
- Extensive sets of patterns and guidelines
- Use of paper prototype

Issues informing the next study

- To use of an authoring tool in the design process.
- To make the experiment to be part of a full teaching course or to be conducted in a way that would guarantee participation and acceptable drop-out rates.
- To form and use a balanced set of patterns and guidelines.
- To employ a set of metrics for the design tasks

Parts of the Study	No. of participants	Data collection Methods
1 Preliminary Test - Group formation	11	
2 Tutorials with Patterns-Guidelines	4 (Guidelines group), 4 (Patterns group)	
3 Evaluation and Design Test	1 (Guidelines group), 1 (Patterns group)	Design Test
4 Focus Group session	10	Focus Group

First Study

Students' profile: Undergraduates following an E-commerce module in the third year in a Business Administration course in the Business Administration Dept., TEI of Athens, Greece, during October 2005-February 2006.

Shortcomings

- High dropout rate at the late stages of the experiment
- Extensive sets of patterns and guidelines
- Skills of students (experience with computers - some of them did not practise enough)

Issues informing the next study

- To extend the teaching tutorials and bring students to an adequate level of competency
- To assign students individually to work on their own
- To assure students have reached a satisfactory level of design efficiency.
- To improve the metrics that could allow evaluators to work quicker and more reliable
- To improve sets of patterns and guidelines

Parts of the Study	No. of participants	Data collection Methods
1 Web design tutorials	172	
2 Test - Selection of participants	172	
3 Web design tutorials	42	
4 Preliminary test - Group formation	28	
5 Tutorials with Patterns-Guidelines	15 (Guidelines group),16 (Patterns group)	Observation
6 Redesign and Design Test	14 (Guidelines group),14 (Patterns group)	Design test
7 Interview, Questionnaire, Evaluation Test	13 (Guidelines group),13 (Patterns group)	Interview, Questionnaire, Evaluation test

Main Study

Students' profile: Undergraduates in the final (fourth) year of an Automation course in the Automation Department, TEI of Piraeus, Greece, during February 2006 - April 2006

Differences from the previous study

- The level of students (interested in web design, technically oriented, motivated to learn, efficient in the use of tools and techniques).
- The teaching approach and tutorials (extended tutorials covering a wide range of techniques, more design tests and practice).
- The balanced sets of patterns/guidelines (reduced in number, reviewed and improved, with better examples).
- Improved tests (design and evaluation test, no redesign test)
- Improved instruments (questionnaires), in depth interviews allowing qualitative analysis

Intervention

- Eliminate participants with some experience in web design.

Parts of the Study	No. of participants	Data collection Methods
1 Web design tutorials	65	
2 Test - Selection of participants	45	
3 Web design tutorials	45	
4 Preliminary test - Group formation	39	
5 Tutorials with Patterns-Guidelines	20 (Guidelines group), 19 (Patterns group)	Observation
6 Design Test	20 (Guidelines group), 19 (Patterns group)	Design test
7 Evaluation Test , Questionnaire	20 (Guidelines group), 19 (Patterns group)	Evaluation test, Questionnaire
8 Interview/Questionnaire	16 (Guidelines group), 18 (Patterns group)	Interview, Questionnaire

Full details and lengthy descriptions about each study are given in the relevant sections (see Chapter 4 and Chapter 6). More details for the first study (timetable and group composition) can be found in Table 4.1 and Table 4.3. The same details for the main study can be found in Table 6.1 and in Table 6.2.

3.16 Summary

This chapter has outlined some important aspects of the methodology used in the study and has also provided an account of the rationale for the choice of methods and the way in which the methods are employed. The justification for adopting a multi-method approach (triangulation) in the present research has been discussed. The whole research process and the two strategies employed, experimental and survey, in order to achieve the research objectives have been presented.

A number of data collection methods, both quantitative and qualitative, were used collecting quantitative data from the tests and the questionnaires and qualitative data from the interviews and the observations. Several issues regarding the reliability and validity of the study and of the instruments used were raised. The tests used for statistical analysis were briefly presented; more details will be given together with the results of the analysis. Ethical issues, typical of a study of this nature, were outlined together with the way in which they were addressed. Finally, an overview of the three studies was presented showing the stages and details of each study.

Chapter 4

Preparation for the Main Study

4.1 Introduction

Three experiments were conducted for the purposes of this research: the exploratory study, the first study, and finally the main study. The findings and lessons learned during the exploratory and the first study have considerably influenced and contributed to the success of the main study.

This chapter details the experimental setting, the selection of participants, the teaching method and finally the instruments used in the exploratory and the first study.

The exploratory study, presented in Section 4.2, served as an opportunity to investigate the nature of the experiment and get feedback and experience in working with patterns and guidelines.

Section 4.3 presents the first study and while giving details of the experiments, two key issues for the experiment are described. First, the choice and the formation of the sets of patterns and guidelines used for the study are discussed; several criteria and restrictions were used to choose the proper sets, which should raise the same usability issues. Second, the metrics used by the independent evaluators to grade the web sites designed by the students are introduced briefly; these metrics were further developed and are described in more detail in Chapter 5.

Section 4.4 reports on the results, using the observations, questionnaires, interviews, and the tasks completed by the participants. The following two Sections 4.5 and 4.6 describe the limitations of the first study, the conclusions, and the

considerations for the following main study. Finally, a summary of the chapter is given in Section 4.7.

4.2 Exploratory study

The first experiment, named "exploratory study", took place in March-May 2005 during the spring semester at Sheffield Hallam University in England. The study was conducted with a group of students enrolled in an HCI course at Sheffield Hallam University, UK.

The exploratory study had an investigative nature, and served as a preliminary study for subsequent experiments. The main purpose of the experiment was to investigate the application of patterns and guidelines as a teaching tool and to identify problems and issues related to the experimental procedures.

4.2.1 Participants and preliminary test

The number of students participating in the group was 11 in total, 9 male and 2 female. There was no training of the students in the course that was directly related to the experiment. Participants were undergraduates following an HCI module in the second year of a Computing course. Therefore it was assumed that they had the necessary skills and knowledge to participate in the experiment. Students took part in a preliminary design test intended to evaluate their sense and knowledge of usability. The purpose of this test was to balance the two groups and control for experience, design ability and knowledge about usability.

This test consisted of two parts. The first part contained multiple choice questions about general principles of HCI. The second part consisted of a series of small pictures depicting parts of a web page. In each picture there was a usability error or some aspect whose current design could be greatly improved. The students were asked to identify the errors and/or suggest an alternative design to improve the user interface and help a potential user of the web page. See Appendix 4.1 for the tasks developed for the preliminary test.

The scores on this test ranged from 37 to 90 on a scale of 0-100. Based on the scores the students were divided into two groups, using a rank sampling approach that takes into account the ranking of each student within the group (see Section 3.7.1 for details of the procedure). In this way one group was considered statistically equivalent to the other with regards to their ability and knowledge of usability issues.

4.2.2 Patterns and guidelines for the study

A selected set of patterns from van Welie (2001-2007) (hereafter referred to as "van Welie patterns") and a set of guidelines taken from Koyani guidelines were used to teach students usability principles and web interface design. The two sets were not extensively balanced, since it was not possible to match the existing sets of patterns and guidelines; however, patterns and guidelines presented overall guidance in corresponding categories (see Appendix 4.2 for examples of patterns and guidelines used for teaching). Only a very small number of patterns and guidelines were equivalent to each other. Nonetheless, the final test included usability issues that were presented to both groups of students in one or another format.

4.2.3 Teaching usability

One group was trained in the design and usability of web interface using guidelines and the other group using patterns. The set of patterns and the set of guidelines were printed in a booklet and distributed to the students. Further details of the experiment and the training are as follows: a two-hour teaching session was delivered to each group; a one-hour post test was conducted to assess the effect of patterns and guidelines on the students; a short lecture covering patterns and guidelines was given so that all students would be equally trained, taking into account relevant ethical issues and following academic traditions.

However, after the preliminary test the students' attendance of lectures and tutorials was erratic and below expectations. There were several reasons for this: time of the experiment, which was towards the end of the semester; students were busy due to end-of-term assignments; small number in initial set of students; and participation in the classes was not compulsory.

After the final test, in order to ensure that all students received the same course content, participants were given a short lecture covering patterns and guidelines: half of the participants had been trained with guidelines and the rest with patterns. Attendance at this last lecture was very good and a focus group session was conducted. During this session patterns and guidelines were reviewed and participants expressed their feelings, understanding and opinions about the usefulness of patterns and guidelines in the design process.

4.2.4 Design and evaluation test

Despite students' erratic attendance and the high drop-out rate, the final test was conducted. Only two students, one from each group, participated in the test. Students were asked to evaluate and design web pages using the patterns and guidelines that had been presented during the training sessions with the help of the relevant manuals; see Appendix 4.3 for the tasks of the final assignment.

The evaluation task consisted of identifying flaws and usability problems and suggesting useful redesign ideas and improvements (where applicable) in two small sections of a web site; see Appendix 4.4 for some pages of the site. Most of the errors were identified by previous independent research work on the site (van Welie and Klaasse, 2004). It was stipulated that at least 10 contributions should be made towards the usability of the site.

The design task (see Appendix 4.3) consisted of designing and producing a paper prototype (Preece et al., 2002) of two interlinked web pages representing the e-cards section of a museum, where visitors are able to choose and e-mail a card to a friend free of charge. Specific requirements regarding the content and the functionality of each page were given.

4.2.5 Early findings

The analysis of the test regarding the design skills of the students was inconclusive due to the small number of students participating in the final test. Although the small number of participating students means that it was not possible to draw any conclusions comparing guidelines and patterns, some observations can be presented. These observations are consistent with the findings and conclusions of Wesson and Cowley (2003), and are based mainly on the experience of teaching patterns and guidelines and the focus group session rather than on the assessment of the design and evaluation tests of the students:

1) Guidelines seem to be easier to teach than patterns and also easier for students to comprehend and remember, probably because they come in a short, compact format of up to half a page, while patterns can be as short as half a page but range up to two or even more pages. A pattern also consists of more parts than a guideline, and it takes more time to describe each part of the format of a pattern even if the information of a given pattern is the same as that of an equivalent guideline. For this reason if patterns are to be used as a teaching tool they require a more detailed analysis and presentation before they can be used in the classroom.

2) Patterns require a more careful and thoughtful teaching approach if their full potential is to be realised: Links between patterns need further attention in order to be appreciated by the students. Furthermore, during the presentation of a pattern, links to other patterns cannot be understood until the full set of patterns is presented. Without explaining the connection between the pattern being introduced and another one that has not yet been presented (and is therefore not known), the presentation may not produce any positive learning outcome, and instead may simply confuse students.

3) The names of patterns and guidelines carry significant weight: Patterns such as "Breadcrumbs" to assist navigation and guidelines such as "Avoid jargon" are easily remembered and also easily applied. On the other hand, guidelines with indistinguishable names such as "Provide Users with Good Ways to Reduce Options" or "Order Elements to Maximise User Performance" do not convey any information and probably mislead students. Also pattern names such as "Doormat Navigation" or "Faceted Menu" can be too abstract and without any meaning until the patterns are explained or studied in more detail.

4) Pattern languages are still incomplete since there are quite a few guidelines that do not correspond to any pattern. Furthermore, examining any of the most prominent pattern languages, it is quickly noticeable that these languages may share only a few matching patterns.

5) It is easy to assess students when they perform a web page evaluation. There are three possible outcomes when a designer performs an evaluation of a web page: a true error is found; an error is missed or a false error (also referred to as false positive) is reported (Sears, 1997). However, it is more difficult to judge students' design skills and the extent to which patterns and guidelines have affected their decisions. Design assessment is even more difficult when the artefact is in a prototype form. Students delivered the design test using pen and paper. Judging the quality of the design and assessing the application of usability principles has to be appropriately modified to reflect and allow interpretation of attributes and qualities in the prototype. The design test needed to be adapted to take into account the constraints of the tools employed. These constraints had an effect on the type of test that was administered to the students and put a limit on the extent of the design task. Use of colours, different font styles, dynamic behaviour of pages, links and navigation within a site can not be incorporated in a test such as the one conducted due to the time taken to depict these kinds of features and the lack of proper tools to quickly illustrate them.

6) The examples presented with each pattern or guideline are probably the part that captures the attention and interest of students. This was indicated by the majority of the students during the last teaching session. The importance of examples in learning is expected as examples are part of the cognitive processes in acquiring and using knowledge (Hativa, 2001; Jones and Idol, 1990; van Lehn, 1996). Examples help a user to better comprehend the context and the intention of the pattern or guideline and provide an easy guide for their application.

The designs that the students produced were paper-based sketches developed in a very short time. One must question the extent to which the initial design can be attributed to the effect of a different training approach, as opposed to factors relating to the personality and personal design skills of each individual. It is reasonable to assume that the different types of character and the different cognitive skills of the students come into play. At the same time it is difficult to evaluate paper prototypes, especially if they have not been developed into more concrete presentations or some form of interactive and more detailed prototype. Designers, developing a pen and paper prototype without tool support, need more time to further develop and iterate the initial designs. This would allow for any differences between designers as to the way they approach the design process. Some designers, for example, prefer to sketch their initial ideas even if they lack detail and probably have errors while others prefer to think and present an improved initial prototype with fewer errors.

In conclusion, the problems identified during the exploratory study and the experience gained helped the researcher in modifying the experimental approach regarding the following three key aspects:

- The use of an authoring tool in the design process.
- The experiment to be part of a full teaching course or to be conducted in a way that would encourage participation and acceptable drop-out rates.
- The use of a balanced set of patterns and guidelines to improve its use in teaching.

These aspects will be taken into consideration and discussed in the next section, where the first study is presented.

4.3 First study

The main purpose of the first study was to (1) develop and scrutinise the metrics and the assessment procedures; (2) examine and analyse data collected through the techniques

employed; (3) investigate the application of patterns and guidelines as a teaching tool under real academic conditions, spanning a course's duration; (4) explore the use of the authoring tool; (5) test-implement the teaching approach; (6) format and examine a balanced set of patterns and guidelines; and (7) get an estimate of the reliability and validity of the study. Limitations and shortcoming of the first study informed the main study.

4.3.1 General description

The second experiment, named "first study", took place between October 2005 and February 2006 at the Technological Educational Institute (TEI) of Athens in Greece. The experiment was conducted with a group of undergraduate students following an e-commerce course, of four years duration, in the third year of their studies in the Business Administration Department of the TEI. Academic establishments such as TEI are higher public educational institutes, with the status of universities. Graduates are eligible for postgraduate studies in the EU and the USA. There were more than 170 students taking the course, which introduces students to simple web design and e-commerce principles.

4.3.2 Design tool for web sites

One of the requirements of this experiment was that the final deliverable of each student should be a real web site, ready for publication on the Internet, and not any type of low or high quality prototype. The exploratory study established that using paper or a software tool to build a prototype would put the design of the experiment at a disadvantage. One reason was that it would be difficult for the evaluators to judge prototypes. Prototypes depend on the skills of individuals, in other words their crafting, drawing and handwriting abilities. Lin (2005), in order to compare artefacts using his "Damask" prototyping tool, and to avoid such problems, resorted to transforming these artefacts into HTML representations.

Another drawback of building a prototype is the level of patterns/guidelines that can be applicable to prototypes. Prototypes are mainly used to present high-level design concepts and functional or interactive issues, not small detailed items. Prototypes would have required the application of high-level design patterns/guidelines that cannot be comfortably applied by students and novice designers without previous extensive design knowledge.

Finally, students would not have liked the idea of producing a prototype either with the help of a software tool or by hand as the whole concept and purpose of a prototype would have needed to be explained to them, probably together with an overview of the development process and the iterative design concept in order to appreciate the prototype. On the other hand, producing a web site that could be published brings more enthusiasm to participants, despite the drawbacks of ignoring lifecycle models in software engineering and interaction design.

For this purpose, a quick review of the available tools for teaching web design was made. An authoring tool popular with designers and at the same time offering a WYSIWYG (What You See Is What You Get) editor was required. Students would be attracted to the idea of getting to know and use a widely acceptable tool, since some of them might even use this knowledge as an extra qualification for future job hunting. The options were restricted to only two tools, FrontPage (Microsoft Corporation, 2003) and Dreamweaver (Macromedia, 2004). Both tools were carefully examined by paying attention to the interface and the designing procedures of each program. Although Dreamweaver is the most popular tool used by professionals, FrontPage offered some advantages that suited the particular setting:

- It was easier to learn with less technical details that would not confuse novices.
- It had a familiar interface since beginners could relate it to other Microsoft Office products, specifically to Microsoft Word, resulting in a less steep learning curve.
- It would be a simpler working environment to introduce to the students with less demanding settings for a quick start.

The latest version of FrontPage (Microsoft Corporation, 2003), English version, was used for all the tutorials. Copies of the program were also made available to students to install them in their personal computers through academic licences.

4.3.3 Participants and initial group

The course tutorials started with an introduction to web site design using FrontPage. However, it was soon evident that the level of knowledge the students would reach would not be high or sufficient to design a web site of reasonable quality. The result would rely mostly on the students' aptitude for design and it would not be possible to test a comprehensive set of guidelines/patterns. Furthermore, it would be impossible to cater for all students since resources were limited. For these reasons purposive sampling

(Cohen et al., 2000; Robson, 2002) was employed, with the best and most skilful students selected to form the final group to participate in the experiment.

After three weeks of tutorials of one hour per week (according to the official timetable), students were asked to fill in a questionnaire (see Appendix 4.5), in order to obtain information about the level of their computer experience and some biographical data. A small design test was then administered to the students. Based on their performance, the best students were selected and offered a place in a course about Web Design and Usability. The course had the form of a seminar and was set apart from the usual formal academic course that the students were taking. Students were promised a certificate of participation and prizes for the best achievers.

4.3.4 Final group of participants

The main purpose of selection was to avoid problems with poorly performing students who could not use the authoring tool or were lacking in motivation. The selection of students was based on their knowledge of FrontPage techniques that had been taught to them in previous tutorials. At the same time, two other factors were also taken into account: good knowledge of using computers and having access to a computer and Internet from home. Students were required to have a computer at home in order to get some practice and work on their assignments; Internet and e-mail was necessary in order to receive and send electronic material over the Internet. Three groups were formed from the students selected for the experiment and who had been accepted to participate. The total number of students was 42.

4.3.5 Teaching web design

Tutorials in FrontPage and web design lasted until the preliminary test before the treatment. A tutorial of two hours' duration was arranged once a week. Students had eight more hours of FrontPage tutorials and a two-hour lecture about usability principles in web design and the evaluation of web sites. Tutorials were conducted by the author.

During that period two small assignments were sent to the students by e-mail; students were obliged to send them back by a specified deadline. These assignments forced students to practise on their own and also give an indication of their design skills and capabilities. At the same time it was possible to monitor the progress of the students. Students who did not deliver both assignments were not allowed to take the final tests. These procedures were considered necessary in order to make sure that students were engaged in the tutorials.

The following Table 4.1 presents the details of the course, the procedures/activities involved, the duration of each activity and its purpose/content, the number of participants in each stage, and the number of staff acting as educators, supporting staff or facilitators during the tutorials and tests.

Table 4.1: Timetable of the experiment

Procedure/Activity	Duration	Purpose or Content	Participants/staff No.
Tutorials	3 hours	FrontPage	172 / 1
Selection	1 hour	Small test	172 / 1
Tutorials	4 hours	FrontPage	42 / 1
Tutorials	2 hours	Usability principles	36 / 1
Tutorials	4 hours	FrontPage	33 / 1
Preliminary test	Forming two balanced groups		
Tutorials Patterns/Guidelines	4 hours	Guidelines/patterns	31 / 2
Testing	2 hours 15 min.	Redesign - design tests	28 / 3
Interview / Questionnaire	30-40 min.	Collection of data	26 / 2
Testing	50 min.	Evaluation test	26 / 2

4.3.5.1 Use of template for tests

Students produced a variety of design solutions for a particular site, in the small tests during the tutorials, with different page layout, page sizes, menus, colour of the page, and images for the site. Evidently, students tend to exaggerate their designing inspirations and design web sites with pages overloaded with graphics and technical features that mostly distract rather than please the visitor.

For these reasons, the use of a partially prefabricated site was deemed necessary for the final tests. All pages of the web site were based on one or two basic templates. On each page the necessary text and photos/images were included. The template, usually a layout table with appropriate colour background, defined the page layout. In that way, all the students would adhere to certain rules regarding the general layout of the site, the size and number of pages, the content, and the use of colours. This had also a desirable effect on students' artefacts since it forced students to take a certain direction and, although it restricted freedom of expression and the creativity of the designers, it allowed the evaluators to better judge the site based on the evaluation metrics.

Employing a template is a practice that is typically followed in the process of designing a site. Usually a team of designers pre-determines the layout, the graphics, and the content that will go onto a web site and afterwards another designer or designers work on the detailed interface. Web design companies prefer to work with certain templates that they have built themselves or they choose and buy a suitable template

from another company, in order to cut down on development costs (Newman and Landay, 2000; Taylor et al., 2005). Templates, like "Liquid Layout" (van Welie, 2001-2007), "Fixed Width Screen Size" (van Duyne et al., 2002), are part of pattern collections and guidelines as well (US Department of Health and Human Services, 2006). Templates and relevant design concepts were described in the class but they were not associated with patterns or guidelines during the initial training of students.

In order to complete the design the students had to format text, provide headings, use lists, format and size pictures, specify the layout of the elements within a page, identify and format links, provide a navigation scheme using interactive buttons with labels, etc. In all tests, the designed site was delivered in electronic form with all pages linked according to the navigation scheme. The site included all the features that would make web pages ready to be published.

4.3.5.2 Preliminary assignment

After the FrontPage tutorials, a preliminary assignment was administered to the students (see Table 4.1). The students' performance on this assignment was used as a criterion to split the participating students into two balanced groups with regards to their design ability and the skills that they had developed so far.

The assignment required students to design, according to instructions, a static web site. The site was two levels deep, implying the use of a two-level navigation scheme. Figure 4.1 shows two of the pages of the web site as they were when given to the students for development. The site was about a corporate company presentation, displaying mainly information about the company without any product sales or allowing any complex interaction activities. For ease of use, if a hyperlink could not be linked to a real address, it was linked to a hypothetical (dummy) page within the site. A variable width template, consisting of two or three columns, depending on the particular page, was used for the site. Instructions were included with the assignment (see Appendix 4.6). Figure 4.2 shows two pages of a web site created by one of the students.

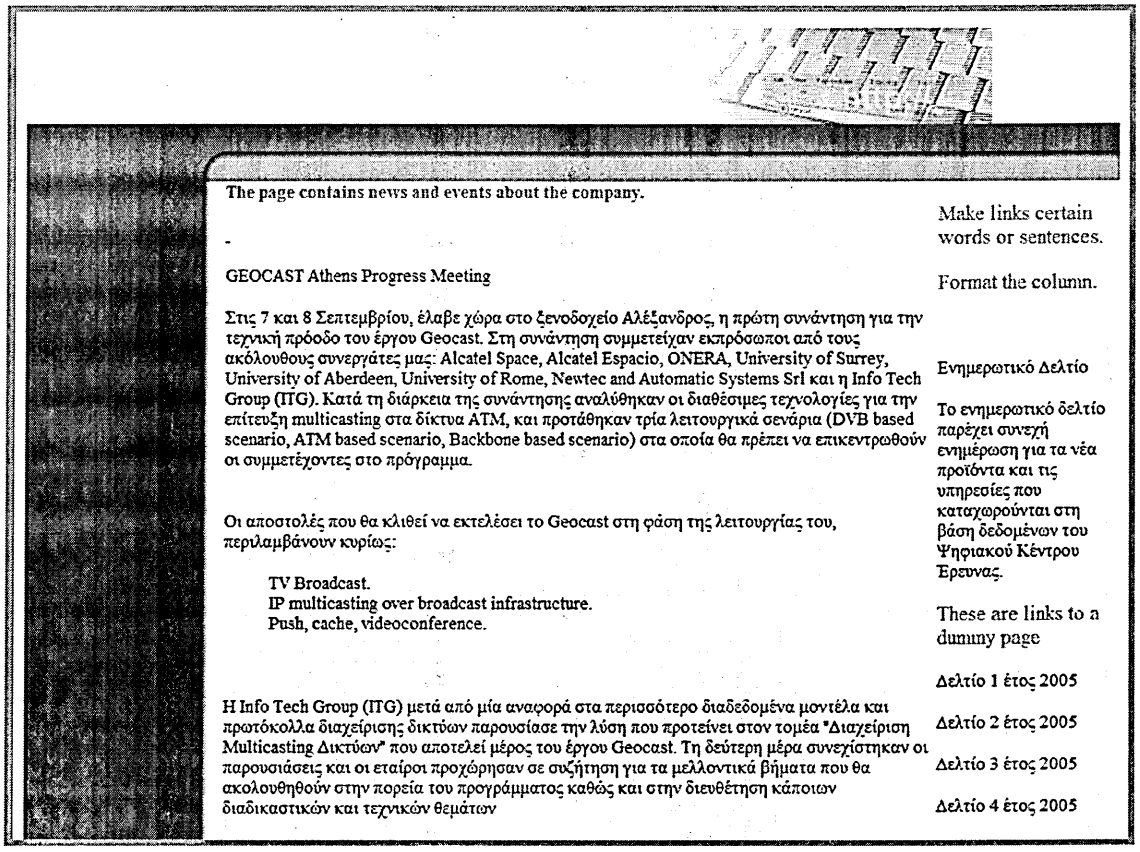


Figure 4.1: Pages of the preliminary assignment

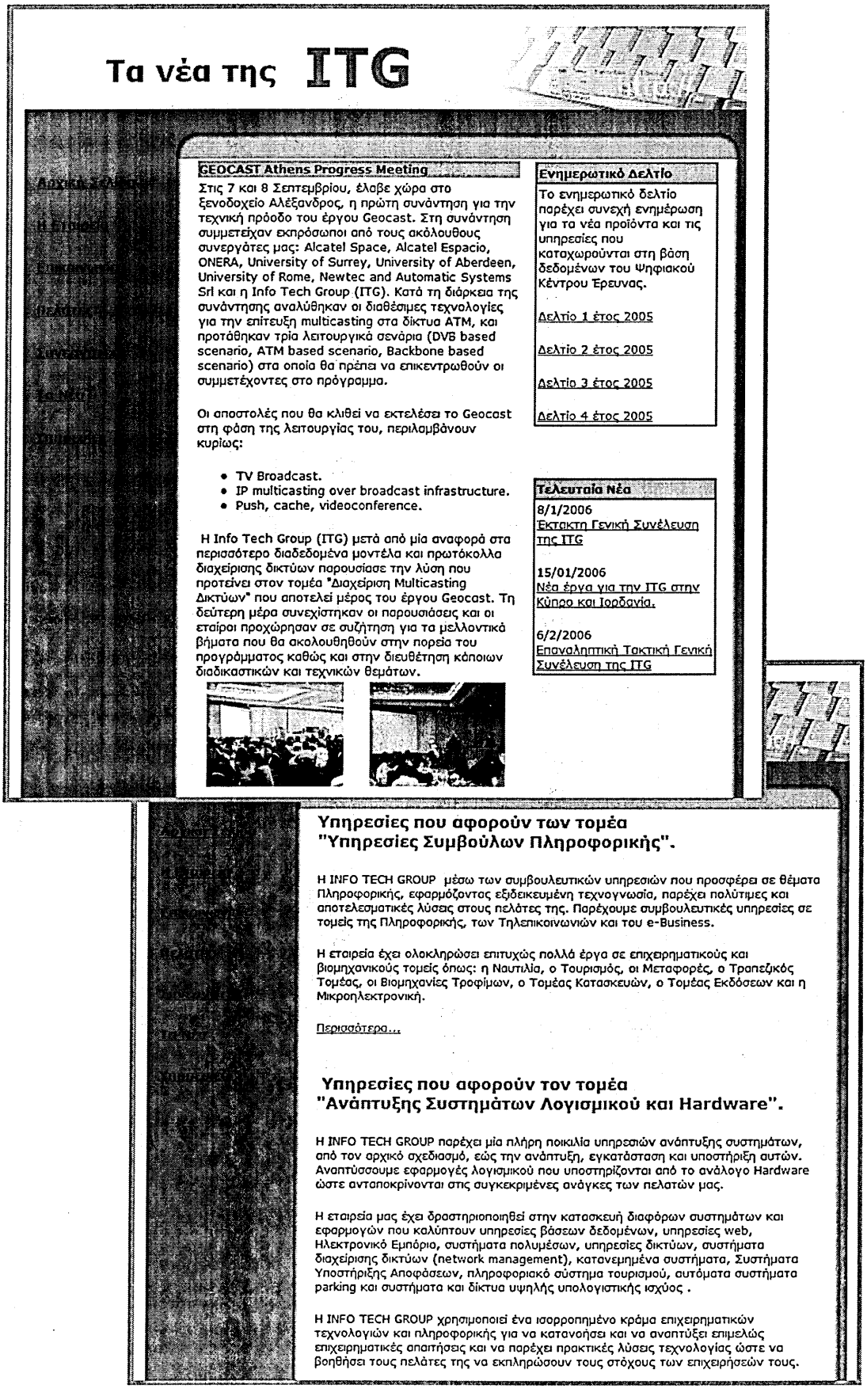


Figure 4.2: Sample pages of a participant (preliminary assignment)

A professional designer judged the students' designs. The focus of the evaluation was on the general impression of the site, its navigation and consistency, how skilful and knowledgeable the student appeared to be, and how many good usability practices were followed in designing the site. The evaluator was mainly comparing and ranking sites, not actually scoring or performing a detailed evaluation. The time required for evaluating each site was approximately 15 minutes. The evaluator, a professional designer, commented that it was more difficult to rank poor sites while good ones were taking less time.

Based on the performance of the preliminary test, students were divided into two groups using a rank sampling approach that takes into account the ranking of each student within the group. This procedure was explained in Section 3.7.1. In this way one group was considered equivalent to the other with regards to its ability and knowledge about usability.

The assignment also served as an exploratory test and indicated the level and the features that should be included in the future design test. Any student who failed to deliver the final preliminary assignment on time was dropped from the course.

4.3.6 Patterns and guidelines for the first study

The previous exploratory study clearly had shown than one necessary requirement for the experiment was to select a set of patterns and a set of guidelines and to balance these two sets to present the same advice and guidance.

Current patterns and pattern languages (Graham, 2003a, 2003b; van Duyne et al., 2002; van Welie, 2000-2007) contain patterns that in their majority address complex or abstract issues of design (e-commerce, site genres, trust and credibility, etc.). Novice designers do not possess the necessary technical knowledge and experience to apply these patterns in their design work. Such patterns deal with advanced issues that may only be clearly explored in large scale design tasks. Similar observations can be made about the available guidelines: although their complexity is somewhat lower than that of patterns, many are not suitable for a time-limited experiment involving a novice designer. Such patterns and guidelines involve programming techniques that the students, in the current experimental setting, would not be able to build using their knowledge of FrontPage (complex menu structures, search options, interactive forms, e-commerce patterns, etc.). Furthermore, some of the patterns deal with advanced issues of web design which exceed the ability of the novice designers to understand, including all the implications of applying the design principles of such patterns.

Keeping in mind these restrictions, identifying a set of patterns and guidelines that could be used as an instructional tool for teaching design principles was critical to the success of the experiment. The following criteria were used for the selection of patterns and guidelines:

- They had to be meaningful for the students, that is, their underlying concepts had to be easy to understand.
- They had to be easy to apply and include in a web site using their existing technical web design skills.
- They had to be close to the students' level of design experience and appropriate to their particular level of knowledge so that they could be associated with problems the students had encountered in their short careers as designers.

4.3.6.1 Choosing patterns and guidelines

Existing and widely known pattern languages were examined. This process revealed several weaknesses of current pattern languages, some of which were identified in the previous exploratory study as well. Most of the patterns could not meet the above criteria. Patterns focus mainly on high-level design issues. Although low-level design guidance is incorporated into these patterns, that guidance and the knowledge conveyed will be probably lost and ignored by someone inexperienced in web design. Similar observations can be made by inspecting the available guidelines.

Also, the formation of a balanced set of guidelines and patterns presents some difficulties. One problem with existing sets of patterns and guidelines is the lack of consistency between patterns and guidelines. Comparing, for example, the Koyani guidelines with the currently developed pattern languages, it is evident that only a small number of guidelines could be directly mapped onto the existing patterns. This can be attributed to an existing gap between patterns and guidelines in their approach to design: patterns are used mostly as components to build web sites while guidelines are small pieces of prescriptive advice.

Patterns address more complex design issues and one pattern can combine several guidelines together (van Welie et al., 2000). Other patterns contain advice that is spread across several guidelines. The patterns mainly in the van Duyne et al. (2002) pattern language (hereafter referred to as "van Duyne patterns") incorporate several guidelines, after the problem statement where the forces of the problem are described. These guidelines are presented to the reader as useful approaches, strategies, tips or well-known good practices to help with the problem. For example, van Duyne's pattern

concerned with links, named "Obvious links", contains several guidelines about links within the problem section of the pattern, where details about the problem are given and the forces that affect the problem are described. Two of those guidelines "Use Familiar Language" and "Separate Links That Word-Wrap" correspond to "Use Meaningful Link Labels" and "Use Appropriate Text Link Lengths" of the Koyani guidelines respectively. Nevertheless, most of the patterns that contain guidelines are complex and multi-dimensional patterns and, therefore, do not meet the criteria that prescribe the use of simple and applicable patterns.

There are also guidelines that present advice about complex or high-level design issues. Typically they come in a prescriptive way (e.g. use site maps or use thumbnail images), but the information they provide to the user is limited and sketchy, and presume that the reader already knows how to handle a site map or similar design components. Comparing a high-level guideline such as Koyani's "Use Site Maps" to van Welie's "Site Map", the following differences can be distinguished (See Figure 4.3 and Figure 4.4.

7:7 Use Site Maps

Relative Importance: 1 2 3 ○ ○

Strength of Evidence: 1 2 3 4 ○

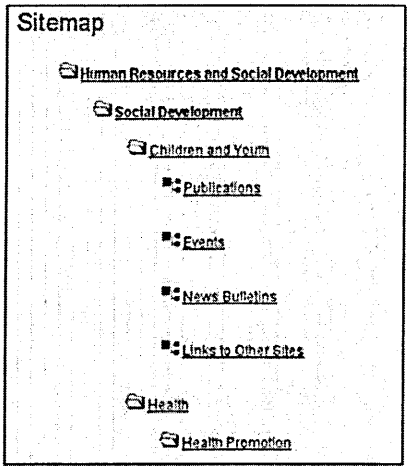
Guideline: Use site maps for websites that have many pages.

Comments: Site maps provide an overview of the website. They may display the hierarchy of the website, may be designed to resemble a traditional table of contents, or may be a simple index.

Some studies suggest that site maps do not necessarily improve users' mental representations of a website. Also, one study reported that if a site map does not reflect users' (or the domain's) conceptual structure, then the utility of the map is lessened.

Sources: Ashworth and Hamilton, 1997; Billingsley, 1982; Detweiler and Omanson, 1996; Dias and Sousa, 1997; Farkas and Farkas, 2000; Farris, Jones and Elgin, 2001; Kandogan and Shneiderman, 1997; Kim and Hirtle, 1995; McDonald and Stevenson, 1998; McEneaney, 2001; Nielsen, 1996a; Nielsen, 1997a; Nielsen, 1999b; Nielsen, 1999c; Nielsen, 1999d; Stanton, Taylor and Tweedie, 1992; Tullis, 2001; Utting and Yankelovich, 1989.

Example:



This site map effectively presents the site's information hierarchy.

The use of headers, subcategories, and alphabetization make this site map easy to scan.

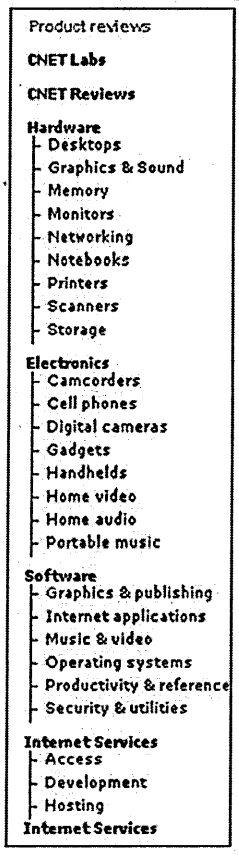


Figure 4.3: Use Site Maps (Koyani guideline)

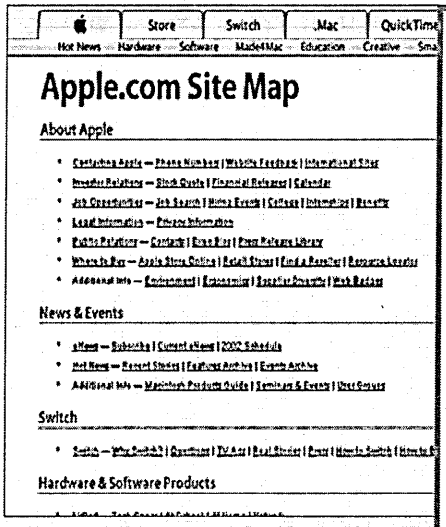
Site Map

Problem

The users need to find a specific page

Solution

Show a map of the site.



From www.apple.com/

Use when

Small to medium sized sites. Typically when the site has more than two levels in the structure and many elements on each level. For such sites, the sitemap functions as a navigation alternative. For very small sites the main navigation typically already resembles a sitemap. Don't use sitemaps for really large sites unless it is a catalog. Users want to see where they can go. Users know that a site is organized but they don't know how. Users want to see where they are.

How

The sitemap shows a hierarchical structure of the site in one page. The structure is focused on the users' needs which could be the site's hierarchical structure or a different kind of structure. The map shows ALL elements of each level and at least two levels. Each level is labeled and possible color-coded to indicate a category. Color-coding can also be used to distinguish areas that are under restricted access. The layout of the map is basically a tree but other layouts are possible. The sitemap is accessible from every page in the web site. The page from which the sitemap is accessed is highlighted in the sitemap.

Why

A sitemap is like a table of contents of a site. Showing a map with the sites structure and all the available pages gives the users complete information. It answers the question where they are and what is available. It also allows the users to reach that page in one action.

More Examples

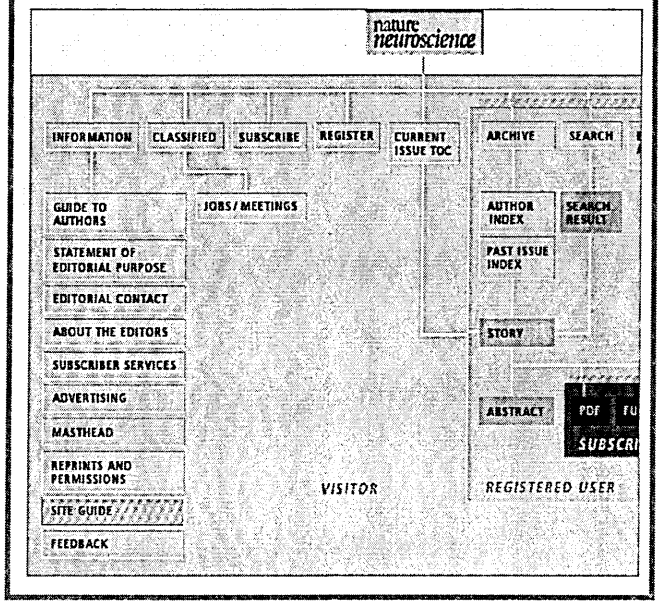


Figure 4.4: Site Map (van Welie pattern)

The guideline mainly points out that a site map provides an overview and the hierarchy of the site and could be presented using a table of contents or an index. In contrast, the pattern provides more extensive information:

- The problem and the solution to the problem.
- What the application of the pattern offers to the user (in the "Why" section).
- What kind of sites a site map is best for and where it can be applied and what users' needs it fulfils (in the "When" section).
- Finally, constructing details such as use of colour codes and labels, the possible layouts for a site map, and suggestions that the current position in the site should be highlighted and the map should be accessible from every page (in the "Solution" section).

Obviously, the pattern provides richer information and includes aspects of how to implement the solution. This comparison of a guideline to a similar pattern highlights the fact that it would be difficult to balance guidelines with patterns in a strict way. One way to transform such patterns into guidelines is by eliminating details about the background, the implementation and any other information that usually is not included in the guideline format.

Due to the difficulties presented here and in order to avoid complicated procedures of transforming patterns into guidelines or developing new patterns, with all the drawbacks that such a procedure would imply, a simpler and more straightforward approach was employed: first a body of usable guidelines complying with the criteria of the study was formed, since it was easier to find guidelines that addressed low-level problems; afterwards, the selected guidelines were converted into patterns. A similar approach was followed in the early years of HCI pattern history: Skogseid and Spring (1995) presented one of first sets of patterns for HCI by classifying, grouping and generalising guidelines and principles available in the existing literature.

An additional complication in this experiment was the fact that the work was conducted in a Greek University; since few HCI patterns are available in Greek, patterns and guidelines written in English required translation into Greek to make them accessible to the students.

The patterns that were used for the study were simple. However, developing and implementing simple patterns draws a parallel with the use of simple programming patterns, inspired by the success of Object Oriented Design (OOD) patterns (Gamma et al., 1994). OOD patterns focus on advanced software design problems with a target

audience of mostly designers and are used in advanced design courses. More recently, related research (Astrachan et al., 1998; Bergin, 2001; Muller and Haberman, 2005; Muller et al., 2004; Proulx, 2000) has been carried out into simple programming patterns that are being developed with the intention to teach simple programming principles to computer science students. In a similar way, simple design patterns are introduced in this research to teach usability principles and web design issues to novice designers.

4.3.6.2 Forming balanced sets of patterns and guidelines

The Koyani guidelines were chosen for the experiment since they had been recently developed and are presented as a complete, comprehensive set of research-based guidelines. These guidelines were developed by a team of experts, using other existing research-based guidelines. Furthermore, comments and examples of good and bad design are included in each guideline, making them easy to convert into patterns.

A stepwise approach to defining the set of patterns and guidelines was followed:

Step 1: Initially all the patterns from the known pattern languages (van Welie patterns, van Duyne patterns) that met the specified criteria were collected. These patterns were not many; however, it was ensured that every pattern that could be used was included in the set. This set consisted of five "simple patterns", which can be mapped to a single guideline each; see Appendix 4.7 for these patterns.

Step 2: A set of guidelines from the Koyani collection of guidelines was selected that was appropriate for the study. The chosen set of Koyani guidelines was converted into patterns using the format that was employed for this study.

As a result of the first two steps a set of patterns was formed. Some of the guidelines, relevant to a common design issue, were consolidated and formed a single pattern. For example, four guidelines about lists formed one pattern that contained all four guidelines. Patterns that correspond to more than one guideline are referred to as *compound* patterns. Compound patterns present a higher complexity level.

Step 3: This step involved the formation of the guidelines set. This set included the patterns that had been collected in Step 1, which were first converted into guidelines, and the guidelines that had been collected in Step 2. All guidelines were presented in the appropriate format used in this study.

The examples and illustrations in the set of guidelines were removed and put all together at the end of the guideline section as an independent set of examples of good design, with captions and the guideline code number that the example referred to. In that

way guidelines were presented in the customary format to a great extent i.e. not including examples (Apple Computer, 2003; Brinck et al., 2002; International Standards Organisation, 1998; Nielsen, 2000a; Nielsen and Loranger, 2006). However, guidelines were not put at a disadvantage by stripping them of examples that help the designer to better appreciate them.

All the information and advice included in each pattern and the corresponding guideline (or guidelines in the case of compound patterns) was examined to verify that equivalent information was being given.

The final set presented to the students comprised 50 guidelines and 32 patterns. In the collection of patterns there were simple patterns, consisting of one guideline, and compound patterns which were a synthesis of at least two and up to four guidelines. There were 24 patterns that were equivalent to 24 guidelines. There were three patterns that corresponded to a set of two guidelines each (that is, six guidelines in total). Finally, there were five patterns that corresponded to a set of four guidelines each (that is, 20 guidelines in total); see Table 4.2 for the complete list of patterns and guidelines, presented in nine categories. The categories are based on Koyani's approach in categorising guidelines.

4.3.6.3 Guideline format for study

The format in which guidelines were presented was adapted from the format used in the Koyani guidelines. Essentially, all the information presented in the Koyani guidelines, apart from the sources and the two rankings, was included in the guideline. The format consists of a **heading-title** for the guideline, the **guideline** itself followed by **comments** explaining why the guideline should be used, and in some cases how it should be applied, and finally **examples** of the guidelines. The illustrations in the original guideline depicting bad or good examples of web designs were used. However, as mentioned above, these examples were placed after the full set of guidelines, at the end of the booklet, as a set of examples of good design, each with the guideline title that the example refers to. See Figure 4.5 for an example of the format that guidelines were presented.

Table 4.2: Patterns and guidelines used in the first study
Compound patterns are shown in greyed out cells.

Category	Pattern Name	Guideline Title
Home page	1. Home Page	1. Create a Positive First Impression of Your Site 2. Ensure the Homepage Looks like a Homepage 3. Limit Prose Text on the Homepage 4. Limit Home Page Length
	2 Home Page Link	5. Enable Access to the Home Page
Page Layout and Design	3 Important Items	6. Place Important Items at Top Center 7. Place Important Items Consistently
	4 White Space 5 Nice Alignment	8. Use Moderate White Space 9. Align Items on a Page
Navigation	6. Users' Location 7. Page List of Contents 8. Descriptive Tab Labels 9. Length of Navigation 10. Meta Navigation 11. Repeated Menu	10. Provide Feedback on Users' Location 11. Use a Clickable 'List of Contents' on Long Pages 12. Use Descriptive Tab Labels 13. Keep Navigation-only Pages Short 14. Use Meta Navigation 15. Repeat Navigation at the Bottom of the Page
Headings, Titles and Labels	12. Page Titles 13. Critical Data	16. Provide Descriptive Page Titles 17. Highlight Critical Data
Links	14. Clear Links	18. Provide Consistent Clickability Cues 19. Avoid Misleading Cues to Click
	15. Descriptive Link Names	20. Use Text for Links and Clickable images 21. Ensure that Embedded Links are Descriptive 22. Designate Used Links 23. Use Appropriate Text Link Lengths
	16 Link and Destination	24. Match Link Names with Their Destination Pages
	17 External Links	25. Indicate Internal vs. External Links
	18. To the Top Link	26. Allow Users to Go Back to the Top of the Page
Text and Typography	19. Nice and Clear Text Appearance	27. Use Black Text on Plain, High-Contrast Backgrounds 28. Format Common Items Consistently 29. Use at Least 12-Point Font 30. Use Familiar Fonts
	20. Consistency in Text 21. Emphasised Text 22. Attention Attracting Features 23. Mixed Case Text	31. Ensure Visual Consistency 32. Emphasise Importance 33. Use Attention-Attracting Features when Appropriate 34. Use Mixed Case with Prose
	24. Printable Page	35. Provide Printing Option 36. Develop Pages that Will Print Properly
	25. Alternating Row Colours	37. Use Alternating Row Colours for Tables
Lists	26. Lists	38. Display Related Items in Lists 39. Introduce Each List 40. Format Lists to Ease Scanning 41. Capitalise First Letter of First Word in Lists
Graphics, Images, and Multimedia	27. Quick and Noteworthy Images	42. Use Video, Animation, and Audio Meaningfully 43. Limit the Use of Images 44. Ensure that Images Do Not Slow Downloads 45. Ensure Web Images Convey Intended Messages
	28. Logos 29. Images Above the Fold 30. Clickable Images 31. Thumbnails 32. Simple Background	46. Include Logos 47. Limit Large Images Above the Fold 48. Label Clickable Images 49. Use Thumbnail Images to Preview Larger Images 50. Use Simple Background Images

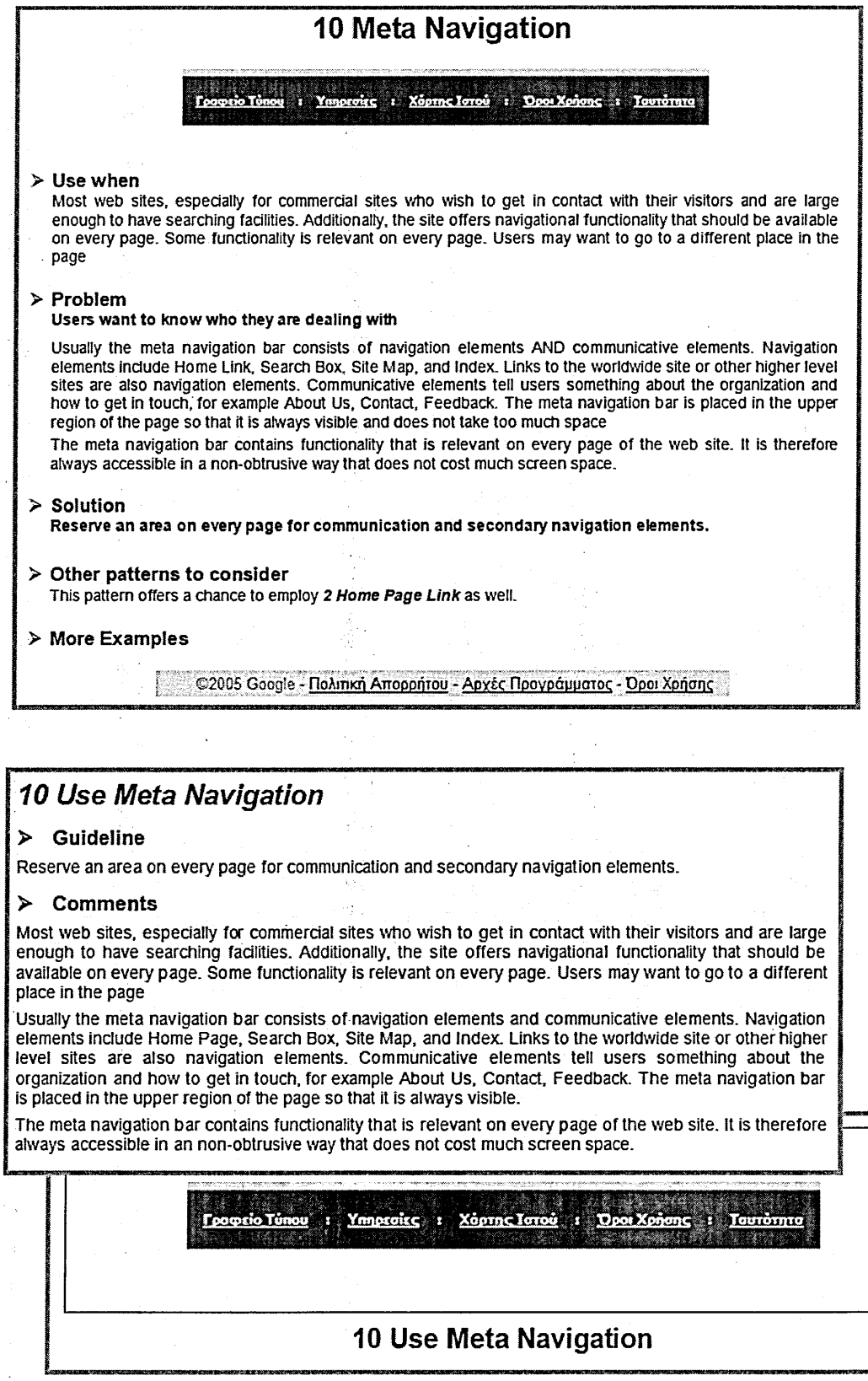


Figure 4.5: The format of a patterns and the corresponding guideline (Examples for guidelines were put after the full set of guidelines).

4.3.6.4 Pattern format for study

Patterns were presented in a format that would make balancing guidelines and patterns easy. Also, another requirement for the pattern format was to be simple so the students could familiarise themselves with the pattern terminology, since they were introduced to the idea of patterns for the first time. The format is consistent with published formats for web design; sections from the van Welie and van Duyne pattern languages were used to structure the patterns for the study. At the same time the format was close to Alexander's format of architectural patterns.

Patterns were presented in the following format:

- The **name** of the pattern
- A **picture** as an example of its application
- A section describing **when** the pattern is used
- A short **problem statement** followed by a detailed description of the problem and the solution to the problem and the forces involved
- The **solution** for the problem in a condensed statement
- **Other patterns** that may be taken into account
- **More examples** of the pattern.

Each pattern was formed by taking, to a great extent, the advice and examples given in each guideline and presenting them in a pattern format. The advantage of this approach, in connection with the format adopted for patterns and guidelines, is that the basic content, narrative and examples, of the patterns and guidelines are equivalent. The only exception to this rule are the examples section, where at the end of a pattern in some cases more examples were given in the "more examples" section. This is a very distinctive feature of the pattern format and this tradition of presenting patterns and this tradition was followed. Also, since patterns suggest the use of a pattern language, in the relevant section of the pattern wherever applicable, links to other related patterns were given. See Figure 4.5 for an example of the format that patterns were presented.

4.3.7 Teaching patterns and guidelines

For the final stage of the experiment one group of students was exposed to patterns and the other one to guidelines. These groups are referred to as the *patterns group* and the *guidelines group* in this study. The prepared set of 50 guidelines and the equivalent set of 32 patterns were presented. Students were also given a booklet, of about 50 pages, for their own use during the lectures and to study afterwards. The booklet was in black

and white, having a negative effect on the illustration of some examples. For this reason, the same booklet was sent by e-mail to each student in an Acrobat PDF file, where examples were in colour. The coloured version was more attractive and helpful to students while studying on their own. Students were warned not to pass any information to members of the other group and they were promised to receive all the educational material, as well as other learning resources and available collections of patterns and guidelines at the end of the experiment. The time needed to cover the set of guidelines and the equivalent set of patterns was four hours, spanning two sessions.

The guideline/patterns tutorial was given by an independent lecturer while the current author was acting as an observer. The duties of the observer were: to make sure that the lecturer did not favour patterns or guidelines and that the teaching approach followed was not biased toward either of them; to make sure that every pre-planned aspect of the teaching process was covered; to observe and keep notes of the students' reactions and attitude during the lectures.

4.3.8 Post-treatment design task

In order to prepare a design test for the experiment numerous relevant web pages from Greek web sites were searched and examined. A number of web pages were initially selected that included graphics and content suitable for the assignment. The selected material was put on several web pages, all using the same template. The pages were structured without any specific format and the material was presented in a way that would challenge students' design skills.

The final design exercise was pilot tested by an academic with experience in web design for any flaws or errors as to what was required to design and as to the degree of difficulty it presented to the students. The design exercise initially consisted of four pages, but the pilot test revealed that the time needed for the completion would exceed the allocated time for the test and one page was left out. Any comments and input from the designer were taken into account; flaws were corrected and the test was refined.

The drop-out rate from the course was high, with only 31 of the initial 42 students remaining on the course. Of the 31 students that followed the last lectures about patterns/guidelines, three were dropped from the tests since they had not followed the full pattern/guideline tutorials or had missed some of the earlier tutorials about web design; as a consequence their performance was below standard. The number of students that completely followed the course, delivered all the required tests and assignments and were thus eligible to participate in the post-treatment test was 28.

The two groups, formed by using a rank sampling procedure using the results of the preliminary test, as described in Section 3.7.2 were equal in number: the guidelines group consisted of 7 male and 7 female participants while the patterns group consisted of 8 male and 6 female participants. Table 4.3 shows the allocation of the students into groups and the number and percentages of male and female students in each group.

Table 4.3: Number of male and female students in each group

	Total		Guidelines Group		Patterns Group	
	No.	% within group	No.	% within group	No.	% within group
Male	15	53.6	7	50.0	8	57.1
Female	13	46.4	7	50.0	6	42.9
Total	28	100.00	14	100.00	14	100.00

The design session lasted 2 hours and 15 minutes and took place in the university's big internet room, where all participants could be accommodated. During the test one more lecturer, apart from the researcher, was present, helping with questions and problems that students faced during the test, taking notes while observing students and helping to ensure that the experiment run smoothly. Another member of the technical staff was present to help with any problems that might arise. Computers and positions of the students were pre-arranged so that a student could not view anyone else's screen.

An instruction sheet was given to each student (see Appendix 4.8). The test included two tasks.

The first task was a redesign task that required students to revisit and redesign two pages of their final pre-treatment assignment. Each student was given back his own pre-treatment assignment test, i.e. the designed artefact in electronic form. Students were asked to redesign two pages, the home page and the page presenting information about the company, using the recently acquired knowledge of good design. The task was a mixture of evaluation and design, i.e. to find out what was wrong with their initial design and to redesign the two pages according to the principles they had learned in the guidelines/patterns session. This part was intended to be compared with the students' original work and identify the changes each student had made in their work and to what extent it had improved. A time limit of 30 minutes was specified for this task.

The second task was a pure design task and consisted of designing, from scratch, three pages of a web site for a small company hosting and creating web sites for its customers. For this test, a partial model based on a template was given to the students

that included a three-column page layout for the site, with the text and the images allocated at the appropriate pages. The partial model included the prefabricated pages of the design test in electronic form; see Appendix 4.9 for screenshots of some pages, in the form given to the students, and pages from a site delivered by a participant.

The template forced the students to follow a certain design direction that was deemed necessary to make the scoring of each site easier. During the design process, the students' progress was monitored. Students were reminded not to deviate from the format imposed by the template and attempt changes to the structure of the site unless they considered that essential and important to the usability of the site. A time limit of 1 hour and 45 minutes was specified for this task.

The test was of a degree of difficulty comparable to the preliminary test, but requiring a simpler one level navigation scheme. Students were free to use their booklet of patterns and guidelines during the tasks. Also they were free to ask individually, with caution not to disturb or affect the rest of the students, any question regarding technical details whenever they had problems in implementing their ideas. This allowed students to present what they wanted and not to be hindered by any technical deficiencies and bugs that they were unable to tackle. Some students made use of this when they had problems remembering a particular technique and resorted to asking for help.

4.3.9 Post-treatment interviews and questionnaire

Finally, a post-test questionnaire and an interview individually with each student were used to collect qualitative and quantitative data about the students' attitude and opinions towards patterns and guidelines.

Students started by completing a questionnaire containing questions about their background and their experience with computers and programming. Other questions on the questionnaire assessed their opinion about the training tutorials, the set of patterns/guidelines, the format in which these were presented, how extensively they were used, how they felt about using patterns/guideline, how useful this could be for future work, and what they liked most about working with them. Students rated the extent of agreement or disagreement to these questions using a five-point Likert scale; see Appendix 4.10 for the questionnaire.

Following the completion of the questionnaire, students were engaged in a semi-structured interview. The interview session for each student lasted between 20 and 40 minutes and the interviews were tape recorded. During the interview, students viewed the pages of the redesign and the design tasks and were encouraged to make comments

about their designs and their experiences participating in the study. Finally, students expressed their opinion about patterns and guidelines and how they perceived the two forms of advice when a pattern and the corresponding guideline were compared side-by-side. Another academic, acting as facilitator-observer, participated in the interviews, asking questions and helping with any problem arising.

4.3.10 Post-treatment evaluation test

In order to create a web site for the evaluation task, a similar approach to the design assignment was followed by examining several Greek web sites and choosing and reconstructing one. A wide range of usability problems, i.e. violations of the patterns/guidelines, were inserted in the web pages. The usability problems were breaching advice given by the patterns and guidelines presented to the students. Twenty-six students were engaged in the evaluation session. Two participants, one in each group, were not allowed to participate further in the experiment after their extremely poor performance in the design tasks.

4.3.10.1 Usability evaluation methods

Usability evaluation methods can be categorised as analytic that are expert-based or empirical that are often referred to as user testing (Gray and Salzman, 1998). Expert-based methods include techniques such as heuristic evaluation (Nielsen and Molich, 1990), cognitive walkthroughs (Lewis et al., 1990; Wharton et al., 1992), usability walkthroughs (Bias, 1991), heuristic walkthroughs (Sears, 1997), formal usability inspections (Kahn and Prail, 1994; Nielsen, 1994), standards inspection (Nielsen, 1994), GOMS (Card et al., 1983; John and Kieras, 1996a, 1996b), guideline reviews and guidelines checklist (Brinck et al., 2002).

Some of the expert-based techniques are referred to as expert review or expert inspections (Avouris, 2001; Hartson et al., 2001; Hertzum and Jacobsen, 2001), and usually involve a number of experts performing an evaluation using heuristics, rules, principles, or any other criteria to evaluate the site.

4.3.10.2 Evaluation task

The task required students to perform a usability evaluation of a site in the form of an expert review, using as criteria the usability principles contained in patterns and guidelines. The web site was that of a small IT company selling services and a small range of software products.

The site was loaded on a web browser and students could verify and check links and the navigation of the site. Evaluation was required on four out of the five pages of

the site. The fifth page was included in the site in order to make the navigation and the site more realistic. Students were instructed to mark the errors on a printed page of the web page instead of performing an "out of the book" exemplary evaluation (Nielsen, 1992). Printed copies of the pages were given to the students and the students identified the errors, marking on the page the exact point where the error was found. See Appendix 4.12 for screenshots of the web page to be evaluated.

Students did not rate the severity of each error, as typically required by a heuristic evaluation (Cockton and Woolrych, 2001), but were allowed to write comments on the errors, or suggest actions for improvements, although the latter was not compulsory. Participants were recommended to spend the first five minutes exploring the site, in order to get a feel of the site and to start evaluating and mark the errors afterwards. Towards the end of the session participants were advised to again spend five minutes on the home page, and probably identify more usability violations now that they had a better overall impression of the site.

4.3.11 Metrics for scoring

A set of predefined metrics were given to the evaluators. Only metrics that were related to the teaching material covered in the tutorials were used. Each metric could be related to a specific pattern/guideline presented to the students. For example, students were not marked for content, content organisation, or search capability and general functionality of the site since the patterns/guidelines tutorials did not cover these aspects of web design. Also, there were no scores for errors in web pages that could not be associated with a specific pattern/guideline.

A detailed presentation of each metric will be given in Chapter 5 (see Table 5.4). The reason for this is that the metrics were reformulated and refined to reflect certain drawbacks and shortcomings that were discovered while they were employed in the second experiment. For now, suffice it to say that the metrics were related to the teaching material covered in the tutorials. Each metric reflected the actual use of a specific pattern/guideline.

4.3.11.1 Work of evaluators

Two experienced evaluators worked independently to rate the students' artefacts according to the predefined set of metrics. All students' web sites, 28 in total, were allocated code numbers and the evaluators had no knowledge of the designer or under which condition the site was created. After the initial preparation, all sites were put together as subweb sites to a main index page in such way as to be easy for the

evaluators to navigate through all sites and pages. A copy of this site was given to each evaluator. Evaluators were advised to work with their computers connected to the Internet since some of the pages contained external links to other web sites.

Firefox v.1.5 (Mozilla, 2005) was initially adopted by the evaluators for previewing web pages due to its multi-tabbed functionality. Small differences in viewing web pages between web browsers are known to be expected. The default web page browser on the students' PC was MS Internet Explorer v.6.0.2 (Microsoft Corporation, 2004). However, it was noticeable that students' web pages displayed very differently in Firefox compared to Internet Explorer, affecting the marking of web sites. The main reason for this was that students were using FrontPage tools inconsistently and sometimes in an unconventional way, inserting at the same time HTML tags causing elements to be displayed shown very differently in the two browsers. To avoid such errors, two Internet Explorer engine-based type of browsers Maxthon v.1.5.6 (Maxthon International Ltd., n.d.) and Slim Browser V4.06 (FlashPeak, n.d.) with multi-tab functionality were used by the evaluators.

Tabs allow the user to view multiple web pages in the same browser window and to switch between the web pages with ease and comfort without the need to open a new browser window. The evaluators could afford to open all the pages of the site at the same time or to load a particular page from all students on the same unique browser window. In that way, previewing, checking, and comparing web sites and pages was much easier for the evaluators and taking less time to evaluate the students' work.

4.4 Results and discussion of the first study

In this section the results and conclusions of the second experiment will be presented and discussed in order to explicate how the main study was prepared. These are derived from the redesign task, the design task, the observations that were made during the experiment, and the questionnaires and interviews collected from the students.

4.4.1 Observations during the presentation

During the presentation of patterns and guidelines a number of issues related to the teaching process were noticed and identified. These issues were discussed and analysed by the lecturer who delivered the presentation together with the observer (the current author) and are described here. Some of these issues support and extend the observations that were made during the first experiment, that is, the exploratory study.

4.4.1.1 Interest of students

The majority of students showed that they had an above average interest in patterns and guidelines. Most of them were asking questions about design issues and trying to relate them to their limited experience with web design and the problems they encountered during the assignments. They were making notes on the booklets, underlining or highlighting text. Then again, a small number were following the tutorial with some degree of indifference.

4.4.1.2 Impact of examples for guidelines and patterns

Guidelines in the booklet were presented one after the other, in the appropriate sections, without any examples. All the examples together were positioned at the end of the booklet, in a separate section. In the tutorial about guidelines, the first two guidelines were delivered in a similar way, not including any examples, trying to communicate the purpose of the guideline without examples. However, students indicated they were having trouble in following the main design principle and the advice given by the guidelines. The tutorial continued by presenting each guideline with an appropriate example.

This observation suggests that even simple guidelines can not be fully comprehended if there are no examples to accompany them. Examples are considered an essential part of patterns. In contrast, guidelines quite often are presented without any examples, using textual information to describe them. It seems that guidelines lose a lot of their power without examples and that examples are important for appreciating a guideline. Experienced designers, having extensive knowledge of their domain, understand and relate guidelines to their past experience. Students, having limited experience, could not identify the notion of the guideline and visualise the practical aspects of the guideline without the use of some illustrative examples.

4.4.1.3 Time taken to deliver patterns/guidelines

Guidelines can be delivered to the class quicker than patterns due to their shorter format, although the extent of advice given with each pattern and corresponding guideline is the same. While delivering the patterns section the lecturer had to give the name of the pattern first, then explain the problem, discuss the solution and present the examples. However, the total time dedicated to the set of guidelines and the set of patterns was the same since a review of the guidelines was presented at the end of each session.

4.4.1.4 Unsuccessful examples

The patterns and guidelines used in the experiment were not refined for the particular study or for educational purposes. All the supporting material, text and illustrative examples, was taken from the original set of the patterns and guidelines chosen.

Some of the examples were not successful as they were not conveying clearly the principle encompassed within a pattern/guideline. These examples were not specific and to the point and were not supporting the pattern or guideline in the best of ways.

Still, there were other examples which students could relate to their limited experience and knowledge. It should be noted that all the examples were taken from sites in English and, in some cases, these were not fully comprehended by students with below average knowledge of English.

A number of examples were accompanied by small captions pinpointing the exact application of the pattern/guideline or, in the case of a bad example, where the usability violation was exactly. Captions and callouts proved to be quite important and extremely helpful to students. Students were making comments triggered by the captions, and were relying on them to better understand the appropriate use of a pattern/guideline. Examples with no callouts, especially those that were not communicative enough, would generate, most of the times, a request for further explanation.

4.4.1.5 Technical questions about patterns/guidelines

Students were interested in the actual implementation of the pattern/guideline and any further technical details involved while applying the pattern/guideline. Some of them were asking details of the procedures needed to follow in FrontPage. Those most interested in web design asked for resources and access to more advanced design tools (navigation menus, image editing tools, etc.) with the intention of implementing the advice in the best way. Such details are not usually available in the format of patterns and guidelines. The exception to this is the latest Yahoo! pattern collection (Yahoo!, 2005) where code is presented to designers through existing links in the pattern presentation.

4.4.2 Results of redesign task

For this task students were asked to redesign two pages from their pre-assignment test. This exercise, together with the interviews where questions about the redesigned pages were made, revealed several themes and issues.

The trained students made changes to the web pages, obviously influenced by the newly acquired knowledge introduced by patterns and guidelines. A line cannot be

drawn between the patterns group and the guidelines group as to which performed the most changes since it is estimated that other factors, such as motivation for this particular test or previous state of site, influenced the student in tackling the redesign task. One factor that cannot be ignored in all the tasks is the overall engagement of each student with the course and his attitude towards learning something new. This depends on the individual, the personal skills and capabilities, and the extent to which one can apply new knowledge without practice.

There were a number of students who made many modifications in the redesigned pages. To do this they used patterns/guidelines quite effectively and worked efficiently to improve the usability of the site, following advice given by patterns/guidelines. One particular student demonstrated the great effect that patterns/guidelines had on the design habits by making seven successful changes and additions to the previous design.

The majority of the students made on average three to four changes in the two web pages. Most of these changes were easy to apply additions or alterations, usually applying new components in the web site and not complicated or abstract usability principles. Both groups had a tendency to favour certain patterns/guidelines that were advocating the same usability principles. Starting with the most often used ones, those usability principles in the form of patterns/guidelines were:

- Repeated menu at the bottom
- Elimination of white space
- Removing underlined text
- Link to the top of the page
- Alternating row colours for tables.

Other principles that were employed to a lesser extent were improved text background, lists, and printer-friendly pages.

The overall number of changes made was not as great or as widespread as expected. This could be attributed to the time limit given for redesign and the fact that students were concerned to tackle the new design task. Some of the students, when asked in the interviews about their low number of changes, attributed this to fears that a small change could possibly require other modifications which could not be predicted and would have taken more time than was allotted for this task. Other students mentioned that they avoided applying the principles due to lack of extensive experience and practice in applying the relevant techniques. Some of the changes they made backfired and resulted in violations of other principles without the designer realising

this or in design problems that could not be easily resolved. One of these students, a female, admitted that she tried a major change and had problems that left her no time to do more. This has been described as *viscosity* in the cognitive dimensions framework (Green and Blackwell, 1998). The cognitive dimensions framework has been used to evaluate programming languages and software systems (Roast et al., 2000; Khazaei and Triffit, 2002). Viscosity refers to resistance to change and has been associated with the modifiability of software design and programming structures (Roast and Siddiqi, 1996). Viscosity proved to be high in redesigning web pages, even when users rely on a graphical programming environment such as FrontPage instead of changing code in HTML programming structures.

If the site delivered by the student was already in a good state not many improvements could be made using patterns and guidelines. They were some highly performing students whose pages were close to a professional level and had only a few usability flaws. The designers of such sites confessed that they had imitated sites from the Internet. These students made only a couple of changes to the designs. One student presented a very good site, and most of the usually easy-to-apply patterns/guidelines commonly encountered in web sites were already included. The few errors that could be fixed, and the usability issues that could be addressed successfully in such cases, required the application of complex patterns/guidelines or other patterns/ guidelines that obviously students could not remember or which had not made an impression on them.

Other students, mainly those who did not perform well in the test or were probably having difficulties during the tutorials, made only a couple of changes reflecting the use of patterns/guidelines. Some of those students opted to make only aesthetic changes that sometimes breached further usability issues or backfired to the detriment of the overall presentation of the page. Finally, two students, one in the patterns and the other in the guidelines group, did not make any significant or identifiable changes to the site. These two students performed also at a very low level in the design task. Apparently both were not motivated to carry out the task and the experiment, and were therefore excluded from any further tests and interviews.

In summary, the particular themes that emerged from the redesign task were the following:

- The extent to which patterns and guidelines are adopted and used by students varies and depends on many factors, as is the case with any learning material delivered to students;

- Redesigning a site did not appeal much to some students; they were indifferent to presenting a better design and wanted to tackle the design task which was scheduled after the redesign;
- Some students' practice was not affected much by the set of patterns or guidelines; and
- Some students did not have the required technical skills to make the changes and were hindered by viscosity in web design.

4.4.3 Results of design task

Two independent evaluators, academics with extensive experience in design and usability since the early days of web design, marked the design task, which involved presenting from scratch three pages of a web site.

Fourteen students in each group completed the design task. Students were assessed using the metrics that measure seven different dimensions of good design practice: Home page, Navigation, Links, Page Layout and Design, Headings and Titles, Text and Typography, and Lists.

The most challenging task for the evaluators was to judge the designs in a fair and objective way. The range of mistakes made by the students produced a varied appearance of elements on a page. This created problems for the evaluators trying to apply the metrics. Frequently, clarifications of a particular metric had to be made in order to have a uniform grading scheme for the evaluators to follow. This revealed one limitation of the metrics, namely that some had to be developed further in order to make the evaluators' work more precise.

Several minor shortcomings of the metrics were also revealed. Some of these were due to the design task itself, while others were due to the patterns/guidelines. Metrics reflect the use and application of patterns/guidelines; however, it was not clear if some of the metrics were measuring the application of a particular pattern/guideline or the application of another one giving similar advice. Compound patterns were making the compilation of scores more difficult since a score measuring a compound pattern included scores from several guidelines. This procedure, although hindering the evaluators' progress, helped the study to improve the set of metrics by refining them, thus making them more relevant and accurate for the task. Despite these limitations, the grading of the sites continued to the end in order to obtain a full picture of the metrics and the grading procedure.

The scoring procedure helped in advancing the design features and requirements for the design task by focusing only on those details that could be easily measured by the metrics, while pinpointing features which were questionable and which were obstructing evaluation of the site. Equally importantly, the scoring procedure refined and developed the metrics and cleared up any difficulties in applying them.

Overall, the quality of the sites was lower than expected, making rating more difficult. Each evaluator spent on average more than 90 minutes to evaluate and rate each site, using the set of metrics. Sometimes the evaluator would perform better and quicker if he had loaded onto the web browser all the sites at the same time together, working on only one metric. Sometimes, a comparison of a certain design issue on a particular page across all students was sufficient to produce an objective score. The process of scoring, although time-consuming, was not difficult once the evaluators had gained some experience working with the metrics and the scoring procedure.

Due to the limitations of the metrics no statistical comparison of the groups is presented. However, the impact the patterns and guidelines had on the students will be further examined in the next subsections, based on the qualitative and quantitative data collected via the questionnaires, the interviews, and the other tasks.

4.4.4 Analysis of questionnaires and interviews

Twenty-six participants were interviewed, thirteen from the guidelines group and thirteen from the patterns group. The following subsections present some observations and findings that surfaced in the interviews and questionnaires.

4.4.4.1 Attitude towards patterns/guidelines

Several statements were used in the questionnaires to evaluate user attitude towards patterns/guidelines (see Appendix 4.10). Students declared their agreement or disagreement with a statement using a five-point Likert scale ranging from 1="strongly disagree" to 5="strongly agree". Each statement was rated by all participants without any comparison being made between patterns and guidelines, as participants were not aware of the two alternative formats. Students' opinions of and attitudes to patterns/guidelines are presented in Table 4.4.

Table 4.4: Students' attitudes to use and usefulness of patterns and guidelines

Statement	Guidelines group (N=13)		Patterns group (N=13)	
	Mean	SD	Mean	SD
Patterns/guidelines help me to improve as designer	3.692	0.75	3.769	0.73
I will make use of patterns/guidelines in the future	4.769	0.44	4.308	0.85
Patterns/guidelines are useful for the redesign test	3.846	0.55	4.000	0.71
Patterns/guideline are useful for the design test	4.000	0.58	3.846	0.69
Patterns/guideline are useful for the evaluation test	4.200	0.63	4.222	0.44

Table 4.4 shows that both patterns and guidelines are considered by students useful for their improvement as designers and useful for the tasks they performed: the redesign, the design, and the evaluation of web sites. Also both groups expressed their certainty that they will make extensive use of patterns and guidelines. The results are in line with Borchers' (2002) study where only patterns were used for teaching usability principles. In the current experiment, students showed that they like patterns and guidelines equally. There was no statistically significant difference between the patterns group towards patterns and the guidelines group towards guidelines regarding their contribution in improving as designers, the intention for future use of them, and their usefulness for the three tasks; both formats were rated highly. This indicates that either format is appreciated by students as providing knowledge and experience to novice designers.

4.4.4.2 Preference of students for patterns and guidelines

While patterns and guidelines are both considered beneficial and useful, when students compare the formats side-by-side they express a strong preference for patterns. During the interviews students were shown patterns with their corresponding guidelines and asked to compare them and to express their preferences for either of the two formats.

Three different patterns and their corresponding guidelines were presented to the students. Each pattern was positioned against the corresponding guideline as a set. There were two simple patterns (named Simple1 and Simple2), corresponding to one guideline each, and one compound pattern (named Compound1) corresponding to four guidelines, see Table 4.5.

Table 4.5: Patterns and guidelines for comparison

Case	Pattern Name	Guideline Title
Simple1	8. Descriptive Tab Labels	12. Use Descriptive Tab Labels
Simple2	18. To the Top Link	26. Allow Users to Go Back to the Top of the Page
Compound1	26. Lists	38. Display Related Items in Lists 39. Introduce Each List 40. Format Lists to Ease Scanning 41. Capitalise First Letter of First Word in Lists

Students expressed their preference for a format after studying the matched patterns and guidelines on their own. See Appendix 4.11 for pairs of patterns and guidelines that students compared.

The preferences of all students for each pattern/guideline are shown in Table 4.6.

Table 4.6: Preference of all students in numbers and percent

	Participants and their preferences					
	Simple1		Simple2		Compound1	
	N	%	N	%	N	%
Neutral	1	3.8	2	7.7	1	3.8
Patterns	23	88.5	21	80.8	19	73.5
Guidelines	2	7.7	3	11.5	6	23.1
Total	26	100	26	100	26	100

The following Figure 4.6 depicts the number of students (shown in Table 4.6) and their preferences for each set of pattern and guideline/guidelines.

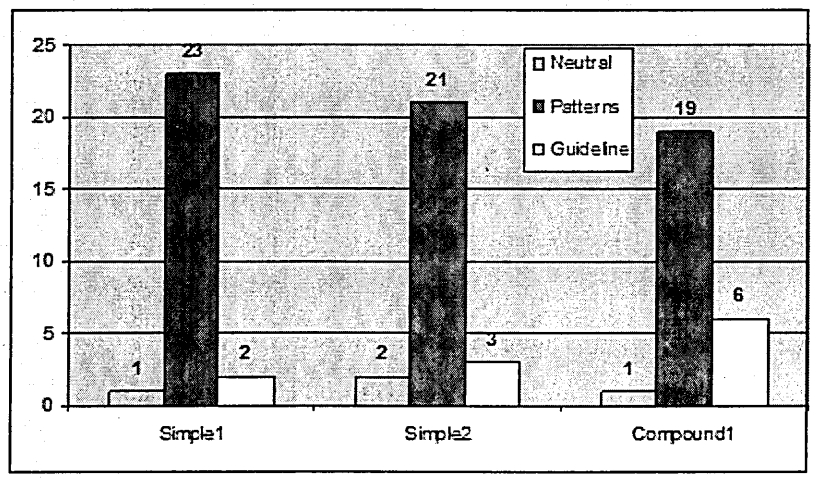


Figure 4.6: Preferences of all students

Looking at the first case ("Simple1") of Figure 4.6, for example, it can be seen that one student has no preference for a particular format, while twenty-three prefer the pattern format and only two the guideline format. The preference of all students for

patterns is clear. The pattern format is still preferable even in the case of compound patterns. However, there is a small but noticeable increase in the number of students who prefer the guideline format in the case of more complex advice instead of a compound pattern containing a multitude of usability guidelines. This issue was further investigated in the subsequent main study.

The following Table 4.7 shows the preference of students. Each of the 26 students indicated their preference for a pattern or a guideline after viewing three pairs of patterns and guidelines. Therefore the total number of pairs of patterns and guidelines compared by all students was 78.

Table 4.7: Preference of students comparing patterns and guidelines

Preference	No.	%
Neutral or no preference	4	5.1
Patterns	63	80.8
Guidelines	11	14.1
Total	78	100

Table 4.7 shows that the preferred choice of all students in presenting advice and experience is the pattern format: in four instances students could not make a distinction between the two formats, in 63 instances their preference was patterns, while only in 11 instances the choice was guidelines.

4.4.4.3 Other emerging issues

During the interviews students were asked for their overall impression – and any criticism – of the course, the teaching process and the material that was used, and what improvements could be made about the presentation and the format of the patterns/guidelines.

The general consensus was that the course was successful and contributed significantly to the students acquiring an initial body of knowledge about designing and evaluating web sites and to their appreciation of the importance of usability for web sites.

The main focus of the interviews, however, was on patterns and guidelines. Some of the initial questions about the course were really intended "to warm up" the participants and make them feel comfortable. Students' suggestions highlighted the following issues.

Explanations and captions for each example

Participants expressed a desire for more explanations to be given with the examples. Explanations were given during teaching; however, when students were studying the patterns they felt that more explanations were necessary. As one participant explained:

> I liked to study them in electronic format, not using the notes, since I could see the examples in colour. However, I would have liked more explanations with the examples and some improvement of some captions.

The lack of explanations and poor captions was also detected by the research team during teaching and handling of the patterns and guidelines.

More examples of good and bad design

Some of the examples given of patterns and guidelines illustrated not only good design practices but also bad examples to avoid. Participants reported that bad examples were useful and necessary. One participant said:

> I would have liked more examples from bad sites with errors. These bad examples will help me to understand what to avoid during design so that I will not make the same mistakes again.

Clear and colourful examples

The booklets distributed to students were in black and white. Participants indicated that black and white was not good for web design, and that sometimes the resolution of the examples needed improving because they were not clear even in electronic form on the computers.

Examples together with the text

Although more examples were requested by both groups, some participants from the guidelines group mentioned that it was better for examples to be next to the guidelines instead of at the end of the booklet:

> If you want to improve the booklet, it would be much better if each piece of text [guideline] has next to it the relevant example so that the principle can be compared with the example... and also it would be much easier for the reader to connect the example with the text.

4.4.5 Results of evaluation task

After each interview students participated in the evaluation task. Each student worked on his own in the presence of a supervisor. The time limit on this task was 50 minutes. See Appendix 4.12 for the web site evaluated by participants.

The students' performance varied. Only two students took advantage of the full time for the evaluation. It is probably the case that some students did not perform to the best of their abilities and with the same enthusiasm. One reason for this could be the fact that they did the evaluation task alone and lost interest after working on the first page of the web site.

A factor that points towards this conclusion is that the students' rate of finding errors dropped a great deal when they evaluated the last three pages compared to the first page. It should be noted that the errors on each page were of a similar degree of difficulty and were violating related usability principles. Table 4.8 shows how students performed in each of the four pages. Numbers in per cent represent thoroughness, the ratio of true errors found to the total number of errors that could be possibly identified. The maximum, minimum and the average thoroughness is taken over all the participants in this study.

Table 4.8: Thoroughness on each page and overall for the site (all participants)

	Page 1	Page 2	Page 3	Page 4	Overall (4 pages)
Errors (No.)	21	17	17	20	75
Maximum thoroughness (%)	76.2	52.9	58.8	45.0	46.7
Minimum thoroughness (%)	19.0	11.8	11.8	5.0	14.7
Average thoroughness (%)	43.0	31.0	29.4	22.3	31.7

Still, the number of errors found on each page was quite high. Similar research into a heuristic evaluation performed by novice designers reported that the average number of errors was 36% (Chevalier and Ivory, 2003a). The average number of errors by the group of students was close to 32% (see Table 4.8). The average is much higher on the first page (43%) where students worked harder, and lower on the rest of the pages.

There were no difference between the patterns group and the guidelines group, and their performance was similar. The average percent of the identified errors for the patterns group was 31.5% (n=13, SD= 8.48) and for the guidelines group 31.9% (n=13, SD=10.23).

Nielsen and Landauer (1993) showed that predicting the number of usability problems found by a number of persons (test users or heuristic evaluators) can be modelled using the following formula, which relates the detection of errors from i persons to the number of known problems N and the probability L of any person finding any problem:

$$\text{Problems detected} = N * (1 - (1 - L)^i)$$

Nielsen and Landauer (1993) indicate a typical value for L to be 31% (0.31). Plotting a curve for this value of L, while N can be any number of problems, it can be deduced that five persons will reveal 84% of the problems, while fifteen persons will find close to 100% of the problems. Based on this formula Nielsen and Landauer (1993) argued that as few as five users are enough to find 85% of usability problems. This claim is supported by several researchers (Barnum, 2003; Nielsen, 2000b; Virzi, 1990, 1992) but also questioned by others (Faulkner, 2003; Law and Hvannberg, 2004; Spool and Schroeder, 2001; Woolrych and Cockton, 2001). In one study the rate of problem detection was as low as 0.09, implying that the number of evaluators to reveal 75% of the errors is predicted to be as high as 16 persons (Law and Hvannberg, 2004).

Taking into account that the average percentage of errors found by the participants in the evaluation task was close to 32%, and using the above formula it is estimated that 85% of the errors will be revealed by five evaluators, which is very close to what is claimed by Nielsen (1993, 2000b).

The performance of all the participants on each page and overall, as a group, is shown in the following Table 4.9.

Table 4.9: Errors in each page, missed and found errors (all participants)

	Errors in page No.	Errors missed No.	Errors missed %	Errors found (thoroughness) %
Page 1	21	0	0	100
Page 2	17	1	6	94
Page 3	17	1	6	94
Page4	20	2	10	90
Total	75	4	5	95

Overall, the performance of the participants was very good and succeeded in identifying the majority of errors. However, it should be considered that most of the errors in the web site were embedded and were simply surface errors. Inspections tend to easily identify surface errors such as those in the task site (Cockton and Woolrych, 2001). Another factor that should be taken into account was that most, if not all, the errors were breaching usability principles found in the set of guidelines/patterns used to teach students and not complex issues of web design. Participants in total managed to identify 95% of the maximum 75 errors in the site; even in the fourth page, where the lowest number of errors were reported, the total percentage found is more than 90%.

In some instances participants identified errors and suggested improvements in places not even the designer of the site and the members of the research team had thought of; for example, two participants suggested a button next to the search box to help visitors instead of relying on pressing the enter button.

4.4.5.1 False positives

Participants reported a small number of false positives (false alarms). This happens when a problem or an error reported actually is not an error or is of extremely low severity to be of some worth (Cockton et al., 2003). Five participants reported one false positive, two participants reported two false positives, and another two participants reported three each. The remaining participants did not report any false positives at all.

The rate of reporting false positives was much lower compared to the true problems reported. Research into the number of false positives reported during an expert review is contradictory. Several studies (Catani and Biers, 1998; Rooden et al., 1999; Stanton and Stevenage, 1998) in different domains report that such evaluations detect far more false positive problems than actually exist while there is a tendency to miss real problems. Bailey (2001) summarises some of the studies and indicates that it was estimated that for every true problem identified there were on average 1.2 false positives reported, and concludes that heuristic evaluators are likely to identify more false alarms and miss problems than pinpoint true errors.

This is contradicted by Molich and Dumas (2004), who point out that in their experiments on existing web sites the number of false alarms is very low or zero and that a carefully structured expert review by professionals is comparable to the results of a usability test. Law and Hvannberg (2004) comment that the effectiveness of usability evaluation methods depends on: the tasks, the techniques, the context, the experience, and the characteristics of the evaluators.

4.4.5.2 Comments and suggestions

Some participants suggested corrections to the site which although not correcting actual errors could possibly have improved the site if they were applied in the design. These suggested corrections pertained to the two colours of the headings and the logos of the site, which a number of participants reported they did not like. Although this was not considered an error by the researchers and the experts helping with the experiment, the participants' argument is based on patterns/guidelines advocating consistency and avoiding use of many colours within a site. Along the same lines, a number of participants suggested that the top of each page should be filled more and empty space

should be effectively used. Again, this argument is not without merit. As one participant commented:

> The empty space above the left column makes a bad impression and is there without reason. The top of the page seems empty.

Another one added:

> The white space between these elements is excessive and screen space is not used effectively; in essence the outcome is not pleasing for the visitor.

Some participants emphasised the existence of white space by pointing out that the home page, apart from having excessive white space, contained too much text, resulting in visitors needing to scroll to view the full length of the page; such comments originated in the patterns/guidelines giving advice about how to get rid of white space and shorten a page. Making appropriate use of space within a page, or avoiding white space as was it referred to, was a term that was popular among participants; the principle concerning empty space was well understood.

A couple of participants made comments about the overall look of the home page, following the principle that the home page should look like a home page and the visitor should get a positive first impression. While these comments are easily expressed verbally, the underlying principle is not easily applied when designing as it requires a very experienced designer. This suggests that design and evaluation tasks may bring out different aspects of usability principles. Some of these aspects can not be explicated easily during the designing of a web page; however, they can be pointed to as missing or be suggested for improvement while evaluating a site.

Criticism and constructive suggestions were offered by participants concerning the appearance of text. For example, participants indicated that some words in the text, according to their evaluation, should stand out more by bolding or italicising them to attract visitors' attention.

In a few cases, participants, having misinterpreted a usability principle, suggested action and gave advice for correcting a problem that was wrong and would have caused usability problems:

> These moving elements [gif images about e-mailing the company] should be on every page.

Other suggestions were without any real value and some can be classified as false positives: "this search box should be a bit lower to catch the visitor's eye more" or "a

table should be used to make the page more pleasant" or "use of screen tips on these hyperlinks should be of help" or "this picture is not relevant and does not promote the site".

Some of the participants instead of pinpointing the exact location of errors made comments such as "links should be formatted in a consistent way" or "text should be formatted more consistently". Comments such as these, provided they could be linked to a specific error, were considered to predict an error; otherwise they were ignored.

4.4.5.3 Easy and difficult to identify errors

The easiest errors to find were those that can be identified simply by looking at the page. A number of usability violations were immediately obvious. The errors most frequently identified were: bad alignment of text pages (especially in the centre column), overly underlined text, white space, bad background in text, bullets, coloured text, missing elements from one page, missing headings, change in font style (Arial, Times), and text alignment problems.

Participants seemed to have difficulties spotting usability issues that required interaction or several steps from one page to the next. The most difficult errors to find were:

- Missing page titles: the title of the page was present on the first page but titles were missing on the remaining pages.
- Consistency in labels and navigation buttons: some of the labels on the main navigation bar were intentionally changed. Also some links on the repeated menu were changed at the bottom of the page or were written with English characters instead of Greek.
- Linking errors: Some hyperlinks were not linked to the right destination; this type of error requires careful interaction with all the pages of the site, an aspect that participants were not trained to carry out.

Summarising, it can be stated that overall participants performed well in the evaluation task although some of them did not evaluate the site in a consistent way as participants did not work with full commitment on every page of the site. Furthermore, participants carrying out the evaluation task demonstrated that they understood complex usability principles which could not be used in the design task.

4.4.6 Other observations

In the following subsections some practical details are presented concerning the use of patterns and a pattern language, based on observations made during the experiment. At the same time, patterns are contrasted with guidelines in these practical aspects.

4.4.6.1 Use of patterns as a communication tool

Patterns have been suggested as a "lingua franca" to enhance and facilitate communication between designers (Erickson, 2000). Here patterns are not intended to be used as a common language, since there was no communication involved in designing, but as "a technical lexicon" (Dearden and Finlay, 2006). The questionnaires completed by participants and the discussions that took place during the interviews gave the investigators the opportunity to find out if participants used patterns as a vocabulary and had adopted the new terminology.

Participants had the opportunity to refer to patterns/guidelines, in writing, during the completion of questionnaires and while patterns and guidelines were discussed during the interviews. Only a small number of participants used the proper pattern names or terminology to describe the changes made in the redesigned pages. The majority of the participants did not use the names of patterns to refer to them; this observation concerns mainly the patterns group since presumably the name of each pattern captures its essence and the key elements of a design structure (Gamma et al., 1994; Mueller et al., 2004).

The same applies to the use of the proper vocabulary by the guidelines group as well as to the design principles underlying guidelines that are not captured in a name but in a sentence. Participants were describing patterns and guidelines and general design issues using their own personal expressions to refer to them. However, participants used and adopted in their discussions some catchy technical terms, such as "white space" and "meta-navigation".

Concluding, it can be stated that the use and adoption of patterns and guidelines as a technical vocabulary by the participants was not extensive, mainly because they did not have the opportunity, through cooperation with other participants or after long-term use, to become familiar with them and adopt them; instead, participants were focussing on the ideas and the principles behind any pattern/guideline.

4.4.6.2 Use of pattern language

Patterns most often are presented as a pattern language, as a set of interlinked patterns. A designer can use the links to generate a thorough solution to a design problem

(Graham, 2003a; Montero et al., 2002; van Duyne et al., 2002). References to other patterns were included in each pattern, whenever appropriate, as part of the format used to present patterns; however, no special emphasis was put on these links during the presentation. A diagram depicting the patterns and the links between them was given to the patterns group (see Appendix 4.13). The diagram was in the form of a simple tree-like structure of the patterns, based on the spatial relationship of the different parts of the site: The web site is made of pages, content (text and graphics), and a navigational structure (menu and links).

Participants did not appreciate the links in the patterns or even asked any specific questions about the structure of the pattern language. This can be attributed to the following factors:

- **Links were not described extensively**: A proper presentation and a real coverage and explanation of the links within the pattern language would have required extra time for teaching that was not available for the course. A further discussion about patterns and the possible advantages of the pattern language would have resulted in the patterns group having more training time than the guidelines group. Further explanations of pattern links and the pattern language would have implied the use of a pattern-based approach (Graham, 2003a; Montero et al., 2002; van Duyne et al., 2002). However, such an approach would have favoured the patterns group by presenting them with extra tools and making known additional design procedures.
- **Volume of knowledge**: Participants were overwhelmed by the new knowledge, both about web design (FrontPage) and usability issues (patterns/guidelines), and needed time to assimilate that knowledge and appreciate links and the language structure of patterns.

A further observation made during the work and handling of the patterns and the pattern language was that the set of 50 patterns presented to the class was not complete, since it was formed and presented for the educational purposes of the experiment. Several patterns that could have helped make the language more robust were missing. Links included with a pattern were limited or there were no links at all. Design issues and sites are getting more and more complicated. One may question if it is even possible to develop a full pattern language for web design. Keeping this in mind, a possible solution to develop and present complete pattern languages is to build pattern

languages focussing on specific dimensions of design, such as navigation, structure, presentation, graphics, etc.

4.4.6.3 Side effects of using patterns and guidelines

Sometimes the application of patterns/guidelines was causing other problems and usability violations. This can be attributed to participants not being totally familiar with every pattern/guideline or not having the proper technical skills to efficiently apply the advice given in patterns and guidelines. Some participants were applying patterns/guidelines per se, that is, to demonstrate their possession of skills and knowledge in the use of principles without paying attention to any side effects. Others were taking the advice given in patterns and guidelines as a rule that should be followed at all times without exception.

4.5 Shortcomings of the first study

The experiment was fraught with problems but it was still possible to get many and valuable results and to identify differences between patterns and guidelines as tools of transferring knowledge and experience. Most of these problems were related to the design of the experiment and the extensive resources required administering and coordinating a full course about web design, which was not part of the academic curriculum. Nonetheless, the first study helped in modifying and improving the experimental setting, among other things suggesting more rigorous procedures for the main study.

The study did not produce the expected results in terms of the performance of both groups and the quality of the artefacts produced. Overall, the performance of the participants and the final design artefacts were, on average, of lower quality than expected. However, the study helped the researcher to eliminate weaknesses and strengthen the overall experimental approach.

The experimental design revolved around three issues:

- The participants' level of experience and design competence
- The course structure and the training procedures
- The set of patterns/guidelines used.

These issues will be discussed below and explanations will be given of how they affected the participants' performance and the results of the first study.

4.5.1 Students' level of experience

The level of experience refers to students' initial level of computer experience and skills with computers, while the design competence refers to the experience and ability students had in using the design tools and techniques when they participated in the final tests.

4.5.1.1 Experience with computers

The students participating in this study were taking an e-commerce module in a Business Administration Department, therefore the initial level of computer dexterity and experience was average. Some of the students did not have extensive experience with computers and thus could not efficiently use all the FrontPage tools. Their lack in computer skills was a contributing factor to their performance as designers and consequently the impact the patterns/guidelines had on them. There were interested in learning more about techniques and procedures dealing with small details of design; they were mostly focussed on overcoming technical deficiencies and for that reason usability issues were probably considered of lesser importance.

4.5.1.2 Design competence

Several factors, as will be described in the following sections, contributed to students' design competence and skills. Here students' design competence is examined as an issue of the first study by itself.

A small number of students found it easy to pick up techniques and could follow, without any suggestion or hint from the tutor, common practices and design traditions that are evident on the majority of Internet sites. Some of these students expressed the view, during the interviews, that patterns/guidelines made them appreciate and become more conscious of design features they had frequently seen on the Internet.

However, at the end of the design tutorials most students did not reach a sufficient level of familiarity with design techniques. Probably some students did not practise enough or as much as they claimed. The selected patterns and guidelines could not address all the issues faced by novice designers. Simple exposure to patterns/guidelines could not transform them into first-rate designers. Although their impact on students is unquestionable, the extent of this impact was lower than anticipated. Furthermore, although students could focus on central design issues and specific, they could not understand all the implications and the consequences of the application of a given pattern/guideline; while applying one pattern/guideline they would violate another usability issue. Chung et al. (2004), in another controlled empirical study into the use of

patterns, concluded that although patterns help designers, less and highly experienced ones alike, still the performance of experienced designers not using patterns is rated higher than that of less experienced designers using them. Chung et al. (2004) interpret this as "having experience is more important than using patterns", meaning that patterns cannot replace experience.

Lewis and Rosson (2002) used the term "design readiness", by analogy to "reading readiness" and "mathematical readiness", to refer to a student's ability to comprehend and apply essential abstract concepts of OOD and programming. The concept of readiness has also been used in web-related businesses as "Internet readiness" to refer to a company's potential to move into e-commerce transactions (ASBDC, 2000). Several sectors of the company are assessed to rate the company's readiness. One of these is the readiness of the company's human resources, depending on factors such as the personnel's skills to use e-mail, and knowledge of HTML and FTP tools.

Employing the term design readiness, it is argued that students had not reached this state and consequently could not fully incorporate patterns/guidelines in their design practice. This is based on the observations during the design test. Students were mainly concerned with issues of implementing the tools and had not reached a level of thinking about usability issues that had them employing the use of patterns/guidelines. Although students in the final group were chosen, by using as criterion their performance in class, there were still participants that were low-performing or proved to be unmotivated during the tutorials. It would have been preferable to rely on well-performing participants for the experiment; however, no more participants could be eliminated from the study since the drop-out rate was already quite high.

4.5.2 Structure of course and training procedures

In this section several factors related to the course and the teaching procedures are discussed. These have influenced the experiment to a certain extent. Certain drawbacks are highlighted which need to be considered in designing the next experiment of the main study.

4.5.2.1 Restrictions on teaching design issues

The tutorials on web design were focussed on the use of FrontPage tools and several technical issues of web design, that is, how to do things – *not* how to produce pages of good quality. Students had never designed a web page before and they were designing as most beginners do: they applied many colours, a variety of fonts, added graphics and

animation for no significant reason, etc. Design tools and techniques were used for impression instead of creating quality web designs. When a usability error was made by a student during the tutorials the tutor could not suggest any improvement to the design, or draw the student's attention to the particular usability violation, since by doing this he would directly interfere with quality and usability issues of web design with the particular student. The study design demanded that no advice or suggestion for improvement would be given to any one study participant. This policy was purposefully followed during the tutorials since advice about web design and guidance about usability were supposed to be given only during the usability lectures in the form of patterns/guidelines.

In retrospect, some usability issues, related to common and often presented problems, should have been included in the teaching process, provided they were discussed with all the participants. All usability design issues were left out to be addressed by guidelines and patterns; however, this proved to somehow restrict the overall progress of the students.

4.5.2.2 The authoring tool

FrontPage was chosen as authoring tool mainly for its ease of use, with its shallow learning curve allowing students to quickly progress during the initial stages of the tutorials. However, even FrontPage had tools and techniques that students found difficult to master in the relatively short period available for the tutorials, such as navigation bars based on a proprietary navigational structure, frames shared between web pages, page layout tables, etc. This wide choice of available techniques was sometimes confusing students instead of giving them a clear picture of web design procedures. The lesson learned was that tutorials should focus on easy, widely accepted techniques that students could easily master and avoid offering a choice of different methods, which had a negative effect, mostly on weak students. Also more time and practice during the tutorials may have offered students the opportunity of becoming familiar with such tools.

4.5.2.3 Design pairs of students

During the tutorials students were allocated in pairs to each computer, due to the small number of personal computers available in the classroom. A drawback of students working in pairs is that the student most skilful and knowledgeable with computers is in charge and completes all the tasks, while the other student just follows the tutorial watching the screen, contributing only verbally to the completion of the task. In most of

the cases, any given pair of students established such a working relationship for the subsequent tutorials. Eventually only one student uses the software tool and gets all the training. The other student, although understanding the necessary actions to perform a certain task, is not really working with the tool and eventually does not gain any real benefit and does not build the necessary skills to design competently.

Students working in pairs were frequently advised to change places so that both would have the chance to work on the computer; however, there were cases where someone was relying mostly on his partner to perform the tasks and tests during the tutorials. The end result was that some of the students did not get enough real practice. They were not comfortable in using all the tools and could not remember the necessary sequence of actions to perform a given technique. This clearly showed itself to be the case in the final test when students were observed working alone.

4.5.3 Set of patterns/guidelines as contributing factor

In the next subsections the factors related to patterns and guidelines used for the experiment are discussed and how they affected the experiment.

4.5.3.1 The number of patterns and guidelines

Although a careful selection of patterns and guidelines was made, it is quite likely that the number of patterns (32 patterns and 50 guidelines) was too large to be fully appreciated by all students.

Students were in a position to understand all the principles and advice included in the sets of patterns and guidelines; however, it is not certain if they could actually identify where and when the application of a particular pattern/guideline was required. Sometimes the application of a pattern/guideline produced other usability violations to which students did not pay any attention.

Students did not get the chance to exercise their newly presented knowledge in order to be able to associate all patterns/guidelines with real design problems and situations. The experimental design did not prescribe any tutorials after the presentation of patterns/guidelines, and any assimilation of patterns and guidelines was left to the individual. Students were advised to spend one hour revising and studying patterns/guidelines. The time that students spent, according to their statements, ranged from 30 minutes to a few hours. However, it is known that participants tend to exaggerate in such statements since self-reporting as a method of data collection is prone to the Hawthorne effect, i.e. participants perform differently while under

observation (Adair, 1984; Keeves, 1997) and tend to fabricate; evidently, some students did not spend anything like the amount of time claimed on their studies.

Furthermore, there were some patterns/guidelines that could not be applied in the design or in the evaluation task. These were included in the tutorials so that the students could gain a better and broader idea about design issues; these could have confused students and blurred the general picture instead of, as intended, providing a general outline of common usability issues.

Kotze et al. (2006a) explain how pattern-related knowledge affects students, using Gorman's (2002) model of knowledge transfer in technology. Gorman distinguishes four types of knowledge transfer and stages of the level of knowledge a person possesses:

- Declarative knowledge (what): refers to recalling events and facts.
- Procedural knowledge (how): refers to knowing how to do something.
- Judgemental knowledge (when): refers to recognising when to apply knowledge.
- Wisdom (why): refers to judgment of applying a new course of action.

Most of the students did not develop their judgemental knowledge, while some did not even reach the stage of possessing declarative knowledge. This was expected, to a certain degree, since there was not enough time for students to assimilate new knowledge; however, it is the researcher's estimation that the number of patterns/guidelines was also too great for the students' abilities, taking into account the presentation time and the massive body of new knowledge presented to them.

4.5.3.2 Weak or unsuccessful examples

The issue of some of the examples not being successful was discussed in Section 4.4.1.4. This was based on observations during the tutorials, where further explanations and clarifications of certain design issues were requested by students. There were situations where the illustration and the examples could not capture the relevant usability principles for the particular patterns/guidelines.

During the evaluation and handling of patterns and guidelines by all involved in the study (students, evaluators and assistants) it became apparent that in several cases better and more illustrative examples could be found by searching the Internet.

Another contributing factor to the examples not strongly communicating the intended message was that they were taken mainly from American sites, and thus were in English, and students were probably not familiar with them or could not understand

all the textual information included in each page. The examples used for the presentation were from Koyani et al. (2003). It should be pointed out that in the new version of these guidelines, published after our experiments (mid-2006), the examples were improved and updated in many guidelines (US Department of Health and Human Services, 2006).

4.5.3.3 General purpose patterns

Students, due to their lack of experience in web design and probably the limited time available for learning and practising, were still making elementary but critical mistakes, which had a negative impact on the overall picture of their web sites. The set of patterns/guidelines employed did not efficiently convey the right information to novice designers. This could be partially attributed to the fact that the patterns/guidelines used in the study were targeted a wide audience of designers and intended for use by designers with above average design skills. The sets were not designed for teaching novice designers. Although they mostly referred to common design issues, they presented advice mainly for experienced designers and did not directly tackle the problems that a novices and inexperienced designer face or the mistakes that beginners quite often make. This, combined with the fact that specific guidance were avoided during tutorials, resulted in artefacts of average quality.

4.6 Considerations for improvements

Based on the above observations the researcher took into consideration the following issues, which informed the main study of the research.

The short duration of tutorials and the lack of practice by a number of the students affected their performance. Web pages designed by the participants were of reasonable quality. Students did not reach a level of knowledge and experience to use patterns/guidelines efficiently; instead, they were still focussing on overcoming problems with their handling of the authoring tool. Of course, the designs of the best students were of high quality, close to a professional level of presentation, extensively using patterns/guidelines as a resource of good usability ideas. However, the majority of the students were still regularly making simple mistakes, such as underlining text, using many fonts, having inconsistent presentations, excessively using graphics, etc.

This also had an impact on the scoring procedure of the designs. Due to the errors and average quality of the web sites, evaluators needed more time than anticipated to

rate students' web pages, while quite often they had to ask for help in clarifying the recommended scoring method and the metrics.

Students were not taught any good usability practices during the FrontPage tutorials because the experiment focussed solely on the effect that patterns/guidelines had on students as resources of good design principles and usability at the end of the course; the only source of usability was patterns and guidelines. This had some negative effects on students' performance since they did not assimilate, as expected, the knowledge that patterns and guidelines offered. One necessary step, in order to improve students' performance as designers, would be to expose them to a limited number of design principles. This would also help them reach the stage of being able to employ patterns/guidelines more successfully and would increase the impact of patterns/guidelines on them.

In order to advance students to a higher level of design performance and design readiness, good design practices should be taught and presented to students early, in order to give them time to practise and assimilate the knowledge. Students' attention should be drawn to their errors on specific issues and they should be reminded of the design principles again and again. This would bring students to a higher level of design ability and would allow them to focus better on usability issues.

Furthermore, the students' lack of experience in applying and using patterns and guidelines, which were large in number and covered a wide area of design issues, and probably also the way in which they were depicted in the booklets, with poor examples, were other contributing factors that reduced the impact patterns/guidelines had on students.

Evidently, the complexity and the level of patterns/guidelines and how relevant they are to the students' experiences have an impact on their usefulness to students and on their effectiveness. Students used the predominant patterns/guidelines, i.e. those that they could understand and had drawn to their attention. These patterns/guidelines were those that the students could easily assimilate, depending on the point of design readiness each student had achieved: The best and more experienced students could pick up a greater number of patterns/guidelines because more patterns/guidelines could make sense to them, and they could easily find places to successfully apply them. The analysis of the interviews and the questionnaires shows that the patterns/guidelines that attracted them mostly were "White Space" and "Repeated Menu" at the bottom of the page, "Link to the Top" on the page and "Length of Homepage".

4.7 Summary

In this chapter the exploratory and the first study were described. Ensuring reliability and validity is a necessary requirement for any experiment in order to avoid possible shortcomings and pitfalls in any research outcomes (Pallant, 2001). Both experiments helped in identifying and eliminating several drawbacks of the experimental approach.

The exploratory study revealed that an authoring tool was required to help investigate the design practices of students, and that patterns and guidelines presenting equivalent sets of usability principles were required in order to ensure that all participants received the same design knowledge.

The first study introduced a full-scale course about web design to students and offered the opportunity to better prepare the main study. The findings of the first study were valid but the study itself presented several inconsistencies and shortcomings.

In summary, the weaknesses identified in the first study were the following: First, the students did not cope well with the redesign task, probably because revisiting a web site did not appeal to them; second, students should be technically advanced to a higher level of design in order to employ design tools and techniques without any difficulty; third, a different setting is required for the evaluation task in order to maintain the students' interest and enthusiasm; finally, several issues and details about the teaching and learning process and issues regarding the format of patterns/guidelines need to be dealt with.

Another important issue brought up by the first study was that patterns and guidelines needed to be refined. Some drawbacks of the patterns/guidelines and the associated metrics that hindered scoring of the sites were revealed. Therefore, the initial metrics and the scoring procedure needed to be improved for the main study. At the same time, the quality of the instruments (assignment tests, tasks and questionnaires) should be enhanced.

Finally, several findings in this chapter provide an insight into the practices that were easily adopted by the participants, how they perceived patterns and guidelines, and what they suggested to improve their presentation and format.

The next chapter presents the guidelines, the patterns, and the metrics used in the main study with all the improvements made to the experiment as were dictated by the exploratory and the first study.

Chapter 5

Patterns, Guidelines and Metrics

5.1 Introduction

In this chapter the improvements made to the design of the experiment, the sets of patterns and guidelines, and the set of metrics used for scoring the designed web sites of each participant are presented.

Firstly, the changes in the design of the experiment, improving on the design of the first study, are described in Section 5.2. The level and profile of the participants were different. Improvements and enhancements were made to the teaching approach, the sets of patterns/guidelines, and the design test based on the experience gained from the first study. In Section 5.3 a short account of web design criteria is given.

After that the metrics are presented in sections, where each section describes the metrics for a specific web design dimension. For each metric the rationale and related principles together with references to relative research are given, followed by a summary of the procedure and the scoring details in applying the metric. Finally, a summary of the chapter is provided at the end of the chapter.

5.2 Improved design of the experiment

Taking into account the previous first study, several improvements were made to get more concrete results of the impact of patterns and guidelines on the activities of novice designers. More specifically, the experiment was improved in four areas:

1) The level of students

2) The teaching approach and tutorials
3) The balanced sets of patterns/guidelines
4) The design test.

These four areas of improvement are considered an essential part of the experiment and will be described in detail in the following sections. Furthermore, these sections provide sufficient detail to allow the experiment to be replicated.

More other minor improvements were made in several stages of the main study, however these will be presented in the next chapter together with the description of the details of each procedure involved in the main study.

5.2.1 Level of students

The participants in this study, due to their background at the university, were more technically oriented than those in the first study. Their experience with computers and the initial level of skills in using them were higher.

The previous study involved students following a Business course while the students in this study were following an Automation Engineering course. Students were familiar with programming languages and code since they had successfully attended three programming courses consisting of theory and laboratory tutorials. Two of the courses were in C++ and one in Visual Basic. Another course that is considered related to web design, and which students had already passed, was Telematics comprising theory and laboratory tutorials. All the students had access to the internet from home on personal computers or laptops. All reported that their computer literacy was more than three on a five-point Likert-type scale, ranging from 1="beginner" to 5="expert". Their internet experience and everyday use was also reported to be above average.

Participants were aware of design procedures, highly motivated, and comfortable following the techniques implemented in the design of web pages. Students managed to quickly master the essential techniques of FrontPage and shifted their focus to improving these techniques and learning more complicated and advanced web design tools.

Although it can be argued that the design of a web site is not a technical issue, being comfortable with tools and techniques allows a designer to employ easily patterns and guidelines and tackle practical problems that may appear. Sometimes, students resorted in working with HTML code instead of the appropriate FrontPage tool.

5.2.2 Teaching approach and tutorials

In this section, the teaching approach taken and the improvements made to the tutorials to improve the design abilities of students are described. The focus and intention of the approach was to bring the students' design ability up to a good level.

5.2.2.1 Improved tutorials

Tutorials were conducted by the author, while a technical assistant was present at all times to help with computer problems and the use of educational equipment (network, projector, screen, etc.).

The tutorials introduced the use of FrontPage tools and technical issues of web design. One of the tutorials was about general usability principles and the evaluation of web sites. This tutorial was delivered before the preliminary test used to form the two groups for the treatment.

Evidently students were progressing much more quickly than students in the first study. A careful selection of the available techniques was made and presented to the students. The experience obtained from the first study showed that some of these tools, for example design layout tables, needed extensive practice otherwise they would confuse students. Several proprietary techniques and tools available in FrontPage were not taught and students were advised not to use them. This allowed for better and more thorough practice with the conventional tools and techniques.

Despite students' rapid progress, the extent of web design knowledge was kept to what was planned. Students reached a level where more advanced features, such as frames and forms, could be introduced to them. However, teaching new techniques would have taken more time and would thus not allow for extensive practice of already known techniques to ensure that all students reached a certain degree of "design readiness". It was not also considered appropriate for students to use ready-made solutions such as themes or wizards, ready-made link bars based on navigation, etc., which would have distorted their real knowledge of usability, and thus their score, as demonstrated in the web site designed by them.

For the same reasons, tutorials did not involve any teaching and use of Cascading Style Sheets (CSS), although CSS are industry standard, in order to be able to check if students complied with certain patterns/guidelines advocating consistency. CSS provide an easy way of adding styles to web documents. The use of CSS directs and forces the designer into following consistency rules which may not have been followed if CSS were not used.

Students' interest was kept strong with small tutorials about specific tools used for web design, such as gif animators and menu makers. These tutorials were only introduced at an elementary level and it was made clear that they were not to be used and were not required for the final tests.

Throughout teaching, following an approach similar to that taken in the first study, any reference to good practices was intentionally avoided in order not to affect a particular student or group of students. The only direct instructions given were about the use of FrontPage as a website building software tool and about the use of the selected FrontPage tools to build web pages. However, a number of design principles were included so that students would avoid making the elementary mistakes that participants in the first study made. These principles will be described in the following section.

5.2.2.2 Principles and design concepts

A number of design principles and design issues were intentionally presented and practised during the FrontPage tutorials. That was deemed appropriate in order to help students advance their web design skills and to help them stop making elementary usability mistakes. The intention was to bring the students to a better design level than the students in the first study.

These principles were introduced using traditional teaching techniques without employing patterns/guidelines. The introduction to basic design practices, used on all modern sites, started early in the series of tutorials and it was made sure that students had time to practise and adopt them. The specific principles presented were about page layout, tables, borders, text, use of colour and graphics. In contrast, such principles were delivered in the first study in a pattern/guideline format during the last tutorials of the course when patterns/guidelines were introduced.

Advancing the design level and abilities of student had the effect of also helping the evaluators to score the web sites more easily and quickly. Good sites can be evaluated and graded easily, while poor sites require more time to make a just and unbiased decision.

Apart from these design principles delivered to all students, the tutor would not directly suggest any quality or usability issues or how to make improvements to the appearance of the web page since he would be directly interfering in quality and usability issues of the web design of an individual student. Avoiding to present advice and good practices about design was a rule that was strictly followed during the tutorials.

because advice and good practices were supposed to be delivered only during the patterns/guidelines lectures.

5.2.2.3 Use of template

The use of a template for assignments, with prefabricated web pages, was employed in this study as well. Furthermore, in order to compare similar sites and to avoid sites with different text and graphics, the content, text and photos/images were included on each page. The use of a template and the partial model, although somehow restricting creativity, was deemed necessary and supported evaluators in judging any student's site based on the defined evaluation metrics.

5.2.3 Balanced sets of patterns and guidelines

The collection of patterns/guidelines, apart from making corrections and additions to the text and improve some pattern names, was improved in three ways: by reducing the number of patterns/guidelines; by using clearer and more illustrative examples; and by developing and including patterns/guidelines that addressed the most common mistakes novice designers make. The experience gained through the first study and the observations made during small tests in the tutorials helped in identifying errors students were making and the design principles they were violating.

5.2.3.1 Number of patterns and guidelines

The first study concluded that the number of guidelines/patterns was proved to be too great for the students and did not help them comprehend, to the degree expected, the key usability issues and principles that should apply to their designs. It was decided to reduce the number and to select only patterns and guidelines that would adequately cover the most essential and necessary design issues. The rationale for that was to make learning more effective, by limiting the domain knowledge required by the participants, and to also make the experiment more successful, by ensuring that the participants could perform a meaningful task to a standard that could be sensibly evaluated and could give measurable results.

This allowed for a small reduction in the number of guidelines/patterns. However, the number of patterns/guidelines presented to students and used in this experiment was further reduced by eliminating certain patterns/guidelines not applicable in the design tests. From the set of 50 guidelines and the equivalent set of 32 patterns that were used for teaching in the first study, only a subset could be employed in the design of the site. Since students were going to be tested on an improved version of the same design assignment used in the first study, it was possible to specify to a great extent the

patterns/guidelines that could be applied in the site. Patterns/guidelines that were not related to the requirements and the task for the web site were left out. The final set presented to the students consisted of 35 guidelines and 25 patterns. Table 5.1 shows the patterns and the guidelines corresponding to each pattern. Some patterns/guidelines that could not be directly implemented in the design test were included in the sets since they were considered essential for the overall training of students as novice designers. Numbers next to the pattern names and the guideline titles indicate the identification number of each pattern/guideline as they were presented in the booklet provided to students.

Table 5.1: Patterns and guidelines for the main study

Category	Pattern Name	Guideline Title
Home page	2. Home Page Link	1. Enable Access to the Home Page
	1. Home Page Length	2. Limit Home Page Length
Page Layout and Design	3. Consistent Important Items	3. Place Important Items Consistently
	4. White Space	4. Use Moderate White Space
	5. Item Alignment	5. Align Items on a Page
Navigation	6. Users' Location	6. Provide Feedback on Users' Location
	7. Page List of Contents	7. Use a Clickable 'List of Contents' on Long Pages
	8. Descriptive Tab Labels	8. Use Descriptive Tab Labels
	9. Length of Navigation	9. Keep Navigation-only Pages Short
	10. Meta Navigation	10.Use Meta Navigation
	11. Repeated Menu	11. Repeat Navigation at the Bottom of the Page
Headings, Titles and Labels	12. Nice Headings	12. Use Unique, Descriptive and Emphasised Headings
	13. Page Titles	13. Provide Descriptive Page Titles
Links	14. Properly Placed and Descriptive Links	14. Provide Links where the User May Need Them 18. Match Link Names with Their Destination Pages 19. Ensure that Embedded Links are Descriptive 20. Designate Used Links
	15. Obvious Links - Consistent Cues	15. Provide Consistent Clickability Cues 16. Avoid Misleading Cues to Click
	16. Clickable Images	17. Use Text for Links and Clickable images
	17. To the Top Link	21. Allow Users to Go Back to the Top of the Page
Text and Typography	18. Consistency in Text	23. Ensure Visual Consistency in Text 24. Format Common Items Consistently 25. Use at Least 10-Point Font 26. Use Familiar Fonts
	19. Visible Text	22. Use Black Text on Plain, High-Contrast Backgrounds
	20. Emphasised Text	27. Emphasise Importance in Text
	21. Attention Attracting Features	28. Use Attention-Attracting Features when Appropriate
	23. Mixed Case Text	29. Use Mixed Case with Prose
	22. Aligned Text	30. Use Proper Alignment for Text
	24. Alternating Row Colours	31. Use Alternating Row Colours for Tables
Lists	25. Lists	32. Display Related Items in Lists 33. Introduce Each List 34. Format Lists to Ease Scanning 35. Capitalise First Letter of First Word in Lists

There were twenty-one patterns that could be mapped one-to-one to guidelines; one pattern that corresponded to a set of two guidelines (two guidelines in total); and three patterns that corresponded to a set of four guidelines each (twelve guidelines in total).

The new reduced set of patterns was simpler in complexity than the set delivered in the first study. Most of the patterns corresponded to one guideline, and only four patterns corresponded to more than one guideline, while in the previous set of patterns used for the first study a total number of eight patterns corresponded to more than one guideline. See Appendix 5.1 for the full set of patterns and guidelines delivered to each group during the tutorials. The sets are presented as they were given to each participant in booklets, being translated from Greek into English. See Appendix 5.2 for the Greek version of the patterns and guidelines.

5.2.3.2 Improved sets of patterns/guidelines

During the first study it was evident that some of the examples used for teaching (mainly from the Koyani guidelines) were not clear in communicating the intended message to the students. Students were asking questions about these examples and the tutor had to clarify them and indicate the exact application of the guideline/pattern. Some of the examples were not successful and were misleading readers and some presented problems to students not understanding the English content of the particular pages. For the main study these examples were replaced.

After an extensive search on the Internet, focusing mainly on Greek sites, it was possible to find clearer and more illustrative examples, and these were included in the collection. Whenever possible, the examples were taken from well-known sites that students most likely had visited and they were familiar with. Finally, some of the pattern names and guideline titles were changed in a way that would improve the impression and understanding of a pattern/guideline.

5.2.3.3 Additional patterns/guidelines

A small number of patterns/guidelines were added to the set that would help students improve their design habits. These new patterns/guidelines were dealing with errors that beginners quite often make, and were based on the most common mistakes that students make as novice designers (text alignment, font size, underlined text, etc.). Experienced designers usually do not make these mistakes. One pattern/guideline was about text alignment, advocating that text should usually be aligned left. The other one was about the use of fonts and size of fonts. This pattern/guideline replaced the original Koyani

"Use at Least 12-Point Size Font" guideline with a new one advising the use of 10-Point size fonts or less but big enough so that users will be able to read it comfortably. Also more specific advice was given about the use of serif and sans serif fonts, advocating the use of sans serif fonts for modern sites. Finally, in the patterns/guidelines section about links explicit advice was added strongly advocating that underlined text should be used only for links. New examples were included with the patterns/guidelines.

Font family and size of text together with text alignment and unduly underlined text greatly affect the overall impression of a web site. These new patterns/guidelines helped improve the overall design and made the web pages follow modern trends and conform to industry practices of web design. Scoring and evaluating of the pages was easier and evaluators could focus on other design issues according to the metrics.

In general, the resulting patterns and guidelines were more concise and could be easily delivered in the three-hour lecture allocated for that purpose. The added examples and the refinements of the old patterns/guidelines together with the additions of new patterns and guidelines resulted in an improved set focussing on novice designers for the purpose of the experiment.

5.2.4 Design test

In the first study, the evaluators had quite a difficult task rating and scoring the designs of the students. The test for the first study was refined and improved in several aspects. One of the pages taking too much time for students to complete was totally replaced by a new one. Another page, which did not contribute enough to the students' score since only a small number of patterns/guidelines could be applied, was modified. Other design details that were difficult for the evaluators to rate were eliminated or replaced.

The questions raised during the test in the first study were also taken into account. The instructions given to the students and the requirements for the site, written and verbally, were clearer and now addressed key design points. A couple of specific instructions were added, guiding students to avoid certain design practices that proved to be problematic in the first study.

The revised test had a positive effect on the scoring procedures. The evaluators spent less time to preview and grade each page. The metrics used for the evaluation were easier to apply, without resorting to new rules and heuristics, making the evaluators feel that their score was just and objective. In other words, the revised test resulted in the metrics producing more concrete evidence about the effect and influence of patterns and guidelines on the students.

The modifications that were made to the tasks and the metrics were aimed at making the investigation more focused on "comparing patterns and guidelines". There is nothing to suggest that the modification to the tasks and the metrics made them more or less valid. These modifications would make it more difficult to compare the results of the main study with that of the first study but, as the results of the two studies are not directly compared in this thesis, it can be said that these modifications have only positive effect on the outcome of the study.

5.3 Web design criteria

Nielsen (2000a) summarises that a successful website has high-quality content, is often updated, has minimal download time, is relevant to the user's needs and is easy to use.

An extensive survey of web design literature on usability principles, usability evaluation methods and development of instruments to measure aspects of web design revealed a number of criteria that have an impact on the quality and usability of web interfaces. Several authors refer to these criteria as dimensions, factors or issues. Table 5.2 contains a summary of website quality criteria suggested in the literature.

Table 5.2: Website quality criteria

Author	Criteria
Doll et al., (1994)	Content, Accuracy, Format, Ease of use, Timeliness
Abels et al., (1998)	Personalisation, Structure, Navigation, Layout, Search, Performance
Kirakowski et al., (1998)	Attractiveness, Control, Efficiency, Helpfulness and Learnability
Olsina et al., (1999)	Reliability, Usability, Functionality, Efficiency
Nielsen, (2000a)	High-quality content, Often updated, Minimal download time, Ease of use, Relevant to users' needs, Unique to the online medium, Net-centric corporate culture
Barnes and Vidgen, (2001)	Usability and Design, Information Quality, Service Interaction Quality
Cox and Dale, (2002)	Ease of Use (Purpose, Design, Communication), Customer Confidence, On-line Resources, Relationship Services
Loiacono et al., (2002)	Usefulness, Ease of Use, Entertainment, Complimentary Relationship
Marquis, (2002)	Short download time, Ease of navigation, Minimal menu options, Ease of use/structure, Multiple links to pages
Palmer, (2002)	Download delay, Navigation, Content, Interactivity, Responsiveness
Zhang and von Dran, (2002)	Easy to navigate, Accuracy of information, Search tool, Clear layout, Comprehensiveness of information, Up-to-date information
Mich et al., (2003)	Identity, Content, Services, Location, Maintenance, Usability, Feasibility
De Marsico and Levialdi, (2004)	Appearance and Effectiveness of layout, Navigation, Ease of Search, Site content, Satisfaction
Hung and McQueen, (2004)	Ease of identification, Ease of use, Usefulness, Interactivity
Zviran et al., (2006)	Usability, Content, Search, Navigation, Performance

This list is not exhaustive and, although each of these studies may focus on web design from a different perspective (e-commerce, e-government, tourism, etc.), the most common criteria, such as content, ease of use, navigation, search, etc. can be clearly identified.

A similar set of criteria and metrics are currently used for the evaluation and ranking of "Best Web Sites" by several organisations and institutions that have established annual awards for web sites. The awards are decided by a jury made up of web experts, designers and practitioners based on review and analysis using a set of criteria. Table 5.3 presents three different sets of criteria (The Webby Awards, n.d.; The World Best Websites, n.d.; The 100 Best Websites, 2004).

Table 5.3: Web awards criteria

The Webby Awards	The World Best Websites	The 100 Best Websites
1. Content 2. Structure & navigation 3. Visual design 4. Functionality 5. Interactivity 6. Overall experience	1. Functionality 2. Design 3. Content 4. Originality 5. Professionalism & effectiveness **Second level judging criteria:** Innovation; Search engine Visibility and rankings; Server security checks, etc.	1. Overall excellence 2. Content richness 3. Breadth 4. User-friendliness 5. Reliability 6. Wholesomeness 7. Freshness 8. Security **Secondary criteria:** Creative and innovative; Multimedia rich; Objective; Aesthetic, etc.

