A study of inventory classification in healthcare logistics using system dynamics modelling.

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A Study of Inventory Classification in Healthcare Logistics
Using System Dynamics Modelling

Lina Khalil Al-Qatawneh

A thesis submitted in partial fulfilment of the requirements of
Sheffield Hallam University
for the degree of Doctor of Philosophy

May 2006
Abstract

One of the key challenges for a modern day health care provider is to dispense high quality of medical care while limiting or even reducing the health care expenditures. This research work endeavours to meet this challenge through effective management of hospitals logistics systems. The aim of this research work is to provide a structured mechanism for modelling and analysing health care logistics to be able to understand its dynamic behaviour and effectively manage its logistical activities on the basis of the model. In order to achieve the research objectives, this research uses system dynamics as the main medium of analysis, and in particular, employs an integrated system dynamics framework which has been used previously for manufacturing industry supply chain designs and tests the feasibility of the framework for analysing and modelling health care logistics. This is ascertained by developing and incorporating a decision making metrics in the system dynamics model based on item criticality, usage, and value to optimise overall logistics costs.

System Dynamics methodology is employed at first to develop a model for existing inventory control decisions, and subsequently to produce two alternative approaches based on traditional \((R, s, S)\) inventory control approach and Continuous Replenishment Inventory and Order Based Production Control CR(IOBPCS) approach. These approaches are tested for two case hospitals, namely: Children’s National Medical Center (CNMC) USA, and Derbyshire Royal Infirmary (DRI) UK. The dynamic analysis for each case revealed problems in terms of multistage inventories and order batching, which could lead to demand amplification causing a detrimental effect on the inventory management throughout the supply chain. Accordingly, the simulations results produced for the two cases are benchmarked using alternative strategies in terms of lower inventory cost, and robustness to meet the unpredictable demand arising from a large number of items.

Overall, this research work has enhanced the understanding of hospitals logistics systems by building qualitative and quantitative models. More specifically, this research work has illustrated the applicability of the integrated system dynamics framework in analysing and modelling hospitals logistics systems and inventory control decisions. One particular contribution of this study is introducing inventory classification based on the criticality of items for patient needs which is more suited for health care situations rather purely cost based policies prevalent in other manufacturing and service chains. Therefore, this work has rigorously tested a multi-criteria based inventory classification method that takes into account the criticality of use, cost, and usage value of items for optimising overall inventory cost while maintaining the required patient care/service level. Future studies may be conducted to further evaluate the trade-offs in between different logistics decision making (such as, inventory control, service level, purchasing, transportation and warehousing) in order to design a set of “best practice” simulation models to optimise the overall dynamic behaviour for health care supply chains.
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My family and friends deserve my uttermost gratitude and appreciation. First, I would like to thank my mother and father for their love and care all these years. Secondly, I would like to thank my mother and father in law as well as my sister in law for their support and taking care of my children when I was away. Finally, and most importantly, my deepest appreciation to my beloved husband Mustafa and my three wonderful sons Yousef, Ahmad and Ibraheem for their continuing love, encouragement, and support in completing this thesis. It is to them that I rightly dedicate this thesis.
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Chapter One: Introduction

1.1 The Research Issues

This research work investigates the issue of logistics management in health care and how to effectively manage hospitals logistics systems as an attempt to contain cost without sacrificing the quality of health care. This research work argues that an effective management of hospitals logistics systems should be based on a clear understanding of the interconnectivity in between logistical activities in a hospital logistics system and which demands trade-offs considerations between various logistical decisions. This research work argues that this understanding is achieved through modelling hospitals logistics systems and analysing their dynamic behaviour. In addition, this research work argues that an effective management of hospital logistics addresses the conflicting objectives of minimizing logistics-related cost while simultaneously reducing the incidence of stockouts, especially for critical items. Therefore, this research work focuses in the assessment of the dynamic behaviour of health care logistics on two main variables: logistics cost and service level. Furthermore, this research work investigates a number of strategies to improve the dynamic behaviour of hospitals logistics systems in terms of performance and cost. As part of this investigation, this research work assesses the role of inventory classification when incorporated into the redesigning strategies of health care logistics. This research work argues that a distinctive feature of health care logistics is the criticality of items used by hospitals and the life threatening situations that could happen due to the unavailability of these items. Therefore, this research work studies the impact of using a multi-criteria inventory classification method that takes into account the criticality, cost, and usage value of items on logistics cost reduction.

The remaining of this chapter is organised as follows. Section 1.2 presents a brief background concerning the issues that are raised in this research work and the context of this research. Section 1.3 discusses the overall aims and objectives of this research work. The research questions are given in section 1.4. Finally, section 1.5 gives an overview of the structure of this thesis and section 1.6 summarises this chapter.
1.2 The Research Background and Context

Offering health care and developing health services are fundamental national duties. Most of the population in the developed countries are covered against medical cost by one of the following three models: National Health Service (NHS), Social Insurance (SI), and Private Insurance (PI). Irrespective of the economic and health care structure, a major concern with health care is its growing cost. The latest OECD Health data (2005) shows that the highest health care spending as a percent of gross domestic product (GDP) between the thirty OECD countries amounts 15% in the United States followed by 11.5% in Switzerland, 11.1% in Germany, 10.5% in Iceland, 10.3% in Norway, and 10.1% in France. This rise in the health care expenditure may be attributed to factors including population aging, population increase, widening range of treatment available, level of technology used, and intensive labour requirements (Docteur and Oxley, 2003; Mehrotra et al., 2003). Therefore, providing a high quality of medical care at a reduced cost has become a top priority for many governments in the world.

Although personnel, nursing and physician pay is the single largest expense in any hospital, costs related to inventory, logistics, and administration processes are nevertheless significant and are steadily rising. In some cases, it is estimated that approximately 30-40% of hospital spending is invested in various logistical activities (Sheyer, 1995; Poulin, 2003). Logistic related costs are often ignored whenever governments or other organizations examine the economics of health care service delivery. Rather than introducing efficiencies in logistics and supply processes, health care service providers usually look at cutting suppliers’ margins or reducing the price of standard medical products whenever faced with budget cuts.

In recent years, the health care industry began to realise that health care strategies should be directed toward identifying the logistics solutions that will lead to increase in overall customer service levels and reductions in total health care cost. Therefore, more interest should be directed to investigating logistics in health care.
Although, there is an established work in the literature that has provided insights concerning health care logistics, the focus of these studies was directed toward qualitative process improvements. There are few studies that have quantitatively analysed problems associated with logistical activities within the context of health care, and most of which have focused on only one particular logistical activity, mainly inventory control. Therefore, one can argue that considering the effect of the interrelated decisions that are applied for managing the logistics system within the context of health care and understanding the dynamic nature of health care logistics to aid in the whole logistics system design are still to be explored. In this research work, the modelling and analysis of health care logistics are expected to be more useful to this context. Since the health care industry started to realise the important role logistics management can play to contain cost without sacrificing the quality of health care, the assessment of the dynamic behaviour of health care logistics in terms of performance and cost increases the importance of this research work to this context.

Moreover, the distinctive feature of health care logistics concerning the criticality of items and the life threatening situations that could happen due to the unavailability of these items may require different redesigning strategies than those used to improve the dynamic behaviour of other industries logistics systems. Therefore, investigating redesigning strategies that takes into consideration the criticality of items adds to the importance of this research work to this context.

1.3 Aims and Objectives

The overall aim of this research work is to understand the dynamic behaviour of health care logistics systems to effectively manage their logistical activities. Among the objectives of this research work is first to provide a structured mechanism for modelling and analysing health care logistics to be able to understand its dynamic behaviour and effectively manage its logistical activities on the basis of the model. The second objective of this research work is the application of modelling system dynamics for health care logistics that incorporates service and cost dimensions. This research work will focus in the assessment of the dynamic behaviour of health care logistics on two main variables: logistics cost and service level. The third objective is redesigning health care logistics to improve its dynamic behaviour in terms of performance and cost,
taking into consideration the distinctive feature of health care logistics concerning the criticality of items. The attainment of these objectives will enable the achievement of the overall aim of this research work.

1.4 Research Questions

From the literature review, it was apparent that there is a gap in understanding the dynamic nature of health care logistics systems as a comprehensive whole and in considering the effect of the interrelated decisions that are applied for managing logistics systems in health care, which formed the overall aim of this research work and its main question. To enable the achievement of this aim, the following research questions were developed based on a comprehensive and critical review of the available literature:

- Is the integrated system dynamics framework for supply chain design applicable in the health care industry?

- Does the integrated system dynamics framework provide a structured mechanism for analysing and modelling health care logistics systems and their dynamic behaviour?

- Does the analysis and evaluation of the effects of the different logistics decisions on the dynamic behaviour of health care logistics reveal any problematic behaviour?

- How to quantify in terms of cost the relative improvements of redesign strategies in health care logistics?

- What is the role of inventory classification when incorporated into the redesigning strategies of health care logistics?
• What is the impact of using a multi-criteria inventory classification method that takes into account the criticality, cost, and usage value of items on logistics cost reduction?

1.5 Structure of the Thesis

The rest of the thesis is organised in four chapters. The main aim of Chapter Two is to review the available literature to identify existing gaps in the body of knowledge developed during previous work and then to develop, based on these gaps, the research questions that specify exactly what is going to be investigated in this research work.

The main aim of Chapter Three is to explain how to develop conceptual and quantitative models of hospitals logistics systems using System Dynamics methodology. This chapter first explains the development of a general conceptual model of a hospital logistics system. Then, this chapter describes the conceptual model development, simulation model development and dynamic analysis of two specific hospital logistics systems: one using a traditional \( (R, s, S) \) inventory control approach and the other using continuous replenishment (CR).

The main aim of Chapter Four is to answer the research questions through conducting two case studies. This chapter begins by discussing the research methods. This is followed by demonstrating the implementation of the various stages of an integrated system dynamics framework proposed to be used for logistics system redesign of two case hospitals: Children’s National Medical Center (CNMC) in the United States of America (USA), and Derbyshire Royal Infirmary (DRI) in the United Kingdom (UK). This chapter concludes with a discussion of how, through conducting the two case studies in this chapter, this author answered the research questions that were developed in Chapter Two.

The main aim of Chapter Five is to identify the main contribution of this research work to the body of knowledge. This chapter also evaluates the research methodology and highlights the main limitations of this research work. The chapter ends by giving suggestions for future research.
1.6 Summary

This chapter began by discussing the issues that are raised and investigated in this research work. This was followed by presenting a brief background concerning these issues and the context of this research work. This chapter then provided the overall aim and objectives of this research work as well as the research questions. This chapter concluded by giving an organisation structure for the rest of the thesis.
2.1 Introduction

This chapter first gives an overview of the relevant literature on logistics and supply chain management and then –more specifically- on health care logistics to identify its main characteristics and features and what is distinctive about it. This chapter then provides a comprehensive and critical review of the available literature on modelling health care logistics to identify existing gaps that will provide an overall aim for this research work. This is followed by a critical review of the different modelling techniques that have been used to analyse problems associated with logistical activities to choose the appropriate approach that is useful for solving the main question of this research work. A brief discussion of the chosen approach is then provided, followed by a critical review of the literature on the role of using this approach in the field of logistics management. The research questions that specify exactly what is going to be investigated in this research work are developed in this chapter based on the identified gaps in the literature.

2.2 Logistics and Supply Chain Management

The term supply chain management (SCM) was originally introduced in the early 1980’s (Oliver and Webber, 1992), and since then it has received ever-growing interest both from academics and practitioners. Several definitions of SCM have been offered in the literature. For example, Stevens (1989) describes a supply chain as a system whose constituent parts include material suppliers, production facilities, distribution services, and customers linked together via the feed forward flow of materials and the feedback flow of information as shown in Figure 2.1. According to Stevens (1990) SCM controls the flow of material from suppliers, through the value adding processes and distribution channels, to customers.
Over the last two decades, a number of related fields have contributed to the explosion of SCM literature (Chen and Paulraj, 2004) such as purchasing and supply, logistics and transportation, operations management, marketing, organizational theory, management information systems, and strategic management. Bechtel and Jayaram (1997) and Otto and Kotzab (2003) provided an extensive retrospective review of the literature and research on SCM. According to Gunasekaran (2004), there is a gap that exists between practice and theory, which needs to be addressed with a view to enhancing the application of SCM in real life environments and through further theoretical developments in the field. He argues that there are only a limited number of models and application frameworks that are available in the literature to give a comprehensive analysis of an integrated SCM system.

According to Lambert (2004) there is a great deal of confusion regarding exactly what supply chain management involves and that many use supply chain management as a synonym for logistics. In order to develop a common view of the field, the Global Supply Chain Forum was established. The forum is a group of non-competing firms and academic researchers who, working together, developed the following definition of SCM:

*Supply Chain Management is the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders.*
In October 1998, the Council of Logistics Management (CLM) has announced a modified definition of logistics based on the understanding of SCM that has been reconceptualised from integrating logistics across the supply chain to integrating and managing key business processes across the supply chain. The CLM defines logistics as:

Logistics is that part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related information from the point-of-origin to the point-of-consumption in order to meet customers’ requirements.

This author agrees with the above distinction between logistics and SCM, and considers that SCM embraces all business processes—not just logistics—cutting across all organisations within the supply chain. From that understanding, in this research work, this author will focus on logistics as part of SCM, specifically, on analysing and managing hospitals logistics systems.

Each echelon in the supply chain has its own logistics system. Each logistics system is associated with its own logistics activities. A comprehensive list of these activities is provided by Coyle et al. (1996) as shown in Table 2.1. However, each echelon may not place responsibility for all of these activities within their logistics system. For example, this research, with case studies included in the thesis, suggests that hospitals usually do not include production planning in their logistics systems. However, production planning is one of the main logistics activities for product manufacturers.

Table 2.1: Logistics activities

<table>
<thead>
<tr>
<th>Traffic and Transportation</th>
<th>Production planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warehouse and storage</td>
<td>Purchasing</td>
</tr>
<tr>
<td>Industrial packaging</td>
<td>Customer service levels</td>
</tr>
<tr>
<td>Materials handling</td>
<td>Plant and warehouse site location</td>
</tr>
<tr>
<td>Inventory control</td>
<td>Return goods handling</td>
</tr>
<tr>
<td>Order fulfilment</td>
<td>Parts and service support</td>
</tr>
<tr>
<td>Demand forecasting</td>
<td>Salvage and scrap disposal</td>
</tr>
</tbody>
</table>

Source: Coyle et al. (1996)
Each of the indicated logistics activities demands some kind of decision making. For example, decisions related to warehousing (Ballou, 1992; Bowersox and Closs, 1996) include: how many warehouses, where to locate the warehouse, what size the warehouse should be, and so on. Such decision making has pros and cons. For example, a faster transport system would permit the holding of lower inventories and use less warehousing space. Also, the interconnectivity in between logistics systems demands that the decision maker evaluates various economic trade-offs. For example, adding a warehouse means adding related fixed and variable costs. However, this may reduce the overall transportation cost.

Logistics also has important relationships with other operational systems such as: manufacturing, marketing, finance, and other key business processes. In the case of marketing, logistics must ensure that the customers requirements as identified by the marketing system are available when and where desired by customers. Similarly, with regards to manufacturing, a long production run means more products, therefore requiring larger warehouse space to maintain a high level of inventory.

In summary, in any supply chain, interrelationships exist between:

- Different echelons within the supply chain.
- Sub-systems in each echelon.
- Different logistics activities.

Therefore, to optimize costs in supply chains, the following optimisation and trade-offs need to be considered:

a) the cost of each logistics activity individually; and/or
b) the trade-off between various logistics activities; and/or
c) the trade-off between sub-systems; and/or
d) the trade-off between different echelons in a supply chain.

In practice, these trade-offs are driven by the overall supply chain as well as business strategy. Therefore, this author would like to define supply chain management (SCM) as follows:
Supply chain management is about managing and coordinating all trade-off relationships that could exist in a supply chain in a way that optimises the overall supply chain cost while maintaining a high customer service level.

### 2.3 Health Care Logistics

The research in this thesis represents the view that a typical health care supply chain consists of three echelons: health care provider, distributor, and product manufacturer, which are linked together via information, material, and cash flows as shown in Figure 2.2. Information and cash would flow in both directions, whereas, materials would usually flow in one direction—except in the case of reverse logistics\(^1\). As shown in Figure 2.2, the health care provider orders its supplies—medical and non-medical products—either directly from product manufacturers, or from distributors who in turn order their supplies from product manufacturers.

![Figure 2.2: A typical health care supply chain](image)

1. The concept of reverse logistics in health care is concerned with the recycling of pharmaceutical stock for later re-use (Ritchie et al., 2000). Reverse logistics will not be included in the scope of this research work.
Based on the literature review of logistics systems that is discussed briefly in section 2.2, a holistic view of a health care supply chain was drawn as illustrated in Figure 2.3, showing interrelationships between different echelons within the supply chain, subsystems in each echelon, and different logistics activities.

A literature review of health care supply chains revealed that they are complex supply chains due to the wide product range, the criticality of and the perceived need to supply very high level of services for most items, and the high value of products involved (Beier, 1995). The wide variability in product ranges is often the result of too much differentiation among the available products. This usually tends to occur due to the subjective decision making of persons involved (e.g. physicians who have significant technical knowledge of what the products are supposed to do) (Neumann, 2003). In many industries, fluctuations in demand can be linked to specific factors that can be controlled to some extent. However, health care organisations have very little control over the demand for supplies (Smith, 1999). In this author's view, this is due to the fact that the health care industry is unique in terms of the large volume of diverse support services required to deliver the end product which is patient care.

Like its counterparts, the health care industry is beginning to look into effective supply chain management (SCM) as an answer to its quest for reducing costs. Hospitals are taking advantage of the latest tools available on the market including: implementation of the Universal Product Number (UPN) (DeJohn, 1997), bar coding (Moynihan, 1998), automated data capture and electronic data interchange (EDI) (Moynihan, 1997).

There have been some global initiatives to enhance the benefits of SCM, for example, Efficient Healthcare Consumer Response (EHCR). In 1996, the EHCR initiative was launched by a consortium of health care industry associations and health care supply chain participants in response to intensifying pressure to reduce health care costs while enhancing the quality and efficiency of care (CSC, 1996). The goal of EHCR is to streamline the health care products supply chain by improving efficiency and eliminating waste at every step of the chain. EHCR has three foundation strategies that are based upon: efficient product movement, efficient order management and efficient information sharing. The key enablers of these strategies are product identification through bar coding, continuous replenishment, and activity based costing.
Figure 2.3: The overall interfaces and interrelationships in a health care supply chain
In healthcare, usually the management of logistics activities within hospitals is discussed under the broad heading of materials management. One of the classical definitions of materials management in hospitals comes from Arnold Reisman (1981, p432) who defines it as:

* A term used to describe the grouping of management functions related to the complete cycle of material flow, from the requisitioning, purchase, and internal control of materials; to the planning and control of work in process; to the warehousing, shipping, distribution, and/or disposal after use of a product.

The logistics department – also named as the materials management department or the supply department – is the focal point of a hospital’s logistics activities. It has direct responsibility for managing the functions of purchasing, inventory control, warehousing, and transportation (Henning, 1986; Scheyer, 1995; Poulin, 2003).

In recent years, health care strategies are directed toward identifying the logistics solutions that will lead to increases in overall customer service levels and reductions in total health care cost. This led to the application of time-based logistics strategies including: just-in-time (JIT) (North, 1994; Heinbuch, 1995; Whitson, 1997), stockless inventory (Wilson et al., 1992; Rivard-Royer et al., 2002), vendor-managed inventory (Haavik, 2000), third-party logistics (Kontzer, 2003), time-phased order points (Spedding, 1998), reverse logistics (Ritchie et al., 2000), and efficient healthcare consumer response (EHCR) (CSC, 1996). All of these time-based logistics strategies which Kotzab (1999) refers to as IT-driven logistics strategies employing EDI, barcode and scanning technology are pursuing the following objectives (La Londe and Masters, 1994; Aptel and Pourjalali, 2001):

- a) Reduction of cycle time.
- b) Reduction of inventories.
- c) Avoiding duplications of logistics costs.
- d) Increasing customer service.

In this author’s view, in a hospital setting, these objectives lead to conflicts within concerned parties. Health providers (e.g. physicians, nurses, and laboratory technicians) are generally quite intolerant of shortages or stockouts, however, they are relatively less
sensitive to costs. Whereas, hospital administrators are concerned with decreasing the total cost, while increasing hospital service level.

There are a variety of ways by which hospital service level is measured (Morey et al., 1994; Huarng and Lee, 1996; Pina and Torres, 1996; Mittler, 1998). These measures are a reflection of how hospitals insure for each patient the availability of:

a) Excellent medical and nursing staff.
b) High standard medical technology.
c) Short queues and waiting time.
d) High hotel services.
e) Availability of medical and non-medical products.

This research work is concerned exclusively with the availability of medical and non-medical products. However, there are implied benefits of this associated with short queues and waiting time and high hotel services.

Based on the literature review, the following points summarise the main characteristics and features of health care logistics:

I. Hospitals generally think of their offerings as services rather than products. The core service is inpatient care.

II. Hospitals when providing their main product – inpatient care – need tangible medical and non-medical products.

III. Hospitals maintain a large number of different products. This wide variability of product types is caused by the diverse health services the hospital offers to patients and the role of physicians in choosing these products.

IV. The large diversity of patients’ needs, combined with the physicians’ preferences of the way to treat their patients makes the demand for products unpredictable and uncontrollable.
V. In hospitals, products are ranged between high-critical to low-critical item. High-critical items are either essential for the work carried out and/or have no immediate alternative. While, medium-critical items are important for the work, but may have acceptable alternatives, or other sizes may be used in the event of stock-out. Low-critical items are unlikely to affect the well being of patients other than causing minor inconvenience.

VI. The unavailability of critical items could lead to life threatening situations.

VII. Although critical items constitute a small number of items, the majority of the total inventory investment is in critical items (around 60%) (Nicholson et al., 2004). This is because critical items are usually extremely expensive, have a short shelf-life, and/or require expensive storage facilities on site.

Other industries logistics systems may have the same above characteristics and features of health care logistics, except for one. The criticality of certain items used by hospitals and the life threatening situations that could happen due to the unavailability of these items is a distinctive feature of health care logistics. This feature is what makes health care logistics distinct and different from other industries logistics systems. Therefore, this feature will be one of the main concerns of this research work when modelling and analysing health care logistics systems.

2.4 Modelling Health Care Logistics

Most of the research in the health care industry has been directed toward qualitative process improvements (Jarrett, 1998). There are only a few examples that quantitatively analyse problems associated with logistical activities in health care. Kapur and Moberg (1987) modified a traditional EOQ model, to manipulate yearly inventory turns and generate optimal space requirements for the stores operations at Georgetown University Hospital. The advantage of the results of their study is that a material management system can be configured for acceptable yearly turns such that space requirements can be reduced.
Beier (1995), applied an economic order quantity (EOQ) analysis to questionnaire data in order to draw a comparison with current inventory management practices in hospital pharmacies. The results of the comparison suggest that the average pharmacy has the potential for savings in inventory related costs. However, Beier assumes too much homogeneity in the inventory items analysed. The application of an EOQ model over a broad spectrum of inventory items can be questioned.

Dellaert and Poel (1996), suggested an inventory control model by extending an EOQ model to a so-called \((R,s,c,S)\) model, in which the values of the control parameters \(s\), \(c\), and \(S\) are determined in a very intuitive way. They compared various cost components and service levels through a simulation study. The comparison showed a decrease in the cost in combination with an increase in the service rate for the proposed new rule. They also showed that the performance of the new rule was comparable to that of a rule in which the control parameters were determined in a more sophisticated way.

Banerjea-Brodeur et al. (1998) presented an application of a routing model. Their study aimed at improving the linen delivery operations in a hospital by reassessing the quantities of linen to be delivered and by redesigning the delivery schedule using a tabu search heuristic algorithm.

In a more recent study, Nicholson et al. (2004) have compared inventory policies, inventory costs, and service levels in an in-house three-echelon distribution network vs. an outsourced two-echelon distribution network for non-critical inventory items. They have found that the recent trend of outsourcing to distribute non-critical medical supplies directly to the hospital departments using the two-echelon network resulted not only in inventory cost savings but also did not compromise the quality of care as reflected in the service levels.

Most of the studies mentioned above focused on only one particular logistical activity - inventory control. They addressed some specific scenarios of inventory policies, but failed to consider explicit interrelations among the hospital logistical activities in an overall supply chain context. Answers to all questions related to the planning and control of all logistical activities in a hospital logistics system can not be provided by inventory control models alone. The interconnectivity in between logistical activities in a hospital logistics system –as explained in section 2.2 and section 2.3 – demands that
the decision maker considers the trade-offs between various logistical activities. Therefore, focusing on only one particular logistical activity is too restrictive to be very useful in understanding the dynamic nature of health care logistics which will help in giving a comprehensive treatment to the entire health care logistics system. The literature review of modelling health care logistics showed that there is a gap in understanding the dynamic nature of health care logistics systems as a comprehensive whole and in considering the effect of the interrelated decisions that are applied for managing logistics systems in health care. This gap has directed the focus of this research work towards analysing and modelling health care logistics to be able to understand its dynamic behaviour and effectively manage its logistical activities on the basis of the model. The main question of this research work is:

How can an understanding of the dynamic behaviour of hospitals logistics systems through modelling and analysis help hospitals to effectively manage their logistical activities?

There is an agreement in the literature that an effective management of hospital logistics addresses the conflicting objectives of minimizing logistics-related cost while simultaneously reducing the incidence of stock-outs, especially for critical items. In health care, as explained in section 2.3, the availability of medical and non-medical products is a measure of hospital service level. Therefore, one of the objectives of this research work is the application of modelling system dynamics for health care logistics that incorporates service and cost dimensions. This research work will focus in the assessment of the dynamic behaviour of health care logistics on two main variables: logistics cost and service level.

2.5 Quantitative Techniques Used to Analyse Problems Associated with Logistical Activities

Logistics – not specifically for health care – and issues associated with logistical activities have received great attention in the literature. The areas of logistics receiving attention by researchers can be classified as warehousing and facility location, inventory control, transportation/routing and scheduling, demand forecasting, production
planning, and logistics systems design. The last of these classifications, which is an organised attempt to consider the previously mentioned classifications as a comprehensive whole, is most relevant to the main objective of this research work. The following is a brief discussion of some examples from the literature for the most popular quantitative techniques that have been used to analyse problems associated with logistical activities, including: optimisation models, queuing models, simulation models, and heuristic models.

- **Optimisation models:** The Concise Oxford Dictionary of Mathematics defines optimisation as:

  "The process of finding the best possible solution to a problem. In mathematics this often consists of maximizing or minimizing the value of a certain function, perhaps subject to given constraints."

The optimisation models in use today incorporate such techniques as mathematical programming (linear, integer, dynamic, mixed-integer linear, etc.), enumeration, sequencing, and the use of calculus (Ballou, 1992). In logistics, optimisation techniques have been applied to problems associated with facility location, inventory control, routing, scheduling, and supplier selection. Some examples from literature are: Ahn *et al.* (1994) formulated a mathematical model to minimize the sum of inventory holding costs at the depot and the inventory and transportation costs in the parts manufacturer on JIT production systems, Speranza and Ukovich (1994) developed some optimisation models for the minimization of transportation and inventory costs on single links of logistics networks, Bertazzi and Speranza (1999) proposed a mixed integer linear programming model to deal with the problem of minimizing the sum of the inventory and transportation costs in the multi-product logistics network with one origin, Leung *et al.* (2002) proposed an optimisation model which can effectively find an optimal transportation strategy in terms of optimal delivery routes and optimal vehicle fleet composition, Hwang (2002) developed a two-step approach of logistics system design which optimises the performance of logistics system subject to required service levels both in the number of warehouses/distribution centres and vehicle routing schedule, and
Fleischmann and Kuik (2003) considered a stochastic inventory model encompassing random item returns.

- **Queuing Models:** Queuing theory is the branch of operations research concerned with waiting line (delay/congestion). In logistics, queuing models have been developed to aid management decisions concerning arrival schedules, speed of service facilities, the number of facilities and their location (Haley and Krishnan, 1995). Some examples from literature are: Kim and Tang (1997) developed a queuing model of a pull-based production control system for a single-stage facility, Elwany and Baddan (1998) modelled the job-shop as a single server queue and provided a procedure for calculating the sensitivity of the production lead time to the average job processing time for a single machine problem under general priority rule using simulation, and Souza et al. (2001) modelled a production process for studying the focused factory using multi-class $GI/G/c$ queuing models.

- **Simulation models:** A simulation model creates an approximate (mathematical) model of some system and runs it for a simulated length of time in an attempt to predict aspects of the dynamic behaviour of that system. In other words, simulation models are “what if” tools (Ganeshan and Harrison, 1995) that predict how systems might behave in the future under assumed conditions. There are many different simulation techniques, including: stochastic modelling, system dynamics, discrete simulation, and role-playing games (Sterman, 1991). In logistics, simulation techniques have been applied to problems associated with demand and sales planning, inventory planning, distribution and transportation planning, and production planning and scheduling (Terzi and Cavaleri, 2004), as well as in logistics systems design (Mentzer and Schuster, 1982). Some examples from literature are: Alstrom and Madsen (1992) developed a simulation model to simulate a number of different inventory control systems under different assumptions, Ruiz-Torres and Tyworth (1997) studied basic scheduling rules and existing routing/transportation alternatives using a simulation model, Perea et al. (2000) proposed a framework to model the flow of information and material within the supply chain and uses them to capture its dynamic behaviour, Persson and Olhager (2002) evaluated alternative supply chain designs by developing a simulation model using discrete event simulation techniques, Chen et al. (2002) described an
application of discrete-event simulation to study logistics activities in a chemical plant, Lai et al. (2003) built an integrated framework model of JIT and Kanban using a system dynamics tool.

- **Heuristic models**: A heuristic model usually do not have a precise mathematical form but can be a rule of thumb or an educated guess that reduces or limits the search for solutions in domains that are difficult and poorly understood (Ballou, 1989). In logistics, problems associated with distribution and logistics network design have been approached by a variety of heuristic methods. The grid technique is a well-known heuristic approach used to determine a least-cost facility location for companies with multiple markets and multiple supply points (Coyle et al., 1996). Some examples from literature are: Kim (1995) developed a heuristic inventory model for determining the ordering schedule in which the demand rate is changing linearly with time and the decay is assumed to be a constant rate of the on-hand inventory, Randhawa and Rai (1995) developed a linear programming optimisation model to determine production goals in glass fibre manufacturing industry and then used the output of that model in a heuristic model to incorporated system-specific constraints in developing processing sequences, Chiu (1995) constructed a heuristic \((R,T)\) model to deal with the problem of determining a best order-up-to-level and review interval policy for a fixed-life perishable product under the assumption that the lead time is positive, Korupolu et al. (2000) performed an analysis of a local search heuristic for several NP-hard facility locations problems, and Levin and Ben-Israel (2004) presented a heuristic method for solving large-scale multi-facility location problems.