Usually each of the criteria is evaluated separately and carries a certain weight towards the total score, depending on the type and the goal of each site. Among these awards, and several others, the "Webby Awards" have been presented each year since 1995 for web sites in over 60 categories and appear to carry the most authority and validity. Winners of the Webby awards have been used in previous studies regarding automated evaluation techniques (Ivory and Hearst, 2001) and analysis of web site evaluation criteria (Sinha et al., 2001). Most of these criteria draw from the literature and the research in the field of web design evaluation and give a picture of the diverse measures used to judge web sites. The majority of the above criteria require a subjective evaluation of a specific usability dimension.

5.4 Metrics

This section presents the metrics employed in the study. Some of the metrics were not used in the previous first study because the related patterns/guidelines were not presented to the students.

The most important factor that should be taken into consideration in the selection of the criteria for this study is the actual set of guidelines and patterns that will be used for teaching. The chosen criteria and metrics employed for this experiment should therefore have a double objective: to reflect the application of patterns and guidelines used in the tutorials on usability with the help of patterns and guidelines, and to represent the widely accepted criteria used in evaluating the quality of web sites.

Most of the metrics are variations of the metrics used in the first study, but improved to make them easier to apply and to accommodate the changes in the final assignment. Each metric is used by the evaluators to measure the application of a pattern/guideline. A metric is formed for each pattern (and the corresponding guideline or guidelines). Sometimes a metric is further divided into submetrics. The submetrics were introduced for two reasons:

1) To delineate the scoring procedure and to help evaluators judge and rate faster and more consistently the specific usability principles of the pattern.
2) In cases of compound patterns submetrics represent the scoring of one of the guidelines corresponding to the pattern.

Each metric is presented as follows: The metric name is followed by a metric code used to make the collection and compilation of the scores easier. The metric code represents a unique key to the pattern/guideline use in the experiment and was used internally among the members of the evaluation team. The pattern and the guidelines that the metric is related to are given. After that, a short literature review follows, with common recommendations and research background relevant to and supporting the use of the metric. Following that a metric summary of the scoring scheme is given, in a table format. The metric summary provides an overview of the metric and the scoring method. Each metric summary presents several criteria related to the metric. The criteria, in affirmative or interrogative form, depict the metric. These criteria are taken from the literature on assessing the usability of sites (Brinck et al., 2002; CPSnet, 2004; Ivory, 2004; The Webby Awards, n.d.). After the criteria, a short instruction ("Protocol") is included, followed by a details ("Scores") specifying the procedures for awarding points to each metric.

Some of the metrics are adapted to be applicable to Greek sites (labels, headings etc.). Each metric is related to one pattern and the corresponding guidelines. Table 5.4 shows the set of metrics and the corresponding patterns and guidelines. Numbers next to the pattern names and the guideline titles indicate the identification number of each pattern/guideline as they were presented in the booklet provided to students.

More details of the scoring procedure are needed to clarify the scoring method and scoring process applicable to the specific design exercise given to the students. These details explain how points are awarded and provide a grading template for the design test. See Appendix 5.3 for details of the procedure followed by the evaluators and how points are awarded for each specific metric.

The set of metrics measures the performance of the students, which is the degree to which they followed the design principles and advice given in the set of guidelines/patterns used in the tutorial. The set of metrics does not measure all aspects of web design, but only those that the students were taught during the tutorials about guidelines/patterns.

Table 5.4: Metrics, patterns and guidelines
(patterns/guidelines without metrics are not included)

Category	No.	Metric Code	Metric	Pattern Name	Guideline Title
Home page	1	M06_N5	Home Page Link	2. Home Page Link	1. Enable Access to the Home Page
	2	M05_N4	Home Page Length	1. Home Page Length	2. Limit Home Page Length
Page Layout and Design	3	M01_C1	Consistent Important Items	3. Consistent Important Items	3. Place Important Items Consistently
	4	M18_T8	White Space	4. White Space	4. Use Moderate White Space
	5	M19_D2	Aligned Items	5. Item Alignment	5. Align Items on a Page
Navigation	6	M04_N9	Location Indication	6. Users' Location	6. Provide Feedback on Users' Location
	7	M02_N3	Descriptive Labels	8. Descriptive Tab Labels	8. Use Descriptive Tab Labels
	8	M03_N6	Repeated Menu	11. Repeated Menu	11. Repeat Navigation at the Bottom of the Page
Headings, Titles and Labels	9	M12_T9	Headings	12. Nice Headings	12. Use Unique, Descriptive and Emphasised Headings
	10	M13_D4	Page Titles	13. Page Titles	13. Provide Descriptive Page Titles
Links	11	M07_L1	Links	14. Properly Placed and Descriptive Links	14. Provide Links where the User May Need Them 18. Match Link Names with Their Destination Pages 19. Ensure that Embedded Links are Descriptive 20. Designate Used Links
	12	M08_L2	Cues to click	15. Obvious Links - Consistent Cues	15. Provide Consistent Clickability Cues 16. Avoid Misleading Cues to Click
	13	M09_L8	Clickable Images	16. Clickable Images	17. Use Text for Links and Clickable Images
	14	M10_L5	To the Top Link	17. To the Top Link	21. Allow Users to Go Back to the Top of the Page
Text and Typography	15	M14_T1	Consistency in Text	18. Consistency in Text	23. Ensure Visual Consistency 24. Format Common Items Consistently 25. Use at Least 10-Point Font 26. Use Familiar Fonts
	16	M16_T3	Visible Text	19. Visible Text	22. Use Black Text on Plain, High-Contrast Backgrounds
	17	M15_E1	Emphasised Text	20. Emphasised Text	27. Emphasise Importance in Text
	18	M17_T4	Aligned Text	22. Aligned Text	30. Use Proper Alignment for Text
Lists	19	M11_T6	Lists	25. Lists	32. Display Related Items in Lists 33. Introduce Each List 34. Format Lists to Ease Scanning 35. Capitalise First Letter of First Word in Lists

Each metric score contributes equally to the score of the student. A score from 0 to 9 shows conformity and application of patterns/guidelines to the site. If a metric is based on submetrics, then the score is calculated by taking the average of the submetrics. For some metrics, a different scale was used in order to facilitate the work of the evaluators; however, at the end all scores were rescaled to the 0–9 range.

One potential bias in formulating the metrics rises in the case of compound patterns. Simple and compound patterns contribute equally to the score of a participant. Each compound pattern is based on submetrics. These submetrics represent the scoring of each of the guidelines that are used to form the compound pattern. The average of the submetrics is used to calculate the overall score of each compound pattern. By averaging the scores of the submetrics the impact of each submetric on the total score of a participant is lessened. Such a bias is discussed in Chapter 6 where the results of the main study are presented.

The dimensions or categories used for the metrics are based on the groups of guidelines in Koyani's approach since most of the guidelines were chosen from that work. In the following section the metrics are presented in each of the seven dimensions or categories.

5.5 Metrics for Home Page

There are two patterns in this dimension: Home Page Link and Home Page Length.

5.5.1 Home Page Link

Metric Code: M06_N5
Guideline: Enable Access to the Home Page
Pattern: Home Page Link

Metric rationale and background

Home page provides an entry to the web site. Lynch and Horton (2002) insist that every web page should have at least one link to the home page or to a page with a navigation menu. Brinck et al. (2002) in a general checklist for a web site include the question "is there a clearly marked link back to the home page?"

Nielsen advocates using a link, image or text to the home page (Nielsen and Tahir, 2002). Instone (1997), reporting on usability testing, considers this type of error to be severe but not critical and advocates the use of the main company logo as link to the home page, adding that a designer should also consider putting the label "Home" right below the company logo.

Students were advised that home page should have a link even to itself, since it is getting to be the norm in most web sites (Yank, 2002), and because it enhances consistency by novice designers. Usually a user will recognise that he or she is still in the same page without difficulty.

Metric summary

Metric Code: M06_N5
Criteria: Is there a home link on every page? Do they use the logo as a link to Home Page? Or any other appropriate labels (e.g. "Home")?
Protocol Review all pages and check if there is a home link on every page. The Home Page itself should count as one of the pages. **Scores** If a link to Home Page exists on every page then score=4 points; on 2 pages score=2 points; on any 1 page score=1 points; otherwise score=0 points.
Total max score=4 points.

5.5.2 Home Page Length

Metric Code: M05_N4
Guideline: Limit Home Page Length
Pattern: Home Page Length

Metric rationale and background

Nielsen and Tahir (2002) consider the home page to be the most important page of a web site. The home page usually contains the elements that will attract the visitor's attention and provides the navigation to access all other pages of the web site. Home pages are the most visited places on a web site (van Duyne et al., 2002) and therefore they should be designed with special care.

A short home page cannot contain much information and content; however, short pages do not require scrolling, so users can view everything on one screen. This becomes more important with the home page. Geissler et al. (2001) found that consumers' perceived complexity of web home pages is influenced by the number of links in the page, the home page length, the number of graphics, and the use of animation. Consumers tend to favour home pages having a moderate degree of complexity (Geissler et al., 2001).

Lynch and Horton (2002) recommend that, since a home page contains navigational elements, it is more appropriate to keep the home page short, that is, to no more than one or two screens. Ivory (2001) highlights that scrolling is an important issue, especially for a home page that serves as an entrance to the web site. Nielsen and

Tahir (2002) suggest that the designer attend to the length of the home page, having most of the most important information at the top.

Metric summary

Metric Code: M05_N4
Criteria: Is home page appropriately short? **Protocol** Check the length of the home page. Has the designer made an effort to limit its length? Note that some space can be allowed at the bottom of each column. **Scores** On the central column give 1 point for eliminating space at the top, 1 point at the bottom and 1 between content. The same applies to the right column as well. **Total max score=2 columns*3=6 points.**

5.6 Metrics for Page Layout and Design

There are three metrics in this dimension, corresponding to the following three patterns: Consistent Important Items, White Space and Item Alignment.

5.6.1 Consistent Important Items

Metric Code: M01_C1
Guideline Pattern: Place Important Items Consistently
Consistent Important Items

Metric rationale and background

Consistency is one of Norman's (1988) usability principles, advocating the use of similar design features and standard ways of interface design. The principle is concerned with access and ease of learning and remembering (Benyon et al., 2005).

Koyani et al. (2003) refer to consistency in several guidelines about links and text appearance. The guideline and the corresponding pattern were revised to some extent to make the guideline clearer for the participants. The focus of the particular guideline is on navigation and other important items such as navigational elements, logos, page headings, and images.

Nielsen (2007) considers consistency one of the top ten worst usability mistakes of all times. Lynch and Horton (2002) suggest that consistency adds to a site's unique identity, making the site easier to remember. Consistent layout and navigation help users to predict the location of the navigational elements and other information across the pages of the site. If a site is consistent, visitors become familiar with it more quickly. Research indicates that users develop a model of where to anticipate the location of certain objects such as navigation, external links, search engine, home link

and advertisement banners (Bernard, 2001, 2002). This kind of knowledge increases the effectiveness of a typical web site.

Metric summary

Metric Code: M01_C1

Criteria: Is the site consistent in layout? Mainly top of page?
The metric has 2 submetrics:
M01a_C1 refers to consistency in navigation bars.
M01b_C1 refers to consistency in other page elements and the general layout.

Submetric: M01a_C1

Criteria: Navigation bar is placed in a consistent way within every page of the site. Are buttons organised and match on all pages?

Protocol
Check the navigation bars on all 3 pages for position and organisation of buttons.
Scores
Scores for position: score=4 points if all navigation bars are in exactly the same place without any movement; score=3 points if there is a very small movement or mistake; score= 2 points if 2 navigation bars are in the same place; score =1 point if there is some movement; score=0 points if there is no consistency at all.
Scores for buttons organisation: score=4 points if there is no change; score=2 points if there is a change on one bar; score=0 points if there is no consistency at all.

Max score for the submetric=4+4=8 points.

Submetric M01b_C1

Criteria: Is the site consistent in layout? Mainly top of page and graphics?

Protocol
Determine the consistency of logos and image at the top each page.
Scores
Score=3 points if there is no movement; or 2 points for noticeable but not disturbing movement; or 0 points when logos in the 3 pages are not in the same place. Max score for logos and images=3 points.
Check the consistency of page headings on the 3 pages. Page headings should be in the same place when someone visits the pages one after the other. Score=3 points if headings are in the same place; or 2 points if 2 of them are in the same place; or 0 points if there is a noticeable movement of all headings. Max score for headings=3 points.
Check the pages for the overall page layout impression: Determine the score by checking if there is a noticeable change in the template that the site is based on and by looking at changes in the width of columns. Score=3 points if the layout is consistent; score=2 points if there is a small violation; score=1 points if the inconsistency is noticeable; score=0 points when there in no consistency at all. Max score for overall page layout=3 points.

Max score for the submetric=3+3+3=9.

Total max score=8+9=17.

5.6.2 White Space

Metric Code: M18_T8
Guideline: Use Moderate White Space
Pattern: White Space

Metric rationale and background

The term "white space" is designers' jargon and indicates space on the web page that is empty. White space is used to separate and emphasise elements on a page and make the design more attractive. The right amount of white space makes a page more visually

appealing than another with a cluttered layout. Also pages with too much white space seem empty and not worth visiting. An excess amount of white space makes pages longer, which means that users have to scroll to view the page.

White space also affects the reading and scanning performance of the visitor. It has been suggested that sites with extra white space decrease scanning performance on searching tasks and score low on users' preferences (Spool et al., 1999). However, Chaparro and Bernard (2001) contradict this by indicating that they found no significant difference in scanning and finding information in web pages with three different levels of white space, although users prefer a medium level of white space to separate paragraphs and columns instead of excessive or very little white space.

Chaparro et al. (2004) investigated the use of white space in text passages. White space, in the form of margins and leading between text lines affects reading speed and text comprehension. Margins result in slower reading performance but improved comprehension while leading does not have an affect on speed. Both margins and the right amount of leading are the best combination in users' preferences for text.

Metric summary

Metric Code: M18_T8
Criteria: Use moderate white space on the pages; Page utilises space– no "white space". Use white space to visually organise the page. **Protocol** Check each page for the right amount of white space. **Scores** Check for correct application of white space at the places indicated below. White space should not be excessive and the designer should have eliminated white page that was introduced on purpose. But, if white space is too little, no score should be given. Give 1 point for the correct amount of white space at each of the places described below. Page 1: Check central (top, middle, and bottom) and right columns (top, middle, and bottom). Max score=6 points. Page 2: Check top, middle and bottom of remaining 2 columns and only the bottom of the right column. Max score=5 points. Page 3: Check only the central column at the top, the middle, and the bottom. Give 1 point for each correct application of white space. Max score=3 points. **Total max score=Page 1+Page 2+Page 3=6+5+3=14 points.**

5.6.3 Aligned Items

Metric Code: M19_D2
Guideline: Align Items on a Page
Pattern: Item Alignment

Metric rationale and background

Similar elements should be aligned with each other since this helps in creating associations for a number of elements. Alignment applies to any screen elements:

paragraphs, text blocks, buttons, images or pictures, links, entry fields, or even combinations of them.

Alignment is used to organise web content. Good and consistent alignment makes scanning pages easier and facilitates reading. Organisational cues that make text scannable and facilitate searching are headings, introductions, lists and tables. (Spyridakis, 2000).

Alignment and grouping is important for rapid performance and affect the preferences of users. Text lines which do not have a uniform starting point force the user's eyes to move backwards and forwards and reduce the readability of text (Williams, 2000). Pages with reduced alignment and no indication of grouped elements are considered poorly designed (Parush et al., 1998).

In the web site designed by the students, this guideline applies mainly to images and text. Pictures, and text in paragraphs, should be properly aligned. Text includes headings. Furthermore, pictures and text should be aligned with each other, so that the overall page design should be nice and aesthetically pleasing.

Metric summary

Metric Code: M19_D2
Criteria: Is alignment used effectively? For text and pictures? Is alignment applied?
Protocol Check for alignment violations within the columns of each page. **Scores** Page 1: Check the right and centre columns first. On the right column the heading should be properly aligned. Pictures should be properly aligned with each other, and text as well. Use your judgement to consider as misalignment anything that violates the principle. Score=3 points for a properly aligned page. Subtract 1 point for any misalignment error. Max score=3 points. Page 2: Check all three columns. On the left column, the 2 pictures should be aligned; also the two paragraphs. On the centre column the headings, text and pictures at the bottom of the column should be properly aligned. On the right column headings and text should be properly aligned. Max score=3 points. Page 3: Look mainly at the central column for violations of the principle. Similar elements should be aligned the same. Max score=3 points.
Total max score=3 pages*3=9 points.

5.7 Metrics for Navigation

There are three patterns and consequently three metrics in this dimension. The patterns are: Users' Location, Descriptive Tab Labels and Repeated Menu.

5.7.1 Location Indication

Metric Code: M04_N9
Guideline: Provide Feedback on Users' Location
Pattern: Users' Location

Metric rationale and background

Visitors should know at any time their position within a web site. Users do not always enter a web site through the home page. Proper feedback should be given on every page in order for users to understand their location and how to proceed to the next target, otherwise users will feel lost and disorientated (Katz-Haas, 1998; Lynch and Horton, 2002).

Farkas and Farkas (2000) note that clear, short, and obvious orientation information should be provided not only on the home page but also on lower-level pages to support continuity in the exploration of the web site. Ivory (2004) adds that while users should be able to determine their location from every single page of the site, there should be no conflicts between the elements that help orientation.

Elements that provide feedback and support orientation within a site are page titles, the path from the home page to the current location of the user ("breadcrumbs"), links that match the destination, indications on the navigation bar, etc.

Metric summary

Metric Code: M04_N9
Criteria: Are you able to determine your current location within the site? Is there a clear location indication?
Protocol Review all pages and check if there are clear indications of the visitor's location. Each page scores from 0 to 3 points. **Scores** Determine the score for each page using the following criteria: If there is a clear page title, then score=2 points; if the navigation menu indicates location, then score=1 or 2 points depending on how clear the indication is; if in the navigation bar there are matching links to the headings of the page, then score=3 points for an exact match, or score=2 points if label and heading are matched but using different alphabets; score=1 points if both are English; score=0 points otherwise. Exercise your personal judgement to determine how clearly the current location is indicated, and decide the score of the page. If more that one of the above criteria is applicable, choose the one resulting in the maximum score.
Total max score=3 pages*3=9 points.

5.7.2 Descriptive Labels

Metric Code: M02_N3
Guideline: Use Descriptive Tab Labels
Pattern: Descriptive Tab Labels

Metric rationale and background

Labels are used in navigation (tabs, buttons or links). Nielsen and Loranger (2006) suggest that labels should be specific and descriptive. Non-descriptive labels puzzle

visitors and force them to presume the destination. Users should not have to guess what is behind a label or find out where they need to go by trial and error.

Labels should clearly suggest and communicate effectively the destination (Brinck et al., 2002). Links should be clear but short, especially in tabs or buttons where space is restricted. However, clarity should not be sacrificed for space (Apple Computer, 1996).

Metric summary

Metric Code: M02_N3
Criteria: Are the navigation labels clear and descriptive? Navigation is user-friendly?
Protocol Review all labels of the main navigation bar. **Scores** There are 5 labels. If all of them are in Greek, score=4 points; or if one of them is labelled "Home" and the rest are in Greek, score=3 points; if 2 labels are in English, score=1 points; otherwise score=0 points. Max score=4 points. To the above score add one point for each Greek label that is descriptive of the page that the link points to. Max score=5 points.
Total max score=5+4=9 points.

5.7.3 Repeated menu

Metric Code: M03_N6
Guideline: Repeat navigation at the bottom of the page
Pattern: Repeated Menu

Metric rationale and background

This guideline was derived from a pattern (van Welie, 2001-2007). Koyani et al. (2003) do not include this guideline in their list of guidelines. A bottom navigation bar is considered a standard in web design, advocated by many authors and specialists (Liebel, n.d.). Navigational elements should always be present (Ivory, 2004; The Webby Awards, n.d.). The easiest way to achieve this is to duplicate the navigational items or bar at the bottom of each page (Apple Computer, 1996).

A navigation menu at the bottom of the page provides users a mechanism for navigating the site without forcing them to go back to the top of the page where the main navigation elements should be. Employing a navigation bar, usually consisting of text links, means that the user has control over navigation (Brinck et al., 2002).

Metric summary

Metric Code: M03_N6
Criteria: Duplicate Navigational Items at the bottom of your pages. Is the navigation bar repeated at the bottom of the screen?
Protocol Review all pages and check if there is a repeated menu at the bottom of the page. The format and the presentation of the menu are irrelevant; however, a meta-navigation bar does not get any points. **Scores** If there is a menu at the bottom, the page scores 3 points; otherwise 0.
Total max score=3 pages*3=9 points.

5.8 Metrics for Headings, Titles and Labels

There are two metrics in this dimension, corresponding to the following two patterns: Nice Headings and Page Titles.

5.8.1 Headings

Metric Code: M12_T9
Guideline: Use Unique, Descriptive and Emphasised Headings
Pattern: Nice Headings

Metric rationale and background

This guideline refers to the Koyani guideline "Use Unique and Descriptive Headings". An addition to the guideline was included since it was considered more suitable for students to have all information about headings together. The addition advised designers that headings should be properly emphasised by applying suitable formatting.

Results from usability studies show the need for unique and descriptive headings on blocks of information (Williams and Spyridakis, 1992; Spyridakis, 2000). Headings should not be the same or even similar for different content. The structure and presentation of the page should help users ignore large blocks of information (Nielsen, 1997). Clear and unique headings facilitate scanning through information (Garrand, 2006) and allow communicating the hierarchical structure of the content (IBM, 1999).

Every single page should have a unique, brief and descriptive heading. The heading should be properly emphasised to make it stand out from text or other subheadings in the page. Larger font size, bold letters and white space around the heading are effective ways of emphasising a heading (Williams, 2000).

The metric is affected by M03_N6 (Repeated Menu at the bottom of the page). Also note that this metric refers to emphasising the headings of a page while metric M15_E1 (Emphasised Text) refers to emphasised words and sentences within text.

Metric summary

Metric Code: M12_T9

Criteria: Are the headings provided unique, descriptive and properly emphasised?

Protocol
Review all pages and check the existence of unique and descriptive headings; check also that headings are properly emphasised.

Submetric M12a_T9 for providing unique and descriptive headings

Scores
Score=3 points, for each page, if the heading is in Greek and also descriptive; score=2 points if the heading is not descriptive but still in Greek. If the heading is in English or written in English characters, then score=1; finally score=0 points if the heading is missing.
Max score for submetric=3 pages*3=9 points.

Submetric M12b_T9 for emphasising the headings

Protocol
Check every page for properly emphasised headings. The designer should provide the main heading of each page.
Scores
Page 1: Score=2 points, that is, 1 point for the main heading and 1 point for the heading on the left column. Max score=2 points.
Page 2: Give 1 point for each heading properly emphasised. There should be one main heading, one heading on the left column and at least two on the right column. Max score=4 points.
Page 3: One point for each heading properly emphasised. There should be one main heading and 2 or more headings on the centre column (depending on the designer's formatting). If the designer formatted the text using a table, use your discretion to allocate points. Max score=3 points.
Max score for submetric=page1+page2+page3=2+4+3=9

Take the average of the 2 sub metrics
Total max score=9.

5.8.2 Page Titles

Metric Code: M13_D4
Guideline: Provide Descriptive Page Titles
Pattern: Page Titles

Metric rationale and background

Page titles are the main approach used by search engines to identify web pages. Most users find a web page via a search engine. Nielsen (2000a) suggests writing page titles that have good visibility in search engines, using unique words such as the company's name. Especially for home page, it is recommended to begin the page title with the company name, if applicable, followed by a brief, clear and unique description of the site and avoid generic terms like "welcome" or "home page" (Nielsen, 2007).

Page titles are also used by default in the "Favourites" lists when users bookmark a site. Giving a unique and meaningful title to a page results in a clear and easy to recognise entry in the bookmarks list.

Page titles should accurately reflect the content and purpose of the page. Spyridakis (2000) advocates that designers should devote some time to carefully choose

meaningful page titles. This helps users to orient and identify pages. Sometimes a page title is the same as the main heading of the page.

Metric summary

Metric Code: M13_D4
Criterion: Browser Page Title describes the page.
Protocol Review all pages and check if there is a page title for each page. The Page Title should be different from the one initially given to each page. **Scores** If the title is descriptive and in Greek, score=3 points; if the title is in English, score=1.5 points, and finally, score=0 if there is no change in the page title.
Total max score=3*3 pages=9.

5.9 Metrics for Links

There four metrics in this dimension correspond to the following four patterns: Properly Placed and Descriptive Links, Obvious Links – Consistent Cues, Clickable Images and To the Top Link.

5.9.1 Links

Metric Code: M07_L1
Guideline: Provide links where the user may need them
Match Link Names with Their Destination Pages
Ensure that Embedded Links are Descriptive
Designate Used Links
Pattern: Properly Placed and Descriptive Links

Metric rationale and background

This is a compound pattern that corresponds to four guidelines. To form the compound pattern one guideline that does not belong to the Koyani guidelines was introduced, advocating the provision of links in places where the user may need them (CPSnet, 2004). Koyani guidelines have two similar guidelines: "Link to Related Content" and "Link to Supportive Information". The specific guideline, as it was presented to students, is more generic than the two Koyani guidelines and more suitable for novice designers.

The web site should have links to other content within or outside the web site in places where the user may need them. The simplest form of such links are e-mail links to help visitors send e-mail. More links within text, such as embedded links, support easy navigation to relevant sections and help the visitor to quickly find related information and to move around the site.

Matching link names with destination pages indicates to users what to expect when they click on the link and gives them feedback that they have reached the required destination (Brinck et al., 2002; Koyani et al., 2003).

Links embedded within text should be understandable and meaningful (Ivory, 2004). Borges et al. (1998) report that frequently link names do not allow users to predict the destination and that in one fourth of cases users get the wrong idea about the content of the destination page. Link names should not use technical words; they should be concise and they should make the destination obvious by providing hints on the content of the destination they link to (Borges et al., 1996). Links that confuse or are ambiguous discourage users from exploring a site and degrade comprehension (Mobrand and Spyridakis, 2007; Wei et al., 2005).

It was possible to measure the performance of the participants in applying or not three out of the four guidelines. Guideline Designate Used Links is the default standard for links made with FrontPage. The students were not technically capable of changing the link colour of visited links because that was intentionally left out of the tutorials. It was discovered in the first study that this kind of knowledge was causing problems and not all students were capable of dealing with it unless extensive tutorials were given. Taking the score of this particular guideline into account would probably be unfair to people that had designated and defined links compared to those that had not, especially in places where links were presented against a blue background. A change of colour was necessary in such cases to avoid having blue links against a blue background. Therefore, the performance of the participants in this aspect was not measured.

Metric summary

Metric Code: M07_L1

There are 3 submetrics.
M07a_L1 for guideline Provide Links where the user may need them.
M07b_L1 for guideline Match Link Names with Their Destination Pages
M07c_L1 for guideline Ensure that Embedded Links are Descriptive
There is no metric for guideline Designate Used Links.

Submetric Code: M07a_L1

Criteria: Are links provided at places where user needs them?

Protocol
Designers should provide links at the place where users might feel the necessity for a link.
Scores
Page 1 right side bar: there are 3 images and also the last text paragraph that should be linked to web pages. Allocate 1 point for each link. Max score=4 points.
Page 2 left column: there should be 2 links; the existing images or the text or both should be made links. Score=1 points for each link provided by the designer in any form (using images, text, or both). Max score=2 points.
Page 3 centre column: the two e-mail addresses should be made links. Max score=2 points.
Max for submetric=4+2+2=8 points.

Submetric Code M07b_L1

Criteria: Are the names of the links understandable and meaningful?

Protocol
Are the names of the links understandable and meaningful?
Scores
Page 2 left column: Designers had the choice to make either text or images into links. Therefore any text links should not be included in the score for the metric. Page 2 centre: There should be 5 links, one to each paragraph. Text links should be descriptive but this is a very subjective matter. Use your personal judgement to evaluate the links, but make sure you apply the same criteria across all the designs under examination. Max score=5 points.
Page 2 right column: This column should have 7 links, i.e. 4 links in the magazine section (top of the column) and 3 links in the bottom section of the column (news section). Each link that is considered descriptive gets 1 point; otherwise score is 0 point. Max score=7 points.
Max score for submetric=5+7=12 points.

Submetric Code: M07c_L1

Criteria: Do the names of the links match the destination?

Protocol
This principle can only be applied, in the present test, to the buttons in the navigation bar.
Scores
For each page determine if there is a match between the link and the destination page (heading). If there is an exact match regardless of the actual meaning or language of the label, then score=3 points. Give the same score for a very close match ("Home" matches with "home page" or "Αρχική" with "Αρχική Σελίδα".) Otherwise score=0 points.
Max score for submetric=9 points.

Overall score for the group of metrics: rescale each of 3 submetrics and take the average.
Total max score=9 points.

5.9.2 Cues to Click

Metric Code: M08_L2
Guideline: Provide Consistent Clickability Cues
Avoid Misleading Cues to Click
Pattern: Obvious Links - Consistent Cues

Metric rationale and background

Consistent cues should be used throughout the web site to indicate that an element is a link and the user can click it. It has become a design standard that blue underlined text is considered a link (Brinck et al., 2002).

Lynch and Horton (2002) point out that if underlined text is included in a web page it will be confused with a hypertext link. Cues like these should be avoided; otherwise users will be lured into worthless clicks (Farkas and Farkas, 2000).

Other cues that may be used to indicate links could be bullets, arrows or other symbols; however, these cues should be used consistently throughout the web site. This rule applies especially to elements that are close together and are formatted in a similar way. As a general rule a designer should keep away from formatting elements in a way that suggests clickability (Koyani et al., 2003).

Metric summary

Metric Code: M08_L2

The metric has 2 submetrics.
M08a_L2 refers to misleading clues in images.
M08b_L2 refers to misleading clues in text.

Submetric M08a_L2

Criteria: Is the navigation instantly perceived as navigation (Images)?

Protocol
Review all pages and check for misleading cues to click on images and texts. Check places where there are groups (2 or more) of images. Determine if all pictures/images are links or none of them is. Consistency is ensured if all the images are links or none is. In the web site there were 3 groups of pictures.

Scores
Page 1: in the right column there is one group of 3 pictures.
Page 2: in the right column there is one group of 2 images and in the centre column another group of 2 images.
Page 3: there are no images to check.
For each group of pictures assign 3 points if all of them or none of them are made links; otherwise score=0 points. Max score=9 points.
Max score for submetric=9 points.

Submetric: M08b_L2

Criteria: Is the navigation instantly perceived as navigation? Underlined text?

Protocol
Check pages for misleading cues within text. Links, usually, should be underlined and in blue. Check every page for underlined text and count the occurrences of underlined text that are not links.

Scores
Determine, for each page, the number of times that an underlined text is not a link (including headings). For each page, if this number=0, then score=3; otherwise score=0.
Max score for submetric=3 pages*3=9 points.

Total max score=average of two submetrics=9.

5.9.3 Clickable images

Metric Code: M09_L8
Guideline: Use Text for Links and Clickable images
Pattern: Clickable Images

Metric rationale and background

Images and graphics used for links should have text associated with them. The text should be close enough to image/graphics and describe or hint at the destination of the link (Farkas and Farkas, 2000). Users do not remember the meaning of icons and the destination associated with them, even of those that are used frequently. The destination of a link is conveyed much better in the form of text than as a clickable image or icon. Text should accompany icons, whether or not the meaning of the icon is obvious, indicating the destination and/or the resulting action of the link (IBM, 1999).

Although images, used as links, make the page visually interesting and attractive, text links are more easily recognised as clickable (Koyani et al., 2003). One more advantage of text links is that they download faster than images, a factor that should be taken into account if download time is affected by the user's connection.

Research shows that the performance of users with readily identifiable links is superior to the performance on pages when they are forced to minesweeping (use the mouse in a sweeping motion looking for links) (Bailey, 2000). Minesweeping is slow and frustrating for users.

Metric summary

Metric Code: M09_L8
Criteria: Do labels accompany each clickable image?
Scores Check if some explanatory text or label has been used to indicate the meaning of the 2 clickable images. Score for each image=2 points; otherwise 0. Max score =2*2=4 points.
Rescale score. **Total max score=9 points.**

5.9.4 To the Top Link

Metric Code: M10_L5
Guideline: Allow Users to Go Back to the Top of the Page
Pattern: To the Top Link

Metric rationale and background

This guideline was derived from a pattern (van Welie, 2001-2007). Koyani et al. (2003) do not include this guideline in their list of guidelines. On long pages users may want to go back to the top of the page. Placing a link at the bottom of the page or at regular

locations within long blocks of text allows users to go to the main navigation or to the top part of the content. Links to the top eliminate scrolling on long pages.

Metric summary

Metric Code: M10_L5
Criteria: Are there links to the top of the page placed at the bottom or at regular locations down the page? Back to top links?
Protocol Review all pages and check if there is link to the bottom of the page on every page. **Scores** If link to the top of the page exists on each page, then score=3 points; otherwise score=0 points.
Total max score=3pages*=9 points.

5.10 Metrics for Text and Typography

There are four patterns in this dimension: Consistency in Text, Visible Text, Emphasised elements and Aligned Text.

5.10.1 Consistency in text

Metric Code: M14_T1
Guideline: Ensure Visual Consistency in Text
Format Common Items Consistently
Use at Least 10-Point Font
Use Familiar Fonts
Pattern: Consistency in Text

Metric rationale and background

Consistency is considered to be one of the fundamental principles in design and implementation of effective interfaces. Consistency is included in Nielsen's "Ten Usability Principles" (Nielsen, 2001), and in Tognazzini's "First Principles of Interaction Design" (Tognazzini, 1992). Instone (1997), interpreting Nielsen's heuristic about consistency in the case of web design, comments that buttons, page titles and headers should be consistent within a web site.

Studies of computer interface consistency (Schneider et al., 1984; Eberts, 1997; Schneider and Shiffrin, 1977) reported that tasks performed using more consistent interface displays resulted in: (1) a reduction of task completion times; (2) a reduction in errors; (3) an increase in user satisfaction; and (4) a reduction in learning time. Visual consistency includes size and spacing of characters, colours employed for fonts, labels and backgrounds and the location of elements such as labels and images.

However, more recent research (Ozok and Salvendy, 2000) indicates that the lack of consistency in websites does not affect human performance or user satisfaction of

experienced users to a great extent. Inconsistency problems increase errors, rather than decrease performance or user satisfaction with the website.

The use of CSS is recommended and provides consistency within a site. However, CSS were not taught to students, in order to be able to identify if usability principles were employed as a consequence of applying patterns/guidelines and not due to the use of CSS that facilitate consistency of appearance.

Common items should be formatted consistently (Smith and Mosier, 1986; Ahlstrom and Longo, 2001) in a format that users are familiar with and help scanning and readability. Such items are phone numbers, time records, etc. Font size is important for readability and fast scanning (Laarni, 2003). Research has shown that sans serif fonts have a small advantage over serif fonts and are more preferred by users (Bernard and Mills, 2000; Schriver, 1997). Nielsen (2000a) recommends using sans serif fonts for smaller text and serif fonts for larger text.

Several writers recommend using a 12-Point font size for body text (Ivory and Hearst, 2001; Lynch and Horton, 2002; Lengel, 2002). Other researchers recommend font size greater than 9 points, specifying 10 to 11 points for body text (Flanders and Willis, 1998; Schriver, 1997).

Research comparing font types and sizes of fonts indicates that serif fonts (Georgia and Times) are considered more attractive, but they are generally less preferred. Overall, Verdana (a sans serif font) appears to be the best font choice, being the most preferred: it can be read fairly quickly and is perceived as being legible by users (Bernard, 2002).

Koyani et al. (2003) recommend a size of at least 12 points. However, with screen resolutions increasing in pixels and screen sizes getting larger, most web pages are shown in a size close to 10 points. For this reason the guideline presented to students insists on using 10 points for body text. Smaller font sizes can be used, depending on the underlying text purpose; however, a size of less than 6 points should be avoided.

The typeface has a major influence on the legibility of a web page. To achieve a good reading speed familiar fonts should be used. The most common serif typefaces are Times and Times New Roman. The most common sans serif typefaces are Arial, Helvetica and Verdana. Sans serif fonts are easier to read on computer screens while serif fonts are easier to read in actual print.

However, research has shown that no reliable difference exists between familiar fonts and a variety of factors may affect the user (Bernard and Mills, 2000; Bernard et al., 2002). Decorative, fancy or stylish fonts which may look attractive and impressive

but are not always available on every browser should be avoided. These fonts may present readability problems as well.

Metric summary

Metric Code: M14_T1

MetricT1_TextCon contains 4 submetrics.
M14a_T1 refers to guideline Ensure Visual Consistency in Text.
M14b_T1 refers to guideline Format Common Items Consistently.
M14c_T1 refers to guideline Use at Least 10-Point Font.
M14d_T1 refers to guideline Use Familiar Fonts.

Metric M14a_T1 for Guideline Ensure Visual Consistency in Text

Criteria: Are typefaces used properly and consistently? Is the site consistent in font?

The metric contains 3 submetrics:
M14a1_T1 refers to the headings, and the subheadings.
M14a2_T1 refers to the font used.
M14a3_T1 refers to the colour used for text.

Submetric M14a1_T1

Protocol
Check for consistency of text among headings and sub-headings. Check the page headings. They should be formatted in a consistent way and with the same font style. Also, check for consistency among the column headings and the sub-headings within the text. Headings in the same page should be consistent, and preferably consistent in different pages as well. However, this depends on the way the 2 pages are presented to the user. In the current design test, check the two headings "Web Creations" and "Περιοδικό Infoistos"; exercise your personal judgement to determine consistency between these two headings.
Score=4 points if there is an exact consistency. Subtract one point for each error in the page headings and the sub-headings, and more points if there are more serious errors. Also check for labels or navigation bars where text is used, e.g. at the bottom of the page Do not take into account the sub-heading in the left column ("Αλλα προϊόντα").
Max score=4 points.

Submetric M14a2_T1

Protocol
Check for text consistency on every page with regards to all text attributes: font, size, bold, italic and underline (except colour and background). This includes spacing of the text. Score=4 points if there is exemplary consistency. Subtract one point for each place where there is inconsistency in the text.
Max score=4 points.

Sub metric M14a3_T1

Protocol
Check for text colour and text background consistency. Score=2 points if there is full consistency. Subtract one point if there is an inconsistency in the colour of text or in the background. Use of peculiar colour, although not a critical usability issue, is still a diversion in the consistent use of colours.
Max score=2 points.

Max score=Sum of submetrics=4+4+2=10 points.

Metric M14b_T1 for guideline Format Common Items Consistently

Protocol
Check for consistency in the format of common items. Specific text was provided, on the third page, to check if designers would format this according to the guideline. The text displays the phone, fax numbers and e-mails of the company's two branches. Check the initial text given in the assignment and determine what the designer added and formatted.
Scores
Score=4 points if all text is consistent, i.e. phone numbers have the city code and the same formats and also that any designer added text and format are the same; score=3 points if there is an error or the designers left something out, e.g. fax numbers do not have the same format; score=2 points if there are more errors; score=1 points if there is only a small indication of change to achieve consistency; finally score=0 points if the designer – although he has probably formatted the text – has not made any effort to format items in a consistent way. The format and the functionality of the two e-mail links should not be taken into account.
Max score=4 points.

Metric M14c_T1 for guideline Use at Least 10-Point Font.

A violation of the guideline would result in 0 points for the particular page; otherwise the score should be 3 points for the page.
Max score=3*3 pages=9 points.

Metric M14d_T1 for guideline Use Familiar Fonts

A violation of a guideline would result in 0 points for the particular page; otherwise the score should be 3 points for the page.
Max score=3*3 pages=9 points.

Rescale each of 4 submetrics and take the average.
Total max score=9 points.

5.10.2 Visible Text

Metric Code: M16_T3
Guideline: Use Black Text on Plain, High-Contrast Backgrounds
Pattern: Visible Text

Metric rationale and background

Many experts on web design recommend using high contrasting background and text colour, preferably light background with dark text (Nielsen, 2000a; Badre, 2002; Lynch and Horton, 2002; Nielsen and Tahir, 2002). Background that obscures text should be avoided.

Scharff and Ahumada (2003) reported that a plain background produces faster search times than a medium textured background. Participants were 26% more accurate in reading text when they read it with dark characters on a light background (Bauer and Cavonius, 1980) while the colour combination that is perceived to be the most readable is text on white background (Scharff et al., 1996, 1999).

If a sufficient contrast between the text and the background exists many colour combinations are possible, although dark characters on a light background are superior to light characters on a dark background (Ivory and Hearst, 2001, Sklar, 2003; Shneiderman, 1998).

Metric summary

Metric Code: M16_T3
Criteria: Is the text visible against the background colour? Is the font colour appropriate and is there sufficient contrast?
Protocol Check that the designer dealt with the usability issues intentionally embedded on the web site. **Scores** Page 1: the text in the right column should be more visible. Give 4 points if there was change to a visible combination; otherwise score=0 points). Page 2: the text in the left column should be more visible (i.e. white or black depending on the background colour). Give 5 points if there was a change; otherwise score=0 points. Check the rest of the pages and subtract 2 points from every column or place (table, frame, navigation bar, etc) where there is a violation of the principle. Apply this rule to places where there are links that are not clearly visible, usually links in blue colour against a dark blue colour.
Total max score=9 points.

5.10.3 Emphasised Text

Metric Code: M15_E1
Guideline: Emphasise Importance in Text
Pattern: Emphasised Text

Metric rationale and background

Important words or small sentences within a block of text should be emphasised to attract the readers' attention.

Nielsen (1997) remarks that highlighted words using typeface variation and colour should be employed to help visitors scan pages. Brinck et al. (2002) point out that by highlighting text in useful ways the important information should be made obvious and should require no effort to read. However, excessive use of highlighting, e.g. too much use of bold can render text less legible than normal text

Glynn et al. (1985) comment that type face, weight or font size, italics and underlining become part of the meaning of the text, and become cues for attracting the reader's attention. Overuse of emphasis leads to a situation where everything is highlighted and nothing is emphasised. Lynch and Horton (2002) suggest using a single font family and varying its weight and size for emphasis. If colour is used for text, bold formatting should be used as well since coloured text is a potential usability flaw for anything that is not a link. Underlining text should be reserved for links and not headers or as a means of giving emphasis to text on websites (Nielsen, 2004).

Metric summary

Metric Code: M15_E1

Criteria: Emphasise elements to attract attention.

Protocol
Review all pages and check the existence of elements that are properly emphasised.
Check every page for properly emphasised headings. Main headings should be provided by the designers.
Scores
Page 1: Determine points based on the work that the designer has made on the page. If the intentionally underlined text and the bold words have been eliminated, then score=1 point; if additionally some key words, such as company name, have been emphasised, score=2 points; if additionally to the above some key sentences have been emphasised, score =3 points; otherwise, when everything was left unchanged as it was to begin with, score=0 points. Max score=3 points.
Page 2: Check the central and the right column. Ideally, on the central column the dates in each paragraph should be emphasised. Max score for this column=2 points. The right column also scores 2 points for properly emphasised text, one point in the "Magazine" section and one in the "Latest News" section. Consult the suggestions about what is considered as proper emphasis. In the right column on the top half section some key sentences (such as "Περιοδικά No 1, etc.) and also on the bottom half section (such as dates, etc.) could be considered for putting emphasis. However, take into account that there are several links in this column and the format that the designer decides on may be affected by the links. Also consider that there is no unique way of putting emphasis on these sections; this depends on the view of a designer and the place he selects to put emphasis. Max score for this page =2+2=4 points.
Page 3: Check that some words (e.g. telephones, addresses, etc.) are properly emphasised. Page scores 2 points if emphasis is placed on the right places; scores 1 point if only some items are emphasised; otherwise page scores 0 points. Max score=2 points

Total max score=page1+page2+page3=3+4+2=9 points.

5.10.4 Aligned Text

Metric Code: M17_T4
Guideline: Use Proper Alignment for Text
Pattern: Aligned Text

Metric rationale and background

This guideline (and the corresponding pattern) was not included in the Koyani guidelines. The decision to include this guideline was made in order to offer students guidance about aligning text since they frequently aligned text inconsistently and wrongly.

A text block can be aligned left, centred, right and fully justified. Full justification, where the text editor automatically adjusts the space between words, should used carefully as it may result in poor spacing between words (Lynch and Horton, 2002). Poor spacing or inconsistent spacing between words decreases reading speed by as much as 11% (Trollip and Sales, 1986).

Centred aligning text makes it more difficult to read and decreases reading times dramatically. The best and easiest layout is the default left aligned, which requires no attention to alignment (Flanders and Willis, 1998).

Users must search for the beginning of each line in right and centred alignment (Lynch and Horton, 2002) and should be avoided. Centred alignment may be used in narrow columns or narrow frames where problems with readability are minimal. Right alignment should be used only in special cases (decorative text, etc.). Titles and headings should also be flush left or centred aligned.

Metric summary

Metric Code M17_T4
Criteria: Is text properly aligned? Is the use of centre or right-aligned text avoided?
Protocol Check all pages and determine the score for each page. **Scores** Each page gets 3 points it there is no violation of the principle, 2 if there is a minor alignment problem, 1 if there more problems or the problem is visible, and 0 if there is a severe alignment problem in the page. For each page max score=3 points.
Total max score=3 pages *3=9 points.

5.11 Metrics for Lists

There is one pattern in this dimension.

5.11.1 Lists

Metric Code: M11_T6
Guideline: Display Related Items in Lists
Introduce Each List
Format Lists to Ease Scanning
Capitalise First Letter of First Word in Lists
Pattern: Lists

Metric rationale and background

Lists, either bulleted of numbered, are valued by readers because they: (1) draw the reader's attention; (2) are fast to skim; (3) provide information rapidly; and (4) enumerate the most important information (van Duyne et al., 2002). Lists delineate blocks of texts. Scanning a horizontal list of items is slower than scanning vertical lists (Nygren and Allard, 1996). Most users prefer to scan text on web pages instead of reading it and bulleted lists enhance scanning (Morkes and Nielsen, 1997). Spyridakis (2000) suggests that organisational cues, among other topic sentences and lists, make text visually accessible and easily skimmed.

Small introductory headings at the top of each list categorise and annotate the items of the list and allow users to choose the list of interest to them. Headings also show how lists relate to each other (Levine, 1996).

Labels, different background colours, borders and use of white space help users identify and separate one list from another. Chaparro and Bernard (2001) point out that, although there are no significant differences in the time taken to identify information within lists, medium levels of white space produce higher levels of satisfaction and overall are preferred by visitors.

Bullets can strengthen page layout and can add information to a list or clarify its contents (Levine, 1996).

Finally, in order to facilitate readability, only the first letter of list items or field labels should begin with an upper-case letter while the rest should be in lower case unless the item contains logos or acronyms that are normally capitalised (Jarrett, 2005).

Metric summary

Metric Code Lists
Criteria: Is the site easy to read? Lists with bullets? Are bulleted lists used so that the content can be easily scanned?
Scores There are two places in the web site where a list should be used. Each of the 2 required lists, on the home page, is given 50% of the maximum score. Max score=9 points. Determine the number of times that the designer applied bullets incorrectly or made a list. For each place where the student wrongly applied lists, subtract 3 points.
Total max score=9 points.

5.12 Summary

This chapter described the improvements to the design of the experiment and the metrics used for the main study. The improvements were related to the level of participants, the teaching and the tutorials, the sets of patterns/guidelines employed, and the design test. The set of metrics were presented followed by a metric summary of the scoring procedure for each metric.

Each metric measures the application of a pattern and the corresponding guideline/guidelines. There were 19 metrics altogether, although in the case of some metrics and in the metrics related to compound patterns a metric was broken down into several submetrics. Each metric contributed equally to the score of students on a 0–9 scale.

A detailed presentation of the main study with all the qualitative and quantitative analyses involved is given in the next chapter.

Chapter 6

Main Study

6.1 Introduction

In this chapter, a thorough description of the procedures for the main study is provided and the analysis of the data obtained from the experiment is presented.

In Section 6.2, the experiment is detailed in terms of the setting, the selection of participants, the design of the experiment, the tests carried out, and the processes for collection of the data. The techniques and rationale for sampling were improved due to the number of students available to choose from. The size of the two groups was larger, thus allowing employment of parametric tests. The allocation of participants to the experimental groups involved a stratified sampling, followed by several statistical tests to verify that the groups were equivalent.

After Section 6.2, the following four sections of the chapter report on the analysis of collected data. Firstly, in Section 6.3 statistical tests are presented, comparing the performance of the participants in designing a web site. In Section 6.4 details are given about the evaluation task and the results. In Section 6.5 a description is provided of the analysis of the data collected from questionnaires to explore the opinion of students and the perceived attributes and advantages of patterns and guidelines. In Section 6.6 an examination is provided of the data collected from interviews, with emphasis on the attitude and preference of participants towards both formats. The data were analysed using qualitative and quantitative techniques. A summary is provided at the end of the chapter.

6.2 Setting and participants

The study participants were undergraduate students from their fourth (final) year in the Faculty of Technology Applications, Automation Engineering Department, TEI of Piraeus in Greece. Participants were quite skilful in the use of computers and familiar with internet-related activities. Throughout the previous semesters students had taken several programming courses, and had had many hours of computer practice during the course tutorials.

For the purposes of the experiment, a course was scheduled for the first half of the Spring semester 2006. The course took the form of a seminar of 25 plus hours' duration about web design, including use of FrontPage, usability design principles and evaluation techniques. The course was set apart from any regular formal academic course that the students were taking and had no implication or affect on any other course.

6.2.1 Initial group of participants

The seminar was advertised on the school's notice board, while academic staff informed their classes about it during lectures and tutorials. An introductory talk was given to all interested students. Details about the seminar and the requirements for a successful completion of the seminar, resulting in a certificate, were presented. More than 65 students enrolled in the seminar.

Tutorials were given in sessions of two hours twice a week. Students were promised a certificate of participation, with or without distinction, depending on their performance, and prizes for the best. A questionnaire was completed by all prospective study participants, which collected biographical information and information about their computer literacy and level of experience using the internet and their design experience. See Appendix 6.1 for the questionnaire.

6.2.2 Final group of participants

One contributing factor to the diversity of scores between the students of the first study was the level of interest and the level of design readiness they had reached. Fortunately, both factors could be affected. The initial pool of students was 65. It was decided to reduce the number of participants to the maximum number of students that the resources of the Automation Engineering Department allowed by using a purposive sampling technique (Cohen et al., 2000; Robson, 2002) to choose the best performing and most promising students.

During the third week, a one-hour test was administered to the students. Based on that test, a selection of the best 45 students was made. The aim of this test was to choose participants who had a sufficient level of techniques and knowledge since those students would be in a better position to reach a certain level of expertise where they could produce a web site of reasonable quality. The criteria used for this selection were focussed on two issues: dexterity in the use of FrontPage and quality of the design artefact. Dexterity was judged during the test by the researcher and another academic supervising the test by asking questions about the use of tools while at the same time observing the designing progress of students.

The test also allowed the selection of those students who had already made significant progress and were the most interested, efficient, skilful and cooperative. All participants selected had access to a computer and internet from home, and presumably they would be able to attend all classes until the completion of the seminar; otherwise they would be dropped from the course. Students were allowed to miss only one class, but not the patterns/guidelines tutorial.

These requirements and conditions were necessary in order to form a homogeneous group that could cope with the demands of the seminar and participants that were fit for the experimental tests.

6.2.3 Teaching web design

Three classes, with 15 students in each class, were formed and tutorial sessions about web design techniques of two hours' duration twice in a week resumed. Compared to the first study, it was possible to allow a greater number of students to participate in the experiment. This was intended to have a beneficial effect on the statistical analysis of the experiment, resulting in more accurate and unbiased statistical results.

Throughout the duration of the course several small assignments aided students to practise the techniques presented by the tutor. Observing students during these tests helped in understanding their weaknesses and monitoring their progress. Revisions were made to ensure familiarity and full knowledge of certain design techniques. Every student was assigned to one computer, working on their own. Monitors were all 17-inch TFT, set at a resolution of 1280x1024. It was made certain that all students received enough training through practice by completing, to a great extent, all assignments during the tutorials.

Table 6.1 below presents the details of the course, the procedures/activities involved, the duration of each activity and its purpose/content, the number of

participants in each stage, and the number of staff acting as educators, supporting staff or facilitators during the tutorials and tests.

Table 6.1: Timetable of the experiment

Procedure/Activity	Duration	Purpose or Content	Participants/ Staff No.
Tutorials	6 hours (2-hour sessions)	FrontPage	65 / 2
Selection	1 hour	Test using FrontPage	65 / 2
Tutorials	14 hours (2-hour sessions twice weekly over 3.5 weeks)	FrontPage	45 / 2
Tutorials	1 hour	Usability principles	39 / 2
Preliminary test	Forming two balanced groups		
Tutorials	3 hours	Guidelines/patterns	39 / 2
Testing	2 hours	Design test	39 / 3
Testing	1 hour	Evaluation test	39 / 2
Questionnaire	15 min.	Collection of data	39 / 2
Interview/Questionnaire	20-40 min.	Collection of data	34 / 1

The course made heavy demands on resources and staff. One laboratory was required, with 16 computers in a network booked for 12 hours per week. In total, teaching web design to the three groups required around 60 hours and a further six hours of testing to select the final group of 45 participants. Additionally, nine hours were needed for teaching usability principles (three hours for usability principles and six hours for patterns/guidelines). Finally, nine hours were required to complete testing students, not including interviews. Two members of staff were required: one for teaching and one for technical support. Teaching usability principles with patterns and guidelines required two persons. The current author delivered all the teaching apart from the patterns/guidelines tutorials. During the testing procedures three persons were involved.

6.2.4 Preliminary assignment test

All students were doing web design for the first time. In order to avoid bias or confounding the results of the experiment, participants had been selected on the basis that they had no professional or even extensive experience in web design.

However, during the tutorials it was discovered that four of the students had been engaged in web design activities and had published web pages on the internet. After a short interview with each student, it was concluded that that these students were already following common usability principles and practices and were applying unintentionally some of the patterns/guidelines intending for the course. One of the students, for example, mentioned in the interview where he presented his small portfolio that the

greatest advantage of his pages was the small size (in Kb) of his graphics, which he had achieved by using image processing techniques, resulting in minimal download time. Overall, these four students' design attitudes and habits were beyond the beginner-novice level. It was decided not to allow these students to participate in any of the tests. Their current experience with design would be a big advantage to them and their presumably good performance would skew the final results. These students, at their request, were allowed to follow the course, as simple observers, since they wanted to receive the seminar certificate. This incident highlights the significance of the decision to experiment with beginners in web design in order to eliminate prior knowledge and experience; even designers without extensive practice can acquire routines and habits that may strongly affect their design decisions.

None of the other study participants had designed and presented any web page in a professional way or received lessons and tutorials about web design, although some may have experimented with simple authoring tools or automated design of web pages.

Once tutorials finished, the students were given by e-mail their final preliminary assignment. The assignment was a refined version of the preliminary assignment given out in the first study. See Appendix 6.2 for screenshots of the pages of the web site as they were when given to the students for development.

For simplicity's sake and to allow students to focus on other design issues, the site level was only one level deep, requiring one main navigation menu. The site was a seven-page web site of a company. Pages of the site were mostly presenting information about the company. The site is considered to comprise static web pages with navigation, internal and external links (but with no interaction with the user, or connection to databases). Each page of the web site was based on a fixed-width template. Instructions were included with the assignment (see Appendix 6.3). Students delivered the assignment in electronic form. See Appendix 6.4 for an example of the web site created by one of the study participants.

This assignment was used as a criterion to split the students into two balanced groups with regards to their design ability and skills.

6.2.5 Sample description

The total number of students that participated in the design test was 39. There were 20 students in the guidelines group and 19 in the patterns group. Table 6.2 shows the allocation of the students into groups and the number and percentages of male and female students in each group.

Table 6.2: Number of male and female students in each group

	Total		Guidelines Group		Patterns Group	
	No.	% within group	No.	% within group	No.	% within group
Male	30	76.9	15	75.0	15	78.9
Female	9	23.1	5	25.0	4	21.1
Total	39	100.0	20	100.0	19	100.0

The average age of the participants was 23.31 years (range 20–26). The average age for the guidelines group was 23.25 (range 20–26) and for the patterns group 23.37 (range 20–26) years.

Based on their performance in the preliminary assignment, the students were assigned to four groups, from adequate to excellent. In subsequent stratified sampling students were divided into two balanced groups. In this way the two groups were equivalent to the other with regards to their ability and knowledge about web design. In the final experiment one group was to be exposed to patterns and one to guidelines.

6.2.6 Further tests to ensure balanced groups

A number of tests were run to ensure that there were no differences between the groups, that is, that they were quasi-equivalent. These tests are considered tests of homogeneity since they were testing whether the groups are the same (Mendenhall et al., 2005). For this purpose, several types of background information and data were used, collected either through the questionnaires (see Appendix 6.1) or through the performance of the student in courses related to web design.

6.2.6.1 Background variables

The last sections of the questionnaire, used to collect biographical data (see Appendix 6.1), contained questions about the experience of participants with computers and computer-related activities. More specifically, these questions examined their general familiarity with computers, their experience and everyday use of internet, e-mail and surfing on the internet. Students responded to these questions using a five-point Likert-type scale.

6.2.6.2 Statistical analysis of students' characteristics

The number of students giving each of the five possible Likert-type answers can be calculated by simple addition. These numbers form a 2x5 contingency table. A chi-square test (χ^2 test) can be used for such a table to determine if the populations in the groups are significantly different. A chi-square test is a non-parametric test used to

determine if categorical variables, with two or more categories each, are related (Pallant, 2001). An assumption for this test is that the lowest expected frequency in any cell should not be less than five. Some authors suggest a less stringent criterion, that at least 80% of the cells should not have expected frequencies of less than five (Pallant, 2001) and that every expected value in a cell should be greater than one (Howell, 2001). Another concern about the chi-square statistic is that a sufficiently large sample size is assumed; however, there is no universally accepted cut-off, with some setting the minimum sample size at 50, while others would allow as few as 20.

If due to a low number of participants choosing a specific answer this requirement could not be met, two or more categories of the responses may be combined into a single category. An alternative to a chi-square test is Fisher's exact test, which does not require large sample sizes (Howell, 2001). Fisher's exact test is applied in cases where the table is 2x2. For larger than 2x2 tables, a generalisation of Fisher's exact test, the Fisher-Freeman-Halton test is applied (Agresti, 1990; Mehta and Patel, 1999).

An approach that involves a number of comparisons requires some caution to control for an increased risk of Type I error. This type of error rejects the null hypothesis that the two groups are similar or homogeneous. In a situation where many comparisons are made, the probability of encountering at least one case when the test indicates a significant difference is increased. A Bonferroni adjustment (Howell, 2001; Pallant, 2001) is applied to the level of significance in each comparison to control for the problem of making multiple comparisons. The adjustment is to divide the alpha level of significance, which is usually set to 0.05, by the number of comparisons that are made. Therefore, if the number of comparisons is 10, the alpha level for each test is set to 0.005; the reduced level of significance reduces the probability of accepting significance by chance and controls for the Type I error.

6.2.6.3 General computer literacy

The computer literacy is a variable of interest in this kind of study since the experiment involves extensive use of computers. Students were asked to report their own computer literacy. All students reported a level of at least three using a five-point Likert-type scale. The following coding scheme was applied: 1="Beginner", 2="Basic", 3="Intermediate", 4="Advanced", 5="Expert".

If one group is more literate than the other, this could affect the performance of the students while working with computers. Table 6.3 shows the responses of students indicating their computer literacy.

Table 6.3: Self reported computer literacy by group

			Group		Total
			Guidelines	Patterns	
Level of computer experience	3.00	N (within group level %)	4 (20.0)	3 (15.8)	7 (17.9)
	4.00	N (within group level %)	9 (45.0)	10 (52.6)	19 (48.7)
	5.00	N (within group level %)	7 (35.0)	6 (31.6)	13 (33.3)
Total		N (within group level %)	20 (100.0)	19 (100.0)	39 (100.0)

There was no significant difference in reported computer literacy between the two groups (P=1.000, Fisher-Freeman-Halton exact test, details in Appendix 6.5, Table 6.5.1). It should be noted that the P value indicates that the two groups are almost identical with regards to their computer literacy.

6.2.6.4 Internet experience

The study involved design and evaluation of web pages, therefore, the participants' level of experience with the internet including using the internet to communicate by e-mail was of interest.

Students reported their experience on a five-point Likert-type scale and were coded as follows: 1="Very little", 2="Some experience", 3="Average", 4="Good", 5="Very Good". Table 6.4 shows the responses of students indicating their level of experience using the internet.

Table 6.4: Internet experience

			Group		Total
			Guidelines	Patterns	
Internet experience	3.00	N (within group level %)	3 (15.0)	3 (15.8)	6 (15.4)
	4.00	N (within group level %)	9 (45.0)	7 (36.8)	16 (41.0)
	5.00	N (within group level %)	8 (40.0)	9 (47.4)	17 (43.6)
Total		N (within group level %)	20 (100.0)	19 (100.0)	39 (100.0)

The two groups show no significant difference on this aspect (P=0.909, Fisher-Freeman-Halton exact test, details in Appendix 6.5, Table 6.5.2). It should be noted that the value P was not corrected for multiple testing by the step-down Bonferroni procedure.

Three more factors were considered as having a relation to the participants' behaviour, potentially causing a difference in the performance of a participant during the tasks. All three factors are internet-related: (1) the time they have been using the internet; (2) the number of days per week that they use the internet; and (3) how much time they spend every day using the internet and browsing the web.

These factors were assessed again, using the questionnaire, by asking students to indicate their level in response to the following questions on a five-point Likert-type scale:

- Question 1: How long have you been using the Internet?
- Question 2: On average, how often do you access the Internet?
- Question 3: On average, how much time do you spend in a day using the Internet?

Table 6.5 shows the results of asking students how long they have been using the internet. The level of years using internet was measured on a five-point Likert-type scale and were coded as follows: 1="Just recently", 2="Less than 6 months", 3="6 months –1 year", 4="1–2 years", 5="More than 2 years".

Table 6.5: Length of time using the internet

			Group		Total
			Guidelines	Patterns	
Level of years using internet	4.00	N (within group level %)	12 (60.0)	11 (57.9)	23 (59.0)
	5.00	N (within group level %)	8 (40.0)	8 (42.1)	16 (41.0)
Total		N (within group level %)	20 (100.0)	19 (100.0)	39 (100.0)

There was no significant difference in the length of time using the internet between the two groups (P=1.0, Fisher-Freeman-Halton exact test, details in Appendix 6.5, Table 6.5.3). The two groups appear to be equivalent, even without using the Bonferroni adjustment, with regards the length of time the groups have been using the internet.

The following Table 6.6 summarises the answers about weekly access to the internet. The answers were measured on a five-point Likert-type scale. The following coding scheme was applied: 5="Every day", 4="Most days", 3="2-3 days a week", 2="Once a week", 1="Less than once a week". The frequency of participants accessing the internet within a week ranges from every week to every day, with no one indicating accessing the internet less than once a week.

Table 6.6: Weekly access to the internet

			Group		Total
			Guidelines	Patterns	
Level of weekly use of internet	2.00	N (within group level %)	2 (10.0)	1 (5.3)	3 (7.7)
	3.00	N (within group level %)	2 (10.0)	1 (5.3)	3 (7.7)
	4.00	N (within group level %)	3 (15.0)	3 (15.8)	6 (15.4)
	5.00	N (within group level %)	13 (65.0)	14 (73.7)	27 (69.2)
Total		N (within group level %)	20 (100.0)	19 (100.0)	39 (100.0)

The two groups were compared using the Fisher-Freeman-Halton exact test (P=1.0, details in Appendix 6.5, Table 6.5.4) There was no statistical difference between the two groups; in fact, the test indicates that the two groups were almost identical in this respect.

Daily access to the internet varied from less than an hour to more than five hours. Table 6.7 shows the daily access of the students to the internet. The answers were measured on a five-point Likert-type scale. The following coding scheme was applied: 1="Less than 1 hour", 2="2 hours", 3="3 hours", 4="4 hours", 5="5+ hours".

Table 6.7: Daily access to the internet

			Group		Total
			Guidelines	Patterns	
Level	1.00	N (within group level %)	1 (5.0)	0 (0.0)	1 (2.6)
	2.00	N (within group level %)	9 (45.0)	7 (36.8)	16 (41.0)
	3.00	N (within group level %)	6 (30.0)	7 (36.8)	13 (33.3)
	4.00	N (within group level %)	3 (15.0)	3 (15.8)	6 (15.4)
	5.00	N (within group level %)	1 (5.0)	2 (10.5)	3 (7.7)
Total		N (within group level %)	20 (100.0)	19 (100.0)	39 (100.0)

Statistical analysis indicates that there is no significant difference between the two groups in the time spent daily on the internet groups (P=0.942, Fisher-Freeman-Halton exact test, details in Appendix 6.5, Table 6.5.5). There is no need to use the Bonferroni adjustment.

6.2.6.5 Design experience

One of the requirements of the experiment was that study participants had no experience in web design. Experience was considered a confounding variable that could not be accounted for. Students indicated their design experience on a five-point Likert-type scale (see Appendix 6.1). The following coding scheme was applied: 0="Never", 1="Tried once or twice", 2="Average", 3="Good experience", 4="Expert".

Four students reported an "Average" experience. These students were excluded from the tests as mentioned in section 6.2. Table 6.8 shows the student's web design experience.

Table 6.8: Web design experience

			Group		Total
			Guidelines	Patterns	
Level of design experience	0.00	N (within group level %)	15 (75.0)	15 (78.9)	30 (76.9)
	1.00	N (within group level %)	5 (25.0)	4 (21.1)	9 (23.1)
Total		N (within group level %)	20 (100.0)	19 (100.0)	39 (100.0)

Statistical analysis indicates that the two groups could be considered almost identical with regards to their web design experience (P=1.0, Fisher-Freeman-Halton exact test, details in Appendix 6.5, Table 6.5.6).

6.2.6.6 Grade average

A student's grades are a measure of his or her past academic achievement, ability, strength in learning, and commitment to academic excellence. Past academic success and performance is being used as a benchmark to allow entry or select candidates to a university and has been shown to predict future performance (Blackman and Darmawan, 2004). The previous statistical analyses were based on questionnaires. Students were self-reporting, using their personal estimation of their experience, knowledge, etc. A grade provides a more subjective criterion of a student's overall performance in an academic program.

Students' grades in web design-related courses or modules in previous semesters were taken into account. Such modules, after examining the full range of courses in the syllabus, were considered to be: Programming I Theory, Programming I Laboratory, Programming II Theory, Programming II Laboratory, Programming III Theory, Programming III Laboratory, Telematics Theory, Telematics Laboratory. Grades were collected from official university transcripts.

Two average grades were calculated and used to check if there were any differences between the groups. One average, named total average grade, was calculated using the grades of all courses in theory and laboratories, and another one, named laboratory average grade, was calculated by using the grades for laboratories only. The distributions of the grade averages were assessed for normality using the Shapiro-Wild test, which is recommended for small sample sizes, for example, less than 50 participants (Marques de Sa, 2003; Sen and Srivastava, 1990). In both cases the statistical test suggested a violation of the assumption of normality. In view of this the Mann-Whitney non-parametric test was used to compare the two groups.

The Mann-Whitney test found no significant differences between the two groups. For total average grade P=0.910 (asymp. sig. 2-tailed), and for laboratory average grade P=0.663 (asymp. sig. 2-tailed). Detailed statistical tests are included in Appendix 6.5, Table 6.5.7.

To summarise, after examining the participants using self-reporting assessments and academic grades, the two groups can be considered equivalent for the subsequent experiment and analysis.

6.2.7 Teaching patterns and guidelines

A set of 35 guidelines and an equivalent set of 25 patterns were presented in the tutorials. Both groups of students were given a booklet of 31 pages of either patterns or guidelines to use during the lecture and to study afterwards. The time needed to cover the set of guidelines and the equivalent set of patterns was three hours. The guideline/patterns tutorial was given by an independent lecturer while the researcher was acting as an observer. The duties of the observer were to make sure the lecturer did not favour patterns or guidelines in his presentation and to make sure that every pre-planned aspect of the teaching process was covered.

Patterns and guidelines presented to the students belong to the following seven categories: Home Page, Page Layout and Design, Navigation; Headings Titles and Labels, Links, Text and Typography, and Lists.

In order to elicit at least a minimum degree of study and comprehension, students were asked to complete a two-page form. The form was given at the end of the patterns/guidelines tutorials, and contained a full list of the pattern names or guidelines titles presented in the class, depending on the allocated group (see Appendix 6.6). Students were asked to study patterns/guidelines and then describe, in their own words, the most essential and critical idea incorporated in each pattern/guideline. Each student was obliged to deliver the form either electronically or by hand before the beginning of the testing sessions.

6.2.8 Post treatment design test

The instruction given to the students was to design to the best of their ability. The top-rated students would get bonuses, i.e. vouchers for books and computer peripherals.

Out of the 45 students initially taking part in the experiment four were considered to be experienced (as explained above) and did not participate in the tests at all. Two of the students could not participate at the time specified for the test and were eliminated from the following tests as well. The design session lasted two hours. During the test one more lecturer was present to help with questions and problems that students faced during the task, taking notes while observing students and helping with the smooth running of the experiment.

To limit the possibilities of one student affecting or influencing another, computers and positions of the students were pre-arranged so that a student could only view his own screen. In this way, students were designing using their own ideas and inspiration. Students were advised, if they had any questions, to ask the supervisors

privately without creating any disturbance for the other students. If the question concerned all the students, then the supervisor would address the whole class himself.

The test asked students to design a small, one-level deep web site about a small company hosting and creating web sites for its customers. The site contained five pages and students were required to work and design only three pages of the site; the other two pages were included in order to make the site conceptually complete and to oblige students to provide a more realistic navigation within the site. A separate instructions sheet was provided (see Appendix 6.7).

Each student had to work on a prefabricated site where each page was based on a three-column fixed-width page layout, and the text and images were already on the right page. The inclusion of specific content together with the instructions given to the students invoked the use of patterns/guidelines presented during the tutorials, and allowed an estimation of the impact the patterns/guidelines had on their design products.

Students had to format text and pictures, specify the layout, identify and indicate links, provide a navigation scheme using interactive buttons, and in general design according to the instructions and the requirements given. In brief, students were asked to design as best they could in order to create the best possible presentation of the company on the internet, taking into account the type of company and its business, using the usability principles they had learned during the tutorials.

Students were advised not to use any material apart from that already provided on the site, unless they felt compelled to do so. Each student had access to a small directory containing certain small images, arrows, bullets, small gif files, etc. See Appendix 6.8 for screenshots of the pages of the site, as they were given to the students.

Students were free to use their booklet of patterns and guidelines during the tasks. Also, they were allowed to ask any question about the use of tools or how to do certain things in case of difficulties or couldn't remember the right procedure. That allowed students not to be affected by lack of technical knowledge and to design what they envisioned and imagined, especially in cases where they could not remember certain techniques. Appendix 6.9 shows an example of a designed site by a study participant.

6.3 Results of the design task

Three independent evaluators rated the students' design task according to a predefined set of metrics as described in Chapter 5. Two of the evaluators had also performed the scoring in the first study.

6.3.1 Scoring procedure

Each evaluator spent on average of 65 minutes to make an evaluation of each site, based on the set of metrics; however, the actual time to administer the whole evaluation process was much longer. Sometimes the evaluator worked better if he judged all the sites together, working just on one metric only and comparing a specific page with the same page of all the students.

The work of the evaluators and the scoring was easier than in the first study. This is so for the following reasons:

- Overall, the designs of the students were of better quality and with few errors.
- The structure of the site to be designed was more appropriate to what students had to do; there were no ambiguities and it was easier to assess the particular metric on each page.
- The metrics were improved and provided better instructions for the scoring.
- Two of the evaluators had already participated in the first study.

The default web page browser on the students' PC was MS Internet Explorer v.6.0.2 (Microsoft Corporation, 2004). Following a similar procedure as in the first study, an Internet Explorer engine-based type browser, Slim Browser V4.06 (FlashPeak, n.d.) with multi-tab functionality was used by the evaluators. Sometimes a single pass through all sites was sufficient to judge and score a page.

After the collection of the scores a review of the scores was carried out by all team members, and some errors found in the scores were corrected. See Appendix 6.10 for the scores given by each evaluator and the average scores for each metric used for the comparison of the two groups.

6.3.2 Analysis of the design scores

Using the quantitative measures of the three evaluators, the performance of the two groups was statistically analysed. Twenty students from the patterns group and nineteen from the guidelines group completed their design task. Students were assessed using 19 different metrics, measuring 7 different categories of good design practice: Home Page, Page Layout and Design, Navigation; Headings Titles and Labels, Links, Text and Typography, and Lists.

Table 6.9: Average percentage scores of students

	Home Page	Page Layout & Design	Navigation	Headings, Titles & Labels	Links	Text & Typography	Lists
Guidelines (%)	59.8	81.2	67.9	65.1	50.1	85.5	49.4
Patterns (%)	66.4	85.0	81.5	79.1	63.4	86.4	39.8
Difference	6.6	3.8	13.6	14.0	13.4	0.9	-9.7

Table 6.9 shows the differences between the calculated average scores of the students, measured for the two groups, for each of the seven measured categories. The average scores are given as a percentage, where 100 denotes the maximum that could be achieved for the category. Evidently, students in the patterns group performed better overall. Their scores were higher in six out of the seven categories, whereas in the Links category the guidelines group scored better. However, any differences were not statistically significant.

The main purpose of the experiment was to assess the effectiveness or impact of patterns and guidelines on the design habits of novice designers. To address this question the scores from the two groups are compared. The score for each participant is calculated by adding the points for each particular metric. The maximum score for a participant, using all metrics, is 171 points (9 points for each of the 19 metrics).

Scores reflect the application of the usability principles conveyed, using the two formats or treatments, i.e. either patterns or guidelines. The dependent variable is the students' scores.

The null hypothesis is as follows:

H0: There is no difference between the performances of the students in the patterns group versus those in the guidelines group.

The alternative hypothesis is as follows:

H1: There is a difference between the performances of the students taught usability principles using patterns versus those students taught using guidelines.

To statistically compare the performance, the distribution of the scores was first assessed for normality, using the Shapiro-Wild test, which is recommended for small sample sizes (Marques de Sa, 2003; Sen and Srivastava, 1990). The statistical test indicated no violation of the assumption of normality (see Appendix 6.11, Table 6.11.1); however, due to the small sample sizes involved, the statistical comparison used both an independent samples T-test as well as the non-parametric Mann-Whitney

test. Parametric and their equivalent non-parametric tests were used, whenever applicable, to give a balanced view of the results. Table 6.10 shows the statistics and details of the analysis of the T-test (2-tailed). Using both parametric and the equivalent non-parametric test give

Table 6.10: T-Test analysis using all metrics

Group Statistics					
	Group	N	Mean	Std. Deviation	Std. Error Mean
Overall	Guidelines	20	116.023	13.662	3.055
	Patterns	19	128.688	20.105	4.612

Independent Samples Test							
		Levene's Test for Equ. of var.		T-test for Equality of Means			
		F	Sig.	t	df	Sig.(2-tailed)	Mean Dif.
Overall	Equ. var. assumed	3.623	.065	-2.312	37	.0265	-12.666
	Equ. var. not assumed			-2.289	31.514	.0289	-12.666

According to the test, the patterns group (M=128.688, SD=20.105) performed better than the guidelines group (M=116.023, SD=13.662). Since the computed P =0.0265 (equal variances assumed) is less than 0.05, the null hypothesis is rejected in favour of the alternative, i.e., that there is a statistically significant difference between the two groups in applying the advice, knowledge and experience conveyed by patterns and guidelines.

The average scores of the three judges (average score for each particular metric) were used for this analysis and all the following comparisons as well. Actually, there were few differences in the scores of the evaluators, and a T-test performed for each individual judge produced similar results, i.e., the null hypothesis is rejected.

A similar analysis using the Mann-Whitney non-parametric test (Table 6.11) produces P=0.0284, which is less than the level 0.05, indicating that there is a significant difference between the performance of the two groups, with the patterns group performing better than the guidelines group.

Table 6.11: Mann-Whitney test using all metrics

Ranks				
	Group	N	Mean Rank	Sum of Ranks
Overall	Guidelines	20	16.10	322.00
	Patterns	19	24.11	458.00
	Total	39		
Test Statistics				
Mann-Whitney U				112.000
Wilcoxon W				322.000
Z				-2.192
Asymp. Sig. (2-tailed)				.0284

6.3.3 Subjective and objective metrics

The metrics used by the evaluators can be classified as objective or subjective. Objective metrics, for example, are those measuring the application of guidelines such as "Provide Descriptive Page Titles", "Allow Users to Go Back to the Top of the Page", "Repeat Navigation at the Bottom of the Page", etc. For the objective metrics all evaluators should be able to give the same scores.

Subjective metrics are those that produce a score depending, to a certain extent, on the judgment of each evaluator. Subjective metrics provide a measure of the application for guidelines such as "Use Moderate White Space", "Provide Feedback on Users' Location", "Emphasise Importance", etc.

The following Table 6.12 shows the metrics (objective and subjective), their correspondence to simple and compound patterns, and the total and average for both groups. A description on each of these metrics is given in Chapter 5. The last column indicates which of the two groups performed better by comparing the average of the groups.

Table 6.12: Metrics in categories and group performance

	Metric code	Subjective/ Objective	Simple/ Compound	Guidelines Group		Patterns Group		Better Performance
				Total	Average	Total	Average	
1	M01_C1	Subjective	Simple	154.766	7.738	154.237	8.118	Patterns
2	M02_N3	Subjective	Simple	122.667	6.133	145.999	7.684	Patterns
3	M03_N6	Objective	Simple	81.000	4.050	117.000	6.158	Patterns
4	M04_N9	Subjective	Simple	162.667	8.133	155.000	8.158	Patterns
5	M05_N4	Subjective	Simple	114.000	5.700	114.500	6.026	Patterns
6	M06_N5	Objective	Simple	101.250	5.063	112.500	5.921	Patterns
7	M07_L1	Subjective	Compound	112.062	5.603	117.903	6.205	Patterns
8	M08_L2	Objective	Compound	154.500	7.725	157.500	8.289	Patterns
9	M09_L8	Objective	Simple	40.500	2.025	63.000	3.316	Patterns
10	M10_L5	Objective	Simple	54.000	2.700	96.000	5.053	Patterns
11	M11_T6	Objective	Compound	89.000	4.450	68.000	3.579	Guidelines
12	M12_T9	Subjective	Simple	141.500	7.075	135.500	7.132	Patterns
13	M13_D4	Objective	Simple	93.000	4.650	135.000	7.105	Patterns
14	M14_T1	Subjective	Compound	161.589	8.079	147.376	7.757	Guidelines
15	M15_E1	Subjective	Simple	115.333	5.767	111.667	5.877	Patterns
16	M16_T3	Objective	Simple	168.000	8.400	161.000	8.474	Patterns
17	M17_T4	Objective	Simple	171.000	8.550	171.000	9.000	Patterns
18	M18_T8	Subjective	Simple	115.967	5.798	119.574	6.293	Patterns
19	M19_D2	Subjective	Simple	167.667	8.383	162.334	8.544	Patterns

Therefore, nine metrics that are classified as objective, out of a total of nineteen, are used to produce a separate comparison of the performance of the two groups. Table 6.13 shows details of the independent samples T-test (2-tailed), according to which the patterns group (M=56.895, SD=14.820) performed better than the guidelines group (M=47.613, SD=9.878). The computed P=0.0264 is less than 0.05, indicating that there was a statistically significant difference between the two groups with the patterns group performing better than the guidelines group.

Table 6.13: T-test for objective metrics

Group Statistics					
	Group	N	Mean	Std. Deviation	Std. Error Mean
Objective metrics	Guidelines	20	47.613	9.878	2.209
	Patterns	19	56.895	14.820	3.400

Independent Samples Test								
		Levene's Test for Equ. of var.		T-test for Equality of Means				
		F	Sig.	t	df	Sig.(2-tailed)	Mean Dif.	
Objective metrics	Equ. var. assumed	3.019	.091	-2.313	37	.0264	-9.282	
	Equ. var. not assumed			-2.289	31.145	.0290	-9.282	

A similar analysis using the Mann-Whitney non-parametric test, shown in Table 6.14, indicates that there is a significant difference between the performances of the two groups, with the patterns group scoring better than the guidelines group.

Table 6.14: Mann-Whitney test for objective metrics

Ranks				
	Group	N	Mean Rank	Sum of Ranks
Overall	Guidelines	20	15.78	315.50
	Patterns	19	24.45	464.50
	Total	39		
Test Statistics				
Mann-Whitney U				105.500
Wilcoxon W				315.500
Z				-2.377
Asymp. Sig. (2-tailed)				.0175

Details of the statistical analysis are shown in Appendix 6.12, Tables 6.12.1-2).

6.3.4 Inter-rater reliability

Agreement between the evaluators was determined by using the ICC coefficient. Two coefficients were calculated: one for the scores of the evaluators using all metrics, and one for the scores of the evaluators using only the objective metrics.

Statistical analysis, using the scores of students on all metrics, according to the techniques explained in Chapter 3, shows an inter-rater reliability of ICC=0.995. The ICC coefficient using only the subjective metrics is ICC=0.976. Both coefficients are considered to be excellent (Shrout and Fleiss, 1979). Details of the statistical analysis are shown in Appendix 6.12, Tables 6.12.3-4.

6.3.5 Impact of Compound Patterns

In the first and the main study balanced sets of patterns and guidelines were used. Patterns were simple and compound. In the interviews conducted in the first study, students expressed their preference for simple and compound patterns compared with the corresponding guidelines. There was a significant increase in the number of students preferring guidelines when they were comparing compound patterns. It seems that compound patterns, those formed of at least two guidelines, had less impact on the students of the patterns group. To further investigate this issue, statistical tests were run to compare the performance of students without using the scores for compound patterns.

There were three patterns consisting of four guidelines each, and one pattern consisting of two guidelines. The first comparison was made with the three most complicated compound patterns, those consisting of four guidelines, taken out. The second comparison was made with all four compound patterns taken out. Table 6.15 shows details of the T-test analysis.

Table 6.15: T-Test analysis without compound patterns

Group Statistics					
	Group	N	Mean	Std. Deviation	Std. Error Mean
Without 3 compound	Guidelines	20	97.890	12.142	2.715
	Patterns	19	111.148	19.045	4.369
Without all compound	Guidelines	20	90.156	11.260	2.518
	Patterns	19	102.858	18.211	4.178

Independent Samples Test								
		Levene's Test for Equ. of var.		T-test for Equality of Means				
		F	Sig.	t	df	Sig.(2tailed)	Mean Dif.	
Without 3 compound	Equ. var. assumed	4.222	.047	-2.606	37	.0131	-13.257	
	Equ. var. not assumed			-2.577	30.304	.0151	-13.257	
Without all compound	Equ. var. assumed	5.168	.029	-2.633	37	.0123	-12.692	
	Equ. var. not assumed			-2.602	29.734	.0143	-12.692	

Using an independent samples T-test (2-tailed), the patterns group was found to perform better than the guidelines group. Since Levene's test for equality of variances indicates that the variances for the two groups are not the same (Sig. value for Levene's test $P<0.05$), the compensated P values are used.

The computed P values are less than 0.05, indicating that there is a statistically significant difference between the two groups in favour of the patterns group. The significance level P=0.0151, for the case without the three compound patterns, is less than the P value for the case using all metrics (P=0.0261, see Table 6.10). The significance level P=0.0143 for the case without any compound patterns is even less, indicating that without compound patterns the difference between the two groups is getting bigger.

A similar analysis using the Mann-Whitney non-parametric test (Table 6.16) indicates that there is a significant difference between the performances of the two groups, with the patterns group performing better than the guidelines group. Again there is a small decrease in the P value.

The results suggest that compound patterns do not have the same impact as simple patterns on novice designers. It should be noted that the results of the analysis are intrinsically less reliable than the primary analysis reported in the previous sections, since this analysis examines factors in a way that was not initially designed to explore. This is considered to be a limitation of the study.

Table 6.16: Mann-Whitney test without compound patterns

Ranks				
	Group	N	Mean Rank	Sum of Ranks
Without 3 compound patterns	Guidelines	20	15.95	319.00
	Patterns	19	24.26	461.00
	Total	39		
Without any compound patterns	Guidelines	20	15.90	318.00
	Patterns	19	24.32	462.00
	Total	39		

Test Statistics		
	Without 3 compound patterns	Without any compound patterns
Mann-Whitney U	109.000	108.000
Wilcoxon W	319.000	318.000
Z	-2.276	-2.304
Asymp. Sig. (2-tailed)	.0229	.0212

6.3.6 Metrics and compound patterns

Compound patterns contribute equally to the score of a participant on a scale from 0-9. This score is calculated by averaging the scores of the submetrics that correspond to the guidelines each compound pattern consists of. Therefore, each guideline submetric contributes only partially to the overall score of the compound pattern. The score that each guideline submetric contributes is equal to the guideline submetric score divided by the number of submetrics included in the particular compound pattern. This scoring procedure, from one point of view, may favour patterns although it results in each pattern carrying the same weight towards the final score of the participants. Further advice was sought from expert statisticians regarding either averaging or adding the scores for compound patterns. Both methods were pronounced to be valid.

In this section this issue is examined and, instead of averaging the submetrics scores, the submetric scores are added for each compound pattern. Therefore, compound patterns contribute more to the final score of each participant. See Appendix 6.10 for the scores for each metric used for the comparison of the two groups in this section where submetrics for compound patters are added to the final score of participants.

The following Table 6.17 shows the metrics for simple patterns and the submetrics for each compound pattern, and the total and average scores for both groups. Each metric and submetric is classified as subjective and objective. The last column indicates which of the two groups performed better by comparing the average of the groups. A description of each of these metrics is given in Chapter 5 and in Appendix 5.3. Note that for some compound patterns only the submetrics that were employed in the scoring procedure in the specific design task are used. The same submetrics were

employed in previous analyses when submetrics for compound patterns were averaged. Therefore for metric M07_L1, although four submetrics are included, only three submetrics are used (see Appendix 5.3 Section 5.1) while for metric M11_T6, that also includes four submetrics (see Appendix 5.3 Section 7.1), only one submetric is used.

Table 6.17: Metrics in categories and group performance (with compound submetrics)

	Metric /Submetric code	Subjective/ Objective	Simple/ Compound	Guidelines Group		Patterns Group		Better Performance
				Total	Average	Total	Average	
1	M01_C1	Subjective	Simple	154.766	7.738	154.237	8.118	Patterns
2	M02_N3	Subjective	Simple	122.667	6.133	145.999	7.684	Patterns
3	M03_N6	Objective	Simple	81.000	4.050	117.000	6.158	Patterns
4	M04_N9	Subjective	Simple	162.667	8.133	155.000	8.158	Patterns
5	M05_N4	Subjective	Simple	114.000	5.700	114.500	6.026	Patterns
6	M06_N5	Objective	Simple	101.250	5.063	112.500	5.921	Patterns
7	M07a_L1	Objective	Compound	128.250	6.413	120.375	6.336	Guidelines
8	M07b_L1	Subjective	Compound	82.600	4.130	88.000	4.632	Patterns
9	M07c_L1	Subjective	Compound	125.334	6.267	145.333	7.649	Patterns
10	M08a_L2	Objective	Compound	174.000	8.700	162.000	8.526	Guidelines
11	M08b_L2	Objective	Compound	135.000	6.750	153.000	8.053	Patterns
12	M09_L8	Objective	Simple	40.500	2.025	63.000	3.316	Patterns
13	M10_L5	Objective	Simple	54.000	2.700	96.000	5.053	Patterns
14	M11_T6	Objective	Compound	89.000	4.450	68.000	3.579	Guidelines
15	M12_T9	Subjective	Simple	141.500	7.075	135.500	7.132	Patterns
16	M13_D4	Objective	Simple	93.000	4.650	135.000	7.105	Patterns
17	M14a_T1	Subjective	Compound	166.800	8.340	156.000	8.211	Guidelines
18	M14b_T1	Subjective	Compound	119.550	5.978	91.500	4.816	Guidelines
19	M14c_T1	Objective	Compound	180.000	9.000	171.000	9.000	Same
20	M14d_T1	Objective	Compound	180.000	9.000	171.000	9.000	Same
21	M15_E1	Subjective	Simple	115.333	5.767	111.667	5.877	Patterns
22	M16_T3	Objective	Simple	168.000	8.400	161.000	8.474	Patterns
23	M17_T4	Objective	Simple	171.000	8.550	171.000	9.000	Patterns
24	M18_T8	Subjective	Simple	115.967	5.798	119.574	6.293	Patterns
25	M19_D2	Subjective	Simple	167.667	8.383	162.334	8.544	Patterns

To statistically compare the performance, the distribution of the scores was first assessed for normality using the Shapiro-Wild test which is recommended for small sample sizes (Marques de Sa, 2003; Sen and Srivastava, 1990). The statistical test indicated no violation of the assumption of normality (see Appendix 6.11, Table 6.11.2).

Table 6.18 shows details of the independent samples T-test (2-tailed), according to which the patterns group (M=172.659, SD= 23.144) performed better than the guidelines group (M=159.193, SD=18.142). The computed P=0.0498 is less than 0.05, indicating that there was a statistically significant difference between the two groups with the patterns group performing better than the guidelines group. The P value is very

close to the significance level of 0.05 while the P value in the analysis using the average for compound patterns is 0.0265 (see Table 6.10).

Table 6.18: T-test analysis (compound submetrics are added)

Group Statistics					
	Group	N	Mean	Std. Deviation	Std. Error Mean
Overall	Guidelines	20	159.193	18.142	4.057
	Patterns	19	172.659	23.144	5.310

Independent Samples Test								
		Levene's Test for Equ. of var.		T-test for Equality of Means				
		F	Sig.	t	df	Sig.(2-tailed)	Mean Dif.
Overall	Equ. var. assumed	1.296	.262	-2.028	37	.0498	-13.466
	Equ. var. not assumed			-2.015	34.130	.0518	-13.466

There are many ways of analysing the score of the participants. Adding the submetrics for each compound pattern affects the significance level of the difference however the trend remains the same. By taking the average of the submetrics patterns have equal weight, while by adding the submetrics provides a more detailed analysis and suggests that compound patterns lose some of the impact that patterns have on participants.

Further statistical analyses could be performed to take into account the category, simple or compound, of each pattern as a factor and to study the interaction effect of the factor on the independent variable, i.e. the score of the participants. However such an analysis is beyond the scope of this study.

6.4 Evaluation test and results

In this section the evaluation test is presented and the results of the test. The test required students to perform an expert evaluation and to mark the errors on a web site.

6.4.1 Description of the evaluation test

For this part of the experiment students evaluated a number of web pages. The web site was an improved version of the site that was used in the first study, concerning a small information technology company providing services and offering a small number of software products. Several changes were made to the assignment in order to eliminate errors that were questionable as to their validity of being an error or a simple aesthetic change. The main alterations were the addition of a button next to the search box at the top of the page, and the change of all headings that were coloured blue and red into single-coloured headings. See Appendix 4.12 and Appendix 6.14. Finally, a few more

errors were embedded in the web site while others were eliminated as they proved to be inappropriate for the purposes of the evaluation task.

A designer is expected to possess high evaluation skills since such skills are involved in the decisions taken during the development process. An evaluation requires the usability expert to identify errors, to indicate the severity rate for each usability violation, and to suggest modifications to fix the errors and improve the usability of the web site (Hartson et al., 2001; Nielsen, 1992). Following the same approach, as in the first study, students did not rate the severity of each usability violation they found, for the following reasons:

- There was no time to teach and demonstrate the formal application of usability criteria.
- The impression of the research team was that shifting the focus of the tutorials to a usability evaluation could have a negative effect on the design task.
- There was uncertainty and scepticism about the success of one more demanding test, since students had not developed the necessary skills to perform an exemplary expert evaluation.

The evaluation session lasted 60 minutes. All 39 students participating in the design task completed the evaluation test as well. In the first study the evaluation task was performed by each student working on his own. It is estimated that this affected students' performance and, probably due to lack of motivation, students did not work with the same degree of carefulness on each page: their attention given to the tasks was reduced towards the last pages of the web site. In order to motivate students more, the task was performed in groups. At the end of each session students completed a questionnaire with biographical data and questions about their opinions of patterns and guidelines; see Appendix 6.13.

The task required students to perform an expert evaluation and to mark the errors on four out of the five pages of a web site. Printed copies of the site were given to the students and they marked errors or bad usability issues on the printed page at the point where the mistake was spotted. Some students opted to write very small comments about the error as well. This was allowed in order to elicit more data about the impact of patterns and guidelines. Students were instructed to spend initially five minutes exploring the site, and the rest of the time performing the heuristic evaluation of each page. The site was presented on a computer so that students would be able to interact

with the site and check navigation and links. See Appendix 6.14 for screenshots of the web site evaluated by the students.

6.4.2 Results of the evaluation task

Students' performance on each page was better and more consistent than that of the participants in the first study. There was a drop in the number of errors identified on the fourth page but this was not as severe as in the first study. Most of the students finished the task within the last 10 minutes of the allotted time. Students' rate of thoroughness, the ratio of true errors found to the total number of existing errors, reached a high level. See Appendix 6.15, Tables 6.15.1-2 for a graphical depiction of the errors identified and description of the errors. See also Appendix 6.15, Table 6.15.3 for the details of the results and the number of errors identified on each page by the participants.

Table 6.17 shows how students performed on each of the four pages. Numbers in per cent represent the rate of thoroughness of the participants. The maximum and minimum number is the maximum and minimum thoroughness achieved by the group, and the average is taken over a group of participants.

Table 6.17: Thoroughness on each page and overall for the site (all participants)

	Page 1	Page 2	Page 3	Page 4	Overall (4 pages)
Errors (No.)	26	20	19	22	87
Maximum thoroughness (%)	76.9	95.0	89.5	81.8	80.5
Minimum thoroughness (%)	26.9	20.0	26.3	18.2	29.9
Average thoroughness (%)	50.8	53.7	48.0	43.0	48.9

The participants in this study were more effective than the participants in the first study. Overall students performed very well compared to the results reported by other studies conducting similar experiments (Chevalier and Ivory, 2003a), with the average rate of thoroughness being 48.9%.

Table 6.18 shows the thoroughness achieved on each page and overall for the guidelines group.

Table 6.18: Thoroughness on each page and overall for the site (guidelines group)

	Page 1	Page 2	Page 3	Page 4	Overall (4 pages)
Errors (No.)	26	20	19	22	87
Maximum thoroughness (%)	76.9	70.0	68.4	59.1	66.7
Minimum thoroughness (%)	26.9	30.0	26.3	18.2	29.9
Average thoroughness (%)	50.2	52.0	45.5	40.5	47.1

For the patterns group the thoroughness on each page and overall is shown in Table 6.19.

Table 6.19: Thoroughness on each page and overall for the site (patterns group)

	Page 1	Page 2	Page 3	Page 4	Overall (4 pages)
Errors (No.)	26	20	19	22	87
Maximum thoroughness (%)	76.9	95.0	89.5	81.8	80.5
Minimum thoroughness (%)	30.8	20.0	26.3	18.2	33.3
Average thoroughness (%)	51.4	55.5	50.7	45.7	50.8

The two groups performed similarly on thoroughness. To statistically compare their performance, the distribution of the number of errors identified was assessed for normality using the Shapiro-Wild test (see Appendix 6.16, Table 6.16.1), which is recommended for small sample sizes (Sen and Srivastava, 1990; Marques de Sa, 2003). The statistical test indicated no violation of the assumption of normality; however, due to the sample size of groups involved, the statistical comparison used both an independent samples T-test as well as the non-parametric Mann-Whitney test. There was no significant difference between the two groups ($T(37) = -0.996$, $P=0.325$, equal variances assumed; $P=0.574$, Mann-Whitney, see Appendix 6.16, Tables 6.16.2-3 for details). Although there was no statistical difference in the performance of the two groups, the patterns group performed better. The average thoroughness of the identified errors for the guidelines group was 47.1% (N=20, SD= 9.8) and for the patterns group 50.8% (N=19, SD=12.8).

The most successful among the students found 80% of the errors on the pages. Sixteen students out of the thirty-nine participating identified more than 50% of the errors on the site, of whom nine were in the guidelines group and nine in the patterns group. The lowest thoroughness achieved was 29.9%.

Taking into account the average percentage of errors identified by a participant in the evaluation task was 49% it is estimated that three evaluators are required to reveal 87% of the errors on the web site. This estimation is better than that reported by Nielsen (2000b), who claims that a typical value of the probability of finding an error is 31%. This percentage (49%) is also better than what Chevalier and Ivory (2003a) indicated in their experiment. When judging the performance of the groups, it should be taken into account that most of the errors embedded in the web page were easy to identify.

6.4.3 Missed errors

In total, the study participants managed to identify every error on the pages, that is, thoroughness reached 100%, although some of the errors were identified by only a few of the students. Identified errors on the web site are most likely to be all real usability errors on the site, since 26 students in the first study had already evaluated the site and pinpointed the same errors. The new errors that were embedded in the pages, after consultation with another web designer, were also violating at least one usability principle each. Again, it should be pointed out that one caveat to the very good performance of students is that the errors on the web site were embedded simple errors compared to the errors that are found on real web sites; such surface errors tend to be easy identifiable by evaluators (Cockton and Woolrych, 2001).

The following Table 6.20 shows the number and percentage of errors missed and found on each page for the two groups separately.

Table 6.20: Number and percentage of errors missed and found in each page

No. of errors in page		Guidelines			Patterns		
		No. of errors missed	Percentage of errors missed	Percentage of errors found (thoroughness)	No. of errors missed	Percentage of errors missed	Percentage of errors found (thoroughness)
Page 1	27	1	3.7	96.3	0	0.0	100.0
Page 2	21	0	0.0	100.0	0	0.0	100.0
Page 3	20	0	0.0	100.0	1	5.0	95.0
Page4	23	0	0.0	100.0	0	0.0	100.0
Total	91	1	1.1	98.9	1	1.1	98.9

The guidelines group missed one error on the first page while the patterns group missed one error on the third page. Failing to identify the particular errors is considered accidental since similar errors were identified by the groups on other pages. Each group managed to identify 98.9 % of the errors on the site.

6.4.4 False positives

Students reported a small number of false positives. The number of false positives was greater than those reported by the participants in the first study. The greater number of false positives could, however, be a consequence of the greater number of hits for each participant and not to other effects or failings of the students. Compared to the group of participants in the first study, the participants in this study were more confident and made more comments and suggestions for improvement.

There were some false positives that could be classified as situational, i.e. errors that may not be reported in another case. A few of the students reported that there were some links with a violet colour. These links were visited links as a result of another student having already worked on the site on the same computer. In the interview some of these students were asked about this false positive and they replied that they knew the principle of using different colours for visited and unvisited links; however, they thought that the link colour was wrong, assuming that the site was being used for the first time. These errors were not considered false positives. A couple of students had already commented on the page when they performed the evaluation:

> The colour of this link indicates that the link has been clicked and this confuses the visitor.

And another said:

> Some of the links have red [violet] colour. Usually this colour is used to indicate that the link has been visited by the user.

The guidelines group reported 20 false positives and the patterns group 19. Students reported up to four false positives on a web site. In Table 6.21 below each row shows the number of false positives reported on a web site, followed by the number of students reporting that number of false positives.

Table 6.21: Number of false positives reported in a web site and number of students

			Group		Total
			Guidelines	Patterns	
False positives No.	0	N (within group level %)	3 (15.0)	2 (10.5)	5 (12.8)
	1	N (within group level %)	5 (25.0)	9 (47.4)	14 (35.9)
	2	N (within group level %)	7 (35.0)	6 (31.6)	13 (33.3)
	3	N (within group level %)	4 (20.0)	1 (5.3)	5 (12.8)
	4	N (within group level %)	1 (5.0)	1 (5.3)	2 (5.1)
Total		N (within group level %)	20 (100.0)	19 (100.0)	39 (100.0)

There was no significant difference in the number of false positives reported between the two groups (P=0.560, Fisher-Freeman-Halton exact test, Appendix 6.16, Table 6.16.4 for details). For the test, the number of false positives was coded as categorical variable, i.e. there were five categories. Sometimes false positives were reported for the same element on each page of the site. In such cases the false positive counted only as one.

An account of the most characteristic and common false positives is given below. Three students indicated that one of the side columns was not the same as in the rest of

the pages and that there was a box missing among the boxes promoting the company's products. Students considered that consistency should apply to every element of the page, which is not correct, since putting several promotional elements in the same place does not alter the consistency of the page.

Two students reported as an error certain links that span more than one line within text. While links should not span more that one line in narrow columns without use of a sign to indicate the start of each link, here students applied this advice to text, ignoring that links should be meaningful as well. Usually, long links within text do not confuse visitors as they do in narrow columns. Two more students pointed out that the search box should be somewhere else in a more prominent place; this false positive can only be attributed to students' previous experience of other sites, since there was no guideline/pattern associated with search boxes.

One false positive, identified by one participant, was to eliminate buttons from the navigation bar that corresponded to the current page of the visitor; however, this would violate the consistency of the navigation and is considered a serious error. Finally, some students indicated that there was no button linked to "Home Page"; actually, there was a navigation button linked to the home page of the company but the button did not have the label "Home Page". These students considered that only links labelled "Home Page" were eligible to serve this purpose despite the fact that another button was used for this, having a label the same as the heading of the home page of the company. Other false positives were about alignment, use of fonts, and colour of the text.

Students made several comments to improve presentation and the overall feel of the site. These comments were considered suggestions for improvement since they could not be classified as outright false positives. Comments revolved around the following issues:

- Use of empty space at the top of the page. It was suggested to put some images there or to use other design elements.
- Use of light blue colour to make the site more attractive.
- Use of bold fonts to highlight some words in the text.
- Different position of certain elements.
- Enhancements to help visitors navigate better.
- Suggestions to alternate colour in rows and for the use of bullets.
- Suggestions to achieve greater consistency.

Clearly, some of these comments highlight that principles of usability were successfully transferred to novice designers using patterns and guidelines. Other students suggested improvements, indicating at the same time the usability principle, the problem, and the solution:

> Scanning should be made easy. Here it is not easy to follow the line. Maybe use of alternating colours would be better.

> Home page should be smaller in size and the content should be distributed to other pages.

Other suggestions that reflect usability principles and show the impact of patterns and guidelines are:

> This box on the right column is not consistent from page to page. Fonts and size of fonts change, thus violating consistency on the site.

> It would be possible to use a list of bookmarks on long pages to go to the place the user wants to reach without any scrolling.

To conclude, the participants in the first study and in the main study exhibited the same behaviour in the evaluation tasks, although those in the main study were more knowledgeable and thorough in their evaluation.

6.4.5 Easy and difficult to find errors

Some of the errors were reported only by a few students while others were reported by many. The easy to report errors, as in the first study, were those that could be identified by a simple inspection of the page.

Errors were classified into four categories according to the degree of difficulty of identification. The following Table 6.22 shows the classification based on the number of participants that reported the error. The first column shows the four categories, the second the number of students that managed to report errors in this category and the third the total number of errors at a given level of difficulty in the web site.

Table 6.22: Error categories and numbers of them in the site

Category	Students reporting the error No.	Errors in the site No.
Difficult	0-9	21
Average	10-17	21
Easy	18-25	21
Very easy	>=26	24
Total		87

The most difficult errors to identify were:

1. Page title missing from pages or page title not being descriptive.
2. Missing link to the top of the page on long pages. Some students, while identifying the error on the first page, failed to do the same on other pages wherever necessary.
3. Labels in menus and navigation bars being inconsistent; labels should be consistent with the destination, or the label should be meaningful to the visitor.
4. Images should be accompanied by text to help visitors.
5. Consistent alignment of navigation bars.
6. Links being non-descriptive of the destination; this type of error requires careful examination of the links.
7. Links going to the wrong places; again, this would require interaction with the pages and careful examination of the links.
8. Home page being too long.
9. Some white space that caused inconsistency in the position of the elements.
10. Misalignments and missing separators in tables, but the seriousness of such errors is low.

The easier errors to find were related to missing elements, format of links and text misalignments:

1. Page heading missing or incorrectly formatted.
2. Missing elements (i.e. repeated menu) at the bottom of each page implying inconsistency.
3. Missing elements at the top of each page, such as logos or images, causing inconsistency.
4. Space between elements or menu items placed inconsistently.
5. Different alignment in navigation elements (e.g., meta-navigation menu) at the top of the page.
6. Incorrect appearance of links, e.g., link not properly underlined, link not functioning correctly, or link presented in a colour other than the recommended blue colour.
7. Underlined text in several places; this was an easy to spot error in six different instances on the site.
8. Text items that could be presented better using bullets.
9. Poor visibility of the text, due to dark background or light colour of the font, resulting in low contrast and poor appearance.

10. Text appearance, such as font style, use of capital letters, and font colour.
11. Misalignments of similar items within text.

6.4.6 A comparison based on the difficulty of identifying errors

Using the number of errors each participant identified is one way of examining and comparing the performance of the groups. Another way is to compare the number of students in each group who identified a particular error or group of errors. Such a comparison is presented below.

In order to compare the two groups, the number of participants reporting the error in the guidelines group is compared with the number of participants reporting the same error in the patterns group. These two numbers are compared in the four categories of errors presented above in Table 6.22. For example, the number of very easy to find errors is 24. For each of these 24 errors two sets of 24 numbers are formed, one set for the guidelines group and one for the patterns group. Each number in the set represents the number of students in the group that have identified the error, i.e. the number of times the particular error was reported by the group. A comparison is performed, in the case of very easy errors, between the two sets of the 24 numbers.

The number of times an error was identified by a group depends on the number of experts involved in an evaluation. In this respect, the guidelines group involves one more student than the patterns group. To compensate for this inequality, instead of comparing the number of times a particular error is identified, the concept of *group efficiency* is defined and used. Group efficiency is defined as the number of times the error is identified divided by the number of participants in the group.

To statistically analyse the two groups the non-parametric Mann Whitney Test was used.

Table 6.23: Comparing group rates and group efficiency

	Category of error	Errors in category	P using times that errors are identified	P using group efficiency
Category	Difficult	21	.009	.001
	Average	21	.465	.120
	Easy	21	.516	.890
	Very easy	24	.916	.383

In all comparisons the patterns group performed better than the guidelines group. Table 6.23 shows the performance in each category of errors. Taking, for example, the first row in the category (difficult to find errors), there are 21 errors in this category. The comparison is based on the P values shown in the next two cells: the first cell

shows the P value using the times errors were identified, and the second cell the P value using the group efficiency values. The cases where the patterns group is significantly better than the guidelines group are in bold and greyed out. Detailed statistical tests are included in Appendix 6.17 Tables 6.17.1-4.

It appears that the difficulty of an error is a factor affecting such comparisons. In order to gain a more lucid picture of how the degree of difficulty affects the performance of the groups, further tests were performed. The groups were compared in several circumstances, starting from the very difficult errors. The comparison starts for errors that only 0 and up to 8 participants identified, in order to have a reasonable number of errors for the comparison. The comparison, for simplicity, continues with errors that were identified by only 0-12, 0-16, 0-17, and 0-18 participants. After that number of participants (18) there are no significant differences between the two groups. Table 6.24 shows the comparison of the groups. Detailed statistical tests are included in Appendix 6.17 Tables 6.17.5-9.

The first column indicates the number of students who identified the errors and the next column how many errors were in that category.

Table 6.24: Group comparison using group rates and group efficiency.

Number of students who identified the error	Errors in category	P using times that errors are identified	P using group efficiency
0-8	15	**.037**	**.004**
0-12	27	**.046**	**.004**
0-16	37	.060	**.006**
0-17	42	.134	**.019**
0-18	45	.304	.065

Again, in all comparisons the patterns group performed better than the guidelines group; in cases where the differences were statistically significant are highlighted in bold.

6.5 Results of the questionnaires

Finally, the students completed a post-test questionnaire to provide qualitative and quantitative data about their attitudes towards and opinions of patterns and guidelines. A copy of the questionnaire is included in Appendix 6.18. The questionnaire was completed immediately after finishing the evaluation test. The following sections present some of the findings, examining the opinions of participants and comparing the two groups.

6.5.1 Attitude towards patterns/guidelines

Several statements were used in the questionnaires to evaluate students' attitude towards patterns/guidelines. Students indicated their agreement or disagreement with a statement using a five-point Likert-type scale. Participants rated patterns and guidelines based on their own experience studying and using patterns/guidelines; presumably, participants were not aware of the two alternative formats. Every possible effort was exercised to avoid diffusion of the tests and the material used. Students' attitudes towards and opinions of patterns/guidelines are presented in the following table.

Table 6.25: Students' attitudes towards patterns and guidelines

Question Code	Statement	Guidelines group (N=20)		Patterns group (N=19)	
		Mean	SD	Mean	SD
Q11	The guidelines/patterns, provided for study, were very helpful in explaining how to improve a website.	4.200	.410	4.368	.496
Q12	I believe that the section in the course about the guidelines/patterns helped me to improve my skills.	3.850	.745	4.263	.562
Q21	How much time did you spend every week on studying and practising in the seminar?	2.700	.733	2.895	.658
Q22	How much time did you spend reading the booklet of guidelines/patterns before the final examination?	1.600	.503	1.579	.507
Q31	How often did you use the booklet during the exercise for the design task?	2.500	.761	2.895	.809
Q32	In future, will you use guidelines/patterns if you are required to design other sites?	4.200	.696	4.789	.419
Q41	The guidelines/patterns helped me develop my abilities in designing websites, after learning FrontPage.	3.650	.813	4.105	.459
Q51	How useful were the guidelines/patterns for designing the InfoIstos site?	3.900	.788	4.000	.745
Q52	How useful were the guidelines/patterns for the evaluation of the site that was given to you?	4.100	.852	4.053	.780

Table 6.25 shows that both patterns and guidelines are considered by students useful for their improvement as designers and useful for the design and the evaluation tasks they performed. All students consider the tutorial and the booklet about patterns/guidelines very useful for the course and essential for the development of their skills as designers and evaluators.

Statistical analysis was performed using either a Pearson chi-square test or Fisher-Freeman-Halton test (Agresti, 1990; Howell, 2001; Pallant, 2001). See Appendix 6.19 for details of the statistical tests regarding students' attitude towards patterns and guidelines. Table 6.26 shows the P values for each of the statistical tests comparing the responses of the groups.

Table 6.26: Comparison of opinions and attitudes

Question Code	Statement	P	Test used
Q11	The guidelines/patterns, provided for study, were very helpful in explaining how to improve a website.	.301	Fisher-Freeman-Halton Exact Sig. (2-sided)
Q12	I believe that the section in the course about the guidelines/patterns helped me to improve my skills.	.290	Fisher-Freeman-Halton Exact Sig. (2-sided)
Q21	How much time did you spend every week on studying and practising in the seminar?	.466	Fisher-Freeman-Halton Exact Sig. (2-sided)
Q22	How much time did you spend reading the booklet of guidelines/patterns before the final examination?	.894	Fisher-Freeman-Halton Asymp. Sig. (2-sided)
Q31	How often did you use the booklet during the exercise for the design task?	.512	Fisher-Freeman-Halton Exact Sig. (2-sided)
Q32	In future, will you use guidelines/patterns if you are required to design other sites?	.009	Fisher-Freeman-Halton Exact Sig. (2-sided)
Q41	The guidelines/patterns helped me develop my abilities in designing websites, after learning FrontPage.	.331	Fisher-Freeman-Halton Exact Sig. (2-sided)
Q51	How useful were the guidelines/patterns for designing the InfoIstos site?	.462	Fisher-Freeman-Halton Exact Sig. (2-sided)
Q52	How useful were the guidelines/patterns for the evaluation of the site that was given to you?	.531	Fisher-Freeman-Halton Exact Sig. (2-sided)

There was no significant difference between the two groups in all but one question (Q32, Table 6.26). Table 6.27 shows more details of the comparison of groups with students indicating their intention to use patterns/guidelines in the future for designing web sites: participants in the patterns group indicated the intention towards patterns and participants in the guidelines group indicated their intention towards guidelines.

Table 6.27: Intention to use patterns and guidelines

			Group		Total
			Guidelines	Patterns	
Intention for future use	3.00	N (within group level %)	3 (15.0)	0 (0.0)	3 (7.7)
	4.00	N (within group level %)	10 (50.0)	4 (21.1)	14 (35.9)
	5.00	N (within group level %)	7 (35.0)	15 (78.9)	22 (56.4)
Total		N (within group level %)	20 (100.0)	19 (100.0)	39 (100.0)

Here there is a significant difference between the two groups (see Appendix 6.19 for details). Although both groups are strongly inclined towards using guidelines and patterns again, the patterns group feels more strongly about employing patterns again in the future.

Overall, the results are in line with Borchers' (2002) study where only patterns were used for teaching usability principles. The results also are in line with the first study where both patterns and guidelines were highly rated by participants. This

indicates that either format is valued by students as providing knowledge and experience to novice designers.

6.5.2 Suggestions for improvements

One question in the questionnaire required students to make suggestions for improvements of patterns and guidelines. Two students in the guidelines group and four in the patterns group did not answer this question. The aspects that participants referred to in their suggestions for improvements are as follows:

Examples: Six students in the guidelines group and five in the patterns group asked for more examples. There was, however, a noticeable difference in attitudes between the two groups. The guidelines group was simply asking for more examples, while the patterns group requested examples of higher quality, with more illustrative details.

> [I would like] more examples from several sites about the application of a specific pattern to improve my understanding (participant from the guidelines group).

> More examples; especially collect examples and errors from beginners like us and present them (participant from the patterns group).

Three more members of the guidelines group asked for examples to be included together with guidelines or next to the text accompanying the guideline.

Coverage: Three students from the guidelines group asked for guidelines dealing with advanced issues and tutorials about the application of such guidelines, while three students from the patterns group suggested patterns about site architecture, technical details of web design and programming.

Presentation of patterns/guidelines: Two students from the patterns group indicated that they were satisfied and that no particular improvement was necessary while one student from the guidelines group expressed the same view adding that it would be helpful "if there were more examples similar to the current ones included".

Two students from the guidelines group asked for more guidelines and another one for more guidelines from current sets to be translated into Greek.

One student from each group suggested that more details be added to take into account the purpose of the site.

Two students from the patterns group made suggestions about the presentation of patterns: one asked for contents to be included, and another one for colour to be added in the printed booklets. Finally, two members of the patterns group asked that all this

material and knowledge should be used from the beginning of the tutorial, and in parallel with the use and demonstration of FrontPage techniques.

6.6 Interviews and results

The last stage of the main study involved interviews with the participants. After the evaluation task, availability of the participants became problematic due to their involvement with end of term examinations. For these reasons, interviews were conducted by telephone.

There were 34 interviews conducted in all, with 16 students from the guidelines group and 18 from the patterns group. Interviews with the study participants supplied quantitative and qualitative data that were used for analysis. Questions from the interviews in the first study were revised and restructured. Part of the interview asked participants to compare patterns and guidelines. The comparison involved contrasting simple and compound patterns with corresponding guidelines. The four sets of patterns and guidelines are included in Appendix 6.22.

Interviews were semi-structured and conducted in a conversational format. An interview guide was used in order to control the pace of the interview (Merriam, 1998; Saunders et al., 2000; Seidman, 1998). The interview guide consisted of questions and issues to be explored, and was followed for each participant. A copy of the interview guide is presented in Appendix 6.20.

Interviewees were informed about the focus of the questions in order to prepare them, although there was a possibility that the interview could diverge from the interview guide. A selection of patterns and the corresponding guidelines was prepared and sent to the interviewees prior to the start of the interview. These patterns and guidelines were used for the comparison. Finally, interviewees were informed about how the interview would proceed and were asked for permission to record the interview and use the recording material for research purposes. Interviews were recorded using a voice recorder directly connected to the phone line, allowing recording of both parties involved. Questions that required a written response were sent back through e-mail, after the completion of the interview.

6.6.1 Quantitative analysis

Data obtained in the interviews were analysed using statistical tests. Data in qualitative format were quantified first for the purposes of the analysis.

6.6.1.1 Preference of students for patterns and guidelines

Patterns and guidelines are two forms of expressing advice, knowledge, and design experience. The purpose of this analysis was to identify the form preferred by novice designers. In the first study a similar question was put to the participants. In addition for their preference, this study also asked students to elaborate and discuss why they made a particular choice.

Four different patterns and their corresponding guidelines were presented to the students (see Appendix 6.22). Each pattern was compared against the corresponding guideline/guidelines. There were two simple patterns (cases Simple1 and Simple2), corresponding to one guideline each, and two compound patterns (cases Compound1 and Compound2) corresponding to four guidelines each; see Table 6.28 below.

Table 6.28: Patterns and guidelines for comparison

Case	Pattern Name	Guideline Title
Simple1	10. Meta Navigation	10.Use Meta Navigation
Simple2	17. To the Top Link	21. Allow Users to Go Back to the Top of the Page
Compound1	14. Properly Placed and Descriptive Links	14. Provide Links where the User May Need Them 18. Match Link Names with Their Destination Pages 19. Ensure that Embedded Links are Descriptive 20. Designate Used Links
Compound2	25. Lists	32. Display Related Items in Lists 33. Introduce Each List 34. Format Lists to Ease Scanning 35. Capitalise First Letter of First Word in Lists

Students expressed their preference for the format after studying the matched pairs of patterns and guidelines on their own. Their preference expressed during the interview was quantified into categorical data and coded into three alternatives: guidelines, neutral, patterns.

The preference of the students in the two groups for simple and compound patterns is shown in the following Table 6.29.

Table 6.29: Preference for simple and compound patterns (two groups)

	Participants and their preference							
	Guidelines group				Patterns group			
	Simple1	Simple2	Compound1	Compound2	Simple1	Simple2	Compound1	Compound2
Neutral	0	1	0	1	0	0	0	0
Patterns	13	13	11	10	18	16	14	13
Guidelines	3	2	5	5	0	2	4	5
Total	**16**	**16**	**16**	**16**	**18**	**18**	**18**	**18**

The above Table 6.29 depicts the number of students for each of the two groups separately and their preference for each pair of pattern and guideline/guidelines.

The preferred format for the guidelines group is the pattern format even though the students in that group used guidelines; however, there is an increase on the number of participants preferring the guideline format in the two cases where compound patterns are compared against a set of corresponding guidelines (case Compound1 and Compound2).

A similar comment can be made for the patterns group. The preferred format for the patterns group is the pattern format; however, there is still an increase on the number of participants, preferring the guideline format, in the two cases where compound patterns were used, even though the students in the group used patterns.

The preference for patterns/guidelines for all participants is shown in the following Table 6.30 and Figure 6.1 using a bar graph.

Table 6.30: Preference for simple and compound patterns (all participants)

	Participants and their preference (all participants)			
	Simple1	Simple2	Compound1	Compound2
Neutral	0	1	0	1
Patterns	31	29	25	23
Guidelines	3	4	9	10
Total	**34**	**34**	**34**	**34**

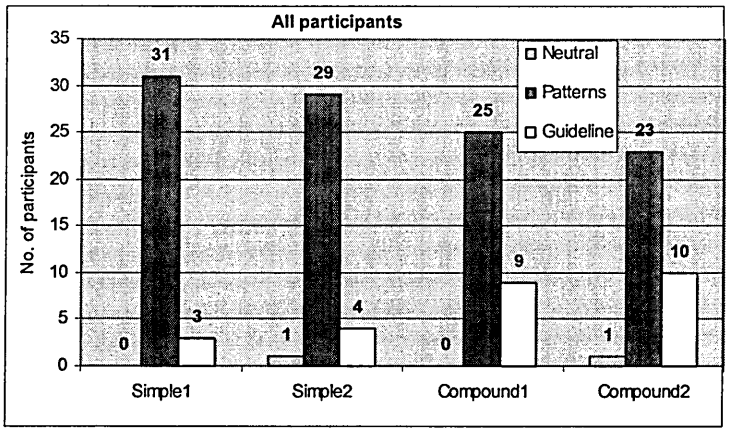


Figure 6.1: Preference of all participants

Looking at the example in the second column (case Simple2) of Figure 6.1 it can be seen that only one person has no preference for a particular format, while twenty-nine prefer the pattern format and only four the guideline format. The preference of all students for patterns is clear. Compound patterns present more complex advice and contain a multitude of usability guidelines. There are several patterns in the literature that are quite lengthy (e.g., van Duyne et al., 2002) and compound patterns of the study are like those patterns. The reason for forming compound patterns and employing them in the experiment was to investigate the use and application of such patterns. While the pattern format is still preferred even in the case of compound patterns, there is a small but noticeable increase in the number of people who like the guideline format when compared with compound patterns.

Another comparison that could be made is between the preference of students for simple vs. compound patterns by combining the two cases of simple patterns into one case, and the two cases of compound patterns into another one. Therefore, for the 34 interviews this yielded 68 instances of comparing a simple pattern to a guideline and 68 instances of comparing a compound pattern to guidelines. Table 6.31 shows the preference of students when comparing simple patterns with guidelines and when comparing compound patterns with guidelines.

Table 6.31: Preference towards simple and compound patterns

	Preference Simple and Compound cases			
	Simple		Compound	
	N	%	N	%
Neutral	1	1.5	1	1.5
Patterns	60	88.2	48	70.6
Guidelines	7	10.3	19	27.9
Total	68	100	68	100

Statistical analysis indicates that the difference between students' preference for simple vs. compound patterns is statistically significant (P=0.015, Fisher-Freeman-Halton exact test, details in Appendix 6.21, Table 6.21.1). This analysis suggests that simple patterns are preferred over compound patterns by all students.

6.6.1.2 Format for presenting advice about web design

Toward the end of the interview, participants were asked to indicate their preference for a format by indicating their personal choice, using an ordinal scale. "Strongly", "Moderately" and "Slightly" were used on the scale for either the patterns or the guideline format, and "Neutral" if no preference was indicated for either of them. The difference between this question and the questions analysed in the previous section was that students were here indicating their overall impression about patterns and guidelines without comparing any particular set of patterns and guidelines. The order of presenting the scale was reversed in half of the questionnaires to avoid bias.

The preference for patterns/guidelines for each group is shown graphically in the following Figure 6.2 using a bar graph. See also Appendix 6.21, Table 6.21.2.

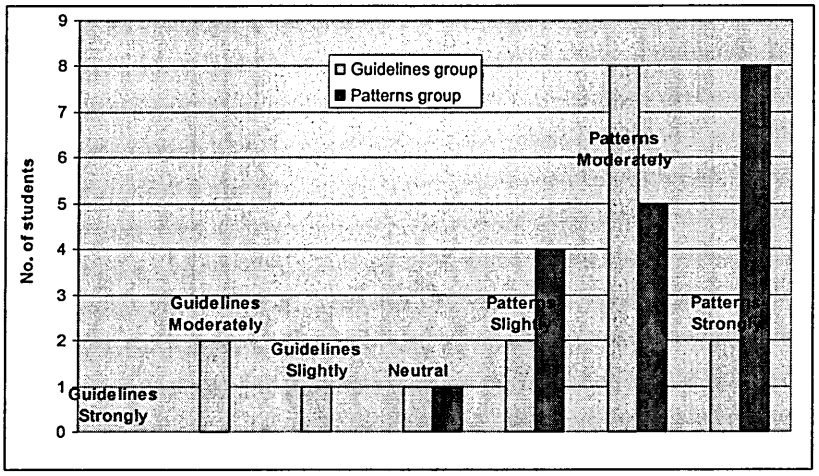


Figure 6.2: Preference for a particular format (two groups)

Statistical analysis indicates that there no significant difference in the preference of students (P=0.108, Fisher-Freeman-Halton exact test, details in Appendix 6.21, Table 6.21.2). This analysis suggests that the preference for a particular format to present advice and knowledge is the same for both groups, namely, in favour of patterns, despite the fact that one group was taught and used guidelines in the tests.

Another test can be performed combining all the categories in the patterns and all those in the guidelines respectively into one category each. This will yield three categories for comparison: guidelines, neutral and patterns. Statistical analysis again indicates that there is no significant difference between the two groups of students

(P=0.160, Fisher-Freeman-Halton exact test, details in Appendix 6.21, Table 6.21.3). In this case 8.8% of the 34 students prefer guidelines, 5.9% have no preference and 85.3% prefer patterns.

6.6.2 Qualitative analysis of interviews

In addition to the quantitative analysis above, the comments and answers from the interviews were also subjected to qualitative analysis. In this section the recurrent themes identified by analysing and coding the data collected in the interviews are presented.

The qualitative analysis allowed summarising the themes regarding the qualities of the patterns/guidelines as perceived by the students, the reasons for students preferring one or the other format, and the advantages or drawbacks of patterns/guidelines from the designers' perspective.

Several authors strongly recommend using a software package to assist the researcher in analysing data in a qualitative study (Denzin and Lincoln, 2000; Patton, 2002; Richards, 2005). Data from interviews were organised and analysed using a qualitative data analysis software package, NVivo v.7 by QSR International (2007).

In total 34 out of the 39 participants in the design and evaluation test were interviewed (87% response rate). There were 16 interviews conducted with participants from the guidelines group and 18 with participants from the patterns group. In the following sections, where the qualitative analysis is presented, participants in the patterns group are identified as P1, P2, ..., P18 and participants in the guidelines groups as G1, G2, ..., G16.

During the opening and closing stages of the interviews students were asked to reflect on the reasons they participated in the seminar, their experience with the tutorials, and their overall impression of the seminar. Due to the voluminous data collected, the taped interviews were listened to first and only those parts considered of interest and related to the purposes of the study were transcribed. Although these data are useful for the future conduct of the course it was decided to leave them out of the transcription for brevity. Every single reference to patterns and guidelines was included in the transcription. Parts of the interviews referring to the way the tutorials conducted, the problems students encountered or students' overall impression, suggestions for future tutorials, etc. were not transcribed. The full transcriptions would not have added any more data to the analysis of the interviews.

The transcribed data was imported into NVivo as documents in Greek. Data were coded using an open coding process. The initial coding imposed no structure on the coding themes and was exploratory. The transcription of the tapes had already revealed themes and made identification of ideas and concepts expressed by the participants easier. The subsequent coding iterations, apart from ensuring accuracy and consistency, involved further coding and at the same time categorisation of codes into a tree structure that started to reveal trends and themes.

The coding was performed by the researcher. Minor amendments in the coding were performed by another coder, who double examined the whole process. See Appendix 6.23 for a sample of the analysis of the qualitative data using Nvivo. Table 6.32 shows the themes in categories for patterns and guidelines as they are described in the following subsections.

Table 6.32: Themes of the qualitative analysis

Guidelines	Patterns
Rationale for preferring guidelines	Rationale for preferring patterns
Perceived advantages of guidelines	Perceived advantages of patterns
Negative opinion about guidelines	Educational value of patterns
Guidelines as chunks of knowledge	Impact of the format
	Number of examples with patterns and guidelines
	Use of patterns/guidelines by novices and experts

6.6.2.1 Rationale for preferring guidelines

The rationale given by students for liking patterns or guidelines is described separately for simple versus compound patterns.

a) Guidelines compared with simple patterns

The main reason for preferring guidelines in this case was that they are compact and simple and that everything that needs to be said is included. One student (participant G16), however, commented that even in this case an example next to the guideline would make the guideline even better. Another student (participant G7) disputed the usefulness of many examples with patterns, and indicated that in the case of patterns the examples (two examples were included with the specific pattern) make "a certain impression on the designer and restrict his imagination and creativity".

b) Guidelines compared with compound patterns

The preference of students for guidelines increased from 10.3%, in the case of simple patterns, to almost 27.9% (see Table 6.31) when guidelines are compared with compound patterns. The main justification given for preferring the guideline format is

that guidelines present a design problem in separate pieces of advice or steps, in a short and compact way. Students were comparing guidelines against two compound patterns: one about links and another one about lists (see Appendix 6.22). Students seem to consider lists and links as one design problem each. Guidelines are pieces of advice or rules that are given in a series of statements. One student, who preferred patterns when simple patterns were used for comparison, commented that:

> With both formats, I am getting the same information and advice more or less. I should indicate that both help me to understand the issues, in contrast to my previous choice [a case where simple pattern was examined], but if I need to choose one of the two formats I would prefer guidelines since they are presented in a simpler way, sequentially, one after the other (participant P1).

Another student, who also preferred patterns in the case of simple patterns, added that the presence of many guidelines, instead of one pattern, affects the user in a positive way:

> Here the four guidelines describe the rules in a clear and essential way without putting any strain on the reader. I prefer guidelines because they give the advice without many lines [of text], although I would have liked examples to be next to the advice. Patterns in this case have too many examples and perhaps some of them are redundant (participant G3).

The issue with examples and the presentation of a compound pattern was indicated by other students as well:

> The number of examples, combined with the position and alignment within the text, may strain the user and not help him understand the principles. Guidelines, being separate pieces of advice one after the other, are easier for someone to study (participant P9).

Other students shared the view that, after the tutorials about web design and the tutorials about patterns/guidelines, they have a sufficient level of knowledge and consider that only a short presentation is needed to teach a principle:

> The short and concise presentation will also help someone to search and find more easily what is needed with the help of short and separate pieces of advice, like that offered by guidelines (participant G15).

Such opinions indicate that the presentation of complex design issues in separate pieces of advice seems to help the organisation of knowledge as well; also, that while patterns may be better to present design issues to beginners, guidelines are more suitable for experienced designers to be used for reference and as a body of principles to search

through and apply if needed. This issue of the designer's level of experience employing patterns and guidelines is detailed in Section 6.6.2.10.

6.6.2.2 Perceived advantages of guidelines

The best characteristics of guidelines are described with words such as short, descriptive, compact, easy to understand, and easy to read and scan through.

According to the students, guidelines are short and, therefore, it is easy to understand the focus of each guideline. At the same time they go to the heart of the problem without any introduction and examples. In this way it is easier for the reader to study them. There is no need for many comments and explanations. The way in which guidelines are presented is descriptive enough to portray the principles or make a strong case for applying the guideline.

The main themes identified in the interviews regarding the advantages of guidelines were format of guidelines and guideline titles. Format refers to the structure of guidelines and their way of being presented. Titles are a theme that emerged unexpectedly in the interviews.

The format and presentation of guidelines are being commented on in a positive way, both individually and as a corpus of knowledge:

> Guidelines are structured and organised. The problems are presented one by one and in this way their location, within the body of guidelines, can be identified. At the same time it is easier to perform a quick search and find the relevant ones of interest (participant P16).

The emphasis here is on the structure of guidelines, presented one after the other with no examples interrupting the presentation. Students also pinpointed the absence of many examples in guidelines improving their presentation. Examples are not always considered a necessity and this is contrasted with patterns. However, reference is made to the desirability, in the case of an experienced designer, in using advice without any examples:

> Sometimes there are too many examples in the case of patterns, and in some cases they are so obvious that there is no need for them. Guidelines are usually more compact and comprehensive and help someone to make a quick revision of usability principles. Examples are already known to the designer; the designer simply goes through the guidelines just in case there is something missing from the designed site (participant P10).

The titles of guidelines offer a lot of information and also provide a way to reference the full body of guidelines presented to the students; this makes them easy to use as a list of

recommended or desirable elements for a site. Moreover, titles offer to a designer a quick way of skipping though guidelines without reading any text, serving as a list of useful pieces of advice:

> My attention is drawn to the titles, the small sentences that describe the guideline. They are clear and easy to comprehend and they help me find what I'm looking for. There is no need to study the full body of text, as in the case of patterns, and this is an advantage; you simply search for the guideline you need and have a look at it (participant G8).

> What I like in guidelines are the headings [titles]: they are accurate and to the point; they are concise; they are easy to read. Guidelines are suitable to flick through and remind you of what you should do and what to avoid in web design (participant P7).

These comments put the emphasis now on the titles and not the structure of the guidelines as a body.

The length of compound patterns is suggested as a drawback of patterns and at the same time it is indicated that one title of a guideline or one successful example is enough for designers to remember the advice given by the guideline. The fact that guidelines are short, shorter than patterns, and are presented in a compact way, even in the case of simple patterns, is considered an advantage of guidelines.

6.6.2.3 Negative opinion about guidelines

Some students did not express any positive response to guidelines, two of whom were in the guidelines group and three in the patterns group. Their comments indicated that there is nothing special about the guideline format and that they prefer patterns. The most severe critique of guidelines was as follows:

> What I have read in the guidelines is not presented in an interesting way in order to study and get something useful. This makes employing guidelines even more difficult (participant G13).

6.6.2.4 Guidelines as chunks of knowledge

During the interview a couple of students referred to the compound patterns used for the comparison to specifically highlight the advantages of the guideline format:

> The most attractive feature of the use of guidelines, in case of a specific design issue, is that they can be short, that is, you can create another guideline or add another one if the existing guideline gets too complicated and large (participant G11).

The comment, not very clear in the student's own words, suggests that patterns can be kept short and that short advice is better than long presentations as in the case of compound patterns. If it is necessary to expand on a piece of advice or add something important, then a new guideline could be formed, thus keeping guidelines short and compact.

6.6.2.5 Rationale for preferring patterns

While comparing patterns and guidelines, students explained why they prefer one or the other format. The reasons given by students for preferring patterns are described separately for simple and compound patterns respectively. Patterns were the most popular choice in both cases.

a) Guidelines compared with simple patterns

Most students argue for having a preference for patterns using the following theme:

> A pattern is better because it explicitly describes clearly when the pattern is used, what the problem is, which solution to apply, and all these together with examples (participant G14).

Examples are considered by students an inseparable part of the pattern:

> The description here [pattern] is better and helps someone who is not familiar with designing web pages. The examples together with the delineation of the problem contribute significantly towards this as well (participant G4).

Another student indicated that the reasons patterns are better are as follows:

> ....because it explains when to use this pattern and how to implement it and also it has more examples than the corresponding guideline (participant G2).

The above comment suggests that patterns seem to be, to some of the students, guidelines presented in a richer way.

b) Guidelines compared with compound patterns

Once again, the majority of students indicated that patterns are preferred to guidelines. Again, the main justification was the examples being together with the problem and the solution. Lack of examples is considered a serious drawback of guidelines, especially now that one pattern corresponds to a set of guidelines. Students commented that it is not easy to understand guidelines:

> It is not easy to follow the logic of guidelines, although there is a sequence of useful pieces of advice, unless you have studied the patterns first (participant P6).

> Positioning the examples next to the description helps in understanding quickly what is this all about since the user is not obliged to go forwards and backwards to check out the examples, as in the case of guidelines. Also, although I think that this particular pattern is somehow not complete yet and the elements are bolted together, my overall impression is still that they are better than the guidelines. However, it would be useful, if together with the examples, there were a clear indication when the example should be applied or avoided since some of the issues are so subtle here (participant G10).

The last sentences in the above comment indicate that examples should be successful and clear in their support of the particular pattern. It should be noted that students made similar comments in the first study as well. At the same time the participant points out that patterns can be improved, especially compound patterns.

6.6.2.6 Perceived advantages of patterns

The perceived advantages of patterns are highlighted with words such as detailed, descriptive, explanatory, informing, illustrative, and revealing. According to the comments, patterns explain "what component to apply", "why something should be there", "what should be included" and "how to implement a pattern". This makes patterns more explanatory, understandable, and constructive. The statement of the problem and the examples are also factors contributing to an understanding of the issues and of how the solution should be presented. Patterns are not considered to be as prescriptive as guidelines.

The main characteristics of patterns that influenced the preference of students are format and examples. The concepts of examples and format were coded in NVivo in cases where explicitly or implicitly mentioned during the interviews. Code occurrence is assumed to quantify the importance of the particular theme for the respondents. Code occurrences were calculated using NVivo: examples were mentioned 56 times while format 37 times.

Format is considered to make a pattern well-written and presentable. Presenting a problem, the solution, and examples make it more interesting and inspirational. The solution part, given in a couple of lines, helps in better remembering the pattern:

> Of the two formats I prefer the pattern, since examples are offered along the text and therefore it is more comprehensible. Also, the pattern describes the solution in a couple of lines, thus helping me to better remember what to do (participant P3).

It should be noted that the solution part of a pattern was most of the times presented using the title of the corresponding guideline.

The format of patterns makes them more readable and gives structure, the same one, across all patterns. Students see patterns as a structure consisting of a problem and a solution, and examples as presenting knowledge and advice. Some comments about students' perceptions of patterns are the following:

> A pattern is more analytical and descriptive and helps someone not familiar with designing. Factors that contribute towards these attributes of the pattern are the examples included with the pattern and the statement of the problem that the designer faces, followed by the analysis of the problem (participant G1).

Other students refer to the format of patterns more explicitly:

> There is an analytical description of the elements involved here and the reasons why they are applied by employing the problem-solution format. This format helps me because there are references to the same problems that I have come across several times and the solution to these problems is given (participant P17).

This arrangement of a problem followed by a solution plus examples is what students find interesting and inspiring. At the same time, they realise that some patterns are just components that can be added to the page, although changes can be made to the suggested application of a pattern:

> I prefer the pattern because the statement of the problem, the solution, and the examples spur my interest and imagination. I also agree with the idea of copying and using something useful; afterwards, once the pattern is there, I can try to make it better (participant P2).

> Here, there is an explanation of the problem in detail and also what steps should be taken to solve the problem. Also, with the use of examples you can understand exactly what should be done by simply looking at them. Examples also help you form some ideas about your own web pages (participant P7).

Examples were the other main characteristic of patterns. However, examples, as indicated above, are part of the format. Most of the discussion regarding the advantages of patterns, although other features were mentioned as well, had a bearing on the examples included in the pattern:

> The pattern is better developed and detailed. It offers an analysis of what actions should be taken and how important is each action. Moreover, an example is included that shows an application of the pattern. The fact that a pattern explains exactly what should be done is good for me. In this way a pattern helps novices but also advanced designers (participant P14).

> I prefer the pattern because the examples that are given are together with the text and this makes pattern clearer (participant G2).

Examples were included with guidelines as well, in a separate section after the guidelines. Most of the students considered the examples to be part of a guideline and as closely related and linked to the guideline as examples in the case of patterns:

> I consider that the pattern assists me more since it contains essentially not only the guideline itself but also examples. I can say with confidence that these examples are the best way of presentation. The guidelines do come with examples but patterns are structured with a persistent format: title, when to use, problem, and solution (participant P12).

6.6.2.7 Educational value of patterns

Patterns are being highlighted by students as having increased educational value for teaching usability principles:

> The presentation [of the principle] is definitely better using the pattern structure; this structure is one that will stay with the reader. It includes examples in a direct way and not at the end, and is better organised, employing a sequence of when to use the pattern, the problem, the solution, etc (participant G8).

While the term "understandable" was used many times, another term that was also used as an attribute of patterns was "pleasant". These terms add to the educational value of patterns:

> A pattern is more understandable and pleasant to read; I also believe that it is presented more clearly and portrays in the best way the term "Meta-navigation" [the name of the pattern] and what needs attention during the application of the pattern. Furthermore, examples are included with the presentation of the pattern (participant P16).

The format of patterns attracted students' attention and suggested greater use of patterns as a means of presenting knowledge in other fields as well:

> Patterns are easy to remember without a particular effort and this is mainly due to the examples and illustrations included. I really believe that if every book I studied had the same rationale and structure, they would be much better (participant P4).

6.6.2.8 Impact of the format

Students were aware that in essence the same information was presented in two different formats. This was indicated on several occasions:

> In this case the pattern is more comprehensible, since it gives details of the problem and the solution. However, both patterns and guidelines describe the same thing (participant G1).

One reason that students were neutral towards patterns and guidelines was that in essence only the presentation was different between patterns and guidelines:

> Essentially, the pieces of advice given and the textual information is the same. In this case, I can not say that I like one more than the other (participant G6).

Despite this, the impact of examples and structure seem to affect novice designers more and this leads them to prefer the pattern format by far:

> The pattern is more usable since it includes those principles that are presented in the guidelines, and also the presence of examples in the form of images makes it easier for the student to understand the issue (participant P5).

6.6.2.9 Number of examples with patterns and guidelines

Most of the students preferred many examples with patterns; this was pointed out in the questionnaire where suggestions for improvement of the patterns and guidelines were made. One student, however, indicated that several examples given without careful consideration of their position within the text may confuse the reader.

The inclusion of a sensitising image (Fincher, 1999a, 1999b, 2002), apart from the examples included at the end of the pattern, is considered useful and contributes to the understanding of the patterns:

> A characteristic picture immediately after the title shows exactly what the pattern talks about and how it improves usability (participant G2).

One student argued about the merit of using many examples but the background to the argument is that the designer is already experienced and examples are known and obvious:

> Sometimes there is no need for so many examples to be given with a specific pattern; some of them are self-evident and maybe they should be omitted. In these cases guidelines are more informing and helpful in reading quickly through guidelines since the designer has the examples already in his mind. He simply goes through the guidelines to check if something is missing (participant G10).

Examples and pictures seem to be considered necessary even in the case of the most committed proponents of guidelines. One student, who indicated a preference for guidelines on each and every one of the four occasions where patterns and guidelines were being compared, commented that:

> In general, the guideline format is my personal choice, being small, compact and coming with all the necessary information. In this case, however, it would be good to have an example close to the text (participant G7).

6.6.2.10 Use of patterns/guidelines by novices and experts

There were several times that students, while commenting on their preference for either guidelines or patterns, referred to the level of experience a designer should have in order to employ patterns or guidelines more effectively. Patterns were suggested for use by persons who have no experience in web design, while guidelines were suggested for use by designers who know the problems of web design and have come across usability problems. One student explained:

> Since they [designers] have come across the problem and know the issues involved, even one simple guideline is more than enough to get the essential meaning and apply the advice successfully (participant G5).

Guidelines are suggested as a checklist; the designer can use them to check if the web site conforms to the collection of guidelines:

> If someone is familiar with designing web pages and simply wants to check some important issues related to web pages, then guidelines should help because are compact and short (participant G12).

The same viewpoint, underlining that guidelines are more suitable for designers with a certain degree of experience, is expressed in the following comment:

> Guidelines should be used by someone who has the essential knowledge of web design and uses the booklet to get advice; in this way it will be difficult to forget something important (participant P3).

This impression of students that guidelines are more suitable for experts than beginners comes from the fact that examples are not included with the text, while patterns always have an example, which makes it easier to understand the design principle or issue. However, the format of patterns is being suggested as another reason for patterns being more appropriate for introducing principles of usability to beginners:

> Each pattern is presented in sections, i.e., when to use the pattern, the associated problem and the solution. This makes it easier to study than text alone. Therefore, I think that a manual with patterns in the hands of a beginner will enable him to design an interesting site (participant P10).

Summarising, several students considered that patterns should be used by both beginners and expert designers while guidelines were considered more appropriate for use by experts and typically as a reference for good design practices.

6.7 Summary

This chapter described in detail the main study of this research endeavour. Participants were from an engineering oriented department and their motivation, enthusiasm, and involvement in the tutorials were genuine.

The initial stage of the study made sure that participants were ready to be engaged in the post-treatment design session, i.e., that they had developed the necessary skills to apply without effort the usability principles taught with the help of patterns and guidelines. Students adopted design habits to a great degree, following the advice given by patterns and guidelines, as was evident in the post-treatment design and evaluation tests. The level of adopting usability principles was found to depend on the extent to which patterns and guidelines affected the design habits of the participants but also on the individual person as well.

The two groups of students were compared using the scores in a design task given by three independent evaluators applying specific metrics. Also groups were compared in an evaluation task using the thoroughness of each participant in identifying errors in a web site. Several sections of the chapters reported the statistical analyses conducted on data collected. Data were checked for conformity to assumptions to ensure that the appropriate statistical tests were conducted.

Other data collected via questionnaires and interviews were analysed statistically and through qualitative analysis.

Participants in the patterns group performed significantly better in the design task with regards to the application of principles conveyed through patterns and guidelines. The performance of the two groups in the evaluation task was comparable; however, students in the patterns group performed significantly better than students in the guidelines group in errors that are difficult to identify and report. Another comparison was made between compound and simple patterns, using the students' scores in the design test and specific questions during the interviews. What is very clear, from both questionnaires and interviews, is that all participants, regardless of their group, value the pattern format and are strongly in favour of it.

Analysis of the qualitative data collected through interviews revealed themes concerning the advantages and drawbacks of patterns and guidelines, and which also highlighted the reasons for students' preference for patterns.

A detailed discussion of the findings presented in this chapter is provided in the next chapter.

Chapter 7

Discussion of Research Findings

7.1 Introduction

In Chapter 6 the research data related to this investigation was analysed. This chapter provides a general discussion of the study's findings in accordance with the objectives of the study and in relation to the literature. It should be kept in mind that published literature and research on this topic, comparing design patterns and guidelines and their respective utility for novice designers, is limited.

This chapter is divided into six sections. Section 7.2 presents an overview of the main results that address the objectives of the study, while Section 7.3 discusses further findings on patterns and guidelines. Section 7.4 presents issues related to the validity and reliability of the study. Finally, Section 7.5 describes certain limitations of the study followed by a brief summary in Section 7.6.

7.2 Results of the study

This section outlines the main results of the research. Previous work in this area is limited and mainly focuses on comparing a group using no patterns with a group using patterns. In one case experienced and inexperienced designers were used (Chung et al., 2004), while in another experiment designers with at least two years experience took part (Saponas et al., 2006). Cowley and Wesson (2005) compared patterns and guidelines based on the opinions of two groups of students, one using guidelines and the other patterns, but only results about perceived characteristics are presented.

The findings of the present research suggest that patterns can have a greater impact on students than guidelines. Certain rules should be followed in the presentation and format of the patterns. Compound patterns should be avoided at the beginning and patterns should be simple and not extensive in order to have a greater effect on novice designers. Patterns and guidelines presenting usability principles and practices are a very effective strategy of integrating knowledge into classroom teaching and influencing students' design habits and practices.

7.2.1 Overview of main findings

The main findings in relation to the objectives proposed in this thesis indicate that:

Design

[F1] There is a statistically significant difference, in favour of the patterns group, in the overall scores for the design task between students using patterns and students using guidelines.

- **[F1.1]** There is a statistically significant difference in the overall scores for the design task, using only objective metrics.
- **[F1.2]** There is no significant difference in the scores for each individual metric in the design task between students using patterns and those using guidelines. In most metrics, students in the patterns group performed better.
- **[F1.3]** Compound patterns negatively affect the performance of students.

Evaluation

[F2] There is no statistically significant difference between the groups in the evaluation task using thoroughness as a measure.

- **[F2.1]** There is a statistically significant difference between the groups when the difficulty of predicting an error is taken into account; students in the patterns group performed significantly better than students in the guidelines group in errors that were difficult to find and report.

Attitude

[F3] The perceived advantages of patterns and guidelines are considered to be equal before participants become aware of the other format.

Preference

[F4] The students' preference for one or the other format strongly favours the pattern format. Preference was measured by comparing patterns against guidelines in four cases for each participant.

[F5] There is a statistically significant difference between the students' preference for simple patterns and their preference for compound patterns. Simple patterns are preferred over compound patterns for presenting knowledge and experience.

[F6] There is no statistically significant difference in the overall preference for a specific format for presenting advice between the groups. The preferred format, by both groups, is patterns.

In the following sections each of these findings will be discussed.

7.2.2 Design

[F1] There is a statistically significant difference, in favour of the patterns group, in the overall scores for the design task between students using patterns and students using guidelines.

Despite the numerous methods for evaluating web sites, it seems that most are not suitable for evaluating web sites like those developed by novice designers. In such sites there may be a number of violations that badly affect the overall score but may not reflect the application of patterns and guidelines.

For example, one method that seems to be suitable is the method proposed by Olsina and Rossi (2002). They implemented a web site quality evaluation method (WebQEM) that uses scores calculated by features analysis or requirements. Each feature is evaluated quantitatively using the "Logic Scoring Preference Method" (LSP method) (Dujmovic, 1996), which results in a score using weights and logical operators. Low level features are measured first and are then combined into aggregation blocks that eventually produce scores for characteristics such as usability and functionality.

However, using WebQEM still requires subjective measures and weights. Furthermore, Yip and Mendes (1995) commented that employing WebQEM and the LSP method to measure web usability produced several problems with regards to the consistency of LSP scores across subjects. Despite this, such a scheme is promising but requires some refinement for a particular study.

Similar studies (Chung et al., 2004; Saponas et al., 2006) used newly developed metrics and heuristics, which are daunting tasks by themselves. In the current study, 19

metrics were used to evaluate the web pages designed by the participants. In effect, the metrics reflect the application of each of the patterns and their corresponding guidelines using the grading scheme developed for the study.

Table 7.1 shows the metrics and the total and average performance of the groups. Column seven (titled "Better") in the table indicates which group performed better, based on the mean difference (shown in the next column). The last two columns show P-values for the T-test and Mann-Whitney test.

Table 7.1: Metrics, group performance and differences

	Metric code	Guidelines Group		Patterns Group		Better	Mean Difference	T-test sig.	Mann Whitney
		Total	Average	Total	Average				
1	M01_C1	154.766	7.738	154.237	8.118	Patterns	0.379	0.409	0.943
2	M02_N3	122.667	6.133	145.999	7.684	Patterns	1.551	0.107	0.072
3	M03_N6	81.000	4.050	117.000	6.158	Patterns	2.108	0.148	0.146
4	M04_N9	162.667	8.133	155.000	8.158	Patterns	0.025	0.955	0.596
5	M05_N4	114.000	5.700	114.500	6.026	Patterns	0.326	0.565	0.342
6	M06_N5	101.250	5.063	112.500	5.921	Patterns	0.859	0.544	0.581
7	M07_L1	112.062	5.603	117.903	6.205	Patterns	0.602	0.188	0.156
8	M08_L2	154.500	7.725	157.500	8.289	Patterns	0.564	0.273	0.420
9	M09_L8	40.500	2.025	63.000	3.316	Patterns	1.291	0.332	0.363
10	M10_L5	54.000	2.700	96.000	5.053	Patterns	2.353	0.079	0.104
11	M11_T6	89.000	4.450	68.000	3.579	Guidelines	-0.871	0.493	0.542
12	M12_T9	141.500	7.075	135.500	7.132	Patterns	0.057	0.929	0.767
13	M13_D4	93.000	4.650	135.000	7.105	Patterns	2.455	0.074	0.075
14	M14_T1	161.589	8.079	147.376	7.757	Guidelines	-0.323	0.298	0.438
15	M15_E1	115.333	5.767	111.667	5.877	Patterns	0.111	0.841	0.682
16	M16_T3	168.000	8.400	161.000	8.474	Patterns	0.074	0.805	0.801
17	M17_T4	171.000	8.550	171.000	9.000	Patterns	0.450	0.096	0.083
18	M18_T8	115.967	5.798	119.574	6.293	Patterns	0.495	0.341	0.181
19	M19_D2	167.667	8.383	162.334	8.544	Patterns	0.161	0.501	0.976

There was no significant difference between the two groups, even though the patterns group performed slightly better, in 17 out of the 19 metrics **[F1.2]**.

However, the difference between the groups is statistically significant when a comparison is made using the overall score of each student **[F1]**. What is also important is that even if the objective metrics are used, i.e. metrics where all evaluators gave the same scores, the difference is still significant **[F1.1]**.

Metrics measure the application of patterns/guidelines, hence the degree to which a metric reflects usability depends on the particular pattern/guideline. However, the usability each pattern/guideline holds is difficult to estimate. Two sites may have the same score but one may score higher in metrics that are important in usability and the other higher in metrics that are not. Since metrics carry the same weight and are

measured on a 0–9 scale, the two sites may have the same overall score but not the same usability.

There was also a statistically significant difference in the overall scores in the design task using only objective metrics, which are easy to employ, because they rely on objective criteria. Objective metrics enhance the validity of the study.

The patterns group performed worse than the guidelines group in two metrics that measure application of compound patterns. By removing all four compound patterns from the statistical analysis the difference between the groups remains statistically significant and increases in favour of the patterns group **[F1.3]**. This is a secondary result and is intrinsically less reliable that the primary results of the study (see Section 6.3.5).

7.2.3 Evaluation

[F2] There is no statistically significant difference between the groups in the evaluation task using thoroughness as measure.

Usability evaluation studies, focussed on comparing evaluation methods, use a number of measures to determine the performance of the evaluators (Sears, 1997). This study used thoroughness and the number of false positives as measures. Several other measures can be employed in a usability evaluation. Validity of a usability evaluation is a measure that calculates the success of the evaluator against the total errors reported, that is true errors identified and false positives. Using validity and thoroughness the effectiveness of the participant can be calculated. Hartson et al. (2001) propose that severity ratings should be taken into account in order to define a better criterion of effectiveness. Furthermore, reliability and downstream utility (Hartson et al., 2001) are suggested as measures for comparing usability evaluation methods. Effectiveness can also be categorised as superficial and actual effectiveness (Cockton et al., 2003; Cockton and Woolrych, 2001).

Such measurements require complex evaluation tasks, which are explained in Section 6.4.1. The experiments were intended for groups which were compared on their design task rather than the evaluation of web site, mainly because the set of guidelines and to a greater extent patterns are intended for design guidance. However, an extensive evaluation task may offer some advantages as described in Section 9.5.

Several studies (Bailey, 2001; Law and Hvannberg, 2004; Woolrych and Cockton, 2001) have criticised heuristic evaluations and expert reviews, indicating that there is very little overlap in findings between expert review and usability testing. Indicative of

this position is Bailey (2001), who states that for every true error there is more that one false positive reported. Other studies dispute such findings (Barnum, 2003; Molich and Dumas, 2004). Still, an expert review is the cheapest and quickest method of performing an evaluation before the web site is published on the internet. Such an approach should be used as a formative method of evaluation to complement other evaluation techniques.

Law and Hvannberg (2004) suggest that the effectiveness of usability evaluation methods depends on the tasks, the techniques, the context, the experience, and the characteristics of the evaluators. Chevalier and Ivory (2003a) report an average thoroughness of 36% for participants in their investigation. In the first study, average thoroughness was close to 32%, and in the main study it reached 48.9%, which is considered to be quite high. There was no statistically significant difference between the performance of the groups on thoroughness and false positives.

The good performance of the study participants in the evaluation task, compared to other studies, can be attributed to the following factors:

- Errors on web pages were mostly easy to find and surface errors that required no extensive or complex interactions.
- Errors were close to the sense of good design practices, which students developed during the web design course.
- Errors, most of the times, violated principles advocated by the set of patterns/guidelines.
- The interface under evaluation was a simple web site, providing information about a company.

It is estimated that the above factors probably had a greater effect on the number of false positives indicated by the participants. Some of the students may have preferred to be conservative in the evaluation and had avoided making risky comments that would have resulted in false positives. Also, the fact that the number of errors was large, more than 20 on each page, may have had an influence on the number of false positives. That is, students reduced their attention to finding errors after they had reported a reasonable number of them.

Furthermore, for an evaluator, it is easier to evaluate a simple web site, and to do so with great success. Such sites are those that student participants visit frequently on the web and are familiar with. Other user interfaces, such as a software interface or a web application that the evaluator is unfamiliar with, are more difficult to evaluate and

require a careful approach. The interface used for evaluation by Law and Hvannberg (2004), resulting in poor results during an evaluation task, was very little known to the majority of users. Law and Hvannberg (2004) also refer to the cognitive load (Sweller, 1994, 1998) which is imposed on students when extra resources (such as new rules, heuristics, laws, principles, or criteria), and which is also due to the extra procedures required to be implemented in the tasks and the reports to be presented after the evaluation. Cognitive load was evident during the first study due to students working with new techniques and concepts. To keep the cognitive load low on them, in both studies, no particular procedures were required in the evaluation task; students simply indicated errors in their own words without using complex technical terms or heuristics.

Finally, participants' comments and suggestions for improving usability and eliminating errors on the site demonstrated that both groups employed usability principles; there was implicit and explicit reference made to specific patterns/guidelines. In some instances, participants suggested improvements in places that were not considered even by the designer of the site and the members of the research team.

Patterns and guidelines can successfully communicate usability principles and knowledge to novice designers and can affect the evaluation skills of participants. It should be noted that students did not receive any formal training about evaluation techniques and procedures.

7.2.3.1 Comparing groups using easy and difficult errors

[F2.1] There is a statistically significant difference between the groups when the difficulty of predicting an error is taken into account; students in the patterns group performed significantly better than students in the guidelines group in errors that were difficult to find and report.

Since most of the errors on the web site were easy to predict, it is possible that any differences in the performance of the participants may be masked. An error can be classified as difficult or easy to predict by using the number of participants who reported the error. There are statistically significant differences between the two groups when the analysis is focussed on errors that are difficult to find, e.g. those errors that were predicted by 10 or 14 participants at most.

7.2.4 Attitude

[F3] The perceived advantages of patterns and guidelines are considered to be equal before participants become aware of the other format.

This result suggests that apart from tutorials on web design techniques any further knowledge and information concerning usability principles in the form of tutorials, or books are considered to be very useful. Such information is very welcome and considered by students necessary knowledge about usability, part of the web design skills a designer should possess.

Patterns and guidelines were presented to participants in tutorials and in booklets to study on their own. Participants had to study the booklet in order to fill in a form with a short description of each pattern/guideline, as explained in Section 6.2.7. There was one question in the questionnaire on the usefulness of the patterns/guidelines presented in the tutorials. There was also another one on their usefulness, as they were presented in the booklet (see Table 6.25). Students considered patterns and guidelines equally useful for both cases.

Participants spent some time studying during the web design tutorials and the sets of patterns/guidelines before the final test. Using the self-reported indications of the participants about study times, there were no significant differences between the groups on both occasions (see Table 6.25).

Students used the booklet during the design task to get advice and information. The average indication by participants to a question about the use of the booklet during the task, using a five-point Likert-type scale, was 2.500 for the guidelines group and 2.895 for the patterns group (see Table 6.25). The following coding scheme was applied: 1="Not at all", 2="A little", 3="Moderately", 4="Much", 5="Very Much". This is in agreement with observations made during the design task, which concluded that the use of the booklet was moderate, i.e. participants used the booklet from time to time. No participants used the booklet as a checklist to check if all possible patterns/guidelines had been applied in the web site, even though this was considered by students as a useful attribute of guidelines. It seems that participants were too confident about remembering and using principles or they must have applied only those principles that they remembered and considered most important. At the same time, one may question if it is practical to search for patterns and guidelines while under pressure of developing the web site. However, tool support, even in the form of a pattern/guideline browser, may prove to be a useful and powerful means for helping novice designers.

During the interviews students were asked about the reasons for making certain errors and the most common explanations given were: lack of experience in applying the principles, lack of practice with patterns/guidelines, time pressure and stress during

the task. It should be noted that there was no time left to iteratively evaluate and redesign the site.

Patterns and guidelines, as was indicated on the questionnaire, are also considered to be equally useful to the design and evaluation tasks, and equally helpful in developing the abilities of participants to design a successful web site.

The only significant difference between the two groups was in the indication for their use in the future for web design (see Table 6.27). Most of the participants in the patterns group (78.9%) indicated that they will "Definitely" employ patterns in future design projects, while from the guidelines group only 35% indicated the same rating. "Definitely" was the highest indication on the five point Likert type scale. This is in line with comments that students made during the interviews about the format of patterns (see Section 6.6.2). It seems that patterns inspired more participants in the patterns group to present and document knowledge than guidelines did in the guidelines group. However, this result is in contrast to what Cowley and Wesson (2005) suggest in a similar experiment, where both groups felt equally positive about using patterns and guidelines in future projects. One possible explanation for this is that both sets were considered to be useful design aids for a designer to implement or to seek advice about. The authors use different sets of well-known patterns (van Duyne et al., 2002; van Welie, 2001-2007) and guidelines based on those by Nielsen et al. (2001), which are available only commercially. These patterns and guidelines refer to high-level and complex usability issues but are probably not balanced. Unfortunately, not many details about the results are presented.

7.2.5 Preference

Students' preference for a particular tool was revealed by comparing patterns with their corresponding guidelines. Their preference was examined in three different aspects: preference for a format, preference for using simple and compound patterns, and for overall preference.

7.2.5.1 Preference for a format

[F4] The students' preference for one or the other format strongly favours the pattern format. Preference was measured by comparing patterns against guidelines in four cases for each participant.

Despite the fact that the guidelines group were taught, studied and used guidelines, their preference for a particular format is the same as for the patterns group, i.e. they prefer patterns over guidelines.

Guidelines are simple and compact. One disadvantage of them, according to participants, is that examples are not given together with the guideline and the guideline comments. Although examples were included at the end of the booklet, the lack of proximity to guidelines is considered to be a drawback. Students were aware of these examples and studied them. However, it seems that the location of examples away from guidelines is not just a simple annoyance, i.e. having to go to the back of the booklet to see the example. Examples, in the form of pictures and illustrations, are not always considered essential in presenting a guideline, and guideline presentations in books (Badre, 2002; Brinck et al., 2002; Fowler and Stanwick, 2004; Lynch and Horton, 2002) do not always include examples. The only exception to this fashion is the Koyani guidelines. Examples make a permanent impression on students' minds. Students were focusing on examples first, over anything else. They were trying to understand the principles relying mostly on the examples instead of reading the text. During the tutorials most of the students' questions were in relation to examples. Also, some of their comments about improvements to patterns and guidelines concerned examples. Examples are an essential part of the learning process, as indicated by cognitive psychology and educational learning (Lee and Boling, 1999; Levin et al., 1987; Paivio, 1986). In the first study, even simple guidelines could not be delivered without examples during the presentation of guidelines. If examples are included with each guideline, then one of their disadvantages can be eliminated and guidelines can be greatly improved.

Examples in patterns, being next to the other pattern elements, are considered an integral part of patterns. The use of an example soon after the title of the pattern is appreciated by students, and is considered to contribute to the overall positive impression made by a pattern. Fincher (1999a, 1999b, 2002) considers that the purpose of the example is to sensitise the user and to invoke a favourable reaction. Participants referred to this example in the pattern as "the characteristic example". Examples invoked several comments by students. As indicated by participants, examples spur their imagination and interest, and make students wanting to copy the example into the web pages and then try to make it better. The importance of examples was demonstrated in the first study where the need for more examples – and also for examples that were successfully conveying the usability principle – was explicitly expressed. In the main study the participants, echoing the same theme, repeated how important examples were.

The format and structure of patterns is the second attribute, after examples, that is considered important by students. Students identified and discussed key aspects in the

pattern format. These aspects reflect completely the opinion voiced by Alexander et al. (1977) that a pattern is a three-part rule expressing a relation between a context, a problem, and a solution and also Tidwell's (1999) definition of a pattern being a solution to a problem in a context. In the interviews participants indicated that they found the problem-solution format easy to understand and to remember. The contextual component of the pattern format was indicated implicitly by participants pointing to the fact that patterns referred to problems they encountered during the design tutorials and design tasks. Similarly, the context of patterns was implied when participants discussed changing patterns in a way suitable to the web page under construction.

Patterns were also described in a way that mirrors what several proponents of patterns suggested about their attributes and advantages. Van Welie et al. (2000) indicate that a pattern presents when, how, and why the solution is applied; participants considered it to be one of the advantages of patterns that they "clearly demonstrate when to use the pattern, what the problem is, and which solution to apply". Griffiths and Pemberton (n.d.) describe patterns as "engaging and lively", while participants suggested that patterns are "revealing" and "illustrative". According to van Welie et al. (2000), patterns are instances of good design and help designers construct new instances. Students highlighted that it was possible to use patterns to form new ideas and that once the patterns were applied they could improve the initial implementation. However, there was no indication that patterns were perceived and used as generative to the extent hinted at by Fincher and Windsor (2000). It is estimated that using low-level patterns and with participants, having limited experience with them, such an attribute was unlikely to be considered as a pattern characteristic.

Patterns used in this study tended to be descriptive, that is they "describe" a problem and "describe" a solution, as was suggested by Alexander et al. (1977); this was also indicated by participants. In contrast, guidelines are prescriptive in nature (Ivory and Hearst, 2001). Some participants highlighted the prescriptive character of guidelines in a negative way by commenting that the style of guidelines is "too imposing and authoritative".

In conclusion, it is evident that some of the issues and attributes discussed and expressed by experts and researchers about patterns and guidelines have surfaced while interviewing students. The difference now is that these characteristics were indicated and expressed by novice designers, having encountered such tools for the first time in their short career as designers.

7.2.5.2 Simple and compound patterns

[F5] There is a statistically significant difference between the students' preference for simple patterns and their preference for compound patterns. Simple patterns are preferred over compound patterns for presenting knowledge and experience.

The result was obtained by quantifying data from the interviews and using statistical analysis. The statistical test did not take into consideration the group that each participant belonged to. The pattern format was still considered to be better than the guideline format even when compound patterns were compared, but the increase in preference towards guidelines in the case of compound patterns needs a careful investigation.

Patterns are described as a mechanism for consolidating knowledge contained in a number of guidelines, in such a way that can be understood and used without any difficulty by designers (Wesson, 1999). Lea (1994) suggests that patterns can be extended down to fine levels of detail and the application of a pattern may require other subpatterns to be implemented. Tidwell (1999) makes clear use of subpatterns. For example, in Tidwell's collection a "Form" pattern is presented in which several subpatterns are included; however, these subpatterns are presented in different sections, keeping the length of the pattern short. Following such an approach, a pattern language can be formed by linking a pattern to its subpatterns. Some pattern languages (Graham, 2003a, 2003b; van Welie, 2001-2007) try to keep each pattern short. In contrast, patterns by van Duyne et al. (2002) present patterns that span several pages. Such patterns include a number of guidelines. Each guideline includes comments, suggestions, and examples. All compound patterns presented in the current study fall into this category of patterns, i.e. a pattern contains a number of guidelines. This may be up to four guidelines, with comments and examples.

Not all patterns have equal value for designers. This has been shown to be true for patterns in other domains as well. Vokac et al. (2004) examine the effects of using OOD patterns in the context of programming maintenance. The authors conclude that each design pattern has its own character. Ease of learning, use, and adoption differ from pattern to pattern. Of the four OOD patterns tested, only two were understood by participants with little or no previous knowledge, one caused some problems, while the other with a fairly complicated structure had a negative effect (Vokac et al., 2004).

In line with the above study, compound patterns in the current research do not have the same value as simple patterns for novices. The structure of compound patterns affected students. Participants explained that in the case of compound patterns the simple and

compact way of presenting guidelines was one reason for preferring the guideline format instead for a compound pattern. Compound patterns seem to require more attention from students in order to focus on each piece of advice presented. Different chunks of knowledge given one after the other, as in the case of guidelines, are considered, at least by some students, to be better than one big single chunk. Another issue with compound patterns is appearance. The appearance of a compound pattern in the booklet was indicated by students as another reason for preferring guidelines. Examples in compound patterns, one for each principle within the pattern, need to be presented in a suitable way so that each example will be associated with the right principle. Each principle should be linked to the previous and the next one in order to make the patterns more coherent for better understanding. Finally, the solution needs to be phrased in a way so as to communicate to designers for every principle presented. The solution part in some van Duyne patterns includes many sentences that the designer may not appreciate and remember. In the patterns used in this study the solution part of compound patterns extended over 3-4 lines of text. Trying to keep the solution brief may make it vague and not to the point.

The result of the comparison of simple with compound patterns is triangulated with the performance of the groups in the design test. Compound patterns, apart from ranking lower in the preference of students, seem to have a smaller impact on students. This argument is based on the scores in the design task. In two out of the four compound patterns used in the design task participants in the guidelines group performed better (but not significantly better). In fact, these two patterns were the only ones where the guidelines group scored higher. By taking out the scores of all compound patterns the difference between the two groups increased in favour of the patterns group.

In conclusion, compound patterns are not as successful as simple patterns in communicating experience and guidance to novice designers. Presenting simple, easy to digest patterns is the preferred format and the one that impacts more novice designers. This of course implies that authors and pattern developers should focus on writing simple patterns for presenting knowledge and experience instead of compound patterns.

7.2.5.3 Overall preference

[F6] There is no statistically significant difference in the overall preference for a specific format for presenting advice between the groups. The preferred format, by both groups, is patterns.

This is the outcome of a question asked just before the end of the interview. Students indicated their overall preference on a 7-point Likert type scale. Students had already compared simple and compound patterns. At that time, students had a better understanding of patterns and guidelines and were required to indicate their conclusive impression. Overall, patterns are preferred by 85.3% of participants, while only 8.8% prefer guidelines. The remaining 5.9% have no preference for a format.

7.3 Other observations and remarks

The conclusions presented in this section are based on observations during the teaching of patterns/guidelines, and the tests and comments of students in the interviews.

7.3.1 Links

Students did not appreciate the potential of existing links within a pattern. No one inquired about those links or asked any questions about them. During the tutorial about patterns and guidelines, only a short explanation about links was given. This was expected after observing similar behaviour in the first study. Links however could be possibly used for more complicated tasks and when a pattern language is more complete and structured.

7.3.2 Pattern names

Pattern names are considered to be one of the important elements of a pattern. Gamma et al. (1994) point out that finding successful names for patterns is one of the hardest part of developing a pattern collection. Pattern names form a basic vocabulary for designers. Van Welie (2001b) suggests that a good pattern name can be part of a vocabulary for discussing problems and solutions to the problems. A single word or a short phrase is used as a pattern name. In contrast, a guideline title usually forms a full sentence and is longer than a pattern name. To come up with good pattern names, Chung et al. (2004) solicited feedback from designers, by asking them to guess what the pattern name might be about, in order to shape good names for patterns.

The pattern names in this study were in Greek. Some of the pattern names, after feedback from the first study, were changed to better reflect the pattern content. The only opportunity for using pattern names, in the main study, was during the interview. Students did not use pattern names except on a few occasions. Overall, the use of pattern names was limited, probably less than in the first study. However, in the first study there were more chances of referring to names since those interviews were more

relaxed. Technical terms, which were also pattern names, such as "meta navigation", "page titles" and "white space", were used, if not extensively.

One reason for pattern names not capturing the attention of participants could be that a particular name was not successful and did not communicate the pattern well. There were also language differences that may possibly have limited and prevented the adoption of pattern names. Some of the pattern names can be short in English, but long in Greek. A pattern name like "Clickable Images" is a long "Images that can be clicked" pattern name in Greek. This happens with other pattern names as well.

It seems that pattern names need to be carefully chosen and developed through feedback and several iterations. This is in line with an earlier study by Wesson and Cowley (2003) and the findings of the exploratory (Kotze et al, 2006b) and the first study. Pattern names probably do not communicate the essence of a pattern and do not attract the attention of users until studied in more detail and used in several discussions. It may be possible that if another designer uses the name to indicate the pattern, then a novice designer might be encouraged to adopt the name as well.

7.3.3 Guideline titles

In contrast to pattern names, guideline titles were described during the interviews as one the main advantages of guidelines. Participants indicated that guideline titles provided all the necessary information to understand the main focus of the guideline. They also indicated that guideline titles can be used as a list to check if all guidelines are followed in a web site. Others suggested that guideline titles can serve as a collection of useful suggestions and recommendations for design.

Guideline titles are judged only as communicating the content of the guideline and not as vocabulary for designers. Guideline titles, short prescriptive sentences, carry successfully the essence of advice included in a pattern name or pattern solution. There are several reasons for this:

- Guideline titles are longer than pattern names and therefore more is said explicitly than implied.
- A guideline title can include a successful pattern name, therefore a title can be as good as a pattern name. A good pattern name like "Meta Navigation" easily becomes a nice title, e.g. "Use Meta Navigation".
- Guidelines come in one form, compact and short, while patterns may come in a compound form where is more difficult to express many guidelines with a short name.

Finally, guideline titles can be used to provide an easy reference guide, which a designer may go through to refresh his memory about good usability practices.

The above discussion leads to a suggestion that may enhance the pattern format. A short summary of the solution could be included in the format and presented in the same fashion as a guideline title. The proposed PLML pattern format (Fincher, 2003) includes a "synopsis" element that provides a summary of the pattern and could be useful in cases where display space is limited. A synopsis, however, is not included in the format of known collections of patterns, with the exception of the pre-pattern collection by Saponas et al. (2006). A synopsis is even more useful with patterns where the solution is long and includes more than one sentence, as in the case of compound patterns.

7.3.4 Pedagogic value of patterns

Patterns are proposed as a tool that supports learning and teaching by capturing and transferring experience (Seffah, 2003). Design patterns present best practice and organise previous experience and knowledge. Knowledge organisation helps students, when faced with a similar problem, to remember and use the information that they have learned (Muller et al., 2004).

Learning is achieved by encoding information in long-term memory. Long-term memory can be enhanced by chunking elements, that is, by creating long memory structures that are used as perception units. Chunking has also been described as schema construction (Jones and Idol, 1990; Sweller, 1994, 1998). Learning new information and codifying the information into a new schema involves the assimilation of information and knowledge. Patterns present knowledge in an organised and structured way that assists knowledge procession and learning (Kotze et al., 2006a).

In this study design principles were presented to students "through patterns" (Griffiths and Pemberton, 2003). Participants commented that the structure of a pattern provides reference to problems that had previously been encountered in designing. This suggests that a pattern has the attribute to make designers remember and use the pattern. The pattern structure was indicated in the interviews as easily remembered after a period of time. Patterns are characterised as easy to understand and pleasant to study, pointing to the fact that patterns present knowledge organised in chunks that are probably easier to assimilate than large undivided units of information.

7.3.5 Target audience

The feeling of students was that guidelines were more appropriate for expert designers who are aware of usability principles and just need a collection of recommendations to remind them of the way a site should be designed. Guidelines, being more compact and not as lengthy as patterns, are considered to be not as rich in information as patterns.

Conversely, patterns are considered to be more suitable for inexperienced persons who need to be introduced to principles of web design or need to familiarise themselves more with design issues. The format of patterns, having examples and a problem-solution structure, contributes towards this impression.

7.4 Validity and reliability of the study

In this section the threats related to validity and reliability to the experiment are analysed. Validity depends on the variables of the experiment and several other factors that may affect the experiment. Different types of validity apply and are prioritised depending on the experimental setting and design and the conclusions drawn from the experiment.

Internal validity of the experiment refers to whether the researcher controlled or eliminated factors that may affect the dependent variable. If there is internal validity in a study then conclusions can be drawn about the causal effect of the independent variables on the dependent variables. There are some but limited threats to internal validity. These threats will be examined here.

The period from treatment to tests in the first study was twelve days. In the main study this period was made as small as possible and was only four days. Some history or maturation effects can be present in cases where students practised or studied more during the period prior to the design test. However, this was not likely due to the limited time before the design test. Time was given to the participants in order to study patterns/guidelines. Participants were told that no practice was required for the test and that they should design according to the usability principles and what they had learned so far and not to use techniques which were not implemented during the tutorials.

Due to drop-out, the number of participants in the patterns and guidelines group was not equal. However, it is estimated that since the number of participants is relatively high, this did not affect the results. It should be noted that despite students dropping out, the groups remained balanced with regards to the variables identified as possibly affecting the results, as described in Section 6.2.6.

The threat of differential selection of participants was also controlled through balanced groups. The worst that could have happened was that the best or the worst of participants were allocated to one group. Study participants were placed into four groups of similar ability – adequate, medium, good and excellent – and then the members of each of these groups were assigned to the two experimental groups in a random fashion.

The only risk in the treatment implementation is diffusion of treatment since between the treatment and the tests some period of time had elapsed. Hence, participants from one group might have informed participants in the second group about the other technique, even though this was not allowed. Diffusion of treatment, it is believed, was under control as the experiment, and thus the performance of students, was not part of an academic course. Nobody would have gained from passing information to someone else, and therefore the risk was low. As an extra measure guarding against diffusion, participants were promised that the material presented to one group would be given to the other after the tests.

Conclusion validity refers to the relationship between the variables of interest and the outcome of the experiment. Threats associated with the statistical tests in the experiments were minimised. Parametric and non-parametric tests were used. Use of non-parametric tests is recommended with small sample sizes and when certain assumptions about distributions are violated. All statistical tests used are considered to be robust and the most suitable; alternative and exact tests were used whenever there was an indication that a test could be inaccurate or certain variables were close to the allowed limits. Threats with respect to the participants are also limited since all of them have attended the same tutorials. Finally all treatment implementations are considered to be reliable.

Testing can not be considered as a threat in the experiment since tests were considered part of the tutorials and all students took part in the same tests. All the tests, including the preliminary test, had the same practice effects on study participants and did not alert them to the intention of the experiment.

Mitchell and Jolley (2004) consider that construct validity is the degree to which the study measures and manipulates the underlying elements that the researcher claims to be measuring and manipulating. Patterns and guidelines were formed and manipulated. The way patterns were formed and how the established concepts of guidelines and patterns are depicted in the patterns and guidelines of the study is detailed in Chapter 8 below. Furthermore, construct validity requires having confidence

in the measurement techniques. A design and an evaluation test were used to reflect and measure the application of patterns and guidelines. For the evaluation test, the ability of participants to find errors within a site was assessed using thoroughness as measurement. Thoroughness is a standard measure within an evaluation method performed by an expert. For the design test several metrics were developed and employed to assess the sites that participants designed. The assessment scores indicate the extent that patterns/guidelines are applied. The application of patterns/guidelines also provides evidence that participants apply principles that affect usability. The more patterns/guidelines are applied, the greater the usability of a web site. However, the application of patterns/guidelines gives only a partial picture of the usability of a site. Scores are positively related to the usability of a site but this relationship can not be specified exactly. Although scores refer to the application of specific metrics, even when two sites have the same score, they may not have the same usability. In conclusion, threats to construct validity are considered to be under control.

External validity refers to the extent to which the results can be generalised across different experimental settings, procedures and participants (Brewer, 2000; Shadish et al., 2002). If the target population is considered to be designers in the web design industry, then the main factor that constitutes a threat to external validity is that participants were students acting as novice designers. There is no threat to the external validity if the experiment is considered to be targeted at students and patterns/guidelines are used to convey experience and guidance to novice designers. The three experiments took place in different settings and at different academic establishments. Furthermore, the fact that the results from the main study confirm and extend the preliminary results and the findings of both the exploratory and the first study are an indication of external validity.

Threats to external validity with regards to the evaluation tasks are considered to be under control. As was explained, no generalisation is made since the errors in the web sites were easy to find and of surface nature. If one needs to generalise, further tests are required with all types of errors. This is described in Chapter 8 where suggestions for further research are made.

A threat to external validity in the form of reactive effects that could be considered in the study was the motivation and probably fatigue of participants in the evaluation test. That was observed in the first study, where each participant evaluated a web site on his own. In order to minimise such an effect, participants in the main study performed the tasks in groups.

The inter-rater reliability of the study across the three evaluators was examined using the ICC measure (Shrout and Fleiss, 1979). Reliability is considered to be very high. One reason for this was the detailed scoring scheme for each particular metric and submetric.

Overall, it is considered that the threats to the experiments are not considered large or significant. After the lessons learned in the first study, all the necessary measures were taken to control and reduce these threats in the main study.

7.5 Limitations

Like every research endeavour, this study is limited in certain respects. These limitations must be taken into account while interpreting the research results. In this section, the key limitations of this study are discussed.

The major limitation of this study is its size and scope. The study examines only a limited set of patterns/guidelines. The way the specific subset of patterns and guidelines was selected and used to present usability principles and guidance to the participants is a limitation compared to the patterns and guidelines that could be used and applied in a typical web design project. The subset of patterns and guidelines affected also the teaching process and the structure of the course as well as the metrics used to evaluate the artefacts. The design principles and issues involved are simple ones. Patterns for complex or high-level usability issues were not employed due to the design of the experiment and the limited experience of the student participants. However, the study can serve as a model for a larger study and this is suggested for future work.

The majority of the patterns used were formed by converting guidelines into patterns. These patterns can be different from what may be expected and considered to be a pattern by the research community. This issue, which is also a limitation, is further detailed in Chapter 8.

Experiments with students have certain limitations and suffer threats to the validity of the study. Some researchers, in software engineering and other domains, suggest that running experiments with students reduces the validity of the study (Kitchenham et al., 2002). Students are not facing the real environment, situation and demands of the production process and sometimes the results are different from those of professionals. However, such reservations do not apply here as the focus of the research was on students acting as novices and a specific requirement of this study was that participants have no experience in design at all. Using participants with a well-known profile and of predictable behaviour was one of the advantages of the study. The

purpose of the web design tutorials was to bring students to a level where it should be easy for them to design web sites in a professional way. Students, acting as novice designers, though lacking extensive experience, offer a better starting point for a proper comparison than designers with a variety of experience, which can not be accounted for. Running the experiment with students can offer some advantages that are almost impossible to find if a similar experiment is conducted with professional designers: discipline in the learning procedures, motivation to perform and learn, high attendance rate, and low drop-out rate in the final tests and tasks. It is suggested that, in experiments employing experienced designers, special care should be taken in order to control the designers with regards to their personal experience and style in experimental work.

The study may be criticised of confounding two issues namely the assessment of teaching of participants using a set of patterns/guidelines and the application of patterns/guidelines by the participants. Teaching refers to the three hours of teaching and presenting patterns and guidelines to the two groups of participants prior to the final tests. An alternative approach could be to deliver three hours of teaching using patterns/guidelines, and then ask the participants to conduct an exercise without the aid of written material. This would test the efficacy of patterns versus guidelines as a teaching method. A different approach, that does not involve teaching, could be to demonstrate to the participants the use of patterns and guidelines using a small set of patterns/guidelines that is not included in the matched sets of patterns/guidelines, i.e. to teach them patterns and guidelines as a method, and then conduct tests where the materials available to them are copies of the matched sets of patterns/guidelines. An example of an experimental design that involves no teaching is that of Chung et al. (2004). They allowed a two day familiarisation period with the patterns and the use of paper copies of the patterns during the task session. One obvious limitation of this approach is that the study-familiarisation time of the participants cannot be controlled or cannot ensure a minimum comprehension level and that some participants may spend no time at all studying the set of patterns/guidelines. Presenting usability issues using patterns/guidelines, as it was done in this study, is not dissimilar from what would have happened in a commercial practice. A company would run a training day in which most, if not all, patterns and guidelines would be presented and then people would be asked to start working and using them in practice. The alternative designs do not present better options than the approach followed in this study. The study approach allowed

controlling other problematic issues that might have risen especially with participants being students with no previous experience in web design.

Metrics could be considered a limitation of the study since they were not tested widely and reflect only the application of patterns and guidelines. An extensive search revealed no metrics suitable for the experiment. Therefore, metrics reflecting the use of patterns and guidelines were developed. The metrics were tested and refined in the first study. Metrics for compound patterns need some attention as to the way they contribute to the overall score. The metrics may be considered too detailed and required some practice. Once the evaluator was familiar with them, the scoring process was able to progress quickly through the web pages.

The current study was not initially designed to focus on and examine the effect of compound patterns, i.e. to explicitly quantify and contrast compound with simple patterns. The statistical analysis using only scores from simple patterns (see Section 6.3.5) was a new test that was carried out prompted by the difference in preference of the participants towards simple and compound patterns. Consequently, the results of this analysis may be intrinsically less reliable. Such an analysis, using only the scores of simple patterns, removes the influence of compound patterns as a confounding factor. However, as mentioned above, it should be noted that the analysis of the interviews indicates that participants prefer simple patterns to compound patterns. It would be of value to conduct experiments examining this aspect further.

Observations were not used extensively in the study, mainly only to improve the design of the experiments rather than as part of the data analysis. However observations used in data analysis may need more rigorous procedures than those used for observations in the current study. A better study design, which results from the experience of the three experiments in this investigation, would still be based on measurements from tests and on qualitative data from interviews, questionnaires, and observations. The weight put on each of these would depend on the objectives of the study. Observational data could be used more through use of consistent and automated methods of collection. Patterns and guidelines can be made available through a browser where a software tool will be used to track the visited patterns/guidelines and the time spent on each of them. In this way, actual use would be accurately monitored (Saponas et al., 2006), especially if combined with video-recorded sessions.

Human factors play an important role that cannot be ignored in situations like this. Participants' motivation, learning style, and attitude towards web design affect the results. Such limitations are present in every experiment. In the final study human

factors were controlled by selecting the best and most motivated students and by carefully balancing the two treatment groups.

Finally, another limitation may be related to the issue of self-reported questionnaires. There could certainly be inconsistencies in the way participants evaluated their preference for patterns or guidelines. However, by replicating the interviews and questionnaires in several aspects, in the first and the main study, results showed to have reliability across students of different backgrounds, abilities and learning orientations.

7.6 Summary

The purpose of this chapter was to discuss and present the results of the main study. The results were linked to previous research and experimental studies about patterns and guidelines.

This thesis empirically tested how patterns and guidelines affect novice designers in creating and evaluating a web sire. Moreover, this study also highlighted empirical evidence concerning students' attitudes and preference towards patterns and guidelines. The research findings have shed new light on a number of issues related with the employment of these tools.

Threats to the validity and reliability of the study were examined and the main limitations that should be taken into account while interpreting the research results were identified.

The following chapter examines the study patterns and guidelines and provides an assessment of the patterns' characteristics.

Chapter 8

A critical evaluation of guidelines and patterns used in the experiment

8.1 Introduction

This chapter will take a critical look at the patterns and guidelines used for experimentation purposes. Its motivation concerns relating the patterns and guidelines used in the study to the broader concepts found in the HCI community. Patterns and guidelines used in the study are compared with other patterns and guidelines from known collections. The primary focus of the comparison is on patterns. The patterns of the study are compared with patterns from established collections using two frameworks of characteristics. This comparison will establish the scope of the study and provide a clear picture of the attributes and features of the patterns used in this study. At the same time, the question as to whether the patterns employed in this study can be regarded as patterns will be addressed.

The patterns and guidelines used in this study are hereafter referred to as "study patterns" and "study guidelines".

Section 8.2 provides an overview and justifies the approach followed in this study. Section 8.3 presents a review of how the sets of the study patterns and guidelines were formed. Section 8.4 contrasts the study guidelines with guidelines from other sources. Subsequent sections 8.5-8.7 provide detailed assessments of the study patterns and compare them with patterns from well-known pattern collections by using

characteristics that make patterns notable. Section 8.8 provides an overview of the study patterns and Section 8.9 presents a summary of the chapter.

8.2 Overview of the approach to the study

Previous research into HCI patterns has followed several approaches. Chung et al. (2004) and Saponas et al. (2006), by using similar procedures, evaluated the effectiveness and use of patterns with one group employing patterns while the control group not using any form of tool or support. A set of patterns was developed for the specific domain of the each study. Both research teams considered those patterns to be pre-patterns since they are not in common use by designers. Cowley and Wesson (2005) compared patterns and guidelines but the sets of guidelines and patterns were not balanced and only the opinion of the users was assessed after an exercise building prototypes and evaluating web sites. Kotze et al. (2006a) explored the use of design patterns and anti-patterns in teaching HCI principles. The authors resorted into using simple positive and negative guidelines to compensate for the complexity of patterns and anti-patterns and the lack of validated and easy to use anti-patterns.

Although patterns were repeatedly compared with guidelines in the literature, based on the attributes and perceived advantages (Borchers, 2000; Dearden and Finlay, 2006; Mahemoff and Johnston, 2001; Griffiths and Pemberton, 2003; van Welie et al., 2000), there was no formal evaluation or comparison of these tools. From the early stages of this attempt (i.e. the exploratory study) to empirically evaluate and contrast patterns and guidelines it was clear that it was not possible to employ existing patterns and compare them with similar existing guidelines since there was not enough commonality of content between patterns and guidelines. If different guidelines and patterns had been employed, the validity of the experiment could have been at risk because the two entities being compared did not contain equivalent information. It was therefore decided to form and compare balanced sets of patterns and guidelines, that is, sets of patterns and guidelines that present the same information in different formats.

In conducting research an investigator makes trade-offs, while employing a particular research method, between the fundamental problems that should be avoided and the problems that are acceptable compromises (McGrath et al, 1982). In this study, the methodological objectives of ensuring a balanced set of patterns and guidelines is in tension with the desire to employ patterns and guidelines as they are found in the literature. This chapter is addressing this issue by examining the origins of patterns and

guidelines, how the development of the balanced set may have changed them, and the implication of this for the immediate findings of the research.

8.3 Forming the balanced sets of patterns and guidelines

In order to form a balanced set of patterns and guidelines for this study, existing patterns and guidelines were employed. In this way developing patterns or guidelines was avoided since such a procedure is a time-consuming iterative process that may involve several stages of peer reviewing and rewriting in order to ensure their validity and authority.

Another limitation, apart form the little overlap of existing patterns and guidelines that was imposed by the study design, was that the participants should be able to instantiate patterns and guidelines using the chosen authoring tool for designing web pages. Novice designers do not understand highly complex design issues and, even if they do, they can not implement solutions or guidance dealing with such issues in a time limited design exercise; familiarity and experience with certain design techniques that are beyond the novice level is required. These limitations were discovered in the exploratory and first study.

Therefore it was decided to collect both patterns and guidelines and convert them into the opposite format in order to compile an adequate number of them. The fact that more guidelines were converted into patterns is due to the small number of patterns available from existing pattern collections that could be suitable for the experimental setting.

The study patterns were formed not in order to replace existing patterns or to present new patterns but to serve the purposes of the experiment that demanded balanced sets of patterns and guidelines, i.e. the aim was to have a pattern and the corresponding guideline to provide equivalent content and to contain the same advice and knowledge. The key distinguishing factor between the study patterns and the study guideline is the format.

8.4 The set of guidelines

The guidelines chosen for the experiment were collected from the Koyani set of guidelines. These guidelines have been developed quite recently and are probably the most comprehensive set of web guidelines in the public domain today.

The Koyani guidelines are comparable to the rest of the guidelines presented in the literature since they are based on existing guidelines available from several sources.

The guidelines were reviewed by web practitioners and usability specialists with regards to their importance and in accordance with existing research evidence. Therefore, their validity is supported by research and their usability value is established, unlike other guidelines that are the result of expert opinion or established design standards. The Koyani guidelines are intended to be used by practitioners and designers who wish to improve their awareness of a wide range of design issues.

Only one guideline about text alignment that was not present in the Koyani guidelines was added to the set of the study guidelines, while five study guidelines were formed by converting van Welie patterns into guidelines (see Section 8.5.1). The content of each study guideline remained to a great extent as they were originally written by their authors. More details about the content, since the study patterns and study guidelines are balanced, are given in the next section where the content of patterns is discussed (see Section 8.5.2).

The format of the study guidelines includes: a heading-title and the guideline itself followed by comments explaining the reasons for using the guideline and, in some cases, a description of how the guideline should be applied. Each of the study guidelines was accompanied by an example; otherwise, the guidelines would have been put at a disadvantage in relation to the patterns. These examples were put at the end of the full set of the guidelines in a separate section. The guideline examples included captions with the title of the guideline they referred to. See Section 8.5.4 for key differences between the study patterns and the study guidelines.

By following the above rules, the study guidelines were, to a great extent, presented in the customary format (Apple Computer, 1996; Badre, 2002; Brinck et al., 2002; Fleming, 1998; IBM, 1999; International Standards Organisation, 1998; Levine, 1996; Nielsen and Tahir, 2002; Pawley et al., 2003; Sun Microsystems, n.d.; World Wide Web Consortium, 1999). These sources present guidelines in a prose-like style or as checklists. Examples are not always presented with the guidelines, and examples are not necessarily part of the guideline. In this study the examples are provided for the study guidelines because it was felt that guidelines without examples would put them at a disadvantage and participants would not appreciate them.

8.5 Assessing the study patterns

The concept of a pattern and what constitutes a pattern has often been debated in the domain of software engineering and HCI (Dearden and Finlay, 2006). Patterns that are presented by some authors and developers are questioned by others. There are many

misconceptions, misinterpretations, and mistakes concerning the understanding and use of patterns (Buschmann et al., 2007).

Borchers (2000) advocates that in presenting HCI patterns they should exhibit the structure, components, and essential characteristics that identify a pattern and make them distinct from other forms of communicating guidance and experience. If patterns do not contain some of these ingredients, then the reasons for adopting the specific format should be explained.

It is therefore necessary to examine more carefully how the study patterns presented here relate to patterns from widely accepted pattern collections, and how the study patterns comply with established characteristics that are present in patterns. The following pattern collections are used to compare the study patterns: Van Welie (2001-2007), van Duyne et al. (2002), Graham (2003a), Tidwell (2005) and Yahoo! (2005). Patterns from these collections will be referred to with the author's name, i.e. Tidwell patterns, Yahoo! patterns, etc.

In assessing the study patterns two sets of characteristics were used. The first set is the extended Winn and Calder (2002) set of characteristics as presented by Dearden and Finlay (2006), while the second set is the set of characteristics by Fincher and Utting (2002). The assessment of the study patterns using these two sets will show the extent to which they meet these characteristics and criteria and how they compare with patterns from other collections.

8.5.1 The origins of the study patterns

Only five patterns taken from other pattern collections were included in the set of study patterns presented in this experimental study, while the rest were formed by converting guidelines into patterns. The patterns shown in Table 8.1 were taken from the van Welie pattern collection.

Table 8.1: Patterns from the van Welie collection and the corresponding guidelines

Pattern Name	Guideline Title
1. Home Page Link	1. Enable Access to the Home Page
10. Meta Navigation	10. Use Meta Navigation
11. Repeated Menu	11. Repeat Navigation at the Bottom of the Page
17. To the Top Link	21. Allow Users to Go Back to the Top of the Page
24. Alternating Row Colours	31. Use Alternating Row Colours for Tables

Note: Numbers identify patterns and guidelines as they were presented in the main study

The first pattern (Home Page Link) was similar to a Koyani guideline (Enable Access to the Home Page). Guidelines were formed from these patterns by using the

information presented in the patterns and converting that information into guidelines. Another pattern, and the corresponding guideline (not present in the Koyani collection) about text alignment, was formed and introduced into the set of the study patterns presented in the main study in order to provide help and guidance to the participants. Compound patterns were formed by combining two and up to four guidelines together. Compound patterns in the main study were different from compound patterns in the first study. The rest of the study patterns were formed by converting Koyani guidelines into study patterns using the procedure described in Section 4.3.6.2.

8.5.2 The content of the study patterns

Guidelines and patterns, with regards their content and examples, were presented to a great extent as they were written by their authors. The essence of each guideline and pattern and the principles underlying them remained the same. There were some cases where the content was slightly modified for the study, by highlighting certain design issues or making the advice given unmistakably clear. For example, the advice given by a Koyani guideline about font size ("Use at Least 12-Point Size Font") was changed suggesting use of 10-Point size font to reflect current web design practices.

The content of each pattern and guideline was reviewed and checked while it was translated into Greek. Some changes were made to the existing examples of patterns and guidelines. As described in Section 5.2.3.2, some of the examples included in the guidelines were not successful and so these were replaced. At the same time, in forming the patterns more examples of good design practice were included in the "More Examples" section of each pattern. These examples were mostly taken from popular Greek sites.

8.5.3 The format of the study patterns

The format of the study patterns is similar to the format of other patterns presented in HCI and web design. Patterns from different pattern collections and languages do not share the same format.

Van Welie et al. (2000) point out that the pattern format should depend on the problem that patterns focus on. They indicate that user interface design patterns focus on usability and therefore they propose a pattern format that makes usability the central point of the pattern. Van Welie's (2001-2007) format for web design patterns has changed over the years. Simpler terminology is used to present the patterns: the

"Context" and "Rationale" sections, of the early format, were replaced by "Use When" and "Why" sections, and a short "How" section was introduced in the pattern format.

Tidwell's (2005) pattern collection focuses on designers and the problems they face during design. Tidwell mixes patterns and techniques for interaction design and indicates that examples, applicability, and evidence are the most important features to people who are trying to use patterns and not formal aspects of them (Tidwell, 2003). Patterns are presented in a format that deviates from the traditional Alexandrian pattern style using only the most fundamental features of a pattern. Tidwell's first set of user-interface patterns (Tidwell, 1999), the predecessor of the current pattern collection, uses a different format.

Van Duyne et al. (2002) focus on presenting a full pattern language with many links that assist designers in following a pattern-based approach to design. The format is very close to Alexander's format of patterns.

The Yahoo! (2005) pattern format is a hybrid format and includes elements from other formats (Fincher, 2000b). These patterns are intended, among other things, to increase consistency, to communicate the Yahoo! style and standards to practitioners, to increase the productivity of the design staff, and to reduce development time. In order to achieve these goals the pattern format includes elements such as "Accessibility", "Blog", "As Used on Yahoo!", and "YUI Code Examples", where HTML code is presented that illustrates how the pattern may be implemented.

The format used to present the study patterns was chosen to comply with the format of the known web pattern collections; see Table 2.2 for an overview of the elements used in the study patterns and in other pattern collections. The study pattern format is very similar to and contains elements from the van Welie and the van Duyne pattern format. The format is simple and the elements can be mapped easily to the guideline format of the study and vice versa.

8.5.4 Differences in the format of the study patterns/guidelines

Table 8.2 shows the format for the study patterns and the study guidelines. The key attributes that differentiates the study patterns from the study guidelines are clearly displayed in this table.

The format in which the study guidelines were presented was aimed to adhere to the Koyani guidelines format while the study patterns format follows the traditional "Alexandrian" problem-solution format.

Table 8.2: Formats used for the study patterns and the study guidelines

Pattern format
• The **name** of the pattern. • A **picture** as an example of its application to sensitise users to the application of the pattern. • A "**Use when**" section describing when the pattern is used. • A "**Problem**" section with a sort problem statement followed by a detailed description of the problem, the solution to the problem and the forces involved. • The "**Solution**" section where the solution for the problem is presented in a condensed statement. • An "**Other patterns to consider**" section with links to other patterns that may be taken into account. • A "**More Examples**" section where another example of the pattern is shown.
Guideline format
• A **heading-title** for the guideline. • A "**Guideline**" section where the guideline itself is presented. • A "**Comments**" section explaining when the guideline should be used and the detailed description of the usability issues and how the guideline should be applied. This section contains the information presented in the "Use When" and the "Problem" section of the corresponding pattern. • An **example** of the guideline. The example is placed after the full set of guidelines together with the guideline title that the example refers to.

8.6 Characteristics of the study patterns

Since there is no formal definition of a pattern (see Section 2.3.2), several researchers have sought to describe patterns through distinctive attributes and characteristics. The most comprehensive list of characteristics is presented by Winn and Calder (2002). The authors proposed nine characteristics by studying the attributes and features of mainly software design patterns. They point out that these characteristics can only serve as a guide and not a definitive test. A pattern like entity, even with all these characteristics, is not definitely a pattern; however, as Winn and Calder suggest, an entity that does not show any one or more of these important characteristics cannot be considered to be a pattern.

Dearden and Finlay (2006) extended the characteristics of patterns by adding some more characteristics that were identified and debated by the HCI community. This extended set of characteristics, 13 all together, is employed to assess the patterns presented and used in the current study. These characteristics at the same time provide a baseline for a comparison of the study patterns with patterns in other collections.

8.6.1 Winn and Calder characteristics

First the nine characteristics proposed by Winn and Calder (2002) are used to examine the study patterns.

1) A pattern implies an artefact

A pattern should describe the design of an artefact. The artefact should provide a "picture" of the "shape" of the potential outcome, helping designers understand the artefact's structure and depicting how the pattern works and what it captures (Winn and Calder, 2002). Software patterns involve artefacts that can be drawn using graphical representations. This characteristic should be more noticeable for HCI patterns since design involves presenting tangible artefacts.

Alexander used patterns as a theoretical account of architectural design and as artefacts explicating design guidance (Dearden and Finlay, 2006). Van Duyne et al. (2002) developed and used patterns following Alexander's approach. Their patterns present design principles to a great degree. However, their patterns also imply artefacts by using well documented examples in the discussion and also through the inclusion of a diagram next to the solution part of the pattern which emphasises the fact that patterns imply artefacts. The patterns from Tidwell, van Welie, and Yahoo! also direct the user towards artefacts. Graham's patterns imply artefacts although some of them, especially some abstract patterns such as "Keep it simple" or "Exploit closure", do not involve artefacts but general design principles and advice.

The study patterns imply artefacts. This is more evident in patterns such as "Home Page Link", "Page List of Contents", "Meta Navigation", "Repeated Menu" and "To the Top Link". However, that was not possible in all the cases. Other patterns, such as "Item Alignment" or "White Space", do not explicitly indicate an artefact. This is mainly due to the way patterns were formed, i.e. by converting prescriptive advice given by a guideline into a pattern presentation. Using compound patterns is a suitable way for presenting simple guidelines in a pattern that implies an artefact. For example, the "Lists" pattern implies an artefact although it includes simple guidelines such as "Capitalise First Letter of First Word in Lists". Van Duyne et al. (2002) have presented simple guidelines using complex patterns that include many guidelines.

2) A pattern bridges many levels of abstraction

Patterns include information at different levels of abstraction providing an overview of the problem but also details and examples of the finished artefact. This aspect relates to Fincher's (1999a) concept of abstraction as a major characteristic element that

distinguishes patterns. The understanding of the forces in the context of the problem helps in describing and presenting a pattern that is not just a concrete solution to a concrete problem (Derntl and Botturi, 2006).

The study patterns are simple low-level patterns aimed at communicating simple usability principles to novice designers. The study patterns originate mostly from guidelines where advice is presented in an explicit, non-abstract way. Therefore while the study patterns bridge different levels of abstraction, by presenting the problem and examples, the range of abstraction levels was limited. Most of study patterns were describing solutions that were presented in the accompanying examples and the abstraction level in which the problem and the forces were presented was not high.

Only the van Duyne pattern language bridges many levels of abstraction, as indicated by Dearden and Finlay (2006). The van Duyne patterns are high-level, complex patterns, very lengthy in format and not appropriate for introducing design principles to novices. The abstraction level of other pattern collections is not very high although it is higher than the level of the study patterns.

High-level and abstract patterns were eliminated in the main study, although some had been presented in the first study. The patterns used in the main study were of a low level, presenting simple, straightforward design guidance. This guidance could not easily be presented in a more abstract form. However, by making a pattern more abstract the pattern might not be apparent to the novice designer (Fincher and Utting, 2002).

3) A pattern is both functional and non-functional

This characteristic refers to the fact that the rationale of a pattern can be viewed from two different perspectives. The solution and the problem are the functional part of a pattern while the justification, the forces, and the trade-offs are the non-functional part. The functional part is an essential part of a pattern.

All study patterns document a problem and the solution to a problem, that is, they have a functional part. It was the functional part of the patterns that attracted participants. They frequently referred to the problem and the solution included in the study patterns during the interviews and they also highlighted that the combination of these two is what makes patterns better than guidelines.

Winn and Calder (2002) point out that the interconnection of functional and non-functional design issues makes patterns so successful and valuable. The non-functional part of the pattern was occasionally evident in the study patterns, although not to the

extent that is required by a properly developed pattern or as is evident in other known pattern languages. Again, the reason for this was that most of the patterns were based on guidelines and only the comments from the original guideline were included in the patterns. Therefore the non-functional part included in a pattern was determined by the amount of comment contained in the corresponding guideline.

One may question the extent to which beginners in web design are capable of grasping or willing to grasp the non functional part of a pattern, i.e. all the forces involved in a pattern or whether they can adapt the solution to different contexts. Dearden et al. (2002a) in experimenting with the use of patterns indicate that participants were only focussing on examples, the problem, and the solution of the pattern and were not reading the explanatory text.

4) A pattern is manifest in a solution

A pattern is recognisable within a developed artefact despite the fact that some patterns capture abstract ideas or high-level concepts. Patterns in web sites are manifested and noticeable. For this reason, patterns have been used not only as design tools but also as evaluation instruments for analysing and assessing web sites (van Welie and Klaasse, 2004).

Study patterns were easily recognisable within the web pages that students presented. This characteristic was actually a necessary requirement for the study patterns since it made it easier for the evaluators to rate the sites designed by the participants. Patterns that were used in the first study and considered to be abstract and not clearly identifiable were eliminated in the main study, resulting in a reduced set of patterns.

5) A pattern captures system hot-spots

Hot spots are those parts of a solution that it is possible to change or modify (Winn and Calder, 2002). By emphasising the invariant elements of a solution patterns implicitly highlight the elements that can be changed but they do not specifically isolate those elements.

There are some web design patterns that indicate what parts of the artefact can be modified due to the forces involved (for example, the "To the Top Link" pattern from the van Welie collection, which is included in the study patterns). However, as Dearden and Finlay (2006) pointed out, this characteristic has not been identified as a characteristic for patterns in the HCI domain, although it is applicable to software

engineering patterns. Therefore this characteristic is not used to assess the study patterns.

6) A pattern is part of a language

According to Alexander patterns do not stand on their own since they loose much of their potential. A single pattern is a nice and useful format that can be used to present good ideas about design (Alexander, 1999). Patterns in a pattern language are connected and interlinked and work together to solve complex and large-scale problems (Alexander, 1979). A pattern language provides words and rules in a way similar to a natural language. In this way, a pattern language creates additional value to single patterns (van Welie and van der Veer, 2003).

In contrast, a collection of patterns that may loosely or informally relate to each other is a simple pattern catalogue (Appleton, 1998). Coplien and Schmidt (1995) suggest that developing a pattern language is a very challenging task while Gamma et al. (1994) express the hope that a pattern language of software design patterns may be formed when more patterns are developed. The term pattern language has been used very loosely in several cases to describe a collection of patterns. Most of the pattern languages for which this status has been claimed, in several domains, may not form a pattern language in Alexander's sense. Borchers (2001) highlights that connectivity is what turns a collection of patterns into a pattern language. Salingaros (2000) proposes that every pattern within a pattern language should be connected to both higher and lower level patterns. Todd et al. (2004) examine whether several HCI pattern collections can be classified as pattern languages using several connectivity criteria. According to them, only the HCI patterns presented by Borchers (2001) can be classified as forming a pattern language.

Below a short analysis of the known web pattern collections is given. In this analysis, the patterns are examined using a very simple rule of connectivity. In this sense a pattern is connected if there is an inward or outward link for the pattern. At the same time the effort the author makes to present links to and from a particular pattern is also examined.

Van Duyne et al. (2002), following Alexander's approach, include many links to higher and lower level patterns by presenting "BACKGROUND" and "CONSIDER THESE OTHER PATTERNS" sections in the format of the pattern. All patterns are connected and links are also presented in a distinct way within the description of each pattern. The authors make a special effort to present links within the language. Probably

this is due to their advocacy of a pattern supported design. This approach starts by collecting some initial patterns and then the links within a pattern are used to collect a set of patterns that could be applied in a specific design project.

Graham (2003a) refers to his patterns as a pattern language and presents diagrams of the links among patterns as a means of navigating the full set of patterns. In the "Context" and "Resultant Context" sections of each pattern several links to other patterns are presented. Graham exploits the links to build an actual concrete site employing an approach similar to that of van Duyne et al. (2002).

Other authors of web design patterns avoid using the term pattern language to describe their patterns and instead prefer to name them as a pattern library or a simple pattern collection. Van Welie refers to his patterns as pattern collection. Van Welie patterns have grown in number from 60, as they were presented in 2003 (van Welie and van der Veer, 2003) to more than 130 at the time the collection was accessed. Some of the patterns are not fully defined yet or some of the pattern components are missing. Only two patterns ("Slideshow" and "Parts Selector") from the fully presented patterns are not linked in any way to the rest of the patterns. The interconnection of patterns, in contrast to the van Duyne patterns, is not a purpose itself. More links however can be easily added within a pattern by expanding the context of it (i.e. the "Use When" or "How" components of the van Welie patterns).

Tidwell's (2005) patterns include both general user interface design patterns and web design patterns. The patterns do not show many links and quite a few of them do not exhibit any links to and from other patterns. Tidwell indicates that her set of more than 90 patterns is not yet complete to qualify as a pattern language. In her presentation of patterns she does not make any effort to show links, and her format deviates from the Alexandrian problem solution structure of a pattern (Fincher, 2000b).

Other web collections have not yet been developed fully and they currently contain a small number of patterns. These collections should not be considered to be a pattern language, even though each pattern is linked to others. The set of Yahoo! patterns, for example, includes only 27 patterns. Each of these patterns is related to at least another pattern through a "Related Patterns" section. Web Patterns (2006) is also a small collection of 16 patterns where all patterns include links. This is made possible by presenting each pattern with a section titled "Works with These Patterns" that includes links to other patterns.

Concluding, it can be said that a pattern can be presented with links to other patterns if the author considers it to be an important issue. However, links are not the

only necessary attribute for a set of patterns to be considered a language in the Alexandrian sense of a pattern language.

References to other patterns were made within the study patterns. These references were not many, since the number of the patterns was small in comparison to other pattern collections. The assimilation techniques of novices may put a limit to the number of patterns and guidelines that can be presented to them, especially if they are not given time to practise and employ the patterns in a design activity. Links to other patterns were not appreciated in the exploratory and first study and therefore no effort was made to highlight those links in the main study. The focus of the study was not on pattern languages and no assumptions were made about relationships or structure among the patterns. Therefore, the study patterns did not include many links to other patterns within the set of patterns presented. In essence, the set of patterns presented in the main study is a pattern collection, not a pattern language.

7) A pattern is validated by use

Patterns are validated only through concrete examples of places where they have been used. Sometimes, instead of examples a "Known Uses" element (van Welie and Tratteberg, 2000) of the pattern presents known instances of the pattern within existing systems. Yahoo!'s (2005) design patterns give not only examples but also links to Yahoo! sites that exhibit the pattern; for each pattern there is a section titled "As Used on Yahoo!" that indicates those links.

One attribute of the study patterns was that they were not developed from scratch but were based either on existing patterns or existing guidelines, and therefore in both cases patterns and guidelines were supported by several examples. The Koyani guidelines are accompanied with examples of each guideline's widespread use and application. Furthermore, the Koyani guidelines are research-based, i.e. they had been evaluated in the context of concrete experience and were presented with justifications.

The study patterns were reviewed and evolved by paying extra attention to the inclusion of successful examples with each one of them: a number of examples were first collected showing the application of the pattern and then the most successful ones were chosen for inclusion. Some of the examples in the original guidelines and patterns were replaced with better ones, using mainly examples from Greek sites. Therefore the study patterns share this characteristic and are validated by use.

8) A pattern is grounded in a domain

Patterns that do not make clear the domain in which they function or patterns that do not share a common domain may lead to misinterpretation or even confusion. This requirement is a very basic one and also easy for pattern writers and developers to follow. All study patterns dealt with web design issues and more specifically with issues that a novice designer faces during the design of a web page and site.

9) A pattern captures a big idea

Patterns do not address easy and small problems. This characteristic suggests that if the problem is trivial or insignificant the value of the pattern is lost. The study patterns do not have this attribute and mainly deal with simple, everyday design issues that novice designers face.

This characteristic seems to apply to software design patterns (e.g. Gamma et al., 1994). HCI patterns and more specifically web design patterns do not always deal with big and difficult problems. For example, how big is the idea behind a pattern such as "Alternating Row Colours" or "To the Top Link" taken from the van Welie pattern collection? It should be noted that both these patterns were included in the study patterns. Tidwell (2003) also indicates that many patterns, such as "Action Buttons" and "About Us", are fairly obvious and do not meet a strict definition of a pattern. These two patterns are included in van Duyne's patterns, a high quality pattern language with great commercial success. Another point is that both these prominent collections (van Welie and van Duyne) contain patterns, such as "Fixed Width Screen Size" and "Expanding Width Screen Size", that refer to standard web page design procedures that should be part of even an elementary web design course.

Overall, the problems that the study patterns deal with are of lower difficulty than the problems that other web design patterns address. The study patterns were formed in order to deal with the problems that newcomers to web design face, and it should be pointed out that some of the study patterns deal with issues that are trivial to experienced web designers.

8.6.2 Added characteristics

The pattern characteristics examined so far, although relevant and applicable to the HCI patterns, were derived from looking mainly at software design patterns. Dearden and Finlay (2006) added four more characteristics that originate from the field of HCI, and these are examined below.

10) Patterns support a "lingua franca"

Patterns should serve as a common language that can facilitate communication among users and designers involved in the design process (Erickson, 2000). Extending this notion of patterns, other authors have suggested that patterns can provide a standard vocabulary for design issues, concepts and activities (Astrachan et al., 1998; Cline, 1996; Schmidt, 1995). However, pattern names need careful consideration (Chung et al., 2004; Meszaros and Doble, 1998).

The names of the study patterns were carefully chosen to allow communication. Some of the pattern names were changed when patterns from the first study were reviewed for the main study in order to enhance their impression and communicative power. Another issue with the pattern names was that existing pattern names in English needed to be rewritten or new ones to be coined in Greek. The potential of using the patterns names exists and pattern names were conscientiously chosen to allow this, although the experiments did not offer any chance to use patterns as a communications tool. Students have used the study patterns as a technical vocabulary in the follow up interviews although not extensively.

11) Different patterns deal with problems at different scales

Patterns can describe high-level design issues and also address low-level details of interaction and interface design. Van Duyne patterns deal with large-scale design issues such as "Site Genres" down to page elements and navigational components; however, most of the patterns do focus on high-level design issues. Van Welie's collection of patterns also deal with a wide range of web design issues from site and page types down to basic interaction and navigation elements.

Yahoo! patterns focus mainly on interface components not higher than page level. Therefore the scale of problem that these patterns address is lower than the level of the van Duyne and the van Welie pattern collections. Tidwell's collection includes patterns for a broad range of design problems but the problems do not go higher than page level. As Tidwell (2003) comments, the patterns that she presents describe key design issues at the appropriate level, not too high and not too low, in order to attract and convince designers of the patterns' value.

Evidently, different audiences are interested in patterns at a different problem level. Patterns that addressed high-level design issues were not included in the main study (the reasons are explained in Section 4.5.3). The problems that the study patterns address are low-level, lower than any of the previously examined collections. The

selected scale proved to be suitable for the purposes of the study and to attract novice designers' attention.

12) Patterns reflect design values

Patterns and pattern languages embody design values that are reflected explicitly (Bayle et al., 1998). Fincher (1999b) states that the values are important to three audiences: users, other designers, and society, although the last audience is not directly addressed by patterns.

What Alexander (1979) considers fundamental and refers to in his work is a "quality without a name". Architectural patterns should help designers achieve this quality and improve human life. According to Borchers (2000), quality in HCI is described by terms such as "intuitive" and "transparent". Pemberton (2000) suggests that patterns are "engaging and lively", implying that these values are also reflected in interface design. Van Welie et al. (2000) propose that usability should be the central point of HCI patterns. Patterns should make interface systems more usable in the same way that architectural patterns enable designers to achieve the "quality without a name" that supports human well-being (van Welie and van der Veer, 2000). Dearden and Finlay (2006) argue that other properties such as usability, acceptability, and engagement may be more appropriate terms to describe quality as a result of applying patterns and suggest that usability is the most suitable at the interface level.

Usability is the focus of the known pattern languages. The van Duyne patterns promise that patterns will help create effective and easy-to-use web sites. Van Welie, as mentioned above, considers his patterns to be tools to improve the usability of sites. Tidwell's (2005) patterns document familiar parts and solutions that make an interface easier to use. Graham (2003a) explicitly states that his pattern language aims to improve web usability.

The study patterns also reflect usability, although this is not explicitly stated within the patterns. Some of the study patterns are based on existing patterns, encompassing usability, while most are based on usability guidelines. Therefore the study patterns express values of usability.

13) Patterns capture design practice

This characteristic is similar to characteristics (4) and (7) but is focused and refers to the process of identifying and developing patterns. Patterns do not capture the individual opinion of the writer but established practice from the domain.

Patterns from the other pattern collections evidently capture design practice, as this characteristic suggests. Some authors (van Duyne et al., 2002; Tidwell, 2005; van Welie, 2001-2007) clearly indicate that patterns were identified and developed by capturing design practice. Yahoo!, being a commercial company, developed the patterns using a design research team via the traditional design process: a common problem is identified and the solution is created and presented using a pattern. Several refinements and reviews of the pattern take place before the pattern is published. Graham (2003a) confesses that he developed his language by using ideas that were already published elsewhere and also by consulting sources such as Nielsen (2000a) and Spool et al. (1999), who discuss issues of usability and web design.

The study patterns were based on known and well documented guidelines and on existing, trusted patterns. As a result, the study patterns were not identified or developed employing a pattern mining or discovery process. However, the study patterns do not capture the writer's opinion. Therefore, this characteristic applies to the patterns that were formed for the purposes of the experiment: although no identification or development of new patterns was involved, the study patterns reflect established practices from the domain.

8.7 Fincher's framework

Fincher (1999a) identified five essential characteristics for patterns and pattern languages: Capture of Practice, Abstraction, Organising or Structuring Principle, Value System and Presentation. These characteristics are described as functional requirements. Four more non-functional characteristics were added later (Fincher and Utting, 2002). Each of the non-functional characteristics is paired with one functional one. The non-functional characteristics are: Non-obvious (paired with Capture of Practice), Insight (paired with Abstraction), Generative (paired with Structuring Principle), and Communicative Power (paired with Presentational Form).

Four of Fincher's functional requirements have been analysed in the previous section, using the extended set of characteristics: characteristics (4), (7) and (13) refer to Capture of Practice, characteristic (2) refers to Abstraction, characteristic (12) refers to Value System and Section 8.5.3 of this chapter about the format of patterns refers to Presentation.

In this section the study patterns are examined using the remaining of Fincher's requirements i.e. the requirement for a Structuring Principle and the non-functional requirements for patterns.

Structuring Principle

Alexander in his work, using the level of physical scale each pattern refers to, organised architectural patterns into sets. Alexander's patterns refer to towns and buildings down to small-scale design issues about single rooms.

The structuring principle of other HCI pattern collections varies. Van Duyne et al. (2002) group patterns according to the design aspects addressed by the patterns. Tidwell (2005) organises the patterns using key concepts in interaction and visual design. Van Welie patterns are structured around three main concepts: the needs of the user, the needs of the application, and the context of design. Yahoo! (2005) also uses user needs to organise patterns.

The study patterns were presented in a way that followed the structure of the corresponding Koyani guidelines. These guidelines were organised around web design issues into 13 categories (e.g., Home Page, Navigation, Links). However, patterns from only seven categories were presented in the main study.

Non-obvious (paired with Capture of Practice)

Patterns should capture and present practice which is non-obvious. Patterns should focus on "why" to apply the pattern and the "rationale" behind a pattern in order to capture non-obvious practice. Van Duyne, van Welie, Yahoo!, and Tidwell pattern collections capture non-obvious practice to a certain extent but each one does so to a different degree. Van Welie and Tidwell patterns have a "why" section while van Duyne patterns give reasons for the application of a pattern through extended discussion of the problem and the forces involved in applying the solution to the problem.

High-level patterns have the potential to capture non-obvious practice better than low-level patterns. The study patterns, being low-level patterns and intended to be used by novices, capture practice that is mainly obvious to trained or experienced web designers. Some of the study patterns include short references to the rationale of a pattern, but these references are sketchy and do not convey any non-obvious practice.

Insight (paired with Abstraction)

Patterns should convey design insights and expertise that reveal why the pattern provides the appropriate solution to the problem. Insights are beyond implementation details and are based on deep and complex issues. The discussion presented in the previous paragraph about the non-obvious requirement in other pattern collections can be repeated for this characteristic as well: other pattern collections provide insights to some extent. The van Duyne patterns, by following Alexander's tradition of presenting

patterns, are the patterns that probably provide higher insights than patterns from other collections. The study patterns provide limited, if any, insight into the application of the pattern.

Generative (paired with Structuring Principle)

Generative patterns support the designer in building new solutions by combining patterns and producing larger and complete designs.

Employing a pattern may possibly give rise to new problems that require attention. Generative patterns facilitate the application of new patterns to solve the new problems (Derntl and Botturi, 2006). From this point of view, pattern collections with many patterns and links among them are more likely to be considered generative. Of the known pattern collections only the van Duyne patterns may be considered generative since these patterns form a pattern language with many links and references to other patterns. These patterns also embody values that help the generation of new solutions. To take advantage of any generative power of a pattern language, the designer should have full appreciation of the links and deep knowledge of the patterns and the problems they solve.

The study patterns lack this generative power: the number of patterns is small, and there are not many links among the patterns. This was also concluded in the qualitative analysis of the students' opinions of the patterns (see Section 7.2.5.1).

Communicative Power (paired with Presentational Form)

Patterns strongly communicate guidance and design concepts to the intended audience. This communicative power is attributed to the format of the pattern (name, examples, etc.) and also to the values exposed through the pattern (Fincher and Utting, 2002).

The communicative power of other pattern collections cannot be accurately judged. It is thought that since these patterns are well written and presented they undeniably have communicative power. The format of the study patterns is similar to that of other pattern collections, therefore it is expected that the study patterns involve similar communicative power. However, the communicative power of the study patterns is only articulated by the format and the examples included rather than the values embodied in the patterns.

The communicative power of the study patterns, as they were perceived by the participants, can be highlighted by referring to the qualitative data from the main study. Patterns names were not considered important and were not appreciated by participants

(see Section 7.3.2). However, the format and the elements of the study patterns seemed to catch the participants' attention and to communicate guidance and experience.

Participants were attracted to patterns and indicated that patterns communicated the knowledge needed to help them, as novices, to learn design and usability principles. Their comments indicated that the sections of the pattern format (problem, solution, examples) had an impact on them. They also referred to the sensitising example that strongly explicated the pattern. Participants indicated that a short sentence, a "synopsis" of the pattern, could probably be used to communicate the core of the pattern, and they even suggested that other courses adopt the same format to provide experience and knowledge. Overall, participants found the study pattern format to be very appealing and this can be used as confirmation that the communicative power of the study patterns is strong.

8.8 Overview of the study patterns

This detailed examination gives a clear picture of the main characteristics of the study patterns. The study patterns contain only a small number of patterns from other pattern collections while the majority originated by converting guidelines into patterns. In summary, the study patterns imply artefacts but also offer prescriptive advice; bridge levels of abstraction; have functional and to a lesser extent non-functional parts; are manifest in a solution; are part of a small pattern collection but not a pattern language; are validated by their use and grounded in a domain; capture solutions to small-scale problems; have the potential to support a "lingua franca"; deal with small-scale problems; reflect values about usability; and capture established design practice. The study patterns are organised in the same way as the guidelines; they do not capture non-obvious practice and design insights although they do have this potential simply by adding content making them richer; and finally, they are not considered to be generative but they have strong communication power.

Table 8.3 shows, according to the author's opinion, the extent to which patterns comply with characteristics and requirements used evaluate the study patterns. An ordinal scale with three values (not at all or low, medium and high) is used.

Table 8.3: Compliance of study patterns to characteristics

	Characteristic	Not at all or low	Medium	High
	Extended Win and Calder characteristics			
1	A pattern implies an artefact			●
2	A pattern bridges many levels of abstraction	●		
3	A pattern includes its rationale (functional and non-functional)		●	
4	A pattern is manifest in a solution			●
5	A pattern captures system hot spots	Does not apply		
6	A pattern is part of a language	●		
7	A pattern is validated by use			●
8	A pattern is grounded in a domain			●
9	A pattern captures a big idea	●		
10	Patterns support a 'lingua franca'			●
11	Different patterns deal with problems at different scales	●		
12	Patterns reflect design values		●	
13	Patterns capture design practice			●
	Fincher's characteristics			
14	Capture of Practice			●
15	Abstraction	●		
16	Organising or Structuring Principle		●	
17	Value System		●	
18	Presentation			●
19	Non-obvious (paired with Capture of Practice)	●		
20	Insight (paired with Abstraction)	●		
21	Generative (paired with Structuring Principle)	●		
22	Communicative Power (paired with Presentational Form)			●

The overall result is that some may see the study patterns as not following the widely accepted notion of a pattern. However, the purpose of the study was not to present high quality patterns; instead, the patterns presented here were mainly to serve the purposes of the study and to compare patterns and guidelines as a medium of transferring knowledge and experience to novices. It was not possible to employ existing patterns and compare them with similar guidelines since there was not enough commonality of content between patterns and guidelines. If different guidelines and patterns had been compared, even though they could both refer to problems in a specific design aspect of web sites (e.g. trust) or to the same dimension (e.g. navigation), the validity of the experiment could have been at risk since entities with different information content would have been compared. By using balanced sets of patterns and guidelines, and showing that even simple patterns that do not possess some key pattern attributes are better in several respects than guidelines, helped in accomplishing the purpose of this experimental study. This approach also indicated that by developing patterns at the appropriate level for novice designers, i.e. simple low-level patterns, and

employing these patterns to teach them usability principles is a useful method for increasing their usability awareness and for having a positive impact on their skills.

Alexander in his works viewed patterns from two perspectives: as a theoretical account of architecture and as constructed artefacts with a specific purpose (Dearden and Finlay, 2006). The purpose of Alexander's patterns was to stimulate discussion and enable user participation. In the same way, some authors are interested in patterns as a way of capturing and communicating design knowledge and values while others as an "accessible form" of guidance. In the former case the focus is on attributes of patterns like abstraction, big ideas, and pattern languages while in the latter case the focus is on patterns that have a practical use and that can be readily applied (Dearden and Finlay (2006). The study patterns were used as a means of presenting practical guidance to novices. From this perspective and from the perspective of using the study patterns as a didactic medium the study patterns qualify as patterns.

Future research can look into patterns from a different perspective and form patterns in another way. Still, other problems similar to the problems and tensions this study faced and threats to the validity of the study should be considered and taken care of.

8.9 Summary

This chapter has presented an analysis of the guidelines and patterns used in the study. Patterns were examined using two sets of characteristics in such way as to clearly show what aspects of the study patterns complied with the pattern community's notion of patterns and what aspects were met only to a certain degree or not all. Overall, the study patterns are low-level, dealing with small-scale problems. They do need refinement and development and do not possess some of the distinctive qualities of patterns. However, the study patterns are appropriate for the purposes of the study since they match the experience and guidance presented by guidelines. The study patterns were used as a means of presenting practical guidance to novices and as a didactic medium and from this perspective they qualify as patterns.

The following chapter provides a summary of the work, describes some of the main contributions, and concludes with suggestions for potential extensions and future research.

Chapter 9

Conclusions and Future Work

9.1 Introduction

This thesis contributes to the ongoing debate concerning the benefits of patterns, as they are contrasted to another form of design guidance in the field of web design, by investigating the effect of patterns and guidelines in the development of skills of novice designers. Its motivation is to gain a better understanding on how novices employ and value patterns and guidelines after being introduced to usability issues with the help of these tools.

This chapter provides a summary of the research, describes some of the implications and the contributions, and suggests directions for future work to extend and build on the work presented in this thesis. Section 8.2 summarises the thesis by revisiting the research questions and the research approach. Section 8.3 presents some implications of the results of this research and Section 8.4 discusses the main contributions. Finally, this chapter concludes with an overview of suggestions for further work in Section 8.5.

9.2 Summary of study

9.2.1 Summary of problem and research questions

Web design patterns provide guidance to novice designers on how web pages should be presented. Since the late 1990s, the HCI community witnessed an increased interest in research focused on HCI design patterns. This interest was triggered by the research

intensity on the subject of OOD patterns and the popularity that OOD patterns had gained within the software engineering community.

The main results of research efforts were two-fold:

- A wealth of literature on the advantages of patterns, and the methodologies and procedures of employing and using patterns with or without tool support.
- The creation and publication of a number of pattern languages.

Some of the pattern languages and collections are now considered standard references and the patterns they contain essential parts of design practice. From one point of view, this is expected since patterns capture successful practice. New patterns are added and old ones modified, following changes in design practices and industry standards.

The purpose of this study was to provide empirical evidence that would allow one to support or reject the claim that web patterns have advantages over web guidelines, and to determine the effects of patterns and guidelines on novice designers. Along the same direction the study aimed to identify the attributes, i.e. the weaknesses and strengths of the pattern and guideline format as they are expressed by novice designers, and also the extent to which these attributes match the weaknesses and strengths suggested and portrayed by researchers.

The effects of the two different conditions, patterns and guidelines, on participants were examined in four aspects:

- Designing a web site according to principles expressed by patterns/guidelines.
- Evaluating a web site and indicating usability errors on the site.
- Attitude of participants, which includes perceived usefulness and intention to adopt, appreciation, and appeal.
- Preference of students for a format while comparing patterns with guidelines.

The difference in the overall scores in the design task between the two groups was statistically significant. A similar comparison made by using only the subjective metrics shows that the patterns group performed also significantly better. Results from the design task and the interviews suggest that compound patterns are inferior to simple patterns and do not create a clear picture of all the usability issues involved to novice designers.

Patterns and guidelines can successfully communicate usability principles and knowledge to novice designers and can affect the evaluation skills of participants. There

were no significant differences between the performances of the two groups in the evaluation task. However, if a comparison is made using difficult to identify errors the patterns group performed significantly better than the guidelines group.

The overwhelming preference for a particular format in presenting guidance is patterns even by the participants trained with guidelines.

Links and pattern names were not appreciated by participants, although guidelines titles were considered as providing useful information and guidance. Patterns are considered by students as better tools to introduce design principles, while guidelines are perceived as tools for more experienced designers. At the same time, patterns are suggested as a useful pedagogic tool for teaching.

9.2.2 The experimental approach

The importance of the triangulation of methods and data sources to establish internal validity is emphasised by several researchers. Triangulation increases the level of credibility of the findings. The mixed methods research approach employed in the study allowed a more comprehensive research design to be created. Qualitative data from interviews and questionnaires were used to support the quantitative data obtained through the web design tasks and other quantitative evaluation measures.

The experimental design of the first and the main study followed the stages suggested by Fenton and Pfleeger (1996) in carrying out experiments: conception, design, preparation, execution, and analysis. The research approach was revisited and redesigned beginning with the exploratory study. During the first study, the methods and techniques for the purpose of the research were established and finalised. Some of these were improved in a way that was easier to implement, while others were abandoned. In the main study, there was no redesign test carried out, and also no attempt was made to explore the effect of a pattern language on students. The redesign task did not appeal much to the participants in the first study. Links within patterns were not appreciated and probably need further consideration in order to take advantage of them.

Stability of methods over time is an indicator of a reliable methodological approach (Miles and Huberman, 1994). Consistency in interviews and questionnaires was demonstrated throughout this research in the procedural formats developed by the researcher. The web site design tasks and the web site usability evaluation tasks were piloted with experienced designers prior to the formal research sessions. All the tasks, instruments and methods employed in the collection of data were tested more formally

under true experimental conditions in the first study before being used in the main study. The instruments were revised to improve clarity, based on feedback and experience gained in the first study.

The resulting experiment in all cases was considered to be a quasi-experimental design (Gill and Johnson, 2002; Nachmias and Nachmias, 2000; Robson, 2002) since sampling methods were used to select the participants. Quasi-experiments constitute the majority of the experiments carried out within the educational world (Wiersma, 2000) as they usually employ convenient and purposive sampling. Two groups were formed for the experiment. Random assignment of participants to such groups is usually employed. In this study, a sampling method was used to allocate the student participants to each group. The sampling method took into consideration the performance and ability of each participant in order to form two balanced groups. In small groups, random allocation may introduce weaknesses in the experiment (Cook and Campbell, 1979; Christensen, 1997). Rank sampling was used in both the exploratory study and the first study. Stratified sampling was used for the main study.

The initial equivalence between the two groups greatly enhanced the internal validity of the study. An alternative approach of using a "between-within subjects comparison" was also considered. However, such approach requires another pre-test design task and puts a heavy load (actually doubling it) on the experts who were to evaluate and score the designed web pages. Evaluators not only spent time on the evaluation tasks but also on learning the grading process and on compiling the grades in an appropriate form. Similar studies employ evaluators on a paid basis to perform such work.

The experimental research design made it possible to prove the extent of the effectiveness of having patterns as a means of presenting advice and information about web design.

9.3 Implications of the research

It is acknowledged that the findings of this work have been derived from studies within educational environment with students acting as novice designers. While the author did not attempt to make generalisations, the advantages of patterns, as they have been identified here, offer different possibilities that concern several communities and should be exploited to their benefit.

The HCI community needs to support designers with techniques and tools in a fast changing technological environment; patterns can help towards this direction. New

fields and domains emerge, but the underlying principles of humans interacting with computers remain the same. The demand for high quality interfaces is growing. Pattern collections, by capturing and sharing knowledge, can assist designers in using proven solutions or in generating new ideas. Such patterns seem to work well in new emerging fields like ubiquitous computing (Chung et al., 2004; Saponas et al., 2006).

Web designers may use several pattern collections already developed for web design. Access to these collections is easy since most of them are available on the internet. Web designers need to develop expertise in their profession and a deeper understanding of usability. At the same time inexperienced designers need to have access to existing knowledge and best practice. Instead of spending lengthy periods of time practising in the profession, and before reaching a high level of expertise, patterns offer help and opportunities to inexperienced designers to progress quicker and apply state-of-the-art solutions.

The teaching community can use a pattern-based instruction approach to present patterns that deal with diverse interaction problems. A successful implementation of this approach needs patterns that should address low level design issues to start with. It should be noted that simple programming patterns have been developed in order to teach simple programming techniques to computer science students (Astrachan et al., 1998; Bergin, 2001; Muller and Haberman, 2005; Muller et al., 2004; Proulx, 2000). However, in the case of web design patterns, not only simple patterns but even high level patterns could be employed provided the recipients of such training have the necessary knowledge and experience to appreciate all details of a pattern. Patterns can present, in an effective way, the many facets of web design. Future designers should have a wider knowledge than pure development skills, and well tested and documented solutions to apply to an artefact.

Finally, another implication of the research is one that several other experts in the field and researchers have voiced (Bayle et al., 1998; Schuler, 2002; Dearden and Finlay, 2006) about the need for a pattern developing effort. This research highlighted that existing pattern languages share little patterns between them. Most of the pattern languages are efforts of inspired individuals or teamwork within companies. A range of substantial pattern collections and pattern languages are available (Fincher, 2000b). Nevertheless, this body of patterns do not even have the same format. Considerable effort is needed to develop a pattern collection or language acceptable and widely recognised as a rich body of providing advice and guidance. Such an effort by a group of researchers was successful resulting in a set of research-based web design and

usability guidelines (Koyani et. al., 2003) that was further refined and improved (US Department of Health and Human Services, 2006).

9.4 Contributions

This dissertation presents the first research in which a direct comparison between patterns and guidelines was attempted based on empirical data. A mixture of research approaches was used to evaluate the performance of participants and explore their preference and attitudes. The study showed that patterns have greater impact on the skills and practices of novices and that participants preferred patterns over guidelines as a means of knowledge transfer.

This work is relevant to and impacts areas of HCI research, education and training, and web design. Some implications of the results for the communities involved in these areas have been presented in the previous section of this chapter. In this section, the contributions are presented in order of their relevance to the aims of this work and are divided into primary and secondary. The primary contributions are based on the empirical work and the results of the study and are the following:

1) Empirical evidence

This study provided empirical evidence to support the contention that patterns have a greater impact on novice designers more than guidelines presenting the same knowledge and experience. To the best of the researcher's knowledge, this is the first study of its kind that compares patterns with a similar tool that provides equivalent design advice and guidance. The performance of the participants was evaluated in a design test and an evaluation test. The fact that designers with no previous experience in web design produced concrete web sites using a popular authoring tool contributes to a realistic setting of the experiments.

2) Insight into advantages of patterns and guidelines

The study provided an interesting insight into a novice designer's experience using patterns and guidelines. The study delineated the particular characteristics of both tools and provided a clear picture of the reasons for participants preferring patterns via the analysis of qualitative data. Knowledge and experience should be presented in a structured pattern format with successful examples that sensitise novices to both problem and solution. The pattern format was the one that captured participants' attention and elicited comments of approval; simple patterns, presenting only one piece of advice, were preferred to compound patterns that contained more than one guideline.

A possible extension of the pattern format adopted in this study may be a small "synopsis" element that summarises the pattern.

This research also makes secondary contributions which are presented below.

3) An experimental approach of comparing patterns and guidelines

An approach was established, within an educational context to compare patterns and guidelines, resulting in an evaluation of these tools. The approach involves certain principles for experimental processes. Processes include teaching procedures and tests, and the use of a balanced set of patterns/guidelines. The comparison made is a synthesis of common tasks in which a designer is involved, i.e. design and evaluation of web pages. Participants with no experience in web design were used and two groups that were not statistically different were formed. Instead of developing new patterns that may require validation and refinement, a simple method of employing existing patterns and guidelines and transforming one format into the other was introduced. The detailed presentation and analysis of three experiments with tests, tasks, and metrics should prove useful in further research and in a replication of the study.

4) A library of balanced sets of patterns and guidelines

A valuable outcome of this study is a library of balanced sets of patterns/guidelines useful in teaching web design principles. The sets can be expanded to include other aspects of web design or they can be tailored to the specific tests of future experiments. Examples provided for several of the patterns and guidelines were replaced with new ones, which were more successful in communicating the intended usability principle. One success of the library is that students requested copies of the patterns in electronic form.

Furthermore, the patterns have merit of their own and are regarded as a useful and effective collection of easy to use patterns providing advice and guidance. Most of the patterns that were employed in this study originate from guidelines. Although participants embraced patterns as an innovative way of expressing advice these patterns can be further improved to meet stricter requirements of the notion of patterns and used for learning and communicating best practices to novices. The patterns presented here can be used to bridge the gap between patterns and guidelines and enrich existing pattern collections.

5) A set of metrics

A set of metrics, assessing aspects of web design principles as applied by students, were developed, tested, changed, and refined to allow independent evaluators to assess and rate the pages that had been designed. The metrics focus on the application of the specific patterns/guidelines used to teach participants usability, i.e. they measure the performance of participants and allow a comparison of guidelines versus patterns. The metrics are classified as being either subjective or objective. Subjective metrics are those that produce a score depending, to a certain extent, on the judgment of each evaluator while objective metrics produce the same score and do not depend on the evaluator's judgment. The current set of metrics do not assess the overall usability of a site and do not capture all the important aspects of web pages, but the metrics can be expanded to meet further demands. As they stand, the metrics can serve as a basis for future work and experiments and as a predictor of usability.

9.5 Future research

There are a number of interesting directions in some of the areas explored in this dissertation in which the understanding and knowledge about patterns and guidelines could be advanced.

The results of the study can be used as a basis for further studies of how patterns could be employed in several stages of a development project. Patterns for different stages of a design lifecycle may be developed, addressing the needs and requirements of novice designers. For example, Koyani guidelines address issues in the design process and the evaluation of a site, in accessibility, and in writing web content. Students indicated that they would like patterns/guidelines for site architecture. At the same time, improvement to the tasks and tests of the experiment could be made and, more importantly, improvements to the metrics and the scoring procedures.

More metrics can be introduced to reflect the use of other patterns/guidelines. An alternative approach would be to adopt some other known scoring procedures. Such an approach was described in Section 7.2.2. The materials developed for the tasks and the assignments can be extended. More requirements may be included in order formulate specific tasks that can be used to evaluate the design skills of novice designers. The requirements will test if certain other usability principles are applied on the web pages. Such tasks are already developed and established in other domains, e.g. in programming.

More work is needed to explore issues associated with compound patterns and how to make patterns easier to understand and use. Several questions arise along this direction. It appears that there is a problem with long and extensive patterns where more than one piece of advice is given; however, this may be due to problems that may be eliminated if patterns are organised and presented in a better way. Another question along this direction concerns patterns that were not possible to include in this study. Complex patterns were not employed in the tutorials and the tests. Complex patterns are those that refer to complex design issues, such as e-commerce, where notions of trust and security are involved. Chung et al. (2004) experimented with patterns about ubiquitous computing and notice that designers failed to take advantage of patterns referring to privacy. Complex patterns are usually difficult to implement. A necessary requirement to be met when investigating such issues is that designers should have the expertise to implement such patterns in the web pages. A possible experiment with complex design issues could be to present patterns/guidelines in the tutorials, but use them only in evaluation tests and not design tasks, in which case design skills are not required. This is further detailed below in this section.

One study can only provide some understanding on how two alternative approaches affect knowledge and the application of usability principles in a limited context. Throughout this research it has been suggested that external validity should be achieved mainly through replications. Replication is a strongly suggested practice in all kinds of empirical research. A replication study in a different setting should indicate that it is unlikely that any conclusions of a study are the result of the particular experimental environment or the characteristics of the participants rather than the condition being examined. Replicated studies help researchers to appreciate the limits of the results.

A replication study would provide further evidence of which factors of the experiment interact with the condition being evaluated by varying or extending certain variables of the experiment. Such replicated studies increase confidence in the experimental design and strengthen the internal validity of the study. Easy access to experimental processes and materials is necessary to encourage further independent replications. This research was conducted within an environment provided by an ordinary higher educational institute. The conditions are simple to replicate and the experimental details easy to follow, having been clearly described to allow the same or an improved design approach. Therefore, to gain further insight, a series of experiments may be required to confirm and extend the findings of this study. Future work is

suggested in the form of four experiments where certain aspects involved in the experiment may change.

1) Experiment with improved-extended sets of patterns/guidelines

The results of the experiment indicate that patterns and guidelines can support novice designers in learning and applying usability principles; patterns and guidelines have an impact on designers, provided that they have reached a certain level of design experience and knowledge. However, patterns have a stronger impact. Overall, patterns are by far the designer's favourite format for presenting and documenting usability principles and good practices. In the current study only simple patterns were used and most of the study patterns originated from guidelines. At the same time the number of patterns used in the experiments was relatively low. It would be beneficial to develop more patterns that address low-level design problems, which is one area that the patterns community has mostly ignored. Simple patterns can be easily implemented by novices. Once the extended set of patterns is properly reviewed and finalised, it could be used in experiments to further the understanding of patterns.

2) Experiment with web designers

A follow-up controlled experiment similar to those reported in this study is needed. The follow up study should not be carried out with students but with novice designers, i.e. persons who have some experience but are not professional web developers. In such a case, the time taken to complete the design tutorials may be shortened and more complex patterns may be used. However, the groups must be carefully balanced on experience or a more sophisticated experimental design could be used. Another issue that should be taken into account is how to control all extraneous variables.

3) Experiment using only evaluation tasks

Such an experiment would be a controlled experiment similar to the experiments reported in this study but using only evaluation tasks. Participants in the current study were tested in tasks of design and evaluation. Considerable time was expended on this in the preparation stage where students were presented with tutorials about web design. An approach that only uses evaluation tasks offers several advantages. Students' performance will not be affected by their technical skills in web design. At the same time more complex patterns and guidelines can be used since the tasks will not require design skills to materialise these patterns. The evaluation task will involve only predicting errors and indicating if the page can be improved by applying patterns and

guidelines. A more complex evaluation task may require severity ratings to be given for errors and also indications of the principle being violated. This is suggested by usability studies and will provide a better picture of the evaluation. If a list of the existing errors for the site is provided, then no experienced judges are required for awarding points. The number of participants may increase to allow for parametric statistical analysis. Also, since the scoring does not require complicated scoring procedures with many evaluators, a pre-treatment test may be performed. This will allow for more robust statistical analysis. Some restrictions may be imposed on the participants and the extent to which they perform a review by specifying specific tasks within the site. In this way, task scenarios may be used to evaluate a specific class of usability problems.

4) Experiment using pairs

All experiments in this study required participants to work on an individual basis. In practice, designing involves teams working together even though the design may implement design details working on his own (Newman and Landay, 2000). A problem with participants working in pairs is that this will reduce the sample size by half, and it also reduces the power of statistical tests. In the first study students worked in pairs during the tutorials. This was considered to be drawback for the experiment since instead of increasing transfer knowledge and motivation it hindered learning, as was explained in Section 4.5.2.3.

However, pair programming, as several empirical studies suggest, improves design quality, reduces defects, increases motivation and enjoyment in the team members, improves team communication, and produces new ideas (Bryant et al., 2005; Jensen, 2003; Lui and Chan, 2003; McDowell et al., 2002). Web design and web programming studies employing pair programming indicate statistically significant differences between designers working in pairs and working alone with regards to the aforementioned advantages (Cockburn and Williams, 2001).

In an experiment that employs pairs of designers, apart from judging the comparing participants' performance other issues can be explored, such as team cooperation, development of a common language, adoption and handling of the sets of patterns/guidelines, and finally communication of ideas.

Publications

The progress of this research produced the following papers relating to this thesis:

Koukouletsos, K. (2005), Evaluating the effectiveness of guidelines and patterns for web design. In McEwan, T., Gulliksen, J. and Benyon, D. (eds.), The Bigger Picture, Proceedings of HCI2005, Springer-Verlag London Ltd, pp. 209 – 211.

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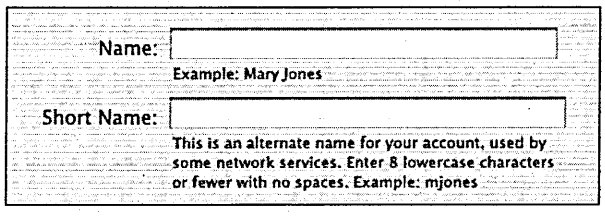
Appendices

Appendix 2.1: A web design pattern (van Welie pattern collection)

Input Hints



From the Mac OS X system preferences

What: Beside an empty text field, place a sentence or example that explains what is required.

Use when: The interface presents a text field, but the kind of input it requires isn't obvious to all users. You don't want to put more than a few words into the text field's label.

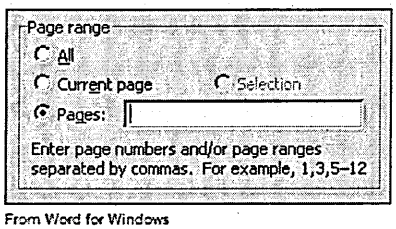
Why: A text field that explains what goes into it frees users from having to guess. If you visually separate the hint from the main label, users who know what to do can more or less ignore the hint, and stay focused on the label and control.

How: Write a short example or explanatory sentence, and put it below or beside the text field. Two examples conjoined by "or" works fine too. Keep the text small and inconspicuous, though readable; consider using a font two points smaller than the label font. (A one-point difference will look more like a mistake than an intended font-size change.)

Also, keep the hint short. Beyond a sentence or two, many users' eyes will glaze over, and they'll ignore the text altogether.

This pattern is often used in conjuction with Forgiving Format, as illustrated by the Word example below, or **Structured Format.** Alternative patterns are Input Prompt (in which a short hint goes into the control itself), and Good Defaults (which puts an actual valid value into the control). Input Hints permit longer, more permanent help text than Input Prompts, but because no default value is present in the text field, the user is forced to consider the question and give an answer.

Examples:



From Word for Windows

The printing dialog boxes used by several Microsoft Office applications supply an Input Hint below a Forgiving Format text field -- it takes page numbers, page ranges, or both. The hint is very useful to anyone who's never had to use the "Pages" option, but users who already understand it don't need to focus on the written text; they can just go straight for the input field.

From the van Welie pattern collection
http://www.welie.com/patterns/showPattern.php?patternID=searcharea

Appendix 2.2: A design pattern (Tidwell's pattern collection)

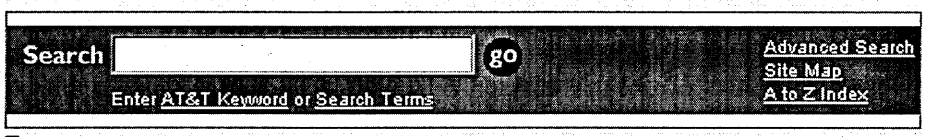
Search Area

Problem

The users need to find a page

Solution

Use a dedicated area with different kinds of search functionality.



From www.att.com

Use when

In addition to the main navigation scheme, the web site has secondary functionality to search for information. Such sites are typically medium to large sites. There may be several kinds of search-related functionality on the site. The search functionality is not the main way to access the information, it has a secondary role.

How

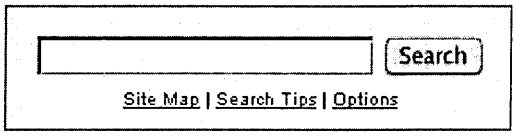
Group the different kinds of search functionality and place them in a small rectangular area. The area is placed in a prominent position on the page but is not masking the main navigation. Use a combination of a Search Box together with a Site Map, Site Index, Search Tips or Advanced Search.

Why

By combining all these search related functionality, the Search Area is THE place for searching and users only need to go to one place on the page. Alternatives and help is provided in a coherent way.

More Examples

Apple uses a search area with sitemap, tips and options.



From Tidwell's pattern collection
http://designinginterfaces.com/Input_Hints

Appendix 4.1: Preliminary test for exploratory study

Surname: ..... **Name:**.....

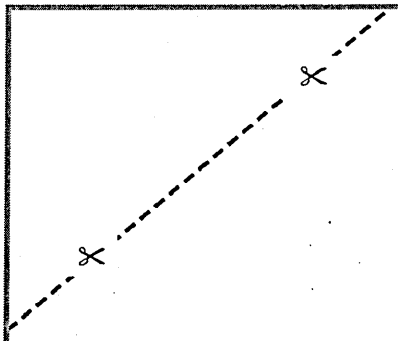
Thank you for completing this test. This is a voluntary test that could indirectly help you with the course. Time for completion: **20 minutes.**
Please note that this test doesn't not contribute towards your grade in any way

Test your knowledge of basic usability principles

First Part: The following multiple choice questions have only one correct answer. Please spend no more than 5 minutes.

1. The basic principles underlying user-centred design are:	☐ a. Relatively new ☐ b. Based on trial and error ☐ c. More art than science ☐ d. Nonexistent, good design is just applied common sense ☐ e. Derived from empirical data regarding human performance characteristics
2. User-centred software development requires the talents and participation of:	☐ a. Programmers ☐ b. User Interface Designers ☐ c. Graphic Artists ☐ d. Instructional Materials Developers ☐ e. All of the above
3. To satisfy both novice and expert users, the best strategy for label and field alignment is:	☐ a. Right align labels and left align fields ☐ b. Left align both fields and labels ☐ c. Left align labels and stagger fields ☐ d. None of the above ☐ e. Any of the above, depending on circumstances
4. The very best kind of "Help" is:	☐ a. Online tutorials ☐ b. Online documentation ☐ c. Reference manuals ☐ d. A "Help" desk ☐ e. Needing none at all
5. Users read fastest from a computer monitor that displays characters as	☐ a. Serif font - Times New Roman or Georgia ☐ b. Sans serif font - Arial or Verdana ☐ c. Microsoft's new ClearType ☐ d. They all elicit the same reading speed

1



These are the ten main usability principles (Nielsen 2001).

1. Visibility of system status (i.e. feedback)
2. Match between system and the real world (speak the user's language)
3. User control and freedom (undo, redo, clear exits)
4. Consistency
5. Help users diagnose and recover from errors
6. Error prevention
7. Recognition not recall (minimize memory load)
8. Flexibility and efficiency (includes shortcuts, macros)
9. Aesthetic and minimalist design
10. Help and documentation

Although **it is not necessary** to use them these usability principles could provide some help while you are answering the second part of this test.

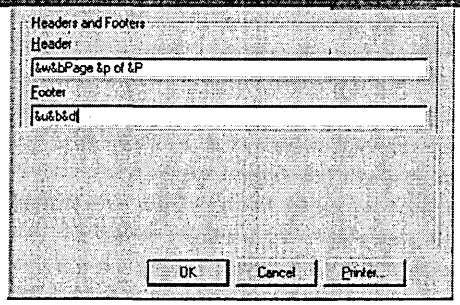
You can cut off this page so you can easily refer to these guidelines while you are completing the rest of the test

2

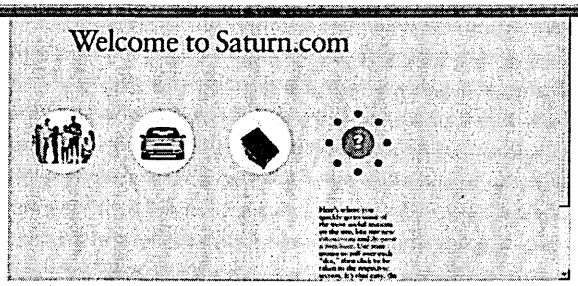
Second Part

You may answer these questions by writing briefly, or using arrows to indicate, or drawing.
Use your previous experience, your sense of usability and the usability principles.