Model-based analysis of logistics systems ranges from specific problem types to overall system design. According to Slats et al. (1995), most of the logistics models in use are based on optimisation and simulation. Each of the following authors addresses a particular approach to logistics modelling and discusses its advantages, disadvantages, and appropriate applications: Powers (1989) addresses the optimisation modelling technique, Ballou (1989) addresses the heuristic modelling technique, and Bowersox and Closs (1989) addresses the simulation modelling technique. Each article is a strong advocate for that particular approach and compares the three approaches from that perspective. Also, Sterman (1991) in his article "A skeptic's guide to computer models"
provides a comprehensive study of the distinction between optimisation and simulation models in terms of the characteristics and capabilities of the two types of models, their fundamental assumptions, their advantages and disadvantages, and uses and misuses. The following limitations of optimisation models and simulation models are summarised from Sterman’s comparison.

The problems and limitations that many of the optimisation models have can be summarised as follows:

1. One of the difficulties with optimisation models is the problem of specifying the objective function; the goal that the model user is trying to reach.

2. Linearity is one of the problems that can seriously undermine the verisimilitude of optimisation models. One of the simplifications that modellers commonly introduce into their optimisation models is that the relationships in the system are linear. However, there are techniques available for solving certain non-linear optimisation problems.

3. Another problem in optimisation models is lack of feedback. Some models do not reflect the fact that complex systems in the real world are highly interconnected, and having a high degree of feedback among sectors. In theory, feedback can be incorporated into optimisation models, but the resulting complexity and non-linearity usually render the problem insoluble.

4. Another problem is lack of dynamics. Many optimisation models are static. They determine the optimal solution for a particular moment in time without regard for how the optimal state is reached or how the system will evolve in the future. Moreover, delays are a crucial component of the dynamic behaviour of systems. But – like non-linearity – they are difficult to incorporate into optimisation models.

The weak points of simulation models can be summarised as follows:

1. The description of the decision rules is one potential trouble spot in a simulation model. The model must accurately represent how the actors in the system make
their decisions, even if these decision rules are less than optimal. Discovering rules is often difficult and cannot be determined from aggregate statistical data, but must be investigated first hand.

2. The majority of data are soft variables that are descriptive, qualitative, difficult to quantify, and has never been recorded. Such information is crucial for understanding and modelling complex systems.

3. The definition of a reasonable model boundary, choosing which factors to be exogenous and which to be endogenous, and choosing which feedbacks to be incorporated into the model are another challenges for the builders of simulation models.

Each model type -optimisation and simulation- has its positive aspects as well as limitations, which can make them appropriate to analyse a specific problem and not another. What is important in modelling is that the model should be built and designed for specific purpose, and that purpose should be to solve a particular problem. A clear purpose allows system-analysts to choose the appropriate type of model that is useful for solving the problem under construction. Therefore, based on the analysis of the literature review of the modelling techniques that have been used to analyse problems associated with logistical activities, this author found that simulation modelling is the most appropriate approach for the purpose of understanding the dynamic behaviour of logistics systems to aid in the whole logistics system design.

To achieve the overall aim of this research work, it is proposed to develop simulation models of hospitals logistics systems using System Dynamics methodology. This is because system dynamics deals with the broad behaviour of the system and how it influences its own evolution into the future which facilitates decision making. System dynamics can accept the complexity, nonlinearity, and feedback loop structures that are inherent in systems, and can then interpret the real world into a description that can be used in subsequent stages as follows: description leads to equations of a model, simulation to understand dynamic behaviour, evaluation of alternative policies, education and choice of a better policy, and implementation (Forrester, 1994). The next section provides information about system dynamics, its definition, and its modelling process.
2.6 System Dynamics Methodology

System dynamics is a methodology for studying and managing complex feedback systems. The methodology of system dynamics was developed in the late 1950s and early 1960s by Jay Forrester at the Massachusetts Institute of Technology’s Sloan School of Management. It was originally rooted in the management and engineering sciences, but the span of its application has now grown extensively to encompass other fields. The System Dynamics Society (2004) – an international, non profit organisation devoted to encouraging the development and use of systems thinking and system dynamics around the world – gives a list of fields in which system dynamics has been applied, including:

- Corporate planning and policy design.
- Public management and policy.
- Biological and medical modelling.
- Energy and the environment.
- Theory development in the natural and social sciences.
- Dynamic decision making.
- Complex non-linear dynamics.

System dynamics has been used in modelling health care issues. For example Coyle (1984) has considered the problem of short-stay psychiatric patients using system dynamics. Gonzalez-Busto and Garcia (1999) and Van Ackere and Smith (1999) have modelled patients waiting lists. Dangerfield and Roberts (1999) have used system dynamics to model the epidemiology of AIDS. Wolstenholme et al. (2004) have developed a model of total patient flow through the UK National Health Service and used it to test alternative major new structural initiatives for relieving pressure on health services. To the best of our knowledge, modelling health care logistics using system dynamics has not previously been done.

Forrester (1961, p13), in his seminal book “Industries Dynamics”, defines system dynamics as:
...the investigation of the information-feedback characteristics of systems and the use of models for the design of improved organisational form and guiding policy.

While, Wolstenholme (1990, p3) defines system dynamics as:

A rigorous method for qualitative description, exploration and analysis of complex systems in terms of their processes, information, organisational boundaries and strategies; which facilitates quantitative simulation modelling and analysis for the design of system structure and behaviour.

Whereas, Coyle (1996) tries to offer a more complete definition of system dynamics, as he argues that Forrester does not say what type of models are involved and neither Forrester’s nor Wolstenholme’s definitions refer to time. Coyle (1996) defines system dynamics as:

System dynamics deals with the time-dependent behaviour of managed systems with the aim of describing the system and understanding, through qualitative and quantitative models, how information feedback governs its behaviour, and designing robust information feedback structures and control policies through simulation and optimisation.

This research work depended on two main sources in learning the basic concepts behind the study of complex systems using system dynamics. The two sources are:

1. "Road Maps, A Guide to Learning System Dynamics": It is a self-study guide to learning system dynamics. It is organised as a series of chapters, and is being developed by the System Dynamics in Education Project at MIT under the direction of Professor Jay Forrester.

2. "Introduction to System Dynamics": It is an online book prepared for the Department of Energy by Michael J. Radzicki, PhD. Of Sustainable Solutions, Inc. While the examples are directed to energy policy, anyone interested in learning system dynamics will find it valuable.
Both sources above can be found on the System Dynamics Society website << http://www.systemdynamics.org/ >>. However, this research work used other sources and references to reinforce the knowledge of these concepts. Appendix A provides a brief discussion of the main concepts of system dynamics. Learning these concepts are fundamental requirements for the system dynamics modeller before going into the modelling process. Meadows (1989, p68) summarises these concepts of system dynamics in one statement as follows:

(System Dynamics) assume that things are interconnected in complex patterns, that the world is made up of rates, levels and feedback loops, that information flows are intrinsically different from physical flows, that non-linearities and delays are important elements in systems, (and) that behaviour arises out of system structure.

Forrester (1961) gives a clear, step-by-step definition of the process to be followed in modelling dynamic systems using the system dynamics methodology. However, over the years different approaches and frameworks for the process of system dynamics modelling have been proposed in the literature such as those proposed by Richardson and Pugh (1981), Wolstenholme (1990), Forrester (1994), Coyle (1996), Albin (1997), Lane and Oliva (1998), and Sterman (2000). Yet, all of these proposed approaches rely on the basic concepts of system dynamics that were explained above. In most of these approaches, the system dynamics modelling process involves the identification, mapping-out, and simulation of a system’s stocks, flows, feedback loops, and non-linearities.

A review of the system dynamics literature showed that there has been an attempt to establish a structured approach that can be used to analyse the dynamic behaviour of supply chains and guide a supply chain redesign. An integrated system dynamics framework for supply chain design as described by Hafeez et al. (1996) (shown in Figure 2.4) has been established in which system dynamics modelling, analysis and simulation aids in the decision making process for logistical control systems. The framework has been successfully used for modelling and analysing a number of supply chains, for example in the steel industry by Hafeez et al. (1996), in the electronic industry by Berry and Naim (1996), and in the medical supplies industry by Evans et al.
(1998). This author has already conducted some elementary study to determine the applicability of the framework in the health care industry as her master’s dissertation (Al-Qatawneh, 1998).

In this research work, the modelling and simulation of the dynamic behaviour of health care logistics is proposed to be conducted by adopting the integrated system dynamics framework for supply chain design (shown in Figure 2.4). Accordingly, the following two research questions were proposed:

- Is the integrated system dynamics framework for supply chain design applicable in the health care industry?

- Does the integrated system dynamics framework provide a structured mechanism for analysing and modelling health care logistics systems and their dynamic behaviour?

2.7 The Role of System Dynamics in Improving Logistics Chain Dynamics

The fundamentals of the research on supply chain behaviour and characteristics were laid by Forrester (1961) in his seminal work on industrial dynamics. Forrester (1961) first demonstrated the potentially devastating phenomenon of demand amplification along the supply chain. He showed, via simulation, that when final customer demand changes upstream the logistics chain, orders amplify as they are transferred from one echelon to another, resulting in large demand fluctuations at the beginning of the logistics chain. Forrester (1961) explains that demand amplification is caused by system structure, and the delays in decision making concerning information and material flows. His explanation is known as the Forrester effect.

Forrester’s work was then complemented by John Burbidge (1983) who coined the “Law of Industrial Dynamics” which states (Towill and Del Vecchio, 1994, p83):
If demand for products is transmitted along a series of inventories using stock control ordering, then the demand variation will increase with each transfer.

Source: Hafeez et al. (1996)

Figure 2.4: An integrated system dynamics framework for supply chain design
Burbidge (1983) explains that demand amplification is caused by the poor practice of placing orders up the logistics chain in batches. His explanation is known as the Burbidge effect or order batching. Later on, other researchers such as Houlihan (1987), Towill (1991), Lee et al. (1997), and Mason-Jones et al. (1997) have further developed the theory of industrial dynamics.

Demand amplification is considered a main problem of logistics chain dynamics that may lead to inefficient capacity utilisation, poor product availability, and high stock levels (Forrester, 1961; Houlihan, 1987; Towill et al., 1992). A review of the available literature shows that no research has been done to study if demand amplification phenomenon is present in the health care industry. Based on the identified gap in the literature, the following research question was formulated:

- Does the analysis and evaluation of the effects of the different logistics decisions on the dynamic behaviour of health care logistics reveal any problematic behaviour?

In the literature there are several studies on how best to improve logistics chain dynamics. Forrester (1961) himself demonstrated how demand amplification could be reduced by removing the distributor echelon in the simulation. Burbidge (1983) also suggested some simple strategies for reducing demand amplification including frequent deliveries and ordering in smaller batch sizes from suppliers (i.e. ordering policies adjustments). Wikner et al. (1991) show that there are a number of business strategies for improving logistics chain dynamics, which includes: tuning policy parameters, reducing time delays, removing a distributor echelon, and integrating information flows along the supply chain. Although the above guidelines provide guidance for improving logistics chain dynamics in a given situation, they rarely quantify these improvements in terms of cost. Therefore, the following research question is proposed to help bridge this gap:

- How to quantify in terms of cost the relative improvements of redesign strategies in health care logistics?
In the literature, most of the redesign strategies suggested to improve logistics chain dynamics have direct impact on the logistics management objectives of providing good customer service level (i.e. reducing the incidence of stock-outs to minimum) while maintaining minimum stock holding requirements. However, in practice, the acceptable level of customer service in a given situation (measured for example by the number of stock-out incidents) may differ from item to item. This is especially true in health care logistics which maintain a large number of different products that are ranged between high-critical to low-critical items. It is acceptable for low-critical items to encounter stock-out situations to a certain degree. Whereas, it is not acceptable at all to encounter stock-out situations for high-critical items since the unavailability of these items could lead to life threatening situations. Again, the issue of criticality of items used by hospitals and the life threatening situations that could happen due to the unavailability of these items is very important to focus on in this research work because this is what makes health care logistics distinct and different from other industries logistics systems.

Inventory classification has been used for a long time (Coyle et al., 1996) as a simple yet very effective technique for stratifying individual items into logical groupings for management where "generic" control policies are set for each group. The analysis of the literature showed that most of the studies on improving logistics chain dynamics assumed that a standardised product unit exists, and that there is gap in considering inventory classification in the redesigning strategies. Therefore, it is proposed in this research work to incorporate inventory classification into the redesigning strategies of health care logistics. Accordingly, the following research question is proposed:

- What is the role of inventory classification when incorporated into the redesigning strategies of health care logistics?

Inventory classification is discussed in more detail in the next section.

### 2.8 Inventory classification

Inventory Classification is usually a first step toward efficient inventory management. The ABC inventory classification method, which groups items based on annual dollar
usage, is the most frequently used method for item aggregation (Cohen and Ernst, 1988). The ABC approach is based on the fact that a small fraction of items account for a high percentage of total dollar use, and that these items are classified as Class A and are given greater management attention (Pinkerton, 1987), whereas, the rest of the items are classified as Class B and Class C and are given moderate to low attention respectively.

The ABC inventory classification method has been specifically proposed by researchers (Reid, 1986; Fernandez, 1987; Reid, 1987) to help hospitals logistics managers to categorize inventory items so that effective managerial policies and procedures can be implemented. However, there is one problem in applying this method in hospitals. The main limitation is that some critical items that may demonstrate low usage value will not receive priority attention under this method. To overcome this limitation, it is proposed in this research work to use a multi-criteria approach for classification purposes that takes into account the criticality, cost, and usage value of the items. Accordingly, the following research question is formulated:

- What is the impact of using a multi-criteria inventory classification method that takes into account the criticality, cost, and usage value of items on logistics cost reduction?

2.9 Summary

The main aim of this chapter is to review the available literature to identify existing gaps in the body of knowledge developed during previous work and then to develop, based on these gaps, the research questions that specify exactly what is going to be investigated in this research work. This chapter first gave an overview of the relevant literature on logistics and supply chain management and then –more specifically- on health care logistics. The analysis of the literature review of health care logistics revealed some of the main characteristics and features of health care logistics and more importantly its distinctive feature. The criticality of items used by hospitals and the life threatening situations that could happen due to the unavailability of these items is what makes health care logistics distinct and different from other industries logistics systems.
Therefore, this feature will be one of the main concerns of this research work when modelling and analysing health care logistics systems.

This chapter then provided a comprehensive and critical review of the available literature on modelling health care logistics which has shown that there is a gap in understanding the dynamic nature of health care logistics systems as a comprehensive whole and in considering the effect of the interrelated decisions that are applied for managing logistics systems in health care. This gap has directed the focus of this research work towards analysing and modelling health care logistics to be able to understand its dynamic behaviour and effectively manage its logistical activities on the basis of the model. Moreover, this research work will focus in the assessment of the dynamic behaviour of health care logistics on two main variables: logistics cost and service level.

This was followed by a critical review of the different modelling techniques that have been used to analyse problems associated with logistical activities, including: optimisation models, queuing models, simulation models, and heuristic models. Based on this critical review, it was found that simulation modelling is the most appropriate approach for the purpose of understanding the dynamic behaviour of logistics systems to aid in the whole logistics system design. To achieve the overall aim of this research work, it is proposed to develop simulation models of hospitals logistics systems using System Dynamics methodology.

A brief discussion of system dynamics, its definition, and its modelling process was then provided, followed by a critical review of the literature on the role of system dynamics in improving logistics chain dynamics. Several gaps in the literature were identified upon which several research questions were proposed. First, it was proposed to study the presence of any problematic behaviour in health care logistics dynamics since a review of the available literature showed that no research has been done to study that in the health care industry. Second, it was proposed to quantify in terms of cost the relative improvements of redesign strategies in health care logistics since most of the guidelines that have been provided in the literature for improving logistics chain dynamics in a given situation rarely quantified these improvements in terms of cost. Third, it was proposed to incorporate inventory classification into the redesigning strategies of health care logistics since the analysis of the literature showed that most of
the studies on improving logistics chain dynamics assumed that a standardised product unit exists, and that there is gap in considering inventory classification in the redesigning strategies.

This chapter ended by a critical review of the ABC inventory classification method which is the most frequently used method for item aggregation. The critical review revealed a main limitation of using this method in healthcare which is that some critical items that may demonstrate low usage value will not receive priority attention under this method. Since the criticality of items used by hospitals (a distinctive feature of healthcare logistics) is the main concern of this research work, it is proposed to use a multi-criteria inventory classification method that takes into account the criticality, cost, and usage value of items and study the impact of its use on logistics cost reduction.

The next chapter explains how to develop conceptual and quantitative models of hospitals logistics systems using System Dynamics methodology.
Chapter Three: Modelling Health Care Logistics Using System Dynamics

3.1 Introduction

This chapter first explains the development of a general conceptual model of a hospital logistics system. Then, this chapter explains how to develop quantitative models of health care logistics by developing simulation models of two specific hospital logistics systems: one using a traditional \((R, s, S)\) inventory control approach and the other using continuous replenishment (CR). The computer simulation models are then subjected to dynamic analysis to represent the relative time behaviour in order to evaluate the impact of the inventory control decisions and service level decisions.

3.2 Conceptual Modelling of a Hospital Logistics System

Through the understanding of the literature review of health care logistics in section 2.3, as well as the understanding of the main concepts of system dynamics explained in Appendix A, a high level stock-flow diagram for a three-echelon health care supply chain is developed as shown in Figure 3.1. In system dynamics, stock-flow diagrams are used as mediums of conceptualization. The stock-flow diagram in Figure 3.1 is drawn using the \textit{ithink} Analyst Software (one of the industry standard system dynamics software). See Appendix B for more information about the \textit{ithink} Analyst Software – specially the purpose of the Map/Model level building blocks which are used in building all stock-flow diagrams in this thesis.

As shown in Figure 3.1, inventories are the “glue” for the individual logistics systems in the supply chain. The dynamic behaviour of inventories is altered by inflows and outflows of material. These inflow and outflow rates are controlled via the decision making at different logistics activities. The trade-off between various logistics decisions are determined by the overall business strategy for each echelon.
Hospitals logistics systems usually have responsibility for the following logistics activities: inventory control, transportation, warehousing, purchasing, and service level (Henning, 1986; Scheyer, 1995; Poulin, 2003). A general stock-flow diagram for a hospital logistics system, developed by this author, is shown in Figure 3.2, which shows the stocks, material flows, information flows and logistics decisions. This stock-flow representation is a reflection of the data gathering and the conceptual knowledge acquired through the literature review and the two conducted case studies that are explained in Chapter Four.

![Figure 3.2: Stock-flow diagram of a hospital logistics system](image-url)
The salient features of Figure 3.2 are explained as follows:

Consumption of all hospital wards and departments are represented as Consumption Rate, and all deliveries from distributors are represented as Distributor Delivery Rate. The Hospital Stock depletes due to Consumption Rate and experiences an increase due to Distributor Delivery Completion Rate. Delivering materials from distributor stock to Hospital Stock takes Transit Time. All materials from distributor to Hospital Stock experience a delay. This pipeline effect is represented by the stock On Transport from Distributor to Hospital (i.e. the materials that have been out of distributor stock but not yet received by Hospital Stock). Transit Time is driven by a combination of Transport Decisions and Warehousing Decisions.

The hospital Inventory Control Decisions determine how much material the hospital should order, which in turn determines how much material the distributor should deliver to Hospital Stock. The ordering process takes Order Processing Delay Time. There is an information delay between the moment when the need for materials is realised by the hospital and the moment when this information is received by the distributor in the form of an order. This is represented by the stock Order Backlog which is increased by Order Rate and decreased by Order Completion Rate. Order Processing Delay Time depends on Purchasing Decisions.

As shown, Inventory Control Decisions, Transportation Decisions, Warehousing Decisions, Purchasing Decisions, and Service Level Decisions are interdependent. The trade-off between these logistics decisions is determined by the Hospital Supply Chain Strategy.

The overall hospital logistics system cost equals the sum of purchasing cost plus transportation cost plus inventory control cost plus warehousing cost (Rivard-Royer et al., 2002). Hospital Supply Chain Strategy should allow for trade-offs between

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1 Throughout this thesis, the names of all variables within stock-flow diagrams—although written in these diagrams as non-italic—will be written within the text in italic format, so the reader can recognize them easily.
inventory control, transportation, warehousing and purchasing with a view to optimising
the overall hospital logistics system cost while maintaining the required service level.

In Figure 3.2, the complete logic of the Inventory Control Decisions, Transportation
Decisions, Warehousing Decisions, Purchasing Decisions, and Service Level Decisions
is not visible as it is embedded within the space-compressed decision-process diamond
(DPD) (see Appendix B for more information about DPD in the ithink Software).
Given the situation, a specific and detailed logic of the logistics decisions can be
constructed according to the operating practices. Such logic can be subsequently
converted into a quantitative model that can be used to study the dynamic behaviour of
the system. The following two sections discuss the common practices in health care for
Service Level Decisions and Inventory Control Decisions.

3.2.1 Hospital service level decisions

As explained in Chapter Two, this research work is concerned with the availability of
medical and non-medical products needed to offer health services for patients. For
hospitals, Service Level Decisions usually entails the following questions:

    a) What is the desired service level?
    b) How much safety stock is to be kept for each item to maintain the desired
       service level?

There are indications that the usual managerial practice, in terms of desired service level
is to treat all items the same. Beier (1995) summarizes the practices that are used in
hospitals to calculate safety stock as follows:

    • No policy for determining safety stock.
    • Carry safety stock for average usage.
    • Carry safety stock for maximum usage.
    • Safety stock is a function of vendor deals.
    • Safety stock is determined by personal judgment. (Beier (1995) shows in his
      study that this practice is the most common one used by hospitals).
3.2.2 Hospital inventory control decisions

In hospitals, the main Inventory Control Decision involves three fundamental questions (Reisman, 1981; Scheyer, 1995):

a) How often to review? (the inventory status)
b) When to order?
c) How much to order?

The answers for the above questions are determined by the inventory control approach used. There are two inventory control approaches that are usually used by hospitals:

1. Traditional \((R, S)\) and \((R, s, S)\) approaches (Reisman, 1981; Cox and Gibson, 1986; Scheyer, 1995).
2. Continuous replenishment (CR) (CSC, 1996) and (Haavik, 2000).

The decision as to which inventory control approach to use depends on the supply chain strategy (for example, continuous replenishment (CR) should be used with time-based logistics strategies such EHCR).

3.3 Quantitative Modelling of a Hospital Logistics System

Although qualitative modelling (as explained in section 3.2) is a valuable device in its own right for describing and understanding hospitals logistics systems and their interrelated logistics decisions, yet qualitative modelling lacks the ability to quantify the effect of the different logistics decisions in terms of time dependent changes in the related outputs. Therefore, qualitative modelling is followed by quantitative modelling which adds significant value by enabling comprehensive and more rigorous dynamic analysis. The qualitative model is usually converted into a quantitative model by developing relevant mathematical equations. To show how this is done, the rest of Chapter Three is devoted to developing and analysing quantitative models of two specific hospital logistics systems: one using a traditional \((R, s, S)\) inventory control approach and the other using continuous replenishment (CR). The reason for choosing
to study the effect of using these two specific inventory control approaches on hospital logistics dynamics is that these two approaches will be used later on in the redesigning strategies for the two case hospitals in Chapter Four.

### 3.4 Modelling a Hospital Logistics System that is Using a Traditional \((R, s, S)\) Inventory Control Approach

The \((R, s, S)\) inventory control approach is one of the most common traditional approaches that are used by hospitals (Reisman, 1981; Cox and Gibson, 1986; Scheyer, 1995). The subsequent sections describe the conceptual model development, simulation model development and dynamic analysis of a hospital logistics system that is using this approach.

#### 3.4.1 Conceptual model of a hospital logistics system that is using a traditional \((R, s, S)\) inventory control approach

The stock-flow diagram of a hospital logistics system that is using the \((R, s, S)\) inventory control approach developed by this author is illustrated in Figure 3.3. The abbreviations \(R, s,\) and \(S\) in this approach are defined as follows (Blumenfeld, 2001):

- \(R\) : review period (time interval between reviews)
- \(s\) : reorder level
- \(S\) : order-up-to level

Usually, hospitals use par level in lieu of order-up-to level and accordingly name this approach as periodic review par level system (Nicholson et al., 2004). One of the major issues in setting par levels for various items in hospitals is that these levels usually tend to reflect the desired inventory levels of the patient caregivers rather than the actual inventory levels needed in a department over a certain period (i.e. par levels are experience-based and politically driven, rather than data-driven) (Prashant, 1991).
Figure 3.3: Stock-flow diagram of a hospital logistics system that is using the \((Q_0, S, S)\) inventory control approach
However, in Figure 3.3 the values of R, s, and S are determined algorithmically. Table 3.1 gives a description of the (R, s, S) inventory control approach, describes how the Inventory Control Decision of (How Often to Review?, When to Order?, and How Much to Order?) is determined, and lists all variables that are used to determine this decision. Appendix C provides a full explanation of how the stock-flow diagram (shown in Figure 3.3) is developed.

The main concept of traditional inventory control approaches is to give optimum answers for the Inventory Control Decision (How Often to Review?, When to Order?, and How Much to Order?) based on a trade-off between inventory carrying cost and ordering cost (Coyle et al., 1996). However, in the case of the (R, s, S) inventory control approach, joint optimization of the three parameters R, s, and S leads to complicated mathematics (Silver and Peterson, 1985). Therefore, the equations in Table 3.1 that are given by Blumenfeld (2001) were developed using a simple heuristic approximation. These equations give approximate optimum values for the three parameters R, s, and S.

Table 3.1: An explanation of the (R, s, S) inventory control approach

<table>
<thead>
<tr>
<th>Inventory control approach</th>
<th>(R, s, S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of the approach</td>
<td>Inventory position (items on hand plus items on order) is reviewed at regular instants, spaced at time intervals R. At each review, if inventory position is at level s or below, an order of sufficient quantity is placed to bring the inventory to a given level S.</td>
</tr>
<tr>
<td>Inventory control decision:</td>
<td></td>
</tr>
<tr>
<td>• How Often to Review?</td>
<td>Inventory status is reviewed at regular instants, spaced at time intervals R, where $R = \frac{\sqrt{2A}}{\sqrt{DH}}$</td>
</tr>
<tr>
<td>• When to Order?</td>
<td>An order is placed: If (inventory position) ≤ s, where $s = D(L + R) + k \sqrt{(L + R)\sigma_D^2 + D^2\sigma_L^2}$</td>
</tr>
<tr>
<td>where, the value of $(k \sqrt{(L + R)\sigma_D^2 + D^2\sigma_L^2})$ is usually referred to as safety stock.</td>
<td></td>
</tr>
</tbody>
</table>
Table 3.1: An explanation of the \((R, s, S)\) inventory control approach (continued)

| • **How Much to Order?** | Order quantity = \((S - \text{inventory position})\), where \(S = s + \text{EOQ}\)  
\[
\text{EOQ} = \sqrt{\frac{2AD}{H}}
\]  
The economic order quantity (EOQ) is the optimal quantity to order — under the condition of certainty—needed to replenish inventory based on a trade-off between inventory carrying cost and ordering cost. |

| Variables used in the decision rule | • \(D\) = average demand (number of items per unit time)  
• \(\sigma_D\) = standard deviation of demand (item per unit time)  
• \(\sigma_D^2\) = variance of demand (items\(^2\) per unit time)  
• \(L\) = average lead time (units of time)  
• \(\sigma_L\) = standard deviation of lead time (unit time)  
• \(\sigma_L^2\) = variance of lead time (units of time\(^2\))  
• \(A\) = ordering cost ($ per order)  
• \(c\) = cost of an item ($ per item)  
• \(r\) = inventory carrying charge (fraction per unit time)  
• \(H = cr\) = holding cost of an item ($ per item per unit time)  
• \(k\) = service level factor |

Sources: (Silver and Peterson, 1985; Blumenfeld, 2001)

### 3.4.2 Simulation model and dynamic analysis of a hospital logistics system that is using a traditional \((R, s, S)\) inventory control approach

A simulation model of a hospital logistics system that is using the \((R, s, S)\) inventory control approach is developed by this author using the stock-flow diagram shown in Figure 3.3. Appendix C provides all the equations that make up the simulation model.
In developing the simulation model it was observed that the model formulation is robust by ensuring:

1. Inflows remain non-negative no matter how large the surplus of their stocks may be.
2. All stocks (conveyors and reservoirs) never fall below zero no matter how large their outflows maybe.
3. Outflows approach zero when their stocks are depleted.
4. "Real data" that is available to the decision makers is used in the model.

Figure 3.4 shows the dynamic behaviour of a hospital logistics system that is using the $(R, s, S)$ inventory control approach for an example item. The variables that are used in the simulation model for the example item are defined in Table 3.2. Figure 3.4 shows Hospital Stock, Order Up To Level, Reorder Level, Consumption Rate, Order Rate, and Distributor Delivery Completion Rate.

**Table 3.2: Definition of the variables used in the simulation model of the $(R, s, S)$ inventory control approach for the example item**

<table>
<thead>
<tr>
<th>Variables used in the simulation model</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Demand</td>
<td>100 item/day</td>
</tr>
<tr>
<td>Item Unit Cost</td>
<td>1 $</td>
</tr>
<tr>
<td>Order Processing Delay Time</td>
<td>1 day</td>
</tr>
<tr>
<td>Transit Time</td>
<td>3 days</td>
</tr>
<tr>
<td>Standard Deviation of Lead Time</td>
<td>$(1/30) * Average Lead Time</td>
</tr>
<tr>
<td>Ordering Cost</td>
<td>15 $</td>
</tr>
<tr>
<td>Inventory Carrying Charge</td>
<td>0.3 /unit time</td>
</tr>
<tr>
<td>Standard Deviation of Demand</td>
<td>$(1/3) * Average Demand</td>
</tr>
<tr>
<td>Consumption Rate</td>
<td>Normal(^2) (100,0.3)</td>
</tr>
<tr>
<td>Service Level Factor</td>
<td>3</td>
</tr>
<tr>
<td>Length of simulation</td>
<td>50 days</td>
</tr>
<tr>
<td>Dt</td>
<td>0.0625 day</td>
</tr>
</tbody>
</table>

\(^2\) The NORMAL function generates a series of normally distributed random numbers with a specified mean and standard deviation (The ithink and STELLA Technical Documentation, 2002).
Figure 3.4: Dynamic behaviour of a hospital logistics system that is using the $(r^*, s, S)$ inventory control approach for the example item defined in Table 3.2
As shown in Figure 3.4, *Hospital Stock* depletes gradually till it reaches *Reorder Level*. At the first *Review Time* that follows this condition, an order is generated. Therefore, in the simulation model, *Order Rate* is a pulse function\(^4\) of height equals \((Q/dt)\), where \(Q\) is the ordered quantity which is calculated according to the equation in Table 3.1.

After a time (equal to *Average Lead Time*), *Distributor Delivery Completion Rate* exhibits a pulse function of height equals \((Q/dt)\) which causes *Hospital Stock* to increase its level by \(Q\). However, because *Consumption Rate* is a continuous function, that means that when the ordered quantity entered the *Hospital Stock*, also a quantity (equal to \(*Consumption Rate*\)\(\times dt\)) was taken out of the Hospital Stock. Therefore, *Hospital Stock* does not reach *Order Up To Level*.

The dynamic behaviour generated by the simulation model is representative of the typical sawtooth pattern (Silver and Peterson, 1985; Blumenfeld, 2001) that is expected to be generated from the traditional \((R, s, S)\) inventory control approach.

The validated simulation model is subsequently used to study the dynamic behaviour of a hospital logistics system that is using the \((R, s, S)\) inventory control approach for various other items. Figure 3.5, Figure 3.6, and Figure 3.7 illustrate the dynamic behaviour of a hospital logistics system that is using the \((R, s, S)\) inventory control approach for three different scenarios as summarised in Table 3.3, respectively. Each Figure shows *Hospital Stock*, *Order Up To Level*, *Reorder Level*, *Consumption Rate*, *Order Rate*, and *Distributor Delivery Completion Rate*.

---

\(^4\) The pulse function has an area of unity; thus an arbitrary pulse input of \(Q\) units at time \(T\) is approximated in simulation models by a rectangular pulse with duration equal to simulation time step \(DT\) and a height of \(Q/DT\) (Sterman, 2000).
Table 3.3: Definition of the variables used in the simulation model of the \((R, s, S)\) inventory control approach for the three test scenarios

<table>
<thead>
<tr>
<th>Variables used in the simulation model</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Demand (item/day)</td>
<td>1</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>Item Unit Cost ($ )</td>
<td>1</td>
<td>30</td>
<td>2</td>
</tr>
<tr>
<td>Order Processing Delay Time (day)</td>
<td>1</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>Transit Time (day)</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Standard Deviation of Lead Time (day)</td>
<td>(1/30) * Average Lead Time</td>
<td>(1/30) * Average Lead Time</td>
<td>(1/3) * Average Lead Time</td>
</tr>
<tr>
<td>Ordering Cost ($ )</td>
<td>15</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>Inventory Carrying Charge (fraction/unit time)</td>
<td>0.3</td>
<td>0.25</td>
<td>0.35</td>
</tr>
<tr>
<td>Standard Deviation of Demand (item/unit time)</td>
<td>(1/30) * Average Demand</td>
<td>(1/3) * Average Demand</td>
<td>(1/3) * Average Demand</td>
</tr>
<tr>
<td>Consumption Rate (item/day)</td>
<td>1</td>
<td>100 + STEP(^5)(20,25)</td>
<td>Normal(50,16.7)</td>
</tr>
<tr>
<td>Service Level Factor</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Length of simulation (day)</td>
<td>365</td>
<td>50</td>
<td>365</td>
</tr>
<tr>
<td>Dt (day)</td>
<td>0.0625</td>
<td>0.0625</td>
<td>0.0625</td>
</tr>
</tbody>
</table>

\(^5\) The STEP function (i.e. STEP(<height>,<time>)) generates a one-time step change of specified height, which occurs at a specified time (The ithink and STELLA Technical Documentation, 2002). Height and time can be either variable or constant.
<table>
<thead>
<tr>
<th>Column 1: Hospital Stock</th>
<th>Column 2: Order Up To Level</th>
<th>Column 3: Reorder Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1: Consumption Rate  
2: Order Rate  
3: Distributor Delivery Completion Rate

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>48</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3.5: Dynamic behaviour of a hospital logistics system that is using the \( (l^*, s, \$) \) inventory control approach for the item of scenario 1 defined in Table 3.3

<table>
<thead>
<tr>
<th>92.00</th>
<th>183.00</th>
<th>274.00</th>
<th>365.00</th>
</tr>
</thead>
</table>

Page 1
<table>
<thead>
<tr>
<th>1: Hospital Stock</th>
<th>2: Order Up To Level</th>
<th>3: Reorder Level</th>
</tr>
</thead>
</table>

Figure 3.6: Dynamic behaviour of a hospital logistics system that is using the $(r, s, S)$ inventory control approach for the item of scenario 2 defined in Table 3.3
<table>
<thead>
<tr>
<th>Hospital Stock</th>
<th>2 Order Up To Level</th>
<th>3: Reorder Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>750</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.00 92.00 183.00 274.00 365.00 Days

1: Consumption Rate 2 Order Rate 3 Distributor Delivery Completion Rate

Figure 3.7: Dynamic behaviour of a hospital logistics system that is using the $(r, s, S)$ inventory control approach for the item of scenario 3 defined in Table 3.3
By analysing the dynamic behaviour of the hospital logistics system shown in Figure 3.4 to Figure 3.7, this author concludes that when using the \((R, s, S)\) inventory control approach the *Inventory Control Decisions* are non-linear, generating a sequence of order impulses rather than continuous-time order flows. This non-linearity -as this author explains- is caused by the conditional statement IF...THEN...ELSE present in the *Inventory Control Decisions*.

Moreover, the analysis shows that *Order Rate* is controlled by what has been consumed (pull) plus safety stock (push), which confirms that the \((R, s, S)\) inventory control approach is a hybrid approach that includes elements of pull- and push-based strategies (Coyle *et al.*, 1996).

The time-based behaviour as illustrated in Figure 3.4 to Figure 3.7 also reveals how the continuous demand for products (i.e. *Consumption Rate*) is transmitted to the distributor (i.e. next echelon in the supply chain) as order pulses known as order batching (Disney and Towill, 2003). It was Burbidge (1983) who first studied how order batching causes the problem of demand amplification (i.e. *Order Rate* has a larger fluctuation than *Consumption Rate*) later known as the Burbidge Effect (explained in section 2.7).

Burbidge (1983) suggested some simple strategies for reducing these fluctuations including frequent deliveries and ordering in smaller batch sizes from suppliers. These suggestions -as this author proves- are more vividly reproduced using continuous replenishment (CR) which is discussed in section 3.5.

Although modelling non-linear systems using control theory usually leads to complicated mathematical models (Edghill and Towill, 1989), Grubbstrom and Wikner (1996) were able to model non-linear inventory control decisions by developing differential equations involving Heaviside and Dirac impulse functions. They have shown that these equations correspond to order policies generating the typical sawtooth patterns of traditional inventory control approaches. However the system that they have modelled was limited to one product system only. Also, in their model, they have assumed that the supply lead time is zero.
In this research, the computer simulation model of a hospital logistics system that is using the \((R, s, S)\) inventory control approach developed by this author overcomes the above shortcomings by having the following added advantages:

- The model is relatively easy to use and understand by end users who are unfamiliar with mathematical difference and differential equations.
- It is relatively easy to change values of variables in this model.
- The model can be easily modified later to include any linear and non-linear decisions without worrying about how sophisticated the equations will be.

### 3.5 Modelling a Hospital Logistics System that is Using Continuous Replenishment (CR) Approach

Continuous replenishment (CR) is a vital tool in the implementation of Efficient Healthcare Consumer Response (EHCR) strategy (CSC, 1996). It has been defined as (Vergin and Barr, 1999, p146):

> the practice of partnering between distributor channel members that changes the traditional replenishment process from distributor-generated purchase orders, based on economic order quantities, to the replenishment of products based on actual and forecasted product demand.

The main concept of CR—as its name implies—is that order rate is adjusted continuously based on actual or forecasted demand. However, in practice, the decision rule of CR took different forms—although based on the same main concept—depending on the industry. In literature, several studies—most of which are quite recent—have looked into some of these decision rules of CR in an attempt to develop analytical models of them, for example by Cachon (1997), Cetinkaya and Lee (2000), Axsäter (2001), Fry et al. (2001), Raghunathan and Yeh (2001), Dejonckheere et al. (2003).

This research work proposes to study one specific decision rule of CR, which is based on the well-studied inventory and order based production control system (IOBPCS).
The term IOBPCS was coined by Coyle (1977) to represent much of the industrial practice associated with manual production control systems. Although the IOBPCS model was developed initially in terms of smoothing factory orders, it can be readily modified to represent other links in the supply chain (Towill and Del Vecchio, 1994). In the IOBPCS model, the ordering rule is based upon forecast demand and the difference between a fixed target level of inventory and the actual level (Towill, 1982).

The CR model that is based on IOBPCS is called throughout this research as CR(IOBPCS). The following sections describe the conceptual model development, simulation model development and dynamic analysis of a hospital logistics system which uses CR(IOBPCS) inventory control approach.

### 3.5.1 Conceptual model of a hospital logistics system that is using CR(IOBPCS) inventory control approach

The stock-flow diagram of a hospital logistics system that is using a CR(IOBPCS) inventory control approach, developed by this author, is illustrated in Figure 3.8. Table 3.4 gives a description of the CR(IOBPCS) inventory control approach, describes how the Inventory Control Decision of (How Often to Review?, When to Order?, and How Much to Order?) is determined, and lists all variables that are used to determine this decision. Appendix D provides a full explanation of how the stock-flow diagram (shown in Figure 3.8) is developed.

However, there is a difference between the CR(IOBPCS) model (in Figure 3.8) and the IOBPCS model developed by Towill (1982), which is how the delay in the system is represented. Towill (1982) represents the production delay as a first order delay. Yet, in the CR(IOBPCS) model in Figure 3.8, this author suggests that transportation/delivery delay is better represented as a pipeline delay. The reason is that pipeline delays preserve the order of entry to a delay so the output is exactly the same as the input, but shifted by the time delay, and also assume no mixing of the contents of the stock in transit at all (Sterman, 2000).
Figure 3.8: The stock-flow diagram of a hospital logistics system that is using CR(IOBPCS) inventory control approach
### Table 3.4: An explanation of the CR(IOBPCS) inventory control approach

<table>
<thead>
<tr>
<th>Inventory control approach</th>
<th>CR(IOBPCS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of the approach</td>
<td>Order rate is adjusted continuously at each period ( t ) and is equal to the sum of forecasted demand and a fraction ( 1/T_i ) of the stock discrepancy.</td>
</tr>
<tr>
<td>Inventory control decision:</td>
<td>At each period ( t )</td>
</tr>
<tr>
<td><strong>How Often to Review?</strong></td>
<td>At each period ( t )</td>
</tr>
<tr>
<td><strong>When to Order?</strong></td>
<td>Order quantity at time ( t = O_t ), where ( O_t = AVCON_i^{T_a} + \frac{1}{T_i} (TL - AL_i) )</td>
</tr>
<tr>
<td><strong>How Much to Order?</strong></td>
<td>( TL = kD )</td>
</tr>
<tr>
<td>Variables used in the decision rule</td>
<td>( (T_a / T_p) ) and ( (T_i / T_p) ) are design parameters which are chosen to give acceptable system performance.</td>
</tr>
<tr>
<td>AVCON^T_a : average consumption at time ( t ) which is the demand forecast using simple exponential smoothing with parameter ( T_a ) (items per unit time)</td>
<td></td>
</tr>
<tr>
<td>( T_a ) : demand averaging time constant.</td>
<td></td>
</tr>
<tr>
<td>TL : target level (items) (which is considered as safety stock)</td>
<td></td>
</tr>
<tr>
<td>( D ) : average demand (number of items per unit time)</td>
<td></td>
</tr>
<tr>
<td>( k ) = service level factor</td>
<td></td>
</tr>
<tr>
<td>AL_i : actual level at time ( t ) (items)</td>
<td></td>
</tr>
<tr>
<td>( T_i ) : inverse of inventory based production control law gain.</td>
<td></td>
</tr>
<tr>
<td>( T_p ) : average lead time (units of time)</td>
<td></td>
</tr>
</tbody>
</table>

Source: (Towill, 1982)
The main concept of the CR(IOBPCS) inventory control approach is to optimise the Inventory Control Decision (How Often to Review?, When to Order?, and How Much to Order?) by choosing the appropriate values for the design parameters \( (T_a / T_p) \) and \( (T_i / T_p) \) based on a trade-off between stock fluctuation and order rate variations (i.e. generating smooth ordering patterns while minimising inventory deviations from target level). The design parameters \( T_a, T_i \) and \( T_p \) are defined as follows:

- \( T_a \): time to average consumption
- \( T_i \): time to adjust inventory
- \( T_p \): actual pipeline lead-time

By using classical control theory techniques, Towill (1982) and (1984) has highlighted that \( (T_a / T_p) = 2 \) and \( (T_i / T_p) = 1 \) are good design parameters for the IOBPCS model (with first order production delay). However, this author has found that \( (T_a / T_p) = 1 \) and \( (T_i / T_p) = 3 \) are good design parameters for the CR(IOBPCS) model in Figure 3.8 (with pipeline delays). Appendix E explains the criterion employed to come up with the optimum values for \( (T_a / T_p) \) and \( (T_i / T_p) \).

In order to quantify system behaviour in the CR(IOBPCS) model in terms of money, stock fluctuation is interpreted as inventory carrying cost and shortage cost (Dejonckheere et al., 2003), while order rate variation is interpreted as transportation cost (Disney et al., 2003). Therefore, in the CR(IOBPCS) model, a trade-off is made between minimising inventory carrying cost and shortage cost on the one hand and transportation costs on the other.

### 3.5.2 Simulation model and dynamic analysis of a hospital logistics system that is using CR(IOBPCS) inventory control approach

A simulation model of a hospital logistics system that is using the CR(IOBPCS) inventory control approach is developed by this author using the stock-flow diagram shown in Figure 3.8 (where \( (T_a / T_p) = 1 \) and \( (T_i / T_p) = 3 \)). Appendix D provides all the equations that make up the simulation model. As with the \((R, s, S)\) inventory control approach (section 3.4.2), it was observed that the model formulation is robust by ensuring:
1. Inflows remain non-negative no matter how large the surplus of their stocks may be.
2. All stocks (conveyors and reservoirs) never fall below zero no matter how large their outflows may be.
3. Outflows approach zero when their stocks are depleted.
4. "Real data" that is available to the decision makers is used in the model.

The simulation model is subsequently subjected to detailed dynamic analysis for different items and scenarios (see Table 3.5). Figure 3.9, Figure 3.10, and Figure 3.11 show the dynamic behaviour of a hospital logistics system that is using the CR(IOBPCS) inventory control approach for the three scenarios as summarised in Table 3.5. Each Figure shows Hospital Stock, Target Level, Consumption Rate, Order Rate, and Distributor Delivery Completion Rate.

### Table 3.5: Definition of the variables used in the simulation model of the CR(IOBPCS) inventory control approach for the three test scenarios

<table>
<thead>
<tr>
<th>Variable</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumption Rate (item/day)</td>
<td>1</td>
<td>100+STEP(20,25)</td>
<td>NORMAL(50,1.67)</td>
</tr>
<tr>
<td>Average Demand (items)</td>
<td>1</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>Transit Time (days)</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Service Level Factor</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>((T_a/T_p))</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>((T_i/T_p))</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Length of simulation (days)</td>
<td>365</td>
<td>50</td>
<td>365</td>
</tr>
<tr>
<td>Dt (day)</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1: Hospital Stock</td>
<td>2: Target Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1.00</th>
<th>92.00</th>
<th>183.00</th>
<th>274.00</th>
<th>365.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 3.9: Dynamic behaviour of a hospital logistics system that is using the CR(IOBPCS) inventory control approach for the item of scenario 1 defined in Table 3.5
Figure 3.10: Dynamic behaviour of a hospital logistics system that is using the CR(IOBPCS) inventory control approach for the item of scenario 2 defined in Table 3.5
Figure 3.11: Dynamic behaviour of a hospital logistics system that is using the CR(IOBPCS) inventory control approach for the item of scenario 3 defined in Table 3.5
For scenario 1, when Consumption Rate is a constant value, Figure 3.9 shows that Hospital Stock stays on the Target Level as expected, since Order Rate is equal to Consumption Rate. This also confirms that the CR(IOBPCS) inventory control approach is a “pull” control concept (i.e. what is ordered is controlled by what is consumed and forecasted to be consumed (Coyle et al., 1996)).

In scenario 2, there is a one time abrupt change in the Consumption Rate (using 20% STEP function). Figure 3.10 shows that at first there is a drop in Hospital Stock to satisfy the initial increase in Consumption Rate, followed by a recovery which is facilitated by the increased Order Rate. As shown, Order Rate not only changes its value to match the new Consumption Rate, but at first it overshoots Consumption Rate to make up the deficit in Hospital Stock. How fast the recovery in Hospital Stock and how much Order Rate overshoots Consumption Rate is determined by the ratios of \((T_a / T_p)\) and \((T_1 / T_p)\). Appendix E explains in detail how the ratios \((T_a / T_p) =1\) and \((T_1 / T_p) = 3\) are chosen based on a trade off between Hospital Stock response and Order Rate response.

In scenario 3, Consumption Rate is represented, more realistically, as a Normal Distributed function, which can be thought of as a sequence of STEP increase and STEP decrease functions. As shown in Figure 3.11, Hospital Stock fluctuates around the Target Level. It also shows that when using the CR(IOBPCS) inventory control approach the Inventory Control Decisions are linear, generating a smooth continuous-time Order Rate based on Consumption Rate (feedforward) as well as Hospital Stock (feedback).

It is important to note that IOBPCS forms the basis of a generic family of dynamic manufacturing ordering and control models (Ferris and Towill, 1993). Since the manufacturing ordering and control decisions for this generic family are linear, they have been largely analysed by control theory techniques; using signal flow diagrams, block diagrams, \(s/z\) transforms, “hard system” control laws, frequency response plots and simulation, for example by Towill (1982), Ferris and Towill (1993), John et al. (1994), Towill and Del Vecchio (1994), Disney and Towill (2002), and Dejonckheere et al. (2003). Since most of the models in the IOBPCS generic family usually contain no more than three design parameters, control theory techniques were found useful to optimise the values of these parameters based on different performance characteristics.
However, since the CR(IOBPCS) model in this research contains only two design ratios (i.e. \( T_a / T_p \) and \( T_i / T_p \)), this author used an easy and straightforward way to find the optimum values of these parameters by quantifying some basic performance characteristics (as explained in Appendix E) directly from the generated dynamic behaviour of the system.

### 3.6 Comparison Between \((R, s, S)\) and CR(IOBPCS) Inventory Control Approaches

Table 3.6 illustrates the main observations made by this author between the \((R, s, S)\) and CR(IOBPCS) inventory control approaches based on the results of the dynamic analysis explained in section 3.4.2 and section 3.5.2.

**Table 3.6: Comparison between \((R, s, S)\) and CR(IOBPCS) inventory control approaches**

<table>
<thead>
<tr>
<th>Key measures</th>
<th>((R, s, S)) inventory control approach</th>
<th>CR(IOBPCS) inventory control approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order Rate generated by the Inventory Control Decision</td>
<td>Triggered</td>
<td>Continuous</td>
</tr>
<tr>
<td>Linearity of the Inventory Control Decision</td>
<td>Non-linear; generating a sequence of order impulses</td>
<td>Linear; generating continuous-time order flows.</td>
</tr>
<tr>
<td>Optimality of the Inventory Control Decision</td>
<td>Based on a trade-off between inventory carrying cost and ordering cost</td>
<td>Based on a trade-off between stock fluctuation (i.e. inventory carrying cost and shortage cost) and order rate variations (i.e. transportation cost).</td>
</tr>
<tr>
<td>Pull versus push</td>
<td>Includes elements of pull- and push-based strategies</td>
<td>Pull-based strategy</td>
</tr>
</tbody>
</table>

Moreover, based on the results explained in sections 3.4.2 and 3.5.2, this author concludes that the dynamic behaviour of hospitals logistics systems is smoother when using the CR(IOBPCS) inventory control approach than \((R, s, S)\) inventory control.
approach. Specifically, with regard to the problem of order batching and the problem of demand amplification encountered when using the \((R, s, S)\) inventory control approach, the CR(IOBPCS) inventory control approach has shown much improved performance.

### 3.7 Summary

This chapter first explained the development of a general conceptual model of a hospital logistics system, which shows the stocks, material and information flows, and logistics decisions. The dynamic behaviour of inventories in a hospital logistics system, as shown in the conceptual model, is altered by inflows and outflows of material. These inflow and outflow rates are controlled via the decision making at different logistics activities including: inventory control decisions, service level decisions, purchasing decisions, transportation decisions, and warehousing decisions.. The trade-off between various logistics decisions are determined by the overall business strategy for each echelon.

This chapter then explained how to develop quantitative models of health care logistics by developing simulation models of two specific hospital logistics systems: one using a traditional \((R, s, S)\) inventory control approach and the other using continuous replenishment (CR). The computer simulation models were then subjected to dynamic analysis to represent the relative time behaviour in order to evaluate the impact of the inventory control decisions and service level decisions.

Based on the results of the dynamic analysis, this author concludes that when using the \((R, s, S)\) inventory control approach the *Inventory Control Decisions* are non-linear; generating a sequence of order impulses which is known as order batching that can lead to demand amplification in the overall supply chain.

However, the results illustrate that when using the CR(IOBPCS) inventory control approach the *Inventory Control Decisions* are linear, generating continuous-time order flows. Therefore, this author concludes that the dynamic behaviour of a hospital logistics system improves when using the CR(IOBPCS) inventory control approach, specifically with regard to the problem of order batching.
The next chapter provides a step by step implementation of an integrated system dynamics framework proposed to be used for logistics system redesign of two case hospitals: Children’s National Medical Center (CNMC) in the United States of America (USA), and Derbyshire Royal Infirmary (DRI) in the United Kingdom (UK).
Chapter Four: Logistics System Redesign of Two Case Hospitals Using an Integrated System Dynamics Framework

4.1 Introduction

The main aim of this chapter is to answer the research questions through conducting two case studies. This chapter begins by discussing the research methods, the adopted approach in choosing the sites and sectors as well as in collecting the data and analysing them. This is followed by a detailed description of the adopted integrated system dynamics framework and how it was applied in the two case studies.

The rest of the chapter demonstrates the implementation of the various stages of the adopted integrated system dynamics framework for supply chain design using the two case hospitals: Children’s National Medical Center (CNMC) in the United States of America (USA), and Derbyshire Royal Infirmary (DRI) in the United Kingdom (UK). This chapter illustrates the qualitative and quantitative analysis of the two case hospitals logistics systems, their dynamic behaviour, and the effect of different logistics decisions – specifically inventory control decisions and service level decisions- on their dynamic behaviour. Several operating strategies are then proposed for redesigning the two case hospitals logistics systems. The computer simulation outputs are used to quantify the effect of the different logistics decisions on inventory cost for each operating strategy and thus provide quantitative evidence to support favourable decisions.

This chapter also answers, through conducting the two case studies, one of the main research questions concerning the role of inventory classification when incorporated into the redesigning strategies of health care logistics. This chapter studies the impact of using a multi-criteria inventory classification method that takes into account the criticality, cost, and usage value of items on logistics cost reduction.
4.2 Research Methods

This chapter will answer the research questions which were developed in Chapter Two through modelling, analysing and redesigning the logistics system of two case hospitals using the System Dynamics Methodology. More specifically, the modelling and redesigning of the logistics system of the two case hospitals are proposed to be conducted by adopting the integrated system dynamics framework for supply chain design (shown in Figure 2.4 in Chapter Two). The framework is in itself a holistic structured approach that is consisting of a number of distinct stages that utilises a range of “soft” and “hard” system analysis techniques originating from a variety of disciplines, such as structured interviews, input-output analysis, process flow charts, information flow analysis, influence and block diagrams, control theory and computer simulation. The following sections discuss the adopted approach in choosing the sites and sectors as well as in collecting the data and analysing them. This is followed by a detailed description of the adopted integrated system dynamics framework and how it was applied in the two case studies.

4.2.1 The research sites

The two case hospitals in this research are: Children’s National Medical Center (CNMC) in the United States of America (USA), and Derbyshire Royal Infirmary (DRI) in the United Kingdom (UK). The choice of the DRI to be one of the two case hospitals in this research work was made because an earlier elementary study to determine the applicability of the framework in the health care industry has been conducted on this specific hospital by this author as her master’s dissertation (Al-Qatawneh, 1998). Therefore, part of the data needed to conduct the DRI case study in this research work was already available. However, to confirm the applicability of the proposed framework in analysing and modelling health care logistics in practice, it was necessary to broaden the scope of this research work to study different operating practices in managing logistics activities. Therefore, it was necessary to conduct another case study and choose another hospital that operates its logistics system in a different way compared to the DRI.
Several comparative studies in the literature (Jost et al., 1995; Savage and Michael, 1995; Rodwin, 1999) that examined the developments in the health care systems of the UK and the USA concluded that both systems represent a study in contrasts. The National Health Service (NHS) in the UK has provided, since 1948, centrally funded and managed and publicly provided medical care, whereas the health care system in the USA is a privately financed and privately organized system with multiple payers. The high level of organization that traditionally existed in the NHS continues to persist even after the reforms, whereas the American health care system historically has been remarkably uncoordinated. Therefore, the decision was made to choose the second case hospital from the USA. Accordingly, this study was set in a comparative context to analyse a private sector health care provider from the USA (Children’s National Medical Center (CNMC)) and a public sector trust in the UK (Derbyshire Royal Infirmary (DRI)) with a view to tracing out the differences in the operating practices in terms of managing logistics activities.

### 4.2.2 Data collection and analysis

Two types of data are needed to be collected during conducting the two case studies at different stages of the adopted integrated system dynamics framework. The first type of data is needed to be collected at the qualitative phase of the framework (discussed in section 4.2.3.1) to acquire sufficient knowledge and understanding of the structure and operation of the two case hospitals logistics systems. The study addressed this research objective by gathering qualitative data from interviews with the Materials Management Director of the CNMC and the Supplies Manager of the DRI. There was no need to interview other people in the two case hospitals since both the Materials Management Director of the CNMC and the Supplies Manager of the DRI are considered the key individual responsible for managing the logistics system in their hospital. Therefore, they have the complete picture of the structure and operation of their logistics system. Moreover, in addition to interviewing the key member responsible for the logistics system, data collection included site visits and review of hospital documents (e.g. hospital brochures, hospital website documents, in-house reports, etc.). All the interviews were transcribed verbatim and memos were written to summarise information from selected hospital documents. The transcribed interviews and the summary memos constituted the data set used for analysis.
The second type of data is needed to be collected for several sample items to test and validate the computer simulation model developed at the quantitative phase of the framework (discussed in section 4.2.3.2). These sample items were selected to be representative of the overall demand pattern as experienced by the system. Accordingly, the variables that are used in the simulation process (e.g. average demand, transit time, unit cost, etc.) for the example items were collected from the respective hospital. The output data calculated from all simulation runs were summarised in spreadsheets using Microsoft Excel Software. The spreadsheet data were then used to construct graphs of average stock, number of orders, and inventory cost.

4.2.3 An integrated system dynamics framework for supply chain design

Figure 2.4 in Chapter Two illustrates the salient features of the integrated system dynamics framework for supply chain design. The framework consists of several steps, which go under two overlapping phases: qualitative phase, and quantitative phase. Although various stages involved are shown as sequential activities, the method is an iterative procedure, which is represented by the feedback loops in Figure 2.4.

Essentially, the framework decomposes the design problem into two parts: conceptual problem and technical problem, and thereby recommends using qualitative and quantitative phases to negotiate the respective problems.

4.2.3.1 The qualitative phase

The qualitative phase is related to acquiring sufficient intuitive and conceptual knowledge to understand the structure and operation of the supply chain (Hafeez et al., 1996), which in turn can help in recognising and defining the conceptual problem. The main steps involved in this phase are system input-output analysis (IOA), conceptual modelling, and block diagram formulation. IOA helps to identify major systems and the balancing of input and output flows between them (Mason-Jones et al., 1998). In the present research work, the author used content analysis, interviews, Pareto analysis, and information flow analysis to conduct case studies.
Conceptualisation is an important step in the methodology, since the mental model of the system developed during the system analysis stage is made explicit by creating special diagrams (Wolstenholme, 1990). In developing the conceptual model, the main variables that have a dominant impact on the functioning and performance of the system are sought, and relative cause and effect relationships and other interactions are mapped into information-feedback loops. The feedback loops in the model are commonly diagrammed using either sock-flow diagrams or causal-loop diagrams (Albin, 1997). These diagrams are alternatively known as pipe diagrams and influence diagrams respectively (Wolstenholme, 1990). In this research work, both causal-loop diagrams and stock-flow diagrams were used as mediums of conceptualization. Stock-flow diagrams were drawn using the ithink Analyst Software - one of the industry standard system dynamics software.

The first step toward the move into the quantitative phase is to transform the conceptual model into a block diagram. The block diagram will be used to construct the exact relationships between various interacting variables in the conceptual model by including mathematical notation that, for example, may represent delays (Naim and Towill, 1994). The conceptual model and the block diagram are then verified by the concerned people. In this research work, block diagrams were not used because the ithink Analyst Software allows the creation of stock-flow diagrams directly on the computer screen as icons and constructs appropriate mathematical relationships between key variables automatically (Wolstenholme, 1999; Richmond, 2001).

4.2.3.2 The quantitative phase

The conceptual understanding sets the scene to solve the associated technical problem. The quantitative phase concerns the development and analysis of mathematical and simulation models. There are three possible techniques for developing the quantitative model, which include: control theory, computer simulation, and statistical analysis. Naim and Towill (1994) explained the difference between these techniques. In this research work, computer simulation models were developed using the ithink Analyst Software. In this software, the equation structure underlying the model diagram is of vital importance. The equations created behind the scenes when stocks and flows are
hooked together are known as "Finite Difference Equations" (See Appendix B to learn about the *ithink* Analyst Software simulation algorithm).

Whichever technique is chosen, the quantitative model should be subsequently verified by the concerned people and then validated against field data to see whether it can accurately reproduce past statistical data as observed in the real system. However, Wolstenholme (1990) argues that in system dynamics models, validity is seen as a more complex concept that centres on users’ confidence in the model, its general behaviour characteristics and its ability to generate accepted responses to policy changes. Once the model has satisfied basic validity tests, it can be subjected to extensive dynamic analysis to represent the time behaviour of the system, and then suggest improving strategies by fine tuning its existing parameters, or redesigning its structure, or exploring different what-if scenarios. Subsequently, the developed model – as best described by Hafeez *et al.* (1996) - may be viewed as a “Management Information System” to investigate various business strategies.

The following sections demonstrate the implementation of the various stages of the adopted integrated system dynamics framework for supply chain design using the two case hospitals: Children’s National Medical Center (CNMC) in the United States of America (USA), and Derbyshire Royal Infirmary (DRI) in the United Kingdom (UK).

### 4.3 Case Study One: Children’s National Medical Center

Purchasing in the USA health sector is a relatively mature area. Usually, small or medium size hospitals increase their buying power by forming a group purchasing organization (GPO). A GPO charges its member hospitals a one-time, up-front fee (Brock, 2003). In return, a GPO provides three essential functions for its member hospitals (*Kaldor et al.*, 2003):

i) Aggregate buying power in order to obtain discounts from manufacturers and distributors

ii) Facilitate and enhance comprehensive product comparison analysis.

iii) Streamline and standardise the purchasing process.
Children’s National Medical Center (CNMC) is a member of Premier—one of the biggest GPOs and a leading healthcare alliance enterprise owned by more than 200 independent hospitals and health systems in the USA. This organisation operates or is affiliated with approximately 1,500 local hospitals and other healthcare sites (Norling, 2002). Figure 4.1 shows the CNMC supply chain which includes: product manufacturers, primary and secondary distributors, and the CNMC. As illustrated in Figure 4.1, the CNMC orders its supplies from:

- Primary and secondary distributors: the CNMC orders most of its supplies from one primary distributor and three secondary distributors (see Figure 4.2 for percentage shares of the overall CNMC supplies). In turn, these distributors order their supplies from product manufacturers.

- Product manufacturers: sometimes the CNMC orders its supplies directly from product manufacturers (about 6000 manufacturers) (see Figure 4.2 for percentage shares of the overall CNMC supplies).