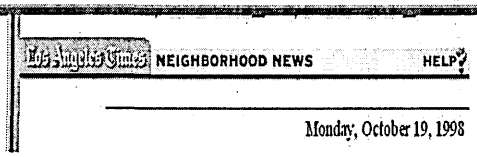
1. **Can you find any problems in this user interface design?**



2. **These icons are links. How can you improve the interface?**



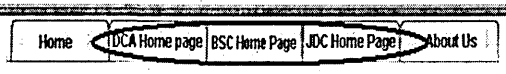
3. **What Might be wrong with these tabs here? How can you improve the interface?**



4. **How can you improve the reading of this list ?**

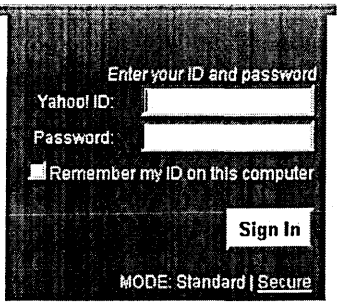
- Specifications
- Implementation
- Publication
- Data
- Global Partners
- Partner Program
- Reseller Registration
- Support Forums

5. **How can you improve the interface of this page? (inside the oval)**



3

6. Can you suggest a way to help users not remembering their password ?



7. How can you improve the information given in these links?

The Rise of the Network Society
How to Win Friends and Influence People
The Truth with Computers
The Media Equation
Radical Equations

8. How can you improve the interface of this page?

(required) First name:
(required) Last name:
Company/Organization:
(required) Mailing Address:
(required) City: State:
Zip Code
(required)Country:
(required) Phone(area code+number):
FAX (area code+number):
(required) E-mail:

9. What Might be Wrong Here? How can you improve the interface of this page where the ovals are.

Please indicate
Yes/No

10. How can you improve the interface of this page?

BODY MASS INDEX
Weight
Height
Calculate Reset

11. What Might be Wrong Here? How can you improve the interface of this page?

Use your card:
Visa
Amex
Master
American Express

4

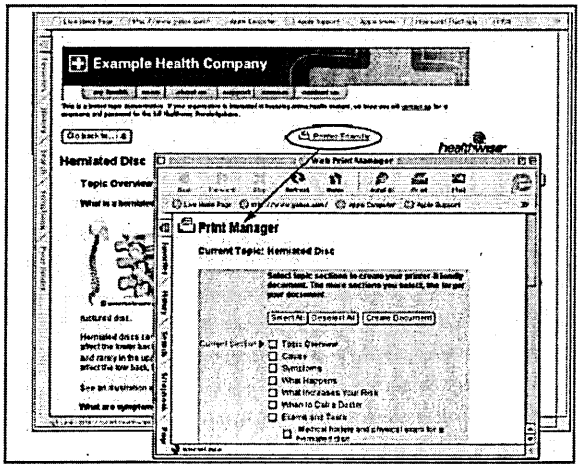
Appendix 4.2: Examples of patterns and guidelines

2:4 Provide Printing Options

Guideline: Provide a link to a complete printable or downloadable document if there are Web pages, documents, resources, or files that users will want to print or save in one operation.

Comments: Many users prefer to read text from a paper copy of a document. They find this to be more convenient, and it allows them to make notes on the paper. Users sometimes print pages because they do not trust the website to have pages for them at a later date, or they think they will not be able to find them again.

Example:

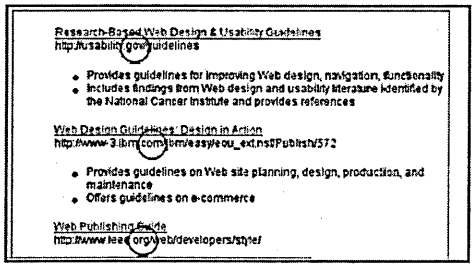


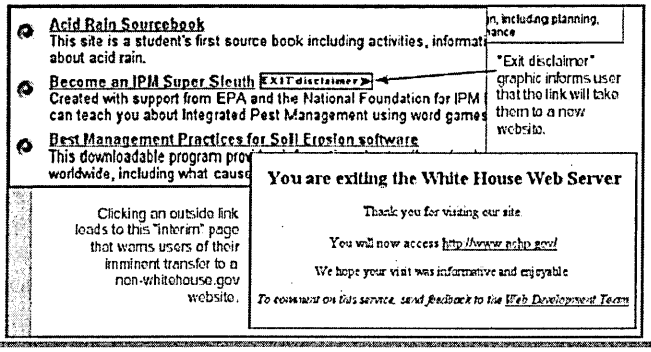
10:12 Indicate Internal vs. External Links

Guideline: Indicate to users when a link will move them to a different location on the same page or to a new page on a different website.

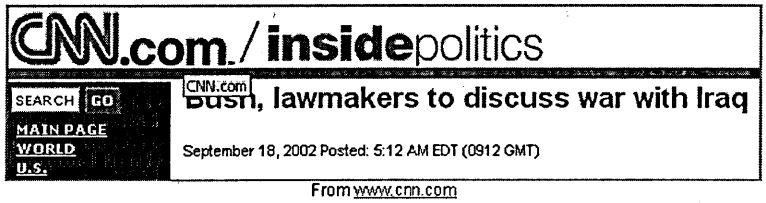
Comments: One study showed that users tend to assume that links will take them to another page within the same website. When this assumption is not true, users can become confused. Designers should try to notify users when they are simply moving down a page, or leaving the site altogether.

Example:





7.8 Home Link



From www.cnn.com

Problem
Users need to get back to a safe/start/familiar point

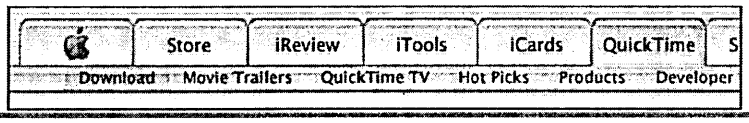
Use when
In most Web/WAP sites there is a home page. This page is usually the starting point for interaction. When users arrive at an arbitrary page within the site, they should be able to go back to the home page.

Solution
Use a fixed element, such as the site's logo, as a link to the home page

Add a link to the homepage on every page. Place the link at the top of the page and if appropriate on the bottom of the screen. If the site has a logo, make the logo a link to the homepage as well. Otherwise, simply link the homepage using the label "home", either a text label or an icon of a house. Make sure the link is always found on the same place.
If the site has subsites, you need to make a distinction between the root home and the local home. In that case make de logo the local home and provide a link to the root home.

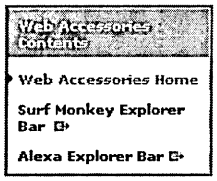
Why
A home link provides a safe exit on every page and always on the same position. No matter what, the users can always get back to a familiar place. Logo's identify the site and are therefore easily chosen to get back to the home page.

More Examples
This example of the Apple website shows how the Apple logo is used as a link to the home page.



7.14 Outgoing Links

From www.microsoft.com



Problem
Users need to know when they leave the current context.

Use when
Websites that contain links to others sites AND links to pages within the site. It also applies to WAP sites. Normally, links contained in a site take users to pages within the same site. However, at times there are also links the make users leave the site. Users must be able to distinguish these two kinds of links. Most links may be internel while external links form an exception.

Solution
Mark outgoing links visually.

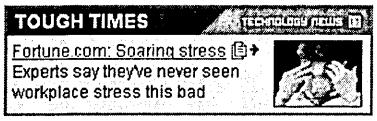
Mark the links by adding a note before or after the link label. Textual or iconic marks are used and coloring provides another redundant hint. When outgoing links are selected a new window is opened.

Why
By adding an icon or other kind of marking, users know that such links are different. This leads to better expectations of what happens when they will click on the link.

More Examples
An example from www.asktog.com:

(Read more.)

This example is from CNN.com:



Appendix 4.3: Task for final assignment (Exploratory study)

1

Usability Workshop

Surname: ..... **Name:** .....

Thank you for completing this test. This is a voluntary test that could indirectly help you with the course. **Duration: 50 minutes**.

Please note that this test does not contribute towards your grade in any way.

1. **What tool are you using for this test** ☐ Guidelines ☐ Patterns

2. **Did you complete the initial test** ☐ Yes ☐ No

3. **Did you study the material it was given about patterns or guidelines?**
   ☐ No ☐ If yes how long?..... Minutes.

2

Task 1 Evaluation and redesign. (Spend approximately 25 minutes)
Your evaluation should be the result of a sound process rather than personal opinion.

Go to www.louvre.fr . Click English language. All the following subtasks are from this site.

1.1 Subtask (10 minutes)
Find any flaws and usability problems on the current page and suggest useful redesign ideas and improvements (where applicable). You should make at least 4 contributions to the usability of this section.

1.2 Subtask (10 minutes)

Find any flaws and usability problems, and suggest useful redesign ideas and improvements (where applicable). You should make at least 6 contributions to the usability of this section.

a) Click on the **Virtual Tour** in the navigation bar > and then choose **Oriental antiquities**. You are to evaluate the navigation between the pages under the Oriental antiquities section.

b) Click on **Selected works>** then on the **Paintings>** then on the link **Selected works>** and finally **Italy 16th Century**. Evaluate this page and find flaws and usability errors. Suggest ways to improve the design. Click on the **Mona Lisa** picture. Do the same for this page. Evaluate the navigation by going to different works of this painting section

Task 2 Design (Spend approximately 25 minutes)
Do not use internet for this task

Design the E-cards section of a museum site, where visitors are able to choose a picture or a photo and e-mail it to a friend. The section should have at least 2 pages. Create a low fidelity prototype using pen and paper sketches. For ease of use, you will want to have one interface screen per piece of A4 paper. Once you make all the changes and you completed your design use a clear page to draw your final prototype.

The minimum requirements are:

1st page: The user can select a card from 4 different categories:

Abstract, Nature, People, Sculpture

In each category there are 6 cards which are shown as small images to choose from. Once the image is chosen the next page appears (2nd page).

2nd page: The page contains a larger view (around 10cm X 7or any similar size) of the chosen card and the fields that the sender can fill in details:

- There should be 4 fields: Name and e-mail address for the sender and the recipient.
- A field where it should be possible to include a greeting (free text).
- A field where a short title message selected from several preformatted greetings can be included (e.g. Hi, Miss you, Love you).

The page should have:

- Two buttons to offer the visitor the possibility: to go a preview page, and to choose another card from those on the 1st page (Design just the buttons, not any other page).
- Anything else to make the page better.

Important: Provide some way of good error feedback, using a method that you think is best when some of the fields are not filled or if a mistake is identified in the form.

Could you write a few words before you finish.

1. What do you think is missing or what you suggest to improve this collection of patterns or guidelines (regarding presentation, wording, examples etc.)

.....
.....
.....
.....
.....
.....
.....

2. What do you think is necessary to improve students' learning about patterns, guidelines and usability principles? Do not take into account the short duration of the teaching sessions.

.....
.....
.....
.....
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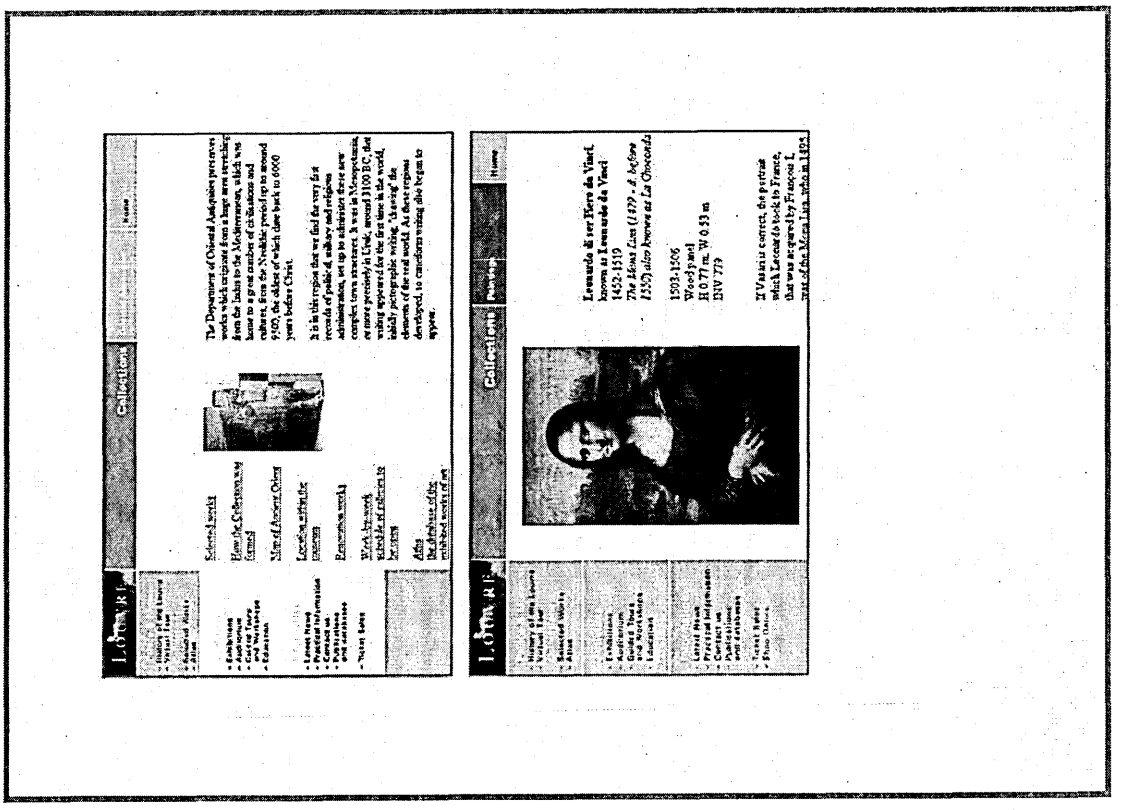
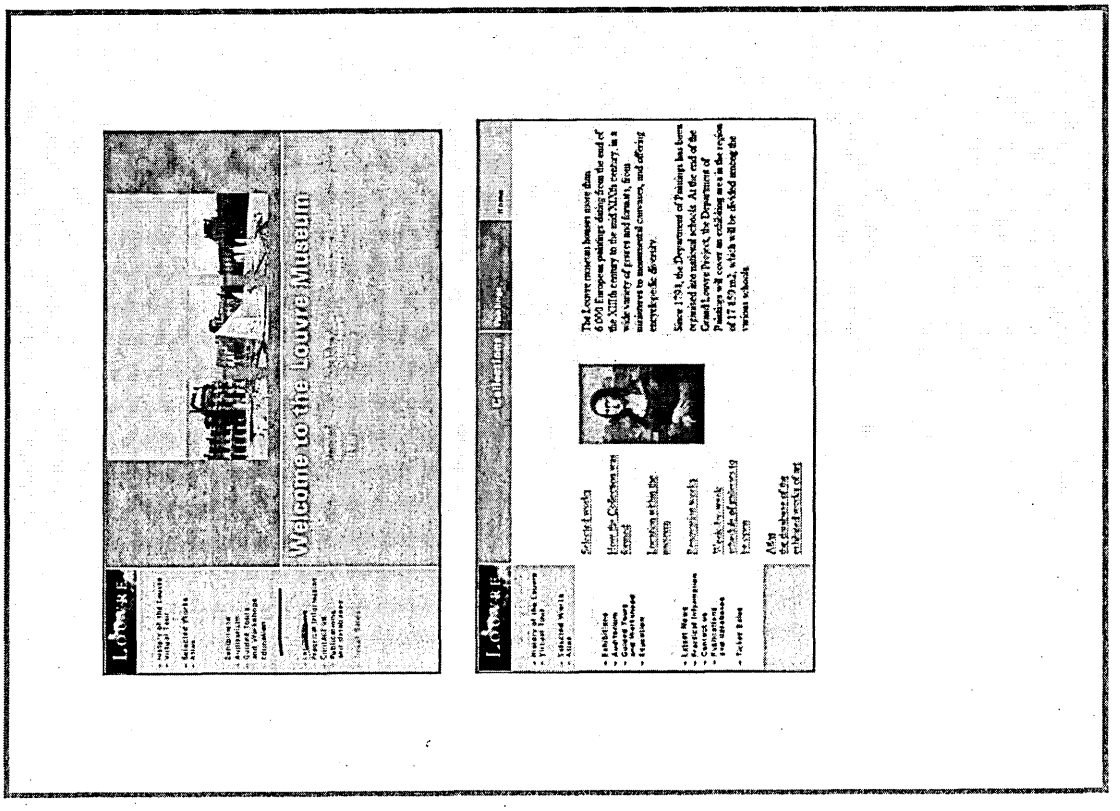
.....

Appendix 4.4: Pages to be evaluated (Exploratory study)





Appendix 4.5: Questionnaire for biographical information and level of experience

E-Commerce course - Student Personal Details

Surname: ..... **Name:**.....

Semester..... **Tutorial: Day** ..... **Time** .....

1. **State the level of your competency and experience in using a personal computer:**

☐	Beginner	I have recently started using a computer.
☐	Basic	Simple use of MS Office (Word, Excel). Simple use of e-mail and internet.
☐	Intermediate	All the above, plus extensive use of MS Office and Internet-related activities.
☐	Advanced	Very good use of the above and also use of some advanced and specialized programs.
☐	Expert	All the above and also installing computer cards, upgrading, networks etc.

2. **Do you have a personal computer at home?**
   ☐ Yes ☐ No

3. **Do you have access to the internet?**
   ☐ Yes ☐ No

4. **You well can you comprehend a text written in English from the internet or from books?**
   ☐ Not at all ☐Just a little ☐Good ☐Very Good ☐Perfect

5. **How long have you been using the Internet**
   ☐ Never ☐ Less than 6 months ☐ 6 months –1 year ☐ 1–2 years ☐ 2–5 years

6. **On average, how often do you access the Internet?**
   ☐ Every day ☐ Most days ☐ 2-3 days a week ☐ Every week ☐ Less than once a week

7. **On average, how much time do you spend in a day using the Internet?**
   ☐ Less than an hour ☐ 1-2 hours ☐ 2-3 hours ☐ 3-4 hours ☐ 4-5 hours ☐ 5+ hours

8. **How competent do you consideer yourself using the Internet**
   ☐ Very Little ☐ Little ☐ Good ☐ Very competent

9. **Have you ever designed a webpage or a website?**

☐	Never	I have never tried, or tried and failed.
☐	Tried once or twice	I have tried as an amateur once or twice.
☐	Average	I can build a simple web site.
☐	Good experience	I can build a web site with extensive features very easily.
☐	Expert	I can build a web site with advanced futures.

10. **Please give the following personal details**

Telephone No.	**Your email addresses**
Home.....	.....
Mobile.....	

Appendix 4.6: Instructions for the preliminary assignment

WEB DESIGN Final Exercise

Design a web site presenting the company profile of ITG. The following pages are needed:

index	Home page
companyinfo	Information about the company
contact	Contact details of the company
pelates	The best clients of the company
sinergates	Several firms and agencies that the company represents or whose products it sells
whatsnew	News of the company
services	Describe the services that the company provides. This page is linked to the pages: **servtomeas1** and **servtomeas2** where the two sectors in which the company specializes are described. Try to make a second navigational level for these two pages.

- Leave the table that provides the layout of the web pages as it is, unless you have an important reason to change it.
- It is important to have a functional navigation scheme and links at the right places. There should be links and a. It would be better to think about navigation before you commit yourself, since it will take more time to make changes later.
- If you think that more pages are needed, you are free to create them.
- The format of the text should be according to the instructions given on each page, next to the text. The instructions are in bold English characters in fuchsia **or in text boxes** and should be deleted once you have finished with each page. The exact meaning of the text is not very important, but do try to use the correct links and headings and proper formatting.
- Try to present the site of the company as best you can in order to portray and "sell" the company over the web. Use the usability principles and other techniques that you have been taught and help users have a good experience while visiting the site.
- Try to avoid extravagant things that will slow you down. Don't forget the site is about a company with a specific goal.
- If you need images or pictures or any other material, you may use the internet to find them. Images or pictures can be found on the following sites.

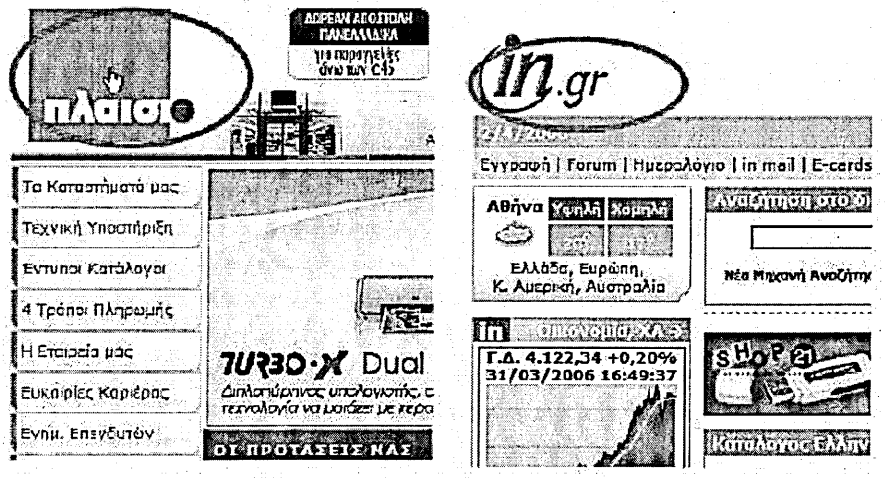
http://www.grsites.com/webgraphics/ http://www.free-backgrounds.com/dan1-10.shtml
http://www.feebleminds-gifs.com/ http://www.iconbazaar.com/index.html
http://www.gifanimations.com/index.jsp http://www.mikesfreegifs.com/

- For questions or any other information please use email.
- You should work alone and any collaboration with other members of the class is not allowed.

Good luck

Appendix 4.7: Five patterns from other pattern languages

Home Page Link



➢ **Use when**

Home page is usually the starting point for interaction. When users arrive at an arbitrary page within the site, they should be able to go back to the home page.

➢ **Problem**

Users need to get back to a safe/start/familiar point

Add a link to the home-page on every page. Place the link at the top of the page and if appropriate on the bottom of the screen. If the site has a logo, make the logo a link to the home-page as well. Otherwise, simply link the home-page using the label "home", either a text label or an icon of a house. Make sure the link is always found on the same place.

A home link provides a safe exit on every page and always on the same position. No matter what, the users can always get back to a familiar place. Logo's identify the site and are therefore easily chosen to get back to the home page.

Add this link on the home page as well to have consistency on the web site.

➢ **Solution**

Enable users to access the homepage from any other page on the website using affixed element such as the site's logo.

➢ **Other patterns to consider**

A link to the home page may be included using pattern **10 Meta Navigation** and pattern **11 Repeated Menu**

➢ **More Examples**

Meta Navigation

- **Use when**

  Most web sites, especially for commercial sites who wish to get in contact with their visitors and are large enough to have searching facilities. Additionally, the site offers navigational functionality that should be available on every page. Some functionality is relevant on every page. Users may want to go to a different place in the page

- **Problem**

  Users want to know who they are dealing with

  Usually the meta navigation bar consists of navigation elements AND communicative elements. Navigation elements include Home Link, Search Box, Site Map, and Index. Links to the worldwide site or other higher level sites are also navigation elements. Communicative elements tell users something about the organization and how to get in touch, for example About Us, Contact, Feedback. The meta navigation bar is placed in the upper region of the page so that it is always visible and does not take too much space

  The meta navigation bar contains functionality that is relevant on every page of the web site. It is therefore always accessible in a non-obtrusive way that does not cost much screen space.

- **Solution**

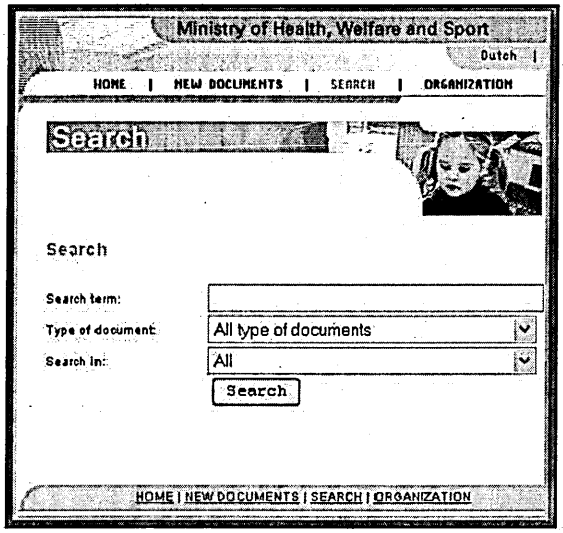
  Reserve an area on every page for communication and secondary navigation elements.

- **Other patterns to consider**

  This pattern offers a chance to employ ***2 Home Page Link*** as well.

- **More Examples**

Repeated Menu



➢ Use when

Web pages are frequently more than one "view" long and users will need to scroll down to see the entire page. In such cases, the main navigation is likely to be out of sight.

➢ Problem

Users need to access the main navigation

This pattern makes the main navigation accessible again.

Allow users to access the navigation after scrolling by repeating the main navigation at the bottom. There is no need to go back to the top because the navigation is within immediate reach.

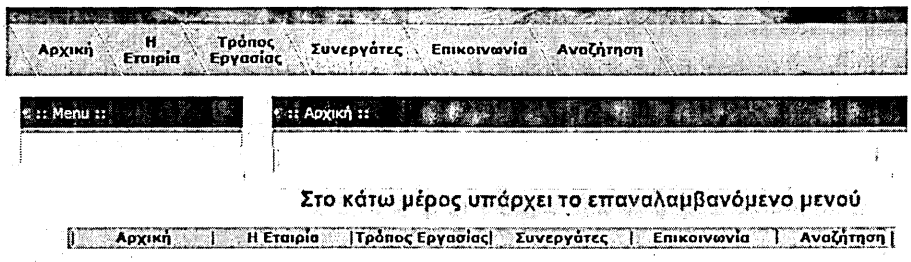
Provide a simple bar with the same elements as the main navigation menu. However, make it simple, preferably just text links in a smaller font size. By presenting it in a different way, the users know that it is not the main navigation but a secondary feature for their convenience

➢ Solution

Repeat the main navigation at the bottom of the page to help users access navigation

➢ More Examples

Pay attention to the main navigation and the repeated menu.



To the Top Link

- **Μπορώ να πληρώσω με πιστωτική κάρτα ή μόνο μετρητά?**

  Βεβαίως μπορείτε να πληρώσετε με την κάρτα σας ή και με κατάθεση σε λογαριασμό τράπεζας που θα σας δοθεί.

- **Πόσος χρόνος θα χρειαστεί για να αποκτήσω τον δικό μου διαθέσιμο χώρο στον server ?**

  Όταν οι πληροφορίες σας θα προσέλθουν στην φόρμα παραγγελίας που παρέχουμε, θα περιμένουμε την τακτοποίηση του λογαριασμού σας. Το domain θα έχει εγκατασταθεί μέσα σε 3 ώρες από τη στιγμή που θα λάβουμε την πληρωμή σας ! Όταν ο λογαριασμός σας είναι έτοιμος θα σας αποστείλουμε μία εντολή ενεργοποίησης μέσω e-mail, περιλαμβανομένου του user-ID, password, και της IP διεύθυνσης.

- **Πως μπορώ να επικοινωνήσω για τυχόν ερωτήσεις που θα έχω ?**

➢ Use when

When pages are longer than 2 views and users are likely to go back and forth the top of the page. Typical use of this pattern is long page types with text where the users jump from one place to the other. Another situation is when displaying long texts and users need to get access to the navigation again

➢ Problem

The users need to go back to the top of the page

Choose strategic locations to place a link in the content labelled 'back to top' or just 'top' with or without and up-pointing icon. Strategic locations are typically paragraph endings or other types of 'blocks'. The link itself points to an anchor placed at the top of the page.

Basically this solution can be used for two reasons:

1. To get back to the main navigation
2. To get back to the top part of the content

If you are doing it for the first option, consider using a **Repeated Menu** at the bottom of the page instead. Even having both a "to the top" link and a repeated menu can be a bit redundant but nevertheless useful for users.

This allows users to go back the main navigation from almost every scrolling position. It may also be convenient for disabled users who scrolling is difficult to do.

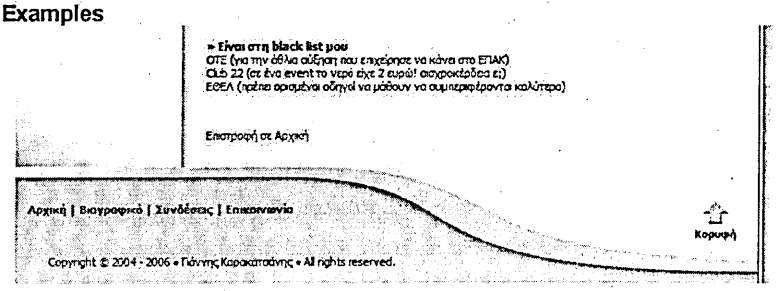
➢ Solution

Provide a link to the top of the page at locations in the main content of the page

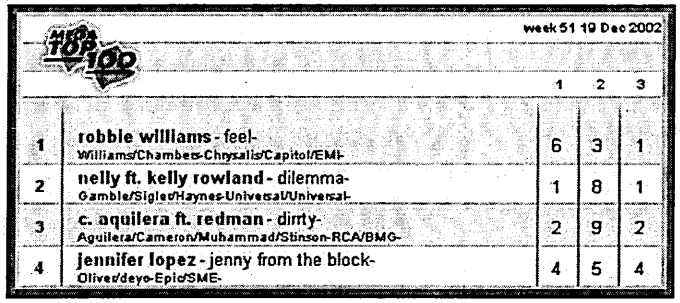
➢ Other patterns to consider

Use this pattern together with ***7 Page List of Contents*** so that visitors may go back to the list of contents.

➢ More Examples



Alternating Row Colours



week 51 19 Dec 2002

		1	2	3
1	**robbie williams** - feel- Williams/Chambers-Chrysalis/Capitol/EMI-	6	3	1
2	**nelly ft. kelly rowland** - dilemma- Gamble/Sigler/Haynes-Universal/Universal-	1	8	1
3	**c. aquilera ft. redman** - dirty- Aguilera/Cameron/Muhammad/Stinson-RCA/BMG-	2	9	2
4	**jennifer lopez** - jenny from the block- Oliver/deyo-Epic/SME-	4	5	4

➢ **Use when**

Tables are common elements within a web page. A table can be quite complex and have several columns which make it hard to see which items belong to the same row.

➢ **Problem**

Users need to read or scan a table in search of particular information

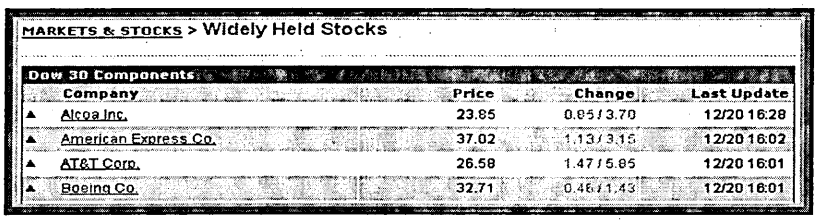
Use two colours of low saturation, e.g. white and a very light shade of an other colour, that are only slightly different. Colour each row of the table by alternating these two colours.

The row colour eliminates the need of table borders and makes it easy for the eye to read a row. In a vertical sense, the colours make it easier to 'catch' an item because it is on either one of the colours

➢ **Solution**

Use alternating row colours for making the table more readable

➢ **More Examples**



MARKETS & STOCKS > Widely Held Stocks

Dow 30 Components

	Company	Price	Change	Last Update
▲	Alcoa Inc.	23.85	0.85 / 3.70	12/20 16:28
▲	American Express Co.	37.02	1.13 / 3.15	12/20 16:02
▲	AT&T Corp.	26.58	1.47 / 5.85	12/20 16:01
▲	Boeing Co.	32.71	0.46 / 1.43	12/20 16:01

Appendix 4.8: Instructions for design test

Redesign and Deign Tasks

Dear Student

This design test consists of two parts. The first part requires you to work again on some of the pages you designed some time ago for the ITG company. The second part requires you to design a web site for a company called Infolstos.

You may ask any question, especially if you cannot apply a specific technique that you want to apply. The same applies if for any reason the final presentation of the website is not as expected and you need some help.

☞First Part
ITG exercise (duration 30 minutes)
Make any change and improvement to the following two pages on the web site in order to improve usability and the overall experience of the user.

index	Home page
companyinfo	Infromation about the company

The navigation of the site may change but do not change any of the other pages on the site.

☞Second Part
Infolstos web site (duration 1 hour 45 minutes)
Please read the following instructions carefully:

- Format and design a web site for a company that itself designs and builds web pages for other companies and individuals.
- You are only required to design three pages, as per the following table:

index	Home page
paketa	Information of packages designed and intended for customers
pelates	Examples of websites belonging to the company's customers

- Create necessary links to the hypothetical webpage "ypothetiki.htm".
- Don't change the table used for page layout because it is possible that other problems will occur that are hard to solve.
- It is important to have a functional navigation scheme and links at the right places. It would be better to think about navigation before you commit yourself, since it will take more time to make changes later.

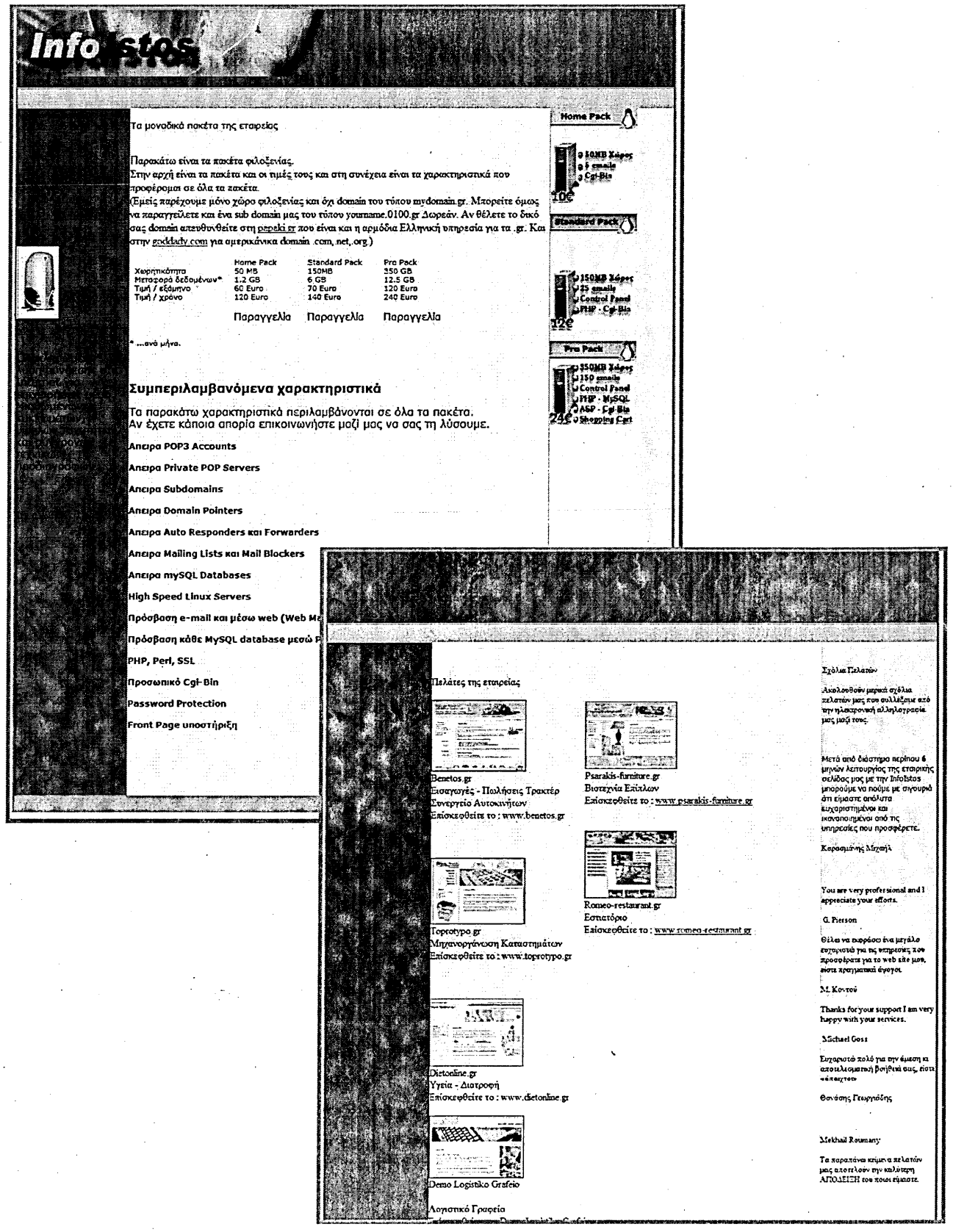
If "Interactive Buttons" are used for navigation, select one of the following from FrontPage:		If a "Link bar based on navigation" is used, then use one of the following from FrontPage:	
• Simple Arrow	• Embossed Capsule	• Deep Blue	• Blue Calm
• Simple Circle	• Glass Rectangle	• Ice	• Water
• Soft Capsule	• Corporate	• Ripple	

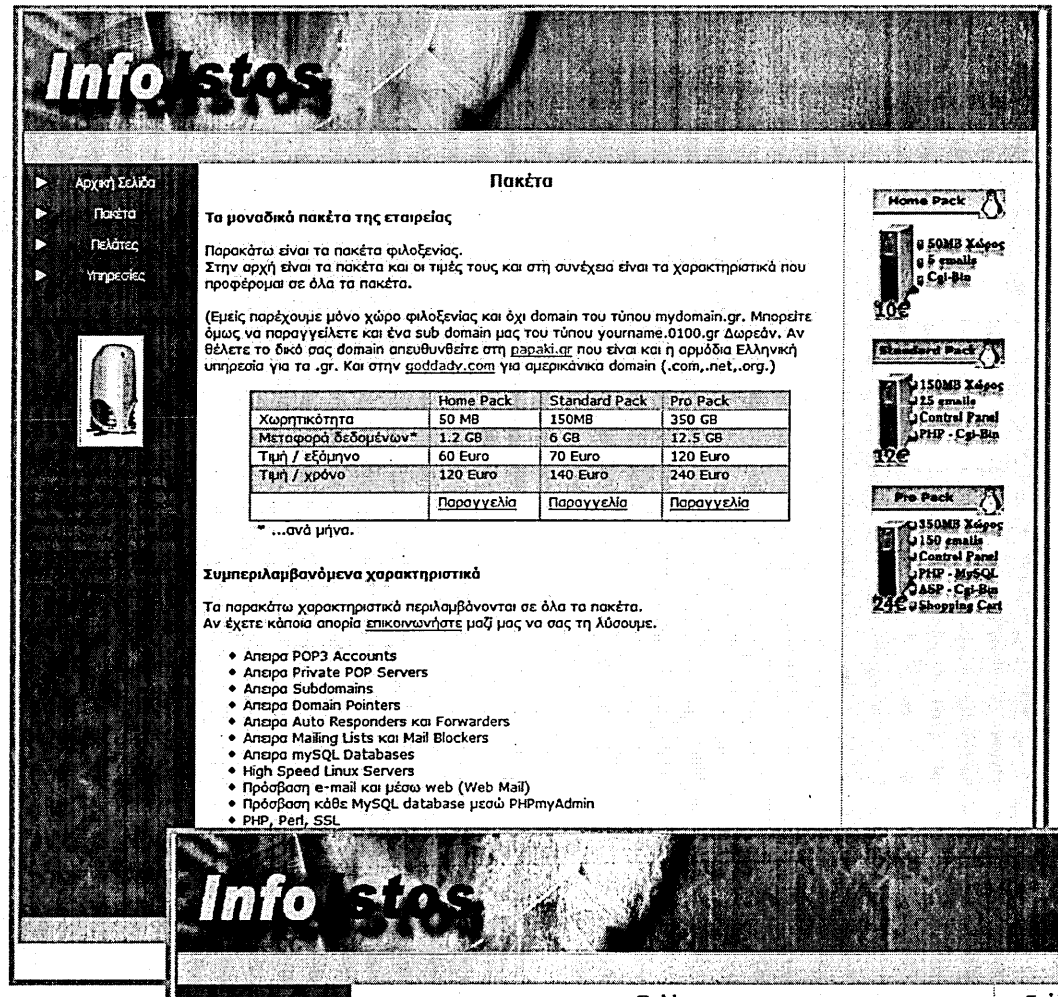
- The format of the text should be according to the instructions given on each page, next to the text. The instructions are in bold English characters in fuchsia **or in text boxes** and should be deleted once you have finished with each page. The exact meaning of the text is not very important, but do try to use the correct links and headings and proper formatting.
- Design the company's site according to the principles of usability and the techniques that you have been taught.
- Try to avoid "over the top" design structures that will take time. Don't forget the site is about a company with a specific goal.
- If you think that you need pictures, images or small gif files, you can find several of them in the directory "my_ikones" or the webpage "eikones.htm", included on the web site.

Good Luck

Appendix 4.9: Initial state of site and pages designed

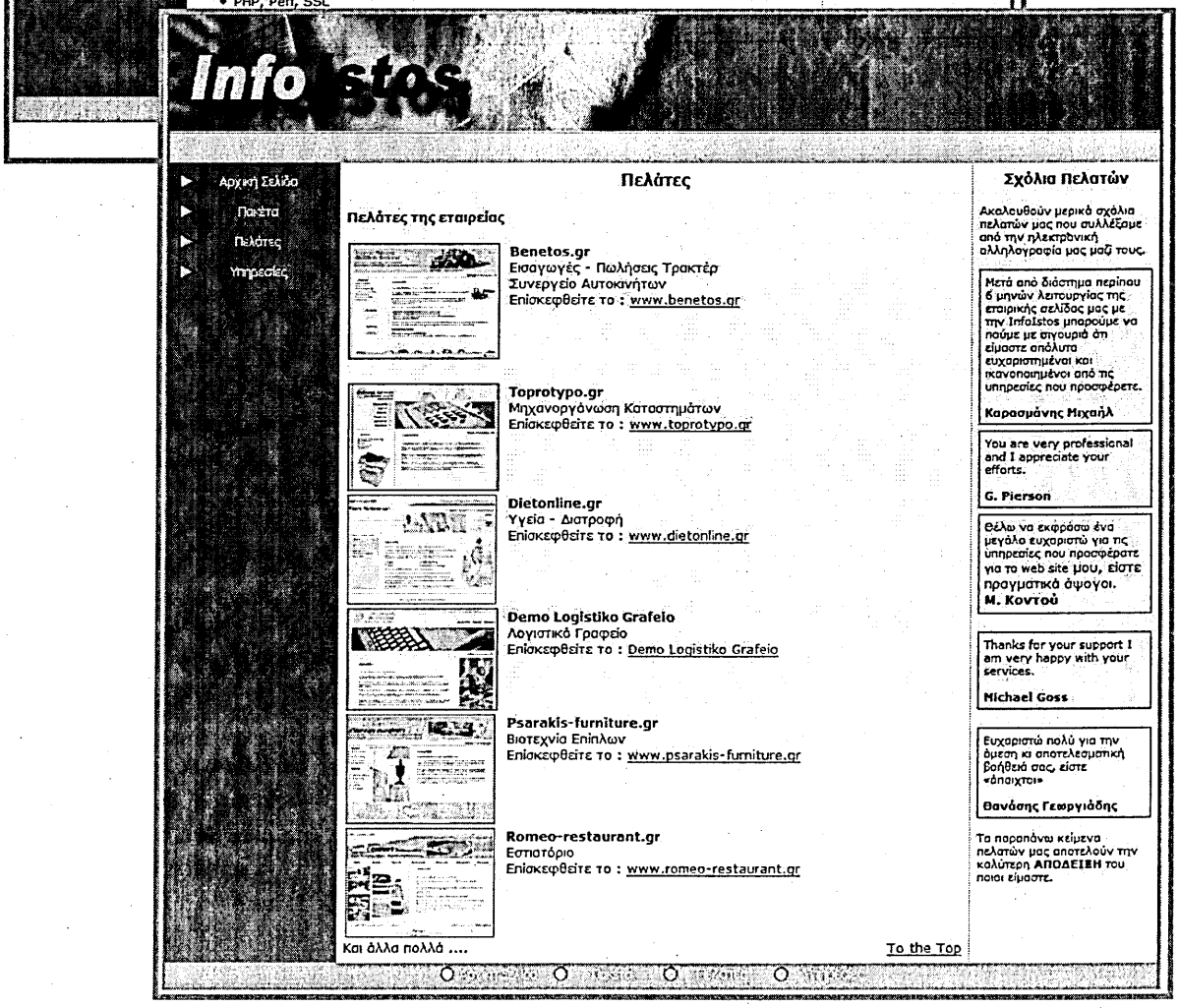
(Two pages from the design task and the same pages as designed by a student)





	Home Pack	Standard Pack	Pro Pack
Χωρητικότητα	50 MB	150MB	350 GB
Μεταφορά δεδομένων*	1.2 GB	6 GB	12.5 GB
Τιμή / εξόμηνο	60 Euro	70 Euro	120 Euro
Τιμή / χρόνο	120 Euro	140 Euro	240 Euro
	Παραγγελία	Παραγγελία	Παραγγελία

* ...ανά μήνα.



Appendix 4.10: Questionnaire – opinion of students about patterns and guidelines

Name: .... Guidelines/Patterns .....

1 Part

State your agreement with the following statements about the booklet.

State your level of agreement with the following statements about the booklet.

The patterns/guidelines was easy to understand.

I disagree totally	I disagree	I neither agree nor disagree	I agree	I agree totally
☐	☐	☐	☐	☐

I believe that the section in the course about the guidelines/patterns helped me to improve my skills.

Not at all	Little	Moderately	Much	Very much
☐	☐	☐	☐	☐

The guidelines/patterns, provided for study, were very helpful in explaining how to improve a website.

Very useful	Useful	Neutral	Useless	Completely useless
☐	☐	☐	☐	☐

What do you suggest to improve the instructions in the booklet?

.....

.....

.....

2 Part

Use an X in marking your answers to the next questions.

How much time did you spend every week on reading and practicing in the seminar?

Less than an hour	1-2 hours	2-4 hours	4-6 hours	More than 6 hours
☐	☐	☐	☐	☐

Specifically, how many hours?

How much time did you spend reading the booklet of guidelines/patterns before the final examination?

Less than an hour	1-2 hours	2-3 hours	3-5 hours	More than 5 hours
☐	☐	☐	☐	☐

3 Part

How often did you use the booklet during the exercise Infolstos

Not at all	A little	Moderately	Much	Very much
☐	☐	☐	☐	☐

In the future, will you use the booklet of guidelines/patterns if you are required to design other sites?

Definitely yes	Yes	Neutral opinion	No	Absolutely not
☐	☐	☐	☐	☐

Page 1

4 Part

Once you had learned to design with Front Page and you had been taught the guidelines/patterns, to what do you think you owe your improvement?

The presentation during the tutorials about guidelines/patterns helped me develop my design abilities.

Not at all	Only a little	Moderately	A lot	Very much
☐	☐	☐	☐	☐

The booklet of guidelines/patterns helped me develop my abilities in designing websites.

Not at all	Only a little	Moderately	A lot	Very much
☐	☐	☐	☐	☐

5 Part

How useful were the guidelines/patterns for the redesign task.

Not at all	Only a little	Moderate	A lot	Very Much
☐	☐	☐	☐	☐

How useful were the guidelines/patterns for designing the Infolstos site

Not at all	Only a little	Moderate	A lot	Very Much
☐	☐	☐	☐	☐

Answer the following question after the assessment of the company's website

How useful were the guidelines/patterns for the evaluation of the site that was given to you

Not at all	Only a little	Moderate	A lot	Very Much
☐	☐	☐	☐	☐

I can remember the following from the guidelines/patterns

1 .....
2 .....
3 .....
4 .....
5 .....
6 .....
7 .....
8 .....
9 .....
10 .....
11 .....
12 .....

Page 2

Comparison of guidelines/patterns

Compare the pattern with the equivalent guideline The two forms present the same advice. Which of the two forms do you prefer and why?

.....

.....

.....

Compare the pattern with the equivalent guideline The two forms present the same advice. Which of the two forms do you prefer and why?

.....

.....

.....

Compare the pattern with these guidelines
The pattern is bigger because in essence it corresponds to two guidelines. The two formats present the same advice. Which of the two formats do you prefer and why?

.....

.....

.....

Appendix 4.11: Patterns and guidelines for comparison

(Only the first pair is presented on the next page. The other two pairs can be viewed in Appendix 6.22)

Case	Pattern Name	Guideline Title
Simple1	8. Descriptive Tab Labels	12. Use Descriptive Tab Labels
Simple2	18. To the Top Link	26. Allow Users to Go Back to the Top of the Page
Compound1	26. Lists	38. Display Related Items in Lists 39. Introduce Each List 40. Format Lists to Ease Scanning 41. Capitalize First Letter of First Word in Lists

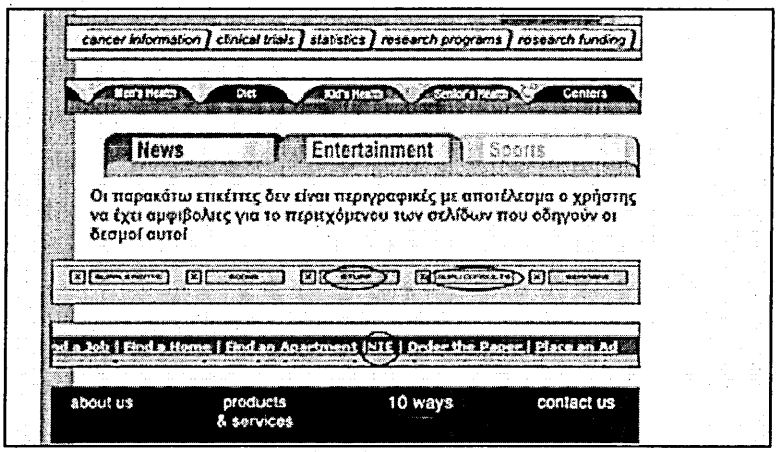
8 Use Descriptive Tab Labels

➤ Guideline

Ensure that tab labels are clearly descriptive of their function or destination.

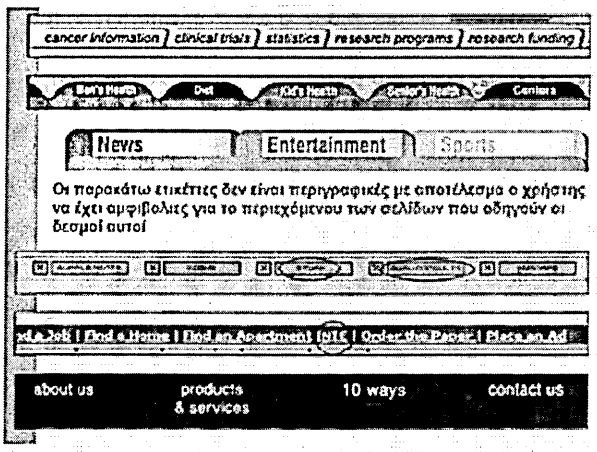
➤ Comments

Users like tabs when they have labels that are descriptive enough to allow error-free selections. When tab labels cannot be made clear because of the lack of space, do not use tabs.



8 Use Descriptive Tab Labels

12 Descriptive Tab Labels



➤ Problem

How user can choose a navigation tab without guessing the function or the destination

Users like tabs when they have labels that are descriptive enough to allow error-free selections. When tab labels cannot be made clear because of the lack of space, do not use tabs.

➤ Solution

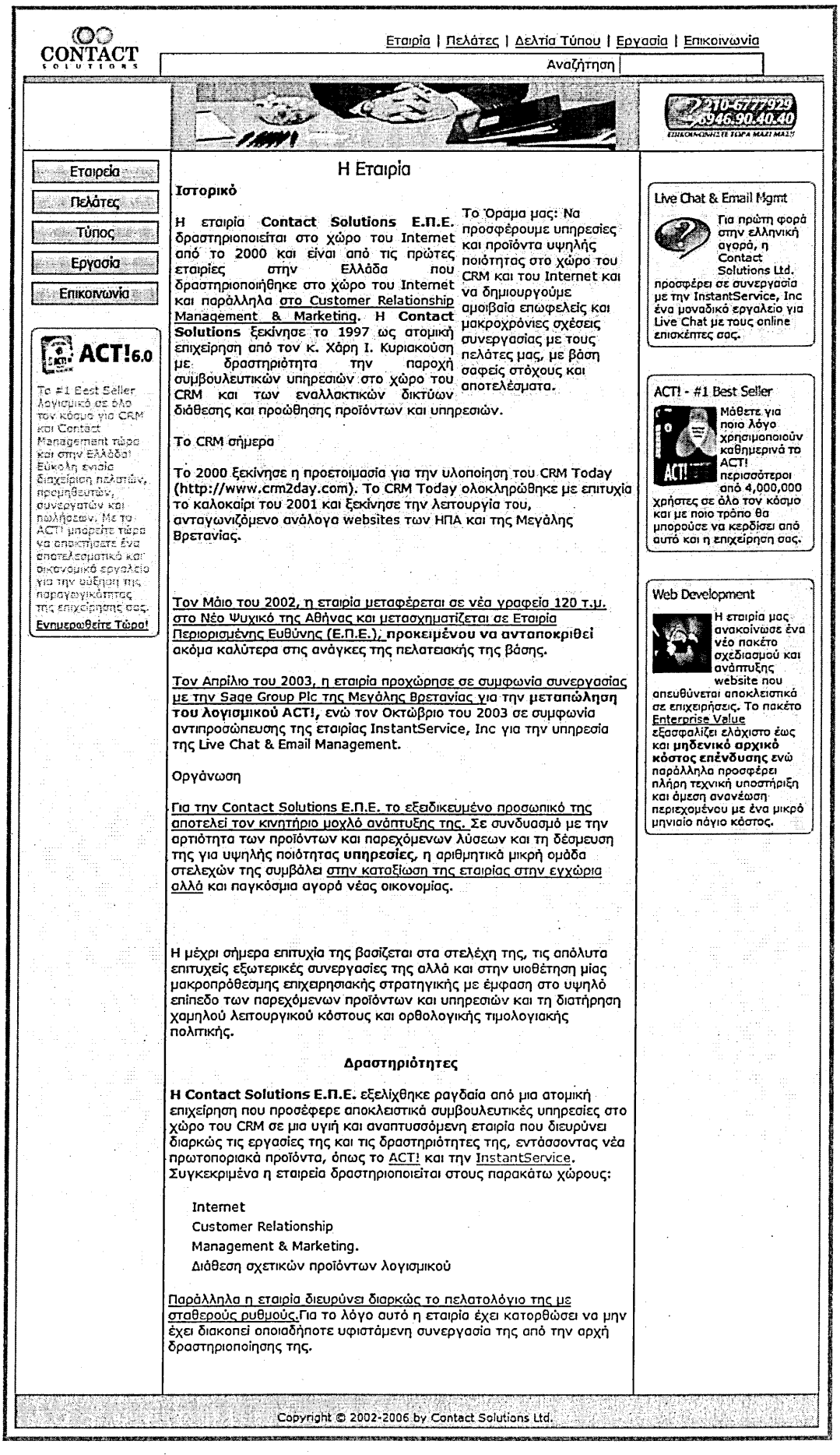
Ensure that tab labels are clearly descriptive of their function or destination

➤ Other patterns to consider

By using this pattern you use pattern ***15 Descriptive Link Names*** at the same time. Also do not forget that pattern ***11 Repeated Menu*** could be applied.

➤ More Examples

Appendix 4.12: Web site for evaluation task



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Η Εταιρία

Ιστορικό

Η εταιρία **Contact Solutions Ε.Π.Ε.** δραστηριοποιείται στο χώρο του Internet από το 2000 και είναι από τις πρώτες εταιρίες στην Ελλάδα που δραστηριοποιήθηκε στο χώρο του Internet και παράλληλα στο Customer Relationship Management & Marketing. Η **Contact Solutions** ξεκίνησε το 1997 ως ατομική επιχείρηση από τον κ. Χάρη Ι. Κυριακούση με δραστηριότητα την παροχή συμβουλευτικών υπηρεσιών στο χώρο του CRM και των εναλλακτικών δικτύων διάθεσης και προώθησης προϊόντων και υπηρεσιών.

Το Όραμα μας: Να προσφέρουμε υπηρεσίες και προϊόντα υψηλής ποιότητας στο χώρο του CRM και του Internet και να δημιουργούμε αμοιβαία επωφελείς και μακροχρόνιες σχέσεις συνεργασίας με τους πελάτες μας, με βάση σαφείς στόχους και αποτελέσματα.

Το CRM σήμερα

Το 2000 ξεκίνησε η προετοιμασία για την υλοποίηση του CRM Today (http://www.crm2day.com). Το CRM Today ολοκληρώθηκε με επιτυχία το καλοκαίρι του 2001 και ξεκίνησε την λειτουργία του, ανταγωνιζόμενο ανάλογα websites των ΗΠΑ και της Μεγάλης Βρετανίας.

Τον Μάιο του 2002, η εταιρία μεταφέρεται σε νέα γραφεία 120 τ.μ. στο Νέο Ψυχικό της Αθήνας και μετασχηματίζεται σε Εταιρία Περιορισμένης Ευθύνης (Ε.Π.Ε.), **προκειμένου να ανταποκριθεί** ακόμα καλύτερα στις ανάγκες της πελατειακής της βάσης.

Τον Απρίλιο του 2003, η εταιρία προχώρησε σε συμφωνία συνεργασίας με την Sage Group Plc της Μεγάλης Βρετανίας για την **μεταπώληση του λογισμικού ACT!,** ενώ τον Οκτώβριο του 2003 σε συμφωνία αντιπροσώπευσης της εταιρίας InstantService, Inc για την υπηρεσία της Live Chat & Email Management.

Οργάνωση

Για την Contact Solutions Ε.Π.Ε. το εξειδικευμένο προσωπικό της αποτελεί τον κινητήριο μοχλό ανάπτυξης της. Σε συνδυασμό με την αρτιότητα των προϊόντων και παρεχόμενων λύσεων και τη δέσμευση της για υψηλής ποιότητας **υπηρεσίες,** η αριθμητικά μικρή ομάδα στελεχών της συμβάλει στην κατοξίωση της εταιρίας στην εγχώρια αλλά και παγκόσμια αγορά νέας οικονομίας.

Η μέχρι σήμερα επιτυχία της βασίζεται στα στελέχη της, τις απόλυτα επιτυχείς εξωτερικές συνεργασίες της αλλά και στην υιοθέτηση μίας μακροπρόθεσμης επιχειρησιακής στρατηγικής με έμφαση στο υψηλό επίπεδο των παρεχόμενων προϊόντων και υπηρεσιών και τη διατήρηση χαμηλού λειτουργικού κόστους και ορθολογικής τιμολογιακής πολιτικής.

Δραστηριότητες

Η Contact Solutions Ε.Π.Ε. εξελίχθηκε ραγδαία από μια ατομική επιχείρηση που προσέφερε αποκλειστικά συμβουλευτικές υπηρεσίες στο χώρο του CRM σε μια υγιή και αναπτυσσόμενη εταιρία που διευρύνει διαρκώς τις εργασίες της και τις δραστηριότητες της, εντάσσοντας νέα πρωτοποριακά προϊόντα, όπως το ACT! και την InstantService. Συγκεκριμένα η εταιρεία δραστηριοποιείται στους παρακάτω χώρους:

- Internet
- Customer Relationship
- Management & Marketing.
- Διάθεση σχετικών προϊόντων λογισμικού

Παράλληλα η εταιρία διευρύνει διαρκώς το πελατολόγιο της με σταθερούς ρυθμούς.Για το λόγο αυτό η εταιρία έχει κατορθώσει να μην έχει διακοπεί οποιαδήποτε υφιστάμενη συνεργασία της από την αρχή δραστηριοποίησης της.

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Η εταιρία μας έχει αναπτύξει ισχυρές και μακροπρόθεσμες συνεργασίες με σημαντικές εταιρίες, διαθέτοντας ένα αξιόλογο πελατολόγιο. Βασική μας προτεραιότητα και επιδίωξη είναι η παροχή υψηλού επιπέδου υπηρεσιών και η ικανοποίηση των πελατών μας στον μέγιστο βαθμό.

Ακολουθεί μία παρουσίαση των σημαντικότερων εταιριών που έχουμε συνεργαστεί:

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Η εταιρία μας προσφέρει πολύ καλές συνθήκες εργασίας σε ένα φιλικό αλλά και εξελισσόμενο περιβάλλον.

Στη συνέχεια ακολουθούν οι υφιστάμενες ανοιχτές θέσεις για εργασία στην εταιρία μας. Επιπλέον μπορείτε να μας αποστείλετε το βιογραφικό σας μέσω email για να σας γνωρίσουμε και θα επικοινωνήσουμε άμεσα μαζί σας μόλις προκύψει μία θέση ανάλογη των προσόντων σας.

Θέση **:: Web Programmer**

Θέση **Υπεύθυνος Πωλήσεων**

Σε περίπτωση που σας ενδιαφέρει κάποια από τις ανωτέρω θέσεις εργασίας, στείλτε μας το βιογραφικό σας μέσω email αναφέροντας και τα πλήρη στοιχεία επικοινωνίας σας ώστε ένας εκπρόσωπος μας να επικοινωνήσει μαζί σας.

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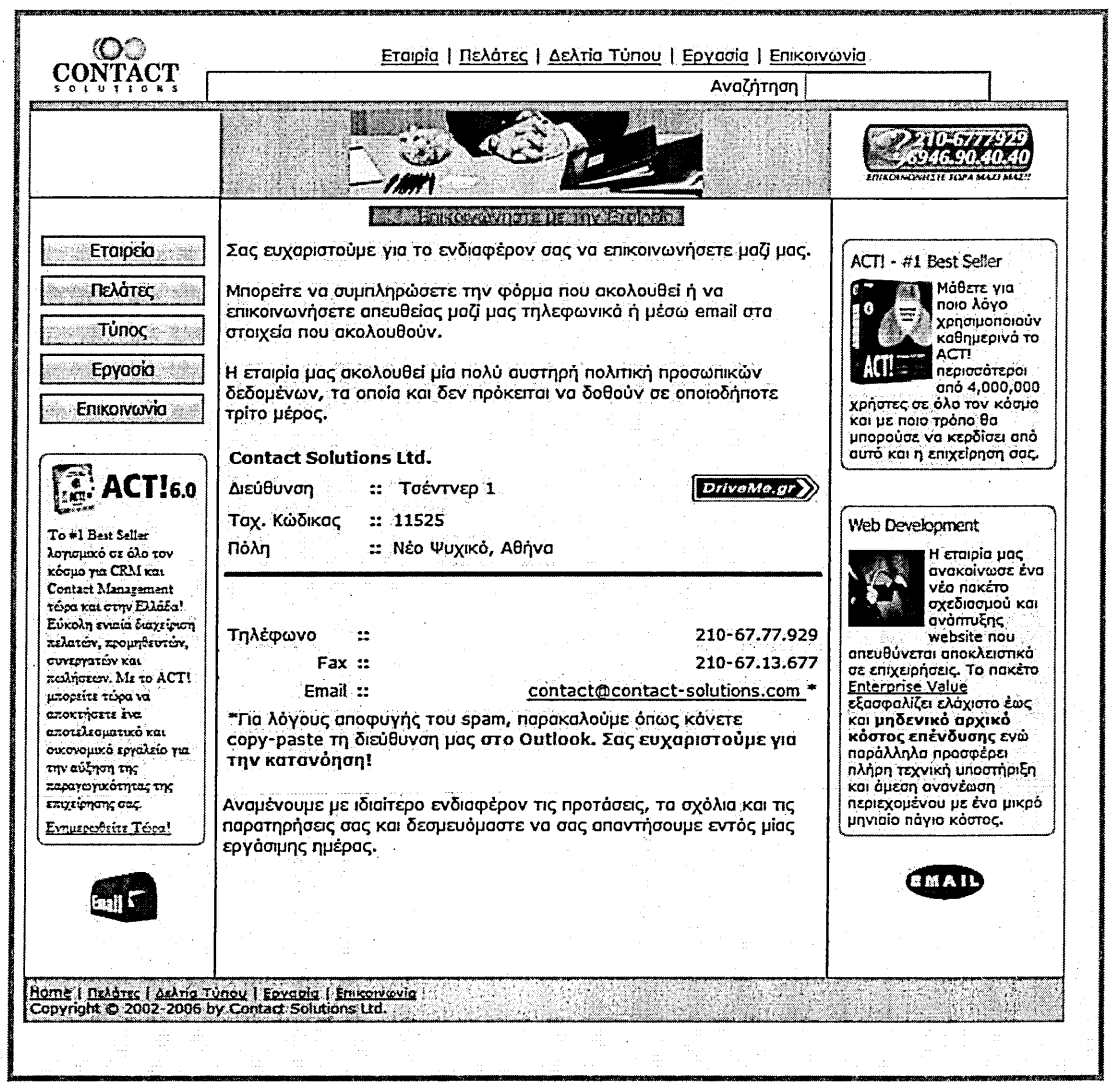
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Μπορείτε να συμπληρώσετε την φόρμα που ακολουθεί ή να επικοινωνήσετε απευθείας μαζί μας τηλεφωνικά ή μέσω email στα στοιχεία που ακολουθούν.
Η εταιρία μας ακολουθεί μία πολύ αυστηρή πολιτική προσωπικών δεδομένων, τα οποία και δεν πρόκειται να δοθούν σε οποιοδήποτε τρίτο μέρος.
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DriveMe.gr
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Τηλέφωνο :: 210-67.77.929
Fax :: 210-67.13.677
Email :: contact@contact-solutions.com *
*Για λόγους αποφυγής του spam, παρακαλούμε όπως κάνετε copy-paste τη διεύθυνση μας στο Outlook. Σας ευχαριστούμε για την κατανόηση!
Αναμένουμε με ιδιαίτερο ενδιαφέρον τις προτάσεις, τα σχόλια και τις παρατηρήσεις σας και δεσμευόμαστε να σας απαντήσουμε εντός μίας εργάσιμης ημέρας.
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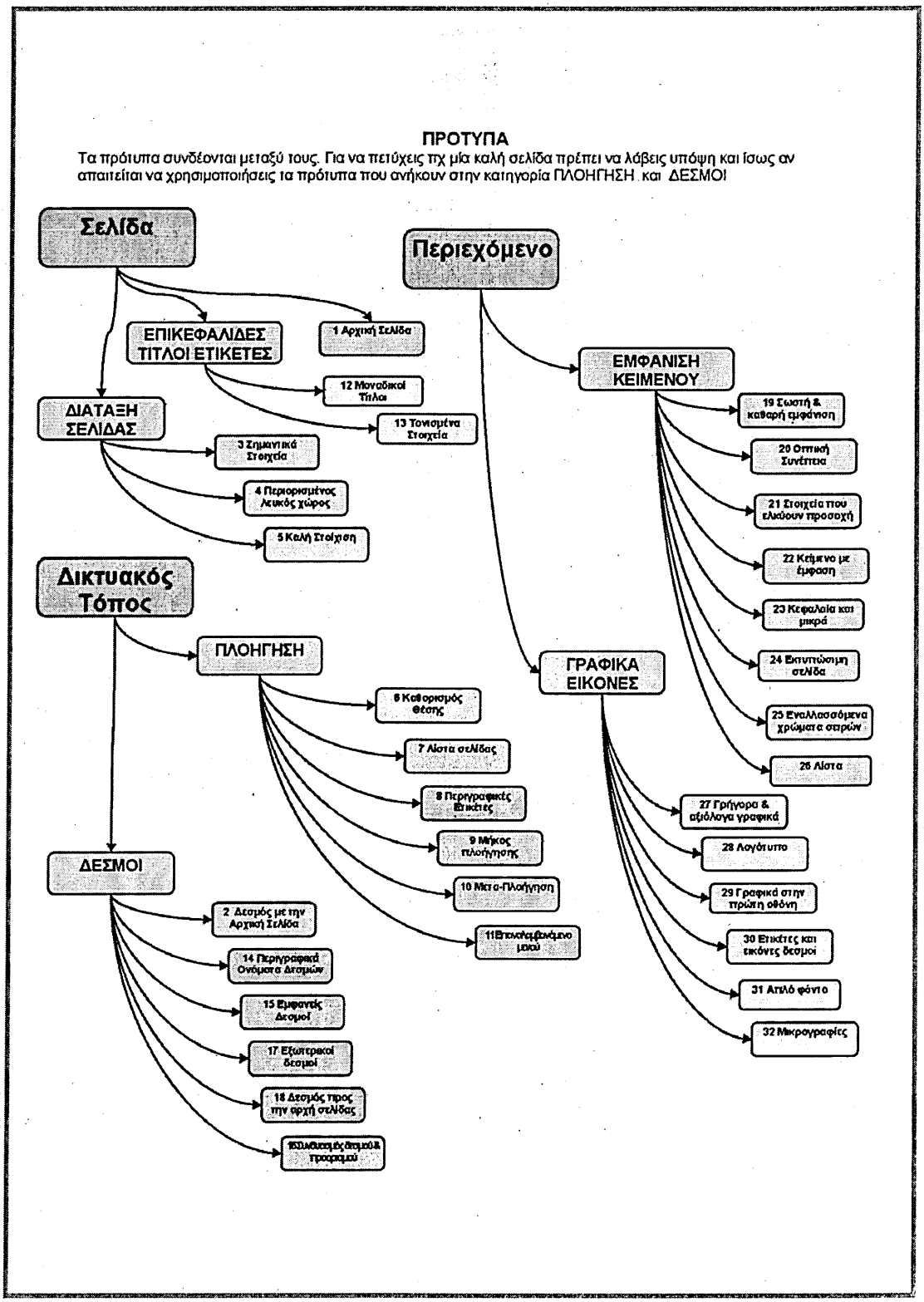
Appendix 4.13: Links for the patterns collection

(Diagram and collection of patterns)



1 Η αρχική σελίδα
- 1 Αρχική σελίδα
- 2 Δεσμός με την Αρχική σελίδα

2 Διάταξη (Layout) σελίδων
- 3 Σημαντικά Στοιχεία
- 4 Περιορισμένος λευκός χώρος
- 5 Καλή Στοίχιση

3 Πλοήγηση
- 6 Καθορισμός Θέσης
- 7 Λίστα σελίδας
- 8 Περιγραφικές Ετικέτες πλοήγησης
- 9 Μήκος πλοήγησης
- 10 Μετα-Πλοήγηση
- 11 Επαναλαμβανόμενο μενού

4 Επικεφαλίδες, τίτλοι, και ετικέτες
- 12 Μοναδικοί τίτλοι
- 13 Τονισμένα στοιχεία

5 Δεσμοί
- 14 Περιγραφικά Ονόματα Δεσμών
- 15 Εμφανείς Δεσμοί
- 16 Συνδυασμός δεσμού & προορισμού
- 17 Εξωτερικοί δεσμοί
- 18 Δεσμός προς την αρχή σελίδας

6 Εμφάνιση κειμένου
- 19 Σωστή & καθαρή εμφάνιση κειμένου
- 20 Οπτική Συνέπεια
- 21 Στοιχεία που ελκύουν προσοχή
- 22 Κείμενο με έμφαση
- 23 Κεφαλαία και μικρά
- 24 Εκτυπώσιμη σελίδα
- 25 Εναλλασσόμενα χρώματα σειρών

7 Κατάλογοι Λίστες
- 26 Λίστα

8 Γραφικά, εικόνες και πολυμέσα
- 27 Γρήγορα και αξιόλογα γραφικά
- 28 Λογότυπο
- 29 Γραφικά στην πρώτη οθόνη
- 30 Ετικέτες και εικόνες δεσμοί
- 31 Απλό φόντο
- 32 Μικρογραφίες

Appendix 5.1: Set of patterns and guidelines (English version)

Patterns for WEB DESIGN

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1 Home Page Length

➢ **Use when**

Every web site has a home page. It is like the front door of a house. Home page is the starting place for most visitors.

➢ **Problem**

Users should be able to move within the site, starting from the home page, until they complete what they want to do within the site

Users that do not know the site well should be able to see what the site includes and how to go there. Home page is overloaded some times, although this is necessary in order to make the site purpose. Overloading the home page is not recommended.

Limit the homepage to one screenful of information if at all possible.

Any element on the homepage that must immediately attract the attention of users should be placed 'above the fold.' Information that cannot be seen in the first screenful may be missed altogether—this can negatively impact the effectiveness of the website. If users conclude that what they see on the visible portion of the page is not of interest, they may not bother scrolling to see the rest of the page.

Some users take a long time to scroll down 'below the fold,' indicating a reluctance to move from the first screenful to subsequent information. Older users and novices are more likely to miss information that is placed below the fold.

The dimensions of a page are based on the screen resolution. The following suggestions for size of a web page are based on the resolution of screen in pixels.

Screen resolution: 800 X 600	Max page width = 780 pixel	Max page height = 430 pixels
Screen resolution: 1024 X 768	Max page width = 970 pixel	Max page height = 600 pixels
Screen resolution: 1280 X 1024	Max page width = 1150 pixel	Max page height = 970 pixels

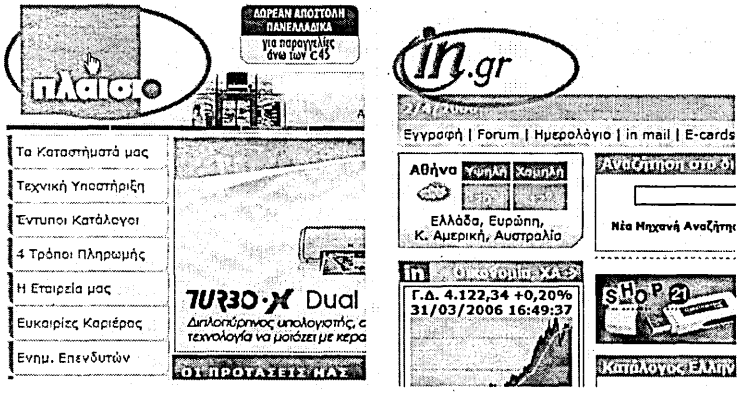
➢ **Solution**

Limit the homepage to one screenful of information if at all possible.

➢ **Other patterns to consider**

Use also ***9. Length of Navigation*** to limit the page in one screenful. Also pattern ***8 Descriptive Tab Labels*** could be used for labels.

2 Home Page Link



➢ **Use when**

Home page is usually the starting point for interaction. When users arrive at an arbitrary page within the site, they should be able to go back to the home page.

➢ **Problem**

Users need to get back to a safe/start/familiar point

Add a link to the home-page on every page. Place the link at the top of the page and if appropriate on the bottom of the screen. If the site has a logo, make the logo a link to the home-page as well. Otherwise, simply link the home-page using the label "home", either a text label or an icon of a house. Make sure the link is always found on the same place.

A home link provides a safe exit on every page and always on the same position. No matter what, the users can always get back to a familiar place. Logo's identify the site and are therefore easily chosen to get back to the home page.

Add this link on the home page as well to have consistency on the web site.

➢ **Solution**

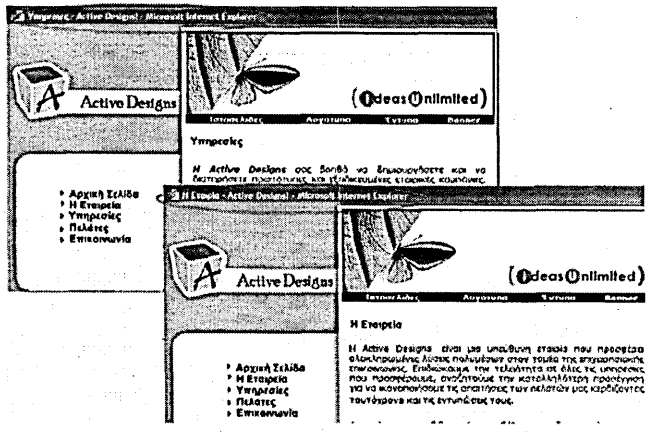
Enable users to access the homepage from any other page on the website using affixed element such as the site's logo.

➢ **Other patterns to consider**

A link to the home page may be included using pattern **10 Meta Navigation** and pattern **11 Repeated Menu**

➢ **More Examples**

3 Consistent Important Items



➢ **Use when**

Usually a web page shows many items. Users should be able to find the most important items easy

➢ **Problem**

How a page should be designed in order to be easy for someone to find the most important items?

Users generally look at the top centre of a page first, then look left, then right, and finally begin systematically moving down the total Web page. All critical content and navigation options should be toward the top of the page. Particularly on navigation pages, most major choices should be visible with no or a minimum of scrolling.

Important items that should be placed consistently are:

- Navigational elements
- Logos
- Page headings
- News headings
- Promotions
- Product names and product images

Users will try to anticipate where common items will appear on their screen. Experienced users will begin moving their mouse to the area of the target before the eye detects the item. Users can anticipate the location of the top items much better than those farther down the page

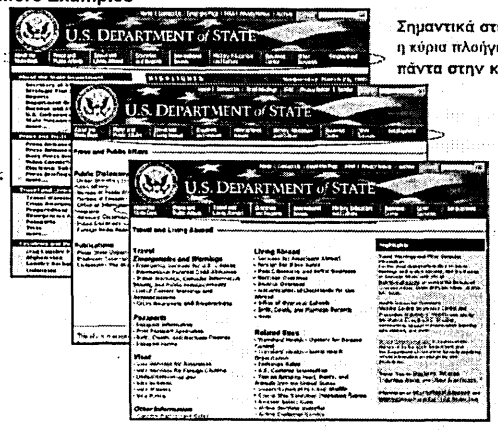
➢ **Solution**

Put important, clickable items in the same locations, and closer to the top of the page, where their location can be better estimated.

➢ **Other patterns to consider**

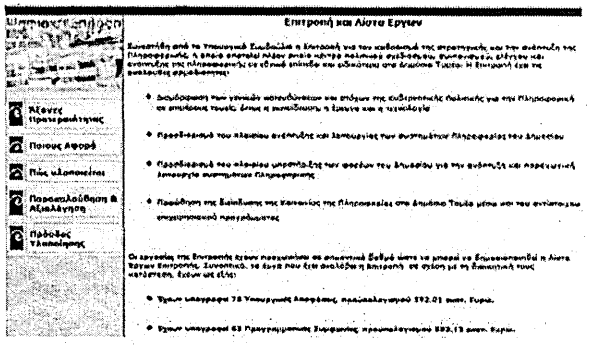
Use pattern ***18 Consistency in Text*** to have consistency in text as well.

➢ **More Examples**



Σημαντικά στοιχεία - στην περίπτωση αυτή η κύρια πλοήγηση που είναι πάντα στην κορυφή της κάθε σελίδας

4 White Space



➢ **Use when**

Space on a page is always valuable. Space should be used properly.

➢ **Problem**

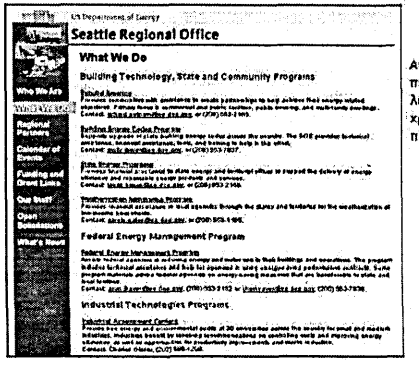
How do you use space within the site most efficiently?

'Density' is the percentage of the screen filled with text and graphics. One study found that higher density is related to faster scanning, and has no impact on user accuracy or preference. Another study found that users prefer moderate amounts of white space, but the amount of white space has no impact on their searching performance. On content (i.e., text) pages, use some white space to separate paragraphs. Too much separation of items on Web pages may require users to scroll unnecessarily.

The easiest way to achieve good density is to limit the amount of white space (areas without text, graphics, etc.) on pages that are used for scanning and searching.

➢ **Solution**

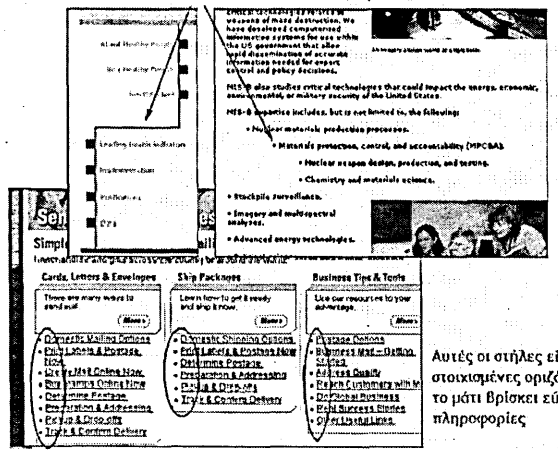
Limit the amount of white space (areas without text, graphics, etc.) on pages that are used for scanning and searching.



Αυτή η σχεδίαση περιορίζοντας τον άγραφο λευκό χώρο διευκολύνει το χρήστη να διερευνά πληροφορίες

5 Item Alignment

Αυτός ο τρόπος στοίχισης κάνει δύσκολή την ανάγνωση με αποτέλεσμα ο χρήστης να καθυστερεί πολύ για να βρει πληροφορίες



Αυτές οι στήλες είναι στοιχισμένες οριζόντια και το μάτι βρίσκει εύκολα τις πληροφορίες

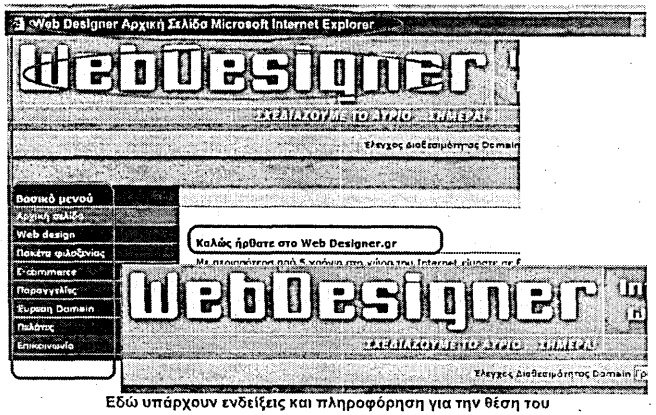
➢ **Use when**
You need to help visitors scan the site easily and to improve the look the looks of the page.

➢ **Problem**
How you make a page easy to scan and more attractive to the eye?

Users prefer consistent alignments for items such as text blocks, rows, columns, check boxes, radio buttons, data entry fields, etc. Use consistent alignment across all Web pages

➢ **Solution**
Visually align page elements, either vertically or horizontally.

6 Users' Location



Εδώ υπάρχουν ενδείξεις και πληροφόρηση για την θέση του

➢ **Use when**
Users should know where they are within the site all the times.

➢ **Problem**
How should users know their place within the site in order to move to another place easily?

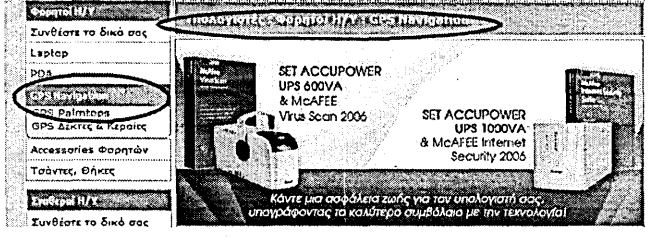
Give user feedback about their whereabouts. Feedback provides users with the information they need to understand where they are within the website, and for proceeding to the next activity. Examples of feedback include:

- Providing path and hierarchy information (i.e., 'breadcrumbs'),
- Matching link text to the destination page's heading, and
- Creating URLs that relate to the user's location on the site.

Other forms of feedback include changing the colour of a link that has been clicked (suggesting that destination has been visited), and using other visual cues to indicate the active portion of the screen.

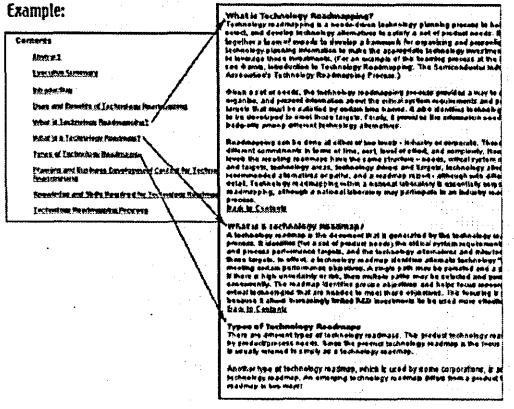
➢ **Solution**
Provide feedback to let users know where they are in the website.

➢ **More Examples**



7 Page List of Contents

Example:



➢ **Use when**
On long pages users want to know the contents of the page and should be able to move to a certain point within a page.

➢ **Problem**
How should users know the contents of a page and how will they move quickly to the content they want

For long pages with several distinct sections that are not visible from the fir s t screenful, add a short, clickable list of the sections (sometimes called 'anchor' or 'within-page' links) at the top of the page. 'Anchor links' can serve two purposes:

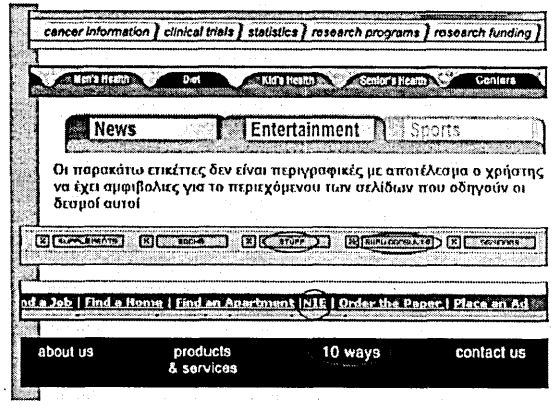
- They provide an outline of the page so users can quickly determine if it contains the desired information, and
- They allow users to quickly navigate to specific information.

Since 'anchor links' enable a direct link to content below the first screenful, they are also useful for getting users to specific information quickly when they arrive from a completely different page.

➢ **Solution**
On long pages, provide a 'list of contents' with links that take users to the corresponding content farther down the page.

➢ **Other patterns to consider**
You usually combine this pattern with ***17 To the Top Link*** so that visitors may quickly go back to the top where a ***7 List of Contents*** is.

8 Descriptive Tab Labels



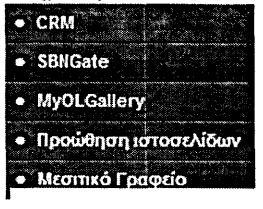
➢ **Problem**
How user can choose a navigation tab without guessing the function or the destination

Users like tabs when they have labels that are descriptive enough to allow error-free selections. When tab labels cannot be made clear because of the lack of space, do not use tabs.

➢ **Solution**
Ensure that tab labels are clearly descriptive of their function or destination

➢ **Other patterns to consider**
By using this pattern you use pattern ***14 Properly Placed and Descriptive Links*** at the same time. Also do not forget that pattern ***11 Repeated Menu*** could be applied.

➢ **More Examples**



9 Length of Navigation

➢ **Problem**
A lot of times navigational pages are lengthy and users need to scroll down to have access to the rest of navigational elements within the page

Ideally, navigation-only pages should contain no more than one screenful of information. Users should not need to scroll the page, even a small distance. One study showed that users considered the bottom of one screenful as the end of a page, and they did not scroll further to find additional navigational options.

➢ **Solution**
Keep Navigation-only Pages Short. Do not require users to scroll purely navigational pages.

➢ **Other patterns to consider**
You should use ***9 Length of Navigation*** to limit the length of the hope page. Use also ***8 Descriptive Tab Labels*** for the labels.

10 Meta Navigation

➢ **Use when**
Most web sites, especially for commercial sites who wish to get in contact with their visitors and are large enough to have searching facilities. Additionally, the site offers navigational functionality that should be available on every page. Some functionality is relevant on every page. Users may want to go to a different place in the page

➢ **Problem**
Users want to know who they are dealing with

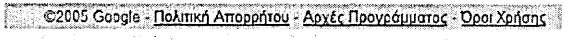
Usually the meta navigation bar consists of navigation elements AND communicative elements. Navigation elements include Home Link, Search Box, Site Map, and Index. Links to the worldwide site or other higher level sites are also navigation elements. Communicative elements tell users something about the organization and how to get in touch, for example About Us, Contact, Feedback. The meta navigation bar is placed in the upper region of the page so that it is always visible and does not take too much space

The meta navigation bar contains functionality that is relevant on every page of the web site. It is therefore always accessible in a non-obtrusive way that does not cost much screen space.

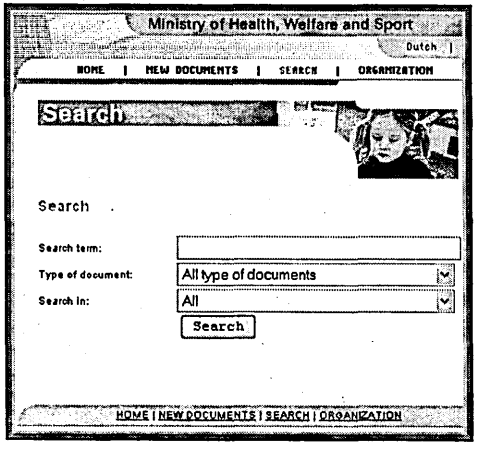
➢ **Solution**
Reserve an area on every page for communication and secondary navigation elements.

➢ **Other patterns to consider**
This pattern offers a chance to employ ***2 Home Page Link*** as well.

➢ **More Examples**



11 Repeated Menu



➢ **Use when**

Web pages are frequently more than one "view" long and users will need to scroll down to see the entire page. In such cases, the main navigation is likely to be out of sight.

➢ **Problem**

Users need to access the main navigation

This pattern makes the main navigation accessible again.

Allow users to access the navigation after scrolling by repeating the main navigation at the bottom. There is no need to go back to the top because the navigation is within immediate reach.

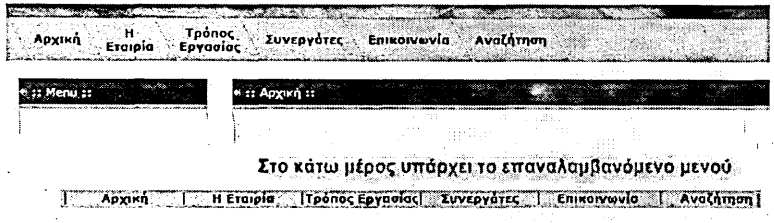
Provide a simple bar with the same elements as the main navigation menu. However, make it simple, preferably just text links in a smaller font size. By presenting it in a different way, the users know that it is not the main navigation but a secondary feature for their convenience

➢ **Solution**

Repeat the main navigation at the bottom of the page to help users access navigation

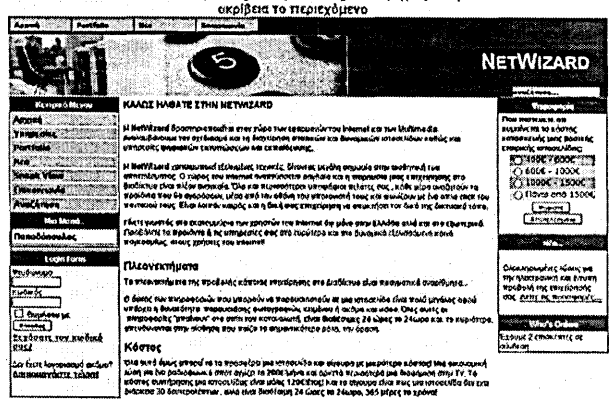
➢ **More Examples**

Pay attention to the main navigation and the repeated menu.



12 Nice Headings

Αυτές οι επικεφαλίδες είναι μοναδικές και περιγράφουν με ακρίβεια το περιεχόμενο



➢ **Problem**

Users should be able to make out headings within a page without any effort.

Using poor headings (mismatches between what users were expecting and what they find) is a common problem with websites. Ensure that headings are descriptive and relate to the content they introduce. If headings are too similar to one another, users may have to hesitate and re-read to decipher the difference. Identifying the best headings may require extensive usability testing and other methods

Furthermore a heading should be emphasized to draw attention. Use a different format for headings in order to make them visible from the surrounding items, especially surrounding text. Put emphasis on headings by changing font characteristics. Important font characteristics include bolding, font size, colour, etc.

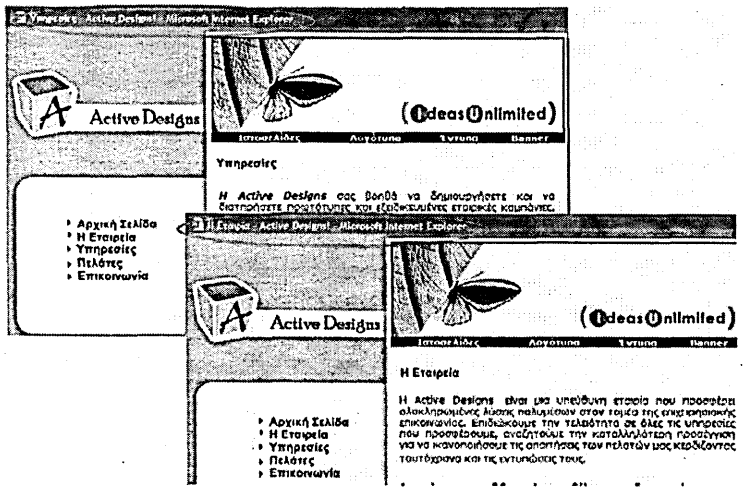
➢ **Solution**

Use properly emphasized headings that are unique from one another and conceptually related to the content they describe.

➢ **Other patterns to consider**

Apart from using ***12 Nice Headings use*** also ***20 Emphasized Text*** to emphasize text on a web page

13 Page Titles



➢ **Use when**

All web pages can have a page title. They help users orient.

➢ **Problem**

Each page should have a unique and descriptive page title.

Title refers to the text that is in the browser title bar (this is the bar found at the very top of the browser screen). Titles are used by search engines to identify pages. If two or more pages have the same title, they cannot be differentiated by users or the Favorites capability of the browser. If users bookmark a page, they should not have to edit the title to meet the characteristics mentioned above.

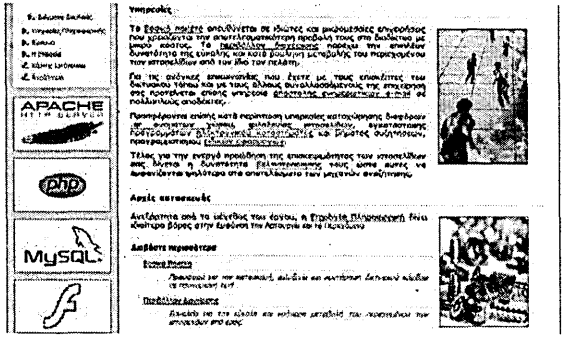
Remember that some search engines only list the titles in their search results page. Using concise and meaningful titles on all pages can help orient users as they browse a page or scan hot lists and history lists for particular URLs. They can also help others as they compile links to your pages.

To avoid confusing users, make the title that appears in the heading of the browser consistent with the title in the content area of the pages

➢ **Solution**

Put a descriptive, unique, concise, and meaningfully different title on each Web page

14 Properly Placed and Descriptive Links



➢ **Use when**

Users move within the web site using navigational elements and links. Links can be in the form of either text, that is embedded links, or images or both of them at the same time. Embedded links should have same essential characteristics in order help users

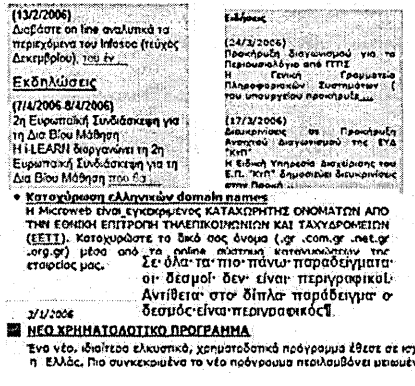
➢ **Problem**

Links should be where users may need them for proper navigation within the site. Many times is not clear if an item in a link or if an item is clickable. At the same time users have to guess the destination of a link or find the destination they want by trial and error.

A designer should try and avoid such problems by following and applying certain established techniques.

Provide links where the user may need them, especially where the user needs more information

The web site should have links to other content within or outside the web site at places where the user may need. The simplest forms of these links are e-mail links to help visitors send e-mail. More links within a text support easy navigation to relevant sections and help the visitor to find quickly relevant information and to move around the site.

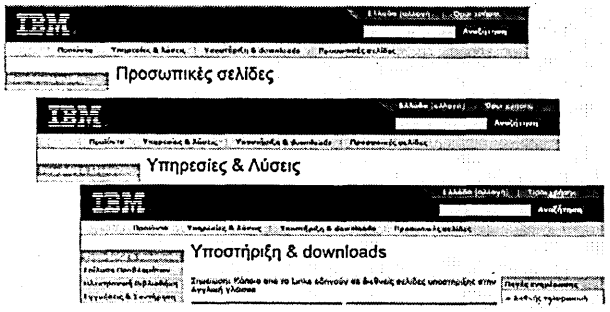


When using embedded links, the link text should accurately describe the link's destination.

Users tend to ignore the text that surrounds each embedded link; therefore do not create embedded links that use the surrounding text to add clues about the link's destination.

Designate Used links by using colour changes to indicate to users when a link has been visited.

Generally, it is best to use the default text link colours (blue as an unvisited location/link and purple as a visited location/link). Link colours help users understand which parts of a website they have visited. In one study, providing this type of feedback was the only variable found to improve the user's speed of finding information. If a user selects one link, and there are other links to the same target, make sure all links to that target change colour.



Make the link text consistent with the title or headings on the destination (i.e., target) page.
Closely matched links and destination targets help provide the necessary feedback to users that they have reached the intended page.

If users will have to click more than once to get to a specific target destination, avoid repeating the exact same link wording over and over because users can be confused if the links at each level are identical or even very similar. In one study, after users clicked on a link entitled "First Aid," the next page had three options. One of them was again titled "First Aid." The two "First Aid" links went to different places. Users tended to click on another option on the second page because they thought that they had already reached "First Aid."

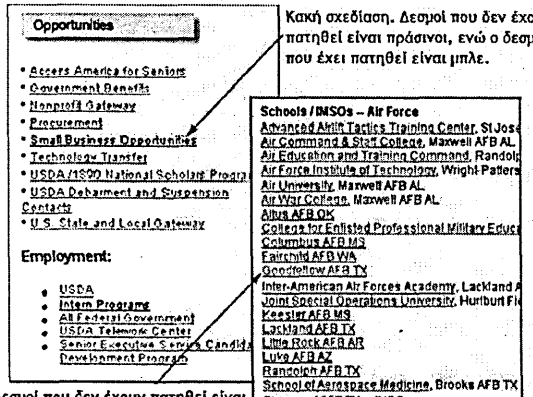
➢ Solution

Links should be at the right place. Embedded links should be descriptive and link names should match the destination pages. Links when clicked should change colour to indicate that they were visited. Make the link text consistent with the destination page.

➢ Other patterns to consider

Use this pattern together with ***15 Obvious Links - Consistent Cues*** to make navigation within the site easier for the user.

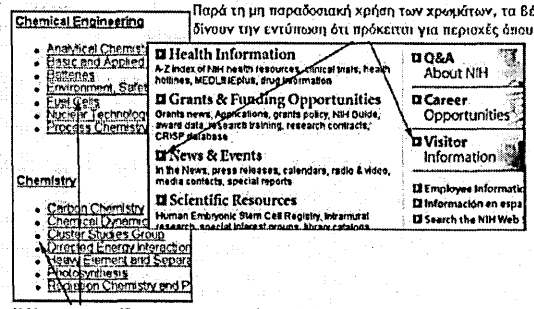
➢ More Examples



Κακή σχεδίαση. Δεσμοί που δεν έχουν πατηθεί είναι πράσινοι, ενώ ο δεσμός που έχει πατηθεί είναι μπλε.

Σωστή σχεδίαση. Δεσμοί που δεν έχουν πατηθεί είναι μπλε, ενώ δεσμοί που έχουν πατηθεί είναι κόκκινοι. Αυτή είναι η συμβατική χρήση των χρωμάτων.

15 Obvious Links - Consistent Cues



Παρά τη μη παραδοσιακή χρήση των χρωμάτων, τα βέλη προς τα δεξιά, προτρέπουν και δίνουν την εντύπωση ότι πρόκειται για περιοχές όπου μπορεί κάποιος να κάνει κλικ.

Η λίστα με κουκκίδες και υπογραμμισμένο γαλάζιο κείμενο αποτελούν πολύ ισχυρές ενδείξεις ότι προσδιορίζουν περιοχές όπου μπορεί κάποιος να πατήσει με το ποντίκι.

➢ Use when

When links are presented they should have the appearance of a link, and other cues that an item is clickable should not be present.

➢ Problem

Users need to know the items that are clickable without effort and thinking. Moreover users do not want to see images that look clickable but they are not.

Provide sufficient cues to clearly indicate to users that an item is clickable.
Users should not be expected to move the cursor around a website ('minesweeping') to determine what is clickable. Using the eyes to quickly survey the options is much faster than 'minesweeping.' Similarly, relying on mouseovers to designate links can confuse newer users, and slow all users as they are uncertain about which items are links.

Be consistent in your use of underlining, bullets, arrows, and other symbols such that they always indicate clickability or never suggest clickability. For example, using images as both links and as decoration slows users as it forces them to study the image to discern its clickability.

Items that are in the top centre of the page or the left and right panels have a high probability of being considered links. This is particularly true if the linked element looks like a real-world tab or pushbutton

Ensure that items that are not clickable do not have characteristics that suggest that they are clickable. Symbols usually must be combined with at least one other cue that suggests clickability. In one study, users were observed to click on a major heading with some link characteristics, but the heading was not actually a link.

Underlined text should be avoided unless the text is a link

However, to some users bullets and arrows may suggest clickability, even when they contain no other clickability cues (underlining, blue coloration, etc.). This slows users as they debate whether the items are links.

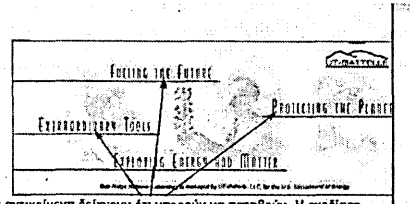
➢ Solution

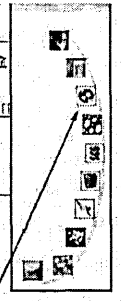
Provide consistent clickability cues within the site and avoid misleading cues to click

➢ Other patterns to consider

Use this patterns together with ***14 Properly Placed and Descriptive Links*** to make navigation easier for the user.

➢ **More Examples**





Αυτά τα αντικείμενα δείχνουν ότι μπορούν να πατηθούν. Η σχεδίαση είναι εντυπωσιακή αλλά μπερδεύει το χρήστη κάνοντάς τον να πιστεύει ότι πρόκειται για υπογράμμιση.

Παράδειγμα προς αποφυγή. Μπλε κείμενο, υπογράμμιση και στο κέντρο της σελίδας. Όμως τίποτα δεν μπορεί να πατηθεί.

Δυο από αυτά τα εικονίδια δεν πατιούνται. Αν ο χρήστης βάλει το ποντίκι από πάνω θα πιστέψει ότι κανένα εικονίδιο δεν πατιέται. Αν ένα εικονίδια πατιέται τότε όλα πρέπει να πατιούνται.

16 Clickable Images

forthnet

Η Εταιρία | Internet | Τηλεφωνία | eBusiness | Επικοιράτητα | e-shop

➢ **Use when**
Images that are clickable are used quite often. Clickable images should be presented in the best possible way

➢ **Problem**
The destination of a clickable image is not readily understood by occasional or infrequent users. Links that use images should have a clear indication of the destination and the purpose, otherwise users get frustrated.

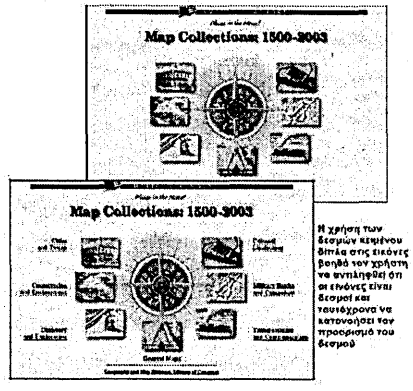
Images that are not recognized as clickable, force users to "minesweep" hoping to find out links. This is more evident when clickable images are not accompanied by text.

In general, text links are more easily recognized as clickable. Text links usually download faster, are preferred by users, and should change colours after being selected. It is usually easier to convey a link's destination in text, rather than with the use of an image.

In one study, users showed considerable confusion regarding whether or not certain images were clickable. This was true even for images that contained words. Users could not tell if the images were clickable without placing their cursor over them ('minesweeping'). Requiring users to 'minesweep' to determine what is clickable slows them down.

➢ **Solution**
Use text links rather than image links and ensure that all clickable images appear together with proper text labels or links

➢ **More Examples**



Η χρήση των δεσμών κειμένου δίπλα στις εικόνες βοηθά τον χρήστη να αντιληφθεί ότι οι εικόνες είναι δεσμοί και ταυτόχρονα να κατανοήσει τον προορισμό του δεσμού

17 To the Top Link

- **Μπορώ να πληρώσω με πιστωτική κάρτα ή μόνο μετρητά?**

  Βεβαίως μπορείτε να πληρώσετε με την κάρτα σας ή και με κατάθεση σε λογαριασμό τράπεζας που θα σας δοθεί.

- **Πόσος χρόνος θα χρειαστεί για να αποκτήσω τον δικό μου διαθέσιμο χώρο στον server ?**

  Όταν οι πληροφορίες σας θα προσέλθουν στην φόρμα παραγγελίας που παρέχουμε, θα περιμένουμε την τακτοποίηση του λογαριασμού σας. Το domain θα έχει εγκατασταθεί μέσα σε 3 ώρες από τη στιγμή που θα λάβουμε την πληρωμή σας ! Όταν ο λογαριασμός σας είναι έτοιμος θα σας αποστείλουμε μία εντολή ενεργοποίησης μέσω e-mail, περιλαμβανομένου του user-ID, password, και της IP διεύθυνσης.

- **Πως μπορώ να επικοινωνήσω για τυχόν ερωτήσεις που θα έχω ?**

➢ Use when

When pages are longer than 2 views and users are likely to go back and forth the top of the page. Typical use of this pattern is long page types with text where the users jump from one place to the other. Another situation is when displaying long texts and users need to get access to the navigation again

➢ Problem

The users need to go back to the top of the page

Choose strategic locations to place a link in the content labelled 'back to top' or just 'top' with or without and up-pointing icon. Strategic locations are typically paragraph endings or other types of 'blocks'. The link itself points to an anchor placed at the top of the page.

Basically this solution can be used for two reasons:

1. To get back to the main navigation
2. To get back to the top part of the content

If you are doing it for the first option, consider using a **Repeated Menu** at the bottom of the page instead. Even having both a "to the top" link and a repeated menu can be a bit redundant but nevertheless useful for users.

This allows users to go back the main navigation from almost every scrolling position. It may also be convenient for disabled users who scrolling is difficult to do.

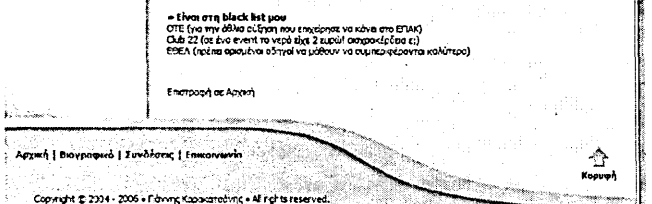
➢ Solution

Provide a link to the top of the page at locations in the main content of the page

➢ Other patterns to consider

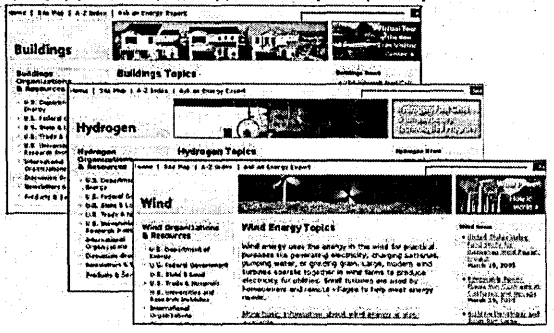
Use this pattern together with ***7 Page List of Contents*** so that visitors may go back to the list of contents.

➢ More Examples



18 Consistency in Text

Εκτός από τα γραφικά και την πλοήγηση, οι επικεφαλίδες οι γραμματοσειρές η ομοιομορφία στο κείμενο συμβάλλουν στην καλή οπτική συνέπεια των σελίδων



➢ Use when

Pages contain text. Text is quite important to users and should be consistent in appearance to improve users experience on the site.

➢ Problem

Users need to read or scan text quickly. Consistency and readability in the text helps towards that.

The following should be applied.

Ensure visual consistency of text elements within and between Web pages.
Two studies found that the number of errors made using visually inconsistent displays is reliably higher than when using visually consistent displays. Visual consistency includes the size and spacing of characters; the colours used for labels, fonts and backgrounds; and the locations of labels, text and pictures.

Visual consistency involves size and character leading and spacing, font colour, colour of headings, fonts and background. Headings should be consistently formatted on the pages of a web site. With regards consistency of position of important items (navigation, headings, labels, images etc) see pattern "Consistent Important Items".

Earlier studies found that tasks performed on more consistent interfaces resulted in:

- A reduction in task completion times;
- A reduction in errors;
- An increase in user satisfaction; and
- A reduction in learning time.

However, users tend to rapidly overcome some types of inconsistencies. For example, one study found that the use of different-sized widgets (such as pushbuttons, entry fields, or list boxes) does not negatively impact users' performance or preferences.

Avoid use of different font families to make them more visually attractive and aesthetically pleasing. Sometimes images are used as heading in which case a different font is used. A different font family may be used in headings to differentiate them from surrounding text and attract users' attention.

Format Common Items Consistently
Ensure that the format of common items is consistent from one page to another. The formatting convention chosen should be familiar to users. For example, telephone numbers should be consistently punctuated (800- 555-1212), and time records might be consistently punctuated with colons (HH:MM:SS).

Τηλ: 210 60 10 455
Φαξ: 210 60 21 521

Καθημερινές : 10:00 - 22:00
Σαβ. Κυρ. : 12:00 - 17:00

Use at least a 10-point font on all Web pages
Traditional paper-based font sizes do not translate well to website design. For instance, Windows Web browsers display type differently depending on the browser (Firefox, Internet Explore et.) and the default resolutions of each browser.

Research has shown that fonts smaller than 12-points elicit slower reading performance from users. For users over age 65, it may be better to use at least 14-point fonts. Never use less than 6-point font on a website. However these studies may be obsolete with improved type of screens capable of much higher.

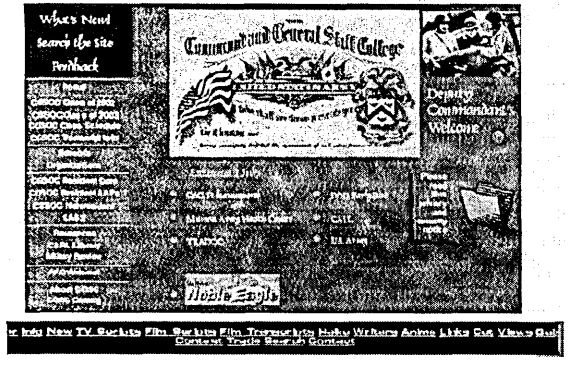
Nowadays, screen resolutions allow smaller font size (e.g. 8, 9, 10) and these are the sizes that are mostly used.

Use a familiar font to achieve the best possible reading speed
Research has shown that sans serif fonts have a small advantage over serif fonts and are more preferred by users. One expert recommends using sans serif fonts for smaller text and serif fonts for larger text.

The typeface has a major influence on the legibility of a web page. To achieve a good reading speed familiar fonts should be used. The most common serif typefaces are Times and Times New Roman. The most common sans serif typefaces are Arial, Helvetica and Verdana. Sans serif fonts are easier to read on computer screens while serif fonts are easier to read in actual print.

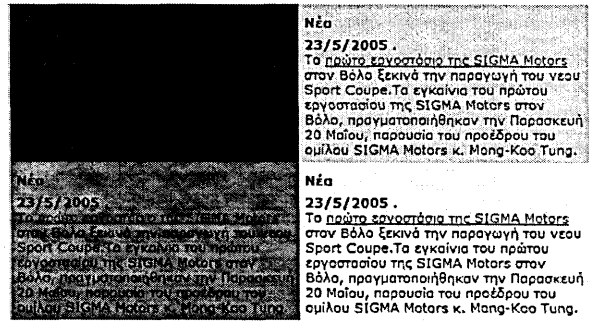
➢ Solution
Ensure visual consistency of text elements within and between Web pages. Format common items, within text, in a consistent way. Use at Least 10-Point font and employ a familiar font to achieve the best possible reading speed

➢ More Examples
Χρήση ασυνήθιστων γραμματοσειρών μπορεί να μειώσει την ταχύτητα ανάγνωσης



➢ Other patterns to consider
With regards consistency of position of important items (navigation, headings, labels, images etc), see pattern ***3 Consistent Important Items*** .Test should be also visible therefore use ***19 Visible Text*** as well.

19 Visible Text



➢ Use when
When text is presented on web pages all visitors should be able to read it. This applies even more when text contains important information.

➢ Problem
Users need to read text without strain, even if there is a background colour or patterns on the page

When users are expected to rapidly read and understand prose text, use black text on a plain, high-contrast, non-patterned background.

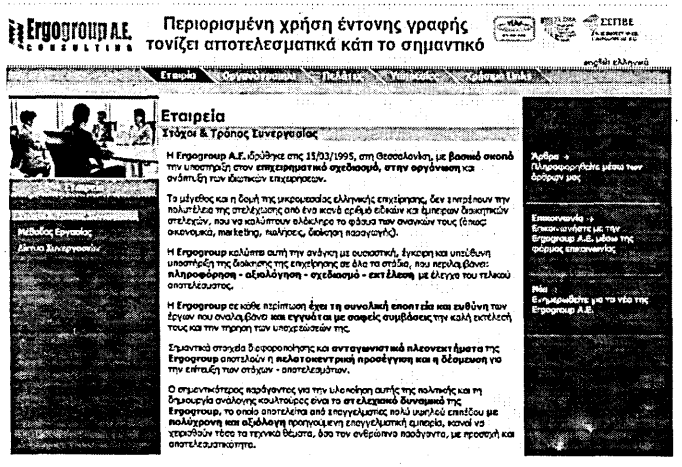
Black text on a plain background elicited reliably faster reading performance than on a medium-textured background. When compared to reading light text on a dark background, people read black text on a white background up to 32% faster. In general, the greater the contrast between the text and background, the easier the text is to read.

Special attention is needed in the colour of links. By default links are blue. Used links are coloured violet. If background colour is one of these then links will be detected by visitors.

➢ Solution
Use black text on a plain, high-contrast, non-patterned background.

➢ Other patterns to consider
Use this pattern with ***18 Consistency in Text*** to have consistency in text.

20 Emphasized Text



➢ **Use when**
On every page some elements should be emphasized.

➢ **Problem**
How text should be emphasized to attract user attention?

Font characteristics that are different from the surrounding text will dominate those that are routine. Important font characteristics include bolding, italics, font style (serif vs. sans serif), font size (larger is better to gain attention), and case (upper vs. lower). When used well, text style can draw attention to important words.

Without emphasis a text is considered boring and may be users ignore important items within text if there are not reading the full text.

The use of differing font characteristics has negative consequences as well— reading speed can decrease by almost 20%, and thus should be used sparingly in large blocks of prose. Do not use differing font characteristics to show emphasis for more than one or two words or a short phrase. Do not use underlining for emphasis because underlined words on the Web are generally considered to be links.

➢ **Solution**
Change the font characteristics to emphasize the importance of a word or short phrase.

➢ **Other patterns to consider**
Use emphasis on text but do not forget to provide and emphasize headings by using ***12 Nice Headings***. If you need to add other graphics to attract attention use pattern ***21 Attention Attracting Features.***

21 Attention Attracting Features

➢ **Use when**
On every page there are elements that must attract users.

➢ **Problem**
How do you make some items within a page to attract attention?

Use attention-attracting features with caution and only when they are highly relevant. Not all features of a website will attract a user's attention equally. The following features are presented in order of the impact they have on users:

- Movement (e.g., animation or 'reveals') is the most effective attention getting item. Research suggests that people cannot stop themselves from initially looking at moving items on a page. However, if the movement is not relevant or useful, it may annoy the user. If movement continues after attracting attention, it may distract from the information on the website.
- Larger objects, particularly images, will draw users' attention before smaller ones. Users fixate on larger items first, and for longer periods of time. However, users will tend to skip certain kinds of images that they believe to be ads or decoration.
- Users look at images for one or two seconds, and then look at the associated text caption. In many situations, reading a text caption to understand the meaning of an image is a last resort. Parts of images or text that have brighter colours seem to gain focus first.

Draw attention to specific parts of a Web page with the appropriate (but limited) use of moving or animated objects, size differential between items, images, brightly-coloured items, and varying font characteristics.

➢ **Solution**
Use attention-attracting features with caution and only when they are highly relevant.

➢ **Other patterns to consider**
Apart from elements within the page there should be emphasized with caution you could use emphasis on text by using ***20 Emphasized Text*** and on headings by using ***12 Nice Headings***

22 Aligned Text

Φτηνά Πακέτα

Παρέχουμε σε όλους φθηνά πακέτα μεταπώλησης που χωράνε Απειρα domain.
Κατασκευάστε τα πακέτα σας και πουλήστε τα. Παρέχουμε δωρεάν control panel (Whm),
και ότι δίνουμε εμείς στα δικά μας πακέτα.

Συμβουλές για αρχαρίους

Το internet είναι σαν τη γη. Για να ζήσει κάποιος στη γη χεριάζετε ένα σπίτι.
Για να μπορέσει να έχει κάποιος σπίτι πρέπει να βρει πρώτα τη διεύθυνση μετά το οικόπεδο
και μετά να το χτίσει.
Το παραπάνω είναι μία παραβολή.
Η διεύθυνση είναι το domain (www.toonomamou.gr) . Πρέπει να αποκτήσετε ένα από τις
αρμόδιες υπηρεσίες.
Το οικόπεδο είναι ο χώρος που θα φιλοξενήσετε το site σας. Εμείς παρέχουμε αυτό το
χώρο μαζί με όλη μας τη βοήθεια και στο χτίσιμο του site σας αλλά και στη διαχείριση του.
Τέλος η οικοδομή είναι το η ιστοσελίδα σας. Σε περίπτωση που δεν έχετε εσείς σελίδα
έτοιμη μπορούμε να σας τη φτιάξουμε σε φοιτητικές τιμές.

Example of bad (centred) alignment. Text is difficult to read.

➢ **Use when**
You need to align text on a page for reading and easy scanning.

➢ **Problem**
Text alignment is not always right

A text block can be aligned left, centred, right and fully justified. Full justification, where the editor automatically adjusts the space between words, should used carefully as it may result in poor spacing between words. Poor spacing or inconsistent spacing between words decreases reading speed by as much as 11%.

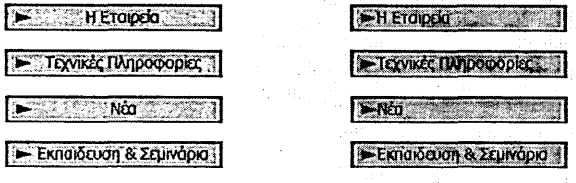
Centred aligning text makes it more difficult to read and decreases reading times dramatically. The best and easiest layout is the default left aligned.

Users must search for the beginning of each line in right and centred alignment and should be avoided. Centred alignment may be used in narrow columns or narrow frames where problems with readability are minimal. Right alignment should be used only in special cases (decorative text, etc.).

Titles and headings should also be flush left or centred aligned.

➢ **Solution**
Use left alignment for text most of the times

➢ **More Examples**
Ακόμη και μενού που είναι στοιχισμένα αριστερά διαβάζονται πιό εύκολα



23 Mixed Case Text

Αυτό το πρότυπο συστήνει την ΧΡΗΣΗ ΜΙΚΡΩΝ ΚΑΙ ΜΕΓΑΛΩΝ ΓΡΑΜΜΑΤΩΝ ΣΕ ΚΑΝΟΝΙΚΟ ΚΕΙΜΕΝΟ ΓΙΑΤΙ η χρήση κεφαλαίων ΕΠΙΒΡΑΔΥΝΕΙ ΣΟΒΑΡΑ ΤΗΝ ΑΝΑΓΝΩΣΗ

Αυτό το πρότυπο συστήνει την χρήση μικρών και μεγάλων γραμμάτων σε κανονικό κείμενο γιατί η χρήση κεφαλαίων επβραδύνει σοβαρά την ανάγνωση

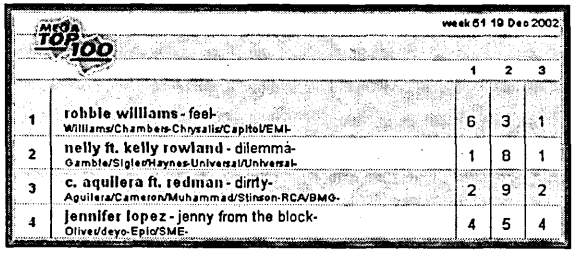
➢ **Use when**
The page contains text intended for reading

➢ **Problem**
The readability of text needs improvement.

Reading text is easier when capitalization is used conventionally to start sentences and to indicate proper nouns and acronyms. If an item is intended to attract the user's attention, display the item in all uppercase, bold, or italics. Do not use these methods for showing emphasis for more than one or two words or a short phrase because they slow reading performance when used for extended prose.

➢ **Solution**
Display continuous (prose) text using mixed upper- and lowercase letters.

24 Alternating Row Colours



➢ **Use when**
Tables are common elements within a web page. A table can be quite complex and have several columns which make it hard to see which items belong to the same row.

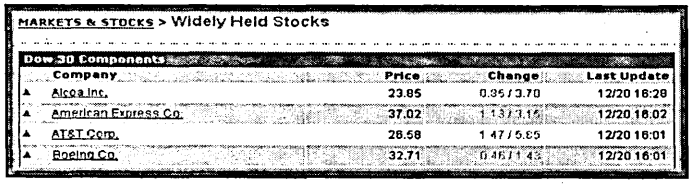
➢ **Problem**
Users need to read or scan a table in search of particular information

Use two colours of low saturation, e.g. white and a very light shade of an other colour, that are only slightly different. Colour each row of the table by alternating these two colours.

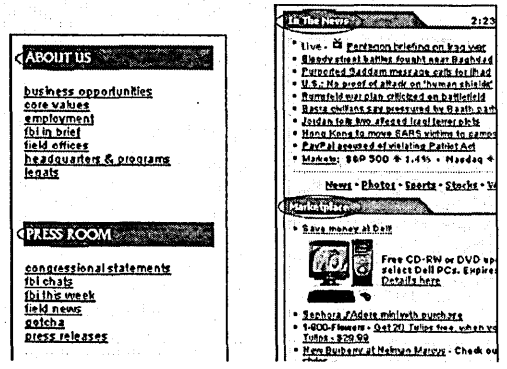
The row colour eliminates the need of table borders and makes it easy for the eye to read a row. In a vertical sense, the colours make it easier to 'catch' an item because it is on either one of the colours

➢ **Solution**
Use alternating row colours for making the table more readable

➢ **More Examples**



25 Lists



➢ **Use when**
Web pages use lists to help users in reading and scanning items

➢ **Problem**
How do you present related items

The Office of Data makes available for download
•Annual Production Statistics
•Monthly Production Statistics
•Weekly Production Statistics and
•Quarterly Consumption Projections.

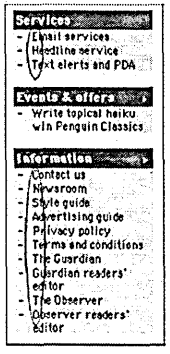
Λίστες με bullets είναι πιό εύκολες στο διάβασμα και την κατανόηση

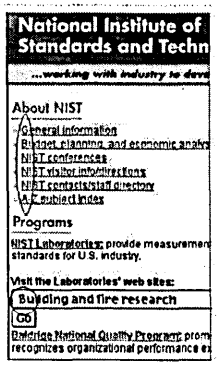
The Office of Data makes available for download Annual Production Statistics, Monthly Production Statistics, Weekly Production Statistics, and Quarterly Consumption Projections.

Display a series of related items in a vertical list rather than as continuous text.
A well-organized list format tends to facilitate rapid and accurate scanning. One study indicated that users scan vertical lists more rapidly than horizontal lists. Scanning a horizontal list takes users 20% percent longer than scanning a vertical list.

Introduce Each List
Provide an introductory heading (i.e., word or phrase) at the top of each list. Providing a descriptive heading allows users to readily understand the reason for having a list of items, and how the items relate to each other. The heading helps to inform users how items are categorized, or any prevailing principle or theme. Users are able to use lists better when they include headings.

Example:



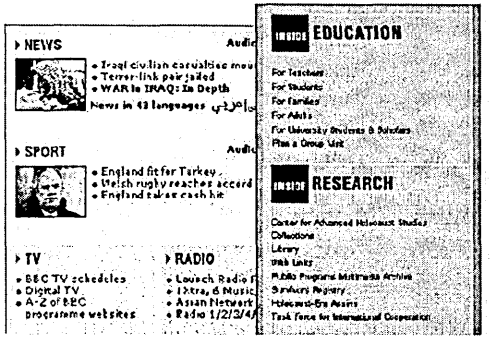


Format Lists to Ease Scanning
Make lists easy to scan and understand. The use of meaningful labels, effective background colours, borders, and white spaces allow users to identify a set of items as a discrete list.

Capitalize First Letter of First Word in LI
Capitalize the first letter of only the first word of a list item, a list box item, check box labels, and radio button labels. Only the first letter of the first word should be capitalized unless the item contains another word that normally would be capitalized.

➢ **Solution**
Display related items in Lists. Introduce each List and capitalize the first letter of first word in Lists Format lists to ease scanning.

➢ **More Examples**
Αυτές οι σελίδες χρησιμοποιούν έγχρωμο υπόβαθρο και λεπτές άσπρες γραμμές για να κάνουν τις λίστες εύκολες στη σάρωση.



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5 The Homepage

1 Enable Access to the Homepage

➢ Guideline

Enable users to access the homepage from any other page on the website using affixed element such as the site's logo.

➢ Comments

Add a link to the home-page on every page. Place the link at the top of the page and if appropriate on the bottom of the screen. If the site has a logo, make the logo a link to the home-page as well. Otherwise, simply link the home-page using the label "home", either a text label or an icon of a house. Make sure the link is always found on the same place.

A home link provides a safe exit on every page and always on the same position. No matter what, the users can always get back to a familiar place. Logo's identify the site and are therefore easily chosen to get back to the home page

Add this link on the home page as well to have consistency on the web site.

2 Limit Homepage Length

➢ Guideline

Limit the homepage to one screenful of information if at all possible.

➢ Comments

Any element on the homepage that must immediately attract the attention of users should be placed 'above the fold.' Information that cannot be seen in the first screenful may be missed altogether—this can negatively impact the effectiveness of the website. If users conclude that what they see on the visible portion of the page is not of interest, they may not bother scrolling to see the rest of the page.

Users that do not know the site well should be able to see what the site includes and how to go there. Home page is overloaded some times, although this is necessary in order to make the site purpose. Overloading the home page is not recommended.

Some users take a long time to scroll down 'below the fold,' indicating a reluctance to move from the first screenful to subsequent information. Older users and novices are more likely to miss information that is placed below the fold.

The dimensions of a page are based on the screen resolution. The following suggestions for size of a web page are based on the resolution of screen in pixels.

Screen resolution: 800 X 600	Max page width = 780 pixel	Max page height = 430 pixels
Screen resolution: 1024 X 768	Max page width = 970 pixel	Max page height = 600 pixels
Screen resolution: 1280 X 1024	Max page width = 1150 pixel	Max page height = 970 pixels

6 Page Layout

3 Place Important Items Consistently

➢ **Guideline**

Put important, clickable items in the same locations, and closer to the top of the page, where their location can be better estimated.

➢ **Comments**

Users generally look at the top center of a page first, then look left, then right, and finally begin systematically moving down the total Web page. All critical content and navigation options should be toward the top of the page. Particularly on navigation pages, most major choices should be visible with no or a minimum of scrolling.