### 4.3.1 Qualitative analysis of the CNMC logistics system

Several meetings were conducted with the Materials Management Director of the CNMC to gain sufficient knowledge and understanding of the structure and operation of their logistics system. The following subsections summarise the analysis and information processing that were performed and the information gathered in these meetings, mainly:

- Input-output analysis (IOA).
- Classification of items.
- Material, information, and cash flows for stock items.
- Material, information, and cash flows for non-stock items.
- Purchasing, warehousing, and transportation decisions.
- Inventory control and service level decisions.
Figure 4.1: The overall material and information flow in the CNMC supply chain
4.3.1.1 Input-output analysis (IOA)

IOA was conducted to identify the major CNMC departments that are involved with the logistics activities and then identify for each department all kinds of input and output flows associated with the logistics activities. As examples, the IOA for the central supply and main warehouse of the CNMC are illustrated, respectively, in Figure 4.3 and Figure 4.4. Subsequently, individual IOA diagrams were then linked together to develop an overall picture of the material, information, and cash flows through the system as described in section 4.3.1.3 and section 4.3.1.4.
4.3.1.2 Classification of items

The items ordered by the materials management department are classified into three types: stock items, non-stock items and special items.

- Stock items (fast moving items): these items are stocked at the main warehouse and represent 98% of all items.
- Non-stock items\(^1\) (slow moving items): these items are delivered directly to the different hospital wards and departments through the hospital receiving dock and they are not stocked at the main warehouse. These items represent about 2% of all items.
- Special items: these are one-time order items.

---

\(^1\) A travelling purchase requisition (TPR) card is issued for non-stock items. This card has all the requisitioning information (quantity, requisition date, supplier ...etc.). One of the purposes of this card is to count how many times it is requested by different wards and departments, and therefore to see if it has to be considered as a stock item or not.
The classification above is based upon the following criteria:

- If an item is used by the hospital 12 times/year, this is to be stocked at the main warehouse.
- If an item —after being considered as a stock item— is used less than 3 times/year in the following year, it will not be stocked at the main warehouse and will be considered as a non-stock item.

4.3.1.3 Material, information, and cash flows for stock items

Figure 4.5 illustrates the material, information, and cash flows for stock items. Different wards and departments consume supplies when conducting services to patients. This causes a decrease in the wards' and departments' stocks. The central supply checks the wards' and departments' stock levels every 24 hours. They simply count manually what is on shelves, and fill in a prewritten list of all items in stocks. Then they top up these stocks daily to a predetermined level from the central-supply-storage area. The central supply works as an internal distribution system.

The central supply uses special computer software to determine its stocks' levels. When these levels fall below a predetermined level, an order is filled and sent to the main warehouse, which is located one mile away from the hospital. The main warehouse then meets the central-supply demand and checks its stocks' levels on the software system. When the main warehouse levels fall below a predetermined limit, an order is filled and sent to the hospital purchase office. In response, the purchase office sends a purchase order to suppliers (primary distributor, secondary distributors, or product manufacturers), and an electronic copy of the purchase order to the accounts payable office (under the finance department).

Suppliers deliver supplies to the main warehouse receiving dock and send an invoice to the accounts payable office. When the receiving dock at the main warehouse receives supplies from suppliers, they fill a receiving note and send it electronically to the accounts payable office. Thereupon, supplies are delivered to the main warehouse.
Figure 4.5: Material, information, and cash flows for stock items (CNMC case study)
The accounts payable office compares and matches the receiving notes and invoices with the copy of the purchase orders and sends payments to suppliers. Payments are usually sent 30 days after receiving the invoice from suppliers.

4.3.1.4 Material, information, and cash flows for non-stock items

Figure 4.6 illustrates material, information, and cash flows for non-stock items. When wards or departments need a non-stock item, they send a requisition directly to the hospital purchase office. In turn, the purchase office sends a purchase order to suppliers and a copy of that order electronically to the accounts payable office. Suppliers then deliver the items to the hospital's receiving dock and send an invoice to the accounts payable office.

The hospital's receiving dock delivers the item directly to the ward or department that requested the item and sends electronically a receiving note to the accounts payable office. In turn, the accounts payable office matches the receiving note and invoice with the purchase order and sends payments to suppliers after 30 days of receiving the invoice from them.

4.3.1.5 Purchasing, warehousing, and transportation decisions

The purchasing activity is the interface between the CNMC and its suppliers. The interaction of the purchase office with other parts of the logistics system has already been illustrated (see Figure 4.5 and Figure 4.6). Information flow is the only flow that comes in and out of the purchase office from and to the other parts. As shown in Figure 4.5 and Figure 4.6, purchasing is grouped along with other materiel-oriented functions within a single materials management department. The purpose of this strategy is that by combining material procurement with control, many communications lines (i.e. information flows) are shortened.
Figure 4.6: Material, information, and cash flows for non-stock items (CNMC case study)
At the CNMC there are three different storage areas for stock items: wards and departments stocks, central supply, and main warehouse. Wards and departments stocks are used for stocking items that are used frequently when conducting services to patients. The central supply –located at the hospital site- works as an internal distribution system to replenish the deficiencies in the wards and departments stocks. The main warehouse –located one mile away from the hospital- is used to replenish the deficiencies in the central supply stocks.

The transport used at the hospital and at the main warehouse either belongs to the distributor/product manufacturer or to a third party. However, the transportation within the hospital boundary is owned by the hospital itself. Delivery of supplies between distributors/product manufacturers and the CNMC is conducted daily.

4.3.1.6 Inventory control and service level decisions

The following describe the inventory control and service level decisions for wards and departments stocks, central supply (CS), and main warehouse (MWH).

Wards and departments stocks:

Wards and departments at the CNMC use an \((R, S)\) inventory control approach; where:

- \(R\): review period (time interval between reviews)
- \(S\): order-up-to level

The values of \(R\) and \(S\) are usually selected based on experience and not algorithmically optimised. Table 4.1 summarises the inventory control and service level decisions for the CNMC wards and departments stocks.
Table 4.1: CNMC inventory control and service level decisions for wards and departments stocks

<table>
<thead>
<tr>
<th>Inventory control approach</th>
<th>$(R, S)$ (non-optimised)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description of the approach</strong></td>
<td>Stock level (items on hand) is reviewed at regular instants, spaced at time interval $R$. At each review an order is placed to bring the inventory to a given level $S$.</td>
</tr>
<tr>
<td><strong>Inventory control decision:</strong></td>
<td>Inventory status is reviewed at regular instants, spaced at time interval $R$, where $R = 24$ hours</td>
</tr>
<tr>
<td>- <strong>How Often to Review?</strong></td>
<td>At each review time (i.e. every 24 hours)</td>
</tr>
<tr>
<td>- <strong>When to Order?</strong></td>
<td>Order quantity $= (S - \text{stock level})$, where $S = (3D)$</td>
</tr>
<tr>
<td>- <strong>How Much to Order?</strong></td>
<td>$D = \text{average demand (number of items per unit time), based on 30 days worth of data}$</td>
</tr>
</tbody>
</table>

Central supply and main warehouse stocks:

The CNMC central supply and main warehouse use an $(R,s,S)$ inventory control approach; where:

- $R$: review period (time interval between reviews)
- $s$: reorder level
- $S$: order-up-to level

The values of $R$, $s$, and $S$ are also usually selected based on experience and not algorithmically optimised. Table 4.2 summarises the inventory control and service level decisions for the CNMC central supply and main warehouse stocks.
Table 4.2: CNMC inventory control and service level decisions for central supply and main warehouse stocks

<table>
<thead>
<tr>
<th>Inventory control approach</th>
<th>(R, s, S) (non-optimised)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of the approach</td>
<td>Inventory position (items on hand plus items on order) is reviewed at regular instants, spaced at time interval R. At each review, if the inventory position is at level s or below, an order of sufficient quantity is placed to bring the inventory to a given level S.</td>
</tr>
<tr>
<td>Inventory control decision:</td>
<td>Inventory status is reviewed at regular instants, spaced at time interval R, where</td>
</tr>
<tr>
<td>• How Often to Review?</td>
<td>R = 24 hours</td>
</tr>
<tr>
<td>• When to Order?</td>
<td>An order is placed: If (inventory position) ≤ s, where</td>
</tr>
<tr>
<td></td>
<td>s = D(L+R) + Safety stock</td>
</tr>
<tr>
<td></td>
<td>Safety stock = (14 D)</td>
</tr>
<tr>
<td>• How Much to Order?</td>
<td>Order quantity = (S – inventory position), where</td>
</tr>
<tr>
<td></td>
<td>S = s + EOQ</td>
</tr>
<tr>
<td></td>
<td>EOQ = [ \sqrt{\frac{2AD}{H}} ]</td>
</tr>
<tr>
<td></td>
<td>The economic order quantity (EOQ) is the optimal quantity - under the condition of certainty - needed to replenish inventory based on a trade-off between inventory carrying cost and ordering cost.</td>
</tr>
<tr>
<td>Variables used in the decision rule</td>
<td>• D = average demand (number of items per unit time)</td>
</tr>
<tr>
<td></td>
<td>• L = average lead time (units of time)</td>
</tr>
<tr>
<td></td>
<td>• A = ordering cost ($ per order)</td>
</tr>
<tr>
<td></td>
<td>• c = cost of an item ($ per item)</td>
</tr>
<tr>
<td></td>
<td>• r = inventory carrying charge (fraction per unit time)</td>
</tr>
<tr>
<td></td>
<td>• H = cr = holding cost of an item ($ per item per unit time)</td>
</tr>
</tbody>
</table>
4.3.2 Conceptual model\(^2\) of the CNMC logistics system

As mentioned earlier, in this case study, both causal-loop diagrams and stock-flow diagrams were used as a medium of conceptualisation. Figure 4.7 shows a causal-loop diagram of the CNMC logistics system for stock items. The causal-loop diagram, being simple to understand, was used as a tool to communicate with the Materials Management Director. A stock-flow diagram of the CNMC logistics system for stock items, shown in Figure 4.8, was developed using the *ithink* Analyst Software to develop the simulation model. Both the causal-loop diagram and the stock-flow diagram were verified by the Materials Management Director who confirms that both models are representative of the decision rules related to the different logistics activities as adopted by the materials management department.

The author would like to point out that in the causal-loop diagram (shown in Figure 4.7) there are four stocks: wards and departments stocks, Central Supply (CS) stock, Main Warehouse (MWH) stock, and suppliers stock. However, in the stock-flow diagram (shown in Figure 4.8) there are two stocks: *CS Stock* and *MWH Stock*; consumption of all wards and departments is represented as *Consumption Rate* and delivery from suppliers is represented as *Suppliers Delivery Rate*.

4.3.3 Computer simulation model of the CNMC logistics system

A computer simulation model of the CNMC logistics system (for stock items) was developed using the verified stock-flow diagram shown in Figure 4.8. The simulation model was developed using the *ithink* Analyst Software. *Appendix F* provides all the equations that make up the simulation model. The main variables in the computer simulation model are: *Consumption Rate*, *Average Demand*, *MWH To CS Average Transit Time*, *CS Average Order Processing Delay Time*, *Ordering Cost*, *Item Unit Cost*, *Inventory Carrying Charge*, *Suppliers To MWH Average Transit Time*, and *MWH Average Order Processing Delay Time*. The verified model was subjected to extensive dynamic analysis as explained in the subsequent subsections.

\(^2\) In this case study, conceptual modelling and computer simulation modelling were conducted for stock items only, as they represent 98% of all items.
Figure 4.7: Causal-loop diagram of the CNMC logistics system for stock items
Figure 4.8: The stock-flow diagram of the CNMC logistics system for stock items
4.3.4 Dynamic analysis

The computer simulation model of the CNMC logistics system was tested for four stock items, namely, scalp sterile disposable (low value and low demand), container specimen sterile (low value and high demand), oxygenator membrane (high value and low demand), and bottle aerobic fan (moderate value and high demand). These items were selected to be representative of the overall demand pattern as experienced by the system. The variables that are used in the simulation process for the example items are defined in Table 4.3. The demand data used is for one month and daily averages are found.

Figure 4.9 to Figure 4.12 show the dynamic behaviour of the CNMC logistics system for the four example items, respectively: scalp sterile disposable, container specimen sterile, oxygenator membrane, and bottle aerobic fan. Each figure shows CS Stock, CS Order Up To Level, CS Reorder Level, Consumption Rate, CS Order Rate, MWH Delivery Completion Rate, MWH Stock, MWH Order Up To Level, MWH Reorder Level, MWH Order Rate, and Suppliers Delivery Completion Rate.

As shown in Figure 4.9 to Figure 4.12, CS Stock depletes gradually till it reaches CS Reorder Level. At the first Review Time that follows this condition, an order is generated. Therefore, at this Review Time, CS Order Rate is a pulse of height (Q/dt), where Q is the ordered quantity given by equation in Table 4.2. After a time (equal to CS Average Lead Time), MWH Delivery Completion Rate is a pulse of height (Q/dt) which causes CS Stock to increase its level by a value of Q. As a result, the dynamic behaviour of CS Stock resembles a sawtooth pattern. Out of the four items analysed, the oxygenator membrane seems to be more difficult to manage due to its variation in demand and consequent irregular CS Stock pattern (Figure 4.11).

Since CS Inventory Control Decisions generates a sequence of order pulses rather than continuous-time order flows, MWH Stock decreases abruptly in an amount equal to Q at each pulse of CS Order Rate. For this reason, the dynamic behaviour of MWH Stock resembles a square wave rather than a typical sawtooth pattern.
Table 4.3: The variables that are used in the simulation process for the example stock items

<table>
<thead>
<tr>
<th>Month/Year</th>
<th>Scalpel sterile disposable</th>
<th>Container specimen sterile</th>
<th>Oxygenator membrane</th>
<th>Bottle aerobic fan</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total consumption (items)</td>
<td>Average daily consumption (item/day)</td>
<td>Total consumption (items)</td>
<td>Average daily consumption (item/day)</td>
</tr>
<tr>
<td>6/98</td>
<td>80</td>
<td>2.7</td>
<td>1031</td>
<td>34.4</td>
</tr>
<tr>
<td>7/98</td>
<td>166</td>
<td>5.5</td>
<td>1313</td>
<td>43.8</td>
</tr>
<tr>
<td>8/98</td>
<td>307</td>
<td>10.2</td>
<td>1063</td>
<td>35.4</td>
</tr>
<tr>
<td>9/98</td>
<td>95</td>
<td>3.2</td>
<td>1466</td>
<td>48.9</td>
</tr>
<tr>
<td>10/98</td>
<td>72</td>
<td>2.4</td>
<td>723</td>
<td>24.1</td>
</tr>
<tr>
<td>11/98</td>
<td>129</td>
<td>4.3</td>
<td>1640</td>
<td>54.7</td>
</tr>
<tr>
<td>12/98</td>
<td>79</td>
<td>2.6</td>
<td>1739</td>
<td>58</td>
</tr>
<tr>
<td>1/99</td>
<td>73</td>
<td>2.4</td>
<td>1407</td>
<td>46.9</td>
</tr>
<tr>
<td>2/99</td>
<td>52</td>
<td>1.7</td>
<td>1455</td>
<td>48.5</td>
</tr>
<tr>
<td>3/99</td>
<td>106</td>
<td>3.5</td>
<td>1504</td>
<td>50.1</td>
</tr>
<tr>
<td>4/99</td>
<td>280</td>
<td>9.3</td>
<td>1320</td>
<td>44</td>
</tr>
<tr>
<td>5/99</td>
<td>133</td>
<td>4.4</td>
<td>1216</td>
<td>40.5</td>
</tr>
</tbody>
</table>

| Average Demand (item/day) | 4.4 | 44.1 | 0.24 | 45.4 |
| MWH To CS Average Transit Time (hours) | 4 | 4 | 4 | 4 |
| CS Average Order Processing Delay Time (hours) | 2 | 2 | 2 | 2 |
| Suppliers To MWH Average Transit Time (hours) | 36 | 36 | 36 | 36 |
| MWH Average Order Processing Delay Time (hours) | 12 | 12 | 12 | 12 |
| Item Unit Cost ($) | 0.72 | 0.16 | 599 | 2.95 |
| Ordering Cost ($) | 15 | 15 | 15 | 15 |
| Inventory Carrying Charge ($/item/day) | 30 % | 30 % | 30 % | 30 % |
Figure 4.9: The dynamic behaviour of the CNMC logistics system for the example item: scalpel sterile disposable (see Table 4.3)
Figure 4.10: The dynamic behaviour of the CNMC logistics system for the example item: container specimen sterile (see Table 4.3)
Note that the dynamic behaviour of the CNMC logistics system, when CS and MWH use a non-optimised \((R, s, S)\) inventory control approach, behaves similarly to using an optimised \((R, s, S)\) inventory control approach (see section 3.4). Specifically, the occurrence of order batching (i.e. the continuous demand for products has been transmitted to the MWH and then to the distributor as order pulses), which is the main cause of the Burbidge Effect problem.

Moreover, since the \((R, s, S)\) inventory control approach used by CS and MWH is non-optimised, both CS and MWH hold very high stock levels, which was also emphasised by the CNMC Materials Management Director to be one of the drawbacks of their inventory control decisions.

### 4.3.5 Redesigning the CNMC logistics system

In this section, several operating strategies for the CNMC logistics system are proposed to improve its dynamic behaviour. The aim is to identify the most successful proposed operating strategy in terms of lower inventory cost and which deals with unpredictable demand of a large number of different items. This author would like to point out that the comparison between the current operating strategy of the CNMC logistics system and the proposed strategies is exclusively done for the inventory cost and not in terms of total logistics cost which is equal to (inventory cost + purchasing cost + transportation cost + warehousing cost (Coyle et al., 1996)). This allows the author to focus on evaluating inventory control decisions, which is the main area of concern for this research. However, to make a fair comparison, other costs are fixed, for example transportation costs are fixed by considering daily deliveries for all the compared operating strategies.

An operating strategy contains several decisions: inventory control decisions, service level decisions, purchasing decisions, transportation decisions, and warehousing decisions. The current operating strategy of the CNMC logistics system and the proposed strategies are explained in Table 4.4. Figure 4.13 to Figure 4.17 show the stock-flow diagram of the CNMC logistics system, respectively, for the following operating strategies: “current situation”, \((R,s,S)\), \((R,s,S)\)(eliminate), CR(IOBPCS), and CR(IOBPCS) (eliminate).
Table 4.4: Summary of the current operating strategy of the CNMC logistics system and the proposed operating strategies for redesigning the CNMC logistics system

<table>
<thead>
<tr>
<th>Name of operating strategy</th>
<th>Inventory control decisions</th>
<th>Service level decisions</th>
<th>Purchasing decisions</th>
<th>Transportation decisions</th>
<th>Warehousing decisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- &quot;current situation&quot;:</td>
<td>Non-optimised ((R,s,S)) inventory control approach. Stock level is checked manually.</td>
<td>100% service level for all items. Safety stock is equal to two weeks worth of stock.</td>
<td>Paper/Fax-based requisitioning and ordering.</td>
<td>Daily deliveries.</td>
<td>Having two main stocks: central supply and main warehouse.</td>
</tr>
<tr>
<td>2- ((R,s,S)):</td>
<td>((R,s,S)) inventory control approach. Stock level is checked manually.</td>
<td>100% service level for all items. Service level factor ((k) =3) (see Table 2.1)</td>
<td>Paper/Fax-based requisitioning and ordering.</td>
<td>Daily deliveries.</td>
<td>Having two main stocks: central supply and main warehouse.</td>
</tr>
<tr>
<td>3- ((R,s,S))(eliminate):</td>
<td>((R,s,S)) inventory control approach. Stock level is checked manually.</td>
<td>100% service level for all items. Service level factor ((k) =3) (see Table 2.1)</td>
<td>Paper/Fax-based requisitioning and ordering.</td>
<td>Daily deliveries.</td>
<td>Having one main stock: central supply (i.e. eliminating main warehouse).</td>
</tr>
<tr>
<td>4- CR(IOBPCS):</td>
<td>CR(IOBPCS) inventory control approach. Stock level is checked using electronic POU*.</td>
<td>100% service level for all items. Service level factor ((k) =1) (see Table 2.4)</td>
<td>Electronic requisitioning, primarily EDI ordering.</td>
<td>Daily deliveries.</td>
<td>Having two main stocks: central supply and main warehouse.</td>
</tr>
<tr>
<td>5- CR(IOBPCS) (eliminate):</td>
<td>CR(IOBPCS) inventory control approach. Stock level is checked using electronic POU*.</td>
<td>100% service level for all items. Service level factor ((k) =1) (see Table 2.4)</td>
<td>Electronic requisitioning, primarily EDI ordering.</td>
<td>Daily deliveries.</td>
<td>Having one main stock: central supply (i.e. eliminating main warehouse).</td>
</tr>
</tbody>
</table>

* POU: Point of use (POU) equipment is an automatic dispensing system that provides secured storage of supplies close to where the supplies are used.
Figure 4.13: The stock-flow diagram of the CNMC logistics system for the “current situation” operating strategy (see Table 4.4)
Figure 4.14: The stock-flow diagram of the CNMC logistics system for the \((R,s,S)\) operating strategy (see Table 4.4)
Figure 4.15: The stock-flow diagram of the CNMC logistics system for the *S)(eliminate) operating strategy (see Table 4.4)
Figure 4.16: The stock-flow diagram of the CNMC logistics system for the CR(IOBPCS) operating strategy (see Table 4.4)
Figure 4.17: The stock-flow diagram of the CNMC logistics system for the CR(IOBPCS) (eliminate) operating strategy (see Table 4.4)
The computer simulation models developed using the stock-flow diagrams shown in Figure 4.13 to Figure 4.17 were run for all items shown in the matrix illustrated in Figure 4.18. This author conducted 242 simulation runs for each model. The matrix shows different combinations of Item Unit Cost, Average Demand, and Standard Deviation of Demand to represent a wide range of different items used by the hospital.

For all simulation runs Consumption rate was set as NORMAL\(^3\)(Average Demand, Standard Deviation of Demand,5). The author set the seed for the NORMAL function to be equal 5 for all simulation runs so a fair comparison between simulation outputs is achieved.

For each simulation run, performance indices were recorded:

1. Average stock\(^4\) (items/year), which is the annual average amount of items held in stock.
2. Number of orders\(^5\) (orders/year), which is the annual total number of orders issued.

The value of average stock is then used to calculate -for each simulation run- the inventory carrying cost according to the following equation:

\[
\text{Inventory carrying cost} = (\text{Inventory carrying charge})(\text{Item unit cost})(\text{Average stock})
\]

Where, inventory carrying charge is fixed for all simulation runs and is equal to (0.3/year).

---

\(^3\) NORMAL(<mean>,<std>[,<seed>]): the NORMAL function generates a series of normally distributed random numbers with a specified mean and standard deviation. NORMAL samples a new random number in each iteration of a simulation. If you wish to replicate the stream of random numbers, specify seed as an integer between 1 and 32767.

\(^4\) Average stock is equal to CS average stock plus MWH average stock. However, in the cases of eliminating MWH, average stock is equal to CS average stock.

\(^5\) Number of orders is equal to CS number of orders plus MWH number of orders. However, in the cases of eliminating MWH, number of orders is equal to CS number of orders.
\[
\text{Standard Deviation of Demand} (\sigma_D) = \frac{1}{3} \text{(Average Demand)}
\]

<table>
<thead>
<tr>
<th>Item Unit Cost ($)</th>
<th>(1)</th>
<th>(10)</th>
<th>(20)</th>
<th>(30)</th>
<th>(40)</th>
<th>(50)</th>
<th>(60)</th>
<th>(70)</th>
<th>(80)</th>
<th>(90)</th>
<th>(100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td></td>
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</tbody>
</table>

Figure 4.18: Matrix of different combinations of Item Unit Cost, Average Demand, and Standard Deviation of Demand to represent a wide range of different items used by the CNMC.
The value of number of orders is then used to calculate -for each simulation run- the order processing cost according to the following equation:

\[ \text{Order processing cost} = (\text{Ordering cost})(\text{Number of orders}) \]

where ordering cost is the cost of placing an order such that:

- It is equal ($15) when using Paper/Fax-based requisitioning and ordering.
- It is equal ($0.43)\textsuperscript{6} when using electronic requisitioning, primarily EDI ordering.

Finally, for each simulation run, the inventory cost was calculated according to the following equation:

\[ \text{Inventory cost} = \text{Inventory carrying cost} + \text{Order processing cost} \]

This author summarised the data calculated for all simulation runs in spreadsheets using Microsoft Excel Software. The spreadsheet data were then used to construct graphs of average stock, number of orders, and inventory cost for the following purposes:

- To investigate how average stock, number of orders, and inventory cost change when changing Average Demand and Item Unit Cost for each operating strategy.

- To compare all operating strategies in terms of average stock, number of orders, and inventory cost when changing Item Unit Cost for each Average Demand.

- To calculate the % changes in average stock, number of orders, and inventory cost when changing from "current situation" operating strategy to the most successful operating strategy.

\textsuperscript{6} This number is assumed based on the Derby Royal Infirmary case study –in Chapter Four- where the hospital uses EDI ordering.
4.3.5.1 Average stock, number of orders, and inventory cost for each operating strategy

In Appendix G (section G.1), Figure G.1 to Figure G.5 illustrate how average stock, number of orders, and inventory cost vary when changing *Average Demand* and *Item Unit Cost* as given in Figure 4.18 for the following operating strategies: “current situation”, \((R,s,S)\), \((R,s,S)\) (eliminate), CR(IOBPCS), and CR(IOBPCS) (eliminate). A cumulative and comparative impact of these behaviours is fully discussed in Appendix G (section G.1). However, Table 4.5 gives an overall summary of the effects of changing *Average Demand* and *Item Unit Cost* on average stock, number of orders, and inventory cost for the five operating strategies.

**Table 4.5: Overall dynamic behaviour for the five operating strategies**

<table>
<thead>
<tr>
<th>Operating strategy</th>
<th>Variable under investigation</th>
<th>Effect of increasing <em>Average Demand</em></th>
<th>Effect of increasing <em>Item Unit Cost</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>“current situation”</td>
<td>Average stock</td>
<td>increases as S-shaped curve</td>
<td>decreases as a goal-seeking exponential decay</td>
</tr>
<tr>
<td></td>
<td>Number of orders</td>
<td>increases as S-shaped curve</td>
<td>increases as S-shaped curve</td>
</tr>
<tr>
<td></td>
<td>Inventory cost</td>
<td>increases linearly</td>
<td>increases linearly</td>
</tr>
<tr>
<td>((R,s,S))</td>
<td>Average stock</td>
<td>increases as S-shaped curve</td>
<td>decreases as a goal-seeking exponential decay</td>
</tr>
<tr>
<td></td>
<td>Number of orders</td>
<td>increases as S-shaped curve</td>
<td>increases as S-shaped curve</td>
</tr>
<tr>
<td></td>
<td>Inventory cost</td>
<td>increases linearly</td>
<td>increases linearly</td>
</tr>
<tr>
<td>((R,s,S)) (eliminate)</td>
<td>Average stock</td>
<td>increases as S-shaped curve</td>
<td>decreases as a goal-seeking exponential decay</td>
</tr>
<tr>
<td></td>
<td>Number of orders</td>
<td>increases as S-shaped curve</td>
<td>increases as S-shaped curve</td>
</tr>
<tr>
<td></td>
<td>Inventory cost</td>
<td>increases linearly</td>
<td>increases linearly</td>
</tr>
<tr>
<td>CR(IOBPCS)</td>
<td>Average stock</td>
<td>increases linearly</td>
<td>stay constant</td>
</tr>
<tr>
<td></td>
<td>Number of orders</td>
<td>stay constant</td>
<td>stay constant</td>
</tr>
<tr>
<td></td>
<td>Inventory cost</td>
<td>increases linearly</td>
<td>increases linearly</td>
</tr>
<tr>
<td>CR(IOBPCS) (eliminate)</td>
<td>Average stock</td>
<td>increases linearly</td>
<td>stay constant</td>
</tr>
<tr>
<td></td>
<td>Number of orders</td>
<td>stay constant</td>
<td>stay constant</td>
</tr>
<tr>
<td></td>
<td>Inventory cost</td>
<td>increases linearly</td>
<td>increases linearly</td>
</tr>
</tbody>
</table>
Although the effects of changing Average Demand and Item Unit Cost on average stock, number of orders, and inventory cost are the same for “current situation” operating strategy, \((R,s,S)\) operating strategy, and \((R,s,S)\)(eliminate) operating strategy, and also the same for CR(IOBPCS) operating strategy, and CR(IOBPCS) (eliminate) operating strategy. Yet the values of average stock, number of orders, and inventory cost for any combination of Average Demand and Item Unit Cost differ in these operating strategies. Therefore, in the next section, this author compares the five operating strategies in terms of average stock, number of orders, and inventory cost when changing Item Unit Cost for each Average Demand.

### 4.3.5.2 Comparison of the five operating strategies in terms of average stock, number of orders, and inventory cost

In Appendix G (section G.2), Figure G.6 to Figure G.16 compare the five operating strategies in terms of average stock, number of orders, and inventory cost when changing Item Unit Cost for the following values of Average Demand, respectively: 1 item/day, 10 items/day, 20 items/day, 30 items/day, 40 items/day, 50 items/day, 60 items/day, 70 items/day, 80 items/day, 90 items/day, and 100 items/day. A full discussion of the comparison presented in Figure G.6 to Figure G.16 is provided in Appendix G (section G.2).

By analysing the overall results discussed in Appendix G (section G.2), in this author’s view, among the proposed operating strategies in Table 4.4 the CR(IOBPCS) (eliminate) operating strategy is the most successful one—in terms of lower inventory cost—for a wide range of different items used by the CNMC. In Chapter Three, this author concluded that the dynamic behaviour of hospitals logistics systems improves when using the CR(IOBPCS) inventory control approach, specifically with regard to the problem of order batching and the problem of demand amplification that are encountered when using the \((R, s, S)\) inventory control approach or when using the current non-optimised \((R, s, S)\) inventory control approach. Therefore, this author would recommend that the CNMC should adopt the CR(IOBPCS) (eliminate) operating strategy.
It is worth noting that (as shown in the Figures G.6 to G.16 in Appendix G) the CR(IOBPCS) (eliminate) operating strategy has the lowest average stock. But at the same time it requires a relatively high number of order processing compared to the (R,s,S)(eliminate) operating strategy. Therefore, in this author’s view, electronic requisitioning using EDI (i.e. very low ordering cost) would ensure that the CR(IOBPCS) (eliminate) operating strategy has the lowest inventory cost. In addition, the use of EDI would provide greater accuracy and control with the capability for frequent order cycles (i.e. continuous replenishment).

Another important conclusion from the above results is that eliminating one level of stocks from the logistics system gives better results, not just in reducing market-demand amplification (Forrester, 1961) and smoothing supply chain dynamics (Wikner et al., 1991), but also in reducing inventory cost by reducing average stock in the system and reducing number of orders. As shown in the Figures G.6 to G.16 in Appendix G, average stock, number of orders, and inventory cost for the (R,s,S)(eliminate) operating strategy are less than for the (R,s,S) operating strategy. Also, average stock, number of orders, and inventory cost for the CR(IOBPCS) (eliminate) operating strategy are less than for the CR(IOBPCS) operating strategy.

4.3.5.3 The % changes in average stock, number of orders, and inventory cost when changing from “current situation” operating strategy to the CR(IOBPCS) (eliminate) operating strategy

From the simulation results, the % decrease in average stock, the % increase in number of orders, and the % savings in inventory cost when the CNMC changes its logistics operating strategy from “current situation” to the CR(IOBPCS) (eliminate) could be deduced using the following equations:

\[
\% \text{ decrease in average stock} = \frac{(\text{average stock})_{\text{current situation}} - (\text{average stock})_{\text{CR(IOBPCS) eliminate}}}{(\text{average stock})_{\text{current situation}}} \times 100
\]

\[
\% \text{ increase in number of orders} = \frac{(\text{number of orders})_{\text{CR(IOBPCS) eliminate}} - (\text{number of orders})_{\text{current situation}}}{(\text{number of orders})_{\text{current situation}}} \times 100
\]

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\[
\% \text{ savings in inventory cost} = \frac{\text{(inventory cost)}_{\text{current situation}} - \text{(inventory cost)}_{\text{CR(IOBPCS) eliminate}}}{\text{(inventory cost)}_{\text{current situation}}} \times 100
\]

The calculated values of the \% decrease in average stock, the \% increase in number of orders, and the \% savings in inventory cost for all items are summarised, respectively, in Figure 4.19 (a) & (b), Figure 4.19 (c) & (d), and Figure 4.19 (e) & (f).

As shown in Figure 4.19, for most items, the high \% savings in inventory cost (about 95\%) is mainly due to the high \% decrease in inventory carrying cost caused by the high \% decrease in average stock.

### 4.3.6 Inventory classification

In the previous section, the five operating strategies that were proposed to improve the dynamic behaviour of the CNMC logistics system assumed that all items are treated the same in terms of service level delivered (i.e. assumed that 100\% service level is to be delivered for each item). As discussed in the literature review in Chapter Two, inventory classification has been used for a long time (Coyle \textit{et al.}, 1996) as a simple yet very effective technique for stratifying individual items into logical groupings for management where "generic" control policies are set for each group. Under such policies, common logistics decisions (such as service level decisions) are applied to each item in a group. Therefore, in this section it is proposed, as one of the main contributions of this research work, to incorporate inventory classification into the redesigning strategies of health care logistics. In particular, it is proposed in this section to incorporate inventory classification into the CR(IOBPCS) (eliminate) operating strategy that were tested in the previous section.

Annual usage and unit cost are two main attributes of items that are usually taken into consideration when classifying inventory using the ABC inventory classification method which is the most frequently used method for item aggregation. However, in health care there is another important attribute of items that should be taken into consideration which is the criticality of items. A distinctive feature of health care logistics is the criticality of items used by hospitals and the life threatening situations that could happen due to the unavailability of these items.
Figure 4.19: The % decrease in average stock, the % increase in number of orders, and the % savings in inventory cost when CNMC changes its logistics operating strategy from “current situation” to the CR(IOBPCS) (eliminate)
The critical review of the ABC inventory classification method, discussed in the literature review in Chapter Two, revealed a main limitation of using this method in health care which is that some critical items that may demonstrate low usage value will not receive priority attention under this method. Therefore, in this section, it is proposed to classify items using a multi-criteria inventory classification method that takes into account the criticality, cost, and usage value of items and study the impact of its use on logistics cost reduction.

Figure 4.20 shows the multi-criteria inventory classification method that is used in this section to classify items for the CNMC and which is adopted from Flores and Whybark (1985) and Partovi and Burton (1993).

<table>
<thead>
<tr>
<th>Criticality classification</th>
<th>High criticality</th>
<th>Medium criticality</th>
<th>Low criticality</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABC Analysis Classification</td>
<td>A item</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B item</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C item</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Flores and Whybark (1985)

**Figure 4.20: A multi-criteria inventory classification matrix**

As shown in Figure 4.20, one dimension of the matrix classifies items in terms of criticality as high, medium and low according to the following criteria:

- High-critical items are either essential for the work carried out and/or have no immediate alternative.
- Medium-critical items are important for the work, but may have acceptable alternatives, or other sizes may be used in the event of stock-out.
- Low-critical items are unlikely to affect the well being of patients other than causing minor inconvenience.
The other dimension of the matrix, shown in Figure 4.20, classifies items according to the ABC analysis classification in terms of annual dollar usage as A item, B item and C item. The procedure for conducting an ABC analysis classification is described at length elsewhere (Reid, 1986; Fernandez, 1987; Reid, 1987). However, the main steps for conducting an ABC analysis classification, as described by Reid (1987), are provided here for convenience as follows:

1. Select those SKUs\(^7\) to be classified.
2. Determine the total number of units issued or utilised during the past fiscal year for each SKU.
3. Determine the average unit cost for each SKU by dividing total purchase costs by total number of SKUs received during the past fiscal year.
4. Calculate the total annual dollar usage cost by multiplying the number of units used by the average unit cost for each SKU.
5. Sort SKUs according to total annual usage value and place in descending sequence of total usage value.
6. Label each SKU descriptively and sequentially number the items.
7. Calculate the cumulative percentage associated with the number of each SKU by dividing the sequentially assigned item number by the total number of SKUs.
8. Determine the cumulative total annual dollar usage value for each SKU.
9. Calculate the percentage of final cumulative total annual dollar usage value for each SKU by dividing the cumulative total amount by the grand cumulative total value for all SKUs.
10. Decide on appropriate divisions for the ABC classes. The percentage of SKUs in each of the three groupings depends on the nature of the SKUs being classified and their relationship to the goals of the department.

The results of the ABC analysis classification are further illustrated graphically. Figure 4.21 shows an example of a common approach for illustrating the ABC results graphically.

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\(^7\) SKU: Stock keeping unit
Figure 4.21: Example of graphical results from the application of the ABC inventory classification method

Once all items are classified into groups according to the multi-criteria inventory classification matrix shown in Figure 4.20, an appropriate % service level is specified for each group of items. In this section it is proposed to use the specified % service level and the specified Service Level Factor \((k)\) as shown in Figure 4.22 when the CNMC uses the CR(IOBPCS) (eliminate) operating strategy.

<table>
<thead>
<tr>
<th>Criticality classification</th>
<th>High criticality</th>
<th>Medium criticality</th>
<th>Low criticality</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABC Analysis Classification</td>
<td>A item</td>
<td>B item</td>
<td>C item</td>
</tr>
<tr>
<td>High criticality service level ((k = 1))</td>
<td>100 % service level</td>
<td>100 % service level</td>
<td>100 % service level</td>
</tr>
<tr>
<td>Medium criticality service level ((k = 0.9))</td>
<td>90 % service level</td>
<td>100 % service level</td>
<td>80 % service level</td>
</tr>
<tr>
<td>Low criticality service level ((k = 0.8))</td>
<td>80 % service level</td>
<td>80 % service level</td>
<td>90 % service level</td>
</tr>
</tbody>
</table>

Figure 4.22: Proposed inventory classification for the CNMC
The new specified Service Level Factor \((k)\) as shown in Figure 4.22 was then used to run the computer simulation model of the CR(IOBPCS) (eliminate) operating strategy for all items shown in the matrix illustrated in Figure 4.18. The resulting simulation output were used to study how incorporating inventory classification, as shown in Figure 4.22, into the CR(IOBPCS) (eliminate) operating strategy affects average stock, number of orders, and inventory cost.

Figure 4.23 (a) & (b), Figure 4.23 (c) & (d), and Figure 4.23 (e) & (f) show, respectively, the % decrease in average stock, the % increase in number of orders, and the % savings in inventory cost when the value of the Service Level Factor \((k)\) changes from 1 to 0.9 and from 1 to 0.8.

As shown in Figure 4.23 (c) & (d), changing the value of the Service Level Factor \((k)\) does not affect the number of orders (i.e. the % change in number of orders is zero). However, changing the value of the Service Level Factor \((k)\) causes a change in average stock. This is because average stock depends on the value of target level which in turn depends on the value of \(k\) (see Table 3.4), such that the smaller the value of \(k\) the smaller the value of target level and hence the smaller the value of average stock. Therefore, as shown in Figure 4.23 (a) & (b), the % decrease in average stock when \(k\) changes from 1 to 0.8 is higher than when \(k\) changes from 1 to 0.9.

Consequently, as shown in Figure 4.23 (e) & (f), the % savings in inventory cost is caused by the % decrease in average stock, such that the higher the % decrease in average stock the higher the % savings in inventory cost. Therefore, the % savings in inventory cost when \(k\) changes from 1 to 0.8 is relatively more than when \(k\) changes from 1 to 0.9.

In this author's view, assigning different % service level to items according to their criticality, usage, and value reduces cost by reducing inventory cost. Therefore, this author would recommend that the CNMC should use the proposed inventory classification method.
Figure 4.23: The % decrease in average stock, the % increase in number of orders, and the % savings in inventory cost when the value of the Service Level Factor (A) changes from 1 to 0.9 and from 1 to 0.8 for the CR(IOBPCS) (eliminate) strategy.
4.4 Case Study Two: Derbyshire Royal Infirmary

Derbyshire Royal Infirmary\(^8\) (DRI) is one of the public sector trusts in the UK. The UK National Health Service (NHS) is undergoing fundamental and tremendous changes, part of which have significant implications for the way in which purchasing and supply is approached and organized within the NHS. The NHS Purchasing and Supply Agency (NHS PASA) was established in April 2000 to streamline health service procurement (NHS Purchasing and Supply Agency, 2003). The NHS Logistics Authority (NHS LA) is a key player that works in partnership with NHS PASA to achieve purchasing and supply goals. The NHS Logistics Authority was formed in April 2000, as the main supply route for consumable products into the NHS (NHS Logistics Authority, 2003). It operates out of seven strategic distribution centres which serve a customer base of over 500 organisations in the English NHS by offering “pick and pack” customised services. It offers a fully automated process from order to payment through e-ordering, e-catalogue, and e-billing, along with supporting management information for every aspect of the activity.

A simplistic view of the DRI supply chain is shown in Figure 4.24 that includes product manufacturers, distributors, the NHS Logistics Authority, and the DRI who are linked together via information and material flows. The supplies department at the DRI is responsible for the availability of medical and non-medical products by ordering them either from the NHS Logistics Authority or directly from product manufacturers. The pharmacy, which is part of the DRI, is responsible for the availability of legally controlled pharmaceutical products by dealing directly with product manufacturers and distributors. The DRI contract with facilities management companies to run catering, cleaning, and sterile services. The items needed to run these services are either ordered by the facilities management companies directly from their supplier (such as, sterile soft packs for wards and theatres), or by the DRI supplies department on behalf of the facilities management companies under certain contractual agreements.

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\(^8\) The Derbyshire Royal Infirmary (DRI) and the Derby City General Hospital (DCGH) were merged into a single Hospital Trust on 1\(^{st}\) April 1998.
Figure 4.24: The overall material and information flow in the DRI supply chain
4.4.1 Qualitative analysis of the DRI logistics system

The following sections summarise the analysis that was performed using the information gathered in the meetings that were conducted with the Supplies Manager of the DRI. The analysis includes:

- Input-output analysis (IOA).
- Classification of items.
- Material, information, and cash flows.
- Purchasing, warehousing, and transportation decisions.
- Inventory control and service level decisions.

4.4.1.1 Input-output analysis (IOA)

An IOA was conducted first to identify the major DRI departments that are involved with the logistics activities and then for each department to identify main input and output flows associated with the logistics activities. As an example, the IOA for the DRI supplies department is illustrated in Figure 4.25. Subsequently, individual IOA diagrams were then linked together to develop an overall picture of the material, information, and cash flows through the DRI logistics system as described in section 4.4.1.3.

4.4.1.2 Classification of items

Items ordered by the DRI supplies department are classified into three types: stock items, non-stock items, and pharmaceutical products.

- Stock items: these are stocked in the inventory of the NHS Logistics Authority. They are listed in a certain catalogue published by the NHS logistics Authority.
- Non-stock items: these are not listed in the NHS Logistics Authority catalogue, and are usually infrequent or patient specific items.
- Pharmaceutical products: these are legally controlled products that can only be ordered by a registered pharmacist.
4.4.1.3 Material, information and cash flows

Figure 4.26 illustrates the material, information, and cash flows for stock items, non-stock items, and pharmaceutical products. There are two approaches for ordering stock items. In the first approach, stocks level at the different wards and departments is checked on a periodical basis using hand-held computers. If the stocks level reaches a predetermined minimum, sufficient supplies are ordered to top up stocks to a maximum level. Ordering is done by feeding the information from the hand-held computers into the NHS Logistics Authority computer network at the DRI supplies department.

The second approach of ordering involves the wards’ and departments’ personnel themselves. Periodically, the stocks level is checked manually to draw up a shopping list, which is passed to the DRI supplies department in paper requisition form. These checks simply involve counting the remaining items. If the levels of stocks reach a predetermined minimum, sufficient supplies are ordered to top up stocks to a maximum level. Upon receiving paper requisition (blue forms) from the different wards and departments, the supplies department manually feed this information into the NHS Logistics Authority computer network.
Figure 4.26: Material, information, and cash flows for stock items, non-stock items, and pharmaceutical products (DRI case study)
All wards are scheduled over the week such that the supplies department receives paper requisitions from 20% of all wards every day. The distribution of wards for ordering purposes is based partly on physical location in order to assist distribution patterns.

The NHS Logistics Authority receives goods from their suppliers in bulk, and then they break the bulk loads into collections of items for particular outlets (called consolidated loads) ready to be dispatched as soon as possible. Invoices from the NHS Logistics Authority are sent to the finance department of the DRI, which in turn sends payments to them after it receives the goods-received note from the different wards. Orders between the DRI and the NHS Logistics Authority, as well as invoices and payments, are done through the NHS computer network.

In the case of non-stock items, whenever a ward or department needs a certain amount of these items, they send a paper requisition (white forms) to the DRI supplies department for the amount needed. The DRI supplies department orders these items from the supplier directly. If some of these items are found to be of high and frequent usage, a contract is made between the DRI and the supplier for a limited time frame called "call-off arrangements". Under this arrangement, whenever a ward or department needs a set quantity of these items, they directly contact the supplier by telephone or fax. Invoices from suppliers are sent to the DRI finance department, which is paid upon receiving the goods-received note from the relevant ward or department. In exceptional cases, certain fast moving items are ordered through the non-stock route due to their specialist nature or avoidance of inappropriate double handling (e.g. artificial hips, intra-ocular lenses, as well for frozen foods, fresh fruit and vegetables).

Pharmaceutical products are considered legally controlled and therefore are ordered by a registered pharmacist directly from suppliers. However, suppliers send invoices to the DRI finance department, which is paid upon receiving the goods-received note from the pharmacy. For non-stock items the DRI supplies department and pharmacy also utilizes nationally negotiated contracts in addition to locally negotiated contracts. This is a service provided by the NHS Purchasing and Supply Agency (PASA) who also negotiate the contracts for NHS Logistics.
All supplies via the NHS Logistics Authority or suppliers are delivered at the DRI receipt and distribution points. Except in the case of pharmaceutical products, they are sent directly to the pharmacy. As the receipt and distribution points at the DRI receive goods, they internally distribute these goods to the relevant wards and departments using internal transport arrangements.

4.4.1.4 Purchasing, warehousing, and transportation decisions

About 75% of the DRI supplies activity is channelled via the NHS Logistics’ route (i.e. stock items) with full e-commerce support from order to payment. The processes involve electronic demand capture at the start of the process from a consistent accurate catalogue and ending with the transmission of electronic invoice information integrated into the DRI financial system. The NHS Logistics Authority supply of products is picked and packed to ward/department level, in quantities required by the DRI and then delivered regularly at agreed times to suit the DRI using the NHS Logistics’ fleet.

The DRI has no central store (i.e. stockless system). However, both stock and non-stock items are stored at points of use (i.e. stored at wards and departments). The NHS Logistics Authority and suppliers deliver products to the DRI receipt and distribution points where they are transported directly to wards and departments.

4.4.1.5 Inventory control and service level decisions

Wards and departments at the DRI use two inventory management approaches according to the item classification as follows:

Stock items:

The \((R,s,S)\) inventory control approach is used for stock items. The abbreviations \(R, s,\) and \(S\) in this approach are defined as follows (Blumenfeld, 2001):

- \(R\): review period (time interval between reviews)
- \(s\): reorder level
• $S$: order-up-to level

The values of $R$, $s$, and $S$ used are experience-based and not algorithmically optimised. For stock items ordered by the materials management personnel, the values of $s$ and $S$ are agreed upon between the DRI supplies department and the wards and departments managers, whereas for stock items that are ordered by wards and departments personnel, the values of $s$ and $S$ are just unofficial targets set by the wards and departments managers. Wards and departments stocks are budget limited and this plays some part in setting the values of $s$ and $S$. Table 4.6 summarises the inventory control and service level decisions for stock items.

### Table 4.6: Inventory control and service level decisions for stock items

<table>
<thead>
<tr>
<th>Inventory control approach</th>
<th>$(R, s, S)$ (non-optimised)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of approach</td>
<td>Inventory position (items on hand plus items on order) is reviewed at regular instants, spaced at time intervals $R$. At each review, if inventory position is at level $s$ or below, an order of sufficient quantity is placed to bring the inventory to a given level $S$.</td>
</tr>
<tr>
<td>Inventory control decision of:</td>
<td></td>
</tr>
<tr>
<td>• <em>How Often to Review?</em></td>
<td>Inventory status is reviewed at regular instants, spaced at time intervals $R$, where $R = 7$ days</td>
</tr>
<tr>
<td>• <em>When to Order?</em></td>
<td>An order is placed: If (inventory position) $\leq s$, where $s = 10D$</td>
</tr>
<tr>
<td>• <em>How Much to Order?</em></td>
<td>Order quantity $= (S - $ inventory position), where $S = 20D$</td>
</tr>
<tr>
<td>Variables used in the decision rule</td>
<td>$D =$ average demand (number of items per unit time)</td>
</tr>
</tbody>
</table>
Non-stock items:

An Ad-Hoc (as and when) approach is used for non-stock items. If wards or departments personnel decide (based on their experience) that there is need for a set quantity of a non-stock item, they make requisition for the amount needed. Therefore, the interval between orders is irregular and the quantity ordered each time is not fixed.

4.4.2 Conceptual model of the DRI logistics system

In this case study, both causal-loop diagrams and stock-flow diagrams were used as mediums of conceptualization. Figure 4.27 shows a causal-loop diagram of the DRI logistics system for stock items. The causal-loop diagram, being simple to understand, was used as a tool to communicate with the Supplies Manager. A stock-flow diagram of the DRI logistics system for stock items, shown in Figure 4.28, was developed using the ithink Analyst Software. Both the causal-loop and the stock-flow diagrams were verified by the Supplies Manager who confirmed that both models are representative of the decision rules related to the different logistics activities adopted by the DRI supplies department.

4.4.3 Computer simulation model of the DRI logistics system

A computer simulation model of the DRI logistics system for stock items was developed using the verified stock-flow diagram in Figure 4.28. The simulation model was developed using the ithink Analyst Software. Appendix H provides all the equations that make up the simulation model. The data needed to run the computer simulation model is: Consumption Rate, Average Demand, NHS LA To Ward or Department Average Transit Time. The verified model was subjected to extensive dynamic analysis as explained in the subsequent sub-sections.

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9 In this case study, conceptual modelling and computer simulation modelling were conducted for stock items only, as they represent more than 75% of all items.
Figure 4.27: Causal-loop diagram of the DRI logistics system for stock items
Figure 4.28: The overall stock-flow diagram of the DRI logistics system for stock items
4.4.4 Dynamic analysis

The simulation model was tested for different items. As an example, this author illustrates the simulation analysis for two stock items: Catheter central venous blister tray (item unit cost=£14.45) and Catheter suction straight tip (item unit cost=£0.25). The two items are used by the Intensive Care Unit. The variables that are used in the simulation process for the two example items are defined in Table 4.7.

Table 4.7: The variables that are used in the simulation model

<table>
<thead>
<tr>
<th></th>
<th>Catheter central venous blister tray</th>
<th>Catheter suction straight tip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Demand (item/day)</td>
<td>0.47</td>
<td>23</td>
</tr>
<tr>
<td>NHS LA To Ward or Department Average Transit Time (days)</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Figure 4.29 and Figure 4.30 show, respectively, the dynamic behaviour of the DRI logistics system for the two example items (i.e. Catheter central venous blister tray and Catheter suction straight tip). Each figure shows Ward or Department Stock, Ward or Department Order Up To Level, Ward or Department Reorder Level, Consumption Rate, Ward or Department Order Rate, and NHS LA Delivery Completion Rate.

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10 At the DRI there are 278 different wards and departments, each of them has its own budget. The Intensive Care Unit is considered one of the highest spend departments at the DRI (yearly expenditure is about £98,000). It uses 420 different stock items.
<table>
<thead>
<tr>
<th>1. Ward or Department Stock</th>
<th>2. Ward or Department Order Bel. To level</th>
</tr>
</thead>
<tbody>
<tr>
<td>92.00</td>
<td>185.00</td>
</tr>
<tr>
<td>274.00</td>
<td>165.00</td>
</tr>
</tbody>
</table>

Figure 4.29: The dynamic behaviour of the DRI logistics system for the example item: Catheter central venous blister tray (see Table 4.7)
Figure 4.30: The dynamic behaviour of the DRI logistics system for the example item: Catheter suction straight tip (see Table 4.7)
As shown in Figure 4.29 and Figure 4.30, Ward or Department Stock depletes gradually till it reaches Ward or Department Reorder Level. Subsequently, at the first Review Time an order is generated. Therefore, at this Review Time, Ward or Department Order Rate is represented as a pulse of a height equal to (Q/dt), where Q is the ordered quantity, which is calculated according to the equation in Table 4.6. After a time (equal to NHS LA To Ward or Department Average Transit Time), NHS LA Delivery Completion Rate is translated as a pulse of height equal to (Q/dt), which causes Ward or Department Stock to increase its level by a value of Q. As a result, the dynamic behaviour of Ward or Department Stock resembles a sawtooth pattern.

As shown in Figure 4.29 and Figure 4.30, the dynamic behaviour of the DRI logistics system when using the non-optimised (R, s, S) inventory control approach behaves in the same way as when using the optimised (R, s, S) inventory control approach (see section 3.4). Specifically, the occurrence of order batching (i.e. the continuous demand for products has been transmitted to the NHS LA as order pulses), which is the main cause of the Burbidge Effect problem.

4.4.5 Redesigning the DRI logistics system

In this section this author proposes two operating strategies for the DRI logistics system. The most successful one in terms of lower inventory cost and more robust to unpredictable demand for a large number of items is identified. This author would like to point out that the comparison between the current operating strategy of the DRI logistics system and the proposed strategies is done, similar to the CNMC case study (see section 4.3.5), in terms of inventory cost only and not in terms of total logistics cost. The current operating strategy of the DRI logistics system and the proposed strategies are summarised in Table 4.8.

Figure 4.31, Figure 4.32 and Figure 4.33 show the stock-flow diagram of the DRI logistics system when using the following operating strategies, respectively: “current situation”, (R,s,S), and CR(IOBPCS). Note that the only difference between Figure 4.28 and Figure 4.31 is that Figure 4.31 introduces uncertainty in the demand pattern. As with the CNMC case study, the computer simulation models developed from the stock-flow diagrams were run for items shown in Figure 4.18 (see section 4.3.5).
Table 4.8: Summary of the current operating strategy of the DRI logistics system and the proposed operating strategies for redesigning the DRI logistics system

<table>
<thead>
<tr>
<th>Name of operating strategy</th>
<th>Inventory control decisions</th>
<th>Service level decisions</th>
<th>Purchasing decisions</th>
<th>Transportation decisions</th>
<th>Warehousing decisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- “current situation”:</td>
<td>Non-optimised ( (R,s,S) ) inventory control approach. Stock level is checked manually.</td>
<td>100 % service level for all items.</td>
<td>Electronic requisitioning, primarily EDI ordering.</td>
<td>Daily deliveries between NHS LA and the DRI.</td>
<td>Central stockless system; both stock and non-stock items are stored at the point of use.</td>
</tr>
<tr>
<td>2- ( (R,s,S) ):</td>
<td>( (R,s,S) ) inventory control approach. Stock level is checked manually.</td>
<td>100 % service level for all items. Service level factor ( (k) =3 ) (see Table 2.1)</td>
<td>Electronic requisitioning, primarily EDI ordering.</td>
<td>Daily deliveries between NHS LA and the DRI.</td>
<td>Central stockless system; both stock and non-stock items are stored at the point of use.</td>
</tr>
<tr>
<td>3- CR(IOBPCS):</td>
<td>CR(IOBPCS) inventory control approach. Stock level is checked using electronic POU*.</td>
<td>100 % service level for all items. Service level factor ( (k) =1 ) (see Table 2.4)</td>
<td>Electronic requisitioning, primarily EDI ordering.</td>
<td>Daily deliveries between NHS LA and the DRI.</td>
<td>Central stockless system; both stock and non-stock items are stored at the point of use.</td>
</tr>
</tbody>
</table>

* POU: Point of use (POU) equipment is an automatic dispensing system that provides secured storage of supplies close to where the supplies are used.
Figure 4.31: The stock-flow diagram of the DRI logistics system when using the “current situation” operating strategy (see Table 4.8)
<table>
<thead>
<tr>
<th>NHS LA Delivery Rate</th>
<th>On Transport From NHS LA To Ward or Department</th>
<th>NHS LA Delivery Completion Rate</th>
<th>Ward or Department Stock Consumption Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

On Demand Rate

Ward or Department Order Rate

Average Transit Time

Figure 4.32: The stock-flow diagram of the DRI logistics system when using the \((R,s,S)\) operating strategy (see Table 4.8)
Figure 4.33: The stock-flow diagram of the DRI logistics system when using the CR(IOBPCS) operating strategy (see Table 4.8)
As with the CNMC case study, for all simulation runs Consumption rate was set as NORMAL (Average Demand, Standard Deviation of Demand, 5). For each simulation run, average stock and number of orders were recorded and then their values were used to calculate inventory carrying cost, order processing cost and inventory cost using the same equations used for the CNMC case study (see section 4.3.5). However, for the DRI case study, inventory carrying charge is fixed for all simulation runs and is equal to (0.07/year) and ordering cost is equal to (£ 0.43).

The data calculated for all simulation runs were summarised in spreadsheets and then used to construct graphs of average stock, number of orders, and inventory cost for the same purposes as for the CNMC case study, which are discussed in the following subsections.

4.4.5.1 Average stock, number of orders, and inventory cost for each operating strategy

In Appendix I (section I.1), Figure I.1 to Figure I.3 illustrate how average stock, number of orders, and inventory cost vary when changing Average Demand and Item Unit Cost as given in Figure 4.18 for the following operating strategies: “current situation”, (R,s,S), and CR(IOBPCS). A cumulative and comparative impact of these behaviours is fully discussed in Appendix I (section I.1). However, Table 4.9 gives an overall summary of the effects of changing Average Demand and Item Unit Cost on average stock, number of orders, and inventory cost for the three operating strategies.

In the next section, the three operating strategies are compared in terms of average stock, number of orders, and inventory cost when changing Item Unit Cost for each Average Demand.
Table 4.9: Overall dynamic behaviour for the three operating strategies

<table>
<thead>
<tr>
<th>Operating strategy</th>
<th>Variable under investigation</th>
<th>Effect of increasing Average Demand</th>
<th>Effect of increasing Item Unit Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>“current situation”</td>
<td>Average stock</td>
<td>increases linearly</td>
<td>stay constant</td>
</tr>
<tr>
<td></td>
<td>Number of orders</td>
<td>stay constant</td>
<td>stay constant</td>
</tr>
<tr>
<td></td>
<td>Inventory cost</td>
<td>increases linearly</td>
<td>increases linearly</td>
</tr>
<tr>
<td>(R,s,S)</td>
<td>Average stock</td>
<td>increases as S-shaped curve</td>
<td>decreases as a goal-seeking exponential decay</td>
</tr>
<tr>
<td></td>
<td>Number of orders</td>
<td>increases as S-shaped curve</td>
<td>increases as S-shaped curve</td>
</tr>
<tr>
<td></td>
<td>Inventory cost</td>
<td>increases linearly</td>
<td>increases linearly</td>
</tr>
<tr>
<td>CR(IOBPCS)</td>
<td>Average stock</td>
<td>increases linearly</td>
<td>stay constant</td>
</tr>
<tr>
<td></td>
<td>Number of orders</td>
<td>stay constant</td>
<td>stay constant</td>
</tr>
<tr>
<td></td>
<td>Inventory cost</td>
<td>increases linearly</td>
<td>increases linearly</td>
</tr>
</tbody>
</table>

4.4.5.2 Comparison of the three operating strategies in terms of average stock, number of orders, and inventory cost

In Appendix I (section I.2), Figure I.4 to Figure I.14 compare the three operating strategies in terms of average stock, number of orders, and inventory cost when changing Item Unit Cost for the following values of Average Demand, respectively: 1 item/day, 10 items/day, 20 items/day, 30 items/day, 40 items/day, 50 items/day, 60 items/day, 70 items/day, 80 items/day, 90 items/day, and 100 items/day. A full discussion of the comparison presented in Figure I.4 to Figure I.14 is provided in Appendix I (section I.2).

By analysing the overall results discussed in Appendix I (section I.2), in this author’s view, among the proposed operating strategies in Table 4.8 the CR(IOBPCS) operating strategy is the most successful one—in terms of lower inventory cost—for a wide range of different items used by the DRI. In Chapter Three, this author concluded that the dynamic behaviour of hospitals logistics systems improves when using the CR(IOBPCS) inventory control approach, specifically, with regards to the problem of
order batching and the problem of demand amplification that are encountered when using the \((R, s, S)\) inventory control approach or when using the current non-optimised \((R, s, S)\) inventory control approach. Therefore, based on these two conclusions, this author suggests that the DRI should consider changing its logistics operating strategy from “current situation” to the CR(IOBPCS) operating strategy.

4.4.5.3 The % changes in average stock, number of orders, and inventory cost when changing from “current situation” operating strategy to the CR(IOBPCS) operating strategy

To benchmark the improvements, this author calculated from simulation output the % decrease in average stock, the % increase in number of orders, and the % savings in inventory cost when the DRI changes its logistics operating strategy from “current situation” to the CR(IOBPCS) as given in the following equations:

\[
\% \text{ decrease in average stock} = \frac{(\text{average stock})_{\text{current situation}} - (\text{average stock})_{\text{CR(IOBPCS)}}}{(\text{average stock})_{\text{current situation}}} \times 100
\]

\[
\% \text{ increase in number of orders} = \frac{(\text{number of orders})_{\text{CR(IOBPCS)}} - (\text{average stock})_{\text{current situation}}}{(\text{number of orders})_{\text{current situation}}} \times 100
\]

\[
\% \text{ savings in inventory cost} = \frac{(\text{inventory cost})_{\text{current situation}} - (\text{inventory cost})_{\text{CR(IOBPCS)}}}{(\text{inventory cost})_{\text{current situation}}} \times 100
\]

The calculated values of the % decrease in average stock, the % increase in number of orders, and the % savings in inventory cost for all items are summarised in Figure 4.34 (a) & (b), Figure 4.34 (c) & (d), and Figure 4.34 (e) & (f), respectively.