Other important items that should be placed consistently are:

- Navigational elements
- Logos
- Page headings
- News headings
- Promotions
- Product names and product images

Users will try to anticipate where common items will appear on their screen. Experienced users will begin moving their mouse to the area of the target before the eye detects the item. Users can anticipate the location of the top items much better than those farther down the page

4 Use Moderate White Space

➢ **Guideline**

Limit the amount of white space (areas without text, graphics, etc.) on pages that are used for scanning and searching.

➢ **Comments**

'Density' is the percentage of the screen filled with text and graphics. One study found that higher density is related to faster scanning, and has no impact on user accuracy or preference. Another study found that users prefer moderate amounts of white space, but the amount of white space has no impact on their searching performance. On content (i.e., text) pages, use some white space to separate paragraphs. Too much separation of items on Web pages may require users to scroll unnecessarily.

The easiest way to achieve good density is to limit the amount of white space (areas without text, graphics, etc.) on pages that are used for scanning and searching.

5 Align Items on a Page

➢ **Guideline**

Visually align page elements, either vertically or horizontally.

➢ **Comments**

Users prefer consistent alignments for items such as text blocks, rows, columns, check boxes, radio buttons, data entry fields, etc. Use consistent alignment across all Web pages

7 Navigation

6 Provide Feedback on Users' Location

➢ **Guideline**

Provide feedback to let users know where they are in the website.

➢ **Comments**

Feedback provides users with the information they need to understand where they are within the website, and for proceeding to the next activity. Examples of feedback include:

- providing path and hierarchy information (i.e., 'breadcrumbs'),
- matching link text to the destination page's heading, and
- creating URLs that relate to the user's location on the site.

Other forms of feedback include changing the color of a link that has been clicked (suggesting that destination has been visited), and using other visual cues to indicate the active portion of the screen

7 Use a Clickable 'List of Contents' on Long Pages

➢ **Guideline**

On long pages, provide a 'list of contents' with links that take users to the corresponding content farther down the page.

➢ **Comments**

For long pages with several distinct sections that are not visible from the fir s t screenful, add a short, clickable list of the sections (sometimes called 'anchor' or 'within-page' links) at the top of the page. 'Anchor links' can serve two purposes:

- They provide an outline of the page so users can quickly determine if it contains the desired information, and
- They allow users to quickly navigate to specific information.

Since 'anchor links' enable a direct link to content below the first screenful, they are also useful for getting users to specific information quickly when they arrive from a completely different page.

8 Use Descriptive Tab Labels

➢ **Guideline**

Ensure that tab labels are clearly descriptive of their function or destination.

➢ **Comments**

Users like tabs when they have labels that are descriptive enough to allow error-free selections. When tab labels cannot be made clear because of the lack of space, do not use tabs.

9 Keep Navigation-only Pages Short

➢ **Guideline**

Do not require users to scroll purely navigational pages.

➢ **Comments**

Ideally, navigation-only pages should contain no more than one screenful of information. Users should not need to scroll the page, even a small distance. One study showed that users considered the bottom of one screenful as the end of a page, and they did not scroll further to find additional navigational options.

10 Use Meta Navigation

➢ **Guideline**

Reserve an area on every page for communication and secondary navigation elements.

➢ **Comments**

Most web sites, especially for commercial sites who wish to get in contact with their visitors and are large enough to have searching facilities. Additionally, the site offers navigational functionality that should be available on every page. Some functionality is relevant on every page. Users may want to go to a different place in the page

Usually the meta navigation bar consists of navigation elements and communicative elements. Navigation elements include Home Page, Search Box, Site Map, and Index. Links to the worldwide site or other higher level sites are also navigation elements. Communicative elements tell users something about the organization and how to get in touch, for example About Us, Contact, Feedback. The meta navigation bar is placed in the upper region of the page so that it is always visible.

The meta navigation bar contains functionality that is relevant on every page of the web site. It is therefore always accessible in an non-obtrusive way that does not cost much screen space.

11 Repeat the main navigation at the bottom of the page

➢ **Guideline**

Repeat the main navigation at the bottom of the page to help users access navigation.

➢ **Comments**

Web pages are frequently more than one "view" long and users will need to scroll down to see the entire page. In such cases, the main navigation is likely to be out of sight.

Allow users to access the navigation after scrolling by repeating the main navigation at the bottom. There is no need to go back to the top because the navigation is within immediate reach.

Provide a simple bar with the same elements as the main navigation menu. However, make it simple, preferably just text links in a smaller font size. By presenting it in a different way, the users know that it is not the main navigation but a secondary feature for their convenience

9 Headings, Titles, and Labels

12 Use Unique, Descriptive and Emphasized Headings

➢ **Guideline**

Use properly emphasized headings that are unique from one another and conceptually related to the content they describe

➢ **Comments**

Using poor headings (mismatches between what users were expecting and what they find) is a common problem with websites. Ensure that headings are descriptive and relate to the content they introduce. If headings are too similar to one another, users may have to hesitate and re-read to decipher the difference. Identifying the best headings may require extensive usability testing and other methods

Furthermore a heading should be emphasized to draw attention. Use a different format for headings in order to make them visible from the surrounding items, especially surrounding text. Put emphasis on headings by changing font characteristics. Important font characteristics include bolding, font size, colour, etc.

13 Provide Descriptive Page Titles

➢ **Guideline**

Put a descriptive, unique, concise, and meaningfully different title on each Web page.

➢ **Comments**

Title refers to the text that is in the browser title bar (this is the bar found at the very top of the browser screen). Titles are used by search engines to identify pages. If two or more pages have the same title, they cannot be differentiated by users or the Favorites capability of the browser. If users bookmark a page, they should not have to edit the title to meet the characteristics mentioned above.

Remember that some search engines only list the titles in their search results page. Using concise and meaningful titles on all pages can help orient users as they browse a page or scan hot lists and history lists for particular URLs. They can also help others as they compile links to your pages.

To avoid confusing users, make the title that appears in the heading of the browser consistent with the title in the content area of the pages.

10 Links

14 Provide links where the user may need them

➢ **Guideline**

Provide links where the user may need them, especially where the user needs more information

➢ **Comments**

The web site should have links to other content within or outside the web site at places where the user may need. The simplest forms of these links are e-mail links to help visitors send e-mail. More links within a text support easy navigation to relevant sections and help the visitor to find quickly relevant information and to move around the site.

15 Provide Consistent Clickability Cues

➢ Guideline

Provide sufficient cues to clearly indicate to users that an item is clickable.

➢ Comments

Users should not be expected to move the cursor around a website ('minesweeping') to determine what is clickable. Using the eyes to quickly survey the options is much faster than 'minesweeping.' Similarly, relying on mouseovers to designate links can confuse newer users, and slow all users as they are uncertain about which items are links.

Be consistent in your use of underlining, bullets, arrows, and other symbols such that they always indicate clickability or never suggest clickability. For example, using images as both links and as decoration slows users as it forces them to study the image to discern its clickability.

Items that are in the top center of the page, or left and right panels have a high probability of being considered links. This is particularly true if the linked element looks like a real-world tab or pushbutton

16 Avoid Misleading Cues to Click

➢ Guideline

Ensure that items that are not clickable do not have characteristics that suggest that they are clickable.

➢ Comments

Symbols usually must be combined with at least one other cue that suggests clickability. In one study, users were observed to click on a major heading with some link characteristics, but the heading was not actually a link.

Underlined text should be avoided unless the text is a link

However, to some users bullets and arrows may suggest clickability, even when they contain no other clickability cues (underlining, blue coloration, etc.). This slows users as they debate whether the items are links.

17 Use Text for Links and in Clickable Images

➢ Guideline

Use text links rather than image links and ensure that all clickable images appear together with proper text labels or links

➢ Comments

The destination of a clickable image is not readily understood by occasional or infrequent users. Links that use images should have a clear indication of the destination and the purpose, otherwise users get frustrated.

Images that are not recognized as clickable, force users to "minesweep" hoping to find out links. This is more evident when clickable images are not accompanied by text.

In general, text links are more easily recognized as clickable. Text links usually download faster, are preferred by users, and should change colors after being selected. It is usually easier to convey a link's destination in text, rather than with the use of an image.

In one study, users showed considerable confusion regarding whether or not certain images were clickable. This was true even for images that contained words. Users could not tell if the images were clickable without placing their cursor over them ('minesweeping'). Requiring users to 'minesweep' to determine what is clickable slows them down.

18 Match Link Names with Their Destination Pages

➢ Guideline

Make the link text consistent with the title or headings on the destination (i.e., target) page.

➢ Comments

Closely matched links and destination targets help provide the necessary feedback to users that they have reached the intended page.

If users will have to click more than once to get to a specific target destination, avoid repeating the exact same link wording over and over because users can be confused if the links at each level are identical or even very similar. In one study, after users clicked on a link entitled "First Aid," the next page had three options. One of them was again titled "First Aid." The two "First Aid" links went to different places. Users tended to click on another option on the second page because they thought that they had already reached "First Aid."

19 Ensure that Embedded Links are Descriptive

➢ Guideline

When using embedded links, the link text should accurately describe the link's destination.

➢ Comments

Users tend to ignore the text that surrounds each embedded link; therefore do not create embedded links that use the surrounding text to add clues about the link's destination.

20 Designate Used Links

➢ Guideline

Use color changes to indicate to users when a link has been visited.

➢ Comments

Generally, it is best to use the default text link colors (blue as an unvisited location/link and purple as a visited location/link). Link colors help users understand which parts of a website they have visited. In one study, providing this type of feedback was the only variable found to improve the user's speed of finding information. If a user selects one link, and there are other links to the same target, make sure all links to that target change color.

21 Allow Users to Go Back to the Top of the Page

➢ Guideline

Provide a link to the top of the page at locations in the main content

➢ Comments

Pages are longer than 2 views and users are likely to go back and forth the top of the page. Typical use of this pattern is long page types with text where the users jump from one place to the other. Another situation is when displaying long texts and users need to get access to the navigation again

Choose strategic locations to place a link in the content labeled 'back to top' or just 'top' with or without and up-pointing icon. Strategic locations are typically paragraph endings or other types of 'blocks'. The link itself points to an anchor placed at the top of the page.

Basically this solution can be used for to reasons:

1. To get back to the main navigation
2. To get back to the top part of the content

If you are doing it for the first option, consider using a Repeated Menu at the bottom of the page instead. Even having both a "to the top" link and a repeated menu can be a bit redundant but nevertheless useful for users.

This allows users to go back the main navigation from almost every scrolling position. It may also be convenient for disabled users who scrolling is difficult to do.

11 Text Appearance

22 Use Black Text on Plain, High-Contrast Backgrounds

➢ Guideline

When users are expected to rapidly read and understand prose text, use black text on a plain, high-contrast, non-patterned background.

➢ Comments

Black text on a plain background elicited reliably faster reading performance than on a medium-textured background. When compared to reading light text on a dark background, people read black text on a white background up to 32% faster. In general, the greater the contrast between the text and background, the easier the text is to read.

Special attention is needed in the colour of links. By default links are blue. Used links are coloured violet. If background colour is one of these then links will be detected by visitors.

23 Ensure Visual Consistency in Text

➢ Guideline

Ensure visual consistency of text elements within and between Web pages.

➢ Comments

Two studies found that the number of errors made using visually inconsistent displays is reliably higher than when using visually consistent displays. Visual consistency includes the size and spacing of characters; the colors used for labels, fonts and backgrounds; and the locations of labels, text and pictures.

Visual consistency involves size and character leading and spacing, font colour, colour of headings, fonts and background. Headings should be consistently formatted on the pages of a web site. With regards consistency of position of important items (navigation, headings, labels, images etc) see guideline "Place Important Items Consistently".

Earlier studies found that tasks performed on more consistent interfaces resulted in:

- a reduction in task completion times;
- a reduction in errors;
- an increase in user satisfaction; and
- a reduction in learning time.

However, users tend to rapidly overcome some types of inconsistencies. For example, one study found that the use of different-sized widgets (such as pushbuttons, entry fields, or list boxes) does not negatively impact users' performance or preferences.

Avoid use of different font families to make them more visually attractive and aesthetically pleasing. Sometimes images are used as heading in which case a different font is used. A different font family may be used in headings to differentiate them from surrounding text and attract users attention.

24 Format Common Items Consistently

➢ Guideline

Ensure that the format of common items is consistent from one page to another.

➢ Comments

The formatting convention chosen should be familiar to users. For example, telephone numbers should be consistently punctuated (800- 555-1212), and time records might be consistently punctuated with colons (HH:MM:SS).

25 Use at Least 10-Point Font

➢ Guideline

Use at least a 10-point font (e.g., typeface) on all Web pages.

➢ Comments

Traditional paper-based font sizes do not translate well to website design. For instance, Windows Web browsers display type differently depending on the browser (Firefox, Internet Explore et.) and the default resolutions of each browser.

Research has shown that fonts smaller than 12-points elicit slower reading performance from users. For users over age 65, it may be better to use at least 14-point fonts. However these studies may be obsolete with improved type of screens capable of much higher resolution.

Nowadays, screen resolutions allow smaller font size (e.g. 8, 9, 10) and these are the sizes that are mostly used. Never use less than 6-point font on a website.

26 Use Familiar Fonts

➢ Guideline

Use a familiar font to achieve the best possible reading speed.

➢ Comments

Research has shown that sans serif fonts have a small advantage over serif fonts and are more preferred by users. One expert recommends using sans serif fonts for smaller text and serif fonts for larger text.

The typeface has a major influence on the legibility of a web page. To achieve a good reading speed familiar fonts should be used. The most common serif typefaces are Times and Times New Roman. The most common sans serif typefaces are Arial, Helvetica and Verdana. Sans serif fonts are easier to read on computer screens while serif fonts are easier to read in actual print.

27 Emphasize Importance in Text

➢ Guideline

Change the font characteristics to emphasize the importance of a word or short phrase.

➢ Comments

Font characteristics that are different from the surrounding text will dominate those that are routine. Important font characteristics include bolding, italics, font style (serif vs. sans serif), font size (larger is better to gain attention), and case (upper vs. lower). When used well, text style can draw attention to important words.

Without emphasis a text is considered boring and may be users ignore important items within text if there are not reading the full text.

The use of differing font characteristics has negative consequences as well— reading speed can decrease by almost 20%, and thus should be used sparingly in large blocks of prose. Do not use differing font characteristics to show emphasis for more than one or two words or a short phrase. Do not use underlining for emphasis because underlined words on the Web are generally considered to be links.

28 Use Attention-Attracting Features when Appropriate

➢ Guideline

Use attention-attracting features with caution and only when they are highly relevant.

➢ Comments

Use attention-attracting features with caution and only when they are highly relevant. Not all features of a website will attract a user's attention equally. The following features are presented in order of the impact they have on users:

- Movement (e.g., animation or 'reveals') is the most effective attention getting item. Research suggests that people cannot stop themselves from initially looking at moving items on a page. However, if the movement is not relevant or useful, it may annoy the user. If movement continues after attracting attention, it may distract from the information on the website.
- Larger objects, particularly images, will draw users' attention before smaller ones. Users fixate on larger items first, and for longer periods of time. However, users will tend to skip certain kinds of images that they believe to be ads or decoration.
- Users look at images for one or two seconds, and then look at the associated text caption. In many situations, reading a text caption to understand the meaning of an image is a last resort. Parts of images or text that have brighter colors seem to gain focus first.

29 Use Mixed Case with Prose

➢ Guideline

Display continuous (prose) text using mixed upper- and lowercase letters.

➢ Comments

Reading text is easier when capitalization is used conventionally to start sentences and to indicate proper nouns and acronyms. If an item is intended to attract the user's attention, display the item in all uppercase, bold, or italics. Do not use these methods for showing emphasis for more than one or two words or a short phrase because they slow reading performance when used for extended prose.

30 Use Proper Alignment for Text

➢ Guideline

Use left alignment for text most of the times

➢ Comments

A text block can be aligned left, centred, right and fully justified. Full justification, where the editor automatically adjusts the space between words, should used carefully as it may result in poor spacing between words. Poor spacing or inconsistent spacing between words decreases reading speed by as much as 11%.

Centred aligning text makes it more difficult to read and decreases reading times dramatically. The best and easiest layout is the default left aligned.

Users must search for the beginning of each line in right and centred alignment and should be avoided. Centred alignment may be used in narrow columns or narrow frames where problems with readability are minimal. Right alignment should be used only in special cases (decorative text, etc.).

Titles and headings should also be flush left or centred aligned.

31 Use alternating row colours for making table more readable

➢ Guideline

Use alternating row colours for making the table more readable to the visitors

➢ Comments

Tables are common elements within a web page. A table can be quite complex and have several columns which makes it hard to see which items belong to the same row.

Use two colours of low saturation, e.g. white and a very light shade of an other color, that are only slightly different. Colour each row of the table by alternating these two colours.

The row colour eliminates the need of table borders and make it easy for the eye to read a row. In a vertical sense, the colours make it easier to 'catch' an item because it is on either one of the colours

12 Lists

32 Display Related Items in Lists

➢ Guideline

Display a series of related items in a vertical list rather than as continuous text.

➢ Comments

A well-organized list format tends to facilitate rapid and accurate scanning. One study indicated that users scan vertical lists more rapidly than horizontal lists. Scanning a horizontal list takes users 20% percent longer than scanning a vertical list.

33 Introduce Each List

➢ Guideline

Provide an introductory heading (i.e., word or phrase) at the top of each list.

➢ Comments

Providing a descriptive heading allows users to readily understand the reason for having a list of items, and how the items relate to each other. The heading helps to inform users how items are categorized, or any prevailing principle or theme. Users are able to use lists better when they include headings.

34 Format Lists to Ease Scanning

➢ **Guidelines**

Make lists easy to scan and understand.

➢ **Comments**

The use of meaningful labels, effective background colors, borders, and white spaces allow users to identify a set of items as a discrete list.

35 Capitalize First Letter of First Word in Lists

➢ **Guideline**

Capitalize the first letter of only the first word of a list item, a list box item, check box labels, and radio button labels.

➢ **Comments**

Only the first letter of the first word should be capitalized unless the item contains another word that normally would be capitalized.

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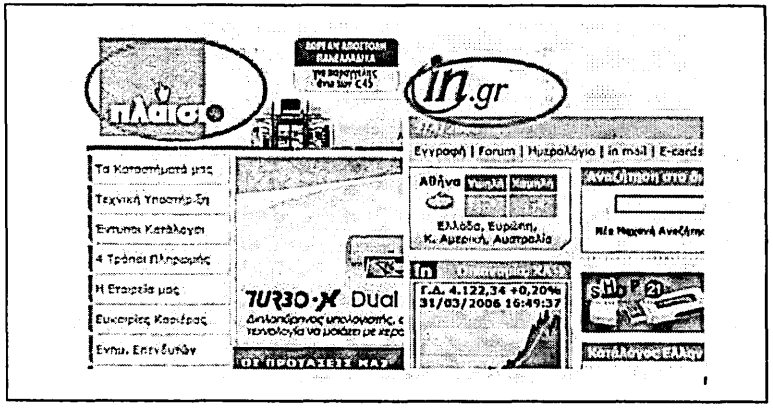
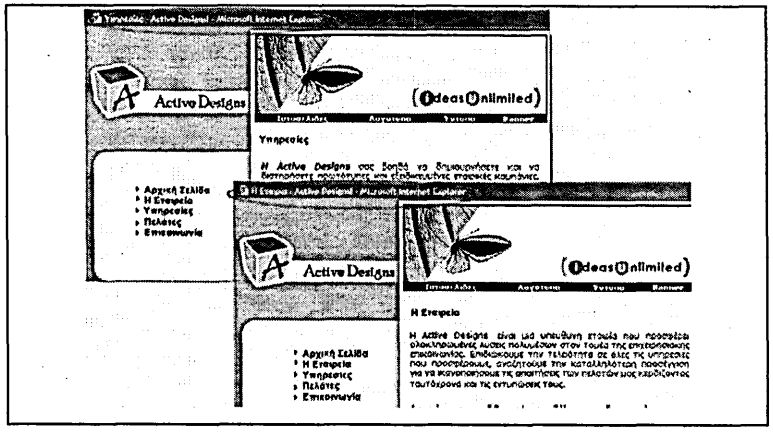
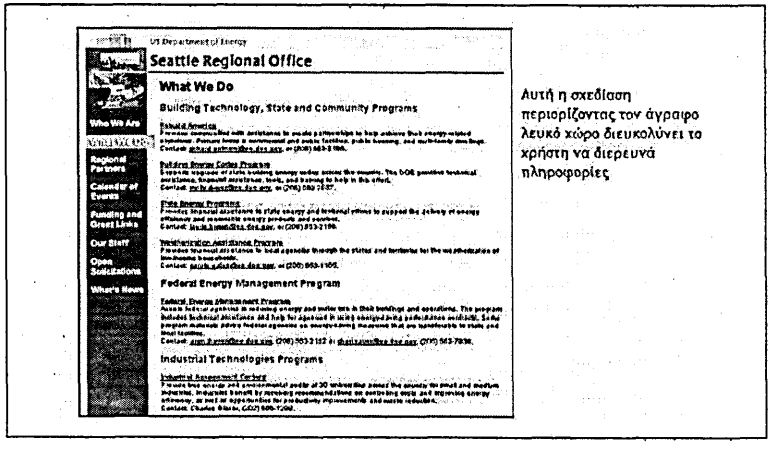


1 Enable Access to the Homepage

2 Limit Homepage Length



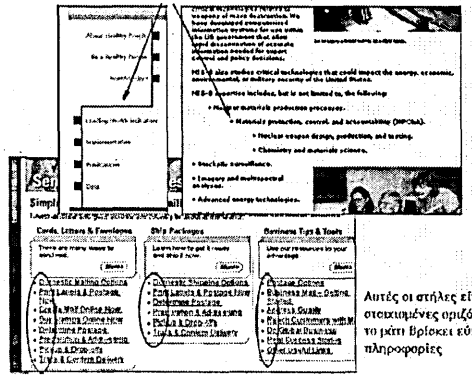
3 Place Important Items Consistently



Αυτή η σχεδίαση περιορίζοντας τον άγραιφο λευκό χώρα διευκολύνει το χρήστη να διερευνά πληροφορίες

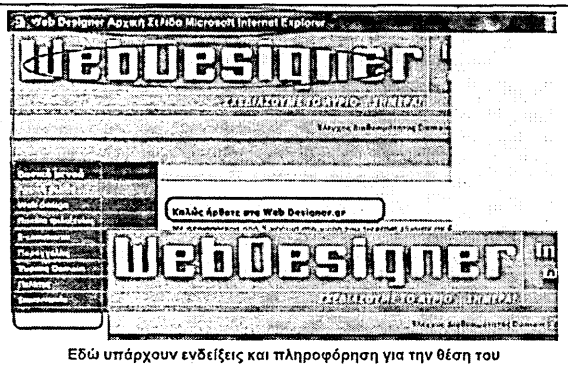
4 Use Moderate White Space

Αυτός ο τρόπος στοίχισης κάνει δύσκολή την ανάγνωση με αποτέλεσμα ο χρήστης να καθυστερεί πολύ για να βρει πληροφορίες



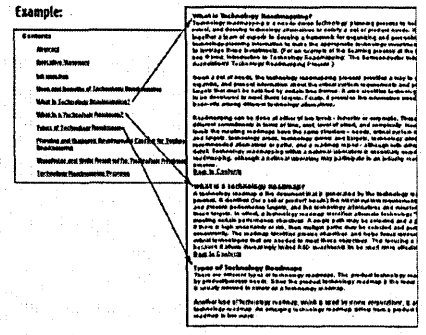
Αυτές οι στήλες είναι στοιχισμένες οριζόντια και το μάτι βρίσκει εύκολα τις πληροφορίες

5 Align Items on a Page

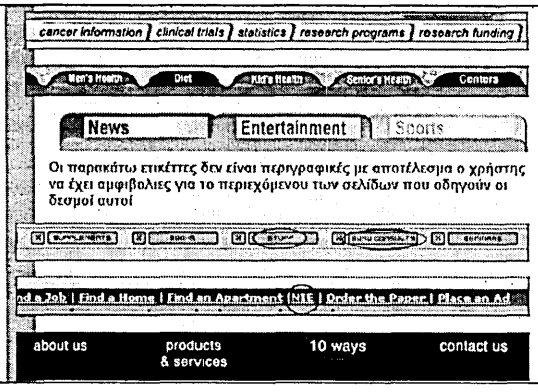


Εδώ υπάρχουν ενδείξεις και πληροφόρηση για την θέση του

6 Provide Feedback on Users' Location

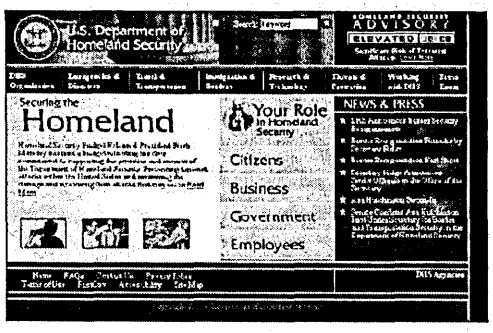


7 Use a Clickable 'List of Contents' on Long Pages



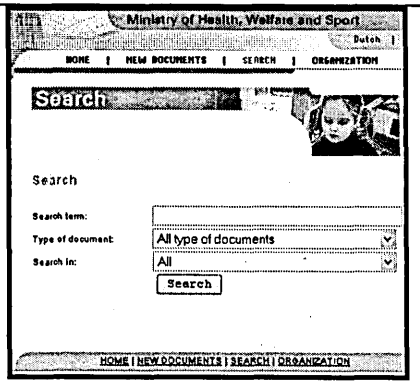
Οι παρακάτω ετικέττες δεν είναι περιγραφικές με αποτέλεσμα ο χρήστης να έχει αμφιβολιες για το περιεχόμενου των σελίδων που οδηγούν οι δεσμοί αυτοί

8 Use Descriptive Tab Labels

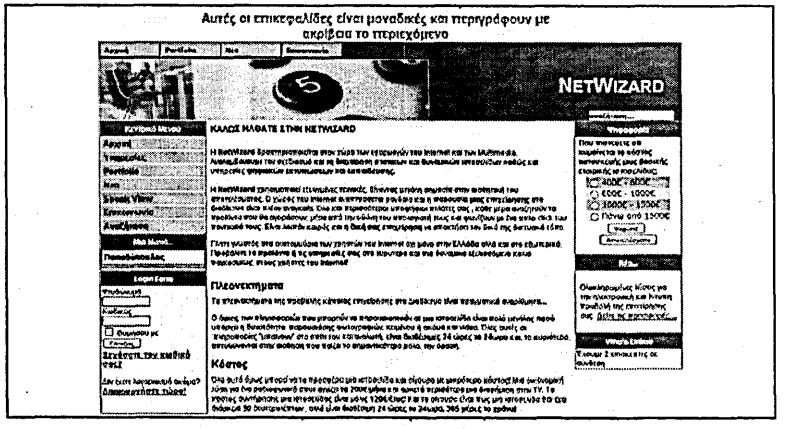


9 Keep Navigation-only Pages Short

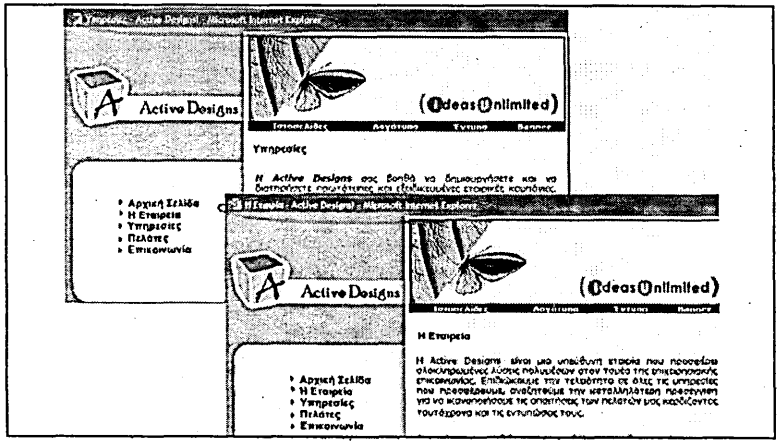
10 Use Meta Navigation



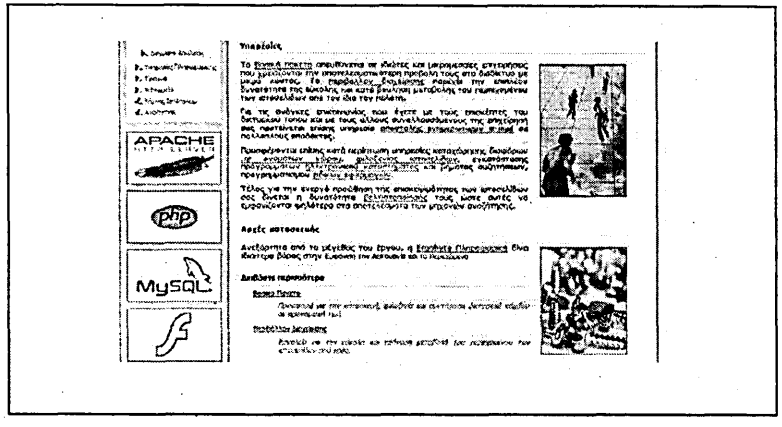
11 Repeat the main navigation at the bottom of the page



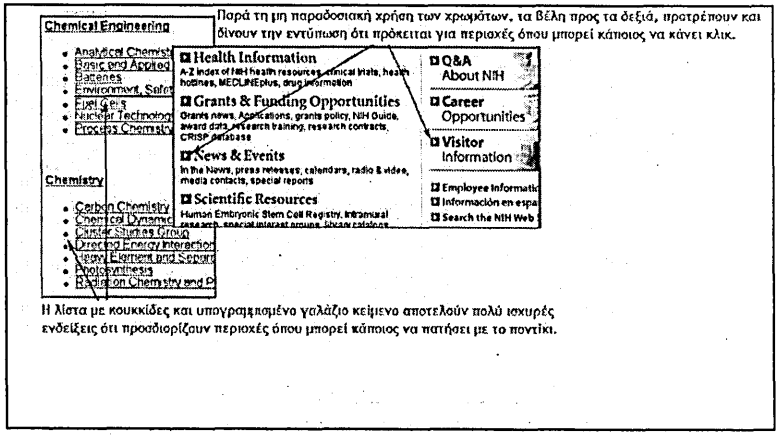
12 Use Unique, Descriptive and Emphasized Headings



13 Provide Descriptive Page Titles



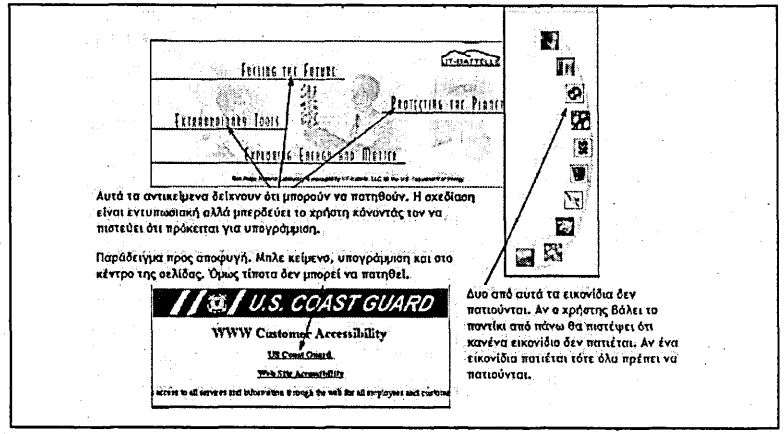
14 Provide links where the user may need them



Παρά τη μη παραδοσιακή χρήση των χρωμάτων, τα βέλη προς τα δεξιά, πρατρέπουν και δίνουν την εντύπωση ότι πρόκειται για περιοχές όπου μπορεί κάποιος να κάνει κλικ.

Η λίστα με κουκκίδες και υπογραμμισμένο γαλάζιο κείμενο αποτελούν πολύ ισχυρές ενδείξεις ότι προσδιορίζουν περιοχές όπου μπορεί κάποιος να πατήσει με το ποντίκι.

15 Provide Consistent Clickability Cues

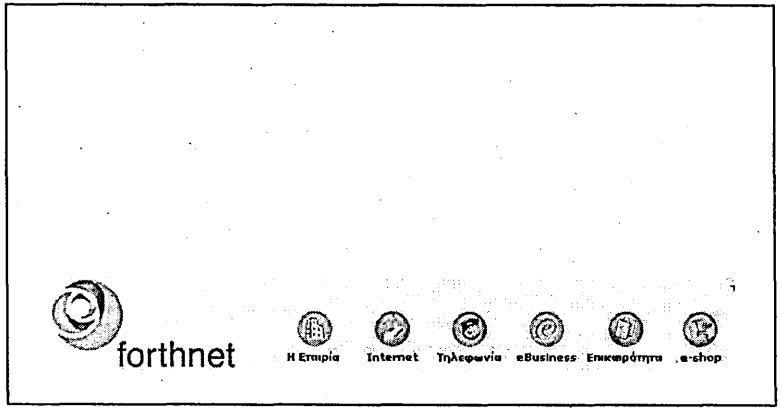


Αυτά τα αντικείμενα δείχνουν ότι μπορούν να πατηθούν. Η σχεδίαση είναι εντυπωσιακή αλλά μπερδεύει το χρήστη κάνοντάς τον να πιστεύει ότι πρόκειται για υπογράμμιση.

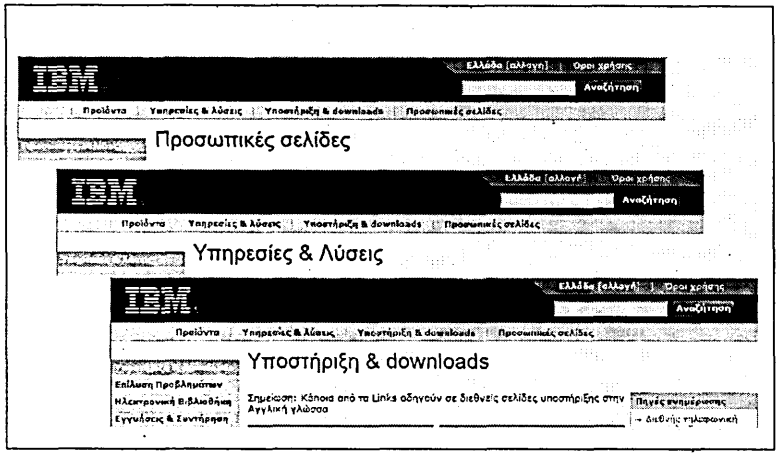
Παράδειγμα προς αποφυγή. Μπλε κείμενο, υπογράμμιση και στο κέντρο της σελίδας. Όμως τίποτα δεν μπορεί να πατηθεί.

Δυο από αυτά τα εικονίδια δεν πατιούνται. Αν ο χρήστης βάλει το ποντίκι από πάνω θα πιστέψει ότι κανένα εικονίδιο δεν πατιέται. Αν ένα εικονίδια πατιέται τότε όλα πρέπει να πατιούνται.

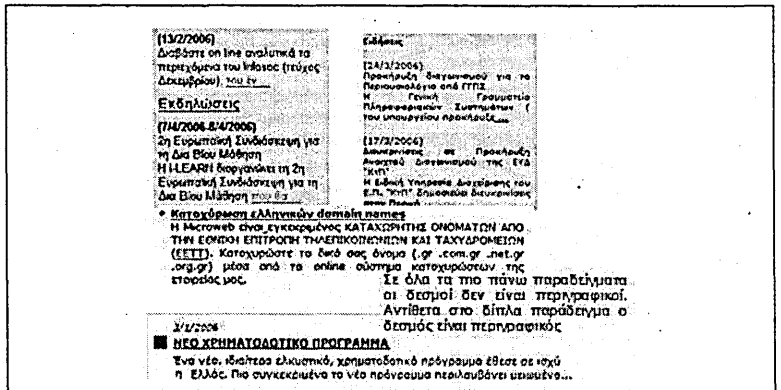
16 Avoid Misleading Cues to Click



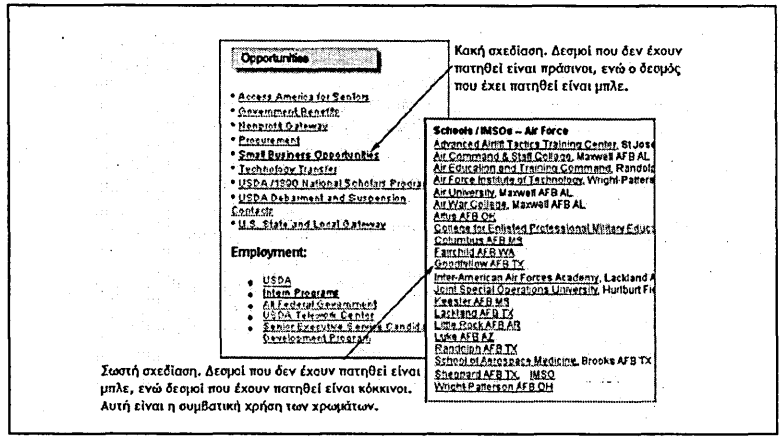
17 Use Text for Links and in Clickable Images



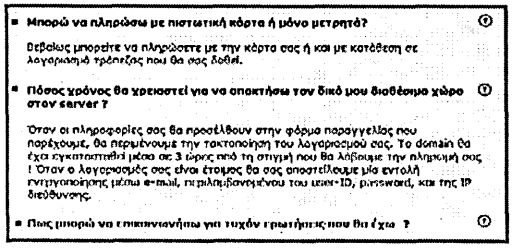
18 Match Link Names with Their Destination Pages



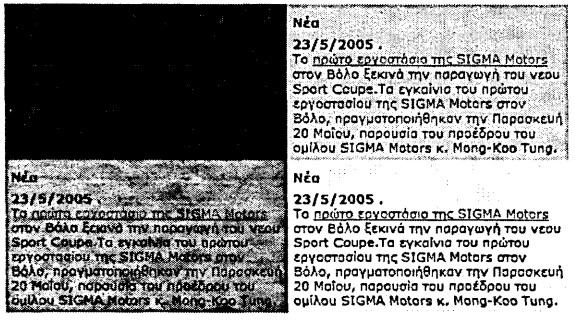
19 Ensure that Embedded Links are Descriptive



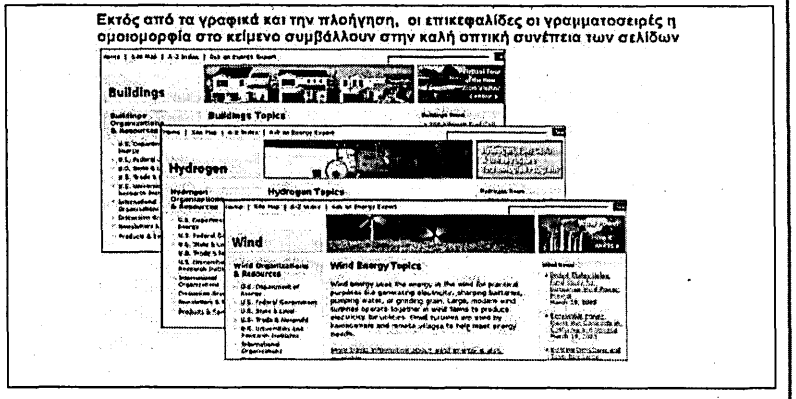
20 Designate Used Links



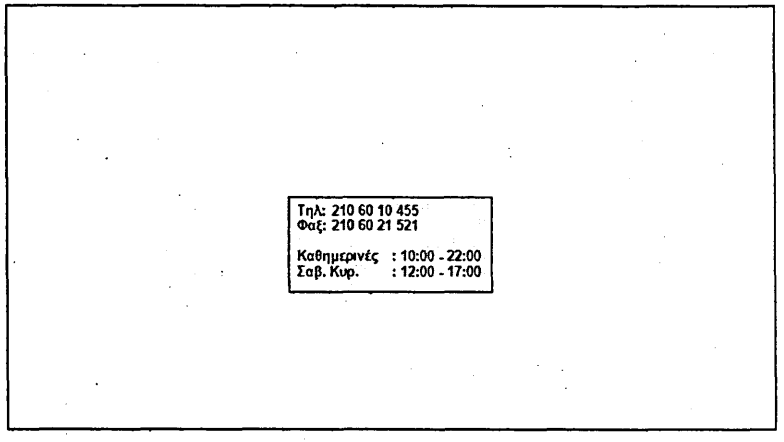
21 Allow Users to Go Back to the Top of the Page



22 Use Black Text on Plain, High-Contrast Backgrounds



23 Ensure Visual Consistency in Text

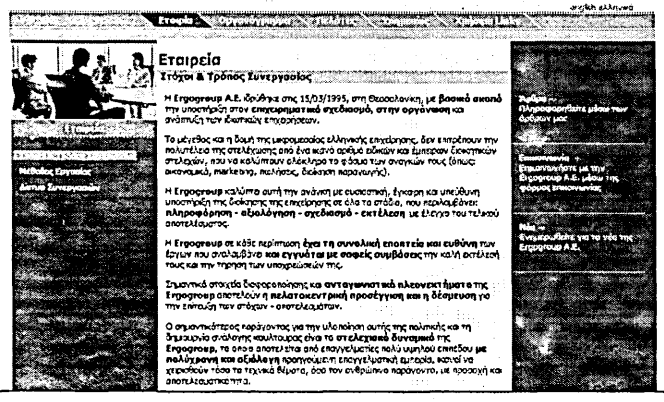


24 Format Common Items Consistently

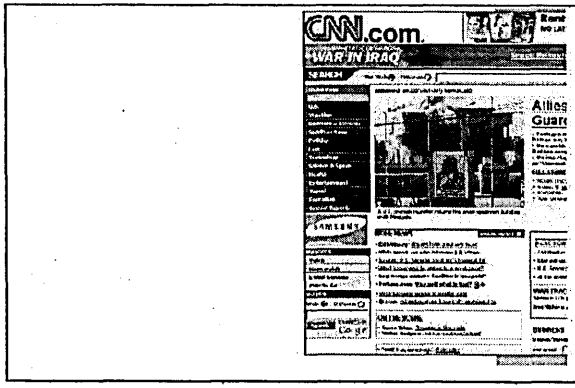
Χρήση ασυνήθιστων γραμματοσειρών μπορεί να μειώσει την ταχύτητα ανάγνωσης

26 Use Familiar Fonts

Περιορισμένη χρήση έντονης γραφής τονίζει αποτελεσματικά κάτι το σημαντικό



27 Emphasize Importance in Text



28 Use Attention-Attracting Features when Appropriate

Αυτό το πρότυπο συστήνει την ΧΡΗΣΗ ΜΙΚΡΩΝ ΚΑΙ ΜΕΓΑΛΩΝ ΓΡΑΜΜΑΤΩΝ ΣΕ ΚΑΝΟΝΙΚΟ ΚΕΙΜΕΝΟ ΓΙΑΤΙ η χρήση κεφαλαίων ΕΠΙΒΡΑΔΥΝΕΙ ΣΟΒΑΡΑ ΤΗΝ ΑΝΑΓΝΩΣΗ

Αυτό το πρότυπο συστήνει την χρήση μικρών και μεγάλων γραμμάτων σε κανονικό κείμενο γιατί η χρήση κεφαλαίων επιβραδύνει σοβαρά την ανάγνωση

29 Use Mixed Case with Prose

Φτηνά Πακέτα

Παρέχουμε σε όλους φθηνά πακέτα μεταπώλησης που χωράνε Απειρα domain. Κατασκευάστε τα πακέτα σας και πουλήστε τα. Παρέχουμε δωρεάν control panel (Whm), και ότι δίνουμε εμείς στα δικά μας πακέτα.

Συμβουλές για αρχαρίους

Το internet είναι σαν τη γη. Για να ζήσει κάποιος στη γη χεριάζετε ένα σπίτι.
Για να μπορέσει να έχει κάποιος σπίτι πρέπει να βρει πρώτα τη διεύθυνση μετά το οικόπεδο και μετά να το χτίσει.
Το παραπάνω είναι μία παραβολή.
Η διεύθυνση είναι το domain (www.toonomamou.gr) . Πρέπει να αποκτήσετε ένα από τις αρμόδιες υπηρεσίες.
Το οικόπεδο είναι ο χώρος που θα φιλοξενήσετε το site σας. Εμείς παρέχουμε αυτό το χώρο μαζί με όλη μας τη βοήθεια και στο χτίσιμο του site σας αλλά και στη διαχείριση του.
Τέλος η οικοδομή είναι το η ιστοσελίδα σας. Σε περίπτωση που δεν έχετε εσείς σελίδα έτοιμη μπορούμε να σας τη φτιάξουμε σε φοιτητικές τιμές.

30 Use Proper Alignment for Text

week 51 19 Dec 2002

		1	2	3
1	**robbie williams** - feel- Williams/Chambers-Chrysalis/Capitol/EMI-	6	3	1
2	**nelly ft. kelly rowland** - dilemma- Gamble/Sigler/Haynes-Universal/Universal-	1	8	1
3	**c. aguilera ft. redman** - dirrty- Aguilera/Cameron/Muhammad/Stinson-RCA/BMG-	2	9	2
4	**jennifer lopez** - jenny from the block- Oliver/deyo-Epic/SME-	4	5	4

31 Use alternating row colours for making table more readable

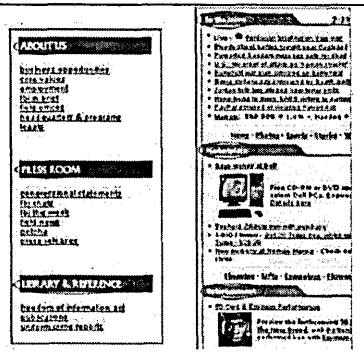
Λίστες με κουκκίδες είναι εύκολες στη αναγνώριση αλλά και στην κατανόηση.

The Office of Data makes available for download
- Annual Production Statistics
- Monthly Production Statistics
- Weekly Production Statistics and
- Quarterly Consumption Projections.

Οι οριζόντιες λίστες όμως δυσκολεύουν πολύ το χρήστη.

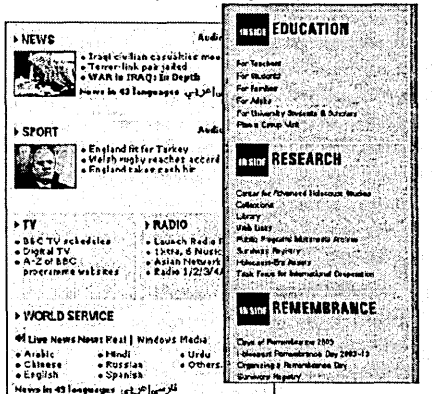
The Office of Data makes available for download Annual Production Statistics, Monthly Production Statistics, Weekly Production Statistics, and Quarterly Consumption Projections.

32 Display Related Items in Lists

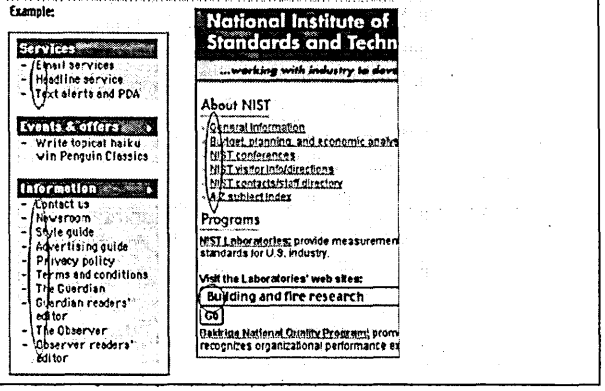


33 Introduce Each List

Αυτές οι σελίδες χρησιμοποιούν έγχρωμο υπόβαθρο και λεπτές άσπρες γραμμές για να κάνουν τις λίστες εύκολες στη σάρωση.



34 Format Lists to Ease Scanning



35 Capitalize First Letter of First Word in Lists

Appendix 5.2: Set of patterns and guidelines (Greek version)

Πρότυπα για WEB DESIGN

Τμήμα Αυτοματισμού

1 Μήκος Αρχικής Σελίδας 2
2 Δεσμός προς την Αρχική Σελίδα 3
3 Σημαντικά Στοιχεία με Συνέπεια 4
4 Περιορισμένος Λευκός Χώρος 6
5 Καλή Στοίχιση 7
6 Καθορισμός Θέσης 8
7 Λίστα Σελίδας 9
8 Περιγραφικές Ετικέτες Πλοήγησης 10
9 Μήκος Πλοήγησης 11
10 Μετα-Πλοήγηση 12
11 Επαναλαμβανόμενο Μενού 13
12 Ωραίες Επικεφαλίδες 14
13 Τίτλοι Σελίδας 15
14 Κατάλληλοι και Περιγραφικοί Δεσμοί 16
15 Συνεπείς και Προφανείς δεσμοί 18
16 Γραφικά - Δεσμοί 20
17 Δεσμός προς την Αρχή Σελίδας 21
18 Συνέπεια στο Κείμενο 22
19 Διακριτό Κείμενο 24
20 Κείμενο με Έμφαση 25
21 Στοιχεία που Ελκύουν Προσοχή 26
22 Καλοστοιχισμένο Κείμενο 27
23 Κεφαλαία και Μικρά 28
24 Εναλλασσόμενα Χρώματα Σειρών 29
25 Λίστες 30

1 Μήκος Αρχικής Σελίδας

➢ Πότε χρησιμοποιείται

Κάθε ιστοχώρος έχει μια αρχική σελίδα. Είναι όπως την μπροστινή πόρτα του σπιτιού σας. Για τους περισσότερους χρήστες, θα είναι η αφετηρία για την πλοήγηση μέσω της περιοχής σας.

➢ Πρόβλημα

Οι χρήστες πρέπει από την Αρχική Σελίδα να μπορούν να κινηθούν για να ολοκληρωθεί ο σκοπός τους μέσα στην περιοχή του ιστοχώρου

Η αρχική σελίδα είναι μια σημαντική σελίδα, είναι η πόρτα στην περιοχή σας. Οι χρήστες που δεν γνωρίζουν τον τόπο πολύ καλά, πρέπει να καταστήσετε σαφές ποιος είναι πίσω από την περιοχή, τι υπάρχει μέσα στον τόπο και μπορεί κάποιος να το βρει. Η αρχική σελίδα συχνά είναι με πολύ υλικό, αλλά αν και είναι σωστό ώστε να προσδιοριστεί ο σκοπός της περιοχής, η εμφάνιση πολύ υλικού στη σελίδα δεν είναι πάντα καλή.

Περιορίστε το Μήκος της Αρχικής Σελίδας σε μία οθόνη (πρώτη οθόνη) με πληροφορίες εάν είναι εφικτό
Οποιοδήποτε στοιχείο στην αρχική σελίδα που πρέπει αμέσως να προσελκύσει την προσοχή των χρηστών πρέπει να είναι τοποθετημένο στη περιοχή της σελίδας που εμφανίζεται στην πρώτη οθόνη. Οι πληροφορίες που δεν μπορούν να εμφανιστούν στην πρώτη οθόνη πιθανό να παραλειφθούν εξ ολοκλήρου από τους χρήστες— με αρνητικό **αντίκτυπο** στην αποτελεσματικότητα του ιστοχώρου. Εάν οι χρήστες καταλήγουν στο συμπέρασμα ότι αυτό που βλέπουν στην πρώτη οθόνη δεν είναι ενδιαφέρον, μπορεί να μην προσπαθήσουν να κατέβουν για να δουν το υπόλοιπο μέρος της σελίδας.

Επιπλέον μερικοί χρήστες καθυστερούν να προχωρήσουν και να κυλίσουν την οθόνη προς το υπόλοιπο κάτω μέρος της σελίδας, και εκδηλώνουν μια απροθυμία να κινηθούν από την πρώτη οθόνη προς τις επόμενες πληροφορίες. Οι μεγαλύτεροι σε ηλικία χρήστες και οι αρχάριοι είναι πιθανότερο να παραλείψουν τις πληροφορίες που τοποθετούνται κάτω από την πρώτη οθόνη.

Οι διαστάσεις μίας οθόνης πληροφοριών είναι βασισμένες αρχικά στην ανάλυση της οθόνης. Παρακάτω θα βρείτε τη διάσταση της **«πρώτης οθόνης»**, ανάλογα με την ανάλυση της οθόνης του υπολογιστή.

Οθόνη 800 X 600	Μέγιστο πλάτος = 780 pixel	Μέγιστο ύψος = 430 pixels
Οθόνη 1024 X 768	Μέγιστο πλάτος = 970 pixel	Μέγιστο ύψος = 600 pixels
Οθόνη 1280 X 1024	Μέγιστο πλάτος = 1150 pixel	Μέγιστο ύψος = 970 pixels

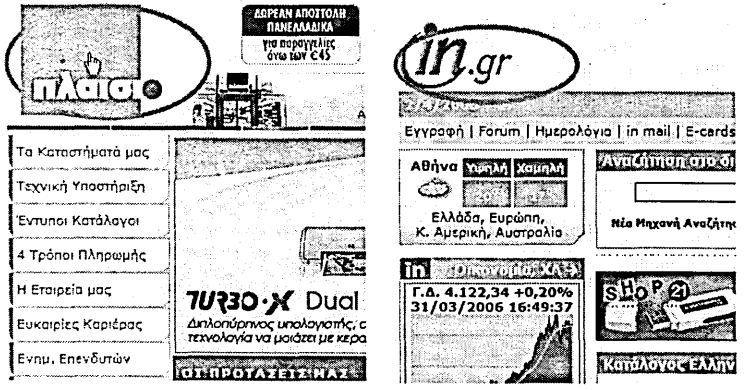
➢ Λύση

Δημιουργήστε μια αρχική σελίδα με περιορισμένο μήκος ώστε μόνο οι κύριες επιλογές να φαίνονται που εισάγει τον δικτυακό στους χρήστες και που τους βοηθά να τον εξερευνήσουν περισσότερο

➢ Μπορούν να ληφθούν υπόψη και

Θα πρέπει να χρησιμοποιηθεί και το ***9 Μήκος Πλοήγησης*** για να γίνει περιορισμός της αρχικής σελίδας σε μία οθόνη. Επίσης για τις ετικέτες να χρησιμοποιηθούν το ***8 Περιγραφικές Ετικέτες Πλοήγησης***

2 Δεσμός προς την Αρχική Σελίδα



➢ **Πότε χρησιμοποιείται**
Η αρχική σελίδα είναι συνήθως η αφετηρία από όπου ξεκινά ο χρήστης την επίσκεψη στο τόπο. Όταν οι χρήστες φθάνουν σε μια τυχαία σελίδα μέσα στην περιοχή, πρέπει να είναι σε θέση να επιστρέψουν στην αρχική σελίδα.

➢ **Πρόβλημα**
Οι χρήστες πρέπει να επιστρέψουν σε ένα αρχικό/ασφαλές/οικείο σημείο μέσα στο δικτυακό τόπο
Προσθέστε ένα δεσμό με την αρχική σελίδα σε κάθε σελίδα. Τοποθετήστε το δεσμό στην κορυφή της σελίδας και εάν είναι θεωρείται κατάλληλο και στο κατώτατο σημείο της οθόνης. Εάν η περιοχή έχει ένα λογότυπο, κάνετε το λογότυπο ένα δεσμό με την αρχική σελίδα επίσης. Διαφορετικά, απλά συνδέστε την αρχική σελίδα χρησιμοποιώντας την επικέτα "Αρχική Σελίδα", είτε με ένα δεσμό κειμένου είτε μια εικόνα ενός σπιτιού. Βεβαιωθείτε ότι η ο δεσμός βρίσκεται πάντα στην ίδια θέση σε όλες τις σελίδες.

Ένας δεσμός προς την αρχική σελίδα παρέχει μια ασφαλή έξοδο από κάθε σελίδα και πάντα προς την ίδια θέση. Οπουδήποτε και αν βρίσκεται κάποιος χρήστες μπορεί πάντα να επιστρέψει σε μια γνωστή θέση. Το λογότυπο προσδιορίζει τον ιστοχώρο και επομένως επιλέγεται εύκολα ώστε να υπάρχει πρόσβαση και επιστροφή στην αρχική σελίδα.

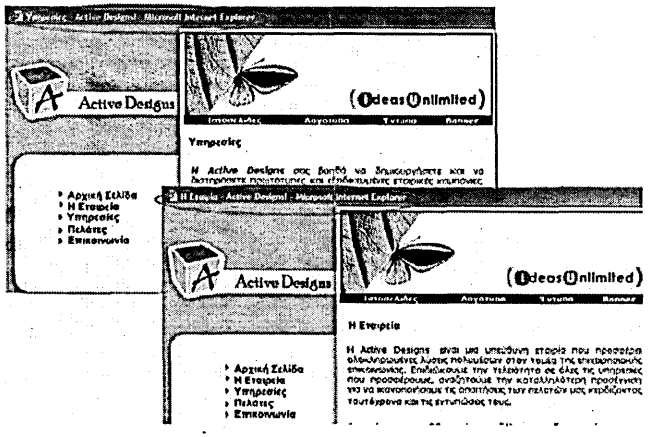
Καλό είναι ο δεσμός να υπάρχει και στην αρχική σελίδα για να υπάρχει ομοιομορφία μεταξύ των σελίδων

➢ **Λύση**
Επιτρέψτε στους χρήστες για να έχουν πρόσβαση στην αρχική σελίδα από οποιαδήποτε άλλη σελίδα της τοποθεσίας.

➢ **Μπορούν να ληφθούν υπόψη και**
Δεσμός προς την Αρχική Σελίδα μπορεί να γίνει με χρήση των ***10 Μετα-Πλοήγηση*** και ***11 Επαναλαμβανόμενο Μενού***

➢ **Άλλα παραδείγματα**

3 Σημαντικά Στοιχεία με Συνέπεια



➢ **Πότε χρησιμοποιείται**
Ενώ μία σελίδα περιέχει πολλά στοιχεία οι επισκέπτες πρέπει να βρίσκουν τα πιο σημαντικά στοιχεία στην οθόνη

➢ **Πρόβλημα**
Πως μπορεί να σχεδιαστεί μία σελίδα ώστε τα πιο σημαντικά στοιχεία να βρίσκονται εύκολα

Οι χρήστες εξετάζουν γενικά το κέντρο της κορυφής μιας σελίδας πρώτα, κατόπιν κοιτάζουν αριστερό, κατόπιν δεξιά, και αρχίζουν τελικά να μετακινούνται συστηματικά προς το κάτω μέρος της ιστοσελίδας. Όλο το σπουδαίο περιεχόμενο και η πλοήγηση πρέπει να είναι προς την κορυφή της σελίδας. Ιδιαίτερα στις σελίδες πλοήγησης, οι πιο σημαντικές επιλογές πρέπει να είναι ορατές χωρίς ή με μία ελάχιστη κύλιση της σελίδας.

Άλλα στοιχεία που πρέπει να τοποθετούνται με συνέπεια είναι:

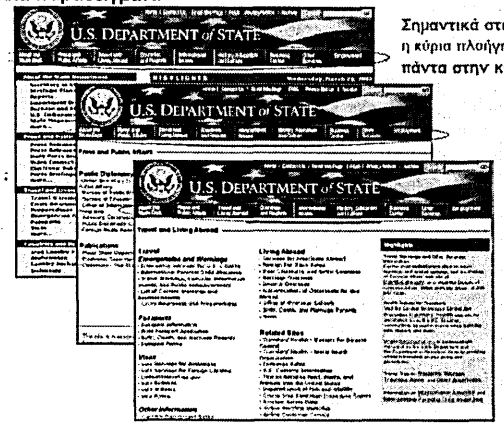
- Τα στοιχεία πλοήγησης
- Το λογότυπο
- Ο τίτλος της σελίδας
- Τίτλος μίας είδησης ή νέου
- Κάποια διαφήμιση
- Το όνομα και η εικόνα ενός προϊόντος

Οι χρήστες γενικά προσπαθούν να εκτιμήσουν την θέση που θα εμφανιστούν τα συνηθισμένα στοιχεία στην οθόνη τους. Οι έμπειροι χρήστες θα αρχίσουν να κινούν το ποντίκι προς την περιοχή του στόχου πριν το μάτι διαπιστώσει το συγκεκριμένο στοιχείο. Οι χρήστες μπορούν να εκτιμήσουν τη θέση των στοιχείων που βρίσκονται στην κορυφή της σελίδας πολύ καλύτερα από αυτά που βρίσκονται πιο κάτω στην σελίδα.

➢ **Λύση**
Βάλτε τα σημαντικότερα στοιχεία στη πάνω μέρος της ιστοσελίδας για να διευκολύνετε τους χρήστες να βρουν τις πληροφορίες, δηλαδή στην θέση που οι χρήστες υποθέτουν ότι θα τα βρουν

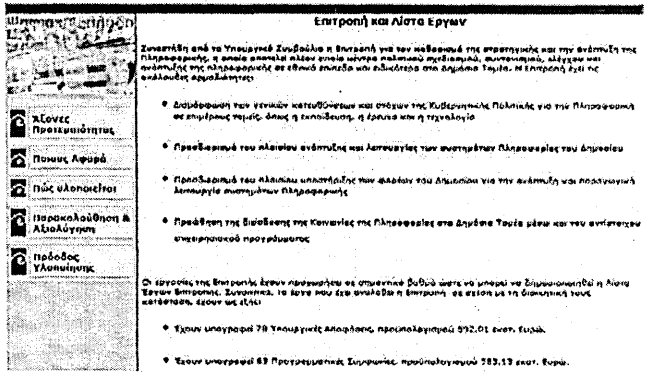
➢ **Μπορούν να ληφθούν υπόψη και**
Το πρότυπο ***18 Συνέπεια στο Κείμενο*** χρησιμοποιείται μαζί ώστε να διασφαλιστεί πλήρης συνέπεια του site

➢ Άλλα παραδείγματα



Σημαντικά στοιχεία - στην περίπτωση αυτή η κύρια πλοήγηση που είναι πάντα στην κορυφή της κάθε σελίδας

4 Περιορισμένος Λευκός Χώρος



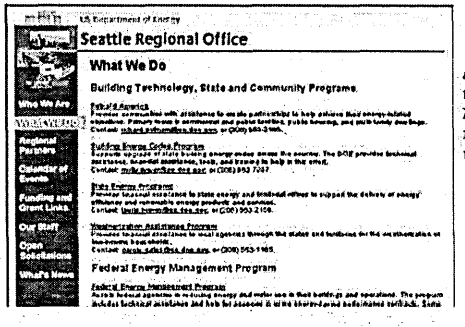
➢ **Πότε χρησιμοποιείται**
Ο χώρος που καταλαμβάνουν τα στοιχεία μία ιστοσελίδας είναι πολύτιμος. Ο χώρος πρέπει να εκμεταλλεύεται κατάλληλα

➢ **Πρόβλημα**
Πως αξιοποιείται ο χώρος που καταλαμβάνει μία σελίδα στην οθόνη;

Ο λογικός τρόπος είναι να περιορίστε το ποσό άγραφου διαστήματος (περιοχές χωρίς το κείμενο, γραφικά, κλπ.) στις σελίδες που χρησιμοποιούνται για διερεύνηση ή βιαστικό διάβασμα και αναζήτηση.

"Η πυκνότητα" είναι το ποσοστό της οθόνης που γεμίζουν με το κείμενο και τα γραφικά. Μια μελέτη διαπίστωσε ότι η υψηλότερη πυκνότητα συσχετίζεται με τη γρηγορότερη σάρωση, και δεν ασκεί καμία επίδραση στην ακρίβεια ή την προτίμηση χρηστών. Μια άλλη μελέτη διαπίστωσε ότι οι χρήστες προτιμούν τα μέτρια ποσά λευκού διαστήματος, αλλά το ποσό άσπρου διαστήματος δεν ασκεί καμία επίδραση στην απόδοση της αναζήτησή τους. Σε σελίδες περιεχομένου (δηλ., με κείμενο), χρησιμοποιήστε κάποιο λευκό διάστημα για να διαχωρίστε τις παραγράφους. Υπερβολικό διαχωρισμός των στοιχείων ιστοσελίδας μπορεί υποχρεώνει τους χρήστες να κυλίουν την οθόνη πάρα πολύ.

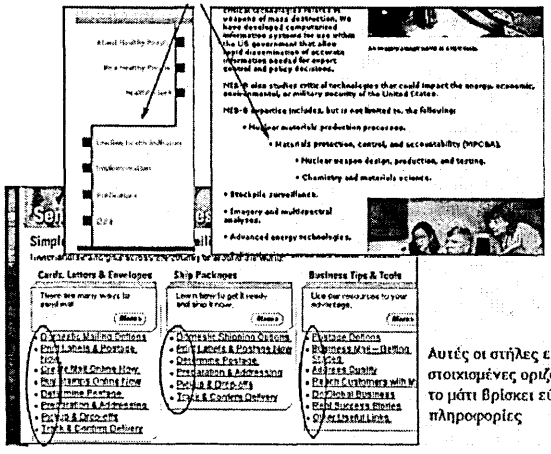
➢ **Λύση**
Μετριάστε τον άγραφο λευκό χώρο στην σελίδα σε σελίδες που είναι για ανάγνωση και σάρωση πληροφοριών.



Αυτή η σχεδίαση περιορίζοντας τον άγραφο λευκό χώρο διευκολύνει τα χρήστη να διερευνά πληροφορίες

5 Καλή Στοίχιση

Αυτός ο τρόπος στοίχισης κάνει δύσκολή την ανάγνωση με αποτέλεσμα ο χρήστης να καθυστερεί πολύ για να βρει πληροφορίες



Αυτές οι στήλες είναι στοιχισμένες οριζόντια και το μάτι βρίσκει εύκολα τις πληροφορίες

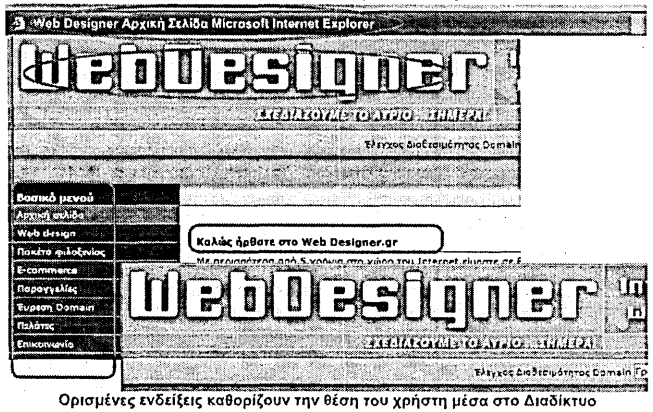
➢ **Πότε χρησιμοποιείται**
Η τάξη σε μία σελίδα βοηθά την σάρωση και αισθητικά είναι πιο ελκυστική

➢ **Πρόβλημα**
Πώς θα γίνει μία σελίδα πιο εύκολη στην σάρωση και αισθητικά είναι πιο ελκυστική

Οι χρήστες προτιμούν τις καθιερωμένες και συνεπείς ευθυγραμμίσεις για τα στοιχεία όπως οι κομμάτια κειμένου, οι σειρές, οι στήλες, τα ελεγκτήρια ελέγχου, τα κουμπιά επιλογής, τα πεδία εισαγωγής δεδομένων κ.λπ. Χρησιμοποιείστε την ίδια στοίχιση σε όλες τις σελίδες.

➢ **Λύση**
Οπτικά ευθυγραμμίστε και στοιχίστε τα στοιχεία σελίδων, είτε κάθετα είτε οριζόντια.

6 Καθορισμός Θέσης



Ορισμένες ενδείξεις καθορίζουν την θέση του χρήστη μέσα στο Διαδίκτυο

➢ **Πότε χρησιμοποιείται**
Ο χρήστης πρέπει να γνωρίζει κάθε στιγμή που βρίσκεται μέσα στο δικτυακό χώρο

➢ **Πρόβλημα**
Πώς ο χρήστης γνωρίζει την θέση του μέσα στον ιστοχώρο ώστε να μπορεί να μετάβεί σε ένα άλλο σημείο;

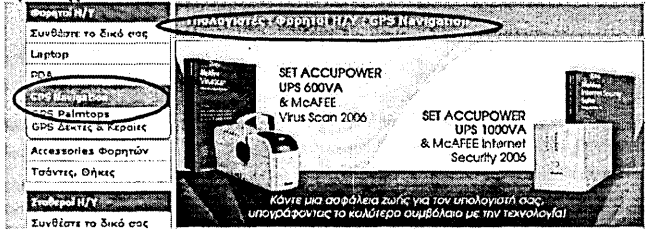
Πολλές ενδείξεις προσφέρουν στους χρήστες τις πληροφορίες για να καταλάβουν που είναι μέσα στον ιστοχώρο, και ποια είναι η σωστή κίνηση για την επόμενη ενέργεια. Τέτοιες ενδείξεις περιλαμβάνουν:

- την εμφάνιση διαδρομή στην ιεραρχία των πληροφοριών και των σελίδων («τρίμματα» (Breadcrumps πχ **Αρχική>Επιπεδο2>Επιπεδο3>**.....).
- τον συνδυασμό των **δεσμών με τους τίτλους των σελίδων**
- και η δημιουργία URL που αφορούν τη θέση του χρήστη στην περιοχή.

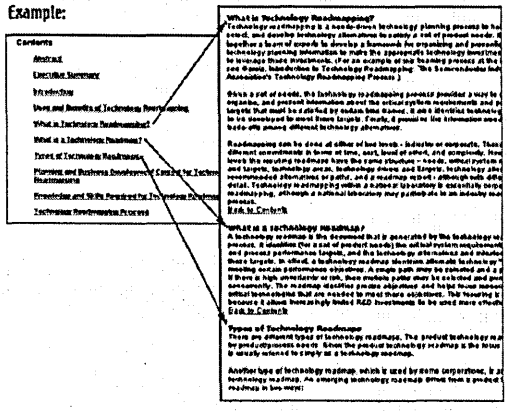
Άλλες μορφές ένδειξης περιλαμβάνουν την αλλαγή του χρώματος ενός συνδέσμου στον οποίο ο χρήστης έχει κάνει κλικ (υποδεικνύοντας ότι ο προορισμός έχει επισκεφτεί), και η χρήση άλλων οπτικών ενδείξεων.

➢ **Λύση**
Παρέχετε ενδείξεις και πληροφορίες για να ενημερώσετε τους χρήστες την θέση τους μέσα στον ιστοχώρο

➢ **Άλλα παραδείγματα**



7 Λίστα Σελίδας



➢ **Πότε χρησιμοποιείται**
Σε μεγάλες μακροσκελείς σελίδας οι χρήστε χρειάζονται να γνωρίζουν τα περιεχόμενο της σελίδας και πρέπει να μετακινηθούν σε ένα συγκεκριμένο σημείο.

➢ **Πρόβλημα**
Πώς ο χρήστης γνωρίζει τι περιέχεται σε μία σελίδα και πως μπορεί γρήγορα να έχει πρόσβαση στο υλικό αυτό

Για τις μεγάλες σελίδες με διάφορα χωριστά τμήματα που δεν είναι ορατά προσθέστε μία μικρή λίστα των τμημάτων, όπου κάθε γραμμή της λίστας να είναι ένας σύνδεσμος προς το συγκεκριμένο τμήμα του κειμένου και βάλτε το στην κορυφή της σελίδας.

Η λίστα με τους συνδέσμους εξυπηρετεί δύο σκοπούς:

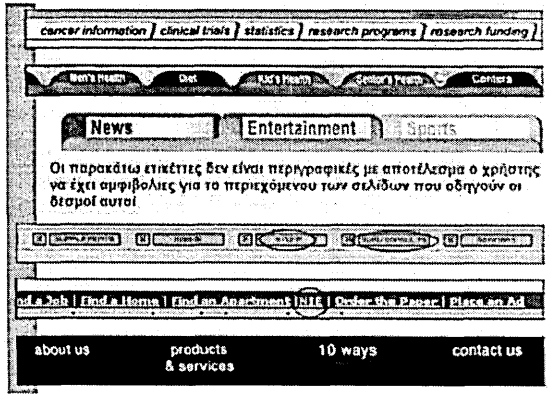
- Παρέχει μια περίληψη της σελίδας έτσι οι χρήστες μπορούν γρήγορα να καθορίσουν εάν περιέχει τις επιθυμητές πληροφορίες και ταυτόχρονα
- Επιτρέπει στους χρήστες για να μεταφερθούν γρήγορα στις συγκεκριμένες πληροφορίες.

Δεδομένου ότι η λίστα με τους δεσμούς επιτρέπει μια άμεση σύνδεση με το περιεχόμενο που βρίσκεται κάτω από την πρώτη οθόνη, είναι επίσης χρήσιμη για στους χρήστες που ξαφνικά βρίσκονται στην σελίδα αυτή προερχόμενοι από μια απολύτως διαφορετική σελίδα του δικτυακού τόπου.

➢ **Λύση**
Στις μεγάλες σελίδες, κάντε μία λίστα περιεχομένου με κάθε γραμμή της λίστας να είναι δεσμός προς περιεχόμενο ή παραγράφους που είναι σε άλλα μέρη της σελίδας τα οποία δεν είναι ορατά .

➢ **Μπορούν να ληφθούν υπόψη και**
Όταν χρησιμοποιείται αυτό το πρότυπο μπορεί να συνδυαστεί με το ***17 Δεσμός προς την Αρχή Σελίδας*** ώστε ο χρήστης γρήγορα να επιστρέφει στην αρχή εκεί που πιθανόν είναι η ***7 Λίστα Σελίδας***

8 Περιγραφικές Ετικέτες Πλοήγησης



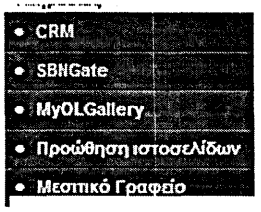
➢ **Πρόβλημα**
Πως ο χρήστης εύκολα και χωρίς καθυστέρηση διαλέγει ένα στοιχείο πλοήγησης

Οι χρήστες προτιμούν τα στοιχεία πλοήγησης με ετικέτες που είναι αρκετά περιγραφικές και επιτρέπουν τις χωρίς λάθη επιλογές. Όταν, λόγω περιορισμένου χώρου δεν μπορούν να χρησιμοποιηθούν περιγραφικές ετικέτες μη χρησιμοποιείτε ετικέτες αλλά ένα άλλο τρόπο να βάλετε τον δεσμό.

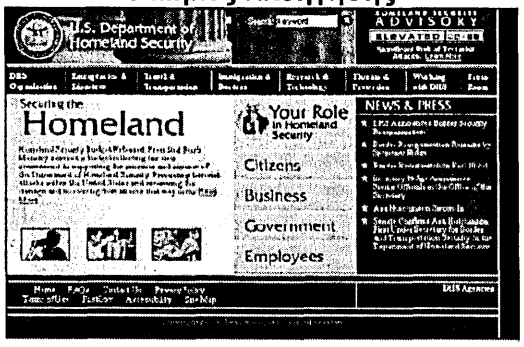
➢ **Λύση**
Χρησιμοποιήστε Περιγραφικές ετικέτες πλοήγησης διασφαλίζοντας ότι οι περιγραφές στις καρτέλες είναι σαφώς περιγραφικές της λειτουργίας ή του προορισμού τους..

➢ **Μπορούν να ληφθούν υπόψη και**
Στην ουσία εφαρμόζεται το πρότυπο ***14 Κατάλληλοι και Περιγραφικοί Δεσμοί.*** Ταυτόχρονα με το πρότυπο αυτό πρέπει να εφαρμοστεί και το ***11 Επαναλαμβανόμενο Μενού***

➢ **Άλλα παραδείγματα**



9 Μήκος Πλοήγησης



➢ **Πρόβλημα**
Πολλές φορές η σελίδες πλοήγησης ξεπερνούν την πρώτη οθόνη και οι χρήστες αναγκάζονται να κυλίσουν την οθόνη για να έχουν πρόσβαση στις επιπλέον επιλογές πλοήγησης

Ιδανικά, οι σελίδες πλοήγησης πρέπει να είναι σε μήκος μικρότερες από μία οθόνη. Οι χρήστες δεν πρέπει να αναγκάζονται να κυλίσουν τη σελίδα, ούτε για μια μικρή απόσταση. Μια μελέτη έδειξε ότι οι χρήστες θεώρησαν το κατώτατο σημείο της οθόνης σαν το τέλος μιας σελίδας, και δεν κύλισαν περαπέρω την σελίδα για να ανακαλύψουν τις επιπρόσθετες επιλογές πλοήγησης

➢ **Λύση**
Περιορίστε το μήκος στις σελίδες πλοήγησης ώστε να μην αναγκάζετε τους χρήστες να κάνουν κύλιση σε σελίδες που είναι αποκλειστικά για πλοήγηση

➢ **Μπορούν να ληφθούν υπόψη και**
Θα πρέπει να χρησιμοποιηθεί και το ***9 Μήκος Πλοήγησης*** για να γίνει περιορισμός της αρχικής σελίδας σε μία οθόνη. Επίσης για τις ετικέτες να χρησιμοποιηθούν το ***8 Περιγραφικές Ετικέτες Πλοήγησης***

10 Μετα-Πλοήγηση

➢ **Πότε χρησιμοποιείται**
Οι περισσότεροι ιστοχώροι, ειδικά για τούς εμπορικούς τόπους που επιθυμούν να έλθουν σε επαφή με τους επισκέπτες τους και είναι αρκετά μεγάλες να έχουν διαθέτουν κάποιο τρόπο αναζήτησης. Ο τόπος προσφέρει πλοήγηση που πρέπει να είναι διαθέσιμη σε κάθε σελίδα. Κάποιες επιπλέον δυνατότητες πλοήγησης πρέπει να είναι διαθέσιμες σε κάθε σελίδα.

➢ **Πρόβλημα**
Οι χρήστες πρέπει να γνωρίσουν με ποιόν έχουν να κάνουν.

Συνήθως η μετα-Πλοήγηση αποτελείται από κάποια δεσμούς πλοήγησης και δεσμούς που βοηθούν την επικοινωνία με τους χρήστες. Τα δεσμοί πλοήγησης περιλαμβάνουν **Αρχική Σελίδα**, **Αναζήτηση**, **Χάρτη**, και Ευρετήριο.

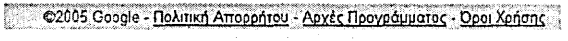
Οι δεσμοί με άλλες περιοχές πιο υψηλού επιπέδου είναι επίσης στοιχεία πλοήγησης. Οι δεσμοί επικοινωνίας πληροφορούν τους χρήστες για την οργάνωση της επιχείρησης και πως κάποιος μπορεί να επικοινωνήσει με αυτή (Τέτοιοι δεσμοί είναι πχ Η Εταιρεία, Επικοινωνία κλπ). Η μπάρα με την Μετα-πλοήγηση τοποθετείται στο πάνω μέρος της σελίδας ώστε να είναι πάντα ορατή.

Η μετα-πλοήγηση περιέχει τα λειτουργικά στοιχεία που είναι σχετικά σε κάθε σελίδα του ιστοχώρου. Πρέπει επομένως να είναι πάντα προσιτή με ένα τρόπο που δεν εμποδίζει και δεν καταλαμβάνει μεγάλο χώρο στην οθόνη.

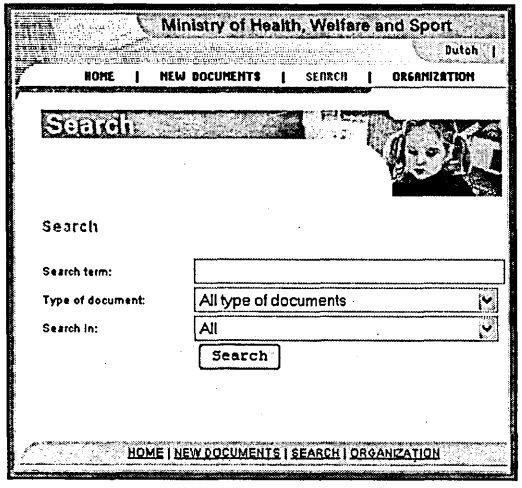
➢ **Λύση**
Διαθέστε ένα μικρό χώρο σε κάθε σελίδα για επικοινωνία και δευτερεύοντα στοιχεία πλοήγησης.

➢ **Μπορούν να ληφθούν υπόψη και**
Αυτό το πρότυπο προσφέρει την δυνατότητα υλοποίησης του ***2 Δεσμός προς την Αρχική Σελίδα***

➢ **Άλλα παραδείγματα**



11 Επαναλαμβανόμενο Μενού



➢ **Πότε χρησιμοποιείται**

Σελίδες συχνά καταλαμβάνουν περισσότερο από μία οθόνη και οι χρήστες θα πρέπει να κυλήσουν προς τα κάτω για να δουν την ολόκληρη σελίδα.

➢ **Πρόβλημα**

Οι χρήστες πρέπει να έχουν πρόσβαση στην κύρια πλοήγηση

Αυτό το πρότυπο επιτρέπει την πρόσβαση στην πλοήγηση και πάλι. Σε τέτοιες περιπτώσεις, η κύρια πλοήγηση είναι πιθανό μην είναι πια ορατή. Επαναλαμβάνοντας το μενού πλοήγησης ο χρήστης έχει πρόσβαση στην πλοήγηση όταν η οθόνη έχει κυλήσει και δεν υπάρχει καμία ανάγκη να επιστρέψει στην κορυφή επειδή το μενού πλοήγησης είναι προσιτό.

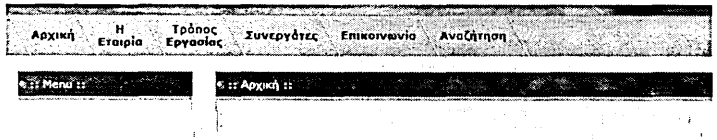
Βάλτε μία απλή μπάρα με τα ίδια στοιχεία όπως η κύρια πλοήγηση. Όμως χρησιμοποιήστε κατά προτίμηση απλούς συνδέσμους με μικρά γράμματα. Παρουσιάζοντας την μπάρα με διαφορετικό τρόπο οι χρήστες καταλαβαίνουν ότι δεν είναι η κύρια πλοήγηση αλλά ένα στοιχείο που τους διευκολύνει.

➢ **Λύση**

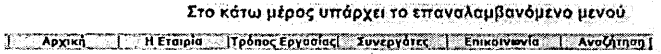
Επαναλάβετε το μενού της κυρίας πλοήγησης στο κάτω μέρος της σελίδας

➢ **Άλλα παραδείγματα**

Προσέξτε την κύρια πλοήγηση και το επαναλαμβανόμενο μενού

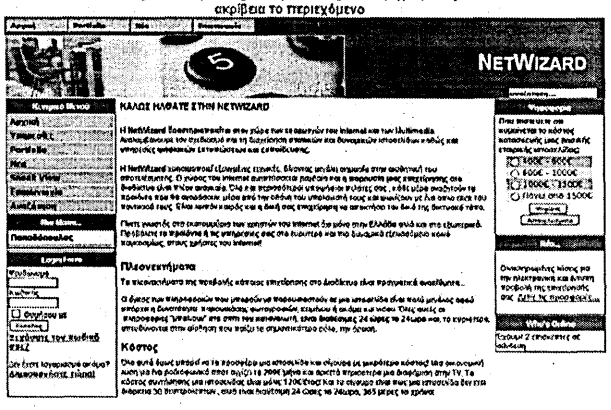


Στο κάτω μέρος υπάρχει το επαναλαμβανόμενο μενού



12 Ωραίες επικεφαλίδες

Αυτές οι επικεφαλίδες είναι μοναδικές και περιγράφουν με ακρίβεια το περιεχόμενο



➢ **Πρόβλημα**

Ο χρήστης πρέπει να κατανοεί και ξεχωρίζει εύκολα τις επικεφαλίδες σε μία ιστοσελίδα

Η χρησιμοποίηση μη επιτυχημένων επικεφαλίδων (κακοί συνδυασμοί μεταξύ των επικεφαλίδων και των πληροφοριών που οι χρήστες βρίσκουν) είναι ένα κοινό πρόβλημα με τους ιστοχώρους. Διασφαλίστε ότι οι επικεφαλίδες είναι περιγραφικές και αφορούν το περιεχόμενο που αναφέρονται. Εάν οι επικεφαλίδες είναι πολύ όμοιοι ο ένας με τον άλλο, οι χρήστες μπορεί να διστάσουν και να ξαναδιαβάσουν το κείμενο για να προσπαθήσουν να καταλάβουν την διαφορά. Ο προσδιορισμός μίας πετυχημένης επικεφαλίδας πιθανόν να απαιτεί δοκιμές με χρήστες.

Επιπλέον μία επικεφαλίδα για να ξεχωρίζει πρέπει να έχει έμφαση. Μορφοποιήστε κατάλληλα τις επικεφαλίδες ώστε να ξεχωρίζουν από τα άλλα στοιχεία που την περιβάλλουν, ιδίως κείμενο. Η έμφαση μπορεί να γίνει με αλλαγή του στυλ της γραμματοσειράς (έντονα), μεγέθους, χρώματος κλπ.

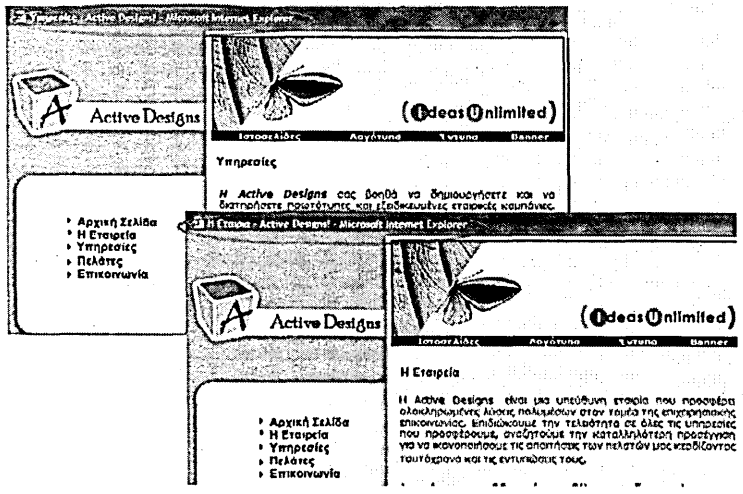
➢ **Λύση**

Χρησιμοποιείστε έμφαση στις επικεφαλίδες που πρέπει να μην μοιάζουν μεταξύ τους και να περιγράφουν εννοιολογικά το περιεχόμενο που ακολουθεί.

➢ **Μπορούν να ληφθούν υπόψη και**

Πέρα από το ***12 Ωραίες Επικεφαλίδες*** πολλές φορές χρησιμοποιείται και έμφαση στο κείμενο σύμφωνα με το πρότυπο ***20 Κείμενο με Έμφαση***

13 Τίτλοι Σελίδας



➢ **Use when**

Όλες οι σελίδες πρέπει να έχουν ένα τίτλο. Τίτλοι βοηθούν του χρήστες να προσανατολιστούν.

➢ **Πρόβλημα**

Κάθε σελίδα πρέπει να έχει ένα μοναδικό και περιγραφικό τίτλο

Ο τίτλος αναφέρεται στο κείμενο που είναι στην λωρίδα τίτλου του Προγράμματος Περιηγητή (Browser) (Αυτή η λωρίδα βρίσκεται στην κορυφή του παράθυρου) Οι τίτλοι χρησιμοποιούνται από τις μηχανές αναζήτησης για να προσδιορίσουν τις σελίδες. Εάν δύο ή περισσότερες σελίδες έχουν τον ίδιο τίτλο, δεν μπορούν να διαφοροποιηθούν από τους χρήστες ή από την κατηγορία Αγαπημένα (Favorites) του περιηγητή. Εάν ο χρήστης καταχωρήσει στον κατάλογο με τα Αγαπημένα μία σελίδα, δεν θα να πρέπει να προσαρμόσει τον τίτλο για να τον εναρμονίσει με τα προαναφερθέντα χαρακτηριστικά.

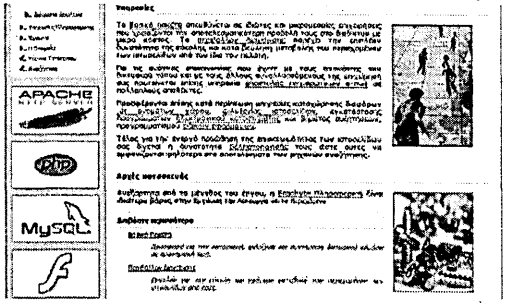
Θυμηθείτε ότι μερικές μηχανές αναζήτησης εμφανίζουν μόνο τους τίτλους στη σελίδα αποτελεσμάτων αναζήτησής. Η χρήση συνοπτικών και με σημασία τίτλων σε όλες τις σελίδες μπορεί να βοηθήσει και να προσανατολίσει τους χρήστες δεδομένου ότι κοιτάζουν βιαστικά την σελίδα ή ανιχνεύουν τους καλύτερους καταλόγους και το ιστορικό για ιδιαίτερες τοποθεσίες (URLs). Καλοί τίτλοι μπορούν επίσης να βοηθήσουν άλλους χρήστες όταν συντάσσουν δεσμούς με τις σελίδες σας.

Για να μην μπερδεύονται οι χρήστες, προσαρμόστε τον τίτλο που εμφανίζεται στο Λογισμικό Πλοήγησης ώστε να είναι σύμφωνος με τον τίτλο του περιεχομένου της σελίδας

➢ **Λύση**

Βάλτε έναν περιγραφικό, μοναδικό, συνοπτικό, με σημασία και διαφορετικό τίτλο σε κάθε ιστοσελίδας

14 Κατάλληλοι και Περιγραφικοί Δεσμοί



➢ **Πότε χρησιμοποιείται**

Οι χρήστες κινούνται μέσα στον δικτυακό τόπο με την βοήθεια των στοιχείων πλοήγησης. Οι δεσμοί είναι ένα από τα στοιχεία πλοήγησης και αποτελούν βασικό στοιχείο ενός δικτυακού τόπου. Οι δεσμοί σε ένα δικτυακό τόπο έχουν την μορφή εικόνας ή ένας συνδυασμό αυτών των δύο. Το πρότυπο περιγράφει ορισμένα ουσιαστικά χαρακτηριστικά των δεσμών ώστε να διευκολύνουν τον χρήστη και αναφέρεται κυρίως σε δεσμούς κειμένου.

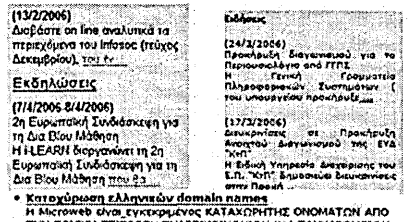
➢ **Πρόβλημα**

Πολλές φορές δεν είναι εμφανές αν κάποιο στοιχείο είναι δεσμός ή δεν είναι άμεσα φανερό ποια γραφικά ή εικόνες είναι δεσμοί και μπορούν να πατηθούν. Επίσης ο χρήστης δυσκολεύεται να αντιληφθεί τον προορισμό ενός δεσμού ή πατώντας σε ένα δεσμό μεταφέρεται σε σελίδα που δεν είναι κατανοητή αμέσως η θέση του.

Ο σχεδιαστής πρέπει να αποφεύγει τέτοια προβλήματα ακολουθώντας και εφαρμόζοντας τις παρακάτω τεχνικές.

Βάλτε δεσμούς εκεί που ο χρήστης θα τους χρειαστεί.

Ο ιστότοπος θα πρέπει να έχει δεσμούς σε άλλο υλικό μέσα και έξω από τον ιστότοπο σε τοποθεσίες που ο χρήστη πιθανόν να χρειαστεί να επισκεφτεί. Η πιο απλή μορφή αυτών των δεσμών είναι δεσμοί e-mail. Άλλοι δεσμοί μέσα στο κείμενο διευκολύνου την πλοήγηση σε σχετικές τοποθεσίες και βοηθούν τον επισκέπτη να βρει γρήγορα σχετικές πληροφορίες και να μετακινηθεί μέσα στον ιστότοπο.



Διασφαλίστε ότι οι ενσωματωμένοι δεσμοί κειμένου είναι περιγραφικοί.

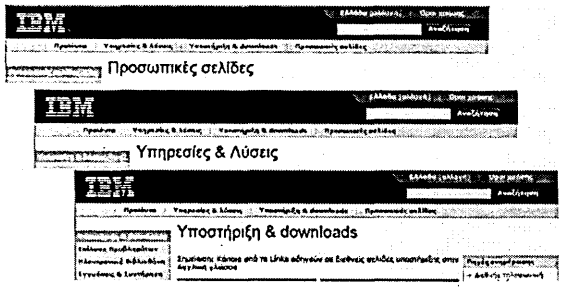
Όταν γίνεται χρήση των ενσωματωμένων δεσμών (κείμενο που έχει γίνει δεσμός ονομάζεται ενσωματωμένος δεσμός), το κείμενο που χρησιμοποιείται πρέπει ακριβώς να περιγράφει τον προορισμό του δεσμού.

Οι χρήστες τείνουν να αγνοήσουν το κείμενο που περιβάλλει κάθε ενσωματωμένο δεσμό επομένως μην δημιουργείτε ενσωματωμένες δεσμούς που χρησιμοποιούν το περιβάλλον κείμενο για να προσθέσουν ενδείξεις και να βοηθήσουν τους χρήστες για τον προορισμό του δεσμού.

Υποδείξτε τους δεσμούς που έχουν χρησιμοποιηθεί.

Κάντε χρήση άλλου χρώματος για να επισημάνετε στους χρήστες τους δεσμούς που έχουν επισκεφτεί. Γενικά, είναι καλύτερο να χρησιμοποιηθούν το προκαθορισμένο χρώμα δεσμών (μπλε για αρχικό δεσμό που ο χρήστης δεν έχει επισκεφτεί και πορφυρό για δεσμό που έχει επισκεφτεί). Η χρήση χρωμάτων βοηθούν τον χρήστη να καταλάβει τα μέρη ενός ιστοχώρου τα οποία έχει ήδη

επισκεφτεί. Σε μια μελέτη, αυτός ο τρόπος ένδειξης ήταν η μόνη μεταβλητή που βρέθηκε να βελτιώνει την ταχύτητα του χρήστη στην εύρεση των πληροφοριών. Εάν ένας χρήστης επιλέγει ένα δεσμό, και υπάρχουν και άλλοι δεσμοί προς τον ίδιο στόχο, βεβαιωθείτε ότι όλοι οι δεσμοί αλλάζουν χρώμα.



Εναρμονίστε τα ονόματα δεσμών με τις αντίστοιχες σελίδες προορισμού

Κάντε τους δεσμούς κειμένου να συμφωνούν με τον τίτλο ή τις επικεφαλίδες του προορισμού (δηλ. στόχους).

Η εναρμονισμένη αντιστοίχηση δεσμών με τον προορισμό προσφέρουν την πιο κατάλληλη ένδειξη στους χρήστες ότι έχουν μεταφερθεί στον επιθυμητό προορισμό.

Εάν οι χρήστες πρέπει να πατήσουν πάνω από μία φορά για να φτάσουν σε έναν συγκεκριμένο προορισμό τότε πρέπει να αποφύγετε την επανάληψη περιγραφής του ίδιου δεσμού επειδή οι χρήστες μπορούν να μπερδευτούν εάν οι δεσμοί σε διαφορετικά επίπεδα είναι ίδιοι ή ακόμα και πολύ παρόμοιοι Σε μια μελέτη, αφού οι χρήστες πάτησαν σε ένα δεσμό που έλεγε "πρώτες βοήθειες," η επόμενη σελίδα είχε τρεις επιλογές. Μία από τους ήταν πάλι με τον τίτλο "πρώτες βοήθειες." Οι δύο δεσμοί "πρώτες βοήθειες" πήγαιναν σε διαφορετικές θέσεις. Οι χρήστες έτειναν να πατήσουν σε άλλες επιλογές στη δεύτερη σελίδα επειδή νόμιζαν ότι είχαν φθάσει ήδη στις "πρώτες βοήθειες."

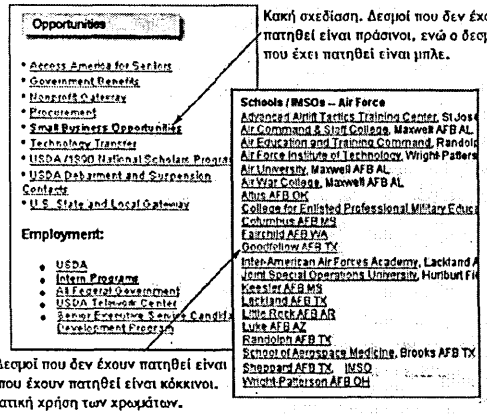
➢ Λύση

Δεσμοί πρέπει να υπάρχουν στην σωστή θέση εκεί που χρειάζονται. Διασφαλίστε ότι οι ενσωματωμένοι δεσμοί κειμένου είναι περιγραφικοί. Υποδείξτε τους δεσμούς που έχουν χρησιμοποιηθεί. Εναρμονίστε τα ονόματα δεσμών με τις αντίστοιχες σελίδες προορισμού ώστε ο χρήστης να γνωρίζει που μεταφέρεται.

➢ Μπορούν να ληφθούν υπόψη και

Χρησιμοποιείστε αυτό το πρότυπο μαζί με το ***15 Συνεπείς και Προφανείς Δεσμοί*** για να κάνετε την πλοήγηση πιο εύκολη και κατανοητή στον χρήστη.

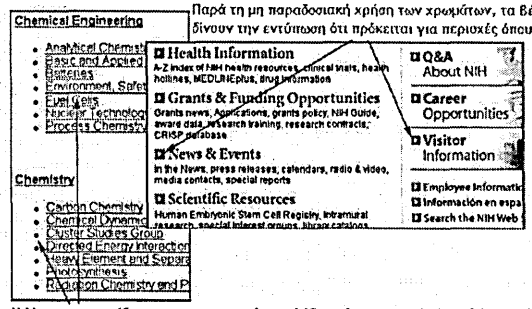
➢ Άλλα παραδείγματα



Κακή σχεδίαση. Δεσμοί που δεν έχουν πατηθεί είναι πράσινοι, ενώ ο δεσμός που έχει πατηθεί είναι μπλε.

Σωστή σχεδίαση. Δεσμοί που δεν έχουν πατηθεί είναι μπλε, ενώ δεσμοί που έχουν πατηθεί είναι κόκκινοι. Αυτή είναι η συμβατική χρήση των χρωμάτων.

15 Συνεπείς και Προφανείς δεσμοί



Παρά τη μη παραδοσιακή χρήση των χρωμάτων, τα βέλη προς τα δεξιά, προτρέπουν και δίνουν την εντύπωση ότι πρόκειται για περιοχές όπου μπορεί κάποιος να κάνει κλικ.

Η λίστα με κουκκίδες και υπογραμμισμένο γαλάζιο κείμενο αποτελούν πολύ ισχυρές ενδείξεις ότι προσδιορίζουν περιοχές όπου μπορεί κάποιος να πατήσει με το ποντίκι.

➢ Πότε χρησιμοποιείται

Μερικές φορές δεν είναι εύκολο να διαπιστωθούν τα στοιχεία που είναι δεσμοί σε μία σελίδα . Το πρότυπο αυτό παρουσιάζει πώς μπορεί ο σχεδιαστής να εμφανίσει με τον καλύτερο τρόπο τους δεσμούς ώστε να μην εκνευρίζονται οι χρήστες και να βλέπουν επίσης ποιοι δεσμοί έχουν χρησιμοποιηθεί.

➢ Πρόβλημα

Ο χρήστης πρέπει να γνωρίζει ποια στοιχεία στην σελίδα είναι δεσμοί και ποια έχει χρησιμοποιήσει σαν δεσμούς για να επισκεφτεί τις αντίστοιχες σελίδες.

Εμφανίστε ενδείξεις για κλικ με συνέπεια για να δείξετε σαφώς στους χρήστες ότι ένα στοιχείο της οθόνης μπορεί να πατηθεί.Οι χρήστες δεν πρέπει να αναγκάζονται να κινούν το δρομέα μέσα στην σελίδα (" κάνουν εξερεύνηση") για να ψάχνουν και να καθορίζουν τι είναι δεσμός ή τι μπορεί να πατηθεί με το ποντίκι. Η οπτική διερεύνηση για να εντοπισθούν αυτά τα στοιχεία είναι πολύ γρηγορότερη από την εξερεύνηση. Η ανάγκη εξερευνήσεων με το ποντίκι για να ανακαλυφτούν οι δεσμοί μπορεί να προκαλέσει σύγχυση και ενόχληση στους αρχάριους χρήστες, και να επιβραδύνει όλους τους χρήστες δεδομένου ότι είναι αβέβαιοι για ποια στοιχεία είναι δεσμοί.

Να είστε συνεπής στη χρήση της υπογράμμισης, κουκίδων, βελών, και άλλων συμβόλων έτσι ώστε δείχνουν πάντα ότι μπορούν ή όχι να πατηθούν. Παραδείγματος χάριν, χρησιμοποιώντας εικόνες και ως συνδέσμους και ως διακοσμητικά στοιχεία επιβραδύνει τους χρήστες δεδομένου ότι τους αναγκάζει να μελετήσουν πρώτα την εικόνα για να διακρίνουν αν πρέπει να πατήσουν.

Τα στοιχεία που είναι στο κέντρο της κορυφής της σελίδας, ή στα αριστερά και δεξιά πλαίσια (στήλες) έχουν μια μεγάλη πιθανότητα για να θεωρηθούν σαν δεσμοί. Αυτό ισχύει ιδιαίτερα εάν το συνδεμένο στοιχείο μοιάζει με ένα πραγματικό κουμπί.

Εξασφαλίστε ότι τα στοιχεία που δεν μπορούν να πατηθούν δεν έχουν τα χαρακτηριστικά που υποδεικνύουν ότι μπορούν να πατηθούν.Τα στοιχεία αυτά πρέπει συνήθως να συνδυαστούν με μία τουλάχιστον άλλη ένδειξη που να υποδεικνύει ότι μπορούν να πατηθούν. Σε μια μελέτη, οι χρήστες παρατηρήθηκαν να προσπαθούν να κάνουν κλικ σε σημαντικό τίτλο με μερικά χαρακτηριστικά δεσμού, ενώ ο τίτλος δεν ήταν πραγματικό δεσμός.

Υπογραμμισμένο κείμενο πρέπει να αποφεύγεται εκτός αν το κείμενο είναι δεσμός.

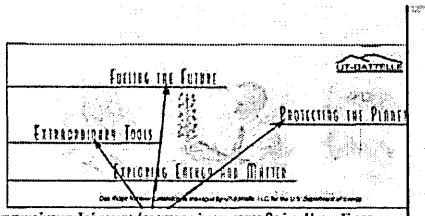
Εντούτοις, σε μερικούς χρήστες οι κουκίδες και τα βέλη μπορούν να υποδεικνύουν πάτημα, ακόμα και όταν δεν περιέχουν καμία άλλη ένδειξη (υπογράμμιση, μπλε χρωματισμός, κ.λπ.). Αυτό επιβραδύνει τους χρήστες καθώς αναρωτιούνται εάν τα στοιχεία είναι δεσμοί. Γενικά το κείμενο με υπογράμμιση θα πρέπει να αποφεύγεται εκτός αν είναι δεσμός.

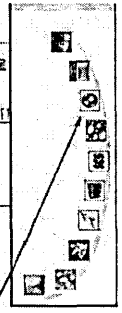
➢ Λύση

Εμφανίστε ενδείξεις για κλικ με συνέπεια για να δείξετε σαφώς στους χρήστες ότι ένα στοιχείο της οθόνης μπορεί να πατηθεί. Εξασφαλίστε ότι τα στοιχεία που δεν μπορούν να πατηθούν δεν έχουν τα χαρακτηριστικά που υποδεικνύουν ότι μπορούν να πατηθούν.

➢ **Μπορούν να ληφθούν υπόψη και**
Χρησιμοποιείστε αυτό το πρότυπο μαζί με το ***14 Κατάλληλοι και Περιγραφικοί Δεσμοί*** για να κάνετε την πλοήγηση πιο εύκολη στον χρήστη.

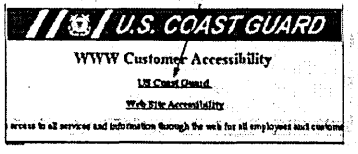
➢ **Άλλα παραδείγματα**





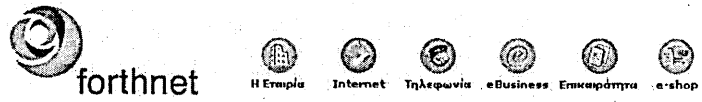
Αυτά τα αντικείμενα δείχνουν ότι μπορούν να πατηθούν. Η σχεδίαση είναι εντυπωσιακή αλλά μπερδεύει το χρήστη κάνοντάς τον να πιστεύει ότι πρόκειται για υπογράμμιση.

Παράδειγμα προς αποφυγή. Μπλε κείμενο, υπογράμμιση και στο κέντρο της σελίδας. Όμως τίποτα δεν μπορεί να πατηθεί.



Δυο από αυτά τα εικονίδια δεν πατιούνται. Αν ο χρήστης βάλει το ποντίκι από πάνω θα πιστέψει ότι κανένα εικονίδιο δεν πατιέται. Αν ένα εικονίδια πατιέται τότε όλα πρέπει να πατιούνται.

16 Γραφικά - Δεσμοί



➢ **Πότε χρησιμοποιείται**
Το πρότυπο αυτό παρουσιάζει πώς μπορεί ο σχεδιαστής να παρουσιάσει με τον καλύτερο τρόπο τους δεσμούς όταν γραφικά ή εικόνες χρησιμοποιούνται για δεσμοί

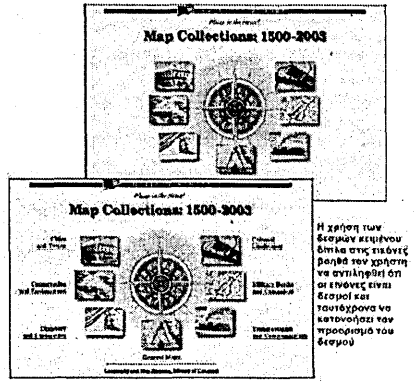
➢ **Πρόβλημα**
Μία εικόνα, πολλές φορές δεν βοηθά τον χρήστη να κατανοεί την σημασία της. Οι δεσμοί που χρησιμοποιούν γραφικά πρέπει να είναι κατανοητοί. Αλλιώς οι χρήστες εκνευρίζονται.Οι εικόνες που δεν προσδιορίζονται με κάποιο άλλο τρόπο ότι είναι δεσμοί, αναγκάζουν τους χρήστες να σαρώνουν με το ποντίκι μία σελίδα για να ανακαλύψουν τις εικόνες δεσμούς, ιδίως αν μία εικόνα δεν συνοδεύεται από κείμενο.

Γενικά, οι δεσμοί κειμένου αναγνωρίζονται ευκολότερα ότι είναι δεσμός και μπορεί να πατηθεί. Οι δεσμοί κειμένου μεταφορτώνονται συνήθως γρηγορότερα, προτιμώνται από τους χρήστες, και πρέπει να αλλάζουν τα χρώματα μετά από το πάτημα. Είναι συνήθως ευκολότερο να εκφραστεί ο προορισμός ενός δεσμού με κείμενο, παρά με τη χρήση μιας εικόνας.

Σε μια μελέτη, στους χρήστες δημιουργήθηκε ιδιαίτερη σύγχυση σχετικά με το εάν ορισμένες εικόνες ήταν ή όχι δεσμοί. Αυτό ίσχυε ακόμη και για τις εικόνες που περιείχαν τις λέξεις. Οι χρήστες δεν ήταν σε θέση να πουν εάν μπορούσαν να πατήσουν τις εικόνες χωρίς να βάλουν το ποντίκι πάνω στην εικόνα ("εξερεύνηση"). Το να απαιτείς από τους χρήστες να εξερευνήσουν για να διαπιστώσουν τι στην πραγματικότητα μπορεί να πατηθεί επιβραδύνει την εργασία.

➢ **Λύση**
Χρησιμοποιείστε κείμενο για δεσμούς αντί για εικόνες και γραφικά και μην αναγκάζετε τον χρήστη να σαρώνει με το ποντίκι την σελίδα για να διαπιστώσει τους δεσμούς. Πάντα καλό είναι να συνοδεύεται η εικόνα από το αντίστοιχο κείμενο –δεσμός που βοηθά στην πλοήγηση.

➢ **Άλλα παραδείγματα**



Η χρήση των δεσμών κειμένου δίπλα στις εικόνες βοηθά τον χρήστη να αντιληφθεί ότι οι εικόνες είναι δεσμοί και ταυτόχρονα να κατανοήσει τον προορισμό του δεσμού

17 Δεσμός προς την Αρχή Σελίδας

- **Μπορώ να πληρώσω με πιστωτική κάρτα ή μόνο μετρητά?**

  Βεβαίως μπορείτε να πληρώσετε με την κάρτα σας ή και με κατάθεση σε λογαριασμό τράπεζας που θα σας δοθεί.

- **Πόσος χρόνος θα χρειαστεί για να αποκτήσω τον δικό μου διαθέσιμο χώρο στον server ?**

  Όταν οι πληροφορίες σας θα προσέλθουν στην φόρμα παραγγελίας που παρέχουμε, θα περιμένουμε την τακτοποίηση του λογαριασμού σας. Το domain θα έχει εγκατασταθεί μέσα σε 3 ώρες από τη στιγμή που θα λάβουμε την πληρωμή σας ! Όταν ο λογαριασμός σας είναι έτοιμος θα σας αποστείλουμε μία εντολή ενεργοποίησης μέσω e-mail, περιλαμβανομένου του user-ID, password, και της IP διεύθυνσης.

- **Πως μπορώ να επικοινωνήσω για τυχόν ερωτήσεις που θα έχω ?**

➢ Πότε χρησιμοποιείται

Οι σελίδες είναι μεγαλύτερες από 2 οθόνες και οι χρήστες είναι πιθανό να θέλουν να γυρίσουν στην αρχή (κορυφή) της σελίδας. Αυτό επιτρέπει στους χρήστες να επιστρέψουν στην κύρια πλοήγηση από σχεδόν κάθε θέση χωρίς να χρειαστεί να κυλίσουν την οθόνη. Μπορεί επίσης να είναι κατάλληλο για χρήστες με ειδικές ανάγκες που δύσκολα μπορούν να κυλίσουν την οθόνη

➢ Πρόβλημα

The users need to go back to the top of the page

Επιλέξτε τις στρατηγικές θέσεις για να τοποθετήσετε τους δεσμούς μέσα στο περιεχόμενο. Οι καλύτερες θέσεις είναι στο τέλος των παραγράφων ή στο τέλος ενός μπλοκ κειμένου.

Η λύση αυτή χρησιμοποιείτε για δύο λόγους

1. Για να επιστρέψουμε στην κύρια πλοήγησης
2. Για να επιστρέψουμε στην κορυφή του περιεχομένου.

Εάν αυτό γίνεται για τον πρώτο λόγο, μπορεί να γίνει χρήση του **Επαναλαμβανόμενου μενού** στο κάτω μέρος της σελίδας αντί για ένα δεσμό μόνο του. Εάν υπάρχουν και τα δύο αν κα τι ένα δεν χρειάζεται είναι χρήσιμα στον χρήστη.

Με τον τρόπο αυτό επιτρέπεται στους χρήστες να μεταφέρονται στην αρχή στης σελίδας από οποιαδήποτε σημείο της σελίδας. Αυτό διευκολύνει και τους χρήστες με ειδικές ανάγκες που δεν μπορούν να χρησιμοποιήσουν κύλιση.

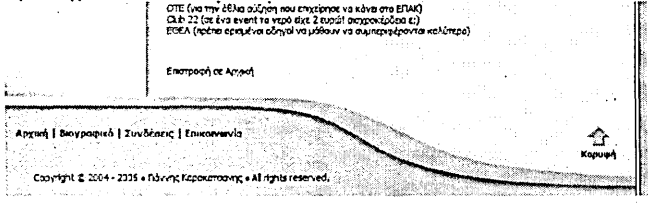
➢ Λύση

Επιτρέψτε στους χρήστες να μεταφέρονται στην αρχή μίας σελίδας με ένα δεσμό

➢ Μπορούν να ληφθούν υπόψη και

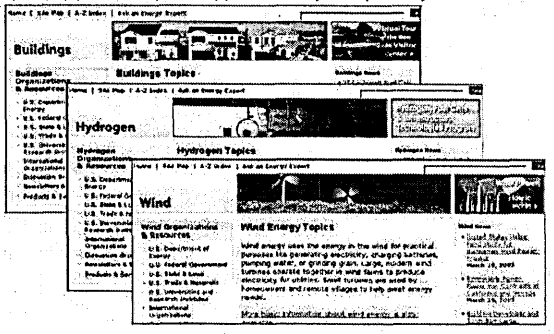
Το πρότυπο μπορεί να συνδυαστεί με το ***7 Λίστα Σελίδας*** ώστε ο χρήστης να μεταφέρεται στην αρχή που είναι η Λίστα Σελίδας

➢ Άλλα παραδείγματα



18 Συνέπεια στο Κείμενο

Εκτός από τα γραφικά και την πλοήγηση, οι επικεφαλίδες οι γραμματοσειρές η ομοιομορφία στο κείμενο συμβάλλουν στην καλή οπτική συνέπεια των σελίδων



➢ Πότε χρησιμοποιείται

Το κείμενο παίζει το πιο σημαντικό ρόλο στο μεγαλύτερο ποσοστό των σελίδων που επισκέπτονται οι χρήστες. Σε κάθε περίπτωση το κείμενο πρέπει να διαβάζεται γρήγορα και με ευκολία και η συνέπεια είναι ένα στοιχείο που συντελεί σε αυτό.

➢ Πρόβλημα

Οι χρήστες πρέπει να διαβάζουν γρήγορα και με ευκολία το κείμενο που εμφανίζεται σε κάθε ιστοσελίδα. Σελίδες που δεν είναι ομοιόμορφες δεν διευκολύνουν τον χρήστη.

Πρέπει να εφαρμόζονται οι παρακάτω αρχές:
Η παρουσίαση του κειμένου σε μία σελίδα ενός δικτυακού χώρου του ιδίου ιστοχώρου πρέπει να είναι ίδια για να διευκολύνουν τον χρήστη δηλαδή να υπάρχει οπτική συνέπεια των στοιχείων του ιστοχώρου στις διάφορες ιστοσελίδας
Δύο μελέτες διαπίστωσαν ότι ο αριθμός λαθών που γίνονται χρησιμοποιώντας οπτικά ασυμβίβαστες παρουσιάσεις είναι πολύ υψηλότερος σε σχέση με τα λάθη που γίνονται σε σελίδες που παρουσιάζονται με οπτική συνέπεια.

Η οπτική συνέπεια περιλαμβάνει το μέγεθος και το διάστημα των χαρακτήρων τα χρώματα που χρησιμοποιούνται για τις ετικέτες, τις γραμματοσειρές και το φόντο. Επίσης μεταξύ των επικεφαλίδων σε κάθε σελίδα πρέπει να υπάρχει συνέπεια. Με τις θέσεις των ετικετών, των εικόνων και των άλλων σημαντικών στοιχείων έχουν αναφερθεί σε άλλη οδηγία.

Άλλες μελέτες διαπίστωσαν ότι κατά την διάρκεια πραγματοποίησης εργασιών σε σελίδες που παρουσιάζουν οπτική συνέπεια διαπιστώθηκε:

1. Μείωση των χρόνων ολοκλήρωσης συγκεκριμένου έργου
2. Μείωση των λαθών
3. Μείωση του χρόνου εκμάθησης και
4. Αύξηση στην ικανοποίηση χρηστών .

Όμως, ένας χρήστης έχει την ικανότητα να ξεπεράσει γρήγορα μερικούς τύπους ασυνεπειών. Παραδείγματος χάριν, μια μελέτη διαπίστωσε ότι η χρήση διαφορετικού μεγέθους όπως τα κουμπιά , πεδία εισαγωγής δεδομένων ή λίστες επιλογών (που συνήθως βρίσκονται σε φόρμες) δεν επιδρά αρνητικά στην απόδοση ή τις προτιμήσεις των χρηστών.

Καλό είναι να μην χρησιμοποιούνται διαφορετικές οικογένειες γραμματοσειρών στην σελίδα έστω και μόνο για λόγους αισθητικής. Οι επικεφαλίδες σελίδας σε ένα τόπο διαφέρουν από το κείμενο για να τραβήξουν την προσοχή ή γιατί γίνονται με χρήση γραφικών.

Μορφοποιήστε κοινά στοιχεία με συνέπεια

Εξασφαλίστε ότι κοινά στοιχεία έχουν μορφοποιηθεί με συνέπεια από την μια σελίδα σε άλλη. Η μορφοποίηση που επιλέγεται πρέπει να είναι γνωστή στους χρήστες. Παραδείγματος χάριν, οι αριθμοί τηλεφώνου πρέπει μορφοποιούνται με τον ίδιο τρόπο (210- 555-1212), και το κείμενο που εμφανίζει χρόνο με χρήση γνωστών σημείων στίξης (άνω και κάτω τελείες (ΩΩ:ΛΛ:ΔΔ).

Τηλ: 210 60 10 455
Φαξ: 210 60 21 521

Καθημερινές : 10:00 - 22:00
Σαβ. Κυρ. : 12:00 - 17:00

Χρησιμοποιήστε γραμματοσειρές μεγέθους τουλάχιστο 10pt

Τα παραδοσιακά σε χαρτί μεγέθη γραμματοσειρών δεν παρουσιάζονται καλά στο σχέδιο ιστοχώρου. Υπάρχουν διαφορές στα Λογισμικά-Προγράμματα Περιήγησης (Internet Explorer, Firefox κλπ).

Η έρευνα έχει δείξει ότι κείμενο μεγέθους μικρότερο από τα 12 σημεία προκαλούν την πιο μικρή ταχύτητα ανάγνωσης στους χρήστες. Για τους χρήστες πάνω από την ηλικία των 65 ετών, μπορεί να είναι καλύτερο να χρησιμοποιηθούν τουλάχιστον 14pt. Όμως τα αποτελέσματα της έρευνας έχουν ξεπεραστεί με νέες βελτιωμένες οθόνες με καλύτερες αναλύσεις.

Οι σύγχρονες οθόνες επιτρέπουν μικρότερες γραμματοσειρές πχ 8,9,10 και πράγματι αυτά τα μεγέθη χρησιμοποιούνται κατά κόρο. Μην χρησιμοποιήστε ποτέ λιγότερο από 6pt σε έναν ιστοχώρο

Χρησιμοποιήστε κοινές και οικείες γραμματοσειρές για να επιτύχετε την καλύτερη δυνατή ταχύτητα ανάγνωσης.

Με έρευνα διαπιστώθηκε οι γραμματοσειρές χωρίς ουρές έχουν ένα μικρό πλεονέκτημα έναντι των αντιστοίχων με ουρές, και προτιμώνται από τους χρήστες. Ένας ειδικός συστήνει γραμματοσειρές χωρίς ουρές για μικρά γράμματα και με ουρές για μεγαλύτερα.

Η γραμματοσειρά παίζει σημαντικό ρόλο στην αναγνωσιμότητα του κειμένου. Το κείμενο για να διαβάζεται πιο γρήγορα πρέπει να γίνεται χρήση οικείων γραμματοσειρών. Οι πιο συνηθισμένες με ουρές είναι οι Times και οι Times New Roman. Οι πιο συνηθισμένες χωρίς ουρές είναι οι Arial, Helvetica και Verdana. Οι γραμματοσειρές χωρίς ουρές διαβάζονται πιο εύκολα στις οθόνες ενώ με ουρές είναι πιο κατάλληλες για χαρτί.

➢ Λύση

Εξασφαλίστε οπτική συνέπεια στο κείμενο στις διάφορες ιστοσελίδας ενός δικτυακού τόπου. Επίσης τα κοινά στοιχεία (ώρες, τηλέφωνα κλπ) πρέπει να είναι μορφοποιημένα με το ίδιο τρόπο. Οι χρησιμοποιούμενες γραμματοσειρές πρέπει να είναι καταλλήλου μεγέθους και οικείες για να μπορούν οι χρήστες να διαβάζουν γρήγορα Χρησιμοποιήστε γραμματοσειρές μεγέθους τουλάχιστο 10pt

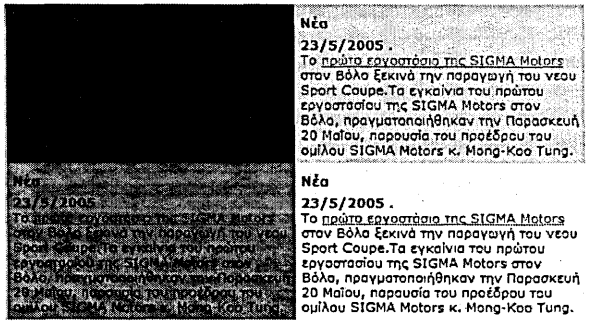
➢ Άλλα παραδείγματα

Χρήση ασυνήθιστων γραμματοσειρών μπορεί να μειώσει την ταχύτητα ανάγνωσης

➢ Μπορούν να ληφθούν υπόψη και

Το πρότυπο μπορεί να συνδυαστεί με το ***3 Σημαντικά Στοιχεία με Συνέπεια*** που αφορά την διάταξη της πλοήγησης και των γραφικών. Πέρα όμως από την συνέπεια το κείμενο πρέπει να έχει και αντίθεση με το υπόβαθρο για να διαβάζεται εύκολο σύμφωνα με το πρότυπο ***19 Διακριτό Κείμενο***

19 Διακριτό Κείμενο



Νέα

23/5/2005 .

Το πρώτο εργοστάσιο της SIGMA Motors στον Βόλα ξεκινά την παραγωγή του νεου Sport Coupe.Τα εγκαίνια του πρώτου εργοστασίου της SIGMA Motors στον Βόλα, πραγματοποιήθηκαν την Παρασκευή 20 Μαΐου, παρουσία του προέδρου του ομίλου SIGMA Motors κ. Mong-Koo Tung.

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➢ Πότε χρησιμοποιείται

Αφορά κείμενο και χρησιμοποιείται σε όλες τις περιπτώσεις και ιδίως στην περίπτωση που το κείμενο είναι μεγάλο.

➢ Πρόβλημα

Το κείμενο πρέπει να εμφανίζεται σε σχέση με το υπόβαθρο, χρώμα και γραφικά, καθαρό και με αντίθεση.

Όταν είναι επιθυμητό οι χρήστες να διαβάσουν γρήγορα και να καταλάβουν το κείμενο κάντε χρήση μαύρου κείμενου σε φόντο που έχει υψηλή αντίθεση και χωρίς σχέδια

Το μαύρο κείμενο σε ένα σαφές υπόβαθρο προκάλεσε σταθερά την καλύτερη ταχύτητα ανάγνωσης απ' ότι σε ένα μέσο διαμορφωμένο υπόβαθρο. Σε μία σύγκριση με κείμενο ελαφρά χρωματισμένο σε ένα σκοτεινό υπόβαθρο και με μαύρο κείμενο σε ένα άσπρο υπόβαθρο διαπιστώθηκε αύξηση ταχύτητας έως και 32%. Γενικά, όσο μεγαλύτερη η αντίθεση μεταξύ του κειμένου και του φόντου τόσο ευκολότερα πρόκειται να διαβαστεί το κείμενο.

Ιδιαίτερη προσοχή χρειάζεται στους δεσμούς και στο χρωματισμό του υπόβαθρου. Συνήθως οι δεσμοί εξ ορισμού είναι μπλε και όταν χρησιμοποιηθούν μωβ. Αν το υπόβαθρο είναι ένα από αυτά τα χρώματα τότε ο δεσμός δεν θα φαίνεται.

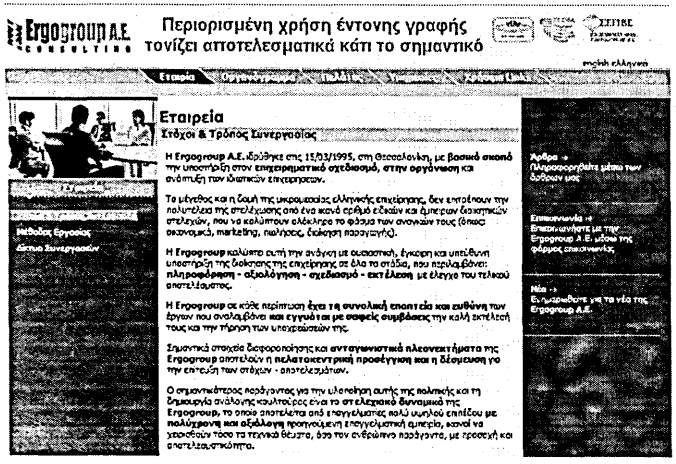
➢ Λύση

Χρησιμοποιήστε μαύρο χρώμα σε καθαρό και με μεγάλη αντίθεση φόντο.

➢ Μπορούν να ληφθούν υπόψη και

Το πρότυπο μπορεί να συνδυαστεί με το ***18 Συνέπεια στο Κείμενο*** που αφορά την διάταξη του κειμένου

20 Κείμενο με Έμφαση



➢ **Πότε χρησιμοποιείται**
Σε κάθε σελίδα υπάρχουν στοιχεία στα οποία πρέπει να δοθεί περισσότερο έμφαση

➢ **Πρόβλημα**
Πως θα δοθεί έμφαση σε ορισμένα στοιχεία κειμένου

Αλλάξτε τα χαρακτηριστικά κειμένου για να υπογραμμίσετε τη σημασία μιας λέξης ή μιας σύντομης φράσης. Κείμενο που παρουσιάζει διαφορετικά χαρακτηριστικά κυριαρχεί στον περιβάλλοντα χώρο. Τέτοια χαρακτηριστικά είναι έντονα γράμματα, πλάγια γράμματα, στυλ γραμμάτων, μέγεθος της γραμματοσειράς και κεφαλαία ή μικρά γράμματα. Η καλή χρήση αυτών των χαρακτηριστικών ελκύουν την προσοχή του χρήστη σε σημαντικές λέξεις.

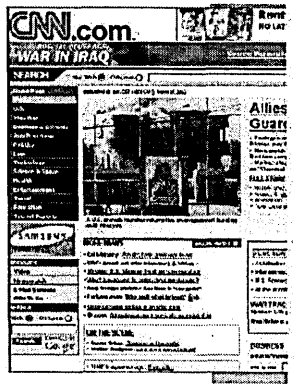
Χωρίς έμφαση ένα κείμενο θεωρείται βαρετό και ίσως οι χρήστες το αγνοήσουν εάν δεν ενδιαφέρονται πραγματικά για το περιεχόμενο.