As shown in Figure 4.34, for most items, the high % savings in inventory cost (about 84%) is mainly due to the high % decrease in average stock which means a high % decrease in inventory carrying cost.
(a) % Decrease in average stock

\[ (T_j) = \left(\frac{1}{3}\right)[\text{Average Demand}] \]

(b) % Decrease in average stock

\[ (CFu = BO)(\text{Average Demand}) \]

c) % Increase in number of orders

\[ (7j = \left(\frac{1}{2}\right)[\text{Average Demand}] \]

d) % Increase in number of orders

\[ (Ty_o = (1/30)[\text{Average Demand}] \]

e) % Savings in inventory cost

\[ (7n = (1/3)[\text{Average Demand}] \]

(f) % Savings in inventory cost

\[ (7n = (1/30)[\text{Average Demand}] \]

Figure 4.34: The % decrease in average stock, the % increase in number of orders, and the % savings in inventory cost when the DRI changes its logistics operating strategy from “current situation” to the CR(IOBPCS) operating strategy.
4.4.6 Inventory classification

In the previous section, the three operating strategies that were proposed to improve the dynamic behaviour of the DRI logistics system assumed that all items are treated the same in terms of service level delivered (i.e. assumed that 100% service level is to be delivered for each item). As done for the CNMC case study, it is proposed in this section to incorporate inventory classification into the CR(IOBPCS) operating strategy that were tested in the previous section and study the impact of its use on logistics cost reduction. In this section, it is proposed to classify items using the same multi-criteria inventory classification method (shown in Figure 4.20) that where used for the CNMC and which takes into account the criticality, cost, and usage value of items.

In this section it is proposed to use the specified % service level and the specified Service Level Factor \((k)\) for each group of items as shown in Figure 4.35 when the DRI uses the CR(IOBPCS) operating strategy.

<table>
<thead>
<tr>
<th>ABC Analysis Classification</th>
<th>High criticality</th>
<th>Medium criticality</th>
<th>Low criticality</th>
</tr>
</thead>
<tbody>
<tr>
<td>A item</td>
<td>100 % service level ((k = 1))</td>
<td>90 % service level ((k = 0.9))</td>
<td>80 % service level ((k = 0.8))</td>
</tr>
<tr>
<td>B item</td>
<td>100 % service level ((k = 1))</td>
<td>100 % service level ((k = 1))</td>
<td>80 % service level ((k = 0.8))</td>
</tr>
<tr>
<td>C item</td>
<td>100 % service level ((k = 1))</td>
<td>100 % service level ((k = 1))</td>
<td>90 % service level ((k = 0.9))</td>
</tr>
</tbody>
</table>

*Figure 4.35: Proposed inventory classification for the DRI*
The new specified Service Level Factor \((k)\) as shown in Figure 4.35 was then used to run the computer simulation model of the DRI CR(IOBPCS) operating strategy for all items shown in the matrix illustrated in Figure 4.18. The resulting simulation output was used to study how incorporating inventory classification, as shown in Figure 4.35, into the CR(IOBPCS) operating strategy affects average stock, number of orders, and inventory cost.

Figure 4.36 (a) & (b), Figure 4.36 (c) & (d), and Figure 4.36 (e) & (f) show, respectively, the % decrease in average stock, the % increase in number of orders, and the % savings in inventory cost when the value of the Service Level Factor \((k)\) changes from 1 to 0.9 and from 1 to 0.8.

As shown in Figure 4.36 (c) & (d), changing the value of the Service Level Factor \((k)\) does not affect the number of orders (i.e. the % change in number of orders is zero). However, changing the value of the Service Level Factor \((k)\) causes a change in average stock. This is because average stock depends on the value of target level which in turn depends on the value of \(k\) (see Table 3.4), such that the smaller the value of \(k\) the smaller the value of target level and hence the smaller the value of average stock. Therefore, as shown in Figure 4.36 (a) & (b), the % decrease in average stock when \(k\) changes from 1 to 0.8 is higher than when \(k\) changes from 1 to 0.9.

Consequently, as shown in Figure 4.36 (e) & (f), the % savings in inventory cost is caused by the % decrease in average stock, such that the higher the % decrease in average stock the higher the % savings in inventory cost. Therefore, the % savings in inventory cost when \(k\) changes from 1 to 0.8 is relatively more than when \(k\) changes from 1 to 0.9.

These conclusions match closely with the CNMC case study (section 4.3.6); that is, assigning different % service level to items according to their criticality, usage, and value will reduce cost by reducing inventory cost. Therefore, based on this conclusion, the DRI should consider the proposed inventory classification method.
Figure 4.36: The % decrease in average stock, the % increase in number of orders, and the % savings in inventory cost when the value of the Service Level Factor (A) changes from 1 to 0.9 and from 1 to 0.8 for the CR(IOBPCS) operating strategy
4.5 Discussion

The following discusses how, through conducting the two case studies in this chapter, this author answered the research questions that were developed in Chapter Two:

- *Is the integrated system dynamics framework for supply chain design applicable in the health care industry?*

Conducting the two case studies in this chapter showed the applicability of the proposed integrated system dynamics framework for supply chain design in analysing and modelling hospitals logistics systems in practice. This chapter illustrated the qualitative and quantitative analysis of the two case hospitals logistics systems, their dynamic behaviour, and the effect of different logistics decisions —specifically inventory control decisions and service level decisions—on their dynamic behaviour.

- *Does the integrated system dynamics framework provide a structured mechanism for analysing and modelling health care logistics systems and their dynamic behaviour? and*  
  *Does the analysis and evaluation of the effects of the different logistics decisions on the dynamic behaviour of health care logistics reveal any problematic behaviour?*

Based on the qualitative analysis, causal-loop diagrams, stock-flow diagrams, and computer simulation models of the CNMC logistics system and the DRI logistics system were developed. The computer simulation models of the CNMC logistics system and the DRI logistics system were tested for different sample items. The data needed to run the computer simulation models for the sample items were collected from the respective hospital. Due to the lack of information about actual stock levels, this author was not able to validate the models against field data to see whether they can accurately reproduce past statistical data as observed in the real systems. However, this author gained confidence in the
simulation models by assessing their general behaviour characteristics and their ability to generate accepted responses to set policy changes.

The simulation analysis revealed that both the current operating strategy of the CNMC logistics system and the current operating strategy of the DRI logistics system were causing the following undesirable characteristics: holding high stocks level due to the use of non-optimised \((R, s, S)\) inventory control approach, and the occurrence of order batching due to the use of non-linear inventory control decisions that generate a sequence of order impulses which in turn causes demand amplification.

As expected by this author, modelling and simulation provided this author and the decision makers at the CNMC and the DRI with a deeper understanding of their logistics systems and allowed them to directly visualise the impact of their logistics decisions on the dynamic behaviour of the systems. This understanding in turn helped to redesign the CNMC and the DRI logistics systems and suggest improving strategies in terms of performance and cost. Accordingly, several logistics operating strategies were then proposed for redesigning the CNMC logistics system as summarised in Table 4.4 and for redesigning the DRI logistics system as summarised in Table 4.8. Conceptual and computer simulation models were developed for all the proposed operating strategies in each case study.

- *How to quantify in terms of cost the relative improvements of redesign strategies in health care logistics?*

The computer simulation models of the current operating strategy and the proposed operating strategies in each case study were tested for all the items of the matrix in Figure 4.18. This author tested a wide range of items used by the hospitals by using this matrix that shows different combinations of Item Unit Cost, Average Demand, and Standard Deviation of Demand. The computer simulation outputs were used to quantify the effect of the different logistics decisions on inventory cost for each operating strategy. However, the comparison between the current operating strategy and the proposed strategies in each case study is conducted for the inventory cost and not in terms of total
logistics cost (inventory cost + purchasing cost + transportation cost + warehousing cost (Coyle et al., 1996)). Nevertheless, this allowed the author to keep the focus on evaluating inventory control decisions, which is the main area of concern for this research.

For the CNMC case study, this author concludes that among the proposed operating strategies, the CR(IOBPCS) (eliminate) operating strategy is the most successful one in terms of lower inventory cost for a wide range of different items used by the CNMC. The analysis of the computer simulation outputs showed that this operating strategy yield the lowest average stock, but at the same time it had a relatively high number of orders to be placed to the supplier. Therefore, in this author’s view, electronic requisitioning using EDI (i.e. very low ordering cost) is essential to ensure that the CR(IOBPCS) (eliminate) operating strategy has the lowest inventory cost. Also, the analysis of the computer simulation outputs showed that eliminating one stock level from the logistics system, such as the main warehouse, reduced inventory cost by reducing average stock in the system and reducing the number of orders. Based on these conclusions and drawing upon the conclusion in Chapter Two about the improvements in the dynamic behaviour of hospitals logistics systems when using the CR(IOBPCS) inventory control approach, this author suggests that the CNMC should consider changing its logistics operating strategy from the current situation to the CR(IOBPCS) (eliminate).

For the DRI case study, this author concludes that among the proposed operating strategies, the CR(IOBPCS) operating strategy is the most successful one in terms of lower inventory cost for a wide range of different items used by the DRI. Therefore, based on this conclusion and drawing upon the conclusion in Chapter Two about the improvements in the dynamic behaviour of hospitals logistics systems when using the CR(IOBPCS) inventory control approach, this author suggests that the DRI should consider changing its logistics operating strategy from the current situation to the CR(IOBPCS).
• What is the role of inventory classification when incorporated into the redesigning strategies of health care logistics? and

What is the impact of using a multi-criteria inventory classification method that takes into account the criticality, cost, and usage value of items on logistics cost reduction?

One of the distinctive characteristics of logistics in the health care industry is that hospitals maintain a large number of different products that are ranged in between high-critical to low-critical items and that the unavailability of critical items could lead to life threatening situations. Accordingly, as part of redesigning the logistics system for both the CNMC and the DRI case studies, it was proposed to incorporate inventory classification into the redesigning strategies. In particular, it was proposed to classify items using a multi-criteria inventory classification method that takes into account the criticality, cost, and usage value of items and study the impact of its use on logistics cost reduction. Studies were conducted to measure the effect of assigning a different % service level to items according to their inventory classification on average stock, number of orders, and inventory cost for the CNMC CR(IOBPCS) (eliminate) operating strategy and for the DRI CR(IOBPCS) operating strategy. It is concluded that assigning a different % service level to items according to their criticality, usage, and value reduces inventory cost. Therefore, this author would recommend that the CNMC and the DRI should use the proposed inventory classification method.

In addition to answering the research questions, through conducting the two case studies, the qualitative analysis and conceptual modelling conducted for the USA and UK case studies allowed the author to compare both hospitals logistics systems and trace out the similarities and differences in the operating practices in terms of managing logistics activities. The quantitative modelling and dynamic analysis conducted in these two case studies allowed the author to compare the impact of these differences on the dynamic behaviour of the respective hospital logistics system. The main similarities and differences in managing the logistics activities between the CNMC and the DRI are summarised as follows:
i. The high level of organisation that traditionally existed in the UK NHS is reflected in the way in which purchasing and supply is approached and organised by the DRI. The establishment of the NHS Logistics Authority as the main supply route for consumable products into the NHS enabled the DRI to increase their buying power which they could not have achieved if they dealt directly with suppliers. Moreover, the NHS Logistics Authority - by offering a reliable fully automated process from order to payment through e-ordering, e-catalogue, and e-billing - enabled the DRI to have a stockless inventory system and reduce their inventory levels. Since the CNMC operates in a sector that is privately financed and privately organised, the CNMC increased their buying power by being a member of Premier. The CNMC, in accordance, orders most of their supplies from one primary distributor and three other secondary distributors as arranged by Premier, although 60% of supplies were ordered from the primary distributor. Yet the CNMC had two types of inventories in addition to wards stocks (i.e. main warehouse and central supply) to ensure the availability of their products. Therefore, the volume of kept inventory along the CNMC pipeline is higher than along the DRI pipeline.

ii. Management of logistics in both the CNMC and the DRI could be considered centralised, since the logistics function is formally written into the organizational chart of the hospital through “materials management”. Moreover, there exists a specific department in both hospitals that has direct responsibility for managing the different logistics activities (i.e. the materials management department at the CNMC and the supplies department at the DRI).

iii. Although the CNMC and the DRI used different inventory control approaches, the two are considered as non-optimised \((R, s, S)\) inventory control approaches that caused the two hospitals to hold higher stocks level than necessary. Moreover, the non-linearity of the inventory control decisions when using the non-optimised \((R, s, S)\) inventory control approach causes the problem of order batching and in turn the problem of demand amplification.

iv. The CNMC and the DRI used similar inventory control approaches and had a similar desired service level for all items irrespective of their classification. The CNMC classified items according to their frequency of use, and used this
classification to decide whether to stock them at the main warehouse or not. Whereas, the DRI classified items according to whether they are listed in the NHS Logistics Authority catalogue or not and used this classification to decide on the way they order them. However, in both case studies, the criticality, cost and usage value of items were not taken into consideration in the classification criteria. Therefore, both hospitals missed the opportunity to choose the appropriate inventory control approaches and the appropriate desired service level for items which can reduce their inventory cost as proved by this author.

v. Since the DRI is already operating an electronic requisitioning system using EDI, it makes it relatively more responsive than the CNMC to implement the proposed CR(IOBPCS) operating strategy which was proved to improve their logistics system in terms of performance and cost.

Moreover, through conducting the two case studies in this research work, this author found that modelling is not just a technology for producing answers but an essential part in the educational process and a tool for improving judgment and intuition upon which decisions are actually based.
Chapter Five: Conclusions and Future Research Work

5.1 Introduction

The aim of this chapter is to present the main concluding remarks as a result of the overall research illustrating the main contributions of this research work to the body of knowledge. This chapter also evaluates the research methodology used and highlights the key limitations of this research. Opportunities for future research work are outlined at the end of this chapter.

5.2 Contribution of the Research Work

The overall aim of this research work was to understand the dynamic behaviour of health care logistics systems to effectively manage their logistical activities. The research work had three objectives. The first objective was to provide a structured mechanism for modelling and analysing health care logistics to be able to understand its dynamic behaviour and effectively manage its logistical activities on the basis of the model. The second objective was the application of modelling system dynamics for health care logistics that incorporates service and cost dimensions. The third objective was to redesign health care logistics to improve its dynamic behaviour in terms of performance and cost, taking into consideration the distinctive feature of health care logistics concerning the criticality of items. In achieving the overall aim and objectives, several research questions were proposed. The answers to these questions were provided in Chapter Four, which enabled the achievement of the overall aim of this research work.

This research work has contributed to the understanding of hospitals logistics systems. At present, there are only a few studies to be found in the literature that have analysed logistics in a health care setting, most of which have focused on some specific logistical activity. This research work considers hospitals logistics systems as complex systems in
which the interaction of the feedback loop structures, non-linearity, and delays produce particular dynamic behaviour. This study takes into consideration all the elements of a hospital logistics system including the stocks, material flows, information flows and logistics decisions. Also it employs a structured integrated framework (Hafeez et al., 1996) using qualitative and quantitative tools for analysing and modelling health care logistics systems for operational and strategic decision making. By providing a step by step implementation of the various stages of the framework, this research work is the first study that shows how to qualitatively analyse a hospital logistics system and build qualitative and quantitative models of it, how to conduct extensive dynamic analysis using the quantitative model to study related dynamic behaviour and the effect of the different logistics decisions on this dynamic behaviour, how to reveal problems in the dynamic behaviour and understand why this problematic behaviour emerged, and how to redesign the hospital logistics system and develop better logistics operating strategies in terms of performance and cost. This research work provided a general conceptual model of hospitals logistics systems that can be considered as a baseline, high level qualitative model and that can be further developed for different scenarios. Moreover, this research work provided a clear understanding of the effect of the inventory control decisions and service level decisions on the dynamic behaviour of hospitals logistics systems. This study has demonstrated the main flaw of the traditional \((R, s, S)\) inventory control approach that can lead to the problems of order batching and demand amplification. Furthermore, this study has investigated a number of strategies to improve the dynamic behaviour of hospitals logistics systems by using the \(\text{CR(IOBPCS)}\) inventory control approach. Also, as a main part of this investigation, this study has assessed the role of inventory classification when incorporated into the redesigning strategies of health care logistics. It has clearly illustrated how to reduce inventory cost by assigning a different % service level to items according to their criticality, usage, and value.

The main contributions of this research work to the body of knowledge are summarised as follows:

1. An analysis of a structured mechanism using system dynamics that can be successfully applied in the health care industry for modelling and analysing health care logistics to allow understanding its dynamic behaviour in order to effectively manage its logistical activities on the basis of the computer model.
2. Analysing and assessing the dynamic behaviour of health care logistics in terms of performance and revealing demand amplification problems in the dynamic behaviour caused by the current inventory control decisions practiced in the health care industry (such as $(R, s, S)$ inventory control approach).

3. Quantifying the impact of inventory control decisions and service level decisions on the dynamic behaviour of hospitals logistics systems in terms of average stock, number of orders and inventory cost which allows choosing the best logistics operating strategy in terms of performance and cost.

4. Reducing inventory cost by using a multi-criteria inventory classification method that takes into account the criticality, cost, and usage value of items and assigning an appropriate percentage service level to items according to their inventory classification.

Also, as part of the contribution of this research work, two papers related to this research work have been presented and published in the following:


5.3 Evaluation of the Research Methodology

The appropriateness of the adopted integrated system dynamics framework for analysing, modelling and redesigning the logistics system for the two case hospitals with the aim of answering the research questions is discussed as follows:

- The integrated system dynamics framework for supply chain design -proposed in this research work- provides the health care decision makers and practitioners
with a structured mechanism (as verified by the practitioners of the two case hospitals) for:

a) Analysing hospitals logistics systems and their dynamic behaviour.
b) Analysing and evaluating the effect of the different logistics decisions on the dynamic behaviour of hospitals logistics systems.
c) Identifying successful logistics decisions and operating strategies that can deal with unpredictable demand for different critical and non-critical items.

- The step by step procedure of the integrated system dynamics framework under the qualitative and quantitative phases proved to be adequate and powerful tools for enhancing the practitioners understanding toward conceptual as well as technical problems associated with their logistics chain. The qualitative phase helps in describing and understanding hospitals logistics systems and their interrelated logistics decisions, whereas the quantitative phase helps in quantifying the impact of different logistics decisions on the dynamic behaviour of hospitals logistics systems.

- In the qualitative phase, tools such as content analysis, interviews, Pareto analysis, information flow analysis, and input-output analysis help in acquiring the conceptual knowledge needed to develop the required conceptual models. Specifically, conceptual models proved to be an essential tool for engaging with the relevant people concerned with the problem situation to capture their mental models.

- In the quantitative phase, the *i*think Analyst Software that was used for developing the computer simulation models proved to have several advantages including:

  a) It allows the creation of stock-flow diagrams directly on the computer screen as icons and the construction of appropriate mathematical relationships between key variables automatically.
b) It allows modelling non-linear, time invariant relationships that are evident or may be assumed.

c) The models developed are relatively easy to use and understood by users who are unfamiliar with mathematical difference and differential equations.

d) The models developed can be modified or expanded by including other linear and non-linear decisions without worrying about the complexity of the resulting equations for further manipulations.

- Developing qualitative and quantitative models proved to be a learning experience for this author and the participants of the two case studies. In particular, they learned how to analyse the impact of different logistics decisions — specifically inventory control and service level decisions — on the dynamic behaviour of the hospital logistics system. This learning experience proved to enhance their understanding how to design more effective logistics operating strategies.

- The computer simulation outputs proved to be very useful in quantifying the effect of different logistics decisions with regard to average stock, number of orders and inventory cost. This allows the decision makers to choose the best logistics operating strategy in terms of performance and cost.

However the methodology demands full commitment from the participants for data collection and verification stages. Sometime it is difficult to collect an unbiased view from participants at individual level.

### 5.4 Limitations of the Research Work

Several limitations have been faced while conducting this research work. Although the general conceptual model of a hospital logistics system developed here includes decision making for the different logistics activities (i.e. inventory control decisions, service level decisions, purchasing decisions, transportation decisions, and warehousing decisions), however, this research work focused only on studying inventory control decisions and service level decisions and evaluating their effects on the dynamic
behaviour of hospitals logistics systems. Also this study considered the inventory cost only during the optimisation process. In future, this can be further enriched by considering other logistics costs (i.e. transportation cost, purchasing cost, and warehousing cost) for cost optimisation.

At the technical level, one limitation is in representing the consumption rate data as constant, step or normal function while conducting the dynamic analysis using computer simulation models. Therefore, any conclusions that might be drawn on the results should be taken into consideration that in real time situations, consumption rates may behave in a continuous level for example similar to a learning curve. This study also considered only a selection of critical and non-critical items for testing the model and can be broadened to include more hospital products.

5.5 Future Research Work

One of the suggestions for future research work is to investigate other inventory control decisions and evaluate their impact on the dynamic behaviour of hospitals logistics systems. For example, it is suggested to study the replenishment rule that is proposed by Dejonckheere et al. (2003) to generate smooth ordering patterns and avoid demand amplification, based on automatic pipeline inventory and order based production control system (APIOBPCS) (John et al., 1994; Mason-Jones et al., 1995; Disney et al., 2000). Further research is also suggested to confirm demand amplification phenomena in the health care industry by collecting more data and performing appropriate tests as given in the literature (Forrester, 1961; Sterman, 2000).

Another avenue for future research work could be to further improve our understanding of hospitals decision making through studying purchasing, transportation, and warehousing decisions. These can be modelled and evaluated through computer simulation based on system dynamics tool. This will allow teasing out the trade-off effects for the different logistics activities. This will help to design a set of “best practice” simulation models that would further optimise total logistics cost while improving the dynamic behaviour of the hospitals supply chain.
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Appendix A: System Dynamics

The aim of this Appendix is to provide a brief discussion of the main concepts of system dynamics. In learning the basic concepts behind the study of complex systems using system dynamics, this research depended on two main sources, which are:

1. "Road Maps, A Guide to Learning System Dynamics": It is a self-study guide to learning system dynamics. It is organised as a series of chapters, and is being developed by the System Dynamics in Education Project at MIT under the direction of Professor Jay Forrester.

2. "Introduction to System Dynamics": It is an online book prepared for the Department of Energy by Michael J. Radzicki, PhD. Of Sustainable Solutions, Inc. While the examples are directed to energy policy, anyone interested in learning system dynamics will find it valuable.

Both sources above can be found on the System Dynamics Society website <<http://www.systemdynamics.org/>>. However, this research work used other sources and references to reinforce the knowledge of these concepts. The following points discuss briefly the main concepts of system dynamics. These summary points are taken from the above two sources as follows:

1. In system dynamics, a system is defined as a collection of elements that continually interact over time to form a unified whole.

2. The structure of the system is those underlying relationships and connections between the components of the system.

3. The behaviour of the system is the way in which the elements or variables composing a system vary over time.

4. System dynamics is concerned with the behaviour of a system over time.
5. Real systems often generate clearly identifiable time patterns or time paths of behaviour. These systems behavioural patterns can be placed into one or a combination of five distinct categories, including: linear family, exponential family, goal-seeking family, oscillation family, and S-shaped family. The linear family of paths includes: equilibrium, linear growth, and linear decline. The exponential family consists of exponential growth and exponential decay. Goal-seeking behaviour is related to exponential decay, however, with one difference in which the time path is either seeking a goal of zero, or seeking a non-zero goal. Oscillation family includes sustained, damped, exploding, and chaos. S-shaped family includes: S-shaped growth, S-shaped growth with overshoot, and overshoot and collapse.

6. In system dynamics, dynamic behaviour is thought to arise due to the “Principle of Accumulation”. More precisely, this principle states that all dynamic behaviour in the world occurs when flows accumulate in stocks.

7. In terms of a metaphor, a stock can be thought of as a bathtub and a flow can be thought of as a faucet and pipe assembly that fills or drains the stock as shown in Figure A.1. The stock-flow structure in Figure A.1 is the simplest dynamical system in the world.

![Figure A. 1: Example of a simple stock and flow structure](image)

8. In system dynamics, both informational and non-informational entities can move through flows and accumulate in stocks.

9. In order to identify stocks and flows, it is essential to determine which variables in the system experiencing the problem define its state (its stocks), and which variables define the changes in its state (its flows).
10. Stocks possess four characteristics that are crucial in determining the dynamic behaviour of systems. More specifically, stocks have memory, change the time shape of flows, “decouple” or interrupt flows, and create delays.

11. The stocks and flows in real world systems are part of feedback loops. And the feedback loops are often joined together by non-linear couplings that often cause counter initiative behaviour.

12. From a system dynamics point of view, a system can be classified as either “open” or “closed”. Open systems have outputs that respond to, but have no influence upon, their inputs. Closed systems, on the other hand, have outputs that respond to, and influence their inputs.

13. Given the fundamental role of feedback in the control of closed systems, then, an important rule in system dynamics can be stated as: every feedback loop in a system dynamics model must contain at least one stock. Figure A.2 shows an example of a simple system dynamics stock-flow structure of a closed system with a positive feedback loop. As shown in Figure A.2, the feedback path for the closed system includes, in sequence, a stock, information about the stock, and a decision rule that controls the change in the flow. An information link is drawn between the stock and flow to transmit information back to the flow variable about the state of the stock variable. This information is used to make decisions on how to alter the flow setting.

![Figure A.2: Simple system dynamics stock-flow structure of a closed system with a positive feedback loop](image)

14. Closed systems are controlled by two types of feedback loops: positive loops and negative loops.
15. Positive loops portray self-reinforcing processes wherein an action creates a result that generates more of the action, and hence more of the result. The simplest and most fundamental positive feedback loop consists of one level and one rate, as shown in Figure A.2, and the rate is directly proportional to the level.

16. Negative feedback loops, on the other hand, describe goal-seeking processes that generate actions aimed at moving a system toward, or keeping a system at, a desired state. The simplest and most fundamental negative feedback loop contains one rate and one level, as shown in Figure A.3, and the rate is directly proportional to the level.

![Figure A.3: Simple system dynamics stock-flow structure of a closed system with a negative feedback loop](image)

17. The two types of feedback, positive and negative, combine to create all of the behaviour observed in complex systems. Frequently, a system’s feedback loops will be joined together in non-linear relationships. These non-linear couplings can cause the dominance of a system’s feedback loops to change endogenously. That is, over time, a system whose behaviour is being determined by a particular feedback loop, or set of loops, can (sometimes suddenly) endogenously switch to a behaviour determined by another loop or set of loops. This particular characteristic of non-linear feedback systems is partially responsible for their complex, and hard-to-understand behaviour.
Appendix B: The *ithink* Analyst Software

The *ithink* Analyst Software is one of the industry standard system dynamics software. The *ithink* and STELLA Technical Documentation (2002) provides the essential "how to" information concerning the use of the *ithink* Analyst Software. The aim of this Appendix is to provide the reader with enough information about the *ithink* Analyst Software to enable him/her to understand the content of this thesis. Therefore, in this Appendix, parts of the above documentation will be provided to give a general picture of how the software works; mainly about:

- The software three-layer operating environment.
- The purpose of the Map/Model level building blocks (which are used in building all stock-flow diagrams in this thesis).
- The purpose of the Ghost tool which is available only on the Map/Model level.
- The simulation algorithm.

*The software three-layer operating environment*

Figure B.1 provides an overview of the software's three-layer operating environment. As the Figure indicates, the software has three distinct layers: the Interface layer, the Map/Model layer, and the Equations layer.

The software opens on the Map/Model layer. This layer is where you will lay out your thinking in the form of a map. On this layer, you will transform maps into models that can be simulated on the computer. The Map/Model layer thus is the "engine room" for the models you create.

Above the Map/Model layer, you'll find the Interface layer. As the name suggests, the Interface layer provides you with the tools needed for engaging end-user interfaces to your models. You'll use these Interface layer tools to create, for example, flight simulator cockpits in which users can interact with the model as the simulation

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1 In this research the words "stock-flow diagram" is used instead of the word map; as the word "map" may imply other meaning to the reader.
progresses. Finally, below the Map/Model layer you'll find the Equations layer. This layer gives you a list of all the equations that make up your model.

The Interface Layer

File Edit Interface Run Help

O □ 0 0 O 1 B

The Map / Model Layer

File Edit Model Run Help

FBBWBWM

The Equations Layer

File Edit Equation Run Help

\[
I(t) = A_{\text{Stock}}(t) = A_{\text{Stock}}(t - dt) + \left( a_{\text{inflow}} - a_{\text{outflow}} \right) \cdot dt
\]

\[
\text{INIT } A_{\text{Stock}} = 42
\]

\[
\text{INFLOWS: } a_{\text{inflow}} = 10
\]

\[
\text{OUTFLOWS: } a_{\text{outflow}} = A_{\text{Stock}} \cdot a_{\text{converter}}
\]

\[
O = a_{\text{converter}} = 0.5
\]

Note: As you create a stock/flow map, the software automatically creates a difference equation structure such as shown here.

Figure B. 1: An Overview of the Operating Environment
The purpose of the Map/Model level building blocks

On the Map/Model layer, you'll find four basic building blocks: the Stock, the Flow, the Converter, and the Connector. The graphical representation and the purpose of each building block are provided here as follows:

**Reservoir stock**

# Stocks: They are accumulations. They collect whatever flows into them, net of whatever flows out of them. The default stock type is the Reservoir. There are other types of stocks including: conveyor, queue, and oven.

Convey or Stock  Queue Stock  Oven Stock

- Flows: The job of flows is to fill and drain accumulations. The unfilled arrow head on the flow pipe indicates the direction of positive flow.

- Converters: The converter serves a utilitarian role in the software. It holds values for constants, defines external inputs to the model, calculates algebraic relationships, and serves as the repository for graphical functions. In general, it converts inputs into outputs. Hence, the name "converter."

Connectors: As its name suggests, the job of the connector is to connect model elements. The software provides for two distinct types of connector: the action connector and the information connector. Action connectors are signified by a solid, directed wire. Information connectors are signified by a dashed wire.
The Decision Process Diamonds: The Decision Process Diamond (DPD) is a mechanism for managing the diagram complexity associated with the representation of decision processes within your models. With DPDs, you can "bury" the intricacies of the decision rules that drive the flows into a "black box" (actually, a lavender diamond). On the surface, you and the users of your models can clearly see both the inputs and the outputs associated with a decision process. When the need arises, you can "drill down" into the detail of the decision process itself. As a result, your models can maintain a bi-focal perspective, displaying the macro- and micro-structure as needed.

The purpose of the Ghost tool

The Ghost tool is available only on the Map/Model level. Its purpose is to make replicas, aliases, or shortcuts for individual stocks, flows, and converters. A Ghost of an entity has no independent identity. It is simply an image of the building block -drawn in dashed lines- from which it was ghosted. The ghosted replica has no equation of its own. When you double-click on a ghosted replica, the dialog box that opens actually belongs to the original from which the replica was made. No matter how many ghosted replicas of a given building block you create, only one dialog box exists - because only one building block exists! The Ghost tool is thus really of value only for cosmetic purposes. A ghost adds no real structure to a model.

In particular, ghosted stocks can have no inflows or outflows; ghosted flows and ghosted converters (when you "Ghost" a flow, its Ghost will appear as a converter) can have no input connectors. Ghosts are thus read-only information holders. You can draw connectors from them. Nothing can go into them.

In your modelling efforts, Ghosts serve the primary role of keeping your diagram tidy. When connectors might otherwise run all over the screen, leading to diagram "spaghetti," ghosted images can help to the connections neat and clean. Figure B.2, illustrates this role of Ghosts.
Without ghosting it is necessary to stretch a connector across an entire page.

By creating a ghost, the associated connector is much shorter!

Figure B.2: Ghosting as an Antidote to Spaghetti

The simulation algorithm

In the software, the equation structure underlying the model diagram is of vital importance. The equations created behind the scenes as you hook together stocks and flows are known as "Finite Difference Equations." In a model, each stock equation is a finite difference equation. Conceptually, solving finite difference equations is straightforward. It involves a two step initialization phase, and a three step iterative evaluation phase:

Initialization Phase:

Step 1. Create a list of all equations in required order of evaluation.
Step 2. Calculate initial values for all stocks, flows and converters (in order of evaluation).

Iteration Phase:

Step 1. Estimate the change in stocks over the interval DT. Calculate new values for stocks based on this estimate.
**Step 2.** Use new values of stocks to calculate new values for flows and converters.

**Step 3.** Update simulation time by an increment of DT. Stop iterating when Time >= simulation To Time.

Step 1 of the iteration phase is a critical one: How does one estimate the change in the value of stocks over the interval DT? The software provides three algorithms for doing this estimation - Euler's, 2nd-order Runge-Kutta, and 4th-order Runge-Kutta.

DT, or dt (depending on your level of disdain), is the interval of time between calculations. DT is expressed in whatever time unit you've chosen for your model. Therefore, DT answers the question: Is my model having its numerical values recalculated once every time period, twice, three times...? Your choice of time unit provides the denominator of the units-of-measure for all of the flows in your model. For example, if you have flows of widgets, people, and dollars (and you are using the default time unit of "Months"), then the units-of-measure for your flows will be widgets/month, people/month, and $/month. If DT in this model is 1.0, then a round of calculations will be performed once each month. If DT is 0.25, then a round of calculations would be performed every 1/4 of a month (or, four rounds of calculations would be performed per month). And, so on.
Appendix C: Conceptual and Simulation Models of a Hospital Logistics System that is Using a Traditional \((R, s, S)\) Inventory Control Approach

The aim of this Appendix is to provide a full explanation of how the stock-flow diagram of a hospital logistics system that is using a traditional \((R, s, S)\) inventory control approach - shown in Figure 3.3 in Chapter Three - is developed, and all the equations that make up the simulation model of that system. The stock-flow diagram and the simulation model are developed using it\textit{th}ink Analyst Software.

The main stock that we are interested in studying its dynamic behaviour in the stock-flow diagram shown in Figure 3.3 is \textit{Hospital Stock}. Consumption of all hospital wards and departments are represented as \textit{Consumption Rate}. Whereas, all deliveries from distributors are represented as \textit{Distributor Delivery Rate}. \textit{Consumption Rate} can be constant or variable (e.g. step input, pulse input, or random input, etc.).

\textbf{The \textit{Hospital Stock} is decreased due to \textit{Consumption Rate} and increased due to \textit{Distributor Delivery Completion Rate}.} Delivering materials from distributor stock to \textit{Hospital Stock} takes \textit{Transit Time}. Materials do not go immediately from distributor to \textit{Hospital Stock}. This pipeline effect is represented by the stock \textit{On Transport from Distributor to Hospital} (i.e. the stock of those materials that have been out of distributor stock but not yet received by \textit{Hospital Stock}).

The pipeline delay is used to model the material delay; since it captures the physical flow of materials between the distributor and hospital. Pipeline delays preserve the order of entry to a delay so the output is exactly the same as the input, but shifted by the time delay, and also assume no mixing of the contents of the stock in transit at all (Sterman, 2000). For the pipeline delay in Figure 3.3, the outflow (\textit{Distributor Delivery Completion Rate}) is simply the inflow (\textit{Distributor Delivery Rate}) lagged by the average delay time (\textit{Transit Time}). Also, the \textit{Distributor Delivery Completion Rate} does not depend on how much material \textit{On Transport From Distributor To Hospital} - an assumption made by this author that there is no transportation capacity limit.
Conveyors—one of the four varieties of stocks used in the *ithink* Analyst software—are great for representing "pipeline delays" (Richmond, 2001). Therefore, the stock On Transport From Distributor To Hospital is represented as a conveyor. However, the Hospital Stock is represented as reservoir—another type of stocks used in the *ithink* Analyst. The reservoir operates most like a bathtub, where stuff flows in, and once it does, individual entities become indistinguishable (Richmond, 2001). Usually, delay times can change. In *ithink* Analyst, the transit time for a conveyor can be either constant or variable. However, in Figure 3.3, the transit time is assumed by this author to be constant and equals Transit Time.

How much material the distributor should deliver to Hospital Stock depends on how much material the hospital orders according to their Inventory Control Decisions. In Figure 3.3, Order Completion Rate is connected to the Distributor Delivery Rate with a solid wire—one of the two types of connectors in the *ithink* Analyst software. The solid wire is called an “action connector”. Therefore, once an order is issued by the hospital and received by the distributor, materials are delivered from distributor to Hospital Stock. Although, the Distributor Delivery Rate and the Order Completion Rate are assumed to be numerically equal and both are measured in the same units, they are distinct concepts. The Distributor Delivery Rate is the rate physical product leaves the distributor’s stock, while the Order Completion Rate represents an information flow (i.e. information about how much material should be delivered).

Ordering process also takes time. There is an information delay between the moment when the need for materials are realized by the hospital and the moment when this information is received by the distributor in the form of an order. A pipeline delay is used to model the information delay in the ordering process. This is represented in the model structure in Figure 3.3 as a conveyor called Order Backlog, which is increased by Order Rate and decreased by Order Completion Rate. The Order Completion Rate is exactly the Order Rate lagged by the Order Processing Delay Time. It is assumed by this author that there is no ordering capacity limit. The amount of materials that are ordered by the hospital depends on their Inventory Control Decisions. A solid wire then is used to connect the Inventory Control Decisions diamond with the Order Rate to transmit the action resulting from the decision.
The inputs to the Inventory Control Decisions and the Service Level Decisions—which are used to build the decisions logic—are information transmitted from other parts of the model using information connectors (dashed connectors)—the second type of connectors in the *ithink* Analyst.

The values of Transit Time and Order Processing Delay Time are either variables or constants. The value of Average Lead Time is equal to the value of Transit Time plus the value of Order Processing Delay Time. The value of Standard Deviation of Lead Time is equal to a fraction of Average Lead Time. The values of Ordering Cost, Item Unit Cost, Inventory Carrying Charge, Service Level Factor, and Average Demand are all constants. The value of Standard Deviation of Demand is equal to a fraction of Average Demand.

Information about the values of Service Level Factor, Average Demand, Standard Deviation of Demand, Average Lead Time, and Standard Deviation of Lead Time are used to determine the value of Safety Stock according to the equation in Table 3.1 in Chapter Three.

Information about the values of Average Demand, Inventory Carrying Charge, Item Unit Cost, and Ordering Cost are used to determine the value of Economic Order Quantity according to the equation in Table 3.1 in Chapter Three.

Information about the values of Average Demand, Inventory Carrying Charge, Item Unit Cost, and Ordering Cost are used to determine the value of Review Period according to the equation in Table 3.1 in Chapter Three; yet, with adding two functions to the equation. The first function is the ROUND function which is added to round the answer that comes from the equation to its nearest integer value. Because, in practice, with traditional inventory control approaches, review is done every day or multiple of a day (for example, not every 3.75 days). The second function is MAX(<expression>,<expression>,...) function which gives the maximum value among the expressions contained within parentheses. And here, the two expressions are 1, and the value that comes out of the ROUND function. So, if the value that comes from the ROUND function is zero, then the value of Review Period is 1; because Review Period should never be zero.
Information about Review Period, Average Demand, Average Lead Time, and Safety Stock are used to determine the value of Reorder Level according to the equation in Table 3.1 in Chapter Three. Information about Reorder Level and Economic Order Quantity are used to determine the value of Order Up To Level according to the equation in Table 3.1 in Chapter Three.

Information about the values of Review Period, Reorder Level, and Order Up To Level, and information about the level of Hospital Stock, On Transport From Distributor To Hospital, and Order Backlog are all used to determine the inventory control decision of (How Often to Review?, When to Order?, and How Much to Order?) according to the conditional statement which states in words: “At each review, if inventory position (items on hand plus items on order) is at level $s$ or below, an order is placed for a sufficient quantity to bring the inventory position up to a given level $S$”. An IF...THEN...ELSE statement is used to perform this conditional statement. In the IF...THEN...ELSE statement, a COUNTER function is used to represent the time interval $R$.

The initial value of Hospital Stock is equal to Order Up To Level. The initial values of both On Transport From Distributor To Hospital and Order Backlog are zero.

The equations that make up the simulation model of the hospital logistics system that is using a traditional $(R,s,S)$ inventory control approach are listed in Table C.1. The equations are listed according to the order of execution.
Table C.1: The equations that make up the simulation model of the hospital logistics system that is using a traditional \((R,s,S)\) inventory control approach

<table>
<thead>
<tr>
<th>Equation Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INITIALIZATION EQUATIONS</strong></td>
</tr>
<tr>
<td>(\text{Order Processing Delay Time} = 1)</td>
</tr>
<tr>
<td>(\text{Transit Time} = 3)</td>
</tr>
<tr>
<td>(\text{INIT Order Backlog} = 0)</td>
</tr>
<tr>
<td>(\text{INIT Transit Time} = \text{varies})</td>
</tr>
<tr>
<td>(\text{INFLOW LIMIT} = \text{INF})</td>
</tr>
<tr>
<td>(\text{CAPACITY} = \text{INF})</td>
</tr>
<tr>
<td>(\text{INIT On Transport From Distributor To Hospital} = 0)</td>
</tr>
<tr>
<td>(\text{TRANSIT TIME} = \text{varies})</td>
</tr>
<tr>
<td>(\text{INFLOW LIMIT} = \text{INF})</td>
</tr>
<tr>
<td>(\text{CAPACITY} = \text{INF})</td>
</tr>
<tr>
<td>(\text{Distributor Delivery Completion Rate} = \text{CONVEYOR OUTFLOW})</td>
</tr>
<tr>
<td>(\text{TRANSIT TIME} = \text{Order Processing Delay Time})</td>
</tr>
<tr>
<td>(\text{Consumption Rate} = 100)</td>
</tr>
<tr>
<td>(\text{Ordering Cost} = 15)</td>
</tr>
<tr>
<td>(\text{Average Demand} = 100)</td>
</tr>
<tr>
<td>(\text{Item Unit Cost} = 100)</td>
</tr>
<tr>
<td>(\text{Inventory Carrying Charge} = 30/100)</td>
</tr>
<tr>
<td>(\text{Review Period} = \text{MAX}(1, \text{ROUND}(\sqrt{((2*\text{Ordering Cost})/(\text{Average Demand}<em>365</em>\text{Item Unit Cost}*\text{Inventory Carrying Charge}))}))</td>
</tr>
<tr>
<td>(\text{Average Lead Time} = \text{Order Processing Delay Time} + \text{Transit Time})</td>
</tr>
<tr>
<td>(\text{Service Level Factor} = 3)</td>
</tr>
<tr>
<td>(\text{Standard Deviation of Demand} = (1/3)\times\text{Average Demand})</td>
</tr>
<tr>
<td>(\text{Standard Deviation of Lead Time} = (1/3)\times\text{Average Lead Time})</td>
</tr>
<tr>
<td>(\text{Safety Stock} = \text{Service Level Factor}\times\sqrt{\text{(Average Lead Time} + \text{Review Period})} \times \text{Standard Deviation of Demand} \times \text{Standard Deviation of Lead Time}}\times\text{(Average Demand} \times \text{Average Demand} \times \text{Standard Deviation of Lead Time}))</td>
</tr>
<tr>
<td>(\text{Reorder Level} = \text{Average Demand}\times\text{Average Lead Time} + \text{Review Period}) + \text{Safety Stock})</td>
</tr>
<tr>
<td>(\text{Order Up To Level} = \text{Reorder Level} + \text{Economic Order Quantity})</td>
</tr>
<tr>
<td>(\text{Order Rate} = \text{When To Order? How Much To Order? How Often To Review?} = \text{IF(COUNTER(1,1+Review Period)=1)})</td>
</tr>
<tr>
<td>(\text{Order Completion Rate} = \text{CONVEYOR OUTFLOW})</td>
</tr>
<tr>
<td>(\text{Distributor Delivery Rate} = \text{Order Completion Rate})</td>
</tr>
<tr>
<td><strong>RUNTIME EQUATIONS</strong></td>
</tr>
<tr>
<td>(\text{Hospital Stock(t)} = \text{Hospital Stock(t-} dt) + \text{(Distributor Delivery Completion Rate - Consumption Rate)} \times dt)</td>
</tr>
<tr>
<td>(\text{Order Backlog(t)} = \text{Order Backlog(t-} dt) + \text{(Order Rate - Order Completion Rate)} \times dt)</td>
</tr>
<tr>
<td>(\text{On Transport From Distributor To Hospital(t-} dt) + \text{(Distributor Delivery Rate - Distributor Delivery Completion Rate)} \times dt)</td>
</tr>
<tr>
<td>(\text{Distributor Delivery Completion Rate} = \text{CONVEYOR OUTFLOW})</td>
</tr>
<tr>
<td>(\text{TRANSIT TIME} = \text{Order Processing Delay Time})</td>
</tr>
<tr>
<td>(\text{Review Period} = \text{MAX}(1, \text{ROUND}(\sqrt{((2*\text{Ordering Cost})/(\text{Average Demand}<em>365</em>\text{Item Unit Cost}*\text{Inventory Carrying Charge}))})))</td>
</tr>
<tr>
<td>(\text{Average Lead Time} = \text{Order Processing Delay Time} + \text{Transit Time})</td>
</tr>
<tr>
<td>(\text{Standard Deviation of Demand} = (1/3)\times\text{Average Demand})</td>
</tr>
<tr>
<td>(\text{Standard Deviation of Lead Time} = (1/3)\times\text{Average Lead Time})</td>
</tr>
<tr>
<td>(\text{Safety Stock} = \text{Service Level Factor}\times\sqrt{\text{(Average Lead Time} + \text{Review Period})} \times \text{Standard Deviation of Demand} \times \text{Standard Deviation of Lead Time}}\times\text{(Average Demand} \times \text{Average Demand} \times \text{Standard Deviation of Lead Time}))</td>
</tr>
<tr>
<td>(\text{Reorder Level} = \text{Average Demand}\times\text{Average Lead Time} + \text{Review Period}) + \text{Safety Stock})</td>
</tr>
<tr>
<td>(\text{Economic Order Quantity} = \sqrt{\text{(2<em>Ordering Cost)<em>Average Demand</em>365</em>Item Unit Cost*Inventory Carrying Charge))}))</td>
</tr>
<tr>
<td>(\text{Order Up To Level} = \text{Reorder Level} + \text{Economic Order Quantity})</td>
</tr>
<tr>
<td>(\text{Order Rate} = \text{When To Order? How Much To Order? How Often To Review?} = \text{IF(COUNTER(1,1+Review Period)=1)})</td>
</tr>
<tr>
<td>(\text{Order Completion Rate} = \text{CONVEYOR OUTFLOW})</td>
</tr>
<tr>
<td>(\text{Distributor Delivery Rate} = \text{Order Completion Rate})</td>
</tr>
</tbody>
</table>
Appendix D: Conceptual and Simulation Models of a Hospital Logistics System that is Using CR(IOBPCS) Inventory Control Approach

The aim of this Appendix is to provide a full explanation of how the stock-flow diagram of a hospital logistics system that is using CR(IOBPCS) inventory control approach - shown in Figure 3.8 in Chapter Three- is developed, and all the equations that make up the simulation model of that system. The stock-flow diagram and the simulation model are developed using *ithink* Analyst Software.

The main stock that we are interested in studying its dynamic behaviour in the stock-flow diagram shown in Figure 3.8 is *Hospital Stock*. Consumption of all hospital wards and departments are represented as *Consumption Rate*. Whereas, all deliveries from distributors are represented as *Distributor Delivery Rate*. *Consumption Rate* can be constant or variable (e.g. step input, pulse input, or random input, etc.).

The *Hospital Stock* is decreased due to *Consumption Rate* and increased due to *Distributor Delivery Completion Rate*. Delivering materials from distributor stock to *Hospital Stock* takes *Transit Time*. Materials do not go immediately from distributor to *Hospital Stock*. This pipeline effect is represented by the stock *On Transport from Distributor to Hospital* (i.e. the stock of those materials that have been out of distributor stock but not yet received by *Hospital Stock*).

The pipeline delay is used to model the material delay; since it captures the physical flow of materials between the distributor and hospital. Pipeline delays preserve the order of entry to a delay so the output is exactly the same as the input, but shifted by the time delay, and also assume no mixing of the contents of the stock in transit at all (Sterman, 2000). For the pipeline delay in Figure 3.8, the outflow (*Distributor Delivery Completion Rate*) is simply the inflow (*Distributor Delivery Rate*) lagged by the average delay time (*Transit Time*).
Also, the *Distributor Delivery Completion Rate* does not depend on how much material
*On Transport From Distributor To Hospital* – an assumption made by this author that
there is no transportation capacity limit.

Conveyors – one of the four varieties of stocks used in the *ithink* Analyst software – are
great for representing “pipeline delays” (Richmond, 2001). Therefore, the stock *On Transport From Distributor To Hospital* is represented as a conveyor. However, the *Hospital Stock* is represented as reservoir – another type of stocks used in the *ithink* Analyst. The reservoir operates most like a bathtub, where stuff flows in, and once it
does, individual entities become indistinguishable (Richmond, 2001). Usually, delay
times can change. In *ithink* Analyst, the transit time for a conveyor can be either
current or variable. However, in Figure 3.8, the transit time is assumed by this author
to be constant and equals *Transit Time*.

How much material the distributor should deliver to *Hospital Stock* depends on how
much material the hospital orders according to their *Inventory Control Decisions*. Usually the use of CR(IOBPCS) inventory control approach is accompanied by the use of point-of-sale (POS) and electronic data interchange (EDI). Therefore, it is assumed
that the Ordering process does not take time\(^1\). And therefore, in Figure 3.8, *Order Rate*
is connected directly to the *Distributor Delivery Rate* with a solid wire – one of the two
types of connectors in the *ithink* Analyst software. The solid wire is called an “action
connector”. Therefore, once an order is issued by the hospital using EDI technology,
and received immediately by the distributor, materials will be delivered from distributor
to *Hospital Stock*. Although, the *Distributor Delivery Rate* and the *Order Rate* are
assumed to be numerically equal and both are measured in the same units, they are
distinct concepts. The *Distributor Delivery Rate* is the rate physical product leaves the
distributor’s stock, while the *Order Rate* represents an information flow (i.e.
information about how much material should be delivered).

The amount of materials that are ordered by the hospital depends on their *Inventory
Control Decisions*. A solid wire then is used to connect the *Inventory Control Decisions*
diamond with the *Order Rate* to transmit the action resulting from the decision.

---
\(^1\) In fact, any process takes time. But, since the ordering process using EDI takes very little time
compared to the time for delivering materials, it is assumed that order processing delay time is equal zero.
The inputs to the Inventory Control Decisions and the Service Level Decisions—which are used to build the decisions logic—are information transmitted from other parts of the model using information connectors (dashed connectors)—the second type of connectors in the ithink Analyst.

The value of Transit Time is either variable or constant. The value of Average Lead Time is equal to the value of Transit Time. The value of Average Demand is constant. Information about the values of Service Level Factor and Average Demand are used to determine the value of Safety Stock according to the equation in Table 3.4 in Chapter Three.

Information about the values of Safety Stock, Consumption Rate, Hospital Stock, and Average Lead Time are used to determine the values of $T_a$, $T_h$, Target Level, Stock Discrepancy, Stock Adjustment and Average Consumption according to the equations in Table 3.4 in Chapter Three.

Information about the values of Average Consumption and Stock Adjustment are then used to determine the inventory control decision of (How Often to Review?, When to Order?, and How Much to Order?) according to the equations in Table 3.4 in Chapter Three.

The initial value of Hospital Stock is equal to Target Level. The initial value of On Transport From Distributor To Hospital is equal to Consumption Rate multiplied by Transit Time; to begin the system in an equilibrium state.

The equations that make up the simulation model of the hospital logistics system that is using CR(IOBPCS) inventory control approach are listed in Table D.1. The equations are listed according to the order of execution.
Table D. 1: The equations that make up the simulation model of the hospital logistics system that is using CR(IOBPCS) inventory control approach

{_INITIALIZATION EQUATIONS }

- Transit_Time = 3
- INIT On_Transport_From_Distributor_To_Hospital = 300
- TRANSIT_TIME = varies
- INFLOW_LIMIT = INF
- CAPACITY = INF
- Distributor_Delivery__Completion_Rate = CONVEYOR_OUTFLOW
- TRANSIT_TIME = Transit_Time
- Consumption__Rate = 100
- Average__Lead_Time = Transit_Time
- Ta = Average__Lead_Time
- Average__Consumption = SMTH1(Consumption__Rate, Ta)
- Ti = 3*Average__Lead_Time
- Service_Level_Factor = 1
- Average__Demand = 100
- Safety_Stock = Service_Level_Factor*Average__Demand
- Target_Level = Safety_Stock
- INIT Hospital_Stock = Target_Level
- Stock__Discrepancy = Target_Level-Hospital_Stock
- Stock__Adjustment = (1/Ti)*Stock__Discrepancy
- Order_Rate = When_to_Order?_How_Much_to_Order?_How_Often_to_Review?
- Distributor_Delivery_Rate = Order_Rate

{ RUNTIME EQUATIONS }

- Hospital_Stock(t) = Hospital_Stock(t - dt) + (Distributor_Delivery__Completion_Rate - Consumption__Rate) * dt
- On_Transport_From_Distributor_To_Hospital(t) = On_Transport_From_Distributor_To_Hospital(t - dt) + (Distributor_Delivery_Rate - Distributor_Delivery__Completion_Rate) * dt
- Distributor_Delivery__Completion_Rate = CONVEYOR_OUTFLOW
- TRANSIT_TIME = Transit_Time
- Average__Lead_Time = Transit_Time
- Ta = Average__Lead_Time
- Average__Consumption = SMTH1(Consumption__Rate, Ta)
- Ti = 3*Average__Lead_Time
- Safety_Stock = Service_Level_Factor*Average__Demand
- Target_Level = Safety_Stock
- Stock__Discrepancy = Target_Level-Hospital_Stock
- Stock__Adjustment = (1/Ti)*Stock__Discrepancy
- Order_Rate = When_to_Order?_How_Much_to_Order?_How_Often_to_Review?
- Distributor_Delivery_Rate = Order_Rate
Appendix E: Criterion for Optimising the Values of the Design Parameters \((T_a / T_p)\) and \((T_i / T_p)\) in a CR(IOBPCS) Model

The aim of this Appendix is to explain the criterion which the author carried out to choose the optimum values for the design parameters \((T_a / T_p)\) and \((T_i / T_p)\) in a CR(IOBPCS) model – shown in Figure 3.8 in Chapter Three – that will give an acceptable system performance based on a trade-off between stock fluctuation and order rate variations.

The criterion adopted here is used by Ferris and Towill (1993), John et al. (1994), and Towill and Del Vecchio (1994). In this criterion, the dynamic behaviour of the system – when subjected to a step increase in consumption – is assessed by a variety of measurements. Figure E.1 shows the dynamic-behaviour measurements that are selected for assessing stock level fluctuation and order rate variation.

To choose the optimum values for the design parameters \((T_a / T_p)\) and \((T_i / T_p)\), the CR(IOBPCS) model is subjected to 20 % step increase in Consumption Rate from an initial steady state rate of 100 items \((T_p =1 \text{ day}, \text{Length of simulation} = 30 \text{ days}, \text{and} \ DT= 0.0625)\). Figure E.2 shows the investigation of the dynamic behaviour of Hospital Stock and Order Rate for seven different combinations of \((T_a \text{ and } T_i)\). From a preliminary study of the dynamic behaviour of Hospital Stock and Order Rate in Figure E.2, some of the combinations are excluded.

Figure E.3 shows the investigation of the dynamic behaviour of Hospital Stock and Order Rate for the four combinations of \((T_a \text{ and } T_i)\) that will be assessed using the criterion in Figure E.1. Table E.1 summarises the results of the dynamic-behaviour measurements as taken from Figure E.3, where the shaded region in the table is for the optimum response. Whereas, Table E.2 summarises the effect of increasing \(T_a\) and \(T_i\) on the dynamic-behaviour measurements.
Since hospitals are usually most concerned with the stock deficit and duration of deficit, the author suggests that \( \frac{T_a}{T_p} = 1 \) and \( \frac{T_j}{T_p} = 3 \) are good design parameters for the CR(IOBPCS). The smallest maximum-stock deficit and the shortest duration of deficit of Hospital Stock is obtained when \( \frac{T_a}{T_p} = 1 \) and \( \frac{T_j}{T_p} = 3 \). However, when \( \frac{T_a}{T_p} = 1 \) and \( \frac{T_j}{T_p} = 3 \), peak overshoot in Order Rate as a percentage of nominal value is still acceptable.

Figure E. 1: Dynamic-behaviour measurements selected for system optimisation
Parameters ($T_a / T_p$ and $T_i / T_p$) in a CR(IOBPCS) Model

Figure E. 2: The investigation of the dynamic behaviour of Hospital Stock and Order Rate for seven different combinations of ($T_a$ and $T_i$)
Figure E. 3: The investigation of the dynamic behaviour of Hospital Stock and Order Rate for the four combinations of (Til and Tj) that will be assessed using the criterion in Figure E.1
Table E. 1: Summary of the results of the dynamic-behaviour measurements as taken from Figure E.3

<table>
<thead>
<tr>
<th>dynamic-behaviour measurements</th>
<th>(Ti=3Tp)(Ta=Tp)</th>
<th>(Ti=4Tp)(Ta=Tp)</th>
<th>(Ti=3Tp)(Ta=2Tp)</th>
<th>(Ti=4Tp)(Ta=2Tp)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hospital Stock measurements</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>maximum inventory deficit (items)</td>
<td>40</td>
<td>40</td>
<td>43.33</td>
<td>45</td>
</tr>
<tr>
<td>maximum inventory deficit as percentage of target level</td>
<td>13.33%</td>
<td>13.33%</td>
<td>14.44%</td>
<td>15%</td>
</tr>
<tr>
<td>duration of deficit (days)</td>
<td>6</td>
<td>18</td>
<td>8</td>
<td>21</td>
</tr>
<tr>
<td>maximum inventory surplus (items)</td>
<td>1.48</td>
<td>0</td>
<td>0.51</td>
<td>0</td>
</tr>
<tr>
<td>maximum inventory surplus as percentage of target level</td>
<td>0.49%</td>
<td>0</td>
<td>0.17%</td>
<td>0</td>
</tr>
<tr>
<td>duration of surplus (days)</td>
<td>5</td>
<td>0</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td><strong>Order Rate measurements</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>peak of over ordering (items per day)</td>
<td>13.33</td>
<td>10</td>
<td>11.94</td>
<td>8.75</td>
</tr>
<tr>
<td>peak of over ordering as percentage of nominal value</td>
<td>11.10%</td>
<td>8.33%</td>
<td>9.95%</td>
<td>7.29%</td>
</tr>
<tr>
<td>duration of over ordering (days)</td>
<td>6</td>
<td>16</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>rise time of ordering (days)</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>maximum fluctuation in ordering (items per day)</td>
<td>13.82</td>
<td>10</td>
<td>12.04</td>
<td>8.75</td>
</tr>
<tr>
<td>maximum fluctuation in ordering as percentage of nominal value</td>
<td>11.52%</td>
<td>8.33%</td>
<td>10.03%</td>
<td>7.29%</td>
</tr>
</tbody>
</table>
Table E. 2: Summary of the effect of increasing \( T_a \) and \( T_i \) on the dynamic-behaviour measurements

<table>
<thead>
<tr>
<th>dynamic-behaviour measurements</th>
<th>( Ti ) increases</th>
<th>( Ta ) increases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital Stock measurements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>maximum inventory deficit</td>
<td>No effect</td>
<td>increases</td>
</tr>
<tr>
<td>maximum inventory deficit as percentage of target level</td>
<td>No effect</td>
<td>increases</td>
</tr>
<tr>
<td>duration of deficit</td>
<td>increases</td>
<td>increases</td>
</tr>
<tr>
<td>maximum inventory surplus</td>
<td>decreases till it reaches zero then it has no effect</td>
<td>decreases</td>
</tr>
<tr>
<td>maximum inventory surplus as percentage of target level</td>
<td>decreases till it reaches zero then it has no effect</td>
<td>decreases</td>
</tr>
<tr>
<td>duration of surplus</td>
<td>decreases till it reaches zero then it has no effect</td>
<td>increases</td>
</tr>
<tr>
<td>Order Rate measurements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>peak of over ordering</td>
<td>decreases</td>
<td>decreases</td>
</tr>
<tr>
<td>peak of over ordering as percentage of nominal value</td>
<td>decreases</td>
<td>decreases</td>
</tr>
<tr>
<td>duration of over ordering</td>
<td>increases</td>
<td>slightly increases</td>
</tr>
<tr>
<td>rise time of ordering</td>
<td>no effect</td>
<td>increases</td>
</tr>
<tr>
<td>maximum fluctuation in ordering</td>
<td>decreases</td>
<td>decreases</td>
</tr>
<tr>
<td>maximum fluctuation in ordering as percentage of nominal value</td>
<td>decreases</td>
<td>decreases</td>
</tr>
</tbody>
</table>
Appendix F: Computer Simulation Model of the CNMC Logistics System

The aim of this Appendix is to provide all the equations that make up the computer simulation model of the CNMC logistics system—for stock items— which was developed using the verified stock-flow diagram shown in Figure 4.8 in Chapter Four. The simulation model was developed using the *ithink* Analyst Software. The equations that make up the simulation model are listed in Table F.1 according to the order of execution.
Table F.1: The equations that make up the computer simulation model of the CNMC logistics system

(Initialization Equations)

- \( \text{MWH\_Average\_Order\_Processing\_Delay\_Time} = 1 \)
- \( \text{MWH\_To\_CS\_Average\_Transit\_Time} = 0.125 \)
- \( \text{CS\_Average\_Order\_Processing\_Delay\_Time} = 0.125 \)
- \( \text{Suppliers\_To\_MWH\_Average\_Transit\_Time} = 1 \)