Η χρήση των διαφορετικών χαρακτηριστικών έχει και αρνητικές συνέπειες στο διάβασμα — η ταχύτητα μπορεί να μειωθεί έως και είκοσι τοις εκατό (20%), και πρέπει τέτοια χαρακτηριστικά να χρησιμοποιούνται με μέτρο σε μεγάλα τμήματα κειμένου. Μην χρησιμοποιείτε διαφορετικά χαρακτηριστικά γραμμάτων για να δώσετε έμφαση σε περισσότερες από μια ή δύο λέξεις ή μια σύντομη φράση. Μην χρησιμοποιήστε την υπογράμμιση για την έμφαση επειδή οι υπογραμμισμένες λέξεις στον διαδίκτυο θεωρούνται γενικά δεσμοί.

➢ **Λύση**
Δώστε έμφαση σε σημαντικά σημεία του κειμένου

➢ **Μπορούν να ληφθούν υπόψη και**
Πέρα από την έμφαση στο κείμενο ένα άλλο στοιχείο που απαιτεί έμφαση είναι οι επικεφαλίδες. Σύμφωνα με το πρότυπο ***12 Ωραίες επικεφαλίδες.*** Αν πρέπει να προσθέσεις γραφικά στην σελίδα κάνε χρήση του πρότυπου ***21 Στοιχεία που Ελκύουν Προσοχή***

21 Στοιχεία που Ελκύουν Προσοχή



➢ **Πότε χρησιμοποιείται**
Σε κάθε σελίδα υπάρχουν στοιχεία που πρέπει να τραβήξουν την προσοχή του χρήστη

➢ **Πρόβλημα**
Κάποια από τα χαρακτηριστικά στοιχεία ενός ιστοχώρου πρέπει να προσελκύσουν την προσοχή ενός χρήστη.

Χρησιμοποιήστε στοιχεία που ελκύουν προσοχή όταν πρέπει και ενδείκνυται. Όλα τα χαρακτηριστικά στοιχεία ενός ιστοχώρου δεν θα προσελκύσουν εξίσου την προσοχή ενός χρήστη. Τα ακόλουθα χαρακτηριστικά στοιχεία παρουσιάζονται κατά σειρά σύμφωνα με τον αντίκτυπο και τη επίδραση που έχουν στους χρήστες:

- Η κίνηση είναι ο αποτελεσματικότερος τρόπος στην προσέλκυση της προσοχής προς ένα στοιχείο. Η έρευνα προτείνει ότι οι άνθρωποι δεν μπορούν να αποφύγουν και να μην εξετάσουν αρχικά στοιχεία που κινούνται σε μια σελίδα. Εντούτοις, εάν η κίνηση δεν είναι σχετική ή χρήσιμη, μπορεί να ενοχλήσει το χρήστη. Εάν η κίνηση συνεχίζεται μετά από την αρχική προσέλκυση της προσοχής του χρήστη, πιθανόν να αποσπάσει ολοκληρωτικά την προσοχή του από τις πληροφορίες που παρουσιάζονται στον ιστόχωρο.
- Τα μεγαλύτερα αντικείμενα, ιδιαίτερα εικόνες, θα τραβήξουν πιο πολύ την προσοχή των χρηστών σε σχέση με τις μικρότερες. Οι χρήστες εστιάζουν στα μεγαλύτερα στοιχεία πρώτα, και για μεγαλύτερες χρονικές περιόδους. Εντούτοις, οι χρήστες έχουν την τάση να αγνοήσουν ορισμένα είδη εικόνων που θεωρούν διαφημίσεις ή απλώς διακοσμητικά στην σελίδα.
- Οι χρήστες εξετάζουν τις εικόνες για ένα ή δύο δευτερόλεπτα, και εξετάζουν έπειτα το σχετικό τίτλο (λεζάντα). Σε πολλές περιπτώσεις η ανάγνωση κειμένου ή της λεζάντας τίτλου είναι η τελευταία λύση για να γίνει κατανοητή η σημασία μίας εικόνας. Επίσης μέρη των εικόνων ή του κειμένου που είναι πιο φωτεινά και έντονα φαίνεται ότι ελκύουν την προσοχή του χρήστη πρώτα.

➢ **Λύση**
Τραβήξτε την προσοχή σε συγκεκριμένα μέρη ιστοσελίδας με την κατάλληλη (αλλά περιορισμένης) χρήση στοιχείων.

➢ **Μπορούν να ληφθούν υπόψη και**
Εκτός από στοιχεία στην σελίδα που πρέπει να έχουν έμφαση με κάποιο μέτρο, πρέπει να δοθεί έμφαση και στο κείμενο κάνοντας χρήση του πρότυπου **20 Κείμενο με Έμφαση** και στις επικεφαλίδες με το πρότυπο **12 Μοναδικές, Περιγραφικές με Έμφαση Επικεφαλίδες.**

22 Καλοστοιχισμένο Κείμενο

Φτηνά Πακέτα

Παρέχουμε σε όλους φθηνά πακέτα μεταπώλησης που χωράνε Απειρα domain.
Κατασκευάστε τα πακέτα σας και πουλήστε τα. Παρέχουμε δωρεάν control panel (Whm),
και ότι δίνουμε εμείς στα δικά μας πακέτα.

Συμβουλές για αρχαρίους

Το internet είναι σαν τη γη. Για να ζήσει κάποιος στη γη χεριάζετε ένα σπίτι.
Για να μπορέσει να έχει κάποιος σπίτι πρέπει να βρει πρώτα τη διεύθυνση μετά το οικόπεδο
και μετά να το χτίσει.
Το παραπάνω είναι μία παραβολή.
Η διεύθυνση είναι το domain (www.toonomamou.gr) . Πρέπει να αποκτήσετε ένα από τις
αρμόδιες υπηρεσίες.
Το οικόπεδο είναι ο χώρος που θα φιλοξενήσετε το site σας. Εμείς παρέχουμε αυτό το
χώρο μαζί με όλη μας τη βοήθεια και στο χτίσιμο του site σας αλλά και στη διαχείριση του.
Τέλος η οικοδομή είναι το η ιστοσελίδα σας. Σε περίπτωση που δεν έχετε εσείς σελίδα
έτοιμη μπορούμε να σας τη φτιάξουμε σε φοιτητικές τιμές.

Παράδειγμα κακής στοίχισης κειμένου. Η ανάγνωση είναι δύσκολη.

➢ **Πότε χρησιμοποιείται**
Το κείμενο πρέπει να είναι στοιχισμένο για να διαβάζεται εύκολα να διευκολύνει την σάρωση με το μάτι

➢ **Πρόβλημα**
Πολλές φορές η στοίχιση του κειμένου δεν είναι σωστή.

Υπάρχουν διάφοροι τρόποι για να τοιχιστεί το κείμενο: αριστερή, κεντρική, δεξιά και ευθυγραμμισμένο δεξιά και αριστερά (πλήρης στοίχιση). Η πλήρης στοίχιση δεν ενδείκνυται γιατί προσθέτοντας μικρά κενά μεταξύ των λέξεων για να γίνει η πλήρη στοίχιση αλλάζει την απόσταση μεταξύ των λέξεων και κάνει το κείμενο δυσκολοδιάβαστο. Η ταχύτητα ανάγνωσης μπορεί να πέσει μέχρι 11%.

Η στοίχιση στο κέντρο είναι κατάλληλοι μερικές φορές για επικεφαλίδες αλλά όχι για κείμενο γιατί συνήθως το ασχημαίνει και επίσης δυσκολεύει την ανάγνωση.

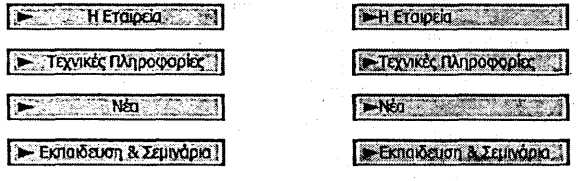
Για μικρές και στενές παραγράφους η στοίχιση στο κέντρο ίσως δεν προκαλεί τόσα προβλήματα. Η στοίχιση δεξιά επίσης καλό είναι να αποφεύγεται για κείμενο, και να χρησιμοποιείται μόνο σε ειδικές περιπτώσεις. Η καλύτερη στοίχιση για σελίδες web είναι η αριστερή η οποία και προβλήματα δεν προκαλεί και διευκολύνει την ανάγνωση του κειμένου.

Τίτλοι κα επικεφαλίδες πρέπει να είναι στοιχισμένες είτε αριστερά είτε με κεντρική στοίχιση.

➢ **Λύση**
Χρησιμοποιείστε αριστερή στοίχιση για κείμενο γιατί είναι η μόνη που δεν προκαλεί προβλήματα

➢ **Άλλα παραδείγματα**

Ακόμη και μενού που είναι στοιχισμένα αριστερά διαβάζονται πιό εύκολα



23 Κεφαλαία και Μικρά

Αυτό το πρότυπο συστήνει την ΧΡΗΣΗ ΜΙΚΡΩΝ ΚΑΙ ΜΕΓΑΛΩΝ ΓΡΑΜΜΑΤΩΝ ΣΕ ΚΑΝΟΝΙΚΟ ΚΕΙΜΕΝΟ ΓΙΑΤΙ η χρήση κεφαλαίων ΕΠΙΒΡΑΔΥΝΕΙ ΣΟΒΑΡΑ ΤΗΝ ΑΝΑΓΝΩΣΗ

Αυτό το πρότυπο συστήνει την χρήση μικρών και μεγάλων γραμμάτων σε κανονικό κείμενο γιατί η χρήση κεφαλαίων επιβραδύνει σοβαρά την ανάγνωση

➢ **Πότε χρησιμοποιείται**
Η σελίδα πρέπει να έχει κείμενο που διευκολύνει το διάβασμα

➢ **Πρόβλημα**
Οι σχεδιαστές πολλές φορές στην προσπάθεια τους να τονίσουν χαρακτηριστικά του κειμένου μορφοποιούν το κείμενο με κεφαλαία γράμματα

Ένα κείμενο διαβάζεται πιο εύκολα όταν χρησιμοποιούνται κεφαλαία και μικρά γράμματα με συμβατικό τρόπο δηλαδή αρχίζοντας τις προτάσεις με κεφαλαία γράμματα, και βάζοντας κεφαλαία μόνο σε ορισμένες λέξεις και τα αρκτικόλεξα. Εάν ένα στοιχείο πρέπει να τραβήξει την προσοχή του χρήστη, εμφανίστε το στοιχείο με κεφαλαία έντονα ή πλάγια γράμματα. Μην χρησιμοποιήστε αυτές τις μεθόδους για έμφαση για περισσότερες από μια ή δύο λέξεις ή για μια έστω σύντομη φράση επειδή επιβραδύνουν την ικανότητα ανάγνωσης όταν χρησιμοποιείται για την εκτεταμένο κείμενο.

➢ **Λύση**
Χρησιμοποιείστε κεφαλαία και μικρά γράμματα στο κείμενο μίας ιστοσελίδας

24 Εναλλασσόμενα Χρώματα Σειρών

week 51 19 Dec 2002

		1	2	3
1	robbie williams - feel- Williams/Chambers-Chrysalis/Capitol/EMI-	6	3	1
2	nelly ft. kelly rowland - dilemma- Gamble/Sigler/Haynes-Universal/Universal-	1	8	1
3	c. aquilera ft. redman - dirrty- Aguilera/Cameron/Muhammad/Stinson-RCA/BMG-	2	9	2
4	jennifer lopez - jenny from the block- Oliver/deyo-Epic/SME.	4	5	4

➢ **Πότε χρησιμοποιείται**

Οι πίνακες αποτελούν ένα χαρακτηριστικό στοιχείο στις ιστοσελίδες. Ο πίνακας μπορεί να είναι αρκετά σύνθετος και να έχει διάφορες στήλες και γραμμές πράγμα που κάνει δύσκολο για κάποιον να βρει ποια στοιχεία ανήκουν στην ίδια σειρά.

➢ **Πρόβλημα**

Ο χρήστης πρέπει να μπορεί να διαβάσει και να σαρώσει ένα πίνακα εύκολα για να βρει την πληροφορία που χρειάζεται.

Χρησιμοποιήστε δύο διαφορετικά χρώματα γραμμών ώστε ο πίνακας να γίνει πιο ευανάγνωστος

Το διαφορετικό χρώμα στις γραμμές κάνει περιττή την ανάγκη χρήσης περιγραμμάτων στον πίνακα και διευκολύνει το μάτι να διαβάσει μια γραμμή.

➢ **Λύση**

Χρησιμοποιήστε χρώματα γραμμών ώστε ο πίνακας να γίνει πιο ευανάγνωστος

➢ **Άλλα παραδείγματα**

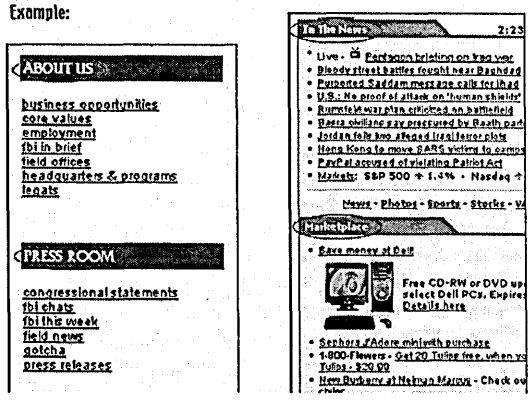
MARKETS & STOCKS > Widely Held Stocks

Dow 30 Components

	Company	Price	Change	Last Update
▲	Alcoa Inc.	23.85	0.85 / 3.70	12/20 16:28
▲	American Express Co.	37.02	1.13 / 3.15	12/20 16:02
▲	AT&T Corp.	26.58	1.47 / 5.85	12/20 16:01
▲	Boeing Co.	32.71	0.46 / 1.43	12/20 16:01

25 Λίστες

Example:



➢ **Πότε χρησιμοποιείται**

Λίστες χρησιμοποιούνται συχνά στις ιστοσελίδες γιατί διευκολύνουν την διερεύνηση και σάρωση του κειμένου

➢ **Πρόβλημα**

Πως θα παρουσιαστούν στοιχεία τα οποία έχουν κάποια σχέση μεταξύ τους

The Office of Data makes available for download
- Annual Production Statistics
- Monthly Production Statistics
- Weekly Production Statistics and
- Quarterly Consumption Projections.

Λίστες με bullets είναι πιό εύκολες στο Διάβασμα και την εστανόηση

The Office of Data makes available for download Annual Production Statistics, Monthly Production Statistics, Weekly Production Statistics, and Quarterly Consumption Projections.

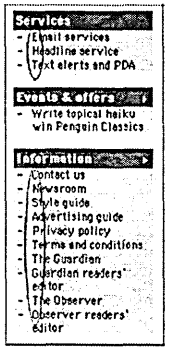
Εμφανίστε συναφή στοιχεία σε Λίστες δηλ σε ένα κάθετο κατάλαγο παρά με την μορφή συνεχούς κειμένου.

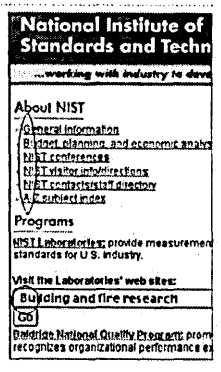
Μία καλά-οργανωμένη μορφή λίστας τείνει να διευκολύνει τη γρήγορη και με ακρίβεια διερεύνηση. Μια μελέτη έδειξε ότι οι χρήστες σαρώνουν τους κάθετους καταλόγους γρηγορότερα από τους οριζόντιους καταλόγους. Η σάρωση ενός οριζόντιου καταλόγου παίρνει τους χρήστες είκοσι τοις εκατό περισσότερο χρόνο (20%) από έναν κάθετο κατάλογο.

Βάλτε ένα εισαγωγικό τίτλο (δηλ. λέξη ή φράση) στην κορυφή κάθε Λίστας.

Η ύπαρξη ενός περιγραφικού τίτλου επιτρέπει στους χρήστες να κατανοήσουν πιο εύκολα το λόγο ύπαρξης μίας λίστας στοιχείων, και γιατί τα στοιχεία σχετίζονται το ένα με το άλλο. Ο τίτλος βοηθά να ενημερώσει τους χρήστες τον τρόπο με τον οποίο τα στοιχεία είναι ταξινομημένα, ή οποιοδήποτε άλλη κοινή αρχή ή θέμα που υπάρχει. Οι χρήστες είναι σε θέση να χρησιμοποιήσουν τις λίστες καλύτερα όταν περιλαμβάνουν τίτλους.

Example:



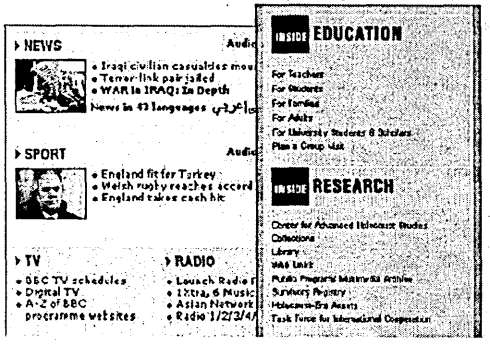


Δημιουργήστε τις λίστες με τρόπο που να διευκολύνεται η εξερεύνηση και κατανόηση.
Η χρήση επικετών που έχουν κάποιο νόημα, ελκυστικά χρώματα φόντου, τα περιγράμματα, και τα λευκά διαστήματα επιτρέπουν στους χρήστες να προσδιορίσουν ένα σύνολο στοιχείων ως μία ξεχωριστή λίστα.

Ξεκινήστε με κεφαλαίο το πρώτο γράμμα στην πρώτη λέξη κάθε γραμμής της λίστας ή στις ετικέτες μίας λίστας πλαισίων ή σε πεδία ελέγχου ή σε κουμπιά επιλογής
Μόνο το πρώτο γράμμα της πρώτης λέξης πρέπει να είναι με κεφαλαίο γράμμα εκτός αν το στοιχείο περιέχει μια άλλη λέξη που γράφεται με κεφαλαίο.

➢ **Λύση**
Εμφανίστε συναφή στοιχεία σε Λίστες με ένα εισαγωγικό τίτλος στην κορυφή κάθε Λίστας. Η μορφή της λίστας θα πρέπει να είναι με τρόπο ώστε να διευκολύνεται η εξερεύνηση και κατανόηση. Ξεκινήστε με κεφαλαίο το πρώτο γράμμα στην πρώτη λέξη κάθε γραμμής ή γενικά σε κάθε στοιχείο της σελίδας

➢ **Άλλα παραδείγματα**
Αυτές οι σελίδες χρησιμοποιούν έγχρωμο υπόβαθρο και λεπτές άσπρες γραμμές για να κάνουν τις λίστες εύκολες στη σάρωση.



Οδηγίες για WEB DESIGN

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5 Η αρχική σελίδα

1 Επιτρέψτε την Πρόσβαση στην Αρχική Σελίδα

➢ **Οδηγία:**

Επιτρέψτε στους χρήστες για να έχουν πρόσβαση στην αρχική σελίδα από οποιαδήποτε άλλη σελίδα της τοποθεσίας.

➢ **Σχόλια:**

Πολλοί χρήστες επιστρέφουν στην αρχική σελίδα για να ξεκινήσουν μία νέα εργασία ή για να αρχίσουν την ίδια εργασία πάλι. Δημιουργήστε έναν εύκολο και προφανή τρόπο για τους χρήστες ώστε να είναι εφικτό η γρήγορη πρόσβαση στην αρχική σελίδα του ιστοχώρου από οποιοδήποτε σημείο στην περιοχή.

Πολλές περιοχές τοποθετούν το λογότυπο της εταιρείας ή του οργανισμού στην κορυφή κάθε σελίδας και το συνδέουν με την αρχική σελίδα. Ενώ πολλοί χρήστες θεωρούν ότι με ένα κλικ με το ποντίκι σε ένα λογότυπο εμφανίζεται η αρχική σελίδα, πολλοί άλλοι χρήστες δεν καταλαβαίνουν ότι το λογότυπο είναι ένας σύνδεσμος με την αρχική σελίδα. Επομένως, συμπεριλάβετε μια σύνδεση που ονομάζεται "Home" (Αρχική Σελίδα) κοντά στην κορυφή της σελίδας για να βοηθήσετε αυτούς τους χρήστες.

Καλό είναι ο δεσμός να υπάρχει και στην αρχική σελίδα για να υπάρχει ομοιομορφία μεταξύ των σελίδων

2 Περιορίστε το Μήκος της Αρχικής Σελίδας

➢ **Οδηγία:**

Περιορίστε την αρχική σελίδα σε μία οθόνη (πρώτη οθόνη) με πληροφορίες εάν είναι εφικτό.

➢ **Σχόλια:**

Η αρχική σελίδα είναι μια σημαντική σελίδα, είναι η πόρτα στην περιοχή σας. Οι χρήστες που δεν γνωρίζουν τον τόπο πολύ καλά, πρέπει να καταστήσετε σαφές ποιος είναι πίσω από την περιοχή, τι υπάρχει μέσα στον τόπο και μπορεί κάποιος να το βρει. Η αρχική σελίδα συχνά είναι με πολύ υλικό, αλλά αν και είναι σωστό ώστε να προσδιοριστεί ο σκοπός της περιοχής, η εμφάνιση πολύ υλικού στη σελίδα δεν είναι πάντα καλή.

Οποιοδήποτε στοιχείο στην αρχική σελίδα που πρέπει αμέσως να προσελκύσει την προσοχή των χρηστών πρέπει να είναι τοποθετημένο στη περιοχή της σελίδας που εμφανίζεται στην πρώτη οθόνη. Οι πληροφορίες που δεν μπορούν να εμφανιστούν στην πρώτη οθόνη πιθανό να παραλειφθούν εξ ολοκλήρου από τους χρήστες— με αρνητικό αντίκτυπο στην αποτελεσματικότητα του ιστοχώρου. Εάν οι χρήστες καταλήγουν στο συμπέρασμα ότι αυτό που βλέπουν στην πρώτη οθόνη δεν είναι ενδιαφέρον, μπορεί να μην προσπαθήσουν να κατέβουν για να δουν το υπόλοιπο μέρος της σελίδας.

Μερικοί χρήστες καθυστερούν να προχωρήσουν και να κυλίσουν την οθόνη προς το υπόλοιπο κάτω μέρος της σελίδας, και εκδηλώνουν μια απροθυμία να κινηθούν από την πρώτη οθόνη προς τις επόμενες πληροφορίες. Οι μεγαλύτεροι σε ηλικία χρήστες και οι αρχάριοι είναι πιθανότερο να παραλείψουν τις πληροφορίες που τοποθετούνται κάτω από την πρώτη οθόνη.

Οι διαστάσεις μίας οθόνης πληροφοριών είναι βασισμένες αρχικά στην ανάλυση της οθόνης. Ο παρακάτω τύπος υποθέτει ότι οι χρήστες έχουν επιλέξει ανάλυση εικονοστοιχείου (pixel):

Οθόνη 800 X 600	Μέγιστο πλάτος = 780 pixel	Μέγιστο ύψος = 430 pixels
Οθόνη 1024 X 768	Μέγιστο πλάτος = 970 pixel	Μέγιστο ύψος = 600 pixels
Οθόνη 1280 X 1024	Μέγιστο πλάτος = 1150 pixel	Μέγιστο ύψος = 970 pixels

6 Διάταξη (Layout) σελίδων

3 Τοποθετήστε τα πιο Σημαντικά Στοιχεία με Συνέπεια

➢ **Οδηγία:**
Βάλτε τα πιο σημαντικά, στοιχεία που μπορεί να ανταποκριθούν σε κλικ του ποντικιού στις ίδιες θέσεις, και κοντά στην κορυφή της σελίδας, στην θέση που οι χρήστες υποθέτουν ότι θα τα βρουν

➢ **Σχόλια:**
Οι χρήστες εξετάζουν γενικά το κέντρο της κορυφής μιας σελίδας πρώτα, κατόπιν κοιτάζουν αριστερό, κατόπιν δεξιά, και αρχίζουν τελικά να μετακινούνται συστηματικά προς το κάτω μέρος της ιστοσελίδας. Όλο το σπουδαίο περιεχόμενο και η πλοήγηση πρέπει να είναι προς την κορυφή της σελίδας. Ιδιαίτερα στις σελίδες πλοήγησης, οι πιο σημαντικές επιλογές πρέπει να είναι ορατές χωρίς ή με μία ελάχιστη κύλιση της σελίδας.

Άλλα στοιχεία που πρέπει να έχουν τοποθετούνται με συνέπεια είναι:

- Τα στοιχεία πλοήγησης
- Το λογότυπο
- Ο τίτλος της σελίδας
- Τίτλος μίας είδησης ή νέου
- Κάποια διαφήμιση
- Το όνομα και η εικόνα ενός προϊόντος

Οι χρήστες γενικά προσπαθούν να εκτιμήσουν την θέση που θα εμφανιστούν τα συνηθισμένα στοιχεία στην οθόνη τους. Οι έμπειροι χρήστες θα αρχίσουν να κινούν το ποντίκι προς την περιοχή του στόχου πριν το μάτι διαπιστώσει το συγκεκριμένο στοιχείο. Οι χρήστες μπορούν να εκτιμήσουν τη θέση των στοιχείων που βρίσκονται στην κορυφή της σελίδας πολύ καλύτερα από αυτά που βρίσκονται πιο κάτω στην σελίδα.

4 Μετριάστε τον άγραφο λευκό χώρο στην σελίδα

➢ **Οδηγία:**
Μετριάστε τον άγραφο λευκό χώρο στην σελίδα σε σελίδες που είναι για ανάγνωση και σάρωση πληροφοριών.

➢ **Σχόλια:**
"Η πυκνότητα" είναι το ποσοστό της οθόνης που γεμίζουν με το κείμενο και τα γραφικά. Μια μελέτη διαπίστωσε ότι η υψηλότερη πυκνότητα συσχετίζεται με τη γρηγορότερη σάρωση, και δεν ασκεί καμία επίδραση στην ακρίβεια ή την προτίμηση χρηστών. Μια άλλη μελέτη διαπίστωσε ότι οι χρήστες προτιμούν τα μέτρια ποσά λευκού διαστήματος, αλλά το ποσό άσπρου διαστήματος δεν ασκεί καμία επίδραση στην απόδοση της αναζήτησή τους. Σε σελίδες περιεχομένου (δηλ., με κείμενο), χρησιμοποιήστε κάποιο λευκό διάστημα για να διαχωρίστε τις παραγράφους. Υπερβολικό διαχωρισμός των στοιχείων ιστοσελίδας μπορεί υποχρεώνει τους χρήστες να κυλίουν την οθόνη υπερβολικά.

5 Στοιχίστε τα στοιχεία σε μια σελίδα

➢ **Οδηγία:**
Οπτικά ευθυγραμμίστε τα στοιχεία σελίδων, είτε κάθετα είτε οριζόντια.

➢ **Σχόλια:**
Οι χρήστες προτιμούν τις καθιερωμένες και συνεπείς ευθυγραμμίσεις για τα στοιχεία όπως οι κομμάτια κειμένου, οι σειρές, οι στήλες, τα ελεγκτήρια ελέγχου, τα κουμπιά επιλογής, τα πεδία εισαγωγής δεδομένων κ.λπ. Χρησιμοποιείστε την ίδια στοίχιση σε όλες τις σελίδες.

7 Πλοήγηση

6 Δώστε πληροφορίες για την θέση μέσα στον δικτυακό τόπο στους χρήστες

➢ **Οδηγία:**
Παρέχετε ενδείξεις για να ενημερώσετε τους χρήστες την θέση τους μέσα στον ιστοχώρο.

➢ **Σχόλια:**
Πολλές ενδείξεις προσφέρουν στους χρήστες τις πληροφορίες για να καταλάβουν που είναι μέσα στον ιστοχώρο, και ποια είναι η σωστή κίνηση για την επόμενη ενέργεια. Τέτοιες ενδείξεις περιλαμβάνουν:

- την εμφάνιση διαδρομή στην ιεραρχία των πληροφοριών και των σελίδων («τρίμματα» - Breadcrumps πχ Αρχική>Επιπεδο2>Επιπεδο3>.....).
- τον συνδυασμό των δεσμών με τους τίτλους των σελίδων
- και η δημιουργία URL που αφορούν τη θέση του χρήστη στην περιοχή.

Άλλες μορφές ένδειξης περιλαμβάνουν την αλλαγή του χρώματος ενός συνδέσμου στον οποίο ο χρήστης έχει κάνει κλικ (υποδεικνύοντας ότι ο προορισμός έχει επισκεφτεί), και η χρήση άλλων οπτικών ενδείξεων.

7 Χρησιμοποιείστε μία λίστα περιεχομένου στις μεγάλες σελίδες

➢ **Οδηγία:**
Στις μεγάλες σελίδες, κάντε μία λίστα περιεχομένου με κάθε γραμμή της λίστας να είναι δεσμός προς περιεχόμενο ή παραγράφους που είναι σε άλλα μέρη της σελίδας τα οποία δεν είναι ορατά .

➢ **Σχόλια:**
Για τις μεγάλες σελίδες με διάφορα χωριστά τμήματα που δεν είναι ορατά προσθέστε μία μικρή λίστα των τμημάτων, όπου κάθε γραμμή της λίστας να είναι ένας σύνδεσμος προς το συγκεκριμένο τμήμα του κειμένου και βάλτε το στην κορυφή της σελίδας.

Η λίστα με τους συνδέσμους εξυπηρετεί δύο σκοπούς:

- Παρέχει μια περίληψη της σελίδας έτσι οι χρήστες μπορούν γρήγορα να καθορίσουν εάν περιέχει τις επιθυμητές πληροφορίες και ταυτόχρονα
- Επιτρέπει στους χρήστες για να μεταφερθούν γρήγορα στις συγκεκριμένες πληροφορίες.

Δεδομένου ότι η λίστα με τους δεσμούς επιτρέπει μια άμεση σύνδεση με το περιεχόμενο που βρίσκεται κάτω από την πρώτη οθόνη, είναι επίσης χρήσιμη για στους χρήστες που ξαφνικά βρίσκονται στην σελίδα αυτή προερχόμενοι από μια απολύτως διαφορετική σελίδα του δικτυακού τόπου.

8 Χρησιμοποιήστε Περιγραφικές Ετικέτες πλοήγησης

➢ **Οδηγία:**
Εξασφαλίστε ότι οι περιγραφές στις καρτέλες είναι σαφώς περιγραφικές της λειτουργίας ή του προορισμού τους.

➢ **Σχόλια:**
Οι χρήστες προτιμούν τα στοιχεία πλοήγησης με ετικέτες που είναι αρκετά περιγραφικές και επιτρέπουν τις χωρίς λάθη επιλογές. Όταν, λόγω περιορισμένου χώρου δεν μπορούν να χρησιμοποιηθούν περιγραφικές ετικέτες μη χρησιμοποιείτε ετικέτες αλλά ένα άλλο τρόπο να βάλετε τον δεσμό.

9 Περιορίστε το μήκος στις σελίδες πλοήγησης

➢ **Οδηγία:**
Μην αναγκάζετε τους χρήστες να κάνουν κύλιση σε σελίδες που είναι αποκλειστικά για πλοήγηση

➢ **Σχόλια:**
Ιδανικά, οι σελίδες πλοήγησης πρέπει να είναι σε μήκος μικρότερες από μία οθόνη. Οι χρήστες δεν πρέπει να αναγκάζονται να κυλίσουν τη σελίδα, ούτε για μια μικρή απόσταση. Μια μελέτη έδειξε ότι οι χρήστες θεώρησαν το κατώτατο σημείο της οθόνης σαν το τέλος μιας σελίδας, και δεν κύλισαν περαιτέρω την σελίδα για να ανακαλύψουν τις επιπρόσθετες επιλογές πλοήγησης.

10 Χρησιμοποιείστε μετα-πλοήγηση

➢ **Οδηγία:**
Βάλτε δεσμούς μετα-πλοήγησης σε κάθε σελίδα για επικοινωνία και δευτερεύοντα στοιχεία πλοήγησης.

➢ **Σχόλια:**
Οι περισσότεροι ιστοχώροι, ειδικά για τούς εμπορικούς τόπους που επιθυμούν να έλθουν σε επαφή με τους επισκέπτες τους και είναι αρκετά μεγάλες να έχουν διαθέτουν κάποιο τρόπο αναζήτησης. Ο τόπος προσφέρει πλοήγηση που πρέπει να είναι διαθέσιμη σε κάθε σελίδα. Κάποιες επιπλέον δυνατότητες πλοήγησης πρέπει να είναι διαθέσιμες σε κάθε σελίδα.

Συνήθως η μετα-Πλοήγηση αποτελείται από τα κάποια δεσμούς πλοήγησης και δεσμούς που βοηθούν την επικοινωνία με τους χρήστες. Οι δεσμοί πλοήγησης περιλαμβάνουν Αρχική Σελίδα, Αναζήτηση, Χάρτης, και Ευρετήριο.

Οι δεσμοί με άλλες περιοχές πιο υψηλού επιπέδου είναι επίσης στοιχεία πλοήγησης. Οι δεσμοί επικοινωνίας πληροφορούν τους χρήστες για την οργάνωση της επιχείρησης και πως κάποιος μπορεί να επικοινωνήσει με αυτή (Τέτοιοι δεσμοί είναι πχ Η Εταιρεία, Επικοινωνία κλπ). Η μπάρα με την Μετα-πλοήγηση τοποθετείται στο πάνω μέρος της σελίδας ώστε να είναι πάντα ορατή.

Η μετα-πλοήγηση περιέχει τη λειτουργικά στοιχεία που είναι σχετικά σε κάθε σελίδα του ιστοχώρου. Πρέπει επομένως να είναι πάντα προσιτή με ένα τρόπο που δεν εμποδίζει και δεν καταλαμβάνει μεγάλο χώρο στην οθόνη.

11 Επαναλάβετε το μενού πλοήγησης στο κάτω μέρος

➢ **Οδηγία:**
Επαναλάβετε το μενού της κύριας πλοήγησης στο κάτω μέρος της σελίδας

➢ **Σχόλια:**
Σελίδες συχνά καταλαμβάνουν περισσότερο από μία οθόνη και οι χρήστες θα πρέπει να κυλήσουν προς τα κάτω για να δουν την ολόκληρη σελίδα.

Σε τέτοιες περιπτώσεις, η κύρια πλοήγηση είναι πιθανό μην είναι πια ορατή. Επαναλαμβάνοντας το μενού πλοήγησης ο χρήστης έχει πρόσβαση στην πλοήγηση όταν η οθόνη έχει κυλήσει και δεν υπάρχει καμία ανάγκη να επιστρέψει στην κορυφή επειδή το μενού πλοήγησης είναι προσπό.

Βάλτε μία απλή μπάρα με τα ίδια στοιχεία όπως η κύρια πλοήγηση. Όμως χρησιμοποιήστε κατά προτίμηση απλούς συνδέσμους με μικρά γράμματα. Παρουσιάζοντας την μπάρα με διαφορετικό τρόπο οι χρήστες καταλαβαίνουν ότι δεν είναι η κύρια πλοήγηση αλλά ένα στοιχείο που τους διευκολύνει.

9 Επικεφαλίδες, τίτλοι, και ετικέτες

12 Χρησιμοποιήστε μοναδικές και περιγραφικές επικεφαλίδες με έμφαση

➢ **Οδηγία:**
Χρησιμοποιείστε επικεφαλίδες που είναι μοναδικοί μεταξύ τους και αφορούν εννοιολογικά το περιεχόμενο που περιγράφουν.

➢ **Σχόλια:**
Η χρησιμοποίηση μη επιτυχημένων επικεφαλίδων (κακοί συνδυασμοί μεταξύ των επικεφαλίδων και των πληροφοριών που οι χρήστες βρίσκουν) είναι ένα κοινό πρόβλημα με τους ιστοχώρους. Διασφαλίστε ότι οι επικεφαλίδες είναι περιγραφικές και αφορούν το περιεχόμενο που αναφέρονται. Εάν οι επικεφαλίδες είναι πολύ όμοιοι ο ένας με τον άλλο, οι χρήστες μπορεί να διστάσουν και να ξαναδιαβάσουν το κείμενο για να προσπαθήσουν να καταλάβουν την διαφορά. Ο προσδιορισμός μίας πετυχημένης επικεφαλίδας πιθανόν να απαιτεί δοκιμές με χρήστες.

Επιπλέον μία επικεφαλίδα για να ξεχωρίζει πρέπει να έχει έμφασή. Μορφοποιήστε κατάλληλα τις επικεφαλίδες ώστε να ξεχωρίζουν από τα άλλα στοιχεία που την περιβάλλουν, ιδίως κείμενο. Η έμφαση μπορεί να γίνει με αλλαγή του στυλ της γραμματοσειράς (έντονα), μεγέθους, χρώματος κλπ.

13 Δώστε περιγραφικούς τίτλους στις σελίδες

➢ **Οδηγία:**
Βάλτε έναν περιγραφικό, μοναδικό, συνοπτικό, με σημασία και διαφορετικό τίτλο σε κάθε ιστοσελίδα.

➢ **Σχόλια:**
Ο τίτλος αναφέρεται στο κείμενο που είναι στην λωρίδα τίτλου του Προγράμματος Περιηγητή (Browser) (Αυτή η λωρίδα βρίσκεται στην κορυφή του παράθυρου). Οι τίτλοι χρησιμοποιούνται από τις μηχανές αναζήτησης για να προσδιορίσουν τις σελίδες. Εάν δύο ή περισσότερες σελίδες έχουν τον ίδιο τίτλο, δεν μπορούν να διαφοροποιηθούν από τους χρήστες ή από την κατηγορία Αγαπημένα (Favorites) του περιηγητή. Εάν ο χρήστης καταχωρήσει στον κατάλογο με τα Αγαπημένα μία σελίδα, δεν θα να πρέπει να προσαρμόσει τον τίτλο για να τον εναρμονίσει με τα προαναφερθέντα χαρακτηριστικά.

Θυμηθείτε ότι μερικές μηχανές αναζήτησης εμφανίζουν μόνο τους τίτλους στη σελίδα αποτελεσμάτων αναζήτησής. Η χρήση συνοπτικών και με σημασία τίτλων σε όλες τις σελίδες μπορεί να βοηθήσει και να προσανατολίσει τους χρήστες δεδομένου ότι κοιτάζουν βιαστικά την σελίδα ή ανιχνεύουν τους καλύτερους καταλόγους και το ιστορικό για ιδιαίτερες τοποθεσίες (URLs). Καλοί τίτλοι μπορούν επίσης να βοηθήσουν άλλους χρήστες όταν συντάσσουν δεσμούς με τις σελίδες σας.

Για να μην μπερδεύονται οι χρήστες, προσαρμόστε τον τίτλο που εμφανίζεται στο Λογισμικό Πλοήγησης ώστε να είναι σύμφωνος με τον τίτλο του περιεχομένου της σελίδας.

10 Δεσμοί

14 Βάλτε δεσμούς εκεί που ο χρήστης θα τους χρειαστεί

➢ **Οδηγία:**
Τοποθετείστε δεσμούς εκεί που ο χρήστης θα θελήσει να αναζητήσει περισσότερες σχετικές πληροφορίες

➢ **Σχόλια:**
Ο ιστότοπος θα πρέπει να έχει δεσμούς σε άλλο υλικό μέσα και έξω από τον ιστότοπο σε τοποθεσίες που ο χρήστη πιθανόν να χρειαστεί να επισκεφτεί. Η πιο απλή μορφή αυτών των δεσμών είναι δεσμοί e-mail.

Άλλοι δεσμοί μέσα στο κείμενο διευκολύνου την πλοήγηση σε σχετικές τοποθεσίες και βοηθούν τον επισκέπτη να βρει γρήγορα σχετικές πληροφορίες και να μετακινηθεί μέσα στον ιστότοπο.

15 Εμφανίστε τα στοιχεία που μπορούν να πατηθούν με συνέπεια

➢ **Οδηγία:**
Εμφανίστε ενδείξεις για κλικ με συνέπεια για να δείξετε σαφώς στους χρήστες ότι ένα στοιχείο της οθόνης μπορεί να πατηθεί.

➢ **Σχόλια:**
Οι χρήστες δεν πρέπει να αναγκάζονται να κινούν το δρομέα μέσα στην σελίδα (" κάνουν εξερεύνηση") για να ψάχνουν και να καθορίζουν τι είναι δεσμός ή τι μπορεί να πατηθεί με το ποντίκι. Η οπτική διερεύνηση για να εντοπισθούν αυτά τα στοιχεία είναι πολύ γρηγορότερη από την εξερεύνηση. Η ανάγκη εξερευνήσεων με το ποντίκι για να ανακαλυφτούν οι δεσμοί μπορεί να προκαλέσει σύγχυση και ενόχληση στους αρχάριους χρήστες, και να επιβραδύνει όλους τους χρήστες δεδομένου ότι είναι αβέβαιοι για ποια στοιχεία είναι δεσμοί.

Να είστε συνεπής στη χρήση της υπογράμμισης, κουκίδων, βελών, και άλλων συμβόλων έτσι ώστε δείχνουν πάντα ότι μπορούν ή όχι να πατηθούν. Παραδείγματος χάριν, χρησιμοποιώντας εικόνες και ως συνδέσμους και ως διακοσμητικά στοιχεία επιβραδύνει τους χρήστες δεδομένου ότι τους αναγκάζει να μελετήσουν πρώτα την εικόνα για να διακρίνουν αν πρέπει να πατήσουν.

Τα στοιχεία που είναι στο κέντρο της κορυφής της σελίδας, ή στα αριστερά και δεξιά πλαίσια (στήλες) έχουν μια μεγάλη πιθανότητα για να θεωρηθούν σαν δεσμοί. Αυτό ισχύει ιδιαίτερα εάν το συνδεμένο στοιχείο μοιάζει με ένα πραγματικό κουμπί.

16 Αποφύγετε τις παραπλανητικές ενδείξεις για πάτημα

➢ **Οδηγία:**
Εξασφαλίστε ότι τα στοιχεία που δεν μπορούν να πατηθούν δεν έχουν τα χαρακτηριστικά που υποδεικνύουν ότι μπορούν να πατηθούν.

➢ **Σχόλια:**
Τα στοιχεία αυτά πρέπει συνήθως να συνδυαστούν με μία τουλάχιστον άλλη ένδειξη που να υποδεικνύει ότι μπορούν να πατηθούν. Σε μια μελέτη, οι χρήστες παρατηρήθηκαν να προσπαθούν να κάνουν κλικ σε σημαντικό τίτλο με μερικά χαρακτηριστικά δεσμού, ενώ ο τίτλος δεν ήταν πραγματικό δεσμός.

Υπογραμμισμένο κείμενο πρέπει να αποφεύγεται εκτός αν το κείμενο είναι δεσμός.

Εντούτοις, σε μερικούς χρήστες οι κουκίδες και τα βέλη μπορούν να υποδεικνύουν πάτημα, ακόμα και όταν δεν περιέχουν καμία άλλη ένδειξη (υπογράμμιση, μπλε χρωματισμός, κ.λπ.). Αυτό επιβραδύνει τους χρήστες καθώς αναρωτιούνται εάν τα στοιχεία είναι δεσμοί.

17 Χρησιμοποιείστε δεσμούς Κείμενου μαζί με γραφικά

➢ **Οδηγία:**
Χρησιμοποιείστε Κείμενο για δεσμούς και πάντα ένα γραφικό δεσμός πρέπει να συνοδεύεται από το κατάλληλο κείμενο δεσμός.

➢ **Σχόλια:**
Μία εικόνα, πολλές φορές δεν βοηθά τον χρήστη να κατανοεί την σημασία της. Οι δεσμοί που χρησιμοποιούν γραφικά πρέπει να είναι κατανοητοί. Αλλιώς οι χρήστες εκνευρίζονται.

Οι εικόνες που δεν προσδιορίζονται με κάποιο άλλο τρόπο ότι είναι δεσμοί, αναγκάζουν τους χρήστες να σαρώνουν με το ποντίκι μία σελίδα για να ανακαλύψουν τις εικόνες δεσμούς, Ιδίως αν μία εικόνα δεν συνοδεύεται από κείμενο.

Γενικά, οι δεσμοί κειμένου αναγνωρίζονται ευκολότερα ότι είναι δεσμός και μπορεί να πατηθεί. Οι δεσμοί κειμένου μεταφορτώνονται συνήθως γρηγορότερα, προτιμώνται από τους χρήστες, και πρέπει να αλλάζουν τα χρώματα μετά από το πάτημα. Είναι συνήθως ευκολότερο να εκφραστεί ο προορισμός ενός δεσμού με κείμενο, παρά με τη χρήση μιας εικόνας.

Σε μια μελέτη, στους χρήστες δημιουργήθηκε ιδιαίτερη σύγχυση σχετικά με το εάν ορισμένες εικόνες ήταν ή όχι δεσμοί. Αυτό Ισχυε ακόμη και για τις εικόνες που περιείχαν τις λέξεις. Οι χρήστες δεν ήταν σε θέση να πουν εάν μπορούσαν να πατήσουν τις εικόνες χωρίς να βάλουν το ποντίκι πάνω στην εικόνα ("εξερεύνηση"). Το να απαιτείς από τους χρήστες να εξερευνήσουν για να διαπιστώσουν τι στην πραγματικότητα μπορεί να πατηθεί επιβραδύνει την εργασία.

18 Εναρμονίστε τα ονόματα δεσμών με τις αντίστοιχες σελίδες προορισμού

➢ **Οδηγία:**
Κάντε τους δεσμούς κειμένου να συμφωνούν με τον τίτλο ή τις επικεφαλίδες του προορισμού (δηλ. στόχους).

➢ **Σχόλια:**
Η εναρμονισμένη αντιστοίχηση δεσμών με τον προορισμό προσφέρουν την πιο κατάλληλη ένδειξη στου χρήστες ότι έχουν μεταφερθεί στον επιθυμητό προορισμό.

Εάν οι χρήστες πρέπει να πατήσουν πάνω από μία φορά για να φτάσουν σε έναν συγκεκριμένο προορισμό τότε πρέπει να αποφύγετε την επανάληψη περιγραφής του ίδιου δεσμού επειδή οι χρήστες μπορούν να μπερδευτούν εάν οι δεσμοί σε διαφορετικά επίπεδα είναι ίδιοι ή ακόμα και πολύ παρόμοιοι Σε μια μελέτη, αφού οι χρήστες πάτησαν σε ένα δεσμό που έλεγε "πρώτες βοήθειες," η επόμενη σελίδα είχε τρεις επιλογές. Μία από τους ήταν πάλι με τον τίτλο "πρώτες βοήθειες." Οι δύο δεσμοί "πρώτες βοήθειες" πήγαιναν σε διαφορετικές θέσεις. Οι χρήστες έτειναν να πατήσουν σε άλλες επιλογές στη δεύτερη σελίδα επειδή νόμιζαν ότι είχαν φθάσει ήδη στις "πρώτες βοήθειες."

19 Διασφαλίστε ότι οι ενσωματωμένοι δεσμοί κειμένου είναι περιγραφικοί

➢ **Οδηγία:**
Όταν γίνεται χρήση των ενσωματωμένων δεσμών (κείμενο που έχει γίνει δεσμός ονομάζεται ενσωματωμένος δεσμός), το κείμενο που χρησιμοποιείται πρέπει ακριβώς να περιγράφει τον προορισμό του δεσμού.

➢ **Σχόλια:**
Οι χρήστες τείνουν να αγνοήσουν το κείμενο που περιβάλλει κάθε ενσωματωμένο δεσμό επομένως μην δημιουργείτε ενσωματωμένες δεσμούς που χρησιμοποιούν το περιβάλλον κείμενο για να προσθέσουν ενδείξεις και να βοηθήσουν τους χρήστες για τον προορισμό του δεσμού.

20 Παρουσιάστε τους δεσμούς που έχουν χρησιμοποιηθεί

➢ **Οδηγία:**
Κάντε χρήση άλλου χρώματος για να επισημάνετε στους χρήστες τους δεσμούς που έχουν επισκεφτεί.

➢ **Σχόλια:**
Γενικά, είναι καλύτερο να χρησιμοποιηθούν το προκαθορισμένο χρώμα δεσμών (μπλε για αρχικό δεσμό που ο χρήστης δεν έχει επισκεφτεί και πορφυρό για δεσμό που έχει επισκεφτεί). Η χρήση χρωμάτων βοηθούν τον χρήστη να καταλάβει τα μέρη ενός ιστοχώρου τα οποία έχει ήδη επισκεφτεί. Σε μια μελέτη, αυτός ο τρόπος ένδειξης ήταν η μόνη μεταβλητή που βρέθηκε να βελτιώνει την ταχύτητα του χρήστη στην εύρεση των πληροφοριών. Εάν ένας χρήστης επιλέγει ένα δεσμό, και υπάρχουν και άλλοι δεσμοί προς τον ίδιο στόχο, βεβαιωθείτε ότι όλοι οι δεσμοί αλλάζουν χρώμα.

21 Επιτρέψτε στους χρήστες να μεταφέρονται στην αρχή μίας σελίδας

➢ **Οδηγία:**
Σχεδιάστε ένα δεσμό προς την κορυφή της σελίδας σε διάφορες θέσεις μέσα στο περιεχόμενο της σελίδας

➢ **Σχόλια:**
Οι σελίδες είναι μεγαλύτερες από 2 οθόνες και οι χρήστες είναι πιθανό να θέλουν να γυρίσουν στην αρχή (κορυφή) της σελίδας. Αυτό επιτρέπει στους χρήστες να επιστρέψουν στην κύρια πλοήγηση από σχεδόν κάθε θέση χωρίς να χρειαστεί να κυλίσουν την οθόνη. Μπορεί επίσης να είναι κατάλληλο για χρήστες με ειδικές ανάγκες που δύσκολα μπορούν να κυλίσουν την οθόνη

Επιλέξτε τις στρατηγικές θέσεις για να τοποθετήσετε τους δεσμούς μέσα στο περιεχόμενο. Οι καλύτερες θέσεις είναι στο τέλος των παραγράφων ή στο τέλος ενός μπλοκ κειμένου.

Η λύση αυτή χρησιμοποιείτε για δύο λόγους

1. Για να επιστρέψουμε στην κύρια πλοήγησης
2. Για να επιστρέψουμε στην κορυφή του περιεχομένου.

Εάν αυτό γίνεται για τον πρώτο λόγο, μπορεί να γίνει χρήση του **Επαναλαμβανόμενου μενού** στο κάτω μέρος της σελίδας αντί για ένα δεσμό μόνο του. Εάν υπάρχουν και τα δύο αν κα τι ένα δεν χρειάζεται είναι χρήσιμα στον χρήστη.

Με τον τρόπο αυτό επιτρέπεται στους χρήστες να μεταφέρονται στην αρχή στης σελίδας από οποιαδήποτε σημείο της σελίδας. Αυτό διευκολύνει και τους χρήστες με ειδικές ανάγκες που δεν μπορούν να χρησιμοποιήσουν κύλιση.

11 Εμφάνιση κειμένου

22 Χρησιμοποιήστε Μαύρο χρώμα σε καθαρό και με μεγάλη αντίθεση φόντο

➢ **Οδηγία:**
Όταν είναι επιθυμητό οι χρήστες να διαβάσουν γρήγορα και να καταλάβουν το κείμενο κάντε χρήση μαύρου κείμενου σε από φόντο που έχει υψηλή αντίθεση και χωρίς σχέδια.

➢ **Σχόλια:**
Το μαύρο κείμενο σε ένα σαφές υπόβαθρο προκάλεσε σταθερά την καλύτερη ταχύτητα ανάγνωσης απ' ότι σε ένα μέσο διαμορφωμένο υπόβαθρο. Σε μία σύγκριση με κείμενο ελαφρά χρωματισμένο σε ένα σκοτεινό υπόβαθρο και με μαύρο κείμενο σε ένα άσπρο υπόβαθρο διαπιστώθηκε αύξηση ταχύτητας έως και 32%. Γενικά, όσο μεγαλύτερη η αντίθεση μεταξύ του κειμένου και του φόντου τόσο ευκολότερα πρόκειται να διαβαστεί το κείμενο.

Ιδιαίτερη προσοχή χρειάζεται στους δεσμούς και στο χρωματισμό του υπόβαθρου. Συνήθως οι δεσμοί εξ ορισμού είναι μπλε και όταν χρησιμοποιηθούν μωβ. Αν το υπόβαθρο είναι ένα από αυτά τα χρώματα τότε ο δεσμός δεν θα φαίνεται.

23 Διασφαλίστε οπτική συνέπεια στο κείμενο

➢ **Οδηγία:**
Εξασφαλίστε οπτική συνέπεια των στοιχείων του ιστοχώρου στις διάφορες ιστοσελίδας.

➢ **Σχόλια:**
Δύο μελέτες διαπίστωσαν ότι ο αριθμός λαθών που γίνονται χρησιμοποιώντας οπτικά ασυμβίβαστες παρουσιάσεις είναι πολύ υψηλότερος σε σχέση με τα λάθη που γίνονται σε σελίδες που παρουσιάζονται με οπτική συνέπεια.

Η οπτική συνέπεια περιλαμβάνει το μέγεθος και το διάστημα των χαρακτήρων τα χρώματα που χρησιμοποιούνται για τις ετικέτες, τις γραμματοσειρές και το φόντο. Επίσης μεταξύ των επικεφαλίδων σε κάθε σελίδα πρέπει να υπάρχει συνέπεια. Με τις θέσεις των επικετών, των εικόνων και των άλλων σημαντικών στοιχείων έχουν αναφερθεί σε άλλη οδηγία.

Άλλες μελέτες διαπίστωσαν ότι κατά την διάρκεια πραγματοποίησης εργασιών σε σελίδες που παρουσιάζουν οπτική συνέπεια διαπιστώθηκε:

1. Μείωση των χρόνων ολοκλήρωσης συγκεκριμένου έργου
2. Μείωση των λαθών
3. Μείωση του χρόνου εκμάθησης και
4. Αύξηση στην ικανοποίηση χρηστών.

Όμως, ένας χρήστης έχει την ικανότητα να ξεπεράσει γρήγορα μερικούς τύπους ασυνεπειών. Παραδείγματος χάριν, μια μελέτη διαπίστωσε ότι η χρήση διαφορετικού μεγέθους όπως τα κουμπιά , πεδία εισαγωγής δεδομένων ή λίστες επιλογών (που συνήθως βρίσκονται σε φόρμες) δεν επιδρά αρνητικά στην απόδοση ή τις προτιμήσεις των χρηστών.

Καλό είναι να μην χρησιμοποιούνται διαφορετικές οικογένειες γραμματοσειρών στην σελίδα έστω και μόνο για λόγους αισθητικής. Οι επικεφαλίδες σελίδας σε ένα τόπο δισφέρουν από το κείμενο για να τραβήξουν την προσοχή ή γιατί γίνονται με χρήση γραφικών.

24 Μορφοποιήστε κοινά στοιχεία με συνέπεια

➢ **Οδηγία:**
Εξασφαλίστε ότι κοινά στοιχεία έχουν μορφοποιηθεί με συνέπεια από την μια σελίδα σε άλλη.

➢ **Σχόλια:**
Η μορφοποίηση που επιλέγεται πρέπει να είναι γνωστή στους χρήστες. Παραδείγματος χάριν, οι αριθμοί τηλεφώνου πρέπει μορφοποιούνται με τον ίδιο τρόπο (800- 555-1212), και το κείμενο που εμφανίζει χρόνο με χρήση γνωστών σημείων στίξης (άνω και κάτω τελείες (ΩΩ:ΛΛ:ΔΔ).

25 Χρησιμοποιήστε γραμματοσειρές μεγέθους τουλάχιστον 10 pt

➢ **Οδηγία:**
Χρησιμοποιήστε γραμματοσειρές μεγέθους τουλάχιστον 10pt σε όλες ιστοσελίδας.

➢ **Σχόλια:**
Τα παραδοσιακά σε χαρτί μεγέθη γραμματοσειρών δεν παρουσιάζονται καλά στο σχέδιο ιστοχώρου. Υπάρχουν διαφορές στα Λογισμικά-Προγράμματα Περιήγησης (Internet Explorer, Firefox κλπ).

Η έρευνα έχει δείξει ότι κείμενο μεγέθους μικρότερο από τα 12 σημεία προκαλούν την πιο μικρή ταχύτητα ανάγνωσης στους χρήστες. Για τους χρήστες πάνω από την ηλικία των 65 ετών, μπορεί να είναι καλύτερο να χρησιμοποιηθούν τουλάχιστον 14pt. Όμως τα αποτελέσματα της έρευνας έχουν ξεπεραστεί με νέες βελτιωμένες οθόνες με καλύτερες αναλύσεις.

Οι σύγχρονες οθόνες επιτρέπουν μικρότερες γραμματοσειρές πχ 8,9,10 και πράγματι αυτά τα μεγέθη χρησιμοποιούνται κατά κόρο. Μην χρησιμοποιήστε ποτέ λιγότερο από 6pt σε έναν ιστοχώρο

26 Χρησιμοποιήστε κοινές και οικείες γραμματοσειρές

➢ **Οδηγία:**
Χρησιμοποιήστε κοινές και οικείες γραμματοσειρές για να επιτύχετε την καλύτερη δυνατή ταχύτητα ανάγνωσης.

➢ **Σχόλια:**
Με έρευνα διαπιστώθηκε οι γραμματοσειρές χωρίς ουρές έχουν ένα μικρό πλεονέκτημα έναντι των αντιστοίχων με ουρές, και προτιμώνται από τους χρήστες. Ένας ειδικός συστήνει γραμματοσειρές χωρίς ουρές για μικρά γράμματα και με ουρές για μεγαλύτερα.

Η γραμματοσειρά παίζει σημαντικό ρόλο στην αναγνωσιμότητα του κειμένου. Το κείμενο για να διαβάζεται πιο γρήγορα πρέπει να γίνεται χρήση οικείων γραμματοσειρών. Οι πιο συνηθισμένες με ουρές είναι οι Times και οι Times New Roman. Οι πιο συνηθισμένες χωρίς ουρές είναι οι Arial, Helvetica και Verdana. Οι γραμματοσειρές χωρίς ουρές διαβάζονται πιο εύκολα στις οθόνες ενώ με ουρές είναι πιο κατάλληλες για χαρτί.

27 Δώστε έμφαση σε σημαντικά σημεία του κειμένου

➢ **Οδηγία:**
Αλλάξτε τα χαρακτηριστικά κειμένου για να υπογραμμίσετε τη σημασία μιας λέξης ή μιας σύντομης φράσης.

➢ **Σχόλια:**
Κείμενο που παρουσιάζει διαφορετικά χαρακτηριστικά κυριαρχεί στον περιβάλλοντα χώρο. Τέτοια χαρακτηριστικά είναι έντονα γράμματα, πλάγια γράμματα, στυλ γραμμάτων, μέγεθος της γραμματοσειράς και κεφαλαία ή μικρά γράμματα. Η καλή χρήση αυτών των χαρακτηριστικών ελκύουν την προσοχή του χρήστη σε σημαντικές λέξεις.

Χωρίς έμφαση ένα κείμενο θεωρείται βαρετό και ίσως οι χρήστες το αγνοήσουν εάν δεν ενδιαφέρονται πραγματικά για το περιεχόμενο.

Η χρήση των διαφορετικών χαρακτηριστικών έχει και αρνητικές συνέπειες στο διάβασμα — η ταχύτητα μπορεί να μειωθεί έως και είκοσι τοις εκατό (20%), και πρέπει τέτοια χαρακτηριστικά να χρησιμοποιούνται με μέτρο σε μεγάλα τμήματα κειμένου. Μην χρησιμοποιείτε διαφορετικά χαρακτηριστικά γραμμάτων για να δώσετε έμφαση σε περισσότερες από μια ή δύο λέξεις ή μια σύντομη φράση. Μην χρησιμοποιήστε την υπογράμμιση για την έμφαση επειδή οι υπογραμμισμένες λέξεις στον διαδίκτυο θεωρούνται γενικά δεσμοί.

28 Χρησιμοποιήστε στοιχεία που ελκύουν προσοχή όταν πρέπει

➢ **Οδηγία:**
Τραβήξτε την προσοχή σε συγκεκριμένα μέρη ιστοσελίδας με την κατάλληλη (αλλά περιορισμένης) χρήση στοιχείων.

➢ **Σχόλια:**
Χρησιμοποιήστε στοιχεία που ελκύουν προσοχή όταν πρέπει και ενδείκνυται. Όλα τα χαρακτηριστικά στοιχεία ενός ιστοχώρου δεν θα προσελκύσουν εξίσου την προσοχή ενός χρήστη. Τα ακόλουθα χαρακτηριστικά στοιχεία παρουσιάζονται κατά σειρά σύμφωνα με τον αντίκτυπο και τη επίδραση που έχουν στους χρήστες:

- Η κίνηση είναι ο αποτελεσματικότερος τρόπος στην προσέλκυση της προσοχής προς ένα στοιχείο. Η έρευνα προτείνει ότι οι άνθρωποι δεν μπορούν να αποφύγουν και να μην εξετάσουν αρχικά στοιχεία που κινούνται σε μια σελίδα. Εντούτοις, εάν η κίνηση δεν είναι σχετική ή χρήσιμη, μπορεί να ενοχλήσει το χρήστη. Εάν η κίνηση συνεχίζεται μετά από την αρχική προσέλκυση της προσοχής του χρήστη, πιθανόν να αποσπάσει ολοκληρωτικά την προσοχή του από τις πληροφορίες που παρουσιάζονται στον ιστόχωρο.
- Τα μεγαλύτερα αντικείμενα, ιδιαίτερα εικόνες, θα τραβήξουν πιο πολύ την προσοχή των χρηστών σε σχέση με τις μικρότερες. Οι χρήστες εστιάζουν στα μεγαλύτερα στοιχεία πρώτα, και για μεγαλύτερες χρονικές περιόδους. Εντούτοις, οι χρήστες έχουν την τάση να αγνοήσουν ορισμένα είδη εικόνων που θεωρούν διαφημίσεις ή απλώς διακοσμητικά στην σελίδα.
- Οι χρήστες εξετάζουν τις εικόνες για ένα ή δύο δευτερόλεπτα, και εξετάζουν έπειτα το σχετικό τίτλο (λεζάντα). Σε πολλές περιπτώσεις η ανάγνωση κειμένου ή της λεζάντας τίτλου είναι η τελευταία λύση για να γίνει κατανοητή η σημασία μίας εικόνας. Επίσης μέρη των εικόνων ή του κειμένου που είναι πιο φωτεινά και έντονα φαίνεται ότι ελκύουν την προσοχή του χρήστη πρώτα.

29 Χρησιμοποιείστε κεφαλαία και μικρά γράμματα για κείμενο

➢ **Οδηγία:**
Παρουσιάστε κείμενο κάνοντας χρήση κεφαλαίων και μικρών γραμμάτων.

➢ **Σχόλια:**
Ένα κείμενο διαβάζεται πιο εύκολα όταν χρησιμοποιούνται κεφαλαία και μικρά γράμματα με συμβατικό τρόπο δηλαδή αρχίζοντας τις προτάσεις με κεφαλαία γράμματα, και βάζοντας κεφαλαία μόνο σε ορισμένες λέξεις και τα αρκτικόλεξα. Εάν ένα στοιχείο πρέπει να τραβήξει την προσοχή του χρήστη, εμφανίστε το στοιχείο με κεφαλαία έντονα ή πλάγια γράμματα. Μην χρησιμοποιήστε αυτές τις μεθόδους για έμφαση για περισσότερες από μια ή δύο λέξεις ή για μια έστω σύντομη φράση επειδή επιβραδύνουν την ικανότητα ανάγνωσης όταν χρησιμοποιείται για την εκτεταμένο κείμενο.

30 Χρησιμοποιείστε κατάλληλη στοίχιση για κείμενο

➢ **Οδηγία:**
Χρησιμοποιείστε αριστερή στοίχιση για κείμενο γιατί είναι η μόνη που δεν προκαλεί προβλήματα

➢ **Σχόλια:**
Υπάρχουν διάφοροι τρόποι για να τοιχιστεί το κείμενο: αριστερή, κεντρική, δεξιά και ευθυγραμμισμένο δεξιά και αριστερά (πλήρης στοίχιση). Η πλήρης στοίχιση δεν ενδείκνυται γιατί προσθέτοντας μικρά κενά μεταξύ των λέξεων για να γίνει η πλήρη στοίχιση αλλάζει την απόσταση μεταξύ των λέξεων και κάνει το κείμενο δυσκολοδιάβαστο. Η ταχύτητα ανάγνωσης μπορεί να πέσει μέχρι 11%.

Η στοίχιση στο κέντρο είναι κατάλληλοι μερικές φορές για επικεφαλίδες αλλά όχι για κείμενο γιατί συνήθως το ασχημαίνει και επίσης δυσκολεύει την ανάγνωση.

Για μικρές και στενές παραγράφους η στοίχιση στο κέντρο ίσως δεν προκαλεί τόσα προβλήματα. Η στοίχιση δεξιά επίσης καλό είναι να αποφεύγεται για κείμενο, και να χρησιμοποιείται μόνο σε ειδικές περιπτώσεις. Η καλύτερη στοίχιση για σελίδες web είναι η αριστερή η οποία και προβλήματα δεν προκαλεί και διευκολύνει την ανάγνωση του κειμένου.

Τίτλοι κα επικεφαλίδες πρέπει να είναι στοιχισμένες είτε αριστερά είτε με κεντρική στοίχιση.

31 Μορφοποιήστε με 2 χρώματα τους πίνακες για είναι ευανάγνωστοι

➢ **Οδηγία:**
Χρησιμοποιήστε χρώματα γραμμών ώστε ο πίνακας να γίνει πιο ευανάγνωστος

➢ **Σχόλια:**
Οι πίνακες αποτελούν ένα χαρακτηριστικό στοιχείο στις ιστοσελίδες. Ο πίνακας μπορεί να είναι αρκετά σύνθετος και να έχει διάφορες στήλες και γραμμές πράγμα που κάνει δύσκολο για κάποιον να βρει ποια στοιχεία ανήκουν στην ίδια σειρά.

Χρησιμοποιήστε δύο διαφορετικά χρώματα γραμμών ώστε ο πίνακας να γίνει πιο ευανάγνωστος

Το διαφορετικό χρώμα στις γραμμές κάνει περιττή την ανάγκη χρήσης περιγραμμάτων στον πίνακα και διευκολύνει το μάτι να διαβάσει μια γραμμή.

12 Κατάλογοι - Λίστες

32 Εμφανίστε συναφή στοιχεία σε Λίστες

➢ **Οδηγία:**
Εμφανίστε συναφή στοιχεία σε Λίστες δηλ σε ένα κάθετο κατάλογο παρά με την μορφή συνεχούς κειμένου.

➢ **Σχόλια:**
Μία καλά-οργανωμένη μορφή λίστας τείνει να διευκολύνει τη γρήγορη και με ακρίβεια διερεύνηση. Μια μελέτη έδειξε ότι οι χρήστες σαρώνουν τους κάθετους καταλόγους γρηγορότερα από τους οριζόντιους καταλόγους. Η σάρωση ενός οριζόντιου καταλόγου παίρνει τους χρήστες είκοσι τοις εκατό περισσότερο χρόνο (20%) από έναν κάθετο κατάλογο.

33 Βάλτε ένα τίτλο σε κάθε Λίστα

➢ **Οδηγία:**
Παρουσιάστε έναν εισαγωγικό τίτλο (δηλ. λέξη ή φράση) στην κορυφή κάθε Λίστας.

➢ **Σχόλια:**
Η ύπαρξη ενός περιγραφικού τίτλου επιτρέπει στους χρήστες να κατανοήσουν πιο εύκολα το λόγο ύπαρξης μίας λίστας στοιχείων, και γιατί τα στοιχεία σχετίζονται το ένα με το άλλο. Ο τίτλος βοηθά να κατανοήσουν οι χρήστες τον τρόπο με τον οποίο τα στοιχεία είναι ταξινομημένα, ή οποιοδήποτε άλλη κοινή αρχή ή θέμα που υπάρχει. Οι χρήστες είναι σε θέση να χρησιμοποιήσουν τις λίστες καλύτερα όταν περιλαμβάνουν τίτλους.

34 Μορφοποιήστε τις λίστες ώστε να διευκολύνεται η σάρωση & κατανόηση

➢ **Οδηγία:**
Δημιουργήστε τις λίστες με τρόπο που να διευκολύνεται η εξερεύνηση και κατανόηση.

➢ **Σχόλια:**
Η χρήση ετικετών που έχουν κάποιο νόημα, ελκυστικά χρώματα φόντου, τα περιγράμματα, και τα λευκά διαστήματα επιτρέπουν στους χρήστες να προσδιορίσουν ένα σύνολο στοιχείων ως μία ξεχωριστή λίστα.

35 Αρχίστε με κεφαλαίο γράμμα την πρώτη λέξη σε κάθε γραμμής της λίστας

➢ **Οδηγία:**
Ξεκινήστε με κεφαλαίο το πρώτο γράμμα στην πρώτη λέξη κάθε γραμμής της λίστας ή στις επικέτες μίας λίστας πλαισίων ή σε πεδία ελέγχου ή σε κουμπιά επιλογής

➢ **Σχόλια:**
Μόνο το πρώτο γράμμα της πρώτης λέξης πρέπει να είναι με κεφαλαίο γράμμα εκτός αν το στοιχείο περιέχει μια άλλη λέξη που γράφεται με κεφαλαίο.

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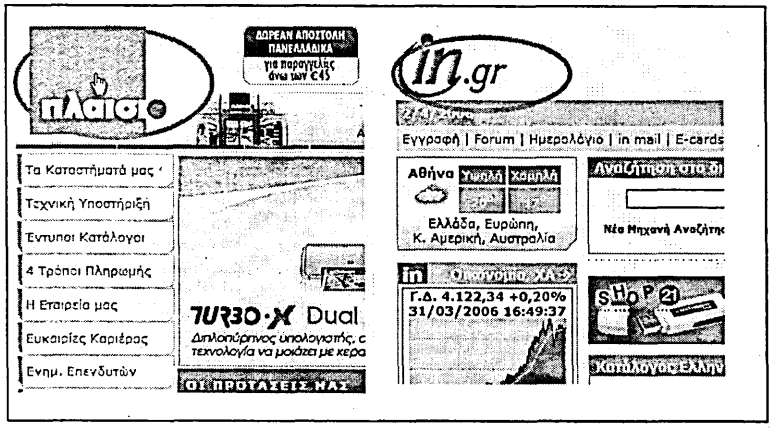
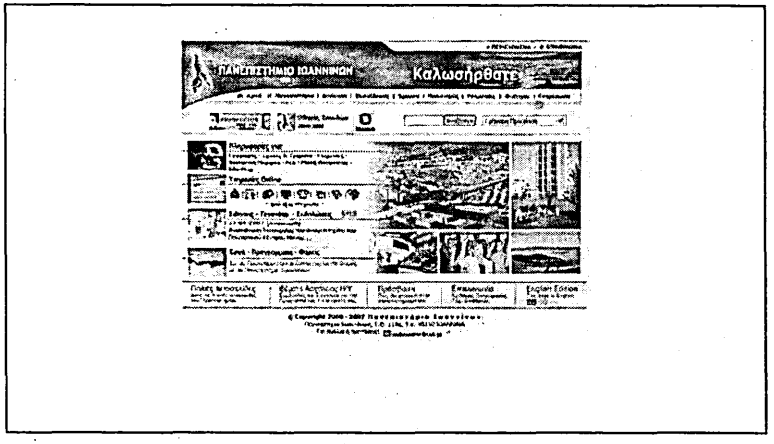
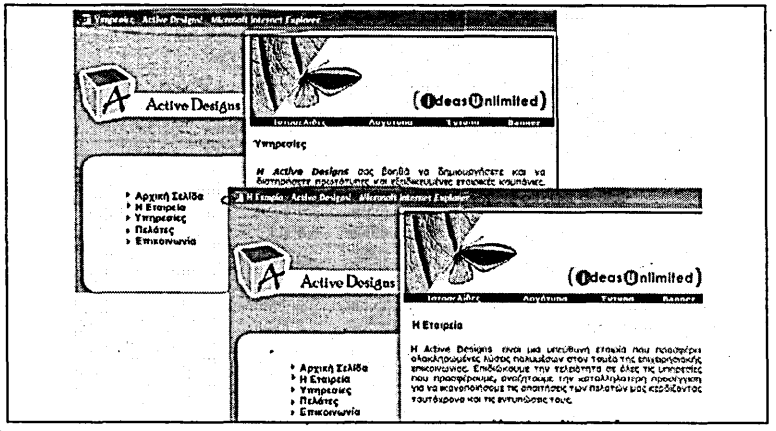
35 Αρχίστε με κεφαλαίο γράμμα την πρώτη λέξη σε κάθε γραμμής της λίστας 31



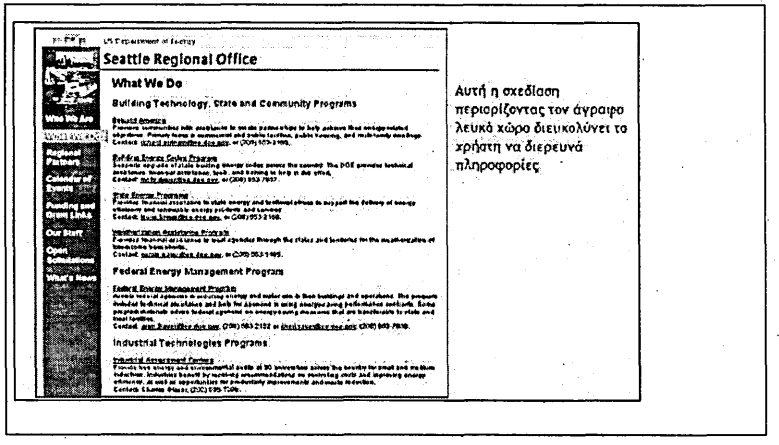
1 Επιτρέψτε την πρόσβαση στην αρχική σελίδα



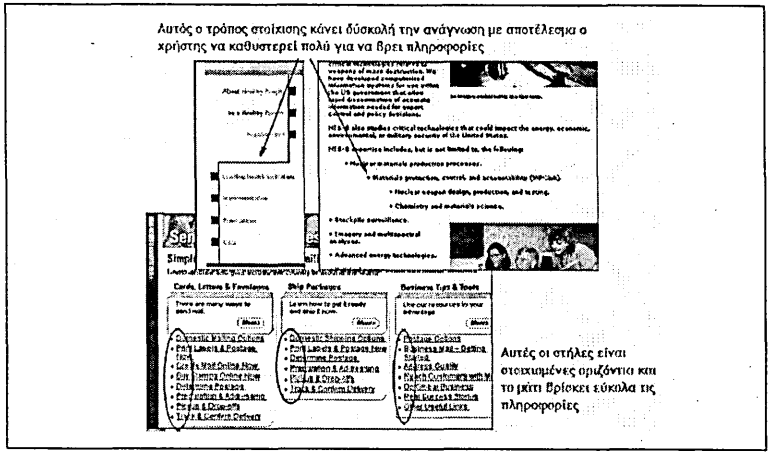
2 Περιορίστε το Μήκος της Αρχικής Σελίδας



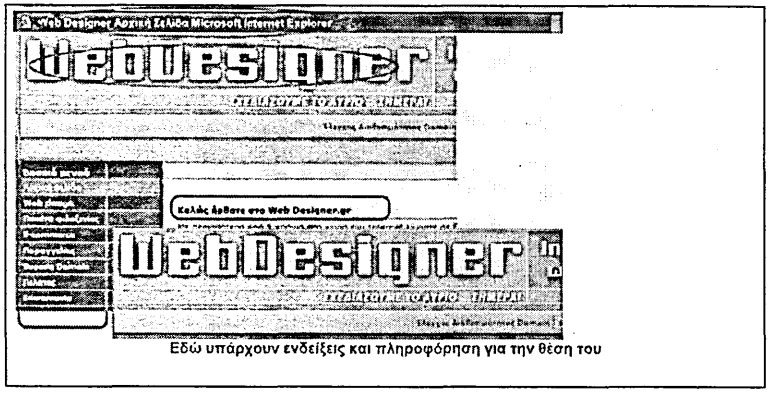
3 Τοποθετήστε τα πιο σημαντικά στοιχεία με συνέπεια



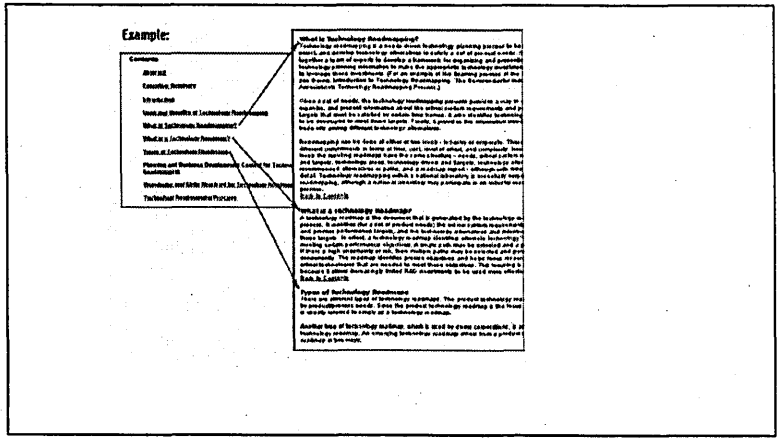
4 Μετριάστε τον άγραφο λευκό χώρο στην σελίδα



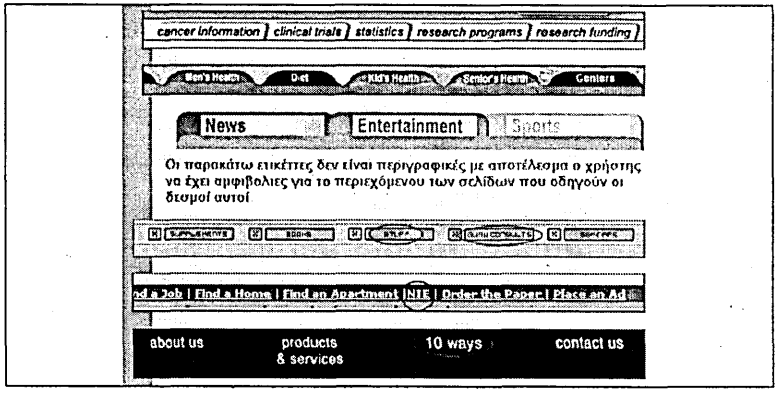
5 Στοιχίστε τα στοιχεία σε μια σελίδα



6 Δώστε πληροφορίες για την θέση μέσα στον δικτυακό τόπο στους χρήστες



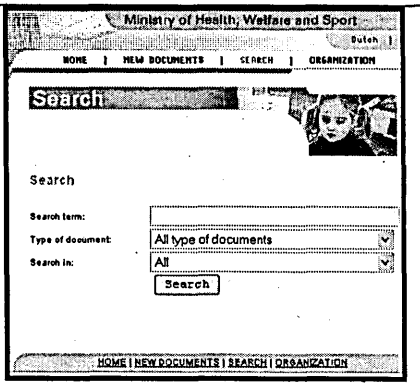
7 Χρησιμοποιείστε μία λίστα περιεχομένου στις μεγάλες σελίδες



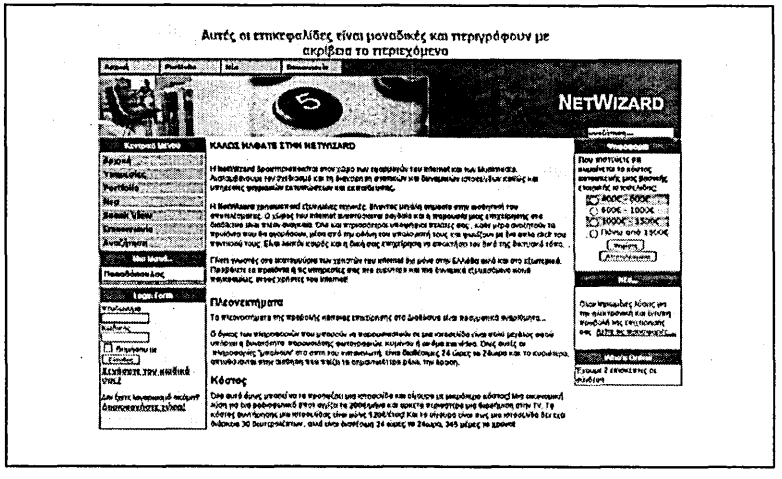
8 Χρησιμοποιήστε Περιγραφικές Ετικέτες πλοήγησης

9 Περιορίστε το μήκος στις σελίδες πλοήγησης

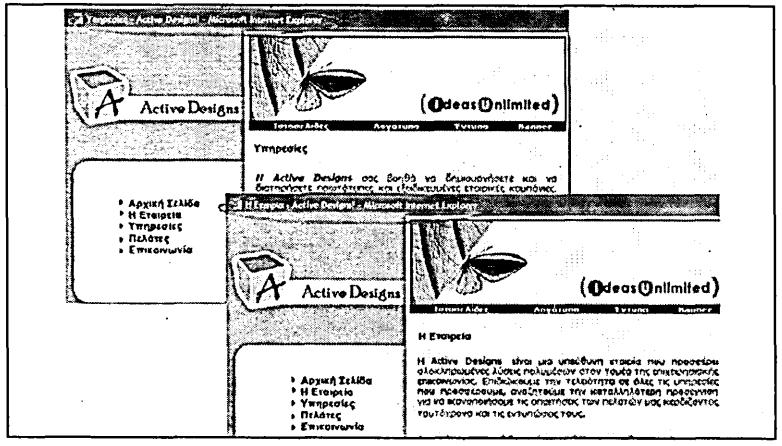
10 Χρησιμοποιείστε μετα-πλοήγηση



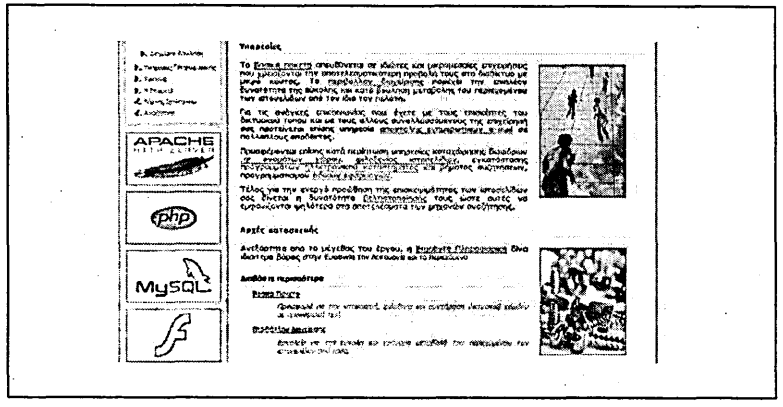
11 Επαναλάβετε το μενού πλοήγησης στο κάτω μέρος



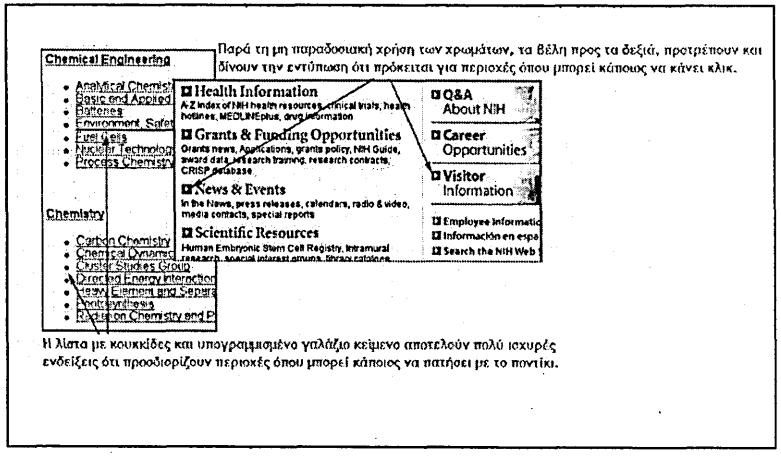
12 Χρησιμοποιήστε μοναδικές και περιγραφικές επικεφαλίδες με έμφαση



13 Δώστε περιγραφικούς τίτλους στις σελίδες



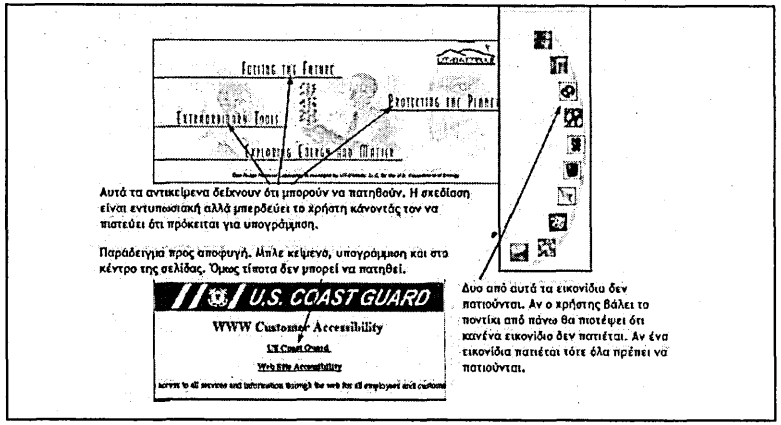
14 Βάλτε δεσμούς εκεί που ο χρήστης θα τους χρειαστεί



Παρά τη μη παραδοσιακή χρήση των χρωμάτων, τα βέλη προς τα δεξιά, προτρέπουν και δίνουν την εντύπωση ότι πρόκειται για περιοχές όπου μπορεί κάποιος να κάνει κλικ.

Η λίστα με κουκκίδες και υπογραμμισμένο γαλάζιο κείμενο αποτελούν πολύ ισχυρές ενδείξεις ότι προσδιορίζουν περιοχές όπου μπορεί κάποιος να πατήσει με το ποντίκι.

15 Εμφανίστε τα στοιχεία που μπορούν να πατηθούν με συνέπεια

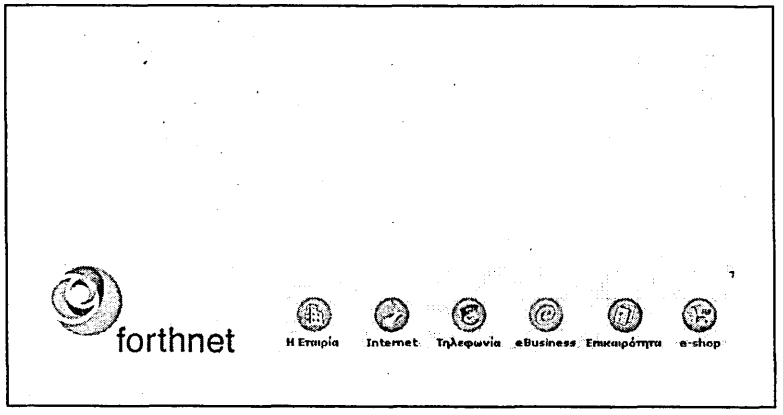


Αυτά τα αντικείμενα δείχνουν ότι μπορούν να πατηθούν. Η σχεδίαση είναι εντυπωσιακή αλλά μπερδεύει το χρήστη κάνοντάς τον να πιστεύει ότι πρόκειται για υπογράμμιση.

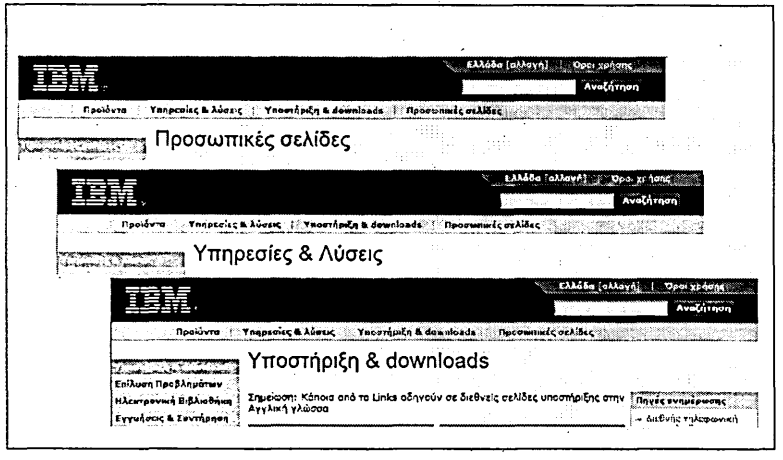
Παράδειγμα προς αποφυγή. Μπλε κείμενο, υπογράμμιση και στο κέντρο της σελίδας. Όμως τίποτα δεν μπορεί να πατηθεί.

Δυο από αυτά τα εικονίδια δεν πατιούνται. Αν ο χρήστης βάλει το ποντίκι από πάνω θα πιστέψει ότι κανένα εικονίδιο δεν πατιέται. Αν ένα εικονίδια πατιέται τότε όλα πρέπει να πατιούνται.

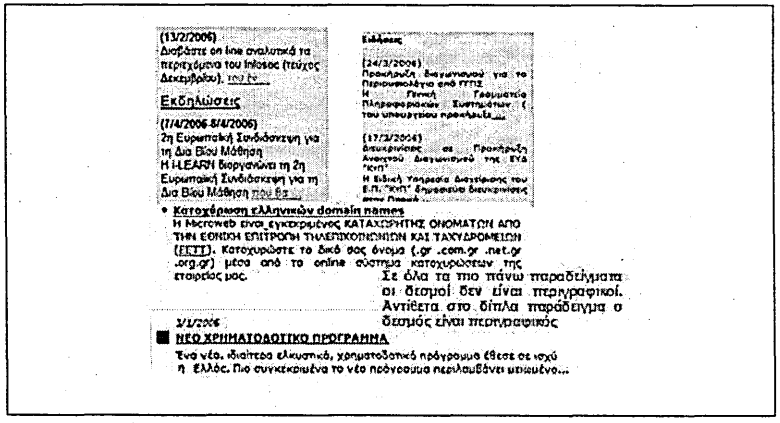
16 Αποφύγετε τις παραπλανητικές ενδείξεις για πάτημα



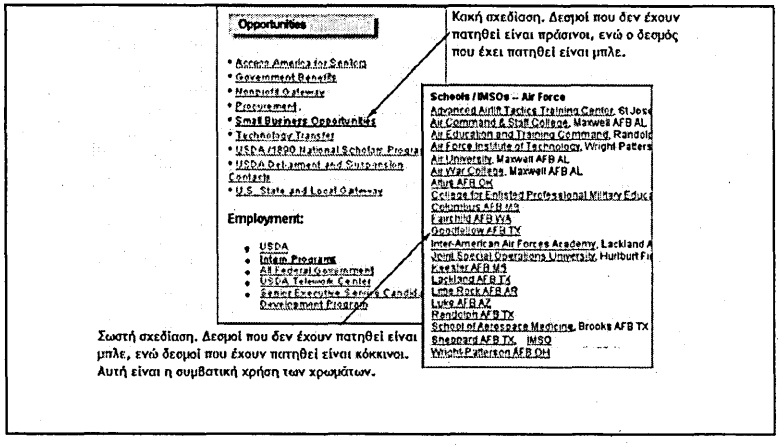
17 Χρησιμοποιείστε και δεσμούς κείμενου μαζί με γραφικά



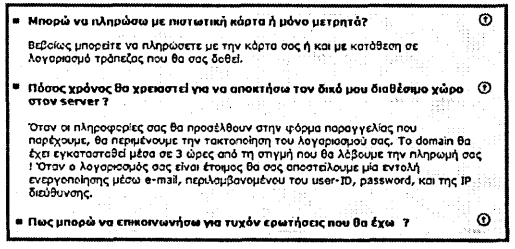
18 Εναρμονίστε τα ονόματα δεσμών με τις αντίστοιχες σελίδες προορισμού



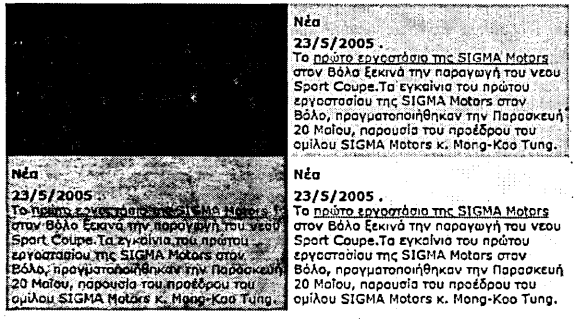
19 Διασφαλίστε ότι οι ενσωματωμένοι δεσμοί κειμένου είναι περιγραφικοί



20 Παρουσιάστε τους δεσμούς που έχουν χρησιμοποιηθεί

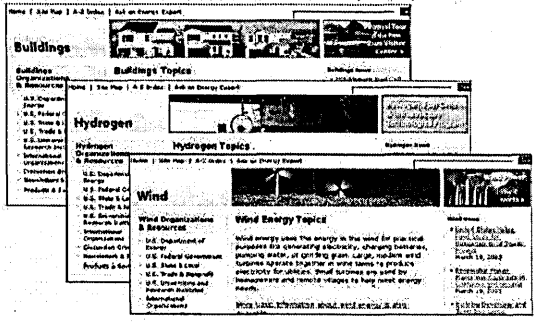


21 Επιτρέψτε στους χρήστες να μεταφέρονται στην αρχή μίας σελίδας

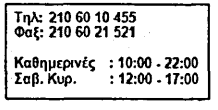


22 Χρησιμοποιήστε Μαύρο χρώμα σε καθαρό και με μεγάλη αντίθεση φόντο

Εκτός από τα γραφικά και την πλοήγηση, οι επικεφαλίδες οι γραμματοσειρές η ομοιομορφία στο κείμενο συμβάλλουν στην καλή οπτική συνέπεια των σελίδων

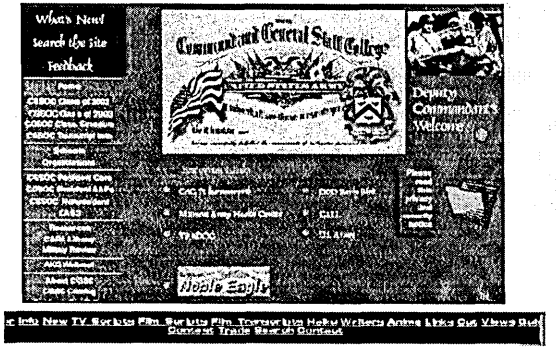


23 Διασφαλίστε οπτική συνέπεια στο κείμενο



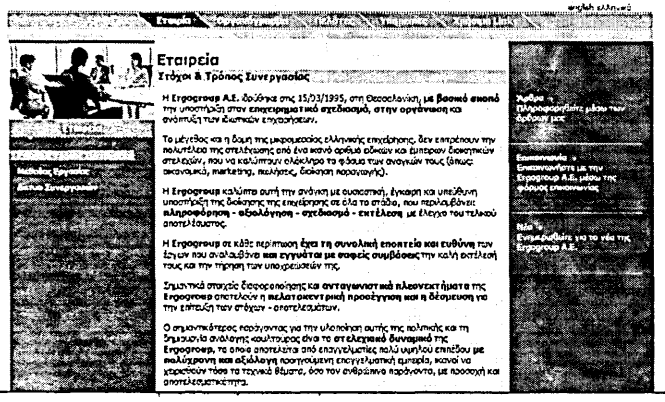
24 Μορφοποιήστε κοινά στοιχεία με συνέπεια

Χρήση ασυνήθιστων γραμματοσειρών μπορεί να μειώσει την ταχύτητα ανάγνωσης



26 Χρησιμοποιήστε κοινές και οικείες γραμματοσειρές

Περιορισμένη χρήση έντονης γραφής τονίζει αποτελεσματικά κάτι το σημαντικό



27 Δώστε έμφαση σε σημαντικά σημεία του κειμένου

28 Χρησιμοποιήστε στοιχεία που ελκύουν προσοχή όταν πρέπει

Αυτό το πρότυπο συστήνει την ΧΡΗΣΗ ΜΙΚΡΩΝ ΚΑΙ ΜΕΓΑΛΩΝ ΓΡΑΜΜΑΤΩΝ ΣΕ ΚΑΝΟΝΙΚΟ ΚΕΙΜΕΝΟ ΓΙΑΤΙ η χρήση κεφαλαίων ΕΠΙΒΡΑΔΥΝΕΙ ΣΟΒΑΡΑ ΤΗΝ ΑΝΑΓΝΩΣΗ

Αυτό το πρότυπο συστήνει την χρήση μικρών και μεγάλων γραμμάτων σε κανονικό κείμενο γιατί η χρήση κεφαλαίων επιβραδύνει σοβαρά την ανάγνωση

29 Χρησιμοποιείστε κεφαλαία και μικρά γράμματα για κείμενο

Φτηνά Πακέτα

Παρέχουμε σε όλους φθηνά πακέτα μεταπώλησης που χωράνε Απειρα domain. Κατασκευάστε τα πακέτα σας και πουλήστε τα. Παρέχουμε δωρεάν control panel (Whm), και ότι δίνουμε εμείς στα δικά μας πακέτα.

Συμβουλές για αρχαρίους

Το internet είναι σαν τη γη. Για να ζήσει κάποιος στη γη χεριάζετε ένα σπίτι. Για να μπορέσει να έχει κάποιος σπίτι πρέπει να βρει πρώτα τη διεύθυνση μετά το οικόπεδο και μετά να το χτίσει.
Το παραπάνω είναι μία παραβολή.
Η διεύθυνση είναι το domain (www.toonomamou.gr) . Πρέπει να αποκτήσετε ένα από τις ορμάδιες υπηρεσίες.
Το οικόπεδο είναι ο χώρος που θα φιλοξενήσετε το site σας. Εμείς παρέχουμε αυτό το χώρο μαζί με όλη μας τη βοήθεια και στο χτίσιμο του site σας αλλά και στη διαχείριση του.
Τέλος η οικοδομή είναι το η ιστοσελίδα σας. Σε περίπτωση που δεν έχετε εσείς σελίδα έτοιμη μπορούμε να σας τη φτιάξουμε σε φοιτητικές τιμές.

30 Χρησιμοποιείστε κατάλληλη στοίχιση για κείμενο

week 51 19 Dec 2002

MEGA TOP 100

		1	2	3
1	robbie williams - feel- Williams/Chambers-Chrysalis/Capitol/EMI-	6	3	1
2	nelly ft. kelly rowland - dilemma- Gamble/Sigler/Haynes-Universal/Universal-	1	8	1
3	c. aquilera ft. redman - dirty- Aguilera/Cameron/Muhammad/Stinson-RCA/BMG-	2	9	2
4	jennifer lopez - jenny from the block- Oliver/deyo-Epic/SME-	4	5	4

31 Μορφοποιήστε με 2 χρώματα τους πίνακες για είναι ευανάγνωστοι

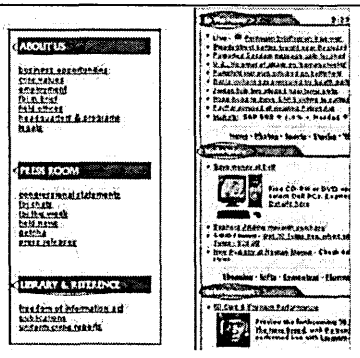
Λίστες με κουκκίδες είναι εύκολες στη αναγνώριση αλλά και στην κατανόηση.

The Office of Data makes available for download
- Annual Production Statistics
- Monthly Production Statistics
- Weekly Production Statistics and
- Quarterly Consumption Projections.

Οι οριζόντιες λίστες όμως δυσκολεύουν πολύ το χρήστη.

The Office of Data makes available for download Annual Production Statistics, Monthly Production Statistics, Weekly Production Statistics, and Quarterly Consumption Projections.

32 Εμφανίστε συναφή στοιχεία σε Λίστες



33 Βάλτε ένα τίτλο σε κάθε λίστα

34 Μορφοποιήστε τις λίστες ώστε να διευκολύνεται η σάρωση & κατανόηση

35 Αρχίστε με κεφαλαίο γράμμα την πρώτη λέξη σε κάθε γραμμής της λίστας

Appendix 5.3: Metrics and scoring details

The metric summary is repeated here as well in order to provide a full and clear picture of each metric

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Metrics for evaluation

1. Metrics for Home Page

There are two patterns in this dimension: Home Page Link and Home Page Length.

1.1. Home Page Link

Metric Code: M06_N5
Guideline: Enable Access to the Home Page
Pattern: Home Page Link

Scoring

All pages of the site, including the home page, should be examined for a link to the home page. Also examine, apart from the main navigation bar, any other way providing access to the homepage, like separate link labels indicating "Home". The other 2 extra pages that students did not work on should not be considered into the scoring process. Score=4 points, if a link to Home page exists in every page, 2 points if exists on 2 pages, 1 point if a link exists on only 1 page and finally 0 when there is no such link.

Metric summary

Metric Code: M06_N5

Criteria: Is there a home link on every page? Do they use the logo as a link to Home Page? Or any other appropriate labels (e.g. "Home")?

Protocol
Review all pages and check if there is a home link on every page. The Home Page itself should count as one of the pages.
Scores
If a link to Home Page exists on every page then score=4 points; on 2 pages score=2 points; on any 1 page score=1 points; otherwise score=0 points.

Total max score=4 points.

1.2. Home Page Length

Metric Code: M05_N4
Guideline: Limit Home Page Length
Pattern: Home Page Length

Scoring

The home page should be shorter than the initial page given to the students. Home page was intentionally made long in order for students to eliminate the unnecessary white space. However, it should be noted that students can not eliminate text or pictures to this effect.
The home page consists of 3 columns. The left one is for the navigation and therefore should not be inspected since only the navigation bar will be presented there. In the central and the right column there are extra empty paragraphs or line breaks which were used to create empty space at the top, the bottom and in between the text or the images. Each column gets a maximum of 3 points: 1 for eliminating paragraphs at the top in the middle and at the bottom of each column. Note that you can exercise your discretion on this scoring and that one paragraph or some space at the bottom of the page could be allowed. The score depends on the final outcome and not judged merely on eliminating every possible line break or paragraph.
Note that shortening the Home page eliminates white space of the page and that scoring of this metric could be taken into account for metric M18_T8.

Max score=2 columns * 3=6 points

Metric summary

Metric Code: M05_N4
Criteria: Is home page appropriately short? **Protocol** Check the length of the home page. Has the designer made an effort to limit its length? Note that some space can be allowed at the bottom of each column. **Scores** On the central column give 1 point for eliminating space at the top, 1 point at the bottom and 1 between content. The same applies to the right column as well. **Total max score=2 columns*3=6 points.**

2. Metrics for Page Layout and Design

There are three metrics in this dimension, corresponding to the following three patterns: Consistent Important Items, White Space and Item Alignment.

2.1. Consistent Important Items

Metric Code: M01_C1
Guideline Pattern: Place Important Items Consistently
Consistent Important Items

Scoring

The metric is further divided into 2 submetrics: M01a_C1 and M01b_C1.

Submetric Code: M01a_C1

Navigation bars should be consistent with regards to their position and the organization of buttons within each page of the web site.

For position: Check the 3 pages for the position of the main Navigation Bar. Navigation Bars should not move while viewing every page on the site. The designer gets 4 points if all navigation bars are exactly in the same place or 3 points if there is a small error-movement. If 2 Navigation Bars are in the same place score=2, if there is a slight movement score=1 and finally, if there is a noticeable movement, score=0. If there is more than one navigation bar then take into account the one that gets the worse score. Max score=4 points.

For buttons: All buttons in the navigation bars should be organised and matched on all pages Follow the same procedure but now check for changes in the order of buttons within the navigation bar from page to page. Score=4 points, if there is no change, or score=2 if there is a change in one navigation bar, or score=0 if there is no match in the buttons of navigation bars. Max score=4 points.

Max score for the submetric=4+4=8 points.

Submetric Code: M01b_C1

Check if the site is consistent in layout. Focus mainly on the top of the page, the graphics-images, the Logo, the headings and the general layout of each web page. Don't check for consistent items at the bottom of each page since other factors (text and graphics) affect consistency. Also note that all designers did not follow a predetermined or unique approach of design at the bottom of each page. For example, the repeated menu was not placed at the bottom by everyone and one cannot judge consistency for this element if it is not there in all designs. The logos, the headings and the general layout of each page are the items you should check for evidence of consistency.

Logos and images at the top of the page: The designer should have produced 3 pages with the logo being at the same place. The logo, ideally, should be enlarged in order to fill completely the top of the page, but this is not a necessity. Also note that one or two images could be used as logos provided there are placed in the top row of the page. Check for consistency in the logo area for evidence that the designer has made an effort to put images at the same place. A little movement that novice designers sometimes can not control is allowed. Score=3 points if there is no movement at all or an extremely small one that is unnoticed to the casual visitor. Score=2 points for noticeable but not disturbing movement, and finally 0 when logos in the 3 pages are not in the same place. Max score for logos and images=3 points

Headings: Check the page headings on all 3 pages. They should be in the same place when someone visits the pages one after the other. Score=3 points if all headings are in the same place. 2 points if two of

them are in the same place i.e. the designer made an effort to achieve consistency, and 0 if there is a noticeable movement of all headings. Some of the designers did not provide a heading on all or some pages. To judge consistency in this case, check for other signs of consistency or for other sub headings on the top of the page. Max score for headings=3 points

Overall page layout: Check the pages for the overall impression of consistency that a user will have by visiting the 3 pages one after the other. Determine the score by checking if there is a noticeable change in the template that the site is based on. This is done by looking for changes in the width of each column. Do not take into account existing elements in the columns, since the three pages have a different purpose and they do not share similar elements. Pages are allowed to change colour for the same reason, i.e. the purpose of each one is very different than the other. Score=3 points if the layout is consistent, or 2 points if there is a small violation, or 1 point if the inconsistency is noticeable, and finally=0 points if there in no consistency at all. Max score for overall page layout=3 points

Max score for submetric=Logos+Headings+Page layout=3+3+3=9 points.
Max score for the metric=sum of 2 submetrics=9+8=17 points

Metric summary

Metric Code: M01_C1

Criteria: Is the site consistent in layout? Mainly top of page?
The metric has 2 submetrics:
M01a_C1 refers to consistency in navigation bars.
M01b_C1 refers to consistency in other page elements and the general layout.

Submetric: M01a_C1

Criteria: Navigation bar is placed in a consistent way within every page of the site. Are buttons organised and match on all pages?

Protocol
Check the navigation bars on all 3 pages for position and organization of buttons.
Scores
Scores for position: score=4 points if all navigation bars are in exactly the same place without any movement; score=3 points if there is a very small movement or mistake; score= 2 points if 2 navigation bars are in the same place; score =1 point if there is some movement; score=0 points if there is no consistency at all.
Scores for buttons organization: score=4 points if there is no change; score=2 points if there is a change on one bar; score=0 points if there is no consistency at all.

Max score for the submetric=4+4=8 points.

Submetric M01b_C1

Criteria: Is the site consistent in layout? Mainly top of page and graphics?

Protocol
Determine the consistency of logos and image at the top each page.
Scores
Score=3 points if there is no movement; or 2 points for noticeable but not disturbing movement; or 0 points when logos in the 3 pages are not in the same place. Max score for logos and images=3 points.
Check the consistency of page headings on the 3 pages. Page headings should be in the same place when someone visits the pages one after the other. Score=3 points if headings are in the same place; or 2 points if 2 of them are in the same place; or 0 points if there is a noticeable movement of all headings. Max score for headings=3 points.
Check the pages for the overall page layout impression: Determine the score by checking if there is a noticeable change in the template that the site is based on and by looking at changes in the width of columns. Score=3 points if the layout is consistent; score=2 points if there is a small violation; score=1 points if the inconsistency is noticeable; score=0 points when there in no consistency at all. Max score for overall page layout=3 points.

Max score for the submetric=3+3+3=9.

Total max score=8+9=17.

2.2. White Space

Metric Code: M18_T8
Guideline: Use Moderate White Space
Pattern: White Space

Scoring

This metric is related to metric N4_ since both are measuring the amount of white space on the page.
The following directions will provide guidance for determining the score for the specific page:
Page 1: Using the directions for scoring for metric N4_HoPaLen decide a score for the Home Page. Use your judgement to check if the designer has eliminated white space. Sometimes although the page is not long, white space still exists. Max score=6

Page 2: The page consists of 3 columns. The left one should not be inspected since there is nothing to take into account there (unless someone has done something unpredictable) in which case subtract 1 from the score. Check the top, the centre and the bottom of the rest of the 2 columns. For each of these places check for evidence that the designer tries to eliminate any white space that is there intentionally or made by him in the process of design. However do not check the bottom of the central column since any white space there is usually caused by the excessive text on the right column. Hence, the maximum score for this page is: 5 places *1 point=5 points

Page 3: Check only the central column, at the top, at the centre among the paragraphs of the text, and at the bottom of the central column. Examine for evidence that the designer has eliminated any white space that is there intentionally or introduced by him during the process of designing. If the length of the page is less than one screen use your discretion to judge white space. Max score = 3 places *1 point=3 points

Limitation of the experiment design: On the News page, in the right column text is disproportionate to the content of the central column of the page and probably the designer can not balance both columns on the page. For this reason white space at the bottom of the central column does not contribute to the score.
Max score=Page 1+Page 2+Page 3=6+5+4=14 points

Metric summary

Metric Code: M18_T8
Criteria: Use moderate white space on the pages; Page utilizes space– no "white space". Use white space to visually organize the page. **Protocol** Check each page for the right amount of white space. **Scores** Check for correct application of white space at the places indicated below. White space should not be excessive and the designer should have eliminated white page that was introduced on purpose. But, if white space is too little, no score should be given. Give 1 point for the correct amount of white space at each of the places described below. Page 1: Check central (top, middle, and bottom) and right columns (top, middle, and bottom). Max score=6 points. Page 2: Check top, middle and bottom of remaining 2 columns and only the bottom of the right column. Max score=5 points. Page 3: Check only the central column at the top, the middle, and the bottom. Give 1 point for each correct application of white space. Max score=3 points. **Total max score=Page 1+Page 2+Page 3=6+5+3=14 points.**

2.3. Aligned Items

Metric Code: M19_D2
Guideline: Align Items on a Page
Pattern: Item Alignment

Scoring

Each of the three pages scores a maximum of 3 points; if there is a small violation score=2 points; and if there is a major violation score=1 point or even 0 point.
Page 1: Check the right and centre column for any misaligned text and pictures. Then focus on the right column. The heading there was, on purpose, aligned right so that designers should work on alignment.

Pictures should be properly aligned with each other, and the same holds for text. Use your judgement to consider as misalignment anything that violates the principle. Note that centred alignment of text is allowed in columns that are not wide. Also everything aligned to the left or to the centre is not considered to be a violation unless there are other reasons. Also use of bullets is not in itself a violation. Score 3 points for a properly aligned page. Subtract 1 point for any misalignment. Max score=3 points.
Page 2: Check all three columns of the page. Left column: The 2 pictures there were on purpose misaligned. Do they have the same alignment? Are the two paragraphs aligned in the same way? Centre column: Headings and text should be properly aligned. Also, the 2 pictures at the bottom of the page should be either aligned left, or centre, or right but they should have the same vertical alignment with each other. Right column: Headings and text should be properly aligned. Max score=3 points.
Page 3: Look mainly at the central column for violations of the principle. Similar elements should be aligned the same. Max score=3 points.
Note that: The 2 pictures in the centre column should be judged only if they are not horizontally aligned.
Max score=3 pages* 3=9 points.

Metric summary

Metric Code: M19_D2
Criteria: Is alignment used effectively? For text and pictures? Is alignment applied?
Protocol Check for alignment violations within the columns of each page. **Scores** Page 1: Check the right and centre columns first. On the right column the heading should be properly aligned. Pictures should be properly aligned with each other, and text as well. Use your judgement to consider as misalignment anything that violates the principle. Score=3 points for a properly aligned page. Subtract 1 point for any misalignment error. Max score=3 points. Page 2: Check all three columns. On the left column, the 2 pictures should be aligned; also the two paragraphs. On the centre column the headings, text and pictures at the bottom of the column should be properly aligned. On the right column headings and text should be properly aligned. Max score=3 points. Page 3: Look mainly at the central column for violations of the principle. Similar elements should be aligned the same. Max score=3 points. **Total max score=3 pages*3=9 points.**

3. Metrics for Navigation

There are three patterns and consequently three metrics in this dimension. The patterns are: Users' Location, Descriptive Tab Labels and Repeated Menu.

3.1. Location Indication

Metric Code: M04_N9
Guideline: Provide Feedback on Users' Location
Pattern: Users' Location

Scoring

Each page scores from 0 to 3 points. There are several ways to indicate the location of the user.

1) If there is a page title the page scores 2 points.
2) If there are indications on the navigation menu, score=1 or 2 points depending on how clear the visual indication is.
3) If the location is based on a matching link in the navigation bar to the destination page's heading: score=3 points if both label and headings are matched and are in Greek; or 2 points if one is Greek and the other English (e.g. "Home page" or "News" is not clear to non-English speaking visitors); and finally 1 point f they are both in English or written with English characters. If the score is based on this criterion use your personal judgement to determine how clear the current location is indicated.

There are other metrics M13_D4 (Page Titles) and M12_T9 (Nice Headings) that affect this metric.

Metric summary

Metric Code: M04_N9
Criteria: Are you able to determine your current location within the site? Is there a clear location indication? **Protocol** Review all pages and check if there are clear indications of the visitor's location. Each page scores from 0 to 3 points. **Scores** Determine the score for each page using the following criteria: If there is a clear page title, then score=2 points; if the navigation menu indicates location, then score=1 or 2 points depending on how clear the indication is; if in the navigation bar there are matching links to the headings of the page, then score=3 points for an exact match, or score=2 points if label and heading are matched but using different alphabets; score=1 points if both are English; score=0 points otherwise. Exercise your personal judgement to determine how clearly the current location is indicated, and decide the score of the page. If more that one of the above criteria is applicable, choose the one resulting in the maximum score. **Total max score=3 pages*3=9 points.**

3.2. Descriptive Labels

Metric Code: M02_N3
Guideline: Use Descriptive Tab Labels
Pattern: Descriptive Tab Labels

Scoring

Apart from the 3 pages that should be included in the main navigation bar, the addition of two more pages was necessary by the requirements of the design test. This meant the addition of two buttons and the associated labels in the navigation bar. One button should be linked to a page about the educational programmes and seminars of the company; the other one should be linked to the technical help and support to the company's customers. The pages were described in such a way so that the designer should provide his own descriptive labels.
Some of the labels that designers provided were written using the English alphabet (e.g. Instead of writing "Νέα" the label was written using the English alphabet like "Nea". (The meaning of "Νέα" is News).This problem would not have arisen if the students were English or the site was presented in English.

Submetric M02a_N3: Review the labels in the main navigation bar. There should be 5 labels. If all labels are in Greek then score=4 points; if one of them has the label Home and the rest Greek score=3 points; if 2 labels are in English score=1 point; otherwise score=0.
Max score=4 points.

Submetric M02b_N3: Add 1 point to the previous score, for each label which is in Greek and the label is descriptive, that is, it indicates very clearly the destination page that the button is linked.
Total score=5 points.
Total maximum points=9 points.

Metric summary

Metric Code: M02_N3
Criteria: Are the navigation labels clear and descriptive? Navigation is user-friendly? **Protocol** Review all labels of the main navigation bar. **Scores** There are 5 labels. If all of them are in Greek, score=4 points; or if one of them is labelled "Home" and the rest are in Greek, score=3 points; if 2 labels are in English, score=1 points; otherwise score=0 points. Max score=4 points. To the above score add one point for each Greek label that is descriptive of the page that the link points to. Max score=5 points. **Total max score=5+4=9 points.**

3.3. Repeated menu

Metric Code: M03_N6
Guideline: Repeat navigation at the bottom of the page
Pattern: Repeated Menu

Scoring

Review all pages and check if the main navigation is repeated at the bottom of the page. The navigation should be repeated even in short pages, where the uses may have access to the navigation menu, in order to be consistent with the other long pages.
Each page that has a repeated menu at the bottom scores 3 points otherwise 0 points. Meta navigation should not be considered as navigation and scores 0 points. Also note that the format (fonts, labels, etc) of the menu is irrelevant.
Max score=3 pages*3=9 points

Metric summary

Metric Code: M03_N6
Criteria: Duplicate Navigational Items at the bottom of your pages. Is the navigation bar repeated at the bottom of the screen? **Protocol** Review all pages and check if there is a repeated menu at the bottom of the page. The format and the presentation of the menu are irrelevant; however, a meta-navigation bar does not get any points. **Scores** If there is a menu at the bottom, the page scores 3 points; otherwise 0. **Total max score=3 pages*3=9 points.**

4. Metrics for Headings, Titles and Labels

There are two metrics in this dimension, corresponding to the following two patterns: Nice Headings and Page Titles.

4.1. Headings

Metric Code: M12_T9
Guideline: Use Unique, Descriptive and Emphasised Headings
Pattern: Nice Headings

Scoring

The user should provide unique, descriptive and properly emphasised headings for all pages. All the main headings for all pages were missing and the designer should have provided headings. Also existing headings that were initially included should be properly emphasised. Finally existing text that serves as heading and was included on the pages should be emphasised. Note that in general there was no requirements for the designers to provide headings apart from page headings, although some of the designers added extra headings.
The metric contains 2 submetrics. Submetric M12a_T9 refers to the designer providing unique and descriptive heading whenever necessary. Sub metric M12b_T9 refers to all the headings being properly emphasised.

Submetric M12a_T9
The user should provide a page heading on each page. The page heading could be placed anywhere, as long as is it in on the top part of the page. The heading should be descriptive of the purpose and the content of the page.
Scoring: For each page determine the score: if the heading is in Greek and descriptive of the purpose of the page then the score is 3 points; or 2 points if the heading is not descriptive. If the heading is in English or written in English characters the score is 1 points; therefore "Home page", "contact" and "news" score 1 point. The score is 0 if the designer did not provide any heading at all.
Maximum score=3pages* 3=9 points.

Submetric M12b_T9

Every heading in the text should be properly emphasised. If the heading was not provided by the designer or is missing there are no points for the specific heading. The font style (bold, underline, italic etc) of the heading should not be the same as the text following the heading.

Scoring: Emphasis can be given to headings, by using greater size font, bold, different colour and background (or any combination of them). If the designer made the heading a link, by using only underlined and blue colour text this is not considered as properly emphasised. If you do not agree with the above suggestions use your judgement to consider when a heading is emphasised and distinguishable from the rest of the surrounding elements; however, make sure your criteria remain the same across every site. Scoring depends on the specific structure of the page and the number of headings within each page.

Page 1: The maximum score is 2 points that is 1 for the main heading that the designer provides and one for the heading in the right column ("Web Creations").

Page 2: Give one point for each heading properly emphasised. There should be one main heading in the centre column, one in the left and at least two in the right column (depending on the designers' formatting). The mandatory heading in the left column is "More products" ("Αλλα Προϊόντα"). The mandatory headings for the right column (those that were provided on purpose) are "Magazine Infoistos" and "Latest News" ("Περιοδικό Infoistos" & "Τελευταία Νέα").

Page 3: Give one point for each heading properly emphasised. There should be one main heading and two or more in the centre column (depending on the formatting). If the designer formatted the text using a table exercise your discretion to allocate points.

Max score=Page1+page2+page3=2+4+3=9 points.

Final score for the metric: Take the average of the 2 sub metrics.
Max score=9 points.

Metric summary

Metric Code: M12_T9

Criteria: Are the headings provided unique, descriptive and properly emphasised?

Protocol

Review all pages and check the existence of unique and descriptive headings; check also that headings are properly emphasised.

Submetric M12a_T9 for providing unique and descriptive headings

Scores

Score=3 points, for each page, if the heading is in Greek and also descriptive; score=2 points if the heading is not descriptive but still in Greek. If the heading is in English or written in English characters, then score=1; finally score=0 points if the heading is missing.

Max score for submetric=3pages*3=9 points.

Submetric M12b_T9 for emphasising the headings

Protocol

Check every page for properly emphasised headings. The designer should provide the main heading of each page.

Scores

Page 1: Score=2 points, that is, 1 point for the main heading and 1 point for the heading on the left column. Max score=2 points.

Page 2: Give 1 point for each heading properly emphasised. There should be one main heading, one heading on the left column and at least two on the right column. Max score=4 points.

Page 3: One point for each heading properly emphasised. There should be one main heading and 2 or more headings on the centre column (depending on the designer's formatting). If the designer formatted the text using a table, use your discretion to allocate points. Max score=3 points.

Max score for submetric=page1+page2+page3=2+4+3=9

Take the average of the 2 sub metrics
Total max score=9.

4.2. Page Titles

Metric Code: M13_D4
Guideline: Provide Descriptive Page Titles
Pattern: Page Titles

Scoring

This metric affects M04_N9 since providing page titles helps the user know his location.
The pages were given to the designers with titles that should be changed (the initial page titles were "index", "nea", "doc1") and were totally non descriptive and not providing any information about the purpose of the page. For each changed title give: 3 points if the page title is in Greek and descriptive; 1.5 points if the page title is not descriptive or is presented in English; and finally 0 points if the page title was not changed at all.
Max score=3 pages * 3=9

Metric summary

Metric Code: M13_D4
Criterion: Browser Page Title describes the page. **Protocol** Review all pages and check if there is a page title for each page. The Page Title should be different from the one initially given to each page. **Scores** If the title is descriptive and in Greek, score=3 points; if the title is in English, score=1.5 points, and finally, score=0 if there is no change in the page title. **Total max score=3*3 pages=9.**

5. Metrics for Links

There four metrics in this category correspond to the following four patterns: Properly Placed and Descriptive Links, Obvious Links – Consistent Cues, Clickable Images and To the Top Link.

5.1. Links

Metric Code: M07_L1
Guideline: Provide links where the user may need them
Match Link Names with Their Destination Pages
Ensure that Embedded Links are Descriptive
Designate Used Links
Pattern: Properly Placed and Descriptive Links

Scoring

There are 3 metrics one for each guideline in this metric (apart from guideline "Designate Used Links").

Metric M07a_L1 for guideline "Provide links at the precise point the user may need it"
Text was embedded, at certain places into the prefabricated pages, to imply the existence of a link in that place. Designers should be able to recognise where users might feel the necessity for a link.
Page 1 Right side bar: There are 3 images. The text above and below the images suggests that visitors can visit sample pages of the company's customers. Also the text at the bottom implies the presence of a link within the text. Therefore all pictures and the text below should be made links. Designers were not allowed to provide extra text to accompany the images. Allocate 1 point for each link. Max score=4 points; one for each link provided.
Page 2 Left column: There should be two links; either the images or the text or both of them should be made links. Consistency of these links is measured by another metric. Score=1 for each link provided by the designer in any form (using images, text, or both). Max score=2 points.
Page 3 Centre Column: The two e-mail addresses should be made links so that visitors could send e-mail easily to the company. Max 2=points.

Total max for the sub metric=4+2+2=8 points

Metric M07b_L1 for guideline "Ensure that Embedded Links are Descriptive"

Page 2 Left Column. The column has two paragraphs that could be made links however the designer has the choice to select only the images as links and therefore was not included in the score for the metric.
Page 2 Centre There should be 5 links, one for each paragraph. An evaluator has 2 options here: to apply the rule very strictly and to ask for fully descriptive sentences, or to be more relaxed and demand smaller sentences of 2–4 words. Dates are not considered to serve as descriptive links. However, apart from this rule, use your own judgement to an rational approach in determining what constitutes a descriptive link. Max score for the column 5 points.
Page 2 Right Column: This column should have 7 links i.e. 4 links in the magazine section (top of the column) and 3 links in the bottom section of the column (News section). The introductory heading in each paragraph or the sentence "Τεύχος...:" or even the whole paragraph should be considered as a descriptive heading. If something else was made a link, a careful examination of the link, as to whether is descriptive, is required. Each evaluator's approach as to what is considered descriptive link differs from evaluator to evaluator. Finally, the sentence "Γίνεται συνδρομητής ..." should be made link as well. Give 1 point for each link that is considered descriptive and 0 points otherwise. Max score=7 points
Max score=5+7=12 points.

Metric M07c_L1 for guideline "Match Link Names with their Destination Pages".

This principle can only be applied, in the present design task, to the buttons in the navigation bar. All other links were associated with a dummy page, included on the site and therefore were not offering the opportunity to the designers to use matched names. This metric is closely associated with metric M02_N3 (Use Descriptive Tab Labels), however here the close matching between links and destination is examined regardless of the issue of the labels being descriptive or not.
For each page determine if there is a match between the link and the destination page (heading). If there is an exact match regardless of the actual meaning or language of the label score=3 points; give points as well to a very close match between link name and page heading. ("Home" matches with "home page" or "Αρχική" with "Αρχική Σελίδα"); otherwise score=0 points.
Max score=9 points.

Overall score for the group of metrics: Rescale each of 3 submetrics and take the average.

Metric summary

Metric Code: M07_L1

There are 3 submetrics.
M07a_L1 for guideline Provide Links where the user may need them.
M07b_L1 for guideline Match Link Names with Their Destination Pages
M07c_L1 for guideline Ensure that Embedded Links are Descriptive
There is no metric for guideline Designate Used Links.

Submetric Code: M07a_L1

Criteria: Are links provided at places where user needs them?

Protocol
Designers should provide links at the place where users might feel the necessity for a link.
Scores
Page 1 right side bar: there are 3 images and also the last text paragraph that should be linked to web pages. Allocate 1 point for each link. Max score=4 points.
Page 2 left column: there should be 2 links; the existing images or the text or both should be made links. Score=1 points for each link provided by the designer in any form (using images, text, or both). Max score=2 points.
Page 3 centre column: the two e-mail addresses should be made links. Max score=2 points.
Max for submetric=4+2+2=8 points.

Submetric Code M07b_L1

Criteria: Are the names of the links understandable and meaningful?

Protocol
Are the names of the links understandable and meaningful?
Scores
Page 2 left column: Designers had the choice to make either text or images into links. Therefore any text links should not be included in the score for the metric. Page 2 centre: There should be 5 links, one to each paragraph. Text links should be descriptive but this is a very subjective matter. Use your personal judgement to evaluate the links, but make sure you apply the same criteria across all the designs under examination. Max score=5 points.
Page 2 right column: This column should have 7 links, i.e. 4 links in the magazine section (top of the column) and 3 links in the bottom section of the column (news section). Each link that is considered descriptive gets 1 point; otherwise score is 0 point. Max score=7 points.
Max score for submetric=5+7=12 points.

Submetric Code: M07c_L1

Criteria: Do the names of the links match the destination?

Protocol
This principle can only be applied, in the present test, to the buttons in the navigation bar.
Scores
For each page determine if there is a match between the link and the destination page (heading). If there is an exact match regardless of the actual meaning or language of the label, then score=3 points. Give the same score for a very close match ("Home" matches with "home page" or "Αρχική" with "Αρχική Σελίδα".) Otherwise score=0 points.
Max score for submetric=9 points.

Overall score for the group of metrics: rescale each of 3 submetrics and take the average.
Total max score=9 points.

5.2. Cues to Click

Metric Code: M08_L2
Guideline: Provide Consistent Clickability Cues
Avoid Misleading Cues to Click
Pattern: Obvious Links - Consistent Cues

Scoring

Two submetrics were used.

Sub metric M08a_L2
Check for places where there are groups (2 or more) of images. Determine if all pictures/images that are in the same place are links or not. Consistency is measured if all the images are links or none of them are. In the text 3 groups of pictures were provided.
Page 1: In the right column there is one group consisting of 3 pictures.
Page 2: In the right column there is one group of 2 images and in the centre column another group of 2 images.
Page 3: There are no images to check.
For each group of pictures assign 3 points if all of them or none of them are made links, otherwise score=0 points.
Max score for submetric=9 points

Sub metric M08b_L2

Check all pages for misleading cues within text. Links usually should be underlined and in blue. Underlined text that is not a link should be avoided and constitutes a violation of the principle even in headings (but not in buttons or navigation bars). Check every page for underlined text and count the occurrences of underlined text that is not a link.
In effect the evaluator should check if there is underlined text that the user may consider it as link, especially if underlined blue text is actually a link. Every student mande blue underlined text as a link. Therefore only underlined text that was not a link is considered as error.
Determine, for each page, the number of times that an underlined text is not a link (including headings). For each page, if this number=0 then score=3; otherwise score=0.
Max score for submetric=3 pages*3=9 points

Metric summary

Metric Code: M08_L2

The metric has 2 submetrics.
M08a_L2 refers to misleading clues in images.
M08b_L2 refers to misleading clues in text.

Submetric M08a_L2

Criteria: Is the navigation instantly perceived as navigation (Images)?

Protocol
Review all pages and check for misleading cues to click on images and texts. Check places where there are groups (2 or more) of images. Determine if all pictures/images are links or none of them is. Consistency is ensured if all the images are links or none is. In the web site there were 3 groups of pictures.
Scores
Page 1: in the right column there is one group of 3 pictures.
Page 2: in the right column there is one group of 2 images and in the centre column another group of 2 images.
Page 3: there are no images to check.
For each group of pictures assign 3 points if all of them or none of them are made links; otherwise score=0 points. Max score=9 points.
Max score for submetric=9 points.

Submetric: M08b_L2

Criteria: Is the navigation instantly perceived as navigation? Underlined text?

Protocol
Check pages for misleading cues within text. Links, usually, should be underlined and in blue. Check every page for underlined text and count the occurrences of underlined text that are not links.
Scores
Determine, for each page, the number of times that an underlined text is not a link (including headings). For each page, if this number=0, then score=3; otherwise score=0.
Max score for submetric=3 pages*3=9 points.

Total max score=average of two submetrics=9.

5.3. Clickable images

Metric Code: M09_L8
Guideline: Use Text for Links and Clickable images
Pattern: Clickable Images

Scoring

Two small images were placed on the second page of the web site to be designed by students. It was, on purpose specified, in the requirements of the design test, that these images should be made links to appropriate sites or to the dummy web page that was provided to serve as a dummy destination page for any link. The designer should make links to the appropriate web page to function and at the same time he should put appropriate small text labels indicating the meaning or the destination of the link.
Check if there are any labels – a small amount of text next to the 2 images making clear the link's destination or the expected response of the link. Give 2 points, for each image that is appropriately labelled.
Max score=4 points.

Metric summary

Metric Code: M09_L8

Criteria: Do labels accompany each clickable image?

Scores
Check if some explanatory text or label has been used to indicate the meaning of the 2 clickable images. Score for each image=2 points; otherwise 0. Max score =2*2=4 points.

Rescale score.
Total max score=9 points.

5.4. To the Top Link

Metric Code: M10_L5
Guideline: Allow Users to Go Back to the Top of the Page
Pattern: To the Top Link

Scoring

Check every page for a link that allows users to move to the top of the page, where the navigation is. If there is such a link, the score for that page is 3 points otherwise 0 points. Although, sometimes, the page is short and can easily fit into one screen the page should have a link to the top in order to be consistent to the other long pages of the site. The web site of the design test had at least 2 pages which could not be shorten enough to fit within one screen.
Max score=3 pages*3=9 points

Metric summary

Metric Code: M10_L5

Criteria: Are there links to the top of the page placed at the bottom or at regular locations down the page? Back to top links?

Protocol
Review all pages and check if there is link to the bottom of the page on every page.
Scores
If link to the top of the page exists on each page, then score=3 points; otherwise score=0 points.

Total max score=3pages*=9 points.

6. Metrics for Text and Typography

There are four patterns in this dimension: Consistency in Text, Visible Text, Emphasised elements and Aligned Text.

6.1. Consistency in text

Metric Code: M14_T1
Guideline: Ensure Visual Consistency in Text
Format Common Items Consistently
Use at Least 10-Point Font
Use Familiar Fonts
Pattern: Consistency in Text

Scoring

There are 4 metrics one for each guideline in this metric.
Guidelines "Use at Least 10-Point Font" and "Use Familiar Fonts" were used by all designers; there were no violations of the principles, therefore each student is given a score of 9 for each guideline. These guidelines were easy to score. A violation of a guideline would result in 0 points for the particular page otherwise the score should be 3 points.

Metric M14a_T1 for Guideline Ensure Visual Consistency in Text
The metric contains 3 sub metrics: M14a1_T1 refers to the headings, and the subheadings, M14a2_T1 refers to the font used and finally M14a3_T1 to the colour used for text.
Submetric M14a1_T1
Check for consistency in text among heading and sub headings. Check for consistency in text alignment and in fonts in every column within a page. Check for violations of consistency in the font colour and the text background.
Check page headings and subheadings within each page.
Check the page headings. They should be formatted in a consistent way and the same font style (The following are considered to play a role in the formatting of heading and subheadings: font, size, colour, underline, italic, background colour, etc.) Also check for consistency in the column headings and the sub headings within the text. Headings in the same page should be consistent.
The page headings are allowed to be formatted using a different font family than the text of each page. Any other headings and sub headings should normally be presented using the same font with the main text (Times, Verdana, etc.).
Also, some headings, that are prominent and possibly at the top of the page, should be consistent between two different pages as well, especially if there are at the top of the page and catch the user's eye when he moves from one page to the other. However, this depends on the way the 2 pages are presented to the user. In the current design test, check the two headings "Web Creations" and "Περιοδικό Infoistos"; exercise your personal judgement to determine consistency between these two headings.
Score=4 points if there is an exact consistency. Subtract one point for each error in the page headings, and the subheadings and more points if there are more serious errors. Also if any labels or navigation bars are made using text at the bottom of the page should be checked. Since many students didn't work on page 2 in the left column and did not format the sentence "Αλλα προϊόντα" as a sub heading do not take the format of that heading into consideration. Max score=4 points.

Submetric M14a2_T1
Check for text consistency (font) in every page. Alignment of text was examined elsewhere using the relevant metric. A designer is allowed to use smaller or larger text size, but it is preferable to use the same font family even only for aesthetic reasons. Except for colour and background, check text for consistency with regards to all attributes (font, size, bold italic, and underline). This includes spacing of the text as well.
Score=4 points if there is a perfect consistency. Subtract one point if there is an inconsistency (unjustified change of style, underline, font family, etc.) in one place (place is considered to be a column within a page). Therefore, a wrongly formatted column, although it may contain more that one paragraphs, counts as 1 point, the same as a wrongly formatted small sentence. Underlined text, even if is not hyperlink is not considered as an error, since this is used by another metric; also bold text is not considered as an error, provided the same font family is used. Max score=4 points

Sub metric M14a3_T1
Check for text colour and text background consistency. Most of the students did not have any inconsistencies in the use of colour. Any change in colour, was considered as aesthetic deviation, and not an important usability issue.
Score=2 points if there is perfect consistency. Subtract one point if there is an inconsistency in the colour of text or in the background that is there is use of unjustified colour, and although this is not a critical usability issue is still a diversion in the consistency of use of colours. Max score=2 points.
Max score=Sum of submetrics=4+4+2=10 points

Metric M14b_T1 for guidelines Format Common Items Consistently
Check for consistency in the format of common items. This especially applies where phone numbers and other common items exist; these items should be formatted consistently.
Specific text was provided to verify if designers would apply this principle according to the guidelines/patterns taught to them. This text is placed on the third page and displays the phone, fax numbers and e-mails of the company's two branches. The designer should make the wording referring to the numbers to be the same; should provide the long distance code for all numbers; should format both text and numbers in the same consistent way. Check the initial text given in the assignment and determine what the designer added and how it was formatted. The format of the text and the wording was intentionally different; also only some long distance codes for phone numbers were included with phone and fax numbers.
Score=4 points if everything is consistent i.e. Phone numbers have the city code and the same format and also the text has changed and is the same; score=3 points if there is an error or the designers left something out i.e. fax numbers do no have the same format; score=2 points if there are more errors;

score=1 point if there is only a small indication of change to achieve consistency; finally score=0 points if the designer although probably formatted the text has not made any effort to format the items using the same format. The format and the functionality of the two e-mail links should not be taken into account.
Max score=4 points.

Metric M14c_T1 for guideline Use at Least 10-Point Font.
A violation of a guideline would result in 0 points for the particular page otherwise the score should be 3 points for the page.
Max score=3*3 pages=9 points.

Metric M14d_T1 for guideline Use Familiar Fonts
A violation of a guideline would result in 0 points for the particular page otherwise the score should be 3 points for the page.
Max score=3*3 pages=9 points.

Overall score for the group of metrics: Rescale each of 4 submetrics and take the average.

Metric summary

Metric Code: M14_T1

MetricT1_TextCon contains 4 submetrics.
M14a_T1 refers to guideline Ensure Visual Consistency in Text.
M14b_T1 refers to guideline Format Common Items Consistently.
M14c_T1 refers to guideline Use at Least 10-Point Font.
M14d_T1 refers to guideline Use Familiar Fonts.

Metric M14a_T1 for Guideline Ensure Visual Consistency in Text

Criteria: Are typefaces used properly and consistently? Is the site consistent in font?

The metric contains 3 submetrics:
M14a1_T1 refers to the headings, and the subheadings.
M14a2_T1 refers to the font used.
M14a3_T1 refers to the colour used for text.

Submetric M14a1_T1

Protocol
Check for consistency of text among headings and sub-headings. Check the page headings. They should be formatted in a consistent way and with the same font style. Also, check for consistency among the column headings and the sub-headings within the text. Headings in the same page should be consistent, and preferably consistent in different pages as well. However, this depends on the way the 2 pages are presented to the user. In the current design test, check the two headings "Web Creations" and "Περιοδικό Infoistos"; exercise your personal judgement to determine consistency between these two headings.
Score=4 points if there is an exact consistency. Subtract one point for each error in the page headings and the sub-headings, and more points if there are more serious errors. Also check for labels or navigation bars where text is used, e.g. at the bottom of the page Do not take into account the sub-heading in the left column ("Αλλα προϊόντα").
Max score=4 points.

Submetric M14a2_T1

Protocol
Check for text consistency on every page with regards to all text attributes: font, size, bold, italic and underline (except colour and background). This includes spacing of the text. Score=4 points if there is exemplary consistency. Subtract one point for each place where there is inconsistency in the text.
Max score=4 points.

Sub metric M14a3_T1

Protocol
Check for text colour and text background consistency. Score=2 points if there is full consistency. Subtract one point if there is an inconsistency in the colour of text or in the background. Use of peculiar colour, although not a critical usability issue, is still a diversion in the consistent use of colours.
Max score=2 points.

Max score=Sum of submetrics=4+4+2=10 points.

Metric M14b_T1 for guideline Format Common Items Consistently

Protocol
Check for consistency in the format of common items. Specific text was provided, on the third page, to check if designers would format this according to the guideline. The text displays the phone, fax numbers and e-mails of the company's two branches. Check the initial text given in the assignment and determine what the designer added and formatted.
Scores
Score=4 points if all text is consistent, i.e. phone numbers have the city code and the same formats and also that any designer added text and format are the same; score=3 points if there is an error or the designers left something out, e.g. fax numbers do not have the same format; score=2 points if there are more errors; score=1 points if there is only a small indication of change to achieve consistency; finally score=0 points if the designer – although he has probably formatted the text – has not made any effort to format items in a consistent way. The format and the functionality of the two e-mail links should not be taken into account.
Max score=4 points.

Metric M14c_T1 for guideline Use at Least 10-Point Font.

A violation of the guideline would result in 0 points for the particular page; otherwise the score should be 3 points for the page.
Max score=3*3 pages=9 points.

Metric M14d_T1 for guideline Use Familiar Fonts

A violation of a guideline would result in 0 points for the particular page; otherwise the score should be 3 points for the page.
Max score=3*3 pages=9 points.

Rescale each of 4 submetrics and take the average.
Total max score=9 points.

6.2. Visible Text

Metric Code: M16_T3
Guideline: Use Black Text on Plain, High-Contrast Backgrounds
Pattern: Visible Text

Scoring

There are some built in usability issues within the site. Text colour should be changed, probably with a change in the background colour, resulting to a more visible combination in two places from what was originally provided in the design test: on the fist page in the right column the colour text was grey; also on the second page in the left column the colour text was light blue against a blue background. Students were reminded not to change the colours of the site unless they had an important reason to do so.

Page 1 Check in the right column. If the colour of the text is changed to a more visible colour the designer gets 4 points.

Page 2 Check the left column of the page. Text and background colours should be changed to more visible and contrasted combination: e.g. white or black text. Score 5 points – or 0 if there was no change. Check the rest of the pages and subtract 2 points from every column or place (table, frame, navigation bar, etc.) where there is a violation of the principle. Check for places where there are links usually in blue colour against dark blue background which is the site's main colour; subtract 2 points from every column or place where there is at least one badly formatted link.

Max score=4+5=9 points.

Metric summary

Metric Code: M16_T3

Criteria: Is the text visible against the background colour? Is the font colour appropriate and is there sufficient contrast?

Protocol
Check that the designer dealt with the usability issues intentionally embedded on the web site.
Scores
Page 1: the text in the right column should be more visible. Give 4 points if there was change to a visible combination; otherwise score=0 points).
Page 2: the text in the left column should be more visible (i.e. white or black depending on the background colour). Give 5 points if there was a change; otherwise score=0 points. Check the rest of the pages and subtract 2 points from every column or place (table, frame, navigation bar, etc) where there is a violation of the principle. Apply this rule to places where there are links that are not clearly visible, usually links in blue colour against a dark blue colour.

Total max score=9 points.

6.3. Emphasised Text

Metric Code: M15_E1
Guideline: Emphasise Importance in Text
Pattern: Emphasised Text

Scoring

This metric is applied to text and not on any headings that are examined using another metric.
Page 1: On this page some words and sentences have been intentionally and wrongly emphasised using underlined and bold text. Designers should eliminate the underlined and bold text and should emphasise some key words or sentences; for example the company's name "Infoistos". The maximum score for the page is 3 points (give 0 points if the underlined or bold text still exists); give 1 point if the erroneously emphasised text is eliminated; give 2 points if more words are emphasised, like the company's name; finally, give 3 points if some key sentences are emphasised. Max score=3 points
Page 2: If there is something emphasised on the left column ignore it.
Check the central and the right column. The central column scores a maximum of 2 points. The right column scores also 2 points; one point for the "Magazine" section and one for the "Latest News" section.
In the central column the dates in each paragraph should be emphasised. In the right column some key sentences on the top half section (like "Περιοδικά No 1 etc) and also on the bottom half section (like dates etc) could be emphasised. But, there in no unique way of placing emphasis on these sections since this depends on how a designer may choose to apply emphasis.
Both columns contain links and that affects how elements are emphasised. There are several ways to emphasise text. The recommended ways are: bold, bullets, background. Making the complete key sentences as links is considered as putting emphasis. On the contrary, when the key sentence itself is not included in the link, while some or all the text below the key sentence is made a link, is probably not a good idea. Changing only the font colour, without any other change to the other text attributes, does not emphasise the text enough. Bullets, although are acceptable in narrow columns, they do not provide an impact on wide columns.
However, emphasis depends on the format of the surrounding elements as well, and the overall view of the specific place. These suggestions serve only as general guidance. Use your judgment to decide about the score and make sure that the criteria you apply are consistent across all sites. Max score=4 points
Page 3: Several words could be possibly emphasised like: telephones, addresses, etc. The page scores 2 points if emphasis is placed on the right places, 1 point if only some items are emphasised and 0 points otherwise. Max score=2 points

Max score=page1+page2+page3=3+4+2=9 points.

Metric summary

Metric Code: M15_E1

Criteria: Emphasise elements to attract attention.

Protocol
Review all pages and check the existence of elements that are properly emphasised.
Check every page for properly emphasised headings. Main headings should be provided by the designers.
Scores
Page 1: Determine points based on the work that the designer has made on the page. If the intentionally underlined text and the bold words have been eliminated, then score=1 point; if additionally some key words, such as company name, have been emphasised, score=2 points; if additionally to the above some key sentences have been emphasised, score =3 points; otherwise, when everything was left unchanged as it was to begin with, score=0 points. Max score=3 points.
Page 2: Check the central and the right column. Ideally, on the central column the dates in each paragraph should be emphasised. Max score for this column=2 points. The right column also scores 2 points for properly emphasised text, one point in the "Magazine" section and one in the "Latest News" section. Consult the suggestions about what is considered as proper emphasis. In the right column on the top half section some key sentences (such as "Περιοδικά No 1, etc.) and also on the bottom half section (such as dates, etc.) could be considered for putting emphasis. However, take into account that there are several links in this column and the format that the designer decides on may be affected by the links. Also consider that there is no unique way of putting emphasis on these sections; this depends on the view of a designer and the place he selects to put emphasis. Max score for this page =2+2=4 points.
Page 3: Check that some words (e.g. telephones, addresses, etc.) are properly emphasised. Page scores 2 points if emphasis is placed on the right places; scores 1 point if only some items are emphasised; otherwise page scores 0 points. Max score=2 points.

Total max score=page1+page2+page3=3+4+2=9 points.

6.4. Aligned Text

Metric Code: M17_T4
Guideline: Use Proper Alignment for Text
Pattern: Aligned Text

Scoring

Built in usability issues
One heading, on the first page in the right column, was aligned right. Designers should have corrected that. Guidelines and patterns suggest that text should be left aligned while headings can be left aligned or centred aligned. Text can be centred aligned in narrow columns, or rows, taking care not to cause long gaps between the words. Right text alignment should be avoided.
Check all pages and determine score for each page. Each page gets 3 points it there is no violation of the principle, 2 if there is a minor alignment problem, 1 if there more problems or the problem is visible, and 0 if there is a severe alignment problem in the page.

Max score=3 pages *3=9 points

Metric summary

Metric Code M17_T4

Criteria: Is text properly aligned? Is the use of centre or right-aligned text avoided?

Protocol
Check all pages and determine the score for each page.
Scores
Each page gets 3 points it there is no violation of the principle, 2 if there is a minor alignment problem, 1 if there more problems or the problem is visible, and 0 if there is a severe alignment problem in the page. For each page max score=3 points.

Total max score=3 pages *3=9 points.

7. Metrics for Lists

There is one pattern in this dimension.

7.1. Lists

Metric Code: M11_T6
Guideline: Display Related Items in Lists
Introduce Each List
Format Lists to Ease Scanning
Capitalise First Letter of First Word in Lists
Pattern: Lists

Scoring

Lists are quite complicated to judge. Although there were several places where lists could be applied, designers chose several different approaches, which are also acceptable and can not be considered to be usability or design error. Designers used bullets on a number of occasions especially in narrow columns, sometimes correctly, other times incorrectly to highlight a sentence. The use of bulleted text in these cases was an easy way to highlight the sentences and make them stand out, instead of using another technique such as background colour or a small images or arrows. Since the application of lists was not the same by all students it was only possible to measure the application of lists in two places where text was provided with this specific purpose: to test the application of lists. In these places employing a list was the only suitable way to present the text. A specially written text, to be formatted using lists, was placed inside the text provided on the home page. Also an evaluator may determine the places where lists and bullets were wrongly applied, i.e in places where it is clearly indicated that the designer is not aware of the correct application of lists. There are places where lists were made of one or two items only, and also where text elements, with no relation to each other, were presented as a list.
Each of the 2 required lists is given 50% of the maximum score. In this case max score=9 points. Determine the number of times that the designer wrongly applied bullets or presented text inappropriately using a list (These errors were made in lists considered by only one item or in places where there was no need for the use of bullets and lists. For each place that the student made an incorrect application of the lists subtract 3 points.

Metric summary

Metric Code Lists
Criteria: Is the site easy to read? Lists with bullets? Are bulleted lists used so that the content can be easily scanned?
Scores There are two places in the web site where a list should be used. Each of the 2 required lists, on the home page, is given 50% of the maximum score. Max score=9 points. Determine the number of times that the designer applied bullets incorrectly or made a list. For each place where the student wrongly applied lists, subtract 3 points.
Total max score=9 points.

Appendix 6.1: Questionnaire to collect information about the participants

Web Design and Evaluation Seminar
Department of Automation and Engineering

The purpose of this seminar is for the participants to familiarize themselves with the use of FrontPage as a basic tool for designing webpages and setting up a website. The seminar is focused on the evaluation of webpages and on the construction of usable internet sites. Duration is 25 hours and will include:

Stage 1 **Duration 6 hours**	• Use of FrontPage 2003, from basic up to an advanced stage. • Test. Selection of participants for the advanced stage.
Stage 2 **Duration 20 hours**	• 12 hours: Use of FrontPage 2003 with the introduction of specialized techniques and principles of designing, assignments and tests. • Tutorials about usability. • Tests in designing and evaluating web pages, questionnaires and interviews.

Do you have a personal computer at home? ☐ Yes ☐ No

Do you have access to the Internet? ☐ Yes ☐ No
If yes, what kind of access? (which provider, kind of connection – modem, ADSL, etc.)

Surname: ..... **Name:** ..... **Semester**.....

Telephone Number..... **Mobile Number** .....

E-mail .....

Questions
(Please answer them as accurate as possible)

1. State the level of your competency in using a personal computer:

☐	Beginner	I have recently started using a computer.
☐	Basic	Simple use of MS Office (Word, Excel) and operating system. Simple use of e-mail and internet.
☐	Intermediate	All the above, plus extensive use of MS Office and Internet-related activities.
☐	Advanced	Very good use of the above and also use of some advanced and specialized programs.
☐	Expert	All the above and also installing computer cards, upgrading, networks etc.

2. State the level of your knowledge in using e-mail and Internet.

☐ Very little ☐ Some experience ☐ Average ☐ Good ☐ Very Good

3. How long have you been using the Internet?

☐ Just recently ☐ Less than 6 months ☐ 6 months –1 year ☐ 1–2 years ☐ More than 2 years

4. On average, how often do you access the Internet?

☐ Every day ☐ Most days ☐ 2-3 days a week ☐ Once a week ☐ Less than once a week

5. On average, how much time do you spend in a day using the Internet?

☐ Less than 1 hour ☐ 2 hours ☐ 3 hours ☐ 4 hours ☐ 5+ hours

6. Have you ever designed a webpage or a website?

☐	Never	I have never tried, or tried and failed.
☐	Tried once or twice	I have tried as an amateur once or twice.
☐	Average	I can build a simple web site.
☐	Good experience	I can build a web site with extensive features very easily.
☐	Expert	I can build a web site with advanced futures.

Appendix 6.2: Preliminary assignment (screenshots)

Page 1

Put a company Logo here

Please follow the instructions included in the releative html page.
Make sure you check each page in preview mode.
It would be better to use the current page layout

Η εταιρεία Info Tech Group (ITG) παρέχει Outsourcing και Συμβουλευτικές Υπηρεσίες Πληροφορικής, Ηλεκτρονικού Επιχειρείν και Τεχνολογίας.

Σκοπός μας να δημιουργήσουμε καινοτομικές λύσεις σε συνεργασία με τους πελάτες μας έτσι ώστε να μετατραπούν σε επιχειρήσεις υψηλής απόδοσης.

Με μεγάλη τεχνογνωσία και εμπειρία στον κλάδο, ένα μεγάλο δίκτυο συνεργατών παγκοσμίως και αποδεδειγμένο ιστορικό επιτυχίας η Info Tech Group (ITG) μπορεί να κινητοποιήσει τους σωστούς ανθρώπους, τα προσόντα και την τεχνολογία που χρειάζεται για να μετατρέψουμε το όραμα των πελατών μας σε αποτέλεσμα.

Η Info Tech Group είναι σε θέση να υποστηρίζει, μέσω ενός ευρύτατου φάσματος συμβουλευτικών υπηρεσιών, οποιονδήποτε οργανισμό ή επιχείρηση, ανεξαρτήτως δραστηριότητας, μεγέθους και διάρθρωσης.

Οι κύριοι πελάτες της εταιρείας είναι μικρομεσαίες επιχειρήσεις (ΜΜΕ) και μεγάλες εταιρείες πληροφορικής με εκτεταμένα εμπορικά δίκτυα. Από το 1994 η Info Tech Group (ITG) παρέχει τεχνογνωσία και υπηρεσίες διεθνώς, στην Ευρωπαϊκή Επιτροπή, στη Eurostat και σε μεγάλες ευρωπαϊκές εταιρείες και οργανισμούς, και σε εθνικό επίπεδο, σε διάφορους κλάδους του Ελληνικού δημόσιου και ιδιωτικού τομέα, ενώ παράλληλα διατηρεί επιχειρηματικές συνεργασίες στην Κεντρική και Ανατολική Ευρώπη .

Διατηρώντας συνεχή επαφή με τις εξελίξεις, αναλύοντας οποιεσδήποτε παραμέτρους και συνδυάζοντας υψηλή τεχνολογία, καινοτομία και συνεργατικότητα, η Info Tech Group συνθέτει λύσεις που οδηγούν οργανισμούς και επιχειρήσεις στην υπεροχή, μέσα από κάθε είδους περιβάλλον.

Ένα σύνολο εξειδικευμένων και έμπειρων στελεχών -υποστηριζόμενο από τα κατά τόπους γραφεία στην Ελλάδα και το εξωτερικό, τα οποία διαθέτουν σύγχρονη υποδομή και εξοπλισμό- είναι πάντα διαθέσιμο για να προσφέρει αξιόπιστα αποτελέσματα. Τα στελέχη μας με εμπειρία σε καινοτομικές νέες τεχνολογίες και εργαλεία μπορούν να βοηθήσουν την επιχείρηση σας να ανακαλύψει καινούργιες ευκαιρίες και να βελτιώσουν τις επιχειρηματικές σας διαδικασίες.

Η Info Tech Group αναπτύσσει στρατηγικές συνεργασίες τόσο στο εσωτερικό της χώρας όσο και το εξωτερικό με εξειδικευμένες εταιρίες και φορείς, ανάλογα με τις εκάστοτε απαντήσεις που προκύπτουν από την υλοποίηση έργων. Η Info Tech Group διαθέτει καινοτόμες υπηρεσίες και προϊόντα, ενώ μεταφέρει συσσωρευμένη εμπειρία από μεγάλα έργα του εξωτερικού προς όφελος των πελατών.

Page 2

Company Name or Logo Here

Format the page using the existing images

Το κύρος και η θέση της Info Tech Group στην ελληνική αγορά, την καθιστούν συνεργάτη επιλογής πολλών διεθνώς αναγνωρισμένων εταιριών του χώρου της πληροφορικής. Στο πλαίσιο αυτό, η Info Tech Group εμπλουτίζει διαρκώς το χαρτοφυλάκιό της με καινοτόμες υπηρεσίες και προϊόντα, ενώ μεταφέρει συσσωρευμένη εμπειρία από μεγάλα έργα του εξωτερικού προς όφελος των ελληνικών επιχειρήσεων.

ORACLE
Oracle Certified Solution Partner

Η Info Tech Group είναι από τις πρώτες εταιρείες στην αγορά που συνεργάζεται επισήμως με την Oracle, (Oracle Alliance Member, ORACLE Certified Partner) αναπτύσσοντας συνεχώς τεχνογνωσία μέσα από την κατασκευή μεγάλων και εξειδικευμένων πληροφοριακών συστημάτων.
http://www.oracle.com

METAGroup META Group

Η Info Tech Group αντιπροσωπεύει αποκλειστικά στην Ελλάδα το συμβουλευτικό οίκο META Group. Η META Group είναι μια πρωτοπόρος εταιρία ερευνών και συμβουλευτικών υπηρεσιών, που εστιάζει στο χώρο της Πληροφορικής και των στρατηγικού επιχειρηματικού μετασχηματισμού. Τα μοντέλα συνεργασίας που προσφέρει στους πελάτες της τους βοηθούν να προσθέτουν αξία τόσο στα IT όσο και στα επιχειρησιακά τους συστήματα και διαδικασίες.
http://www.metagroup.com

HEWLETT PACKARD

Η Info Tech Group αντιπροσωπεύει την Hewlett Packard με λύσεις
HP StorageWorks, οι οποίες καλύπτουν ολόκληρο το φάσμα των αναγκών αποθήκευσης: Network Attached Storage, Storage Area Networks, Tape Storage, Storage Software.
Επίσης είναι αντιπρόσωπος του Hp Openview, προσφέροντας ολοκληρωμένες λύσεις διαχείρισης επιχειρησιακών δικτύων και υπηρεσιών Service Level Management (SLM).
www.hp.gr

RAINBOW TECHNOLOGIES

RAINBOW

Συνεργασία με την Rainbow Technologies, έναν από τους μεγαλύτερους προμηθευτές πληροφοριακών συστημάτων ασφάλειας παγκόσμια για την παροχή λύσεων ολοκληρωμένης ασφάλειας για το internet σε επίπεδο eCommerce, προστασίας περιεχομένου και ασφάλειας τηλεπικοινωνιών.
www.rainbow.com

SurfControl

SurfControl
Με τη χρήση των προϊόντων της SurfControl, η Info Tech Group παρέχει λύσεις content filtering και mail filtering, που προσφέρουν υψηλότερο βαθμό ελέγχου των πόρων μιας εταιρίας σε ότι αφορά την πρόσβαση στο internet.
www.surfcontrol.com

Page 3

Company Name
or Logo Here

The page contains news and events about the company.

There is nothing in the this column. Just format the right column

Make links certain words or sentences.

Format the column.

Ενημερωτικό Δελτίο

Το ενημερωτικό δελτίο παρέχει συνεχή ενημέρωση για τα νέα προϊόντα και τις υπηρεσίες που καταχωρούνται στη βάση δεδομένων του Ψηφιακού Κέντρου Έρευνας.

These are links to a dummy page

Δελτίο 1 έτος 2005

Δελτίο 2 έτος 2005

Δελτίο 3 έτος 2005

Δελτίο 4 έτος 2005

Τελευταία Νέα

Make links certain words or sentences.

Format the column.

8/1/2006
Εκτάκτη Γενική Συνέλευση της ΙΤG
15/01/2006
Νέα έργα για την ΙΤG στην Κύπρο και Ιορδανία.
6/2/2006
Επαναληπτική Τακτική Γενική Συνέλευση της ΙΤG

Page 4

Company Name
or Logo Here

This is a list with the company's customers

ΕΝΔΕΙΚΤΙΚΟΣ ΚΑΤΑΛΟΓΟΣ ΠΕΛΑΤΩΝ:
Παρουσιάζουμε τους πελάτες μας ανα τομέα προϊόντων (Λογισμικό, Hardware, Web and Networks, File Systems) στους οποίους η ΙΤG έχει προσφέρει υπηρεσίες. Ο κατάλογος δεν είναι πλήρης και απλά εμβανίζει τους πρόσφατους μόνο πελάτες της εταιρείας.

Make proper links. Find the real URL addresses on the internet
Λογισμικό

ΕΘΝΙΚΗ ΤΡΑΠΕΖΑ ΤΗΣ ΕΛΛΑΔΟΣ
EFG EUROBANK ERGASIAS
ΤΡΑΠΕΖΑ ΠΕΙΡΑΙΩΣ
ΕΜΠΟΡΙΚΗ ΤΡΑΠΕΖΑ ΤΗΣ ΕΛΛΑΔΟΣ

Make the following sentences as links to a dummy page

Hardware
ΤΡΑΠΕΖΑ ΤΗΣ ΕΛΛΑΔΟΣ
ΔΙΕΘΝΗΣ ΑΕΡΟΛΙΜΕΝΑΣ ΑΘΗΝΩΝ
COSMOTE
ΟΠΑΠ
TIM

Web and Networks
ΕΜΠΟΡΙΚΗ ΤΡΑΠΕΖΑ ΤΗΣ ΕΛΛΑΔΟΣ
ΑΣΟΕΕ
CCC
ERICSSON
ΤΡΑΠΕΖΑ ΤΗS ΕΛΛΑΔΟΣ

File Systems
ΕΚΤ (ΕΘΝΙΚΟ ΚΕΝΤΡΟ ΤΕΚΜΗΡΙΩΣΗΣ)
ΕΜΠΟΡΙΚΗ ΤΡΑΠΕΖΑ ΤΗΣ ΕΛΛΑΔΟΣ
EFG EUROBANK ERGASIAS
COSMOTE
TIM
ΤΡΑΠΕΖΑ ΠΕΙΡΑΙΩΣ
ALPHA BANK

Page 5

Company Name
or Logo Here

These are the services offered by the company

There are 2 departments: IT Consultancy and Software Development and Hardware
H INFO TECH GROUP . είναι μία εταιρεία παροχής συμβουλευτικών υπηρεσιών και ανάπτυξης συστημάτων με ειδίκευση στα πεδία της Τεχνολογίας Πληροφορικής, των Τηλεπικοινωνιών και του e-Επιχειρείν.

Από το 1994 η INFO TECH GROUP παρέχει τεχνογνωσία και υπηρεσίες διεθνώς, στην Ευρωπαϊκή Επιτροπή, στη Eurostat και σε μεγάλες ευρωπαϊκές εταιρείες και οργανισμούς, και σε εθνικό επίπεδο σε διάφορα πεδία του Ελληνικού δημόσιου και ιδιωτικού τομέα, ενώ έχει επεκτείνει τις δραστηριότητές και τις συνεργασίες της στην Κεντρική και Ανατολική Ευρώπη.

Η τεχνογνωσία της εταιρείας μας βασίζεται σε μία ομάδα μόνιμα απασχολούμενων, εξειδικευμένων μηχανικών, που κατά περίπτωση, υποστηρίζονται και από ένα δίκτυο ειδικών συμβούλων που συνεισφέρουν σε συγκεκριμένα έργα και θέματα.

Η τεχνογνωσία της εταιρείας επικεντρώνεται στους ακόλουθους τομείς:

Υπηρεσίες Συμβούλων Πληροφορικής

Μελέτες Πληροφορικής, Μελέτες Σκοπιμότητας, Δραστηριότητες Μεταφοράς και Διάδοσης Τεχνογνωσίας, Εμπορική Εκμετάλευση Έργων και Μελέτες Επιχειρηματικών Σχεδίων (Business Plans).

Ανάπτυξη Συστημάτων Λογισμικού και Hardware

Συστήματα Διαχείρισης Εγγράφων, Υποστήριξης Συνεργασίας και Διαχείρισης Ροών Εργασίας, Ανάπτυξη Βάσεων Δεδομένων, Τεχνολογίες Web (Σχεδιασμός Web Site, Ηλεκτρονικό Εμπόριο, Web Services), Τεχνολογίες Διοίκησης (Διαχείριση Έργων, Συστήματα Διαχείρισης Γνώσης, Συστήματα Υποστήριξης Αποφάσεων), Αυτόματα Συστήματα Ελέγχου (Συστήματα Σταθμευσης, Έλεγχος Πρόσβασης) και Εξειδικευμένες Επαγγελματικές Εφαρμογές.

Οι κύριοι πελάτες της εταιρείας είναι μικρομεσαίες επιχειρήσεις (ΜΜΕ) και μεγάλες εταιρείες πληροφορικής οι οποίες έχουν εκτεταμένα εμπορικά δίκτυα. Η INFO TECH GROUP έχει παρουσιάσει μεγάλη ανάπτυξη τα τελευταία χρόνια σε ότι αφορά στα επιχειρηματικά κέρδη της, στις συνεργασίες της και στην πρόσληψη και παροχή τεχνογνωσίας

Page 6 (top)

Company Name
or Logo Here

This page provides information about the company

Η Info Tech Group (ITG) είναι σε θέση να υποστηρίζει, μέσω ενός ευρύτατου φάσματος συμβουλευτικών υπηρεσιών, οποιονδήποτε οργανισμό ή επιχείρηση, ανεξαρτήτως δραστηριότητας, μεγέθους και διάρθρωσης.

Διατηρώντας συνεχή επαφή με τις εξελίξεις, αναλύοντας οποιεσδήποτε παραμέτρους και συνδυάζοντας υψηλή τεχνολογία, καινοτομία και συνεργατικότητα, η Info Tech Group (ITG) συνθέτει λύσεις που οδηγούν οργανισμούς και επιχειρήσεις στην υπεροχή, μέσα από κάθε είδους περιβάλλον.

Ένα σύνολο εξειδικευμένων και έμπειρων στελεχών -υποστηριζόμενο από τα κατά τόπους γραφεία στην Ελλάδα και το εξωτερικό, τα οποία διαθέτουν σύγχρονη υποδομή και εξοπλισμό- είναι πάντα διαθέσιμο για να προσφέρει αξιόπιστα αποτελέσματα.

Το όραμα μας

Η εδραίωση της Info Tech Group (ITG), ως δυναμικής, ενέλικτης και καινοτόμου εταιρίας, η οποία είναι σε θέση να ενσωματώνει τις νέες εξελίξεις στην τεχνολογία και τα συστήματα διοίκησης και να τις μετατρέπει σε προϊόντα και υπηρεσίες υψηλής προστιθέμενης αξίας για τους πελάτες της.

Οι στρατηγικοί στόχοι

Ενίσχυση της θέσης της Info Tech Group (ITG) στην ελληνική αγορά με επέκταση τόσο των γεωγραφικών ορίων όσο και του εύρους των προσφερόμενων από την εταιρεία υπηρεσιών.

Ανάπτυξη και προώθηση νέων υπηρεσιών / προϊόντων καθώς και εφαρμογή καινοτομικών προσεγγίσεων και νέων μεθοδολογιών με σκοπό την αντιμετώπιση των μελλοντικών προκλήσεων και την ενίσχυση της καινοτομικότητας και δυναμικότητας της Info Tech Group (ITG)

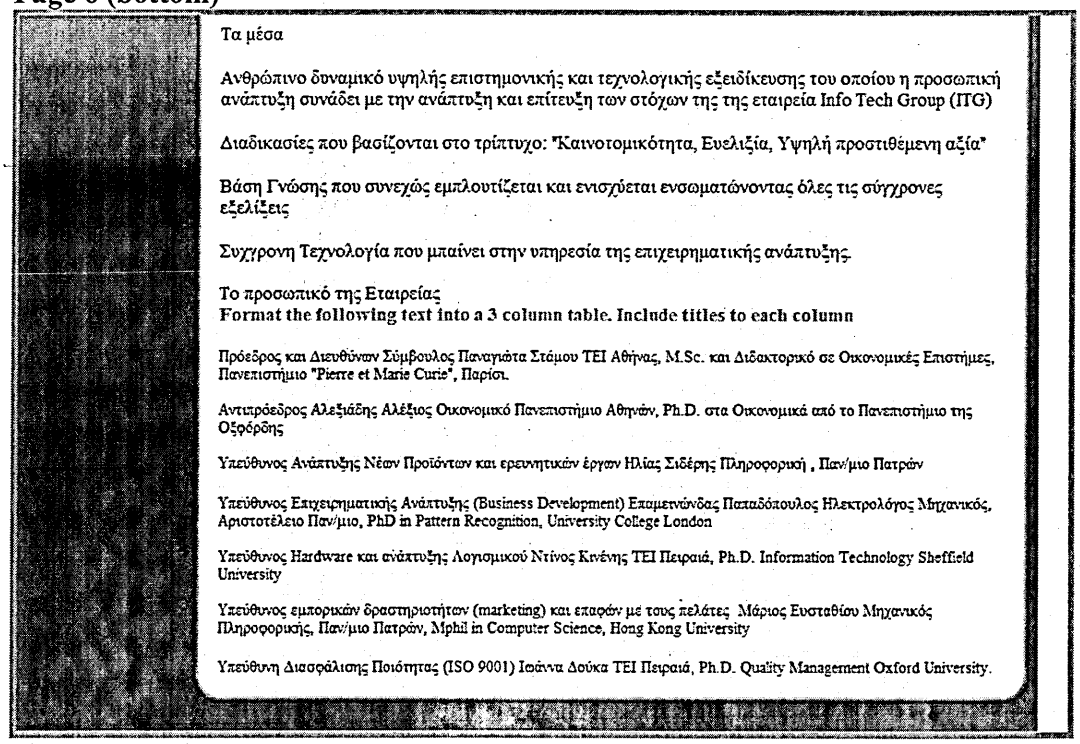
Δυναμική προώθηση στις αγορές του εξωτερικού στις οποίες ήδη έχει παρουσία η Info Tech Group (ITG) με στόχο τη μονιμοποίηση αυτής της παρουσίας και την εκμετάλλευση των ευκαιριών ανάπτυξης που παρουσιάζονται τα αμέσως προσεχή χρόνια.

Εδραίωση της δυνατότητας προσφοράς όλου του φάσματος των υπηρεσιών και προϊόντων που παρέχονται ήδη στην Ελλάδα και στο εξωτερικό.

Βελτίωση της αποδοτικότητας και αποτελεσματικότητας της Info Tech Group (ITG) σε όλες τις δραστηριότητές της.

Ενίσχυση της αποτελεσματικότητας των ανθρωπίνων πόρων της Info Tech Group (ITG) με την παροχή όλων των ευκαιριών και κινήτρων για τη μεγιστοποίηση των δυνατοτήτων τους.
Διατήρηση του επιπέδου γνώσης της Info Tech Group (ITG) σε αντιστοιχία με τις τεχνολογικές και επιστημονικές εξελίξεις, με στόχο την συνεχή προσφορά υπηρεσιών πάντα στην αιχμή της γνώσης και της τεχνολογίας.

Page 6 (bottom)



Τα μέσα

Ανθρώπινο δυναμικό υψηλής επιστημονικής και τεχνολογικής εξειδίκευσης του οποίου η προσωπική ανάπτυξη συνάδει με την ανάπτυξη και επίτευξη των στόχων της της εταιρεία Info Tech Group (ITG)

Διαδικασίες που βασίζονται στο τρίπτυχο: "Καινοτομικότητα, Ευελιξία, Υψηλή προστιθέμενη αξία"

Βάση Γνώσης που συνεχώς εμπλουτίζεται και ενισχύεται ενσωματώνοντας όλες τις σύγχρονες εξελίξεις

Συχγρονη Τεχνολογία που μπαίνει στην υπηρεσία της επιχειρηματικής ανάπτυξης.

Το προσωπικό της Εταιρείας
Format the following text into a 3 column table. Include titles to each column

Πρόεδρος και Διευθύναν Σύμβουλος Παναγιώτα Στάμου ΤΕΙ Αθήνας, M.Sc. και Διδακτορικό σε Οικονομικές Επιστήμες, Πανεπιστήμιο "Pierre et Marie Curie", Παρίσι.

Αντιπρόεδρος Αλεξιάδης Αλέξιος Οικονομικό Πανεπιστήμιο Αθηνών, Ph.D. στα Οικονομικά από το Πανεπιστήμιο της Οξφόρδης

Υπεύθυνος Ανάπτυξης Νέων Προϊόντων και ερευνητικών έργων Ηλίας Σιδέρης Πληροφορική , Παν/μιο Πατρών

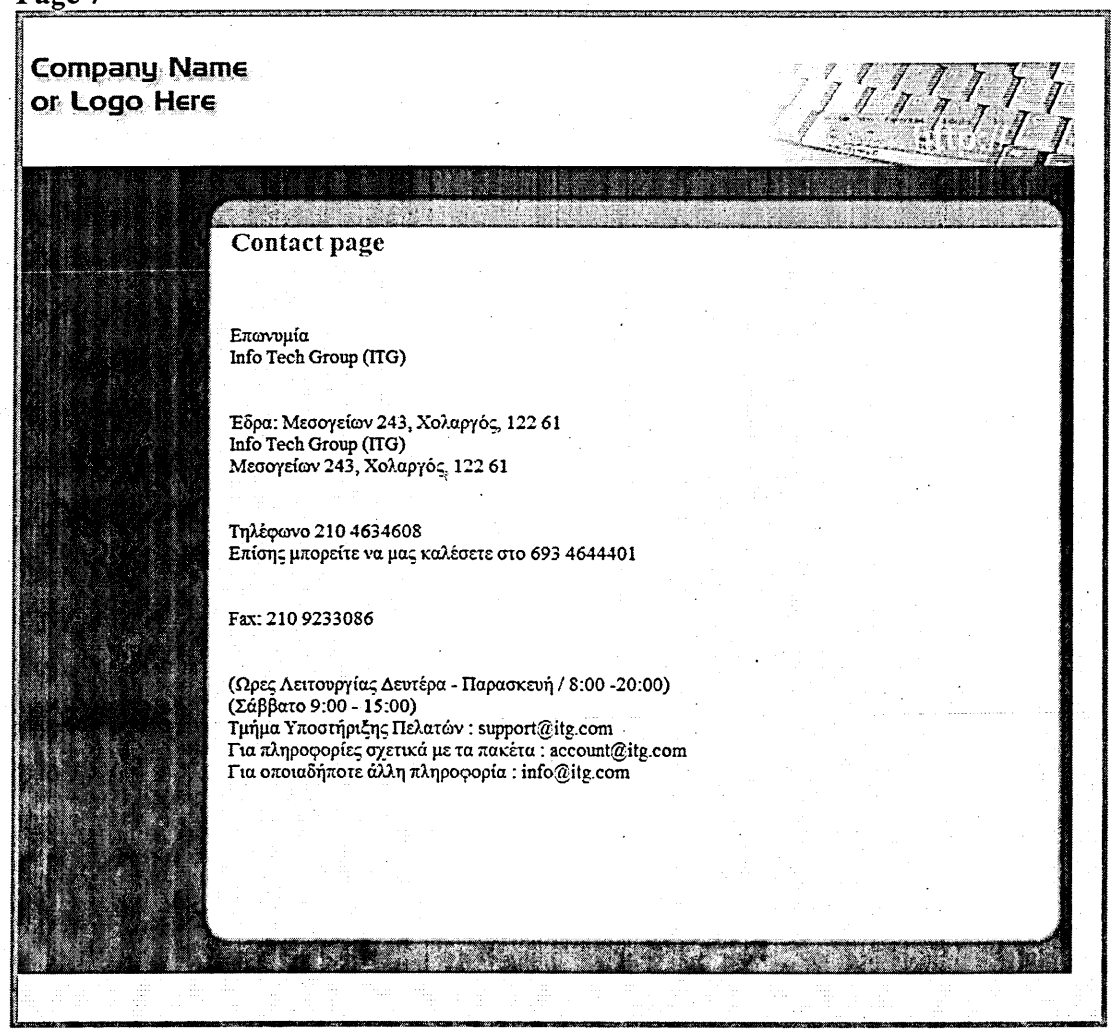
Υπεύθυνος Επιχειρηματικής Ανάπτυξης (Business Development) Επαμεινώνδας Παπαδόπουλος Ηλεκτρολόγος Μηχανικός, Αριστοτέλειο Παν/μιο, PhD in Pattern Recognition, University College London

Υπεύθυνος Hardware και ανάπτυξης Λογισμικού Ντίνος Κινένης ΤΕΙ Πειραιά, Ph.D. Information Technology Sheffield University

Υπεύθυνος εμπορικών δραστηριοτήτων (marketing) και επαφών με τους πελάτες Μάριος Ευσταθίου Μηχανικός Πληροφορικής, Παν/μιο Πατρών, Mphil in Computer Science, Hong Kong University

Υπεύθυνη Διασφάλισης Ποιότητας (ISO 9001) Ιωάννα Δούκα ΤΕΙ Πειραιά, Ph.D. Quality Management Oxford University.

Page 7


Company Name
or Logo Here
Contact page
Επωνυμία
Info Tech Group (ITG)
Έδρα: Μεσογείων 243, Χολαργός, 122 61
Info Tech Group (ITG)
Μεσογείων 243, Χολαργός, 122 61
Τηλέφωνο 210 4634608
Επίσης μπορείτε να μας καλέσετε στο 693 4644401
Fax: 210 9233086
(Ωρες Λειτουργίας Δευτέρα - Παρασκευή / 8:00 -20:00)
(Σάββατο 9:00 - 15:00)
Τμήμα Υποστήριξης Πελατών : support@itg.com
Για πληροφορίες σχετικά με τα πακέτα : account@itg.com
Για οποιαδήποτε άλλη πληροφορία : info@itg.com

Appendix 6.3: Instructions for the preliminary assignment

WEB DESIGN Final Exercise

Design a web site presenting the company profile of ITG. The following pages are needed:

index	Home page
companyinfo	Information about the company
contact	Contact details of the company
pelates	The best clients of the company
sinergates	Several firms and agencies that the company represents or whose products it sells
whatsnew	News of the company
services	Describe the services that the company provides. This page is linked to the pages **servtomeas1** and **servtomeas2** where the two sectors in which the company specializes are described.

- Leave the table that provides the layout of the web pages as it is, unless you have an important reason to change it.
- It is important to have a functional navigation scheme and links at the right places. There should be links and a. It would be better to think about navigation before you commit yourself, since it will take more time to make changes later.
- If you think that more pages are needed, you are free to create them.
- The format of the text should be according to the instructions given on each page, next to the text. The instructions are in bold English characters **in fuchsia or in text boxes** and should be deleted once you have finished with each page. The exact meaning of the text is not very important, but do try to use the correct links and headings and proper formatting.
- Try to present the site of the company as best you can in order to portray and "sell" the company over the web. Use the usability principles and other techniques that you have been taught and help users have a good experience while visiting the site.
- Try to avoid extravagant things that will slow you down. Don't forget the site is about a company with a specific purpose on the Internet.
- If you need images or pictures or any other material, you may use the internet to find them. Images or pictures can be found on the following sites.

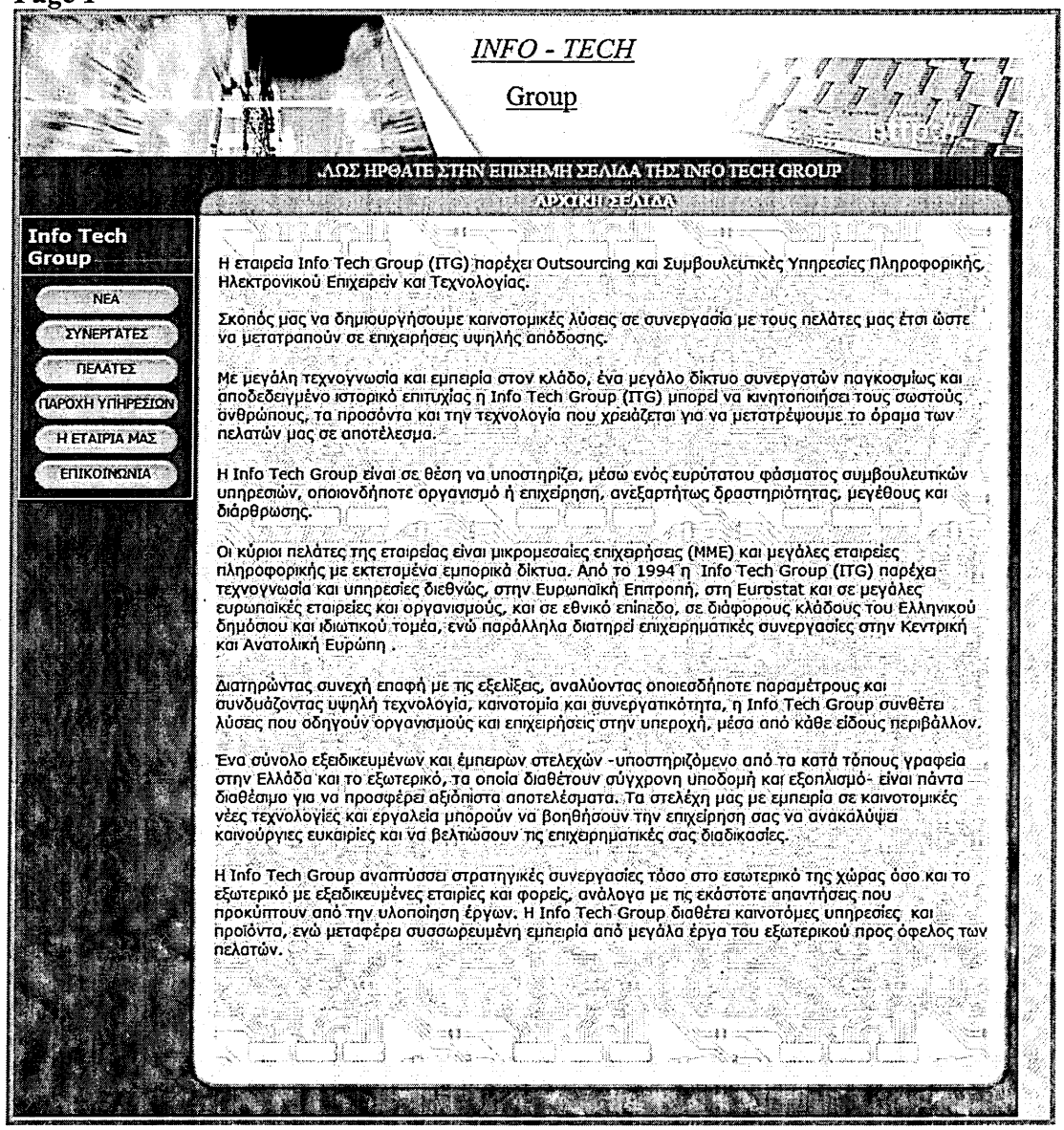
http://www.grsites.com/webgraphics/ http://www.free-backgrounds.com/dan1-10.shtml
http://www.feebleminds-gifs.com/ http://www.iconbazaar.com/index.html
http://www.gifanimations.com/index.jsp http://www.mikesfreegifs.com/

- For questions or any other information please use email.
- You should work alone and any collaboration with other members of the class is not allowed.

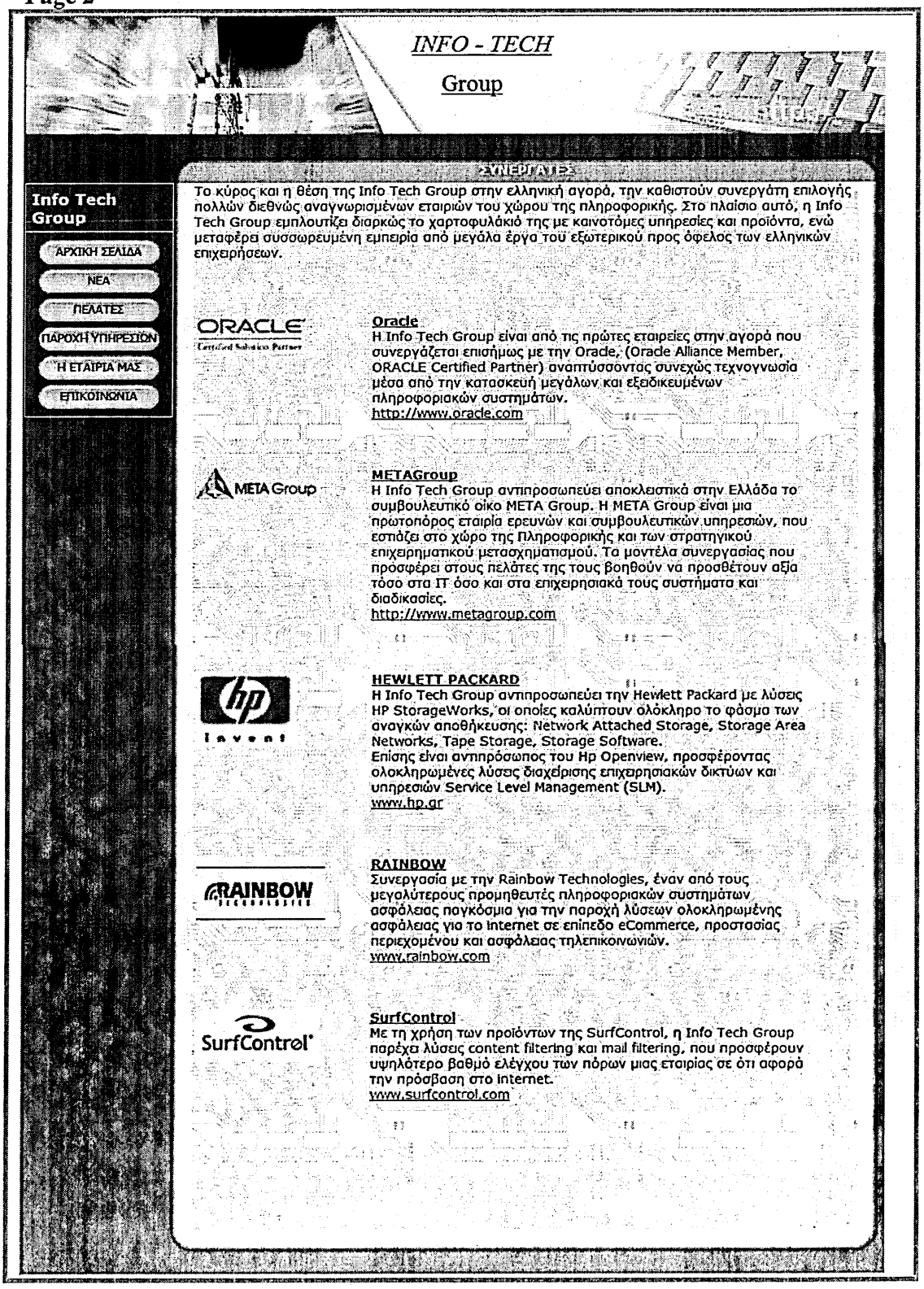
Good Luck

Appendix 6.4: Example of web site created by participants

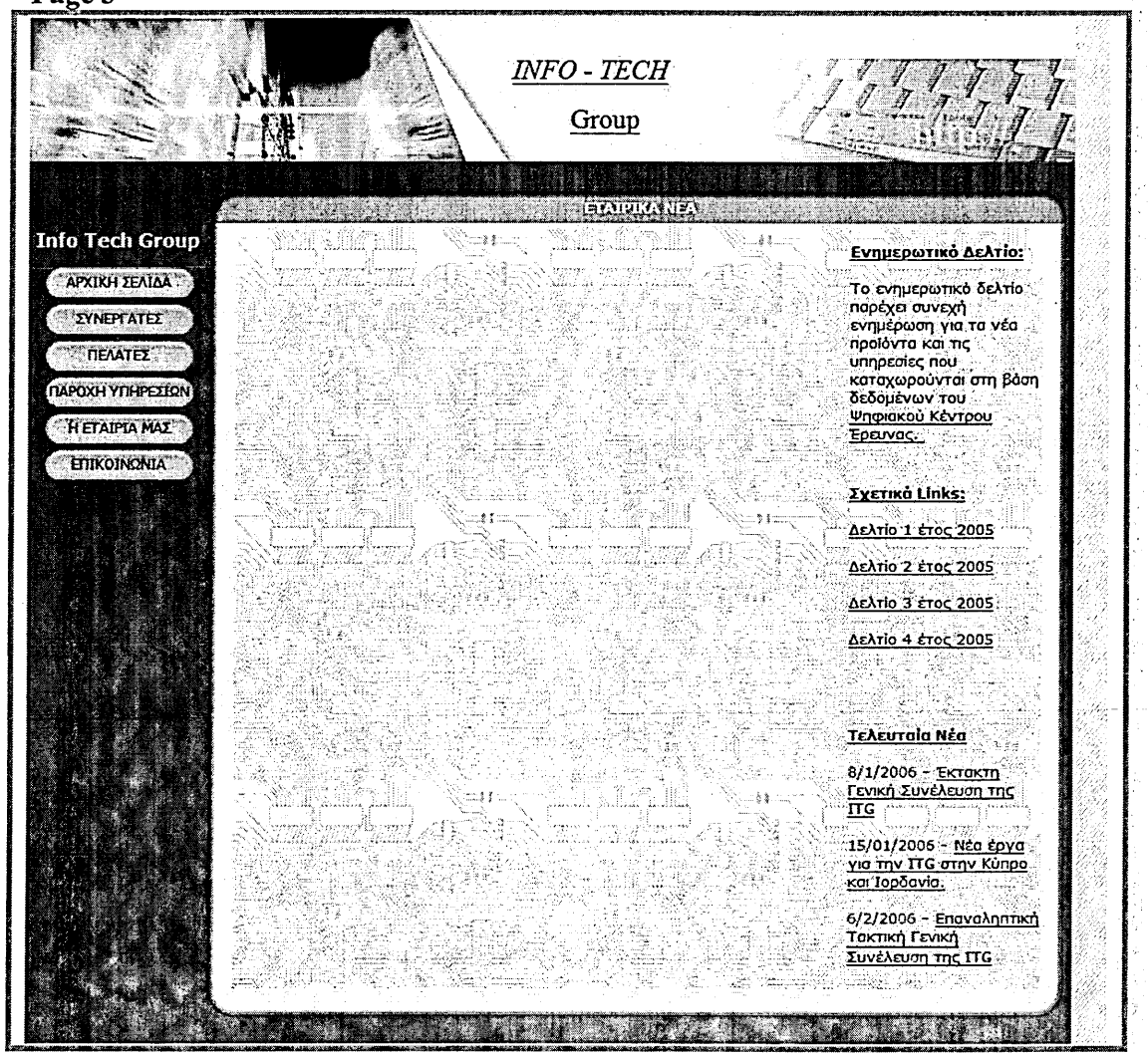
Page 1



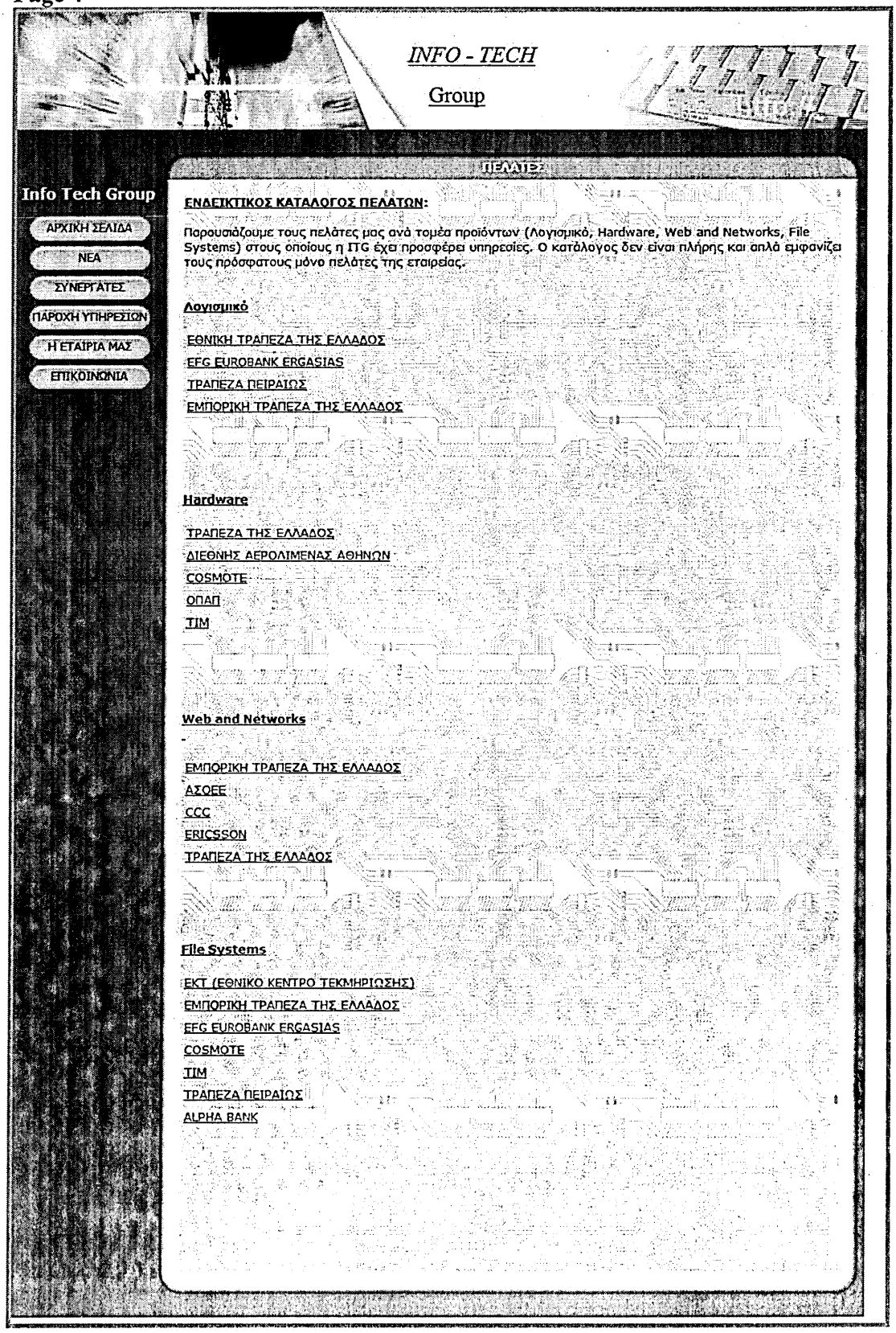
Page 2


INFO - TECH
Group
ΣΥΝΕΡΓΑΤΕΣ
Info Tech Group
ΑΡΧΙΚΗ ΣΕΛΙΔΑ
ΝΕΑ
ΠΕΛΑΤΕΣ
ΠΑΡΟΧΗ ΥΠΗΡΕΣΙΩΝ
Η ΕΤΑΙΡΙΑ ΜΑΣ
ΕΠΙΚΟΙΝΩΝΙΑ
Το κύρος και η θέση της Info Tech Group στην ελληνική αγορά, την καθιστούν συνεργάτη επιλογής πολλών διεθνώς αναγνωρισμένων εταιριών του χώρου της πληροφορικής. Στο πλαίσιο αυτό, η Info Tech Group εμπλουτίζει διαρκώς το χαρτοφυλάκιό της με καινοτόμες υπηρεσίες και προϊόντα, ενώ μεταφέρει συσσωρευμένη εμπειρία από μεγάλα έργα του εξωτερικού προς όφελος των ελληνικών επιχειρήσεων.
ORACLE
Certified Solutions Partner
Oracle
Η Info Tech Group είναι από τις πρώτες εταιρείες στην αγορά που συνεργάζεται επισήμως με την Oracle, (Oracle Alliance Member, ORACLE Certified Partner) αναπτύσσοντας συνεχώς τεχνογνωσία μέσα από την κατασκευή μεγάλων και εξειδικευμένων πληροφοριακών συστημάτων.
http://www.oracle.com
META Group
METAGroup
Η Info Tech Group αντιπροσωπεύει αποκλειστικά στην Ελλάδα το συμβουλευτικό οίκο META Group. Η META Group είναι μια πρωτοπόρος εταιρία ερευνών και συμβουλευτικών υπηρεσιών, που εστιάζει στο χώρο της Πληροφορικής και των στρατηγικού επιχειρηματικού μετασχηματισμού. Τα μοντέλα συνεργασίας που προσφέρει στους πελάτες της τους βοηθούν να προσθέτουν αξία τόσο στα IT όσο και στα επιχειρησιακά τους συστήματα και διαδικασίες.
http://www.metagroup.com
hp
invent
HEWLETT PACKARD
Η Info Tech Group αντιπροσωπεύει την Hewlett Packard με λύσεις HP StorageWorks, οι οποίες καλύπτουν ολόκληρο το φάσμα των αναγκών αποθήκευσης: Network Attached Storage, Storage Area Networks, Tape Storage, Storage Software.
Επίσης είναι αντιπρόσωπος του Hp Openview, προσφέροντας ολοκληρωμένες λύσεις διαχείρισης επιχειρησιακών δικτύων και υπηρεσιών Service Level Management (SLM).
www.hp.gr
RAINBOW
TECHNOLOGIES
RAINBOW
Συνεργασία με την Rainbow Technologies, έναν από τους μεγαλύτερους προμηθευτές πληροφοριακών συστημάτων ασφάλειας παγκόσμια για την παροχή λύσεων ολοκληρωμένης ασφάλειας για το Internet σε επίπεδο eCommerce, προστασίας περιεχομένου και ασφάλειας τηλεπικοινωνιών.
www.rainbow.com
SurfControl
SurfControl
Με τη χρήση των προϊόντων της SurfControl, η Info Tech Group παρέχει λύσεις content filtering και mail filtering, που προσφέρουν υψηλότερο βαθμό ελέγχου των πόρων μιας εταιρίας σε ότι αφορά την πρόσβαση στο Internet.
www.surfcontrol.com

Page 3


INFO - TECH
Group
ΕΤΑΙΡΙΚΑ ΝΕΑ
Info Tech Group
ΑΡΧΙΚΗ ΣΕΛΙΔΑ
ΣΥΝΕΡΓΑΤΕΣ
ΠΕΛΑΤΕΣ
ΠΑΡΟΧΗ ΥΠΗΡΕΣΙΩΝ
Η ΕΤΑΙΡΙΑ ΜΑΣ
ΕΠΙΚΟΙΝΩΝΙΑ
Ενημερωτικό Δελτίο:
Το ενημερωτικό δελτίο παρέχει συνεχή ενημέρωση για τα νέα προϊόντα και τις υπηρεσίες που καταχωρούνται στη βάση δεδομένων του Ψηφιακού Κέντρου Έρευνας.
Σχετικά Links:
Δελτίο 1 έτος 2005
Δελτίο 2 έτος 2005
Δελτίο 3 έτος 2005
Δελτίο 4 έτος 2005
Τελευταία Νέα
8/1/2006 - Έκτακτη Γενική Συνέλευση της ΙΤG
15/01/2006 - Νέα έργα για την ΙΤG στην Κύπρο και Ιορδανία.
6/2/2006 - Επαναληπτική Τακτική Γενική Συνέλευση της ΙΤG

Page 4


INFO - TECH
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Info Tech Group
ΑΡΧΙΚΗ ΣΕΛΙΔΑ
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ΣΥΝΕΡΓΑΤΕΣ
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Η ΕΤΑΙΡΙΑ ΜΑΣ
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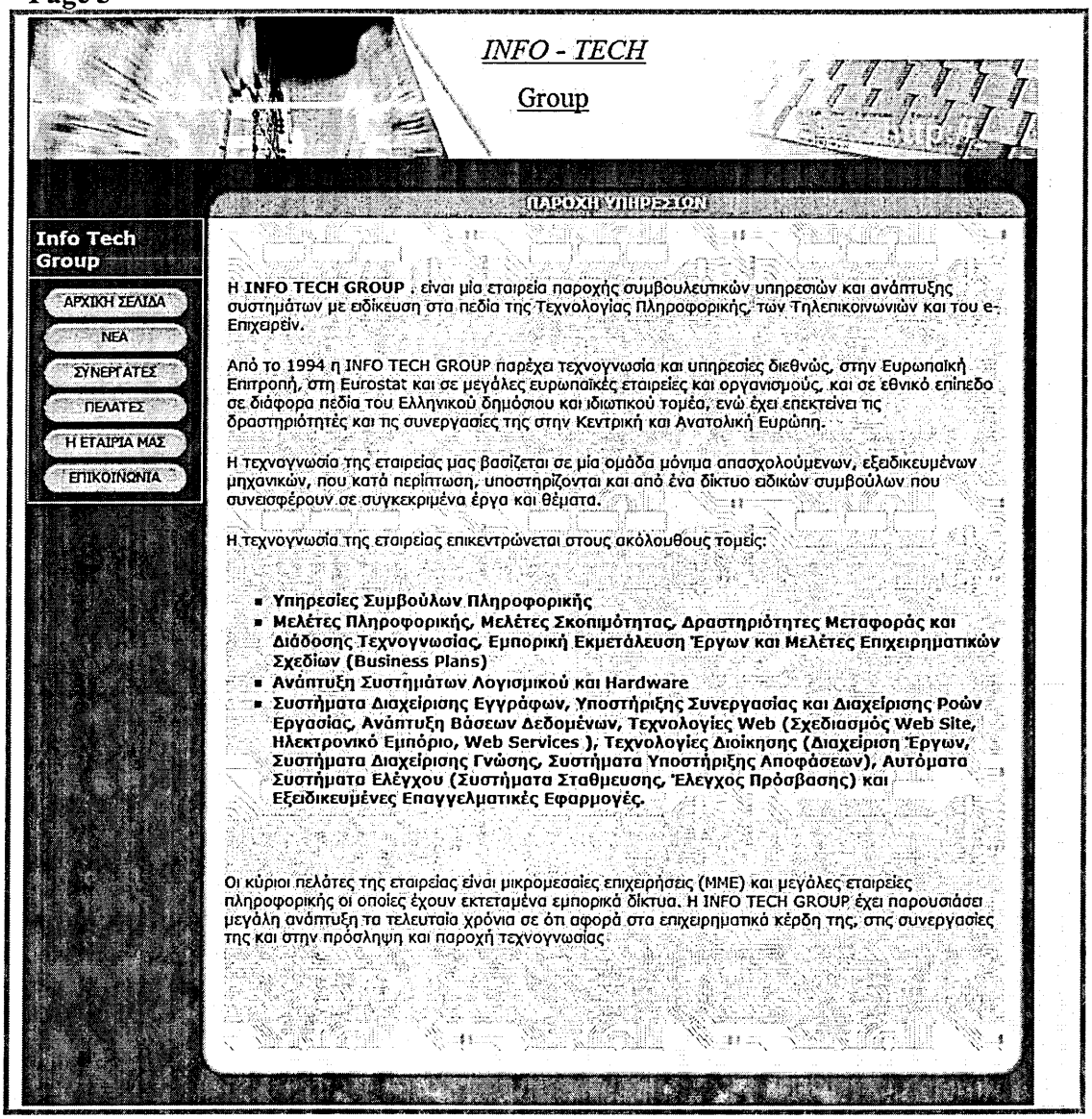
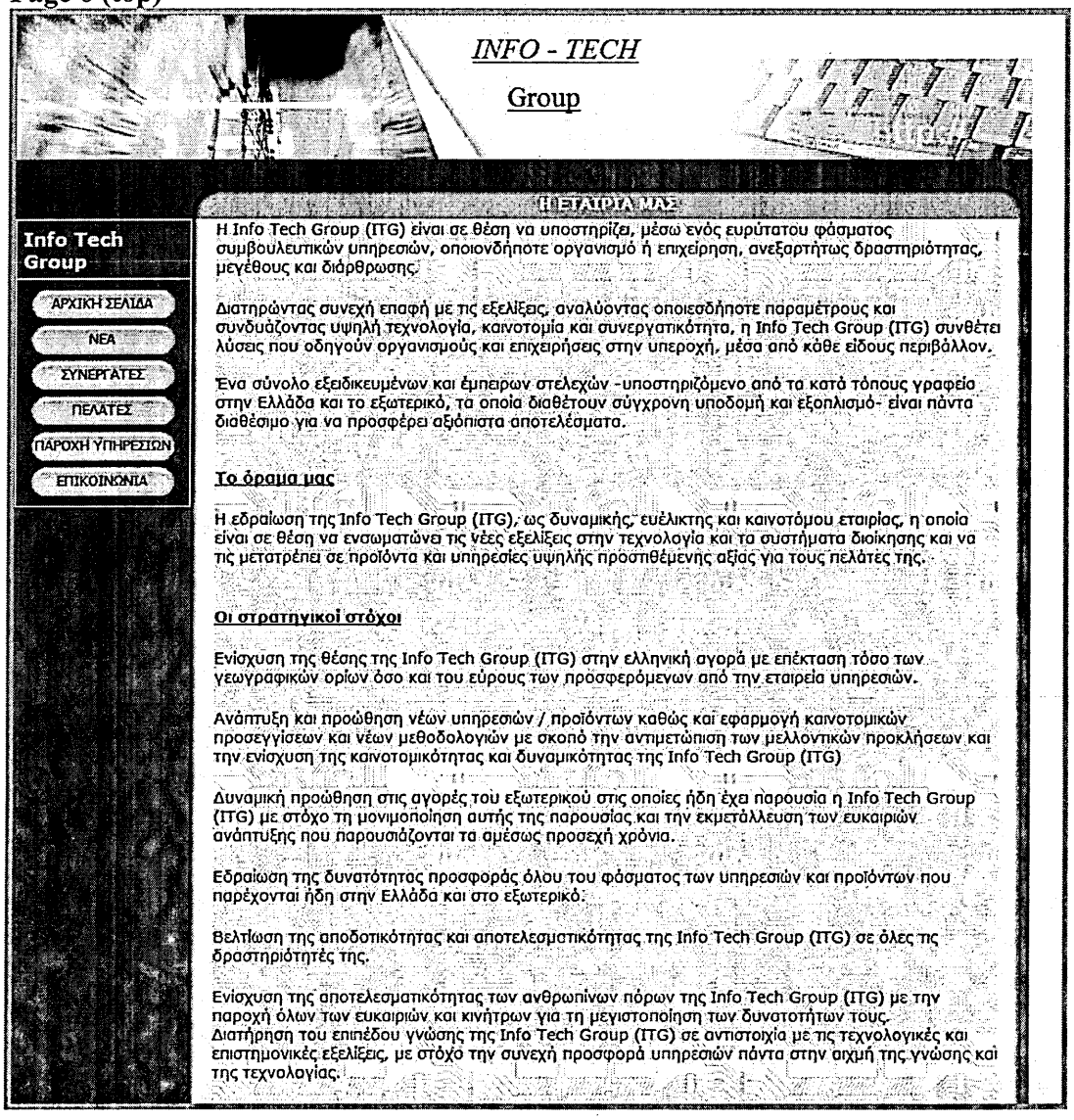
ΕΝΔΕΙΚΤΙΚΟΣ ΚΑΤΑΛΟΓΟΣ ΠΕΛΑΤΩΝ:
Παρουσιάζουμε τους πελάτες μας ανά τομέα προϊόντων (Λογισμικό, Hardware, Web and Networks, File Systems) στους οποίους η ITG έχει προσφέρει υπηρεσίες. Ο κατάλογος δεν είναι πλήρης και απλά εμφανίζει τους πρόσφατους μόνο πελάτες της εταιρείας.
Λογισμικό
ΕΘΝΙΚΗ ΤΡΑΠΕΖΑ ΤΗΣ ΕΛΛΑΔΟΣ
EFG EUROBANK ERGASIAS
ΤΡΑΠΕΖΑ ΠΕΙΡΑΙΩΣ
ΕΜΠΟΡΙΚΗ ΤΡΑΠΕΖΑ ΤΗΣ ΕΛΛΑΔΟΣ
Hardware
ΤΡΑΠΕΖΑ ΤΗΣ ΕΛΛΑΔΟΣ
ΔΙΕΘΝΗΣ ΑΕΡΟΛΙΜΕΝΑΣ ΑΘΗΝΩΝ
COSMOTE
ΟΠΑΠ
TIM
Web and Networks
ΕΜΠΟΡΙΚΗ ΤΡΑΠΕΖΑ ΤΗΣ ΕΛΛΑΔΟΣ
ΑΣΟΕΕ
CCC
ERICSSON
ΤΡΑΠΕΖΑ ΤΗΣ ΕΛΛΑΔΟΣ
File Systems
ΕΚΤ (ΕΘΝΙΚΟ ΚΕΝΤΡΟ ΤΕΚΜΗΡΙΩΣΗΣ)
ΕΜΠΟΡΙΚΗ ΤΡΑΠΕΖΑ ΤΗΣ ΕΛΛΑΔΟΣ
EFG EUROBANK ERGASIAS
COSMOTE
TIM
ΤΡΑΠΕΖΑ ΠΕΙΡΑΙΩΣ
ALPHA BANK

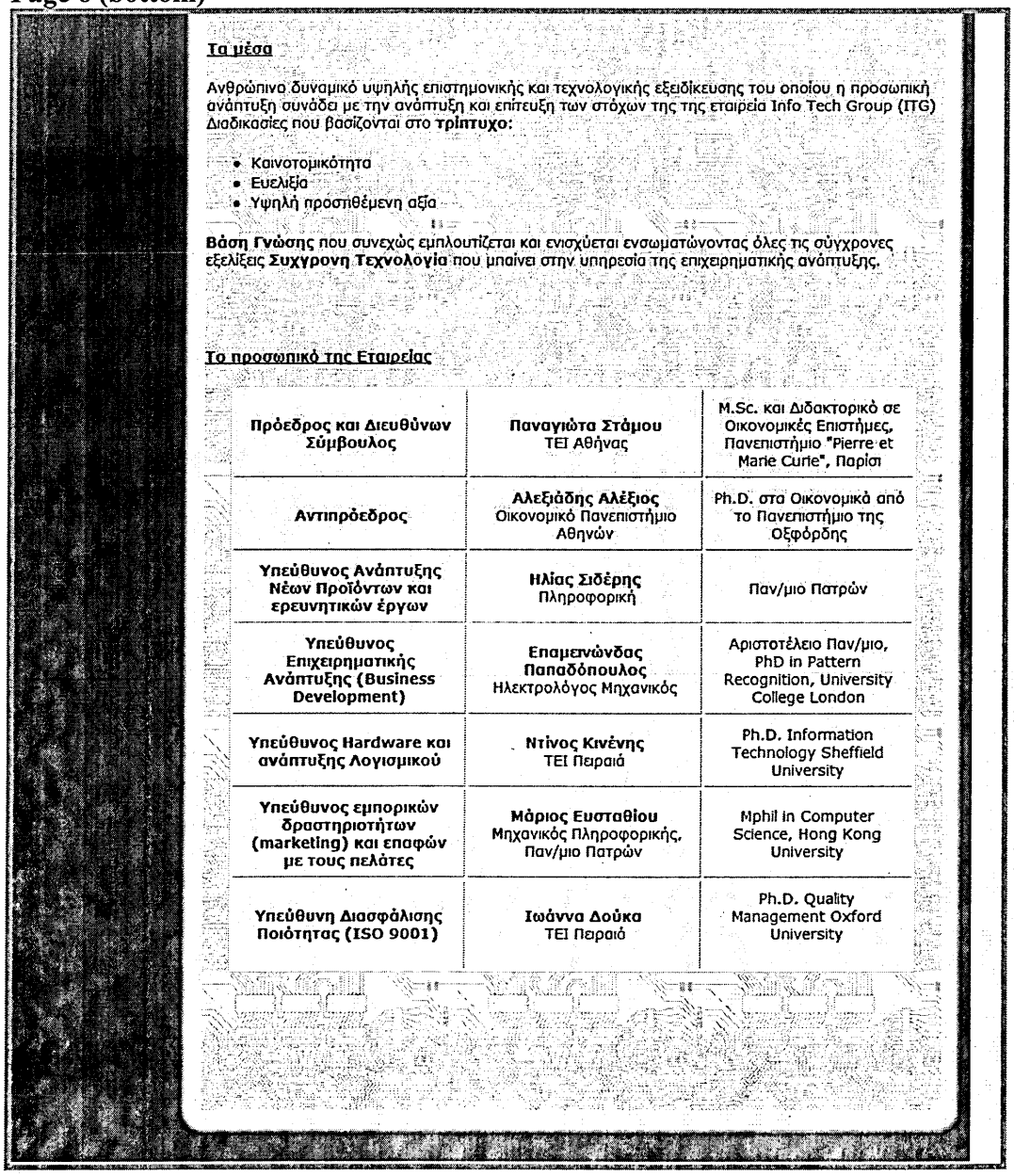
Page 5


INFO - TECH
Group
ΠΑΡΟΧΗ ΥΠΗΡΕΣΙΩΝ
Info Tech Group
ΑΡΧΙΚΗ ΣΕΛΙΔΑ
ΝΕΑ
ΣΥΝΕΡΓΑΤΕΣ
ΠΕΛΑΤΕΣ
Η ΕΤΑΙΡΙΑ ΜΑΣ
ΕΠΙΚΟΙΝΩΝΙΑ
Η INFO TECH GROUP . είναι μία εταιρεία παροχής συμβουλευτικών υπηρεσιών και ανάπτυξης συστημάτων με ειδίκευση στα πεδία της Τεχνολογίας Πληροφορικής, των Τηλεπικοινωνιών και του e-Επιχειρείν.
Από το 1994 η INFO TECH GROUP παρέχει τεχνογνωσία και υπηρεσίες διεθνώς, στην Ευρωπαϊκή Επιτροπή, στη Eurostat και σε μεγάλες ευρωπαϊκές εταιρείες και οργανισμούς, και σε εθνικό επίπεδο σε διάφορα πεδία του Ελληνικού δημόσιου και ιδιωτικού τομέα, ενώ έχει επεκτείνει τις δραστηριότητές και τις συνεργασίες της στην Κεντρική και Ανατολική Ευρώπη.
Η τεχνογνωσία της εταιρείας μας βασίζεται σε μία ομάδα μόνιμα απασχολούμενων, εξειδικευμένων μηχανικών, που κατά περίπτωση, υποστηρίζονται και από ένα δίκτυο ειδικών συμβούλων που συνεισφέρουν σε συγκεκριμένα έργα και θέματα.
Η τεχνογνωσία της εταιρείας επικεντρώνεται στους ακόλουθους τομείς:
Υπηρεσίες Συμβούλων Πληροφορικής
Μελέτες Πληροφορικής, Μελέτες Σκοπιμότητας, Δραστηριότητες Μεταφοράς και Διάδοσης Τεχνογνωσίας, Εμπορική Εκμετάλευση Έργων και Μελέτες Επιχειρηματικών Σχεδίων (Business Plans)
Ανάπτυξη Συστημάτων Λογισμικού και Hardware
Συστήματα Διαχείρισης Εγγράφων, Υποστήριξης Συνεργασίας και Διαχείρισης Ροών Εργασίας, Ανάπτυξη Βάσεων Δεδομένων, Τεχνολογίες Web (Σχεδιασμός Web Site, Ηλεκτρονικό Εμπόριο, Web Services), Τεχνολογίες Διοίκησης (Διαχείριση Έργων, Συστήματα Διαχείρισης Γνώσης, Συστήματα Υποστήριξης Αποφάσεων), Αυτόματα Συστήματα Ελέγχου (Συστήματα Σταθμευσης, Έλεγχος Πρόσβασης) και Εξειδικευμένες Επαγγελματικές Εφαρμογές.
Οι κύριοι πελάτες της εταιρείας είναι μικρομεσαίες επιχειρήσεις (ΜΜΕ) και μεγάλες εταιρείες πληροφορικής οι οποίες έχουν εκτεταμένα εμπορικά δίκτυα. Η INFO TECH GROUP έχει παρουσιάσει μεγάλη ανάπτυξη τα τελευταία χρόνια σε ότι αφορά στα επιχειρηματικά κέρδη της, στις συνεργασίες της και στην πρόσληψη και παροχή τεχνογνωσίας

Page 6 (top)


INFO - TECH
Group
Info Tech Group
ΑΡΧΙΚΗ ΣΕΛΙΔΑ
ΝΕΑ
ΣΥΝΕΡΓΑΤΕΣ
ΠΕΛΑΤΕΣ
ΠΑΡΟΧΗ ΥΠΗΡΕΣΙΩΝ
ΕΠΙΚΟΙΝΩΝΙΑ
Η ΕΤΑΙΡΙΑ ΜΑΣ
Η Info Tech Group (ITG) είναι σε θέση να υποστηρίζει, μέσω ενός ευρύτατου φάσματος συμβουλευτικών υπηρεσιών, οποιονδήποτε οργανισμό ή επιχείρηση, ανεξαρτήτως δραστηριότητας, μεγέθους και διάρθρωσης.
Διατηρώντας συνεχή επαφή με τις εξελίξεις, αναλύοντας οποιεσδήποτε παραμέτρους και συνδυάζοντας υψηλή τεχνολογία, καινοτομία και συνεργατικότητα, η Info Tech Group (ITG) συνθέτει λύσεις που οδηγούν οργανισμούς και επιχειρήσεις στην υπεροχή, μέσα από κάθε είδους περιβάλλον.
Ένα σύνολο εξειδικευμένων και έμπειρων στελεχών -υποστηριζόμενο από τα κατά τόπους γραφεία στην Ελλάδα και το εξωτερικό, τα οποία διαθέτουν σύγχρονη υποδομή και εξοπλισμό- είναι πάντα διαθέσιμο για να προσφέρει αξιόπιστα αποτελέσματα.
Το όραμα μας
Η εδραίωση της Info Tech Group (ITG), ως δυναμικής, ευέλικτης και καινοτόμου εταιρίας, η οποία είναι σε θέση να ενσωματώνει τις νέες εξελίξεις στην τεχνολογία και τα συστήματα διοίκησης και να τις μετατρέπει σε προϊόντα και υπηρεσίες υψηλής προστιθέμενης αξίας για τους πελάτες της.
Οι στρατηγικοί στόχοι
Ενίσχυση της θέσης της Info Tech Group (ITG) στην ελληνική αγορά με επέκταση τόσο των γεωγραφικών ορίων όσο και του εύρους των προσφερόμενων από την εταιρεία υπηρεσιών.
Ανάπτυξη και προώθηση νέων υπηρεσιών / προϊόντων καθώς και εφαρμογή καινοτομικών προσεγγίσεων και νέων μεθοδολογιών με σκοπό την αντιμετώπιση των μελλοντικών προκλήσεων και την ενίσχυση της καινοτομικότητας και δυναμικότητας της Info Tech Group (ITG)
Δυναμική προώθηση στις αγορές του εξωτερικού στις οποίες ήδη έχει παρουσία η Info Tech Group (ITG) με στόχο τη μονιμοποίηση αυτής της παρουσίας και την εκμετάλλευση των ευκαιριών ανάπτυξης που παρουσιάζονται τα αμέσως προσεχή χρόνια.
Εδραίωση της δυνατότητας προσφοράς όλου του φάσματος των υπηρεσιών και προϊόντων που παρέχονται ήδη στην Ελλάδα και στο εξωτερικό.
Βελτίωση της αποδοτικότητας και αποτελεσματικότητας της Info Tech Group (ITG) σε όλες τις δραστηριότητές της.
Ενίσχυση της αποτελεσματικότητας των ανθρωπίνων πόρων της Info Tech Group (ITG) με την παροχή όλων των ευκαιριών και κινήτρων για τη μεγιστοποίηση των δυνατοτήτων τους.
Διατήρηση του επιπέδου γνώσης της Info Tech Group (ITG) σε αντιστοιχία με τις τεχνολογικές και επιστημονικές εξελίξεις, με στόχο την συνεχή προσφορά υπηρεσιών πάντα στην αιχμή της γνώσης και της τεχνολογίας.

Page 6 (bottom)



Τα μέσα

Ανθρώπινο δυναμικό υψηλής επιστημονικής και τεχνολογικής εξειδίκευσης του οποίου η προσωπική ανάπτυξη συνάδει με την ανάπτυξη και επιτευξη των στόχων της της εταιρεία Info Tech Group (ITG) Διαδικασίες που βασίζονται στο **τρίπτυχο:**

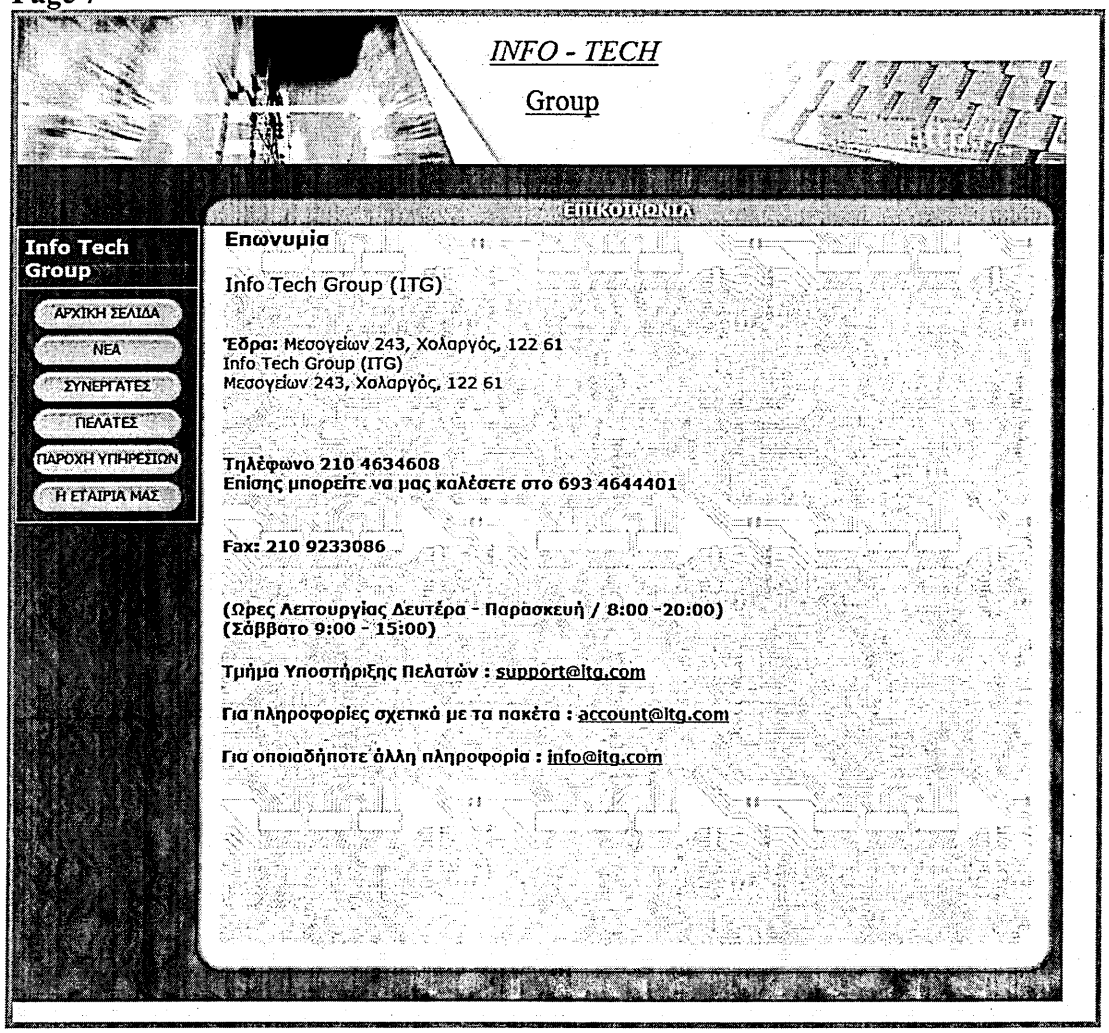
- Καινοτομικότητα
- Ευελιξία
- Υψηλή προστιθέμενη αξία

Βάση Γνώσης που συνεχώς εμπλουτίζεται και ενισχύεται ενσωματώνοντας όλες τις σύγχρονες εξελίξεις **Συχγρονη Τεχνολογία** που μπαίνει στην υπηρεσία της επιχειρηματικής ανάπτυξης.

Το προσωπικό της Εταιρείας

Πρόεδρος και Διευθύνων Σύμβουλος	**Παναγιώτα Στάμου** ΤΕΙ Αθήνας	M.Sc. και Διδακτορικό σε Οικονομικές Επιστήμες, Πανεπιστήμιο "Pierre et Marie Curie", Παρίσι
Αντιπρόεδρος	**Αλεξιάδης Αλέξιος** Οικονομικό Πανεπιστήμιο Αθηνών	Ph.D. στα Οικονομικά από το Πανεπιστήμιο της Οξφόρδης
Υπεύθυνος Ανάπτυξης Νέων Προϊόντων και ερευνητικών έργων	**Ηλίας Σιδέρης** Πληροφορική	Παν/μιο Πατρών
Υπεύθυνος Επιχειρηματικής Ανάπτυξης (Business Development)	**Επαμεινώνδας Παπαδόπουλος** Ηλεκτρολόγος Μηχανικός	Αριστοτέλειο Παν/μιο, PhD in Pattern Recognition, University College London
Υπεύθυνος Hardware και ανάπτυξης Λογισμικού	**Ντίνος Κινένης** ΤΕΙ Πειραιά	Ph.D. Information Technology Sheffield University
Υπεύθυνος εμπορικών δραστηριοτήτων (marketing) και επαφών με τους πελάτες	**Μάριος Ευσταθίου** Μηχανικός Πληροφορικής, Παν/μιο Πατρών	Mphil in Computer Science, Hong Kong University
Υπεύθυνη Διασφάλισης Ποιότητας (ISO 9001)	**Ιωάννα Δούκα** ΤΕΙ Πειραιά	Ph.D. Quality Management Oxford University

Page 7


INFO - TECH
Group
ΕΠΙΚΟΙΝΩΝΙΑ
Info Tech Group
ΑΡΧΙΚΗ ΣΕΛΙΔΑ
ΝΕΑ
ΣΥΝΕΡΓΑΤΕΣ
ΠΕΛΑΤΕΣ
ΠΑΡΟΧΗ ΥΠΗΡΕΣΙΩΝ
Η ΕΤΑΙΡΙΑ ΜΑΣ
Επωνυμία
Info Tech Group (ITG)
Έδρα: Μεσογείων 243, Χολαργός, 122 61
Info Tech Group (ITG)
Μεσογείων 243, Χολαργός, 122 61
Τηλέφωνο 210 4634608
Επίσης μπορείτε να μας καλέσετε στο 693 4644401
Fax: 210 9233086
(Ωρες Λειτουργίας Δευτέρα - Παρασκευή / 8:00 -20:00)
(Σάββατο 9:00 - 15:00)
Τμήμα Υποστήριξης Πελατών : support@itg.com
Για πληροφορίες σχετικά με τα πακέτα : account@itg.com
Για οποιαδήποτε άλλη πληροφορία : info@itg.com

Appendix 6.5: Statistical tests about participants' background

Table 6.5.1: Computer literacy

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.247(a)	2	.884	1.000		
Likelihood Ratio	.247	2	.884	1.000		
Fisher's Exact Test	.345			1.000		
Linear-by-Linear Association	.001(b)	1	.972	1.000	.576	.178
N of Valid Cases	39					

a 2 cells (33.3%) have expected count less than 5. The minimum expected count is 3.41.
b The standardized statistic is .035.

Table 6.5.2: Internet experience

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.283(a)	2	.868	.909		
Likelihood Ratio	.284	2	.868	.909		
Fisher's Exact Test	.398			.909		
Linear-by-Linear Association	.081(b)	1	.777	.828	.476	.168
N of Valid Cases	39					

a 2 cells (33.3%) have expected count less than 5. The minimum expected count is 2.92.
b The standardized statistic is .284.

Table 6.5.3: Time using the Internet

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.018(b)	1	.894	1.000	.576	
Continuity Correction(a)	.000	1	1.000			
Likelihood Ratio	.018	1	.894	1.000	.576	
Fisher's Exact Test				1.000	.576	
Linear-by-Linear Association	.017(c)	1	.895	1.000	.576	.252
N of Valid Cases	39					

a Computed only for a 2x2 table
b 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.79.
c The standardized statistic is .132.

Table 6.5.4: Weekly access to the internet

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.679(a)	3	.878	1.000		
Likelihood Ratio	.691	3	.875	1.000		
Fisher's Exact Test	.924			1.000		
Linear-by-Linear Association	.576(b)	1	.448	.507	.283	.103
N of Valid Cases	39					

a 6 cells (75.0%) have expected count less than 5. The minimum expected count is 1.46.
b The standardized statistic is .759.

Table 6.5.5: Daily access to the internet

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.636(a)	4	.802	.942		
Likelihood Ratio	2.028	4	.731	.942		
Fisher's Exact Test	1.771			.942		
Linear-by-Linear Association	.899(b)	1	.343	.422	.218	.083
N of Valid Cases	39					

a 6 cells (60.0%) have expected count less than 5. The minimum expected count is .49.
b The standardized statistic is .948.

Table 6.5.6: Design experience

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.086(b)	1	.770	1.000	.535	
Continuity Correction(a)	.000	1	1.000			
Likelihood Ratio	.086	1	.770	1.000	.535	
Fisher's Exact Test				1.000	.535	
Linear-by-Linear Association	.083(c)	1	.773	1.000	.535	.284
N of Valid Cases	39					

a Computed only for a 2x2 table
b 2 cells (50.0%) have expected count less than 5. The minimum expected count is 4.38.
c The standardized statistic is -.289.

Table 6.5.7: Grade average

Mann-Whitney test

Ranks

	Group	N	Mean Rank	Sum of Ranks
Total average grade	Guidelines	20	19.80	396.00
	Patterns	19	20.21	384.00
	Total	39		
Laboratory average grade	Guidelines	20	20.78	415.50
	Patterns	19	19.18	364.50
	Total	39		

Test Statistics

	Total average grade	Laboratory average grade
Mann-Whitney U	186.000	174.500
Wilcoxon W	396.000	364.500
Z	-.112	-.436
Asymp. Sig. (2-tailed)	.910	.663
Exact Sig. [2*(1-tailed Sig.)]	.923(a)	.667(a)
Exact Sig. (2-tailed)	.917	.671
Exact Sig. (1-tailed)	.458	.336
Point Probability	.006	.005

a Not corrected for ties.

Appendix 6.6: Forms completed by participants

Guidelines group

Surname .....

Name.....

Describe, in your own words, the key issue and usability principle for each guideline

Guideline	Key issue
1. Enable Access to the Home Page	
2. Limit Home Page Length	
3. Place Important Items Consistently	
4. Use Moderate White Space	
5. Align Items on a Page	
6. Provide Feedback on Users' Location	
7. Use a Clickable 'List of Contents' on Long Pages	
8. Use Descriptive Tab Labels	
9. Keep Navigation-only Pages Short	
10. Use Meta Navigation	
11. Repeat Navigation at the Bottom of the Page	
12. Use Unique, Descriptive and Emphasized Headings	
13. Provide Descriptive Page Titles	
14. Provide Links where the User May Need Them	
15. Match Link Names with Their Destination Pages	
16. Ensure that Embedded Links are Descriptive	
17. Designate Used Links	
18. Provide Consistent Clickability Cues	
19. Avoid Misleading Cues to Click	
20. Use Text for Links and Clickable Images	
21. Allow Users to Go Back to the Top of the Page	
22. Ensure Visual Consistency	
23. Format Common Items Consistently	
24. Use at Least 10-Point Font	
25. Use Familiar Fonts	
26. Use Black Text on Plain, High-Contrast Backgrounds	
27. Emphasize Importance in Text	
28. Use Attention-Attracting Features when Appropriate	
29. Use Mixed Cases with Prose	
30. Use proper alignment for Text	
31. Use alternating row colours for tables	
32. Display Related Items in Lists	
33. Introduce Each List	
34. Format Lists to Ease Scanning	
35. Capitalize First Letter of First Word in Lists	

Surname.....

Name.....

Describe, in your own words, the key issue and usability principle for each pattern

Pattern Name	Key Issue
1. Home Page Link	
2. Home Page Length	
3. Consistent Important Items	
4. White Space	
5. Item Alignment	
6. Users' Location	
7. Page List of Contents	
8. Descriptive Tab Labels	
9. Length of Navigation	
10. Meta Navigation	
11. Repeated Menu	
12. Nice Headings	

13. Page Titles	
14. Properly Placed and Descriptive Links	
15. Obvious Links - Consistent Cues	
16. Clickable Images	
17. To the Top Link	
18. Consistency in Text	
19. Visible Text	
20. Emphasized Text	
21. Attention Attracting Features	
22. Mixed Case Text	
23. Aligned Text	
24. Alternating Row Colours	
25. Lists	

Appendix 6.7: Instructions for design test

Infolstos web site

Design Task

Dear Student

Please read the following instructions carefully:

Task

- Format and design a web site for a company that itself designs and builds web pages for other companies and individuals.
- You are only required to design three pages, as per the following table:

index	Home Page
nea	News page of the company
contact	Information to contact the company

- Create necessary links to the hypothetical webpage "ypothetiki.htm".
- Don't change the table used for page layout because it is possible that other problems will occur that are hard to solve.

Navigation

- It is important to have a functional navigation scheme and links at the right places. It would be better to think about navigation before you commit yourself, since it will take more time to make changes later.
- For the navigation use interactive buttons of appropriate colour and size. **Avoid using a Link bar based on navigation.**

Also, in the navigation bar there will be two more pages:

- One page lists the seminars and the educational program that the company organizes.
- Another one presents information about technical support and other forms of assistance that the company offers to the clients.

These two pages will not be formatted although they are included on the web site – they will only exist in the navigation bar.

Text

- The format of the text should be according to the instructions given on each page, next to the text. The instructions are in bold English characters in fuchsia or in text boxes and should be deleted once you have finished with each page. The exact meaning of the text is not very important, but do try to use the correct links and headings and proper formatting.

General instructions

- Design the company's site according to the principles of usability and the techniques that you have been taught.
- Do not add or use elements like: **breadcrumbs, list of contents, meta-navigations, site maps.**
- Try to avoid "over the top" design structures that will take time. Don't forget the site is about a company with a specific goal.
- If you think that you need pictures, images or small gif files, you can find several of them in the directory "my_ikones" included on the web site.
- You may ask any question, especially if you cannot apply a specific technique that you want to apply. The same applies if for any reason the final presentation of the website is not as expected and you need some help.

Good Luck

Appendix 6.8: Initial state of site given to students

Page 1

Work with both Impages or one of them

Design and format this page

Format and set links
Do not add any text or labels. Use the existing ones only

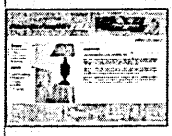
Do not forget navigation

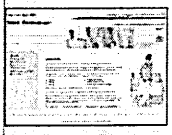
Η InfoIstos είναι η πλέον δημοφιλέστερη και πιο αξιόπιστη εταιρία παροχής **Υπηρεσιών** Internet στην Ελλάδα, ειδικεύεται και προσφέρει εμπορικές υπηρεσίες Internet στην **Ελλάδα** αλλά και σε όλο τον κόσμο. Η InfoIstos είναι μια από τις πλέον δυναμικά αναπτυσσόμενες εταιρίες παροχής ολοκληρωμένων λύσεων στο χώρο του **Internet** και της πληροφορικής, με σημαντική δραστηριότητα τόσο στην ελληνική όσο και στην διεθνή αγορά.

Web Creations

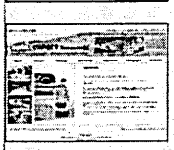
Δείγματα από την ομάδα σχεδιασμού.

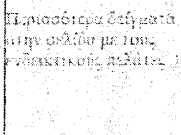
Η InfoIstos δραστηριοποιείται στους εξής τομείς: Υπηρεσίες Φιλοξενίας (Web Hosting),Υπηρεσίες Σχεδιασμού & Δημιουργίας Ιστοσελίδων (Web Design),Υπηρεσίες Διαφήμισης και προώθησης στο Internet (web Promotion),Υπηρεσίες Ανάπτυξης και Υποστήριξης Εφαρμογών Web, Υπηρεσίες Καταχώρισης Domain Name Server, Υπηρεσίες Ανάπτυξης και Υποστήριξης Δυναμικών Ιστοσελίδων





Επίσης η InfoIstos εξειδικεύεται στις σύγχρονες λύσεις ηλεκτρονικού εμπορίου. Το ηλεκτρονικό **εμπόριο** εισέβαλε τα τελευταία χρόνια στον χώρο των επιχειρήσεων διευρύνοντας τα οφέλη των εταιριών από τις on-line πωλήσεις και παρέχοντας νέους περισσότερο λειτουργικούς τρόπους διαχείρισης των πωλήσεων. Τα οφέλη της επιχείρησης σας από την είσοδο της στον κόσμο του ηλεκτρονικού εμπορίου είναι πολλά μεταξύ των οποίων: Αύξηση των πωλήσεων, Βέλτιστη διαχείριση των προϊόντων και των παραγγελιών, Άμεση ικανοποίηση των αναγκών των πελατών, Μεγαλύτερη ασφάλεια στις συναλλαγές, Ακρίβεια στην ενημέρωση γιά νέα προϊόντα και άμεση προώθηση τους στην αγορά.





Περισσότερα δείγματα στην σελίδα με τους πελατικούς πόρτες.

Η τεχνογνωσία που κατέχουμε στον χώρο μας καθιστά ικανούς και μας γεμίζει με αισιοδοξία για να προσφέρουμε τα μέγιστα στον χώρο και να συντελέσουμε και εμείς με την σειρά μας στην περαιτέρω εξέλιξή του.

Page 2

Format the page. Study the text and set proper links. There should be one only link in each paragraph. The destination of each link should be to a dummy page.

The two images should be made links

do not forget

NAVIGATION

Please format

27.03.2006 Η InfoIstos είναι No #1 στην αγορά Server και Unix Server βάσει εσόδων. Η εταιρεία αναλυτών IDC ανακοίνωσε πρόσφατα ότι για το τέταρτο τρίμηνο του 2005, η InfoIstos είναι πρώτη στα συνολικά έσοδα από πωλήσεις server στην Ελλάδα για ενδέκατο συνεχόμενο τρίμηνο.

16.03.2006 Σύμφωνα με μελέτη της InfoIstos, οι Διευθύνοντες Σύμβουλοι στην πλειοψηφία τους σχεδιάζουν ριζικές αλλαγές και προσδοκούν νέες μορφές καινοτομίας για την προώθηση της ανάπτυξης. Σε πρόσφατη μελέτη του τομέα των InfoIstos Business Consulting Services, αναφέρεται ότι το 65% των Διευθύνοντων Συμβούλων (CEO) κορυφαίων επιχειρήσεων σε όλο τον κόσμο, δηλώνουν ότι λόγω των ανταγωνιστικών πιέσεων και της δυναμικής της αγοράς, σχεδιάζουν να αναμορφώσουν ριζικά τις εταιρείες τους, μέσα στα επόμενα δύο χρόνια.

08.03.2006 Η InfoIstos βοηθά τη Στοκχόλμη να περιορίσει την οδική κυκλοφορία κατά 25% σε 1 μήνα. Στοκχόλμη, Σουηδία – 23 Φεβρουαρίου, 2006. Μετά την εφαρμογή τον Ιανουάριο του προγράμματος χρέωσης για τη χρήση των δρόμων σε ώρες αιχμής, τα πρώτα στοιχεία δείχνουν ότι με το πιλοτικό πρόγραμμα επιτεύχθηκε μείωση της κυκλοφορίας κατά 25%.

02.02.2006 Η InfoIstos επεκτείνει τις λύσεις στον κλάδο του λιανικού εμπορίου.Η InfoIstos ανακοίνωσε νέες λύσεις που βασίζονται στην πλατφόρμα BladeCenter της InfoIstos και θα βοηθήσουν τους πελάτες λιανικής να διαχειρίζονται τα απομακρυσμένα περιβάλλοντα καταστημάτων, πιο οικονομικά και αποδοτικά.

02.01.2006 Service Oriented Architecture (SOA).Σήμερα, που οι σύγχρονες επιχειρήσεις καλούνται να ανταποκρίνονται άμεσα στις δυναμικά μεταβαλλόμενες επιχειρηματικές συνθήκες, γίνεται επιτακτική η αξιοποίηση μιας προηγμένης τεχνολογικής υποδομής που επεκτείνει και ενοποιεί τις υπάρχουσες εφαρμογές.

Format column and text.

Certain works or sentences should be made links.

Περιοδικό InfoIstos

Το ενημερωτικό δελτίο παρέχει συνεχή ενημέρωση για τα νέα προϊόντα και τις υπηρεσίες που καταχωρούνται στη βάση δεδομένων του Ψηφιακού Κέντρου Έρευνας.

(Make links to a dummy page)

Περιοδικό πο. 3 έτος 2005

Ανανεωμένο περιοδικό InfoIstos. Διαβάστε online αναλυτικά τα περιεχόμενα του ανανεωμένου Infosoc (τεύχος Ιουνίου 2005) ...

Περιοδικό πο. 3 έτος 2005

Περιοδικό InfoIstos. Διαβάστε online αναλυτικά τα περιεχόμενα του InfoIstos (τεύχος Σεπτ. 2005), του περιοδικού ...

Περιοδικό πο. 1 έτος 2005

Περιοδικό InfoIstos. Διαβάστε online αναλυτικά τα περιεχόμενα του InfoIstos (τεύχος Ιανουαρ. 2005), με τις νέες αντιλήψεις στον χώρο του Web Design ...

Γίνετε συνδρομητής στα Δελτία της InfoIstos
Μπορείτε να λαμβάνετε πλούσιες πληροφορίες για την InfoIstos μέσω e-mail χωρίς κανένα κόστος

Τελευταία Νέα

Format column and text.

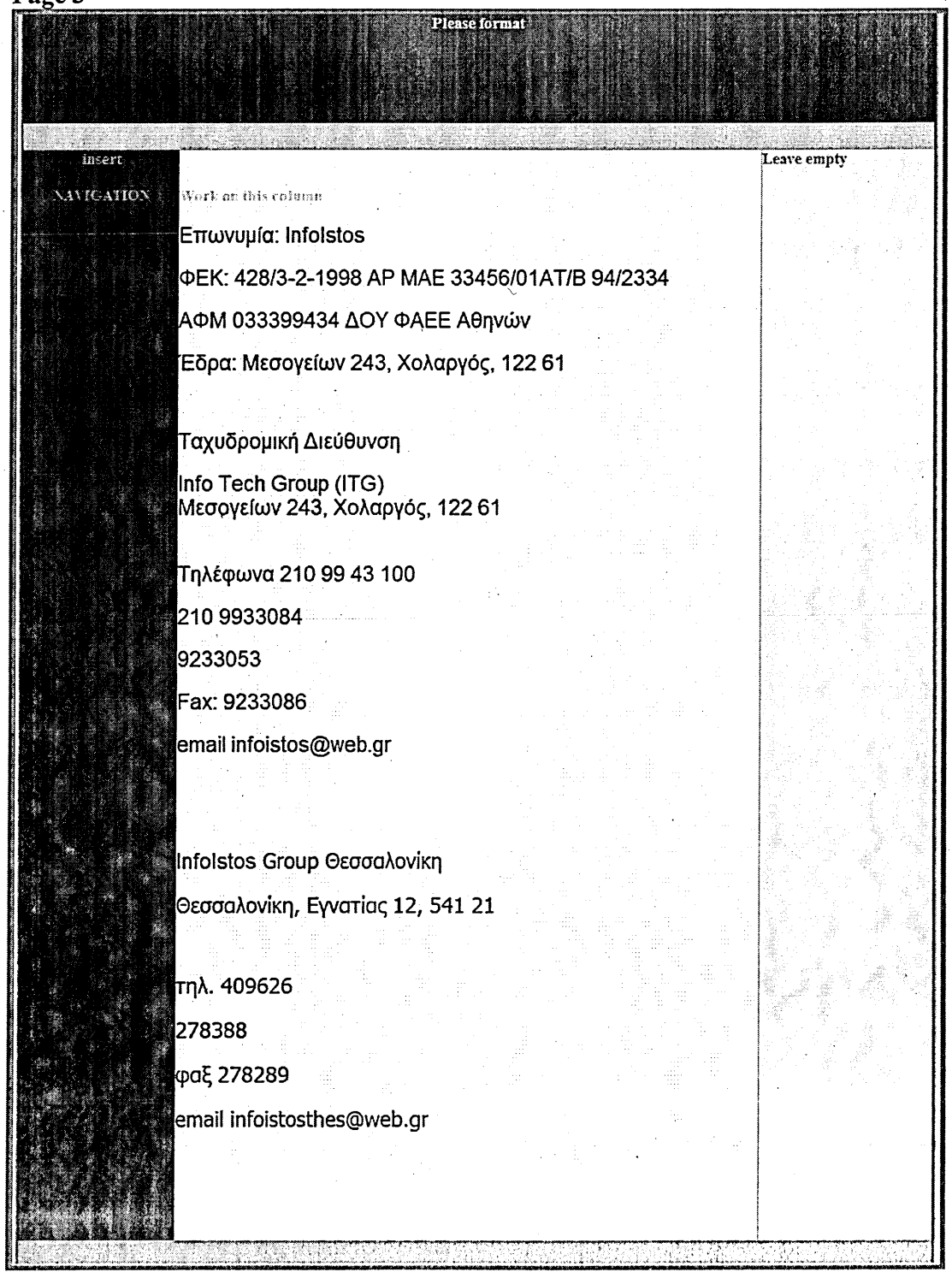
Certain works or sentences should be made links.

8/1/2006
Έκτακτη Γενική Συνέλευση της InfoIstos στη Θεσσαλονίκη

15/01/2006
Νέα έργα για την InfoIstos στην Γαλλία και Κύπρο με διεθνή εντίκτυπο.

6/2/2006
Ετήσια Γενική Συνέλευση της InfoIstos και των θυγατρικών εταιρείων στο Βερολίνο με θέμα την επέκταση της εταιρείας.

Page 3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insert
NAVIGATION
Work on this column
Leave empty
Επωνυμία: Infolstos
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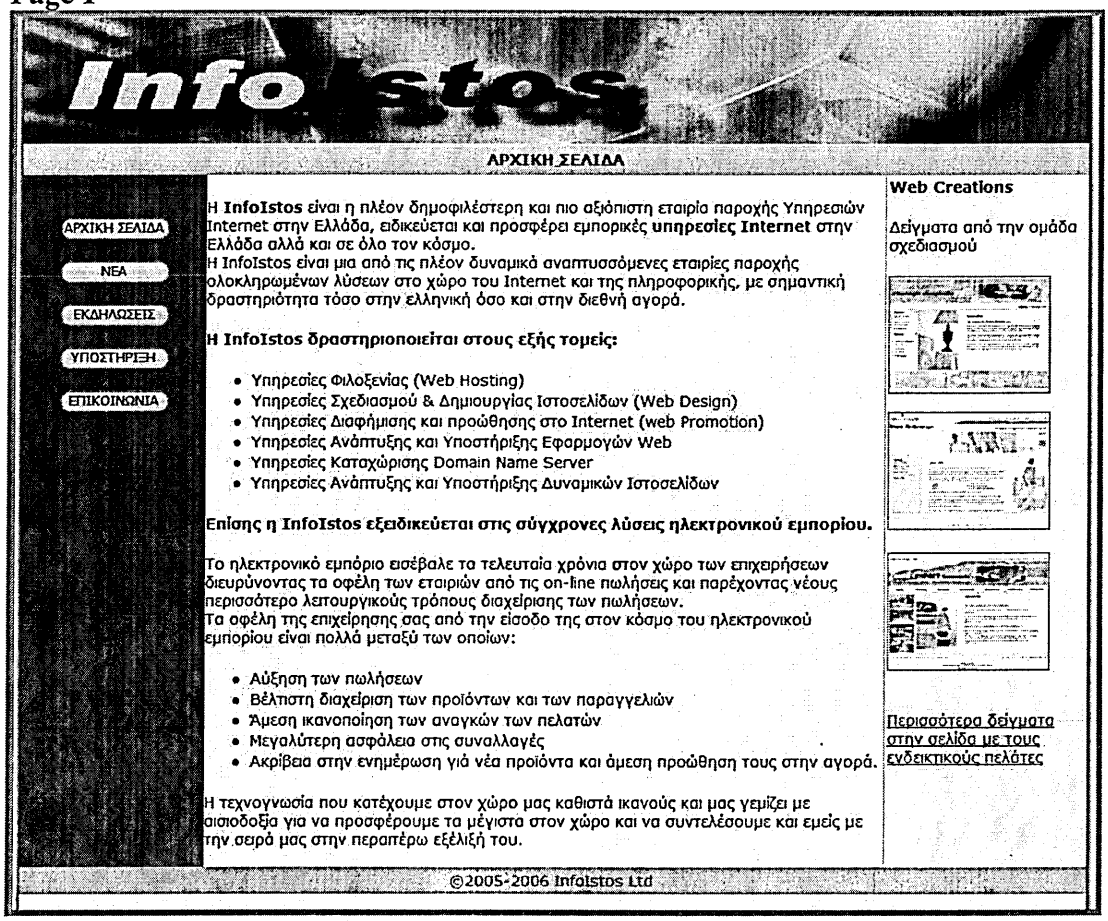
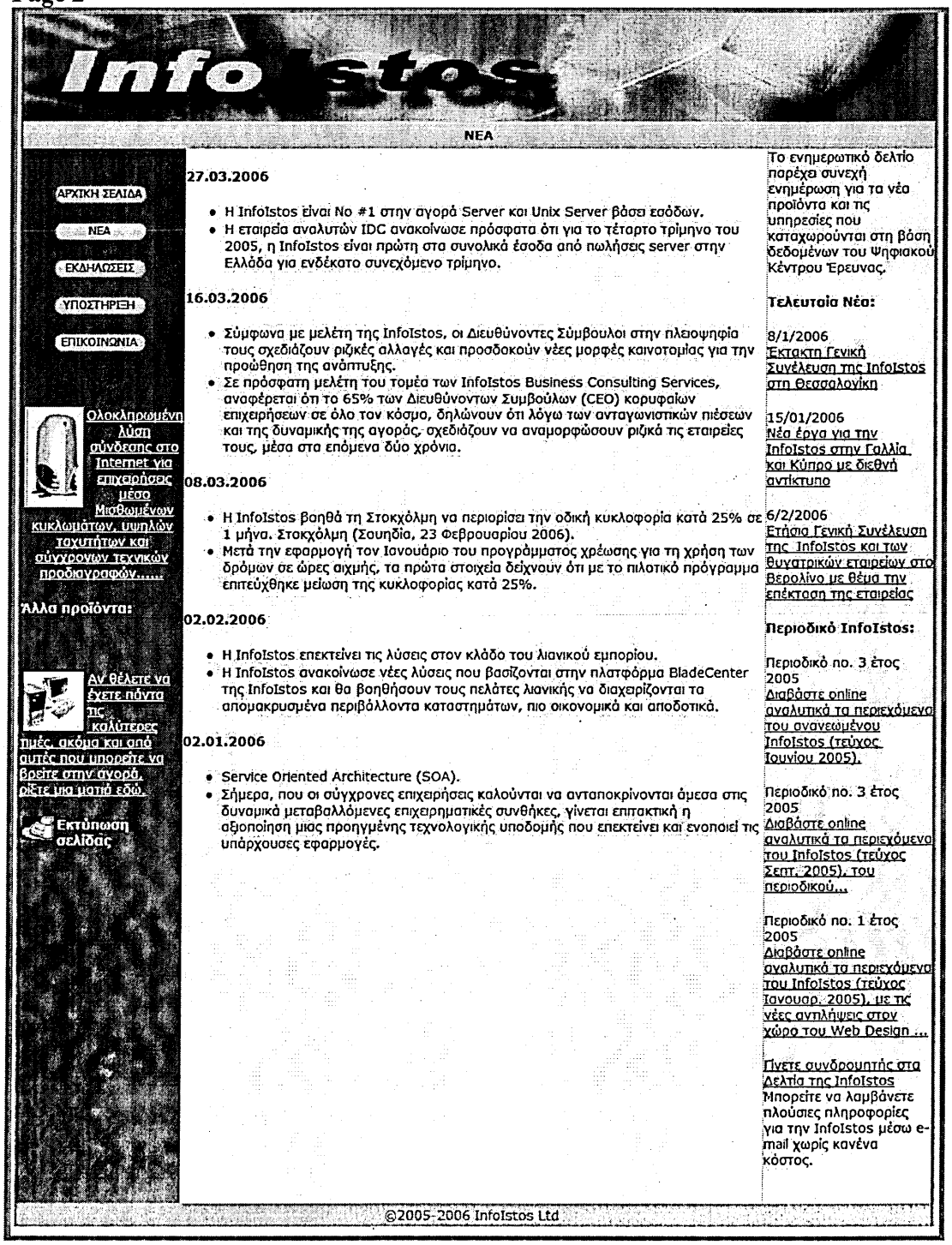
ΑΦΜ 033399434 ΔΟΥ ΦΑΕΕ Αθηνών
Έδρα: Μεσογείων 243, Χολαργός, 122 61
Ταχυδρομική Διεύθυνση
Info Tech Group (ITG)
Μεσογείων 243, Χολαργός, 122 61
Τηλέφωνα 210 99 43 100
210 9933084
9233053
Fax: 9233086
email infoistos@web.gr
Infolstos Group Θεσσαλονίκη
Θεσσαλονίκη, Εγνατίας 12, 541 21
τηλ. 409626
278388
φαξ 278289
email infoistosthes@web.gr

Appendix 6.9: Example of site delivered

Page 1



Page 2


InfoIstos
ΝΕΑ
ΑΡΧΙΚΗ ΣΕΛΙΔΑ
ΝΕΑ
ΕΚΔΗΛΩΣΕΙΣ
ΥΠΟΣΤΗΡΙΞΗ
ΕΠΙΚΟΙΝΩΝΙΑ
Ολοκληρωμένη λύση σύνδεσης στο Internet για επιχειρήσεις μέσω Μισθωμένων Κυκλωμάτων, Υψηλών Ταχυτήτων και σύγχρονων τεχνικών προδιαγραφών.....
Άλλα προϊόντα:
Αν θέλετε να έχετε πάντα τις καλύτερες τιμές, ακόμα και από αυτές που μπορείτε να βρείτε στην αγορά, ρίξτε μια ματιά εδώ.
Εκτύπωση σελίδας
27.03.2006
• Η InfoIstos είναι No #1 στην αγορά Server και Unix Server βάσει εσόδων.
• Η εταιρεία αναλυτών IDC ανακοίνωσε πρόσφατα ότι για το τέταρτο τρίμηνο του 2005, η InfoIstos είναι πρώτη στα συνολικά έσοδα από πωλήσεις server στην Ελλάδα για ενδέκατο συνεχόμενο τρίμηνο.
16.03.2006
• Σύμφωνα με μελέτη της InfoIstos, οι Διευθύνοντες Σύμβουλοι στην πλειοψηφία τους σχεδιάζουν ριζικές αλλαγές και προσδοκούν νέες μορφές καινοτομίας για την προώθηση της ανάπτυξης.
• Σε πρόσφατη μελέτη του τομέα των InfoIstos Business Consulting Services, αναφέρεται ότι το 65% των Διευθύνοντων Συμβούλων (CEO) κορυφαίων επιχειρήσεων σε όλο τον κόσμο, δηλώνουν ότι λόγω των ανταγωνιστικών πιέσεων και της δυναμικής της αγοράς, σχεδιάζουν να αναμορφώσουν ριζικά τις εταιρείες τους, μέσα στα επόμενα δύο χρόνια.
08.03.2006
• Η InfoIstos βοηθά τη Στοκχόλμη να περιορίσει την οδική κυκλοφορία κατά 25% σε 1 μήνα. Στοκχόλμη (Σουηδία, 23 Φεβρουαρίου 2006).
• Μετά την εφαρμογή τον Ιανουάριο του προγράμματος χρέωσης για τη χρήση των δρόμων σε ώρες αιχμής, τα πρώτα στοιχεία δείχνουν ότι με το πιλοτικό πρόγραμμα επιτεύχθηκε μείωση της κυκλοφορίας κατά 25%.
02.02.2006
• Η InfoIstos επεκτείνει τις λύσεις στον κλάδο του λιανικού εμπορίου.
• Η InfoIstos ανακοίνωσε νέες λύσεις που βασίζονται στην πλατφόρμα BladeCenter της InfoIstos και θα βοηθήσουν τους πελάτες λιανικής να διαχειρίζονται τα απομακρυσμένα περιβάλλοντα καταστημάτων, πιο οικονομικά και αποδοτικά.
02.01.2006
• Service Oriented Architecture (SOA).
• Σήμερα, που οι σύγχρονες επιχειρήσεις καλούνται να ανταποκρίνονται άμεσα στις δυναμικά μεταβαλλόμενες επιχειρηματικές συνθήκες, γίνεται επιτακτική η αξιοποίηση μιας προηγμένης τεχνολογικής υποδομής που επεκτείνει και ενοποιεί τις υπάρχουσες εφαρμογές.
Το ενημερωτικό δελτίο παρέχει συνεχή ενημέρωση για τα νέα προϊόντα και τις υπηρεσίες που καταχωρούνται στη βάση δεδομένων του Ψηφιακού Κέντρου Έρευνας.
Τελευταία Νέα:
8/1/2006
Έκτακτη Γενική Συνέλευση της InfoIstos στη Θεσσαλονίκη
15/01/2006
Νέα έργα για την InfoIstos στην Γαλλία και Κύπρο με διεθνή αντίκτυπο
6/2/2006
Ετήσια Γενική Συνέλευση της InfoIstos και των θυγατρικών εταιρείων στο Βερολίνο με θέμα την επέκταση της εταιρείας
Περιοδικό InfoIstos:
Περιοδικό no. 3 έτος 2005
Διαβάστε online αναλυτικά τα περιεχόμενα του ανανεωμένου InfoIstos (τεύχος Ιουνίου 2005).
Περιοδικό no. 3 έτος 2005
Διαβάστε online αναλυτικά τα περιεχόμενα του InfoIstos (τεύχος Σεπτ. 2005), του περιοδικού...
Περιοδικό no. 1 έτος 2005
Διαβάστε online αναλυτικά τα περιεχόμενα του InfoIstos (τεύχος Ιανουαρ. 2005), με τις νέες αντιλήψεις στον χώρο του Web Design ...
Γίνετε συνδρομητής στα Δελτία της InfoIstos
Μπορείτε να λαμβάνετε πλούσιες πληροφορίες για την InfoIstos μέσω e-mail χωρίς κανένα κόστος.
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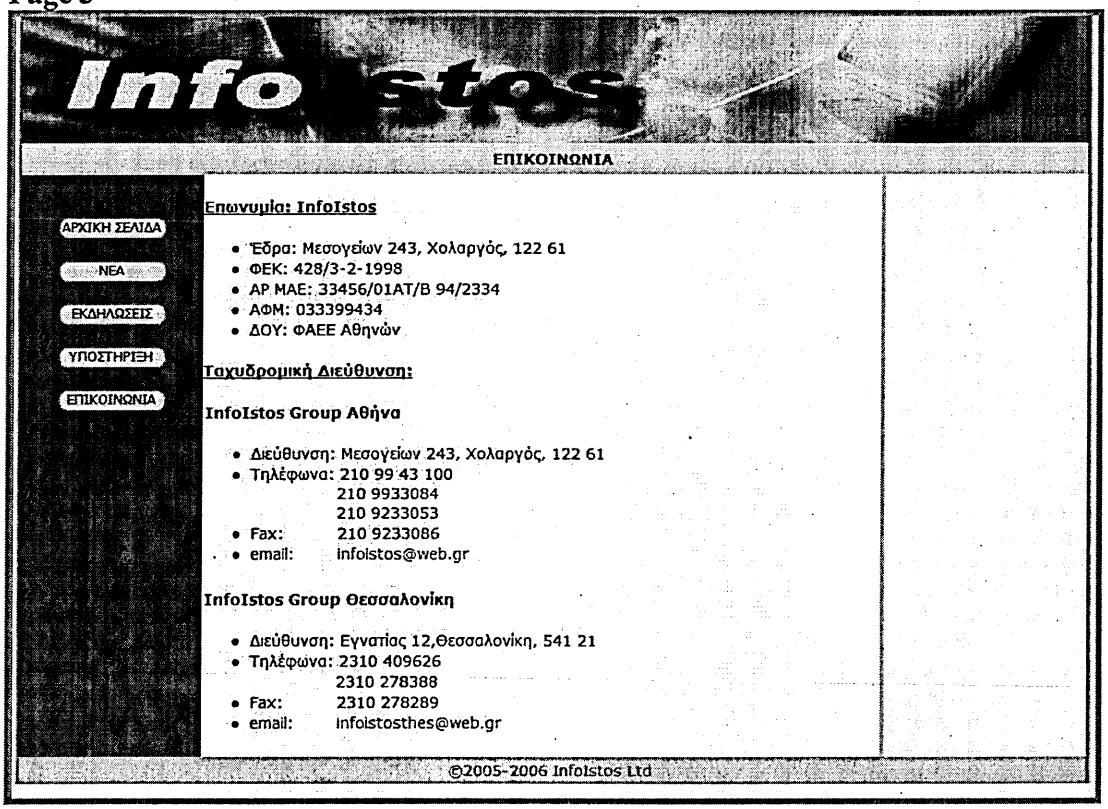
Page 3


InfoIstos
ΕΠΙΚΟΙΝΩΝΙΑ
ΑΡΧΙΚΗ ΣΕΛΙΔΑ
ΝΕΑ
ΕΚΔΗΛΩΣΕΙΣ
ΥΠΟΣΤΗΡΙΞΗ
ΕΠΙΚΟΙΝΩΝΙΑ
Επωνυμία: InfoIstos
Έδρα: Μεσογείων 243, Χολαργός, 122 61
ΦΕΚ: 428/3-2-1998
ΑΡ.ΜΑΕ: 33456/01ΑΤ/Β 94/2334
ΑΦΜ: 033399434
ΔΟΥ: ΦΑΕΕ Αθηνών
Ταχυδρομική Διεύθυνση:
InfoIstos Group Αθήνα
Διεύθυνση: Μεσογείων 243, Χολαργός, 122 61
Τηλέφωνα: 210 99 43 100
210 9933084
210 9233053
Fax: 210 9233086
email: infoistos@web.gr
InfoIstos Group Θεσσαλονίκη
Διεύθυνση: Εγνατίας 12,Θεσσαλονίκη, 541 21
Τηλέφωνα: 2310 409626
2310 278388
Fax: 2310 278289
email: infoistosthes@web.gr
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Appendix 6.10: Scores of the design test

Evaluator 1

	Metric code	F12	Z25	B08	B10	W11	B23	B25	B27	Q45	S03	S05	W70	S80	S81	S82	S84	F54	F55	F56	F57	Q02	W08	Z01	Z03	F01	F11	W01	B11	B21	B29	Q41	Q43	Q47	Q49	S01	S07	S09	W66	S83
1	W01_C1	9.0	8.5	5.8	8.5	2.6	6.9	9.0	9.0	9.0	6.4	6.9	9.0	9.0	4.8	9.0	8.5	7.4	7.9	9.0	9.0	6.4	8.5	9.0	8.5	7.4	9.0	9.0	9.0	8.5	6.9	9.0	9.0	8.5	6.9	8.5	5.8	8.5	8.5
2	W02_N3	9.0	9.0	8.0	0.0	9.0	7.0	7.0	9.0	9.0	7.0	1.0	6.0	9.0	8.0	9.0	7.0	0.0	7.0	1.0	0.0	8.0	9.0	8.0	8.0	9.0	0.0	9.0	9.0	9.0	8.5	9.0	9.0	9.0	8.5	9.0	9.0	9.0	7.0
3	W03_N6	0.0	0.0	9.0	9.0	0.0	0.0	0.0	9.0	9.0	0.0	9.0	0.0	9.0	7.0	9.0	9.0	0.0	0.0	0.0	0.0	9.0	0.0	9.0	9.0	9.0	0.0	9.0	9.0	9.0	9.0	0.0	0.0	9.0	9.0	0.0	9.0	9.0	0.0
4	W04_N9	9.0	9.0	9.0	6.0	6.0	8.0	9.0	8.0	9.0	8.0	5.0	9.0	9.0	8.0	9.0	8.0	6.0	9.0	7.0	9.0	9.0	8.0	9.0	9.0	9.0	7.0	9.0	9.0	9.0	9.0	9.0	9.0	6.0	9.0	6.0	9.0	9.0	6.0
5	W05_N4	9.0	6.0	3.0	6.0	4.5	4.5	6.0	4.5	7.5	6.0	6.0	4.5	4.5	4.5	6.0	7.5	6.0	3.0	7.5	7.5	1.5	9.0	7.5	4.5	7.5	7.5	7.5	6.0	7.5	1.5	7.5	3.0	9.0	4.5	6.0	6.0	6.0	7.5
6	W06_N5	0.0	9.0	9.0	6.0	4.5	4.5	6.0	4.5	9.0	9.0	9.0	2.3	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	4.5	0.0	9.0	0.0	9.0	9.0	9.0	0.0	9.0	9.0	9.0	9.0	9.0	0.0	9.0	0.0
7	W07_L1	8.5	6.5	5.0	6.8	2.8	5.3	5.5	5.4	5.8	4.0	5.8	7.6	7.8	5.5	5.4	3.5	3.1	6.8	2.6	4.4	5.8	5.8	6.6	6.0	8.0	4.6	6.3	8.0	7.5	6.8	3.6	5.5	5.0	7.5	7.3	6.4	5.9	5.8
8	W08_L2	7.5	9.0	9.0	9.0	7.5	4.5	9.0	9.0	7.5	9.0	4.5	9.0	9.0	6.0	9.0	9.0	9.0	4.5	4.5	9.0	4.5	7.5	9.0	9.0	9.0	7.5	9.0	9.0	9.0	7.5	9.0	9.0	7.5	9.0	7.3	9.0	9.0	9.0
9	W09_L8	4.5	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	9.0	0.0	9.0	0.0	0.0	9.0	0.0	9.0	0.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0
10	W10_L5	0.0	9.0	3.0	0.0	9.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	0.0	0.0	6.0	9.0	0.0	9.0	9.0	9.0	9.0	3.0	0.0	0.0	6.0	9.0	0.0	9.0	0.0
11	W11_T6	7.0	0.0	5.0	4.5	7.0	9.0	9.0	9.0	0.0	9.0	0.0	9.0	7.0	4.5	0.0	4.5	4.5	0.0	0.0	0.0	9.0	0.0	9.0	4.5	0.0	9.0	0.0	0.0	8.0	4.5	0.0	4.5	0.0	9.0	5.0	0.0	5.0	0.0
12	W12_T9	9.0	6.5	8.5	8.0	0.5	5.5	7.5	8.0	8.5	7.5	5.5	8.0	8.0	9.0	9.0	7.0	4.5	8.0	6.5	8.5	8.5	6.0	8.5	7.5	9.0	6.0	9.0	9.0	8.0	8.5	8.5	7.0	2.5	6.5	8.5	5.0	7.5	8.0
13	W13_D4	0.0	9.0	9.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	9.0	0.0	0.0	0.0	9.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	0.0	0.0	9.0	9.0
14	W14_T1	9.0	8.6	9.0	7.7	6.5	7.1	8.8	7.9	9.0	8.8	8.8	7.7	9.0	8.6	7.3	8.4	7.9	7.1	7.7	6.1	7.4	8.6	7.7	6.3	9.0	7.9	9.0	6.8	6.5	6.1	7.7	7.9	8.0	6.5	8.8	6.5	9.0	8.8
15	W15_E1	6.0	5.0	7.0	5.0	5.0	2.0	8.0	5.0	8.0	7.0	4.0	8.0	6.0	5.0	4.0	4.0	6.0	5.0	6.0	7.0	5.0	7.0	5.0	7.0	6.0	6.0	6.0	8.0	8.0	4.0	7.0	4.0	3.0	6.0	7.0	1.0	4.0	9.0
16	W16_T3	9.0	9.0	9.0	7.0	7.0	9.0	9.0	9.0	9.0	9.0	7.0	9.0	9.0	9.0	9.0	7.0	6.0	7.0	9.0	7.0	9.0	9.0	9.0	9.0	7.0	7.0	9.0	9.0	9.0	7.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
17	W17_T4	9.0	9.0	9.0	9.0	9.0	5.0	9.0	9.0	9.0	9.0	6.0	9.0	7.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
18	W18_T8	8.4	4.5	5.8	3.9	4.5	3.9	5.8	6.4	7.1	5.8	5.8	3.9	5.8	5.1	6.4	6.4	7.1	6.4	8.4	7.1	1.3	9.0	7.7	5.1	5.8	7.1	7.7	7.7	6.4	7.1	5.1	7.7	8.4	7.7	5.8	5.8	6.4	7.7
19	W19_D2	9.0	8.0	9.0	8.0	7.0	7.0	9.0	9.0	9.0	8.0	6.0	9.0	8.0	9.0	8.0	8.0	9.0	9.0	9.0	9.0	8.0	8.0	9.0	9.0	9.0	9.0	8.0	8.0	9.0	8.0	7.0	9.0	9.0	8.0	9.0	8.0	9.0	8.0
	Total	122.9	135.1	130.9	107.2	97.6	97.2	129.6	133.9	129.0	112.8	101.2	117.2	135.0	114.4	109.1	118.5	115.8	107.7	96.1	102.2	111.3	113.3	146.5	125.1	154.0	115.2	143.5	149.2	142.4	132.7	133.6	121.2	104.7	126.9	149.9	82.6	142.3	154.0	101.3

Evaluator 2

	Metric code	F12	Z25	B08	B10	W11	B23	B25	B27	Q45	S03	S05	W70	S80	S81	S82	S84	F54	F55	F56	F57	Q02	W08	Z01	Z03	F01	F11	W01	B11	B21	B29	Q41	Q43	Q47	Q49	S01	S07	S09	W66	S83
1	W01_C1	9.0	7.9	5.8	8.5	2.1	6.4	9.0	9.0	9.0	6.4	6.9	9.0	9.0	4.8	9.0	7.9	7.4	7.9	9.0	9.0	6.4	8.5	9.0	8.5	7.4	9.0	9.0	8.5	8.5	7.4	9.0	9.0	6.9	8.5	8.5	6.9	6.4	8.5	8.5
2	W02_N3	8.0	9.0	8.0	0.0	9.0	8.0	8.0	8.0	9.0	7.0	2.0	7.0	9.0	7.0	9.0	7.0	0.0	7.0	1.0	0.0	8.0	9.0	8.0	8.0	9.0	0.0	9.0	8.0	9.0	9.0	9.0	9.0	7.0	3.0	9.0	7.0	9.0	8.0	7.0
3	W03_N6	0.0	0.0	9.0	9.0	0.0	0.0	0.0	9.0	9.0	0.0	9.0	0.0	9.0	9.0	0.0	9.0	0.0	0.0	0.0	0.0	9.0	0.0	9.0	9.0	9.0	0.0	9.0	9.0	9.0	9.0	0.0	0.0	0.0	9.0	9.0	0.0	9.0	9.0	0.0
4	W04_N9	9.0	9.0	9.0	6.0	6.0	9.0	9.0	9.0	9.0	9.0	5.0	9.0	9.0	9.0	9.0	6.0	9.0	9.0	7.0	9.0	9.0	7.0	9.0	9.0	9.0	7.0	9.0	9.0	9.0	9.0	9.0	9.0	6.0	9.0	6.0	9.0	9.0	9.0	6.0
5	W05_N4	9.0	6.0	4.5	6.0	4.5	4.5	6.0	4.5	7.5	6.0	6.0	4.5	6.0	4.5	6.0	7.5	6.0	3.0	7.5	7.5	1.5	9.0	7.5	4.5	7.5	6.0	7.5	3.0	6.0	3.0	9.0	7.5	4.5	6.0	6.0	6.0	6.0	6.0	7.5
6	W06_N5	0.0	9.0	9.0	9.0	0.0	9.0	9.0	9.0	9.0	2.3	9.0	0.0	9.0	0.0	0.0	3.5	4.1	6.8	2.9	4.9	6.5	6.5	6.4	6.5	8.0	4.6	7.3	8.3	7.8	6.5	4.1	6.2	5.0	7.0	7.3	6.6	5.6	6.3	4.0
7	W07_L1	8.3	6.8	5.5	6.8	3.0	5.8	5.8	6.4	6.4	4.5	6.8	7.8	8.0	6.3	5.6	3.5	4.1	6.8	2.9	4.9	6.5	6.5	6.4	6.5	8.0	4.6	7.3	8.3	7.8	6.5	4.1	6.2	5.0	7.0	7.3	6.6	5.6	6.3	4.0
8	W08_L2	7.5	9.0	9.0	9.0	7.5	4.5	9.0	9.0	7.5	9.0	4.5	9.0	9.0	6.0	9.0	9.0	9.0	4.5	4.5	9.0	4.5	7.5	9.0	9.0	9.0	7.5	9.0	9.0	9.0	7.5	9.0	9.0	7.5	9.0	6.0	9.0	9.0	9.0	9.0
9	W09_L8	4.5	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	9.0	0.0	9.0	0.0	0.0	9.0	0.0	9.0	0.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0
10	W10_L5	0.0	9.0	3.0	0.0	9.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	0.0	0.0	6.0	9.0	0.0	9.0	9.0	9.0	9.0	3.0	0.0	0.0	6.0	9.0	0.0	9.0	0.0	0.0
11	W11_T6	7.0	0.0	5.0	4.5	7.0	9.0	9.0	9.0	0.0	9.0	0.0	9.0	7.0	4.5	0.0	4.5	4.5	0.0	0.0	0.0	9.0	0.0	9.0	4.5	0.0	9.0	0.0	0.0	8.0	4.5	0.0	4.5	0.0	9.0	5.0	0.0	5.0	0.0	0.0
12	W12_T9	9.0	6.5	8.0	8.0	0.5	5.5	7.5	8.0	8.5	6.5	5.5	8.0	8.5	8.5	9.0	6.0	4.5	7.5	6.5	8.0	8.5	6.0	8.5	7.5	8.5	5.5	9.0	8.0	8.0	8.0	7.0	2.5	6.5	8.5	6.0	7.5	8.0	2.5	
13	W13_D4	0.0	9.0	9.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	9.0	0.0	0.0	0.0	9.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	0.0	0.0	9.0	9.0	9.0
14	W14_T1	9.0	8.6	9.0	7.7	6.5	7.1	8.8	7.9	9.0	8.8	8.8	7.7	9.0	8.6	7.3	8.4	7.9	7.1	7.7	6.1	7.4	8.6	7.7	6.3	9.0	7.9	9.0	6.8	6.5	6.1	7.7	7.9	8.0	6.5	8.8	6.5	9.0	8.8	
15	W15_E1	6.0	5.0	7.0	5.0	5.0	2.0	8.0	5.0	8.0	7.0	4.0	8.0	6.0	5.0	4.0	4.0	6.0	5.0	6.0	7.0	5.0	7.0	5.0	7.0	6.0	6.0	6.0	8.0	8.0	4.0	7.0	4.0	3.0	6.0	7.0	1.0	4.0	9.0	
16	W16_T3	9.0	9.0	9.0	7.0	7.0	9.0	9.0	9.0	9.0	9.0	7.0	9.0	9.0	9.0	9.0	7.0	6.0	7.0	9.0	7.0	9.0	9.0	9.0	9.0	7.0	7.0	9.0	9.0	9.0	7.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	
17	W17_T4	9.0	9.0	9.0	9.0	9.0	5.0	9.0	9.0	9.0	9.0	6.0	9.0	7.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	
18	W18_T8	8.4	4.5	5.8	3.9	4.5	3.9	5.8	6.4	7.1	5.8	5.8	3.9	5.8	5.1	6.4	6.4	7.1	6.4	8.4	7.1	1.3	9.0	7.7	5.1	5.8	7.1	7.7	7.7	6.4	7.1	5.1	7.7	8.4	7.7	5.8	5.8	6.4	7.7	
19	W19_D2	9.0	8.0	9.0	8.0	7.0	7.0	9.0	9.0	9.0	8.0	6.0	9.0	8.0	9.0	8.0	8.0	9.0	9.0	9.0	9.0	8.0	8.0	9.0	9.0	9.0	9.0	8.0	8.0	9.0	8.0	7.0	9.0	9.0	8.0	9.0	8.0	9.0	8.0	
	Total	121.6	135.2	134.7	106.2	97.6	99.5	130.8	136.2	130.0	114.1	105.2	120.8	137.3	114.5	110.4	117.9	117.3	108.4	96.7	101.5	111.1	112.5	147.2	124.9	152.2	111.6	146.5	147.9	143.3	136.6	131.7	121.3	103.5	122.7	149.5	85.0	142.6	154.1	103.2

Evalutator 3

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
		Guidelines group Participant Id. Codes																				Patterns group Participant Id. Codes																		
	Metric code	F12	Z25	B08	B10	W11	B23	B25	B27	Q45	S03	S05	W70	S80	S81	S82	S84	F54	F55	F56	F57	Q02	W08	Z01	Z03	F01	F11	W01	B11	B21	B29	Q41	Q43	Q47	Q49	S01	S07	S09	W66	S83
1	M01_C1	9.0	8.5	5.8	8.5	3.2	6.9	9.0	9.0	9.0	6.4	7.4	9.0	9.0	4.8	9.0	8.5	7.4	7.9	9.0	9.0	6.4	9.0	9.0	8.5	7.4	9.0	9.0	8.5	8.5	6.9	9.0	9.0	7.9	8.5	8.5	6.9	5.8	8.5	9.0
2	M02_N3	9.0	9.0	8.0	0.0	9.0	8.0	7.0	8.0	9.0	7.0	2.0	7.0	9.0	7.0	9.0	7.0	0.0	7.0	1.0	0.0	8.0	9.0	8.0	8.0	9.0	0.0	9.0	8.0	9.0	9.0	9.0	9.0	7.0	4.0	9.0	7.0	9.0	8.0	7.0
3	M03_N6	0.0	0.0	9.0	9.0	0.0	0.0	0.0	9.0	9.0	0.0	9.0	0.0	9.0	9.0	0.0	9.0	9.0	0.0	0.0	0.0	9.0	0.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	0.0	0.0	0.0	9.0	9.0	0.0	9.0	9.0	0.0
4	M04_N9	9.0	9.0	9.0	6.0	6.0	9.0	9.0	8.0	9.0	8.0	4.0	9.0	9.0	9.0	9.0	9.0	6.0	9.0	7.0	9.0	9.0	8.0	9.0	9.0	9.0	7.0	9.0	9.0	9.0	9.0	9.0	9.0	6.0	5.0	9.0	6.0	9.0	9.0	6.0
5	M05_N4	9.0	6.0	4.5	6.0	3.0	3.0	6.0	4.5	7.5	6.0	6.0	4.5	6.0	4.5	6.0	6.0	6.0	3.0	7.5	6.0	1.5	9.0	6.0	4.5	7.5	6.0	6.0	4.5	7.5	3.0	6.0	4.5	7.5	7.5	4.5	4.5	6.0	6.0	7.5
6	M06_N5	0.0	9.0	9.0	9.0	0.0	9.0	9.0	9.0	9.0	9.0	9.0	2.3	9.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	9.0	4.5	0.0	9.0	0.0	9.0	9.0	9.0	9.0	9.0	9.0	0.0	9.0	9.0	0.0	9.0	9.0	0.0
7	M07_L1	8.5	7.0	5.5	6.8	2.8	5.8	5.6	5.6	6.0	4.8	6.5	7.1	7.8	5.5	5.4	3.5	4.1	6.8	3.1	4.6	6.3	6.3	6.4	6.8	7.8	4.6	7.0	8.0	7.5	6.8	4.1	6.2	5.0	6.8	7.0	6.4	5.1	6.8	3.8
8	M08_L2	7.5	9.0	9.0	9.0	7.5	4.5	9.0	9.0	7.5	9.0	4.5	9.0	9.0	6.0	9.0	9.0	9.0	4.5	4.5	9.0	4.5	7.5	9.0	9.0	9.0	7.5	9.0	9.0	9.0	7.5	9.0	9.0	7.5	9.0	9.0	6.0	9.0	9.0	9.0
9	M09_L8	4.5	9.0	0.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	9.0	0.0	0.0	0.0	9.0	0.0	9.0	0.0	0.0	9.0	0.0	9.0	0.0	9.0	0.0	0.0	9.0	0.0	9.0	0.0	0.0
10	M10_L5	0.0	9.0	3.0	0.0	9.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	9.0	0.0	9.0	3.0	0.0	0.0	0.0	9.0	0.0	0.0	6.0	9.0	0.0	9.0	9.0	9.0	9.0	3.0	0.0	0.0	6.0	9.0	0.0	9.0	9.0	0.0
11	M11_T6	7.0	0.0	5.0	4.5	7.0	9.0	9.0	9.0	0.0	9.0	0.0	9.0	7.0	4.5	0.0	4.5	4.5	0.0	0.0	0.0	9.0	0.0	9.0	4.5	0.0	9.0	0.0	0.0	0.0	0.0	9.0	0.0	4.5	0.0	9.0	0.0	9.0	5.0	0.0
12	M12_T9	9.0	6.5	8.5	6.0	1.0	5.5	8.0	8.0	8.5	7.0	5.5	8.0	8.5	8.5	9.0	6.0	4.0	7.5	6.0	8.0	8.5	6.0	8.5	7.5	8.5	6.5	9.0	9.0	8.0	8.0	8.5	7.0	2.5	6.5	8.5	5.0	7.5	8.5	2.5
13	M13_D4	0.0	9.0	9.0	0.0	9.0	0.0	0.0	9.0	3.0	0.0	9.0	9.0	0.0	0.0	9.0	0.0	9.0	9.0	0.0	9.0	0.0	0.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	0.0	0.0	9.0	9.0	9.0
14	M14_T1	9.0	8.6	9.0	7.7	6.5	7.7	7.9	7.9	9.0	9.0	8.8	7.7	9.0	8.8	7.9	8.4	7.7	7.3	7.7	6.1	7.4	8.6	7.7	6.3	9.0	7.9	9.0	6.8	6.5	6.1	7.7	7.9	7.8	6.8	9.0	6.5	9.0	9.0	8.8
15	M15_E1	6.0	5.0	7.0	5.0	5.0	2.0	7.0	5.0	9.0	7.0	5.0	8.0	6.0	5.0	4.0	4.0	6.0	5.0	6.0	7.0	5.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	5.0	7.0	4.0	3.0	5.0	7.0	1.0	4.0	9.0	7.0
16	M16_T3	9.0	9.0	9.0	7.0	7.0	9.0	9.0	9.0	9.0	9.0	9.0	7.0	9.0	9.0	9.0	9.0	7.0	7.0	9.0	7.0	9.0	9.0	9.0	9.0	9.0	7.0	9.0	7.0	9.0	7.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	7.0	9.0
17	M17_T4	9.0	9.0	9.0	9.0	9.0	5.0	9.0	9.0	9.0	9.0	6.0	9.0	7.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
18	M18_T8	8.5	5.1	5.1	3.2	3.9	3.2	5.8	5.8	7.1	5.8	5.1	3.9	5.8	4.5	6.4	5.8	7.1	5.8	7.7	7.1	1.3	9.0	7.1	5.1	6.4	7.1	7.1	5.1	6.4	5.1	7.7	3.9	7.7	7.7	5.8	4.5	5.1	5.8	7.7
19	M19_D2	9.0	8.0	9.0	7.0	7.0	7.0	9.0	9.0	9.0	8.0	5.0	9.0	9.0	9.0	8.0	8.0	9.0	9.0	9.0	9.0	9.0	8.0	8.0	9.0	9.0	8.0	8.0	9.0	9.0	8.0	7.0	9.0	9.0	8.0	9.0	8.0	9.0	9.0	8.0
	Total	123.0	135.7	133.5	105.6	95.8	97.5	128.3	133.8	129.6	113.9	101.8	118.4	138.0	113.1	109.7	115.7	116.8	106.8	95.5	99.8	111.8	114.3	144.1	127.2	152.6	113.6	143.1	144.9	141.4	135.4	132.0	123.4	102.4	123.7	149.3	79.8	141.6	154.5	103.2

Average of all evaluators

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
		Guidelines group Participant Id. Codes																				Patterns group Participant Id. Codes																		
	Metric code	F12	Z25	B08	B10	W11	B23	B25	B27	Q45	S03	S05	W70	S80	S81	S82	S84	F54	F55	F56	F57	Q02	W08	Z01	Z03	F01	F11	W01	B11	B21	B29	Q41	Q43	Q47	Q49	S01	S07	S09	W66	S83
1	M01_C1	9.0	8.3	5.8	8.5	2.6	6.7	9.0	9.0	9.0	6.4	7.1	9.0	9.0	4.8	9.0	8.3	7.4	7.9	9.0	9.0	6.4	8.6	9.0	8.5	7.4	9.0	9.0	8.6	8.5	7.1	9.0	9.0	7.2	8.5	8.5	6.9	6.0	8.5	8.6
2	M02_N3	8.7	9.0	8.0	0.0	9.0	7.7	7.3	8.3	9.0	7.0	1.7	6.7	9.0	7.3	9.0	7.0	0.0	7.0	1.0	0.0	8.0	9.0	7.7	8.0	9.0	0.0	9.0	8.3	9.0	9.0	9.0	9.0	7.3	3.3	9.0	7.0	9.0	8.3	7.0
3	M03_N6	0.0	0.0	9.0	9.0	0.0	0.0	0.0	9.0	9.0	0.0	9.0	0.0	9.0	9.0	0.0	9.0	9.0	0.0	0.0	0.0	9.0	0.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	0.0	0.0	0.0	9.0	9.0	0.0	9.0	9.0	0.0
4	M04_N9	9.0	9.0	9.0	6.0	6.0	8.7	9.0	8.3	9.0	8.3	4.7	9.0	9.0	9.0	9.0	8.7	6.0	9.0	7.0	9.0	9.0	7.7	9.0	9.0	9.0	7.0	9.0	9.0	9.0	9.0	9.0	9.0	6.0	5.3	9.0	6.0	9.0	9.0	6.0
5	M05_N4	9.0	6.0	4.0	6.0	4.0	4.0	6.0	4.5	7.5	6.0	6.0	4.5	5.5	4.5	6.0	7.0	6.0	3.0	7.5	7.0	1.5	9.0	7.0	4.5	7.5	6.5	7.0	5.5	7.5	2.5	6.5	3.5	8.5	8.0	4.5	5.5	6.0	6.0	7.5
6	M06_N5	0.0	9.0	9.0	9.0	0.0	9.0	9.0	9.0	9.0	9.0	9.0	2.3	9.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	9.0	4.5	0.0	9.0	0.0	9.0	9.0	9.0	9.0	9.0	9.0	0.0	9.0	9.0	0.0	9.0	9.0	0.0
7	M07_L1	8.4	6.8	5.4	6.8	2.8	5.6	5.6	5.8	6.1	4.4	6.3	7.5	7.8	5.8	5.5	3.5	3.8	6.8	2.9	4.6	6.2	6.2	6.5	6.4	7.9	4.6	6.8	8.1	7.6	6.7	4.0	5.9	5.0	6.9	7.2	6.5	5.5	6.3	3.8
8	M08_L2	7.5	9.0	9.0	9.0	7.5	4.5	9.0	9.0	7.5	9.0	4.5	9.0	9.0	6.0	9.0	9.0	9.0	4.5	4.5	9.0	4.5	7.5	9.0	9.0	9.0	7.5	9.0	9.0	9.0	7.5	9.0	9.0	7.5	9.0	9.0	6.0	9.0	9.0	9.0
9	M09_L8	4.5	9.0	0.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	9.0	0.0	0.0	0.0	9.0	0.0	9.0	0.0	0.0	9.0	0.0	9.0	0.0	9.0	0.0	0.0	9.0	0.0	0.0	9.0	0.0
10	M10_L5	0.0	9.0	3.0	0.0	9.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	9.0	0.0	9.0	3.0	0.0	0.0	0.0	9.0	0.0	0.0	6.0	9.0	0.0	9.0	9.0	9.0	9.0	3.0	0.0	0.0	6.0	9.0	0.0	9.0	9.0	0.0
11	M11_T6	7.0	0.0	5.0	4.5	7.0	9.0	9.0	9.0	0.0	9.0	0.0	9.0	7.0	4.5	0.0	4.5	4.5	0.0	0.0	0.0	9.0	0.0	9.0	4.5	0.0	9.0	0.0	0.0	0.0	0.0	9.0	0.0	4.5	0.0	9.0	0.0	9.0	5.0	0.0
12	M12_T9	9.0	6.5	8.3	8.0	0.7	5.5	7.7	8.0	8.5	7.0	5.5	8.0	8.3	8.7	9.0	6.3	4.3	7.7	6.3	8.2	8.5	6.0	8.5	7.5	8.7	6.0	9.0	9.0	8.0	8.2	8.3	7.0	2.5	6.5	8.5	5.3	7.5	8.2	2.3
13	M13_D4	0.0	9.0	9.0	0.0	9.0	0.0	0.0	9.0	3.0	0.0	9.0	9.0	0.0	0.0	9.0	0.0	9.0	9.0	0.0	9.0	0.0	0.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	0.0	0.0	9.0	9.0	9.0
14	M14_T1	9.0	8.6	9.0	7.7	6.5	7.3	8.5	7.9	9.0	8.9	8.8	7.9	9.0	8.7	7.5	8.6	7.7	7.2	7.8	6.1	7.4	8.4	7.7	6.3	9.0	7.9	9.0	6.8	6.5	6.1	7.7	7.9	7.8	6.6	8.9	6.6	9.0	9.0	8.9
15	M15_E1	6.0	5.3	7.3	4.7	5.3	2.3	7.7	5.0	8.7	7.0	4.7	8.3	5.7	5.0	4.0	4.0	6.0	5.3	6.0	7.0	5.0	7.0	7.0	5.7	7.0	6.0	6.7	7.3	7.7	4.7	7.0	4.0	3.0	5.3	7.0	1.3	4.0	9.0	7.0
16	M16_T3	9.0	9.0	9.0	7.0	7.0	9.0	9.0	9.0	9.0	9.0	9.0	7.0	9.0	9.0	9.0	9.0	7.0	7.0	9.0	7.0	9.0	9.0	9.0	9.0	9.0	7.0	9.0	7.0	9.0	7.0	9.0	9.0	9.0	7.0	9.0	9.0	9.0	7.0	9.0
17	M17_T4	9.0	9.0	9.0	9.0	9.0	5.0	9.0	9.0	9.0	9.0	6.0	9.0	7.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
18	M18_T8	8.4	4.9	5.1	3.6	4.5	3.9	5.8	5.8	7.3	5.6	5.6	3.6	5.8	4.7	6.4	6.4	6.9	6.2	8.1	7.3	1.3	9.0	7.5	5.4	6.4	7.3	7.5	6.0	6.6	4.9	7.9	3.6	8.1	7.9	6.0	5.4	5.1	6.0	7.5
19	M19_D2	9.0	8.0	9.0	7.7	7.0	7.0	9.0	9.0	9.0	8.0	6.0	9.0	8.7	9.0	8.3	8.0	9.0	9.0	9.0	9.0	8.7	8.0	8.7	9.0	9.0	8.7	8.3	8.7	9.0	8.3	7.0	9.0	9.0	8.0	9.0	8.0	9.0	9.0	8.0
	Total	122.5	135.4	133.0	106.3	97.0	98.1	129.5	134.6	129.5	113.6	102.7	118.8	136.8	114.0	109.7	117.3	116.6	107.6	96.1	101.2	111.4	113.3	145.9	125.7	152.9	113.5	144.3	147.3	142.4	134.9	132.4	122.0	103.5	124.4	149.6	82.5	142.2	154.2	102.6

Average of all evaluators (submetrics for compound patterns are added)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
		Guidelines group Participant Id. Codes																				Patterns group Participant Id. Codes																		
	Metric/ Submetric code	F12	Z25	B08	B10	W11	B23	B25	B27	Q45	S03	S05	W70	S80	S81	S82	S84	F54	F55	F56	F57	Q02	W08	Z01	Z03	F01	F11	W01	B11	B21	B29	Q41	Q43	Q47	Q49	S01	S07	S09	W66	S83
1	M01_C1	9.0	8.3	5.8	8.5	2.6	6.7	9.0	9.0	9.0	6.4	7.1	9.0	9.0	4.8	9.0	8.3	7.4	7.9	9.0	9.0	6.4	8.6	9.0	8.5	7.4	9.0	9.0	8.6	8.5	7.1	9.0	9.0	7.2	8.5	8.5	6.9	6.0	8.5	8.6
2	M02_N3	8.7	9.0	8.0	0.0	9.0	7.7	7.3	8.3	9.0	7.0	1.7	6.7	9.0	7.3	9.0	7.0	0.0	7.0	1.0	0.0	8.0	9.0	7.7	8.0	9.0	0.0	9.0	8.3	9.0	9.0	9.0	9.0	7.3	3.3	9.0	7.0	9.0	8.3	7.0
3	M03_N6	0.0	0.0	9.0	9.0	0.0	0.0	0.0	9.0	9.0	0.0	9.0	0.0	9.0	9.0	0.0	9.0	9.0	0.0	0.0	0.0	9.0	0.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	0.0	0.0	0.0	9.0	9.0	0.0	9.0	9.0	0.0
4	M04_N9	9.0	9.0	9.0	6.0	6.0	8.7	9.0	8.3	9.0	8.3	4.7	9.0	9.0	9.0	9.0	8.7	6.0	9.0	7.0	9.0	9.0	7.7	9.0	9.0	9.0	7.0	9.0	9.0	9.0	9.0	9.0	9.0	6.0	5.3	9.0	6.0	9.0	9.0	6.0
5	M05_N4	9.0	6.0	4.0	6.0	4.0	4.0	6.0	4.5	7.5	6.0	6.0	4.5	5.5	4.5	6.0	7.0	6.0	3.0	7.5	7.0	1.5	9.0	7.0	4.5	7.5	6.5	7.0	5.5	7.5	2.5	6.5	3.5	8.5	8.0	4.5	5.5	6.0	6.0	7.5
6	M06_N5	0.0	9.0	9.0	9.0	0.0	9.0	9.0	9.0	9.0	9.0	9.0	2.3	9.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	9.0	4.5	0.0	9.0	0.0	9.0	9.0	9.0	9.0	9.0	9.0	0.0	9.0	9.0	0.0	9.0	9.0	0.0
7	M07a_L1	9.0	6.8	5.6	9.0	4.5	9.0	6.8	7.9	6.8	2.3	6.8	7.9	9.0	5.6	3.4	4.5	5.6	9.0	1.1	7.9	4.5	6.8	5.6	6.8	9.0	5.6	6.8	9.0	6.8	6.8	3.4	6.8	4.5	9.0	9.0	5.6	1.1	4.5	9.0
	M07b_L1	7.3	4.5	2.5	8.3	4.0	1.8	1.1	3.5	4.8	5.0	3.3	8.0	5.5	3.8	4.0	0.0	5.8	2.3	1.5	6.0	5.0	5.8	4.8	3.5	5.8	5.3	4.8	6.3	7.0	4.3	2.5	3.8	1.5	5.8	3.5	4.8	6.5	5.3	2.3
	M07c_L1	9.0	9.0	8.0	3.0	0.0	6.0	9.0	6.0	6.7	6.0	9.0	6.7	9.0	8.0	9.0	6.0	0.0	9.0	6.0	0.0	9.0	6.0	9.0	9.0	9.0	3.0	9.0	9.0	9.0	9.0	6.0	7.3	9.0	6.0	9.0	9.0	9.0	9.0	0.0
8	M08a_L2	9.0	9.0	9.0	9.0	6.0	9.0	9.0	9.0	6.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	6.0	9.0	9.0	9.0	6.0	9.0	9.0	9.0	9.0	9.0	9.0	6.0	9.0	9.0	9.0	9.0	9.0	9.0
	M08b_L2	6.0	9.0	9.0	9.0	9.0	0.0	9.0	9.0	9.0	9.0	0.0	9.0	9.0	3.0	9.0	9.0	9.0	0.0	0.0	9.0	0.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	6.0	9.0	9.0	9.0	9.0	3.0	9.0	9.0	9.0	9.0
9	M09_L8	4.5	9.0	0.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	9.0	0.0	0.0	0.0	9.0	0.0	9.0	0.0	0.0	9.0	0.0	9.0	0.0	9.0	0.0	0.0	9.0	0.0	0.0	9.0	0.0
10	M10_L5	0.0	9.0	3.0	0.0	9.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	9.0	0.0	9.0	3.0	0.0	0.0	0.0	9.0	0.0	0.0	6.0	9.0	0.0	9.0	9.0	9.0	9.0	3.0	0.0	0.0	6.0	9.0	0.0	9.0	9.0	0.0
11	M11_T6	7.0	0.0	5.0	4.5	7.0	9.0	9.0	9.0	0.0	9.0	0.0	9.0	7.0	4.5	0.0	4.5	4.5	0.0	0.0	0.0	9.0	0.0	9.0	4.5	0.0	9.0	0.0	0.0	0.0	0.0	9.0	0.0	4.5	0.0	9.0	0.0	9.0	5.0	0.0
12	M12_T9	9.0	6.5	8.3	8.0	0.7	5.5	7.7	8.0	8.5	7.0	5.5	8.0	8.3	8.7	9.0	6.3	4.3	7.7	6.3	8.2	8.5	6.0	8.5	7.5	8.7	6.0	9.0	9.0	8.0	8.2	8.3	7.0	2.5	6.5	8.5	5.3	7.5	8.2	2.3
13	M13_D4	0.0	9.0	9.0	0.0	9.0	0.0	0.0	9.0	3.0	0.0	9.0	9.0	0.0	0.0	9.0	0.0	9.0	9.0	0.0	9.0	0.0	0.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	0.0	0.0	9.0	9.0	9.0
14	M14a_T1	9.0	7.2	9.0	8.1	8.1	8.1	8.1	9.0	9.0	8.7	8.1	8.4	9.0	7.8	9.0	9.0	8.4	8.7	7.8	6.3	7.2	7.2	8.1	7.2	9.0	9.0	9.0	9.0	8.1	6.3	8.4	9.0	6.6	8.4	8.7	8.4	9.0	9.0	8.4
	M14b_T1	9.0	9.0	9.0	4.5	0.0	3.0	7.8	4.5	9.0	9.0	9.0	5.3	9.0	9.0	3.0	7.5	4.5	2.3	5.3	0.0	4.5	8.3	4.5	0.0	9.0	4.5	9.0	0.0	0.0	0.0	4.5	4.5	6.8	0.0	9.0	0.0	9.0	9.0	9.0
	M14c_T1	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
	M14d_T1	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
15	M15_E1	6.0	5.3	7.3	4.7	5.3	2.3	7.7	5.0	8.7	7.0	4.7	8.3	5.7	5.0	4.0	4.0	6.0	5.3	6.0	7.0	5.0	7.0	7.0	5.7	7.0	6.0	6.7	7.3	7.7	4.7	7.0	4.0	3.0	5.3	7.0	1.3	4.0	9.0	7.0
16	M16_T3	9.0	9.0	9.0	7.0	7.0	9.0	9.0	9.0	9.0	9.0	9.0	7.0	9.0	9.0	9.0	9.0	7.0	7.0	9.0	7.0	9.0	9.0	9.0	9.0	9.0	7.0	9.0	7.0	9.0	7.0	9.0	9.0	9.0	7.0	9.0	9.0	9.0	7.0	9.0
17	M17_T4	9.0	9.0	9.0	9.0	9.0	5.0	9.0	9.0	9.0	9.0	6.0	9.0	7.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
18	M18_T8	8.4	4.9	5.1	3.6	4.5	3.9	5.8	5.8	7.3	5.6	5.6	3.6	5.8	4.7	6.4	6.4	6.9	6.2	8.1	7.3	1.3	9.0	7.5	5.4	6.4	7.3	7.5	6.0	6.6	4.9	7.9	3.6	8.1	7.9	6.0	5.4	5.1	6.0	7.5
19	M19_D2	9.0	8.0	9.0	7.7	7.0	7.0	9.0	9.0	9.0	8.0	6.0	9.0	8.7	9.0	8.3	8.0	9.0	9.0	9.0	9.0	8.7	8.0	8.7	9.0	9.0	8.7	8.3	8.7	9.0	8.3	7.0	9.0	9.0	8.0	9.0	8.0	9.0	9.0	8.0
	Total	173.8	183.5	179.8	151.8	129.7	135.6	175.2	178.8	176.1	158.2	146.2	166.6	188.5	157.7	152.1	159.2	156.4	147.4	129.7	137.6	150.5	158.3	190.8	166.4	204.8	153.8	194.0	192.7	186.1	174.0	172.5	166.5	144.6	167.0	199.7	121.2	189.3	202.7	145.6

Appendix 6.11: Normality test

Table 6.11.1: Normality test (compound submetrics are averaged)

Tests of Normality

	group	Kolmogorov-Smirnov(a)			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
All metrics	Guidelines	.138	20	.200(*)	.933	20	.178
	Patterns	.170	19	.150	.935	19	.216
Objective metrics	Guidelines	.125	20	.200(*)	.938	20	.219
	Patterns	.134	19	.200(*)	.917	19	.098

* This is a lower bound of the true significance.
a Lilliefors Significance Correction

Table 6.11.2: Normality test (compound submetrics are added)

Tests of Normality

	group	Kolmogorov-Smirnov(a)			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Metrics	Guidelines	.140	20	.200(*)	.952	20	.400
	Patterns	.141	19	.200(*)	.952	19	.435

* This is a lower bound of the true significance.
a Lilliefors Significance Correction

Appendix 6.12: Statistical analysis of the design test

Table 6.12.1: Design test – Parametric analysis

Group Statistics

	group	N	Mean	Std. Deviation	Std. Error Mean
All metrics	Guidelines	20	116.023	13.662	3.0549
	Patterns	19	128.688	20.105	4.6124
Objective metrics	Guidelines	20	47.612	9.878	2.2089
	Patterns	19	56.894	14.819	3.399

Independent Samples Test

		Levene's Test for Equ. of Var.		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-ailed)	Mean Diff.	Std. Error Diff.	95% Conf. Interv.of the Diff.	
									Upper	Lower
All metrics	Equal variances assumed	3.623	.065	-2.312	37	.0265	-12.666	5.479	-23.767	-1.564
	Equal variances not assumed			-2.289	31.511	.0289	-12.666	5.532	-23.942	-1.390
Objective metrics	Equal variances assumed	3.019	.091	-2.313	37	.0264	-9.282	4.014	-17.414	-1.150
	Equal variances not assumed			-2.289	31.145	.0290	-9.282	4.054	-17.550	-1.015

Table 6.12.2: Design test – Non-parametric analysis

Mann-Whitney Test

Ranks

	group	N	Mean Rank	Sum of Ranks
All metrics	Guidelines	20	16.10	322.00
	Patterns	19	24.11	458.00
	Total	39		
Objective metrics	Guidelines	20	15.78	315.50
	Patterns	19	24.45	464.50
	Total	39		

Test Statistics

	All metrics	Objective metrics
Mann-Whitney U	112.000	105.500
Wilcoxon W	322.000	315.500
Z	-2.192	-2.377
Asymp. Sig. (2-tailed)	.0284	.0175
Exact Sig. [2*(1-tailed Sig.)]	.028(a)	.016(a)
Exact Sig. (2-tailed)	.028	.017
Exact Sig. (1-tailed)	.014	.008
Point Probability	.001	.000

a Not corrected for ties.

Table 6.12.3: Intraclass correlation coefficient

Intraclass Correlation Coefficient

All metrics

	Intraclass Correlation(a)	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.995(b)	.991	.997	604.364	38.0	76	.000
Average Measures	.998(c)	.997	.999	604.364	38.0	76	.000

Two-way mixed effects model where people effects are random and measures effects are fixed.

a Type A intraclass correlation coefficients using an absolute agreement definition.

b The estimator is the same, whether the interaction effect is present or not.

c This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Table 6.12.4: Intraclass correlation coefficient

Intraclass Correlation Coefficient

Subjective metrics only

	Intraclass Correlation(a)	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.976(b)	.958	.986	131.220	38.0	76	.000
Average Measures	.992(c)	.986	.995	131.220	38.0	76	.000

Two-way mixed effects model where people effects are random and measures effects are fixed.

a Type A intraclass correlation coefficients using an absolute agreement definition.

b The estimator is the same, whether the interaction effect is present or not.

c This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Appendix 6.13: Questions about their opinion of patterns and guidelines.

Web Design Seminar
Department of Automation and Engineering

Surname: .....Name:.....

Use an X in marking your answers to the next questions. Please answer all questions.

1 Part

Q11:The guidelines/patterns, provided for study, were very helpful in explaining how to improve a website.

I disagree totally	I disagree	I neither agree nor disagree	I agree	I agree totally
☐	☐	☐	☐	☐

What do you suggest to improve the instructions in the booklet?

.....

.....

.....

Q12: I believe that the section in the course about the guidelines/patterns helped me to improve my skills.

Not at all	Little	Moderately	Much	Very much
☐	☐	☐	☐	☐

2 Part

Q21: How much time did you spend every week on studying and practising in the seminar?

Less than an hour	1-2 hours	2-4 hours	4-6 hours	More than 6 hours
☐	☐	☐	☐	☐

Q22: How much time did you spend reading the booklet of guidelines/patterns before the final examination?

Less than an hour	1-2 hours	2-3 hours	3-5 hours	More than 5 hours
☐	☐	☐	☐	☐

3 Part

Q31: How often did you use the booklet during the exercise for the design task?

Not at all	A little	Moderately	Much	Very much
☐	☐	☐	☐	☐

Q32: In future, will you use guidelines/patterns if you are required to design other sites?

Definitely yes	Yes	Neutral	No	Absolutely not
☐	☐	☐	☐	☐

4 Part

Q41: The guidelines/patterns helped me develop my abilities in designing websites, after the initial tutorials using Front Page.

Not at all	Only a little	Moderately	A lot	Very much
☐	☐	☐	☐	☐

5 Part

Q51: How useful were the guidelines/patterns for designing the Infolstos site?

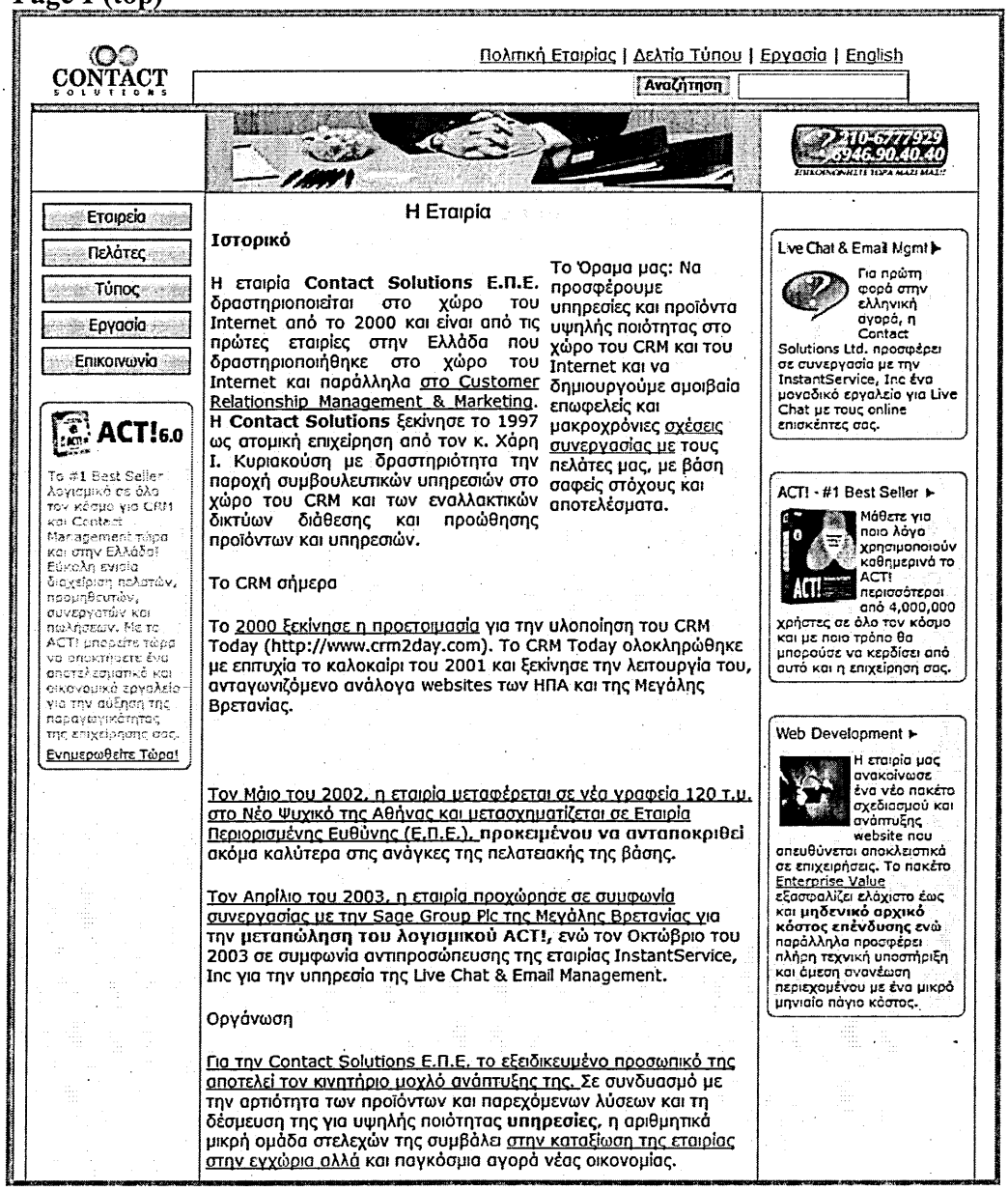
Not at all	Only a little	Moderately	A lot	Very much
☐	☐	☐	☐	☐

Q52: How useful were the guidelines/patterns for the evaluation of the site that was given to you

Not at all	Only a little	Moderate	A lot	Very Much
☐	☐	☐	☐	☐

Appendix 6.14: Web site for evaluation (screenshots)

Page 1 (top)



Page 1 (bottom)

Η μέχρι σήμερα επιτυχία της βασίζεται στα στελέχη της, τις απόλυτα επιτυχείς εξωτερικές συνεργασίες της αλλά και στην υιοθέτηση μίας μακροπρόθεσμης επιχειρησιακής στρατηγικής με έμφαση στο υψηλό επίπεδο των παρεχόμενων προϊόντων και υπηρεσιών και τη διατήρηση χαμηλού λειτουργικού κόστους και ορθολογικής τιμολογιακής πολιτικής.

Δραστηριότητες

Η Contact Solutions Ε.Π.Ε. εξελίχθηκε ραγδαία από μια ατομική επιχείρηση που προσέφερε αποκλειστικά συμβουλευτικές υπηρεσίες στο χώρο του CRM σε μια υγιή και αναπτυσσόμενη εταιρία που διευρύνει διαρκώς τις εργασίες της και τις δραστηριότητες της, εντάσσοντας νέα πρωτοποριακά προϊόντα, όπως το ACT! και την InstantService. Συγκεκριμένα η εταιρεία δραστηριοποιείται στους παρακάτω χώρους:

Internet
Customer Relationship
Management & Marketing.
Διάθεση σχετικών προϊόντων λογισμικού

Παράλληλα η εταιρία διευρύνει διαρκώς το πελατολόγιο της με σταθερούς ρυθμούς.Για το λόγο αυτό η εταιρία έχει κατορθώσει να μην έχει διακοπεί οποιαδήποτε υφιστάμενη συνεργασία της από την αρχή δραστηριοποίησης της.

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Η εταιρία μας έχει αναπτύξει ισχυρές και μακροπρόθεσμες συνεργασίες με σημαντικές εταιρίες, διαθέτοντας ένα αξιόλογο πελατολόγιο. Βασική μας προτεραιότητα και επιδίωξη είναι η παροχή υψηλού επιπέδου υπηρεσιών και η ικανοποίηση των πελατών μας στον μέγιστο βαθμό.

Ακολουθεί μία παρουσίαση των σημαντικότερων εταιριών που έχουμε συνεργαστεί:

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Villa Eleni	Travel4Greece
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Η εταιρία μας προσφέρει πολύ καλές συνθήκες εργασίας σε ένα φιλικό αλλά και εξελισσόμενο περιβάλλον.

Στη συνέχεια ακολουθούν οι υφιστάμενες ανοιχτές θέσεις για εργασία στην εταιρία μας. Επιπλέον μπορείτε να μας αποστείλετε το βιογραφικό σας μέσω email για να σας γνωρίσουμε και θα επικοινωνήσουμε άμεσα μαζί σας μόλις προκύψει μία θέση ανάλογη των προσόντων σας.

Θέση **:: Web Programmer**

::
::
::
::
::

Θέση **Υπεύθυνος Πωλήσεων**

::
::
::
::

Σε περίπτωση που σας ενδιαφέρει κάποια από τις ανωτέρω θέσεις εργασίας, στείλτε μας το βιογραφικό σας μέσω email αναφέροντας και τα πλήρη στοιχεία επικοινωνίας σας ώστε ένας εκπρόσωπος μας να επικοινωνήσει μαζί σας.

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Email

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Email

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Μπορείτε να συμπληρώσετε την φόρμα επικοινωνίας ή να επικοινωνήσετε απευθείας μαζί μας τηλεφωνικά ή μέσω email στα στοιχεία που ακολουθούν.

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Πόλη :: Νέο Ψυχικό, Αθήνα

DriveMe.gr

Τηλέφωνο :: 210-67.77.929
Fax :: 67.13.677
Email :: contact@contact-solutions.com *

*Για λόγους αποφυγής του spam, παρακαλούμε όπως κάνετε copy-paste τη διεύθυνση μας στο Outlook. Σας ευχαριστούμε για την κατανόηση!

Αναμένουμε με ιδιαίτερο ενδιαφέρον τις προτάσεις, τα σχόλια και τις παρατηρήσεις σας και δεσμευόμαστε να σας απαντήσουμε εντός μίας εργάσιμης ημέρας.

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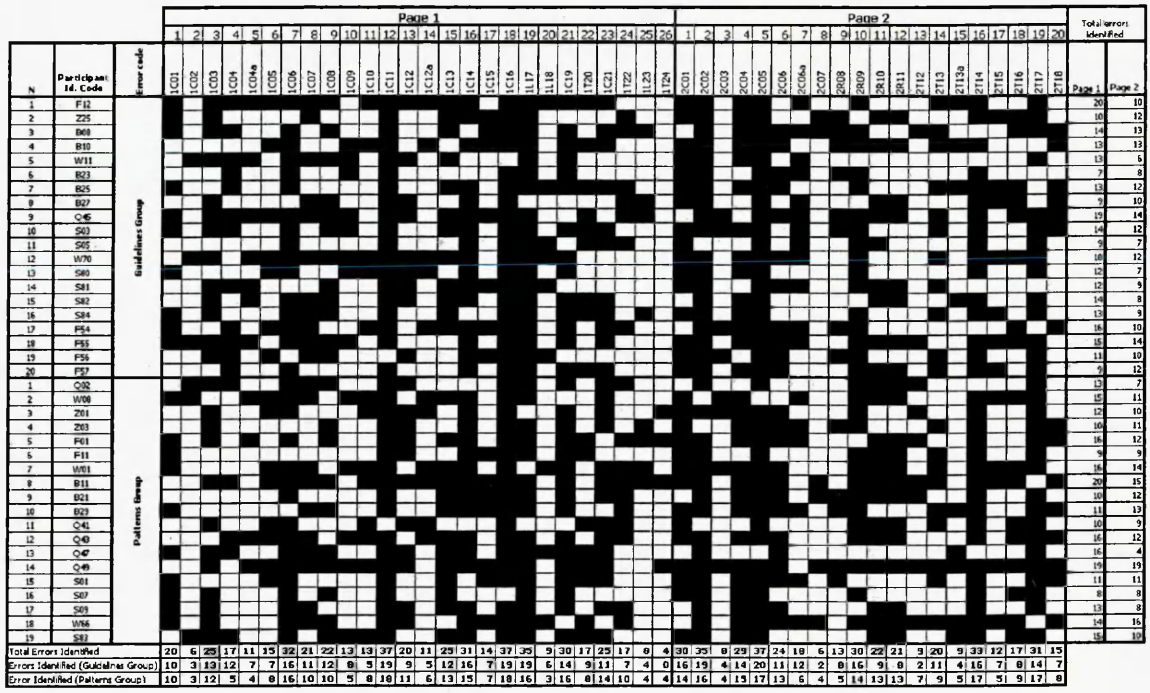
Appendix 6.15: Errors identified by participants

Table 6.15.1: No. of errors and thoroughness of groups



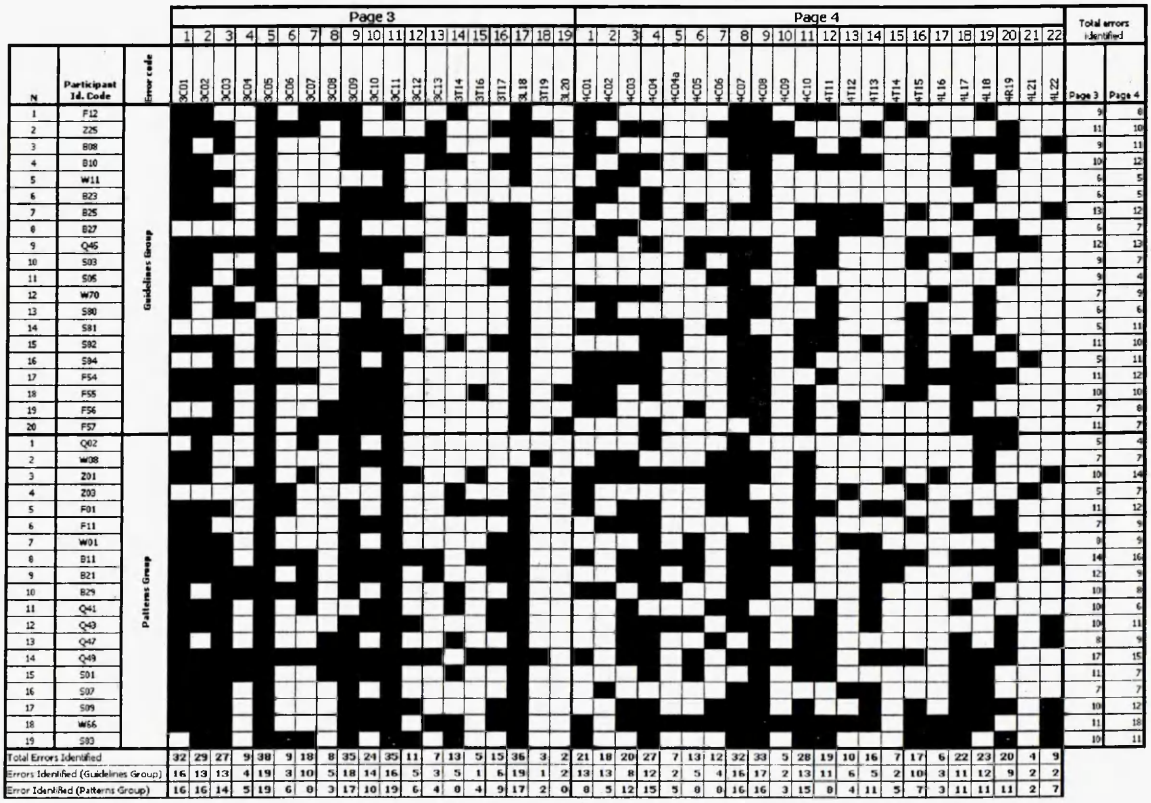


Table 6.15.2: Descriptions of errors

		Page 1																									Page 2																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Error Code	Description																																													
	Total Errors Identified	20	6	25	17	11	15	32	21	22	13	13	37	20	11	25	31	14	37	35	9	30	17	25	17	8	4	30	35	8	29	37	24	18	6	13	30	22	21	9	20	9	33	12	17	31	15
	Errors Identified (Guidelines	10	3	13	12	7	7	16	11	12	8	5	19	9	5	12	16	7	19	19	6	14	9	11	7	4	0	16	19	4	14	20	11	12	2	8	16	9	8	2	11	4	16	7	8	14	7
	Errors Identified (Patterns Group)	10	3	12	5	4	8	16	10	10	5	8	18	11	6	13	15	7	18	16	3	16	8	14	10	4	4	14	16	4	15	17	13	6	4	5	14	13	13	7	9	5	17	5	9	17	8
ICO1	Bad Design Allignment																																													
ICO2	Non descripitve link																																													
ICO3	Heading should be Bold																																												
ICO4	Non descripitve link																																												
ICO4a	Should be link																																													
ICO5	White space																																												
ICO6	Undelined Text in 2-3 places																																												
ICO7	Bold red colour Unnecessary emphasis																																													
ICO8	Heading should be Bold																																												
ICO9	Link																																													
ICO10	White space																																												
ICO11	Link not functioning or non descriptive link																																												
ICO12	Centered Inconsistent																																												
IC12a	White space																																												
IC13	Links in red coulour																																												
IC14	List - no Bullets																																												
IC15	To the Top Link																																												
IC16	Missing - Repeated Menu																																											
IL17	Colour of text not god contrast																																											
IL18	Home page is long																																												
IC19	Underlined text																																											
IT20	Links do not go to right pages																																												
IC21	Underlined text																																												
IT22	Logo-Link to Home Page																																												
IL23	Label navigation Inconsistent																																												
IT24	Page Title																																												
2C01	Heading missing																																												
2C02	Centered Paragraph																																												
2C03	White space																																												
2C04	Underlined text																																												
2C05	Undeline text should be linked																																												
2C06	Bad Allignment of second column																																												
2C06a	Links ok but inconsistent with the rest																																												
2C07	To the Top Link																																												
2R08	Fully Justified text																																												
2R09	White space between boxes																																												
2R10	Should be Link (Picture and Heading)																																												
2R11	Should be Link (Picture)																																												
2T12	Title of Page																																												
2T13	Allignment of Top Menu																																												
2T13a	Error in Links																																												
2T14	Logo is Missing (Inconsisted)																																												
2T15	Label ("Δελτίο Τύπου")																																												
2T16	Labels change position																																												
2T17	Missing Image (Consistency)																																												
2T18	Fully Justified Text Inconsistent																																												

		Page 3																			Page 4																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Error Code	Description																																												
	Total Errors Identified	32	29	27	9	38	9	18	8	35	24	35	11	7	13	5	15	36	3	2	21	18	20	27	7	13	12	32	33	5	28	19	10	16	7	17	6	22	23	20	4	9
	Errors Identified (Guidelines	16	13	13	4	19	3	10	5	18	14	16	5	3	5	1	6	19	1	2	13	13	8	12	2	5	4	16	17	2	13	11	6	5	2	10	3	11	12	9	2	2
	Errors Identified (Patterns Group)	16	16	14	5	19	6	8	3	17	10	19	6	4	8	4	9	17	2	0	8	5	12	15	5	8	8	16	16	3	15	8	4	11	5	7	3	11	11	11	2	7
3C01	Do not Capitalize text																																												
3C02	Bad Underlined text																																												
3C03	Different Font than the rest																																												
3C04	Bad Allignment of text (right alligned)																																												
3C05	Background colour too dark																																												
3C06	Missing separator																																												
3C07	Bad Allignment of text																																												
3C08	Text is not uniformally formatted																																												
3C09	Background colour too dark																																												
3C10	Link name not descriptive																																												
3C11	Menu should be centered alligned same as rest																																												
3C12	Menou Labels not in English (Home Pelates)																																												
3C13	To the Top Link																																												
3T14	Links do not go to right pages																																												
3T16	Page Title																																												
3T17	Logo-Link to Home Page																																												
BL18	Spaces between menu items Inconsistency																																												
3T19	Menou Label "ergasia" should change																																												
BL20	Menou Label (Τύπος) should change																																												
4C01	Smaller Banner -Inconsistent																																												
4C02	Email Link Should be linked																																												
4C03	Link non descriptive																																												
4C04	Link not underlined																																												
4C04a	Image Link with no text																																												
4C05	Bad Allignment																																												
4C06	Missing code telephone number																																												
4C07	Bad Allignment of similar entries																																												
4C08	Font Colour shouldn't be green																																												
4C09	To the top Link																																												
4C10	Menu should not be centered alligned																																												
4T11	Links do not go to right pages																																												
4T12	Allignment of menu																																												
4T13	Logo-Link to Home Page																																												
4T14	Page Title																																												
4T15	Search Go button																																												
4L16	Menou Space																																												
4L17	Font is Times New Roman Inconsistent																																												
4L18	Movement Distraction																																												
4R19	Image should be link																																												
4L21	Label Deltio Typou																																												
4L22	Label shouldn't be HOME																																												

Table 6.15.3: No. of errors and thoroughness of groups

Group	Participant Id. Code	Overall thoroughness	Total errors identified	Errors Identified				Thoroughness				False Positives	Aesthetic Improvements
				Page 1	Page 2	Page 3	Page 4	Page 1	Page 2	Page 3	Page 4		
Guidelines	F12	54.0%	47	20	10	9	8	76.9%	50.0%	47.4%	36.4%	2	5
	Z25	49.4%	43	10	12	11	10	38.5%	60.0%	57.9%	45.5%	1	2
	B08	54.0%	47	14	13	9	11	53.8%	65.0%	47.4%	50.0%	4	1
	B10	55.2%	48	13	13	10	12	50.0%	65.0%	52.6%	54.5%	1	1
	W11	34.5%	30	13	6	6	5	50.0%	30.0%	31.6%	22.7%	2	4
	B23	29.9%	26	7	8	6	5	26.9%	40.0%	31.6%	22.7%	2	0
	B25	57.5%	50	13	12	13	12	50.0%	60.0%	68.4%	54.5%	3	5
	B27	36.8%	32	9	10	6	7	34.6%	50.0%	31.6%	31.8%	0	0
	Q45	66.7%	58	19	14	12	13	73.1%	70.0%	63.2%	59.1%	2	3
	S03	48.3%	42	14	12	9	7	53.8%	60.0%	47.4%	31.8%	3	1
	S05	33.3%	29	9	7	9	4	34.6%	35.0%	47.4%	18.2%	0	3
	W70	52.9%	46	18	12	7	9	69.2%	60.0%	36.8%	40.9%	3	4
	S80	35.6%	31	12	7	6	6	46.2%	35.0%	31.6%	27.3%	1	1
	S81	42.5%	37	12	9	5	11	46.2%	45.0%	26.3%	50.0%	0	4
	S82	49.4%	43	14	8	11	10	53.8%	40.0%	57.9%	45.5%	1	0
	S84	43.7%	38	13	9	5	11	50.0%	45.0%	26.3%	50.0%	3	1
	F54	56.3%	49	16	10	11	12	61.5%	50.0%	57.9%	54.5%	1	2
	F55	56.3%	49	15	14	10	10	57.7%	70.0%	52.6%	45.5%	2	6
	F56	41.4%	36	11	10	7	8	42.3%	50.0%	36.8%	36.4%	2	1
	F57	44.8%	39	9	12	11	7	34.6%	60.0%	57.9%	31.8%	2	1
Patterns	Q02	33.3%	29	13	7	5	4	50.0%	35.0%	26.3%	18.2%	2	3
	W08	46.0%	40	15	11	7	7	57.7%	55.0%	36.8%	31.8%	1	3
	Z01	52.9%	46	12	10	10	14	46.2%	50.0%	52.6%	63.6%	3	4
	Z03	37.9%	33	10	11	5	7	38.5%	55.0%	26.3%	31.8%	1	2
	F01	58.6%	51	16	12	11	12	61.5%	60.0%	57.9%	54.5%	0	2
	F11	39.1%	34	9	9	7	9	34.6%	45.0%	36.8%	40.9%	1	1
	W01	54.0%	47	16	14	8	9	61.5%	70.0%	42.1%	40.9%	2	4
	B11	74.7%	65	20	15	14	16	76.9%	75.0%	73.7%	72.7%	2	1
	B21	49.4%	43	10	12	12	9	38.5%	60.0%	63.2%	40.9%	1	2
	B29	48.3%	42	11	13	10	8	42.3%	65.0%	52.6%	36.4%	2	4
	Q41	40.2%	35	10	9	10	6	38.5%	45.0%	52.6%	27.3%	2	3
	Q43	56.3%	49	16	12	10	11	61.5%	60.0%	52.6%	50.0%	1	3
	Q47	42.5%	37	16	4	8	9	61.5%	20.0%	42.1%	40.9%	2	3
	Q49	80.5%	70	19	19	17	15	73.1%	95.0%	89.5%	68.2%	0	8
	S01	46.0%	40	11	11	11	7	42.3%	55.0%	57.9%	31.8%	1	4
	S07	34.5%	30	8	8	7	7	30.8%	40.0%	36.8%	31.8%	1	1
	S09	49.4%	43	13	8	10	12	50.0%	40.0%	52.6%	54.5%	1	4
	W66	67.8%	59	14	16	11	18	53.8%	80.0%	57.9%	81.8%	4	3
	S83	52.9%	46	15	10	10	11	57.7%	50.0%	52.6%	50.0%	1	4
Both Groups	**Max**	80.5%	70.0	20.0	19.0	17.0	18.0	76.9%	95.0%	89.5%	81.8%	4.0	8.0
	Min	29.9%	26.0	7.0	4.0	5.0	4.0	26.9%	20.0%	26.3%	18.2%	0.0	0.0
	Average	48.9%	42.5	13.2	10.7	9.1	9.5	50.8%	53.7%	48.0%	43.0%	1.6	2.7
Guidelines	**Max**	66.7%	58.0	20.0	14.0	13.0	13.0	76.9%	70.0%	68.4%	59.1%	4.0	6.0
	Min	29.9%	26.0	7.0	6.0	5.0	4.0	26.9%	30.0%	26.3%	18.2%	0.0	0.0
	Average	47.1%	41.0	13.1	10.4	8.7	8.9	50.2%	52.0%	45.5%	40.5%	1.8	2.3
Patterns	**Max**	80.5%	70.0	20.0	19.0	17.0	18.0	76.9%	95.0%	89.5%	81.8%	4.0	8.0
	Min	33.3%	29.0	8.0	4.0	5.0	4.0	30.8%	20.0%	26.3%	18.2%	0.0	1.0
	Average	50.8%	44.2	13.4	11.1	9.6	10.1	51.4%	55.5%	50.7%	45.7%	1.5	3.1

Appendix 6.16: Statistical analysis of the evaluation test

Table 6.16.1: Normality test

Tests of Normality

	group	Kolmogorov-Smirnov(a)			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Total Errors	Guidelines	.121	20	.200(*)	.964	20	.627
	Patterns	.136	19	.200(*)	.932	19	.186

* This is a lower bound of the true significance.

a Lilliefors Significance Correction

Table 6.16.2: T-test

Group Statistics

	group	N	Mean	Std. Deviation	Std. Error Mean
Total Errors	Guidelines	20	41.0000	8.51624	1.90429
	Patterns	19	44.1579	11.16176	2.56068

Independent Samples Test

		Levene's Test for Equ. of Var.		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-sided)	Mean Diff.	Std. Error Diff.	95% Conf. Interval of Diff.	
									Upper	Lower
Total Errors	Equal variances assumed	.473	.496	-.996	37	.325	-3.158	3.169	-9.579	3.263
	Equal variances not assumed			-.990	33.661	.329	-3.158	3.191	-9.645	3.330

Table 6.16.3: Mann-Whitney test

Ranks

	group	N	Mean Rank	Sum of Ranks
Total Errors	Guidelines	20	19.00	380.00
	Patterns	19	21.05	400.00
	Total	39		

Test Statistics

	Total Errors
Mann-Whitney U	170.000
Wilcoxon W	380.000
Z	-.563
Asymp. Sig. (2-tailed)	.574
Exact Sig. [2*(1-tailed Sig.)]	.588(a)
Exact Sig. (2-tailed)	.582
Exact Sig. (1-tailed)	.291
Point Probability	.005

a Not corrected for ties.

Table 6.16.4: Statistical analysis for False Positives

False Positives by Group Crosstabulation

			group		Total
			Guidelines	Patterns	Guidelines
False Positives	.00	Count	3	2	5
		% within group	15.0%	10.5%	12.8%
	1.00	Count	5	9	14
		% within group	25.0%	47.4%	35.9%
	2.00	Count	7	6	13
		% within group	35.0%	31.6%	33.3%
	3.00	Count	4	1	5
		% within group	20.0%	5.3%	12.8%
	4.00	Count	1	1	2
		% within group	5.0%	5.3%	5.1%
Total		Count	20	19	39
		% within group	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	3.196(a)	4	.526	.588		
Likelihood Ratio	3.339	4	.503	.660		
Fisher's Exact Test	3.347			.560		
Linear-by-Linear Association	.686(b)	1	.408	.449	.253	.088
N of Valid Cases	39					

a 6 cells (60.0%) have expected count less than 5. The minimum expected count is .97.

b The standardized statistic is -.828.

Appendix 6.17: Statistical analysis on group efficiency

Table 6.17.1: Mann-Whitney test for difficult errors

Ranks

	Group	N	Mean Rank	Sum of Ranks
Times errors were identified	Guidelines	21	16.67	350.00
	Patterns	21	26.33	553.00
	Total	42		
Group Efficiency	Guidelines	21	15.12	317.50
	Patterns	21	27.88	585.50
	Total	42		

Test Statistics

	Errors Identified for each group	Group Efficiency
Mann-Whitney U	119.000	86.500
Wilcoxon W	350.000	317.500
Z	-2.604	-3.395
Asymp. Sig. (2-tailed)	.009	.001
Exact Sig. (2-tailed)	.009	.000
Exact Sig. (1-tailed)	.004	.000
Point Probability	.000	.000

Table 6.17.2: Mann-Whitney test for average errors

Ranks

	Group	N	Mean Rank	Sum of Ranks
Times errors were identified	Guidelines	21	20.14	423.00
	Patterns	21	22.86	480.00
	Total	42		
Group Efficiency	Guidelines	21	18.57	390.00
	Patterns	21	24.43	513.00
	Total	42		

Test Statistics

	Errors Identified for each group	Group Efficiency
Mann-Whitney U	192.000	159.000
Wilcoxon W	423.000	390.000
Z	-.730	-1.556
Asymp. Sig. (2-tailed)	.465	.120
Exact Sig. (2-tailed)	.475	.122
Exact Sig. (1-tailed)	.237	.061
Point Probability	.006	.001

Table 6.17.3: Mann-Whitney test for easy errors

Ranks

	Group	N	Mean Rank	Sum of Ranks
Times errors were identified	Guidelines	21	22.71	477.00
	Patterns	21	20.29	426.00
	Total	42		
Group Efficiency	Guidelines	21	21.24	446.00
	Patterns	21	21.76	457.00
	Total	42		

Test Statistics

	Errors Identified for each group	Group Efficiency
Mann-Whitney U	195.000	215.000
Wilcoxon W	426.000	446.000
Z	-.650	-.139
Asymp. Sig. (2-tailed)	.516	.890
Exact Sig. (2-tailed)	.524	.896
Exact Sig. (1-tailed)	.262	.448
Point Probability	.004	.005

Table 6.17.4: Mann-Whitney test for very easy errors

Ranks

	Group	N	Mean Rank	Sum of Ranks
Times errors were identified	Guidelines	24	24.71	593.00
	Patterns	24	24.29	583.00
	Total	48		
Group Efficiency	Guidelines	24	22.75	546.00
	Patterns	24	26.25	630.00
	Total	48		

Test Statistics

	Errors Identified for each group	Group Efficiency
Mann-Whitney U	283.000	246.000
Wilcoxon W	583.000	546.000
Z	-.106	-.872
Asymp. Sig. (2-tailed)	.916	.383
Exact Sig. (2-tailed)	.924	.389
Exact Sig. (1-tailed)	.462	.195
Point Probability	.006	.003

Table 6.17.5: Mann-Whitney test –comparison of the groups (Up to 8 participants identified the errors)

Ranks

	Group	N	Mean Rank	Sum of Ranks
Times errors were identified	Guidelines	15	12.23	183.50
	Patterns	15	18.77	281.50
	Total	30		
Group Efficiency	Guidelines	15	10.97	164.50
	Patterns	15	20.03	300.50
	Total	30		

Test Statistics

	Errors Identified for each group	Group Efficiency
Mann-Whitney U	63.500	44.500
Wilcoxon W	183.500	164.500
Z	-2.087	-2.849
Asymp. Sig. (2-tailed)	.037	.004
Exact Sig. [2*(1-tailed Sig.)]	.041(a)	.004(a)
Exact Sig. (2-tailed)	.038	.004
Exact Sig. (1-tailed)	.019	.002

Table 6.17.6: Mann-Whitney test –comparison of the groups (Up to 12 participants identified the errors)

Ranks

	Group	N	Mean Rank	Sum of Ranks
Times errors were identified	Guidelines	27	23.30	629.00
	Patterns	27	31.70	856.00
	Total	54		
Group Efficiency	Guidelines	27	21.43	578.50
	Patterns	27	33.57	906.50
	Total	54		

Test Statistics

	Errors Identified for each group	Group Efficiency
Mann-Whitney U	251.000	200.500
Wilcoxon W	629.000	578.500
Z	-1.993	-2.851
Asymp. Sig. (2-tailed)	.046	.004
Exact Sig. (2-tailed)	.046	.004
Exact Sig. (1-tailed)	.023	.002
Point Probability	.001	.000

Table 6.17.7: Mann-Whitney test –comparison of the groups (Up to 16 participants identified the errors)

Ranks

	Group	N	Mean Rank	Sum of Ranks
Times errors were identified	Guidelines	37	32.84	1215.00
	Patterns	37	42.16	1560.00
	Total	74		
Group Efficiency	Guidelines	37	30.66	1134.50
	Patterns	37	44.34	1640.50
	Total	74		

Test Statistics

	Errors Identified for each group	Group Efficiency
Mann-Whitney U	512.000	431.500
Wilcoxon W	1215.000	1134.500
Z	-1.883	-2.743
Asymp. Sig. (2-tailed)	.060	.006
Exact Sig. (2-tailed)	.060	.006
Exact Sig. (1-tailed)	.030	.003
Point Probability	.000	.000

Table 6.17.8: Mann-Whitney test –comparison of the groups (Up to 12 participants identified the errors)

Ranks

	Group	N	Mean Rank	Sum of Ranks
Times errors were identified	Guidelines	42	38.55	1619.00
	Patterns	42	46.45	1951.00
	Total	84		
Group Efficiency	Guidelines	42	36.30	1524.50
	Patterns	42	48.70	2045.50
	Total	84		

Test Statistics

	Errors Identified for each group	Group Efficiency
Mann-Whitney U	716.000	621.500
Wilcoxon W	1619.000	1524.500
Z	-1.497	-2.336
Asymp. Sig. (2-tailed)	.134	.019
Exact Sig. (2-tailed)	.136	.019
Exact Sig. (1-tailed)	.068	.010
Point Probability	.001	.000

Table 6.17.9: Mann-Whitney test –comparison of the groups (up to 18 participants identified the errors)

Ranks

	Group	N	Mean Rank	Sum of Ranks
Times errors were identified	Guidelines	45	42.69	1921.00
	Patterns	45	48.31	2174.00
	Total	90		
Group Efficiency	Guidelines	45	40.43	1819.50
	Patterns	45	50.57	2275.50
	Total	90		

Test Statistics

	Errors Identified for each group	Group Efficiency
Mann-Whitney U	886.000	784.500
Wilcoxon W	1921.000	1819.500
Z	-1.028	-1.844
Asymp. Sig. (2-tailed)	.304	.065
Exact Sig. (2-tailed)	.306	.065
Exact Sig. (1-tailed)	.153	.033
Point Probability	.001	.000

Appendix 6.18: Questionnaire - opinion of students about patterns/guidelines

Web Design Seminar
Department of Automation and Engineering

Surname: .....Name:.....

Use an X in marking your answers to the next questions. Please answer all questions.

1 Part

Q11:The guidelines/patterns, provided for study, were very helpful in explaining how to improve a website.

I disagree totally	I disagree	I neither agree nor disagree	I agree	I agree totally
☐	☐	☐	☐	☐

What do you suggest to improve the instructions in the booklet?

.....

.....

.....

Q12: I believe that the section in the course about the guidelines/patterns helped me to improve my skills.

Not at all	Little	Moderately	Much	Very much
☐	☐	☐	☐	☐

2 Part

Q21: How much time did you spend every week on studying and practising in the seminar?

Less than an hour	1-2 hours	2-4 hours	4-6 hours	More than 6 hours
☐	☐	☐	☐	☐

Q22: How much time did you spend reading the booklet of guidelines/patterns before the final examination?

Less than an hour	1-2 hours	2-3 hours	3-5 hours	More than 5 hours
☐	☐	☐	☐	☐

3 Part

Q31: How often did you use the booklet during the exercise for the design task?

Not at all	A little	Moderately	Much	Very much
☐	☐	☐	☐	☐

Q32: In future, will you use guidelines/patterns if you are required to design other sites?

Definitely yes	Yes	Neutral	No	Absolutely not
☐	☐	☐	☐	☐

4 Part

Q41: The guidelines/patterns helped me develop my abilities in designing websites, after the initial tutorials using Front Page.

Not at all	Only a little	Moderately	A lot	Very much
☐	☐	☐	☐	☐

5 Part

Q51: How useful were the guidelines/patterns for designing the Infoistos site?

Not at all	Only a little	Moderately	A lot	Very much
☐	☐	☐	☐	☐

Q52: How useful were the guidelines/patterns for the evaluation of the site that was given to you

Not at all	Only a little	Moderate	A lot	Very Much
☐	☐	☐	☐	☐

Appendix 6.19: Attitude towards patterns and guidelines

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Q11	Guidelines	20	4.200	.410	.0918
	Patterns	19	4.368	.496	.1137
Q12	Guidelines	20	3.850	.745	.1666
	Patterns	19	4.263	.562	.1289
Q21	Guidelines	20	2.700	.733	.1638
	Patterns	19	2.895	.658	.1509
Q22	Guidelines	20	1.600	.503	.1124
	Patterns	19	1.579	.507	.1164
Q31	Guidelines	20	2.500	.761	.1701
	Patterns	19	2.895	.809	.1857
Q32	Guidelines	20	4.200	.696	.1556
	Patterns	19	4.789	.419	.0961
Q41	Guidelines	20	3.650	.813	.1817
	Patterns	19	4.105	.459	.1053
Q51	Guidelines	20	3.900	.788	.1762
	Patterns	19	4.000	.745	.1710
Q52	Guidelines	20	4.100	.852	.1906
	Patterns	19	4.053	.780	.1789

Q11: The guidelines/patterns, provided for study, were very helpful in explaining how to improve a website.

Crosstabulation

			Group		Total
			Guidelines	Patterns	Guidelines
Q11	4.00	Count	16	12	28
		% within Group	80.0%	63.2%	71.8%
	5.00	Count	4	7	11
		% within Group	20.0%	36.8%	28.2%
Total		Count	20	19	39
		% within Group	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.365(b)	1	.243	.301	.209	
Continuity Correction(a)	.660	1	.417			
Likelihood Ratio	1.376	1	.241	.301	.209	
Fisher's Exact Test				.301	.209	
Linear-by-Linear Association	1.330(c)	1	.249	.301	.209	.146
N of Valid Cases	39					

a Computed only for a 2x2 table

b 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.36.

c The standardized statistic is 1.153.

Q12: I believe that the section in the course about the guidelines/patterns helped me to improve my skills.

Crosstabulation

			Group		Total
			Guidelines	Patterns	Guidelines
Q12	2.00	Count	1	0	1
		% within Group	5.0%	.0%	2.6%
	3.00	Count	4	1	5
		% within Group	20.0%	5.3%	12.8%
	4.00	Count	12	12	24
		% within Group	60.0%	63.2%	61.5%
	5.00	Count	3	6	9
		% within Group	15.0%	31.6%	23.1%
Total		Count	20	19	39
		% within Group	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	3.777(a)	3	.287	.274		
Likelihood Ratio	4.307	3	.230	.274		
Fisher's Exact Test	3.537			.290		
Linear-by-Linear Association	3.531(b)	1	.060	.065	.048	.033
N of Valid Cases	39					

a 6 cells (75.0%) have expected count less than 5. The minimum expected count is .49.
b The standardized statistic is 1.879.

Q21: How much time did you spend every week on studying and practising in the seminar?

Crosstabulation

			Group		Total
			Guidelines	Patterns	Guidelines
Q21	2.00	Count	9	5	14
		% within Group	45.0%	26.3%	35.9%
	3.00	Count	8	11	19
		% within Group	40.0%	57.9%	48.7%
	4.00	Count	3	3	6
		% within Group	15.0%	15.8%	15.4%
Total		Count	20	19	39
		% within Group	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.592(a)	2	.451	.466		
Likelihood Ratio	1.609	2	.447	.466		
Fisher's Exact Test	1.638			.466		
Linear-by-Linear Association	.765(b)	1	.382	.491	.260	.126
N of Valid Cases	39					

a 2 cells (33.3%) have expected count less than 5. The minimum expected count is 2.92.
b The standardized statistic is .875.

Q22: How much time did you spend reading the booklet of guidelines/patterns before the final examination?

Crosstabulation

			Group		Total
			Guidelines	Patterns	Guidelines
Q22	1.00	Count	8	8	16
		% within Group	40.0%	42.1%	41.0%
	2.00	Count	12	11	23
		% within Group	60.0%	57.9%	59.0%
Total		Count	20	19	39
		% within Group	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.018(b)	1	.894	1.000	.576	
Continuity Correction(a)	.000	1	1.000			
Likelihood Ratio	.018	1	.894	1.000	.576	
Fisher's Exact Test				1.000	.576	
Linear-by-Linear Association	.017(c)	1	.895	1.000	.576	.252
N of Valid Cases	39					

a Computed only for a 2x2 table
b 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.79.
c The standardized statistic is -.132.

Q31: How often did you use the booklet during the exercise for the design task?

Crosstabulation

			Group		Total
			Guidelines	Patterns	Guidelines
Q31	1.00	Count	2	1	3
		% within Group	10.0%	5.3%	7.7%
	2.00	Count	7	3	10
		% within Group	35.0%	15.8%	25.6%
	3.00	Count	10	13	23
		% within Group	50.0%	68.4%	59.0%
	4.00	Count	1	1	2
		% within Group	5.0%	5.3%	5.1%
	5.00	Count	0	1	1
		% within Group	.0%	5.3%	2.6%
Total		Count	20	19	39
		% within Group	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	3.301(a)	4	.509	.695		
Likelihood Ratio	3.739	4	.443	.695		
Fisher's Exact Test	3.484			.512		
Linear-by-Linear Association	2.373(b)	1	.123	.163	.091	.052
N of Valid Cases	39					

a 7 cells (70.0%) have expected count less than 5. The minimum expected count is .49.
b The standardized statistic is 1.541.

Q32: In future, will you use guidelines/patterns if you are required to design other sites?

Crosstabulation

			Group		Total
			Guidelines	Patterns	Guidelines
Q32	3.00	Count	3	0	3
		% within Group	15.0%	.0%	7.7%
	4.00	Count	10	4	14
		% within Group	50.0%	21.1%	35.9%
	5.00	Count	7	15	22
		% within Group	35.0%	78.9%	56.4%
Total		Count	20	19	39
		% within Group	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	8.460(a)	2	.015	.009		
Likelihood Ratio	9.767	2	.008	.009		
Fisher's Exact Test	7.935			.009		
Linear-by-Linear Association	8.172(b)	1	.004	.005	.003	.003
N of Valid Cases	39					

a 2 cells (33.3%) have expected count less than 5. The minimum expected count is 1.46.
b The standardized statistic is 2.859.

Q41:The guidelines/patterns helped me develop my abilities in designing websites, after learning FrontPage.

Crosstabulation

			Group		Total
			Guidelines	Patterns	Guidelines
Q411	2.00	Count	3	0	3
		% within Group	15.0%	.0%	7.7%
	3.00	Count	2	1	3
		% within Group	10.0%	5.3%	7.7%
	4.00	Count	14	15	29
		% within Group	70.0%	78.9%	74.4%
	5.00	Count	1	3	4
		% within Group	5.0%	15.8%	10.3%
Total		Count	20	19	39
		% within Group	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	4.345(a)	3	.227	.331		
Likelihood Ratio	5.554	3	.135	.331		
Fisher's Exact Test	3.970			.331		
Linear-by-Linear Association	4.180(b)	1	.041	.062	.033	.024
N of Valid Cases	39					

a 6 cells (75.0%) have expected count less than 5. The minimum expected count is 1.46.
b The standardized statistic is 2.045.

Q51: How useful were the guidelines/patterns for designing the InfoIstos site?

Crosstabulation

			Group		Total
			Guidelines	Patterns	Guidelines
Q51	1.00	Count	1	0	1
		% within Group	5.0%	.0%	2.6%
	2.00	Count	0	1	1
		% within Group	.0%	5.3%	2.6%
	3.00	Count	1	2	3
		% within Group	5.0%	10.5%	7.7%
	4.00	Count	16	12	28
		% within Group	80.0%	63.2%	71.8%
	5.00	Count	2	4	6
		% within Group	10.0%	21.1%	15.4%
Total		Count	20	19	39
		% within Group	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	3.548(a)	4	.471	.462		
Likelihood Ratio	4.340	4	.362	.462		
Fisher's Exact Test	3.475			.462		
Linear-by-Linear Association	.169(b)	1	.681	.843	.426	.148
N of Valid Cases	39					

a 8 cells (80.0%) have expected count less than 5. The minimum expected count is .49.
b The standardized statistic is .411.

Q52: How useful were the guidelines/patterns for the evaluation of the site that was given to you?

Crosstabulation

			Group		Total
			Guidelines	Patterns	Guidelines
Q52	1.00	Count	1	0	1
		% within Group	5.0%	.0%	2.6%
	2.00	Count	0	1	1
		% within Group	.0%	5.3%	2.6%
	3.00	Count	0	2	2
		% within Group	.0%	10.5%	5.1%
	4.00	Count	14	11	25
		% within Group	70.0%	57.9%	64.1%
	5.00	Count	5	5	10
		% within Group	25.0%	26.3%	25.6%
Total		Count	20	19	39
		% within Group	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	4.337(a)	4	.362	.484		
Likelihood Ratio	5.880	4	.208	.450		
Fisher's Exact Test	3.879			.531		
Linear-by-Linear Association	.034(b)	1	.855	1.000	.505	.147
N of Valid Cases	39					

a 7 cells (70.0%) have expected count less than 5. The minimum expected count is .49.
b The standardized statistic is -.183.

Appendix 6.20: Questionnaire template

Web Design and Evaluation Seminar
Department of Automation and Engineering

Full Name: **Class:**

About the Interview

In the final tutorials of the seminar done in the classroom without the use of computers, some guidelines and patterns were presented about Web Design. There are two ways of presenting usability principles, one is with guidelines and the other is with patterns. Half of the class attended the Guidelines Tutorial and the other half the Patterns Tutorial. The guidelines and patterns were the same but were presented in two different forms. In the classroom you also received a booklet. You attended the tutorial using guidelines.

For the completion of the questionnaire you must open the file **sample_PGs.rar** you were sent. Inside the file you will find two compressed files in .pdf format: **Rsample_guidelines.pdf** (guidelines) **and Rsample_patterns.pdf** (patterns). If you have not received them, please let me know and I will send them to you again.

The two files contain only a few of the guidelines you were taught about web design. You can see that the essence of the two forms of advice (guidelines and patterns) is the same. The form of presentation differs for

Patterns: **[Name – Example - When it is used - Solution – Other Examples]**
Guidelines: **[Title – Instruction – Comments - Only one example]**

Open the two .pdf files **Rsample_guidelines.pdf** and **Rsample_patterns.pdf** and try to compate some patterns and the correspondign guidelines

1. In future, in what format would you prefer the advice on Web Design to be presented? In Guideline format or Pattern format or Neutral? Use only one X to mark the appropriate box.

Guideline format			Neutral	Pattern format		
Guideline strongly ☐	Guideline moderately ☐	Guideline slightly ☐	☐	Pattern slightly ☐	Pattern moderately ☐	Pattern strongly ☐

2. In the last exercise you designed the site for the "Infoistos" company; you made several errors or you did not perform as expected in the following categories or you have violated the following usability principles:
   1.
   2.
   3.
   4.
   5.
   6.

   What was the reason for this or to what can you attribute this? Did you have in mind what you were taught during the seminar, and also the advice in the booklet?

Questions

1. Compare the pattern **with the equivalent guideline**
   The two forms present the same advice. Which of the two forms do you prefer and why? (Which do you understand better or which facilitates your learning more or which explains better what must be done, and why?)

2. Compare the pattern **with the equivalent guideline**
   The two forms present the same advice. Which of the two forms do you prefer and why? (Which do you understand better or which facilitates your learning more or which explains better what must be done, and why?)

3. Compare the pattern **with the 4 guidelines**
   The pattern is bigger because in essence it corresponds to four guidelines. The two formats present the same advice. Which of the two formats do you prefer and why? (Which do you understand better or which helps you more or which explains better what you should do, and why?)

4. Compare the pattern **with the 4 guidelines**
   The pattern is bigger because in essence it corresponds to four guidelines. The two formats present the same advice. Which of the two formats do you prefer and why? (Which do you understand better or which helps you more or which explains better what you should do, and why?)

5. Now that you have compared the guidelines with the patterns, what appeals most to you in the patterns? What draws your attention? What is their best point? What is their advantage? Which of the two is more understandable? Which of the two gives you the most guidance? Give reasons for your answer

6. Now that you have compared the guidelines with the patterns, what appeals most to you in the patterns? What draws your attention? What is their best point? What is their advantage? Which of the two is more understandable? Which of the two gives you the most guidance? Give reasons for your answer.

7. What are your reasons for attending the seminar?

8. With regards to your personal ways of learning and studying, how do you organize your study and retain information in your brain? How do you remember better, with pictures or with text or with something else?

9. What influenced you the most when applying the suggestions and the advice given in the patterns/guidelines? Was it your studying the booklet or the class tutorial or something else?

Appendix 6.21: Statistical test - Preference of students

Table 6.21.1: Chi-square test

Prefernce Crosstabulation (simple vs. compound patterns)

			TypeSimpeCompound		Total
			Simple	Compound	Simple
Preference	Neutral	Count	1	1	2
		% within TypeSimpeCompound	1.5%	1.5%	1.5%
	Patterns	Count	60	48	108
		% within TypeSimpeCompound	88.2%	70.6%	79.4%
	Guidelines	Count	7	19	26
		% within TypeSimpeCompound	10.3%	27.9%	19.1%
Total		Count	68	68	136
		% within TypeSimpeCompound	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	6.872(a)	2	.032	.022		
Likelihood Ratio	7.090	2	.029	.032		
Fisher's Exact Test	7.107			.015		
Linear-by-Linear Association	6.015(b)	1	.014	.023	.011	.008
N of Valid Cases	136					

a 2 cells (33.3%) have expected count less than 5. The minimum expected count is 1.00.

b The standardized statistic is 2.453.

Table 6.21.2: Chi-square test

Preference Crosstabulation (both groups)

			groups		Total
			Guidelines	Patterns	Guidelines
Preference	Guidelines moderately	Count	2	0	2
		% within groups	12.5%	.0%	5.9%
	Guidelines slightly	Count	1	0	1
		% within groups	6.3%	.0%	2.9%
	Neutral	Count	1	1	2
		% within groups	6.3%	5.6%	5.9%
	Patterns slightly	Count	2	4	6
		% within groups	12.5%	22.2%	17.6%
	Patterns strongly	Count	8	5	13
		% within groups	50.0%	27.8%	38.2%
	Patterns strongly	Count	2	8	10
		% within groups	12.5%	44.4%	29.4%
Total		Count	16	18	34
		% within groups	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	7.869(a)	5	.164	.139		
Likelihood Ratio	9.274	5	.099	.149		
Fisher's Exact Test	7.531			.108		
Linear-by-Linear Association	3.881(b)	1	.049	.057	.032	.016
N of Valid Cases	34					

a 9 cells (75.0%) have expected count less than 5. The minimum expected count is .47.
b The standardized statistic is 1.970.

Table 6.21.3: Chi-square test

Preference Crosstabulation (all participants)

			groups		Total
			Guidelines	Patterns	Guidelines
only pat guid neur	Guidelines	Count	3	0	3
		% within groups	18.8%	.0%	8.8%
	Neutral	Count	1	1	2
		% within groups	6.3%	5.6%	5.9%
	Patterns	Count	12	17	29
		% within groups	75.0%	94.4%	85.3%
Total		Count	16	18	34
		% within groups	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	3.757(a)	2	.153	.160		
Likelihood Ratio	4.908	2	.086	.160		
Fisher's Exact Test	3.582			.160		
Linear-by-Linear Association	3.365(b)	1	.067	.094	.063	.047
N of Valid Cases	34					

a 4 cells (66.7%) have expected count less than 5. The minimum expected count is .94.
b The standardized statistic is 1.834.

Appendix 6.22: Patterns and guidelines for comparison

Patterns for WEB DESIGN

10 Meta Navigation 2
17 To the Top Link 3
14 Properly Placed and Descriptive Links 4
25 Lists 6

10 Meta Navigation

> Use when
Most web sites, especially for commercial sites who wish to get in contact with their visitors and are large enough to have searching facilities. Additionally, the site offers navigational functionality that should be available on every page. Some functionality is relevant on every page. Users may want to go to a different place in the page

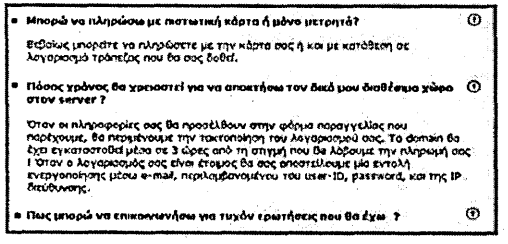
> Problem
Users want to know who they are dealing with
Usually the meta navigation bar consists of navigation elements AND communicative elements. Navigation elements include Home Link, Search Box, Site Map, and Index. Links to the worldwide site or other higher level sites are also navigation elements. Communicative elements tell users something about the organization and how to get in touch, for example About Us, Contact, Feedback. The meta navigation bar is placed in the upper region of the page so that it is always visible and does not take too much space
The meta navigation bar contains functionality that is relevant on every page of the web site. It is therefore always accessible in a non-obtrusive way that does not cost much screen space.

> Solution
Reserve an area on every page for communication and secondary navigation elements.

> Other patterns to consider
This pattern offers a chance to employ *2 Home Page Link* as well.

> More Examples

17 To the Top Link



➢ **Use when**
When pages are longer than 2 views and users are likely to go back and forth the top of the page. Typical use of this pattern is long page types with text where the users jump from one place to the other. Another situation is when displaying long texts and users need to get access to the navigation again

➢ **Problem**
The users need to go back to the top of the page

Choose strategic locations to place a link in the content labelled 'back to top' or just 'top' with or without and up-pointing icon. Strategic locations are typically paragraph endings or other types of 'blocks'. The link itself points to an anchor placed at the top of the page.

Basically this solution can be used for two reasons:

1. To get back to the main navigation
2. To get back to the top part of the content

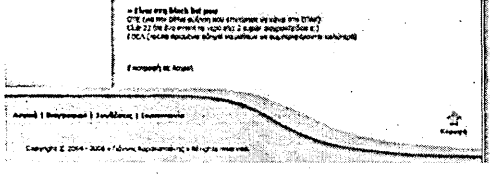
If you are doing it for the first option, consider using a **Repeated Menu** at the bottom of the page instead. Even having both a "to the top" link and a repeated menu can be a bit redundant but nevertheless useful for users.

This allows users to go back the main navigation from almost every scrolling position. It may also be convenient for disabled users who scrolling is difficult to do.

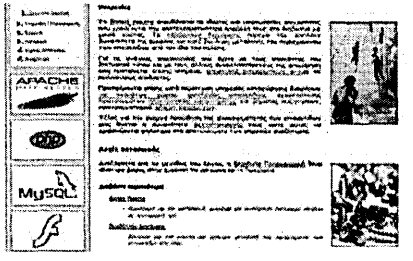
➢ **Solution**
Provide a link to the top of the page at locations in the main content of the page

➢ **Other patterns to consider**
Use this pattern together with ***7 Page List of Contents*** so that visitors may go back to the list of contents.

➢ **More Examples**



14 Properly Placed and Descriptive Links

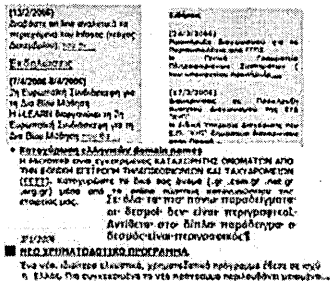


➢ **Use when**
Users move within the web site using navigational elements and links. Links can be in the form of either text, that is embedded links, or images or both of them at the same time. Embedded links should have same essential characteristics in order help users

➢ **Problem**
Links should be where users may need them for proper navigation within the site. Many times is not clear if an item in a link or if an item is clickable. At the same time users have to guess the destination of a link or find the destination they want by trial and error.

A designer should try and avoid such problems by following and applying certain established techniques.

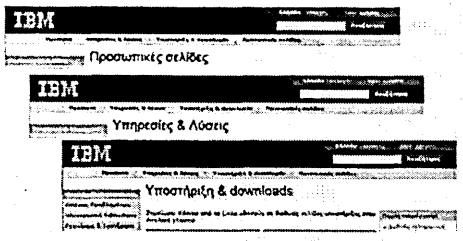
Provide links where the user may need them, especially where the user needs more information
The web site should have links to other content within or outside the web site at places where the user may need. The simplest forms of these links are e-mail links to help visitors send e-mail. More links within a text support easy navigation to relevant sections and help the visitor to find quickly relevant information and to move around the site.



When using embedded links, the link text should accurately describe the link's destination.
Users tend to ignore the text that surrounds each embedded link; therefore do not create embedded links that use the surrounding text to add clues about the link's destination.

Designate Used links by using colour changes to indicate to users when a link has been visited.

Generally, it is best to use the default text link colours (blue as an unvisited location/link and purple as a visited location/link). Link colours help users understand which parts of a website they have visited. In one study, providing this type of feedback was the only variable found to improve the user's speed of finding information. If a user selects one link, and there are other links to the same target, make sure all links to that target change colour.



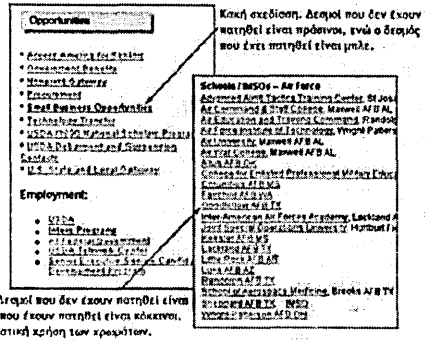
Make the link text consistent with the title or headings on the destination (i.e., target) page.
Closely matched links and destination targets help provide the necessary feedback to users that they have reached the intended page.

If users will have to click more than once to get to a specific target destination, avoid repeating the exact same link wording over and over because users can be confused if the links at each level are identical or even very similar. In one study, after users clicked on a link entitled "First Aid," the next page had three options. One of them was again titled "First Aid." The two "First Aid" links went to different places. Users tended to click on another option on the second page because they thought that they had already reached "First Aid."

➢ **Solution**
Links should be at the right place. Embedded links should be descriptive and link names should match the destination pages. Links when clicked should change colour to indicate that they were visited. Make the link text consistent with the destination page.

➢ **Other patterns to consider**
Use this pattern together with *15 Obvious Links - Consistent Cues* to make navigation within the site easier for the user.

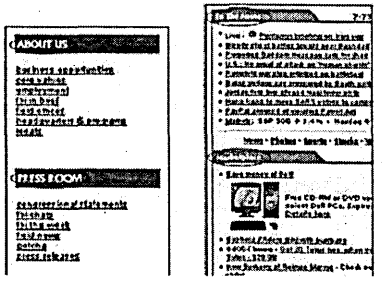
➢ **More Examples**



Κακή σχεδίαση. Δεσμοί που δεν έχουν πατηθεί είναι πράσινοι, ενώ ο δεσμός που έχει πατηθεί είναι μπλε.

Σωστή σχεδίαση. Δεσμοί που δεν έχουν πατηθεί είναι μπλε, ενώ δεσμοί που έχουν πατηθεί είναι κόκκινοι. Αυτή είναι η συμβατική χρήση των χρωμάτων.

25 Lists



➢ **Use when**
Web pages use lists to help users in reading and scanning items

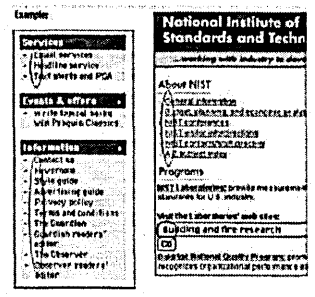
➢ **Problem**
How do you present related items

The Office of Data makes available for download
•Annual Production Statistics
•Monthly Production Statistics
•Weekly Production Statistics and
•Quarterly Consumption Projections.

The Office of Data makes available for download Annual Production Statistics, Monthly Production Statistics, Weekly Production Statistics, and Quarterly Consumption Projections.

Display a series of related items in a vertical list rather than as continuous text.
A well-organized list format tends to facilitate rapid and accurate scanning. One study indicated that users scan vertical lists more rapidly than horizontal lists. Scanning a horizontal list takes users 20% percent longer than scanning a vertical list.

Introduce Each List
Provide an introductory heading (i.e., word or phrase) at the top of each list. Providing a descriptive heading allows users to readily understand the reason for having a list of items, and how the items relate to each other. The heading helps to inform users how items are categorized, or any prevailing principle or theme. Users are able to use lists better when they include headings.

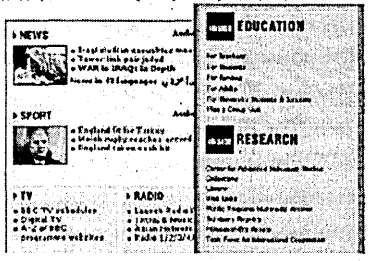


Format Lists to Ease Scanning
Make lists easy to scan and understand. The use of meaningful labels, effective background colours, borders, and white spaces allow users to identify a set of items as a discrete list.

Capitalize First Letter of First Word in LI
Capitalize the first letter of only the first word of a list item, a list box item, check box labels, and radio button labels. Only the first letter of the first word should be capitalized unless the item contains another word that normally would be capitalized.

➢ **Solution**
Display related items in Lists. Introduce each List and capitalize the first letter of first word in Lists Format lists to ease scanning.

➢ **More Examples**
Αυτές οι σελίδες χρησιμοποιούν έγχρωμο υπόβαθρο και λεπτές άσπρες γραμμές για να κάνουν τις λίστες εύκολες στη σάρωση.



Guidelines for Web Design

10 Use Meta Navigation 2
10 Links 2
14 Provide links where the user may need them 2
18 Match Link Names with Their Destination Pages 2
19 Ensure that Embedded Links are Descriptive 3
20 Designate Used Links 3
21 Allow Users to Go Back to the Top of the Page 3
12 Lists 4
32 Display Related Items in Lists 4
33 Introduce Each List 4
34 Format Lists to Ease Scanning 4
35 Capitalize First Letter of First Word in Lists 4

10 Use Meta Navigation

➢ Guideline

Reserve an area on every page for communication and secondary navigation elements.

➢ Comments

Most web sites, especially for commercial sites who wish to get in contact with their visitors and are large enough to have searching facilities. Additionally, the site offers navigational functionality that should be available on every page. Some functionality is relevant on every page. Users may want to go to a different place in the page

Usually the meta navigation bar consists of navigation elements and communicative elements. Navigation elements include Home Page, Search Box, Site Map, and Index. Links to the worldwide site or other higher level sites are also navigation elements. Communicative elements tell users something about the organization and how to get in touch, for example About Us, Contact, Feedback. The meta navigation bar is placed in the upper region of the page so that it is always visible.

The meta navigation bar contains functionality that is relevant on every page of the web site. It is therefore always accessible in an non-obtrusive way that does not cost much screen space.

10 Links

14 Provide links where the user may need them

➢ Guideline

Provide links where the user may need them, especially where the user needs more information

➢ Comments

The web site should have links to other content within or outside the web site at places where the user may need. The simplest forms of these links are e-mail links to help visitors send e-mail. More links within a text support easy navigation to relevant sections and help the visitor to find quickly relevant information and to move around the site.

18 Match Link Names with Their Destination Pages

➢ Guideline

Make the link text consistent with the title or headings on the destination (i.e., target) page.

➢ Comments

Closely matched links and destination targets help provide the necessary feedback to users that they have reached the intended page.

If users will have to click more than once to get to a specific target destination, avoid repeating the exact same link wording over and over because users can be confused if the links at each level are identical or even very similar. In one study, after users clicked on a link entitled "First Aid," the next page had three options. One of them was again titled "First Aid." The two "First Aid" links went to different places. Users tended to click on another option on the second page because they thought that they had already reached "First Aid."

19 Ensure that Embedded Links are Descriptive

➤ **Guideline**

When using embedded links, the link text should accurately describe the link's destination.

➤ **Comments**

Users tend to ignore the text that surrounds each embedded link; therefore do not create embedded links that use the surrounding text to add clues about the link's destination.

20 Designate Used Links

➤ **Guideline**

Use color changes to indicate to users when a link has been visited.

➤ **Comments**

Generally, it is best to use the default text link colors (blue as an unvisited location/link and purple as a visited location/link). Link colors help users understand which parts of a website they have visited. In one study, providing this type of feedback was the only variable found to improve the user's speed of finding information. If a user selects one link, and there are other links to the same target, make sure all links to that target change color.

21 Allow Users to Go Back to the Top of the Page

➤ **Guideline**

Provide a link to the top of the page at locations in the main content

➤ **Comments**

Pages are longer than 2 views and users are likely to go back and forth the top of the page. Typical use of this pattern is long page types with text where the users jump from one place to the other. Another situation is when displaying long texts and users need to get access to the navigation again

Choose strategic locations to place a link in the content labeled 'back to top' or just 'top' with or without and up-pointing icon. Strategic locations are typically paragraph endings or other types of 'blocks'. The link itself points to an anchor placed at the top of the page.

Basically this solution can be used for to reasons:

1. To get back to the main navigation
2. To get back to the top part of the content

If you are doing it for the first option, consider using a Repeated Menu at the bottom of the page instead. Even having both a "to the top" link and a repeated menu can be a bit redundant but nevertheless useful for users.

This allows users to go back the main navigation from almost every scrolling position. It may also be convenient for disabled users who scrolling is difficult to do.

12 Lists

32 Display Related Items in Lists

➤ **Guideline**

Display a series of related items in a vertical list rather than as continuous text.

➤ **Comments**

A well-organized list format tends to facilitate rapid and accurate scanning. One study indicated that users scan vertical lists more rapidly than horizontal lists. Scanning a horizontal list takes users 20% percent longer than scanning a vertical list.

33 Introduce Each List

➤ **Guideline**

Provide an introductory heading (i.e., word or phrase) at the top of each list.

➤ **Comments**

Providing a descriptive heading allows users to readily understand the reason for having a list of items, and how the items relate to each other. The heading helps to inform users how items are categorized, or any prevailing principle or theme. Users are able to use lists better when they include headings.

34 Format Lists to Ease Scanning

➤ **Guidelines**

Make lists easy to scan and understand.

➤ **Comments**

The use of meaningful labels, effective background colors, borders, and white spaces allow users to identify a set of items as a discrete list.

35 Capitalize First Letter of First Word in Lists

➤ **Guideline**

Capitalize the first letter of only the first word of a list item, a list box item, check box labels, and radio button labels.

➤ **Comments**

Only the first letter of the first word should be capitalized unless the item contains another word that normally would be capitalized.

Examples of guidelines

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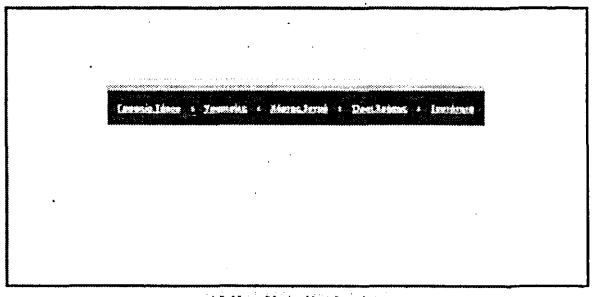
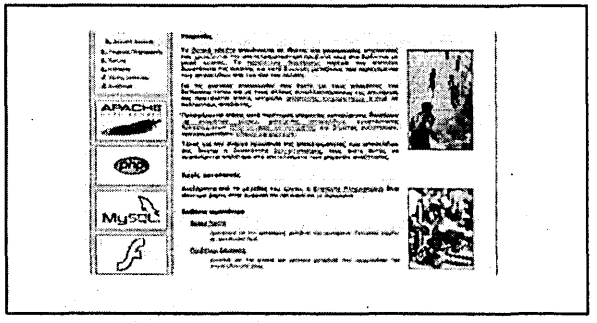
18 Match Link Names with Their Destination Pages 7
19 Ensure that Embedded Links are Descriptive 7
20 Designate Used Links 8
21 Allow Users to Go Back to the Top of the Page 8
32 Display Related Items in Lists 9
33 Introduce Each List 9
34 Format Lists to Ease Scanning 10
35 Capitalize First Letter of First Word in Lists 10



10 Use Meta Navigation



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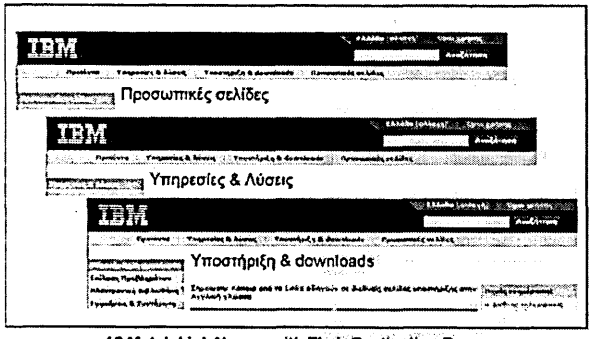
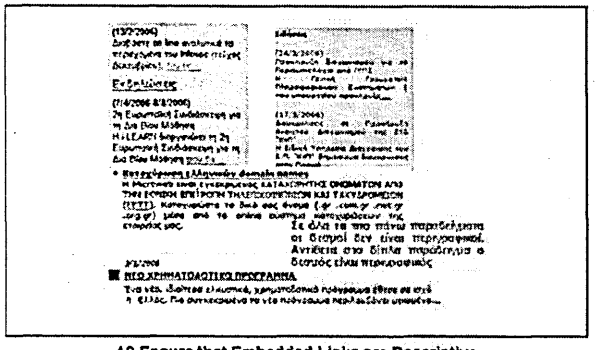
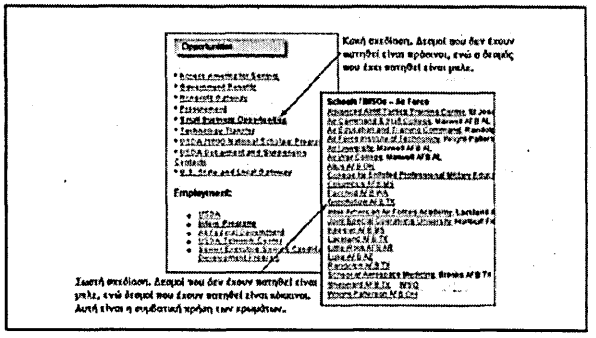


18 Match Link Names with Their Destination Pages

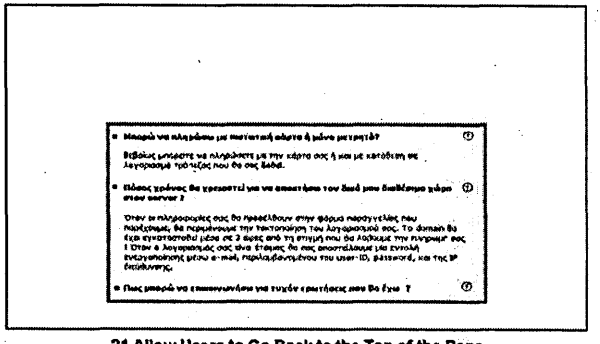


19 Ensure that Embedded Links are Descriptive

Guidelines for web design 7

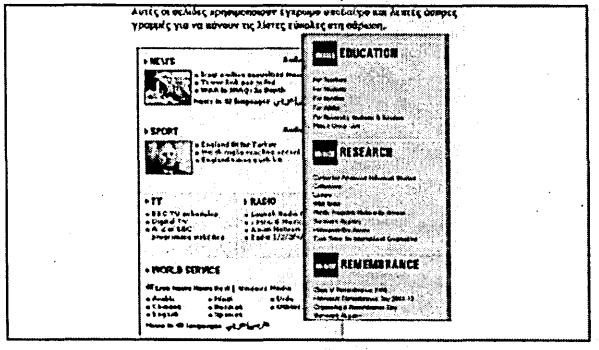


20 Designate Used Links

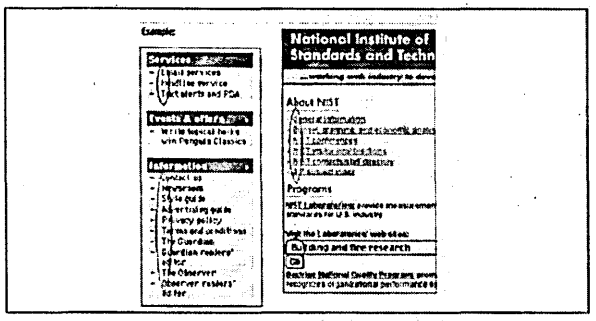


21 Allow Users to Go Back to the Top of the Page

Guidelines for web design 8



34 Format Lists to Ease Scanning



35 Capitalize First Letter of First Word in Lists

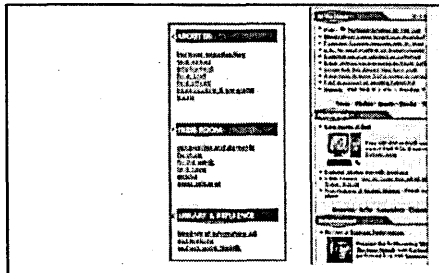
Λίστες με κουκκίδες είναι εύκολες στη αναγνώριση αλλά και στην κατανόηση.

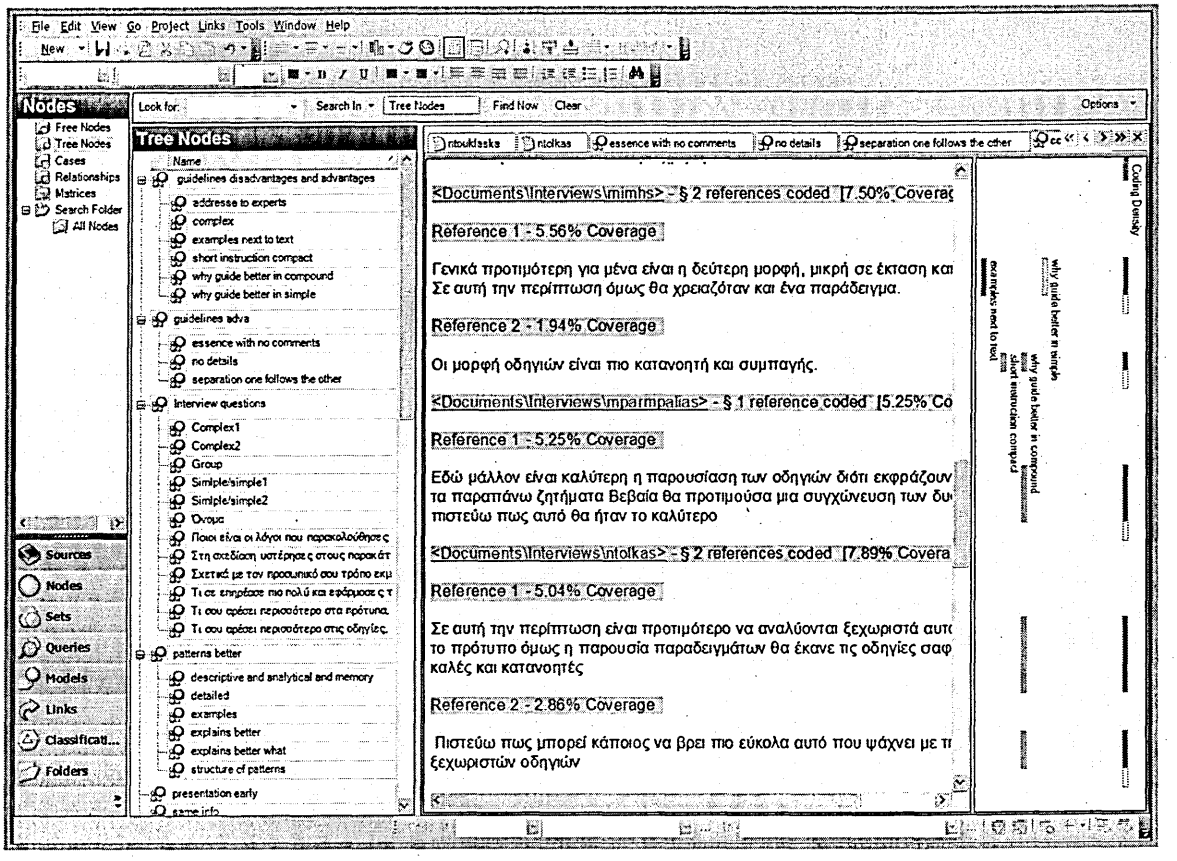
The Office of Data makes available for download
- Annual Production Statistics
- Monthly Production Statistics
- Weekly Production Statistics and
- Quarterly Consumption Projections.

Οι οριζόντιες λίστες όμως δυσκολεύουν πολύ το χρήστη.

The Office of Data makes available for download Annual Production Statistics, Monthly Production Statistics, Weekly Production Statistics, and Quarterly Consumption Projections.

32 Display Related Items in Lists



33 Introduce Each List

Appendix 6.23: Nvivo analysis (screenshot)