Initial on Transport From MWH To CS = 0

- Transit Time = varies
- INFLOW LIMIT = INF
- CAPACITY = INF

Initial CS\_Order\_Backlog = 0

- Transit Time = varies
- INFLOW LIMIT = INF
- CAPACITY = INF

Initial on Transport From Suppliers to MWH = 0

- Transit Time = varies
- INFLOW LIMIT = INF
- CAPACITY = INF

- \( \text{Average\_Demand} = 100 \)
- \( \text{MWH\_Delivery\_Completion\_Rate} = \text{CONVEYOR OUTFLOW} \)
- \( \text{TRANSIT\_TIME} = \text{MWH\_To\_CS\_Average\_Transit\_Time} \)
- \( \text{Consumption\_Rate} = \text{NORMAL(Average\_Demand, 3.5)} \)
- \( \text{CS\_Order\_Completion\_Rate} = \text{CONVEYOR OUTFLOW} \)
- \( \text{TRANSIT\_TIME} = \text{CS\_Average\_Order\_Processing\_Delay\_Time} \)
- \( \text{Suppliers\_Delivery\_Completion\_Rate} = \text{CONVEYOR OUTFLOW} \)
- \( \text{TRANSIT\_TIME} = \text{Suppliers\_To\_MWH\_Average\_Transit\_Time} \)
- \( \text{MWH\_Delivery\_Rate} = \text{CS\_Order\_Completion\_Rate} \)
- \( \text{CS\_Review\_Period} = 1 \)
- \( \text{CS\_Average\_Lead\_Time} = \text{CS\_Average\_Order\_Processing\_Delay\_Time} + \text{MWH\_To\_CS\_Average\_Transit\_Time} \)
- \( \text{CS\_Safety\_Stock} = 277\times\text{Average\_Demand} \)
- \( \text{CS\_Reorder\_Level} = \text{Average\_Demand}\times(\text{CS\_Average\_Lead\_Time} + \text{CS\_Review\_Period}) + \text{CS\_Safety\_Stock} \)
- Ordering\_Cost = 15
- Item\_Unit\_Cost = 1000
- Inventory\_Carrying\_Charge = 30/100
- \( \text{CS\_Economic\_Order\_Quantity} = \text{SORT}((2\times\text{Ordering\_Cost}\times\text{Average\_Demand}\times365)/((\text{Item\_Unit\_Cost}\times\text{Inventory\_Carrying\_Charge}\times365)) \)
- \( \text{CS\_Order\_Up\_To\_Level} = \text{CS\_Reorder\_Level} + \text{CS\_Economic\_Order\_Quantity} \)

Initial CS\_Stock = CS\_Order\_Up\_To\_Level

- \( \text{CS\_When\_to\_Order\_\_How\_Much\_to\_Order\_\_How\_Often\_to\_Review?} = \text{IF}((\text{COUNTER}(1, \text{CS\_Review\_Period} + 1) = 1, \text{AND}((\text{CS\_Stock} + \text{CS\_Order\_Backlog} + \text{On\_Transport\_From\_MWH\_To\_CS}) <= \text{CS\_Reorder\_Level}), \text{then} (\text{CS\_Order\_Up\_To\_Level} - \text{CS\_Stock})/\text{dt}) \), \text{else} (0)) \)
- \( \text{CS\_Order\_Rate} = \text{CS\_When\_to\_Order\_\_How\_Much\_to\_Order\_\_How\_Often\_to\_Review?} \)
- \( \text{MWH\_Order\_Completion\_Rate} = \text{CONVEYOR OUTFLOW} \)
- \( \text{TRANSIT\_TIME} = \text{MWH\_Average\_Order\_Processing\_Delay\_Time} \)
- \( \text{Suppliers\_Delivery\_Rate} = \text{MWH\_Order\_Completion\_Rate} \)
- \( \text{MWH\_Review\_Period} = 1 \)
- \( \text{MWH\_Average\_Lead\_Time} = \text{MWH\_Average\_Order\_Processing\_Delay\_Time} + \text{Suppliers\_To\_MWH\_Average\_Transit\_Time} \)
- \( \text{MWH\_Safety\_Stock} = 277\times\text{Average\_Demand} \)
- \( \text{MWH\_Reorder\_Level} = \text{Average\_Demand}\times(\text{MWH\_Average\_Lead\_Time} + \text{MWH\_Review\_Period}) + \text{MWH\_Safety\_Stock} \)
- \( \text{MWH\_Economic\_Order\_Quantity} = \text{SORT}((2\times\text{Ordering\_Cost}\times\text{Average\_Demand}\times365)/((\text{Item\_Unit\_Cost}\times\text{Inventory\_Carrying\_Charge}\times365)) \)
- \( \text{MWH\_Order\_Up\_To\_Level} = \text{MWH\_Reorder\_Level} + \text{MWH\_Economic\_Order\_Quantity} \)

Initial MWH\_Stock = MWH\_Order\_Up\_To\_Level

- \( \text{MWH\_When\_to\_Order\_\_How\_Much\_to\_Order\_\_How\_Often\_to\_Review?} = \text{IF}((\text{COUNTER}(1, \text{MWH\_Review\_Period} + 1) = 1, \text{AND}((\text{MWH\_Stock} + \text{MWH\_Order\_Backlog} + \text{On\_Transport\_From\_Suppliers\_to\_MWH}) <= \text{MWH\_Reorder\_Level}), \text{then} (\text{MWH\_Order\_Up\_To\_Level} - \text{MWH\_Stock})/\text{dt}) \), \text{else} (0)) \)
- \( \text{MWH\_Order\_Rate} = \text{MWH\_When\_to\_Order\_\_How\_Much\_to\_Order\_\_How\_Often\_to\_Review?} \)
Table F.1: The equations that make up the computer simulation model of the CNMC logistics system (continued)

<table>
<thead>
<tr>
<th>RUNTIME EQUATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS_Stock(t) = CS_Stock(t) + (MWH_Delivery_Completion_Rate - Consumption_Rate) * dt</td>
</tr>
<tr>
<td>MWH_Stock(t) = MWH_Stock(t) + (Suppliers_Delivery_Completion_Rate - MWH_Delivery_Rate) * dt</td>
</tr>
<tr>
<td>On_Transport_From_MWH_To_CS(t) = On_Transport_From_MWH_To_CS(t) + (MWH_Delivery_Rate - MWH_Delivery_Completion_Rate) * dt</td>
</tr>
<tr>
<td>CS_Order_Backlog(t) = CS_Order_Backlog(t) + (CS_Order_Rate - CS_Order_Completion_Rate) * dt</td>
</tr>
<tr>
<td>MWH_Order_Backlog(t) = MWH_Order_Backlog(t) + (MWH_Order_Rate - MWH_Order_Completion_Rate) * dt</td>
</tr>
<tr>
<td>CS_Delivery_Rate = CONVEYOR OUTFLOW TRANSIT TIME = CS_Average_Order_Processing_Delay_Time</td>
</tr>
<tr>
<td>MWH_Delivery_Rate = CS_Delivery_Rate = CONVEYOR OUTFLOW TRANSIT TIME = MWH_Average_Order_Processing_Delay_Time</td>
</tr>
<tr>
<td>CS_Average_Enter = CS_Average_Exit + MWH_To_CS_Average_Transit_Time</td>
</tr>
<tr>
<td>CS_Safety_Stock = 2<em>7</em>Average_Demand</td>
</tr>
<tr>
<td>CS_Economic_Order_Quantity = SQRT((2<em>Ordering_Cost</em>Average_Demand<em>365)/(Item_Unit_Cost</em>Inventory_Carrying_Charge))</td>
</tr>
<tr>
<td>CS_Order_Up_To_Level = CS_Reorder_Level + CS_Safety_Stock</td>
</tr>
<tr>
<td>CS_When_to_Order? = IF(COUNTER(1,CS_Review_Period+1)=1) AND((CS_Stock+CS_Order_Backlog+On_Transport_From_MWH_To_CS)&lt;=CS_Reorder_Level) then((CS_Reorder_Level-CS_Stock)/dt) else (0)</td>
</tr>
<tr>
<td>CS_Order_Rate = CS_When_to_Order?</td>
</tr>
<tr>
<td>MWH_Average_Enter = MWH_Average_Exit + Suppliers_To_MWH_Average_Transit_Time</td>
</tr>
<tr>
<td>MWH_Safety_Stock = 2<em>7</em>Average_Demand</td>
</tr>
<tr>
<td>MWH_Economic_Order_Quantity = SQRT((2<em>Ordering_Cost</em>Average_Demand<em>365)/(Item_Unit_Cost</em>Inventory_Carrying_Charge))</td>
</tr>
<tr>
<td>MWH_Order_Up_To_Level = MWH_Reorder_Level + MWH_Safety_Stock</td>
</tr>
<tr>
<td>MWH_When_to_Order? = IF(COUNTER(1,MWH_Review_Period+1)=1) and ((MWH_Stock+MWH_Order_Backlog+On_Transport_From_Suppliers_to_MWH)&lt;=MWH_Reorder_Level) then((MWH_Reorder_Level-MWH_Stock)/dt) else (0)</td>
</tr>
<tr>
<td>MWH_Order_Rate = MWH_When_to_Order?</td>
</tr>
</tbody>
</table>
Appendix G: Simulation Results of Redesigning the CNMC Logistics System

The aim of this Appendix is to provide a detailed discussion of the simulation results of redesigning the CNMC logistics (section 4.3.5 in Chapter Four). This Appendix contains two sections. The aim of the first section is to investigate how average stock, number of orders, and inventory cost change when changing Average Demand and Item Unit Cost for each operating strategy. The aim of the second section is to compare all operating strategies in terms of average stock, number of orders, and inventory cost when changing Item Unit Cost for each Average Demand.

G.1 Average stock, number of orders, and inventory cost for each operating strategy

Figure G.1 to Figure G.5 illustrate how average stock, number of orders, and inventory cost vary when changing Average Demand and Item Unit Cost as given in Figure 4.18 in Chapter Four for the following operating strategies: “current situation”, \((R,s,S)\), \((R,s,S)(\text{eliminate})\), CR(IOBPCS), and CR(IOBPCS) (eliminate). A cumulative and comparative impact of these behaviours is discussed subsequently.

- Average stock behaviour:

a) Changing Average Demand:

As shown in Figure G.1 (a) & (b) for the “current situation” operating strategy, Figure G.2 (a) & (b) for the \((R,s,S)\) operating strategy, and Figure G.3 (a) & (b) for the \((R,s,S)(\text{eliminate})\) operating strategy, average stock is a function of Average Demand, such that average stock follows an S-shaped curve with respect to Average Demand. This is because average stock depends on the values of reorder level and order-up-to level, where the equation of order-up-to level (see Table 3.1 and Table 4.2) includes a square-root function of Average Demand.
(a) Average stock \( \text{CS}_n = (\frac{1}{3})(\text{Average Demand}) \) 
(b) Average stock \( \text{CS}_D = (\frac{1}{3})(\text{Average Demand}) \) 

(c) Number of orders \( \text{CID} = (\frac{1}{3})(\text{Average Demand}) \) 
(d) Number of orders \( \text{CID} = (\frac{1}{3})(\text{Average Demand}) \) 

(e) Inventory cost \( \text{CID} = (\frac{1}{3})(\text{Average Demand}) \) 
(f) Inventory cost \( \text{CID} = (\frac{1}{3})(\text{Average Demand}) \) 

Figure G. 1: Average stock, number of orders, and inventory cost for the “current situation” operating strategy
<table>
<thead>
<tr>
<th>Item Unit</th>
<th>Average Demand</th>
<th>Unit Cost</th>
<th>Stock</th>
<th>Average Stock</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100–300, 400–700, 800–1000</td>
<td>&lt;7, $\bar{S}$ = (1/3)$\bar{D}$</td>
<td>(1)</td>
<td>(\bar{S})</td>
</tr>
</tbody>
</table>

(a) Average stock \(O' = (1/3)(\bar{D})\)

(b) Average stock \(<\bar{S}, \bar{S} = (1/3)(\bar{D})\)

(c) Number of orders \(CTD = (1/3)(\bar{D})\)

(d) Number of orders \(<\bar{D}, \bar{J} = (1/3)(\bar{D})\)

(e) Inventory cost \(<\bar{C}, \bar{n} = (1/3)(\bar{D})\)

(f) Inventory cost \(C7n = (1/3)(\bar{D})\)

Figure G. 2: Average stock, number of orders, and inventory cost for the \((R,s,S)\) operating strategy
Figure G.3: Average stock, number of orders, and inventory cost for the \((7s,s,5)\) (eliminate) operating strategy
Figure G. 4: Average stock, number of orders, and inventory cost for the CR(IOBPCS) operating strategy
(a) Average stock \((CT) = \frac{1}{3}(Average\ Demand)\)

(b) Average stock \((<7n = \frac{1}{30}(Average\ Demand))\)

(c) Number of orders \((7D = \frac{1}{3}(Average\ Demand))\)

(d) Number of orders \((G^* = \frac{1}{3}(Average\ Demand))\)

(e) Inventory cost \((7^* = \frac{1}{3}(Average\ Demand))\)

(f) Inventory cost \((<7n = \frac{1}{30}(Average\ Demand))\)

Figure G. 5: Average stock, number of orders, and inventory cost for the CR(IOBPCS) (eliminate) operating strategy.
Whereas, as shown in Figure G.4 (a) & (b) for the CR(IOBPCS) operating strategy, and Figure G.5 (a) & (b) for the CR(IOBPCS) (eliminate) operating strategy, average stock is a function of *Average Demand*, such that average stock varies linearly with *Average Demand*. This is because average stock depends on the value of target level; where the equation of target level (see Table 3.4) is a linear function of *Average Demand*.

**b) Changing Item Unit Cost:**

As shown in Figure G.1 (a) & (b) for the "current situation" operating strategy, Figure G.2 (a) & (b) for the \((R,s,S)\) operating strategy, and Figure G.3 (a) & (b) for the \((R,s,S)(\text{eliminate})\) operating strategy, average stock is a function of *Item Unit Cost*, such that average stock decreases as a goal-seeking exponential decay with increased *Item Unit Cost*. This is because average stock depends on the values of reorder level and order-up-to level, where the equation of order-up-to level (see Table 3.1 and Table 4.2) includes an inverse square-root function of *Item Unit Cost*.

Whereas, as shown in Figure G.4 (a) & (b) for the CR(IOBPCS) operating strategy, and Figure G.5 (a) & (b) for the CR(IOBPCS) (eliminate) operating strategy, average stock is not a function of *Item Unit Cost*. Therefore, average stock stays constant when increasing *Item Unit Cost*. This is because average stock depends on the value of target level; where *Item Unit Cost* is not a variable in the equation of target level (see Table 3.4).

- **Number of orders behaviour:**
  
  **a) Changing *Average Demand***:

  As shown in Figure G.1 (c) & (d) for the "current situation" operating strategy, Figure G.2 (c) & (d) for the \((R,s,S)\) operating strategy, and Figure G.3 (c) & (d) for the \((R,s,S)(\text{eliminate})\) operating strategy, number of orders is a function of *Average Demand*, such that number of orders follows a kind of S-shaped growth pattern with increasing *Average Demand*. This is especially true for the lower *Average Demand*.
Demand patterns of 1, 10 and 20. For the higher Average Demand patterns and higher Item Unit Cost, say above ($300 to $1000), there is a discontinuity noticed in the behaviour. This is because number of orders depends on the inverse value of (order-up-to level minus reorder level), on the inverse value of review period, and on consumption, where the equation of order-up-to level contains a square-root function of Average Demand, and the equation of review period\(^1\) contains a square-root function of the inverse of Average Demand (see Table 3.1 and Table 4.2).

However, as shown in Figure G.4 (c) & (d) for the CR(IOBPCS) operating strategy, and Figure G.5 (c) & (d) for the CR(IOBPCS) (eliminate) operating strategy, number of orders is not a function of Average Demand. This is because in the IOBPCS a constant order is placed at each period \(t\) (see Table 3.4).

b) Changing Item Unit Cost:

As shown in Figure G.1 (c) & (d) for the “current situation” operating strategy, Figure G.2 (c) & (d) for the \((R,s,S)\) operating strategy, and Figure G.3 (c) & (d) for the \((R,s,S)\)(eliminate) operating strategy, number of orders is a function of Item Unit Cost, such that number of orders follows a kind of S-shaped growth pattern (as explained earlier) with increasing Item Unit Cost. This is because number of orders depends on the inverse value of (order-up-to level minus reorder level), on the inverse value of review period, and on consumption, where both the equation of order-up-to level and the equation of review period\(^2\) contains a square-root function of the inverse of Item Unit Cost (see Table 3.1 and Table 4.2).

However, as shown in Figure G.4 (c) & (d) for the CR(IOBPCS) operating strategy, and Figure G.5 (c) & (d) for the CR(IOBPCS) (eliminate) operating strategy, number of orders is not a function of Item Unit Cost. This is because number of orders is constant (i.e. ordering is done each period \(t\) (see Table 3.4)).

\(^1\) This is only for the \((R,s,S)\) operating strategy and the \((R,s,S)\)(eliminate) operating strategy. Whereas, for the “current situation” operating strategy, review period is constant.

\(^2\) This is only for the \((R,s,S)\) operating strategy and the \((R,s,S)\)(eliminate) operating strategy. Whereas, for the “current situation” operating strategy, review period is constant.
• Inventory cost behaviour:

  a) Changing *Average Demand*:

For all operating strategies as shown in Figure G.1 (e) & (f) for the “current situation” operating strategy, Figure G.2 (e) & (f) for the \((r,s,S)\) operating strategy, Figure G.3 (e) & (f) for the \((r,s,S)\) (eliminate) operating strategy, Figure G.4 (e) & (f) for the CR(IOBPCS) operating strategy, and Figure G.5 (e) & (f) for the CR(IOBPCS) (eliminate) operating strategy, inventory cost is a function of *Average Demand*, such that inventory cost increases linearly with *Average Demand*. This is because the effect of *Average Demand* on inventory cost combines the effects of *Average Demand* on both average stock and number of orders according to the inventory cost equation (see section 4.3.5).

  b) Changing *Item Unit Cost*:

For all operating strategies as shown in Figure G.1 (e) & (f) for the “current situation” operating strategy, Figure G.2 (e) & (f) for the \((r,s,S)\) operating strategy, Figure G.3 (e) & (f) for the \((r,s,S)\) (eliminate) operating strategy, Figure G.4 (e) & (f) for the CR(IOBPCS) operating strategy, and Figure G.5 (e) & (f) for the CR(IOBPCS) (eliminate) operating strategy, inventory cost is a function of *Item Unit Cost*, such that inventory cost increases linearly with *Item Unit Cost*. This is because the effect of *Item Unit Cost* on inventory cost combines the effects of *Item Unit Cost* on both average stock and number of orders according to the inventory cost equation (see section 4.3.5).

**G.2 Comparison of the five operating strategies in terms of average stock, number of orders, and inventory cost**

Figure G.6 to Figure G.16 compare the five operating strategies in terms of average stock, number of orders, and inventory cost when changing *Item Unit Cost* for the following values of *Average Demand*, respectively: 1 item/day, 10 items/day, 20 items/day, 30 items/day, 40 items/day, 50 items/day, 60 items/day, 70 items/day, 80 items/day, 90 items/day, and 100 items/day. Discussion of the Figures is provided subsequently.
Figure G. 6: Comparison of the five operating strategies in terms of average stock, number of orders, and inventory cost when Average Demand = 1 item/day
Figure G. 7: Comparison of the five operating strategies in terms of average stock, number of orders, and inventory cost when Average Demand = 10 items/day
Figure G. 8: Comparison of the five operating strategies in terms of average stock, number of orders, and inventory cost when Average Demand = 20 items/day.
Figure G. 9: Comparison of the five operating strategies in terms of average stock, number of orders, and inventory cost when Average Demand = 30 items/day
Figure G. 10: Comparison of the five operating strategies in terms of average stock, number of orders, and inventory cost when Average Demand = 40 items/day
Figure G. 11: Comparison of the five operating strategies in terms of average stock, number of orders, and inventory cost when Average Demand = 50 items/day
Figure G. 12: Comparison of the five operating strategies in terms of average stock, number of orders, and inventory cost when Average Demand = 60 items/day
(a) Average stock ($T^* = (1/3)(\text{Average Demand})$)

(b) Average stock ($CTD = (1/30)(\text{Average Demand})$)

(c) Number of orders ($CI^* = (1/3)(\text{Average Demand})$)

(d) Number of orders ($CFD = (1/30)(\text{Average Demand})$)

(e) Inventory cost ($CTD = (1/3)(\text{Average Demand})$)

(f) Inventory cost ($Cn = (1/30)(\text{Average Demand})$)

Figure G. 13: Comparison of the five operating strategies in terms of average stock, number of orders, and inventory cost when Average Demand = 70 items/day

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Figure G. 14: Comparison of the five operating strategies in terms of average stock, number of orders, and inventory cost when Average Demand = 80 items/day
Figure G. 15: Comparison of the five operating strategies in terms of average stock, number of orders, and inventory cost when \( \text{Average Demand} = 90 \) items/day
Figure G. 16: Comparison of the five operating strategies in terms of average stock, number of orders, and inventory cost when Average Demand = 100 items/day
• **Average stock comparison:**

By comparing Figure G.6 (a) & (b) to Figure G.16 (a) & (b), for all items (i.e. for all values of *Average Demand* and for all values of *Item Unit Cost*), average stock is the highest for the “current situation” operating strategy and the lowest for the CR(IOBPCS) (eliminate) operating strategy.

It can be noticed from the above figures that there is a large difference –for all items- between the values of average stock for the “current situation” operating strategy against the remaining four operating strategies. These results are verified by the CNMC Materials Management Director who emphasised the problem of having very high stock levels.

• **Number of orders comparison:**

By comparing Figure G.6 (c) & (d) to Figure G.16 (c) & (d), for all items (i.e. for all values of *Average Demand* and for all values of *Item Unit Cost*), number of orders is the highest for the CR(IOBPCS) operating strategy and the lowest for the \((R,s,S)\)(eliminate) operating strategy. This is because, for the CR(IOBPCS) operating strategy, continuous replenishment means a constant order is placed at each period \(t\) (see Table 3.4). However, for the \((R,s,S)\)(eliminate) operating strategy, number of orders depends on a trade-off between inventory carrying cost and ordering cost.

• **Inventory cost comparison:**

By comparing Figure G.6 (e) & (f) to Figure G.16 (e) & (f), for all items (i.e. for all values of *Average Demand* and for all values of *Item Unit Cost*), inventory cost is the highest for the “current situation” operating strategy. While, for all items except items with *Average Demand* = 1 and *Item Unit Cost* = 1, inventory cost is the lowest for the CR(IOBPCS) (eliminate) operating strategy. However, for items with *Average Demand* = 1 and *Item Unit Cost* = 1, inventory cost is the lowest for the \((R,s,S)\)(eliminate) operating strategy.
The above comparison results of the five operating strategies in terms of average stock, number of orders, and inventory cost is the same for \( \sigma_D = (1/3)(\text{Average Demand}) \) and for \( \sigma_D = (1/30)(\text{Average Demand}) \). \( \sigma_D = (1/3)(\text{Average Demand}) \) was chosen to represent items with high variable demand, whereas \( \sigma_D = (1/30)(\text{Average Demand}) \) was chosen to represent items with low variable demand.
Appendix H: Computer Simulation Model of the DRI Logistics System

The aim of this Appendix is to provide all the equations that make up the computer simulation model of the DRI logistics system—for stock items—which was developed using the verified stock-flow diagram shown in Figure 4.28 in Chapter Four. The simulation model was developed using the *think* Analyst Software. The equations that make up the simulation model are listed in Table H.1 according to the order of execution.

Table H.1: The equations that make up the computer simulation model of the DRI logistics system

```plaintext
(INITIALIZATION EQUATIONS)

1. NHS_LA_To_Ward_or_Department_Average_Transit_Time = 3
2. INIT On_Transport_From_NHS_LA_To_Ward_or_Department = 0
   TRANSIT TIME = varies
   INFLOW LIMIT = INF
   CAPACITY = INF
3. Average_Demand = 100
4. NHS_LA_Delivery_Completion_Rate = CONVEYOR OUTFLOW
   TRANSIT TIME = NHS_LA_To_Ward_or_Department_Average_Transit_Time
5. Consumption_Rate = Average_Demand
6. Ward_or_Department_Review_Period = 7
7. Ward_or_Department_Order_Up_To_Level = 20*Average_Demand
8. INIT Ward_or_Department_Stock = Ward_or_Department_Order_Up_To_Level
9. Ward_or_Department_Reorder_Level = 10*Average_Demand

WHEN_TO_ORDER? HOW MUCH TO ORDER? HOW OFTEN TO REVIEW?

IF (COUNTER(1,1 + Ward_or_Department_Review_Period) = 1)
   AND (Ward_or_Department_Stock + On_Transport_From_NHS_LA_To_Ward_or_Department <= Ward_or_Department_Reorder_Level)
   THEN ((Ward_or_Department_Order_Up_To_Level - Ward_or_Department_Stock)/dt)
   ELSE (0)

Ward_or_Department_Order_Rate = WHEN_TO_ORDER? HOW MUCH TO ORDER? HOW OFTEN TO REVIEW?
NHS_LA_Delivery_Rate = Ward_or_Department_Order_Rate

(RUNTIME EQUATIONS)

1. Ward_or_Department_Stock(t) = Ward_or_Department_Stock(t - dt) + (NHS_LA_Delivery_Completion_Rate - Consumption_Rate) * dt
2. On_Transport_From_NHS_LA_To_Ward_or_Department(t) = On_Transport_From_NHS_LA_To_Ward_or_Department(t - dt) +
   (NHS_LA_Delivery_Rate - NHS_LA_Delivery_Completion_Rate) * dt
3. NHS_LA_Delivery_Completion_Rate = CONVEYOR OUTFLOW
   TRANSIT TIME = NHS_LA_To_Ward_or_Department_Average_Transit_Time
4. Consumption_Rate = Average_Demand
5. Ward_or_Department_Order_Up_To_Level = 20*Average_Demand
6. Ward_or_Department_Reorder_Level = 10*Average_Demand
7. WHEN_TO_ORDER? HOW MUCH TO ORDER? HOW OFTEN TO REVIEW?
   IF (COUNTER(1,1 + Ward_or_Department_Review_Period) = 1)
   AND (Ward_or_Department_Stock + On_Transport_From_NHS_LA_To_Ward_or_Department <= Ward_or_Department_Reorder_Level)
   THEN ((Ward_or_Department_Order_Up_To_Level - Ward_or_Department_Stock)/dt)
   ELSE (0)

Ward_or_Department_Order_Rate = WHEN_TO_ORDER? HOW MUCH TO ORDER? HOW OFTEN TO REVIEW?
NHS_LA_Delivery_Rate = Ward_or_Department_Order_Rate

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Appendix I: Simulation Results of Redesigning the DRI Logistics System

The aim of this Appendix is to provide a detailed discussion of the simulation results of redesigning the DRI logistics (section 4.4.5 in Chapter Four). This Appendix contains two sections. The aim of the first section is to investigate how average stock, number of orders, and inventory cost change when changing Average Demand and Item Unit Cost for each operating strategy. The aim of the second section is to compare all operating strategies in terms of average stock, number of orders, and inventory cost when changing Item Unit Cost for each Average Demand.

I.1 Average stock, number of orders, and inventory cost for each operating strategy

Figure I.1 to Figure I.3 illustrate how average stock, number of orders, and inventory cost vary when changing Average Demand and Item Unit Cost as given in Figure I.8 for the following operating strategies: “current situation”, (R,s,S), and CR(IOBPCS). A cumulative and comparative impact of these behaviours is discussed subsequently.

- Average stock behaviour:
  a) Changing Average Demand:

As shown in Figure I.1 (a) & (b) for the “current situation” operating strategy, average stock is a function of Average Demand, such that average stock increases linearly when increasing Average Demand. This is because average stock depends on the values of reorder level and order-up-to level, where the equations of reorder level and order-up-to level (see Table 4.6) are linear functions of Average Demand.
Figure 1.1: Average stock, number of orders, and inventory cost for the “current situation” operating strategy
<table>
<thead>
<tr>
<th>Item Unit Cost</th>
<th>0</th>
<th>20</th>
<th>50</th>
<th>100</th>
<th>150</th>
<th>200</th>
<th>000</th>
</tr>
</thead>
<tbody>
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<td>Item Unit Cost</td>
<td>0</td>
<td>20</td>
<td>50</td>
<td>100</td>
<td>150</td>
<td>200</td>
<td>000</td>
</tr>
</tbody>
</table>

(a) Average stock \( (T_n = (1/3)(Average Demand)) \)  
(b) Average stock \( (T = (1/3)(Average Demand)) \)

<table>
<thead>
<tr>
<th>Number of orders</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
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<td>150</td>
<td>200</td>
<td>000</td>
</tr>
<tr>
<td>Item Unit Cost</td>
<td>0</td>
<td>20</td>
<td>50</td>
<td>100</td>
<td>150</td>
<td>200</td>
<td>000</td>
</tr>
</tbody>
</table>

(c) Number of orders \( (T_n = (1/3)(Average Demand)) \)  
(d) Number of orders \( (T = (1/3)(Average Demand)) \)

<table>
<thead>
<tr>
<th>Inventory Cost</th>
<th>-800</th>
<th>-500</th>
<th>-1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Cost</td>
<td>-800</td>
<td>-500</td>
<td>-1000</td>
</tr>
</tbody>
</table>

(e) Inventory cost \( (CF_n = (1/3)(Average Demand)) \)  
(f) Inventory cost \( (CF = (1/3)(Average Demand)) \)

Figure I. 2: Average stock, number of orders, and inventory cost for the \((R,s,S)\) operating strategy
Figure I. 3: Average stock, number of orders, and inventory cost for the CR(IOBPCS) operating strategy
As shown in Figure I.2 (a) & (b) for the \((R,s,S)\) operating strategy, average stock is a function of \(Average \ Demand\), such that average stock increases as an S-shaped growth when increasing \(Average \ Demand\). This is because average stock depends on the values of reorder level and order-up-to level, where the equation of order-up-to level (see Table 3.1) contains a square-root function of \(Average \ Demand\).

As shown in Figure I.3 (a) & (b) for the CR(IOBPCS) operating strategy, average stock is a function of \(Average \ Demand\), such that average stock increases linearly when increasing \(Average \ Demand\). This is because average stock depends on the value of target level; where the equation of target level (see Table 3.4) is a linear function of \(Average \ Demand\).

b) Changing \(Item \ Unit \ Cost\):

As shown in Figure I.1 (a) & (b) for the "current situation" operating strategy, average stock is not a function of \(Item \ Unit \ Cost\), such that average stock stays constant when increasing \(Item \ Unit \ Cost\). This is because average stock depends on the values of reorder level and order-up-to level, where \(Item \ Unit \ Cost\) is not a variable in the equations of reorder level and order-up-to level (see Table 4.6).

As shown in Figure I.2 (a) & (b) for the \((R,s,S)\) operating strategy, average stock is a function of \(Item \ Unit \ Cost\), such that average stock decreases as a goal-seeking exponential decay when increasing \(Item \ Unit \ Cost\). This is because average stock depends on the values of reorder level and order-up-to level; where the equation of order-up-to level (see Table 3.1) contains a square-root function of the inverse of \(Item \ Unit \ Cost\).

As shown in Figure I.3 (a) & (b) for the CR(IOBPCS) operating strategy, average stock is not a function of \(Item \ Unit \ Cost\), such that average stock stay constant when increasing \(Item \ Unit \ Cost\). This is because average stock depends on the value of target level, where \(Item \ Unit \ Cost\) is not a variable in the equation of target level (see Table 3.4).
• Number of orders behaviour:

a) Changing Average Demand:

As shown in Figure I.1 (c) & (d) for the “current situation” operating strategy, number of orders is not a function of *Average Demand*. This is because number of orders depends on the inverse value of (order-up-to level minus reorder level), on the inverse value of review period, and on consumption, where the equations of consumption, reorder level and order-up-to level (see Table 4.6) are linear functions of *Average Demand*, whereas review period is constant.

As shown in Figure I.2 (c) & (d) for the (\(r,s,S\)) operating strategy, number of orders is a function of *Average Demand*, such that number of orders follows an S-shaped curve with increasing *Average Demand*. This is because number of orders depends on the inverse value of (order-up-to level minus reorder level), on the inverse value of review period, and on consumption, where the equation of order-up-to level includes a square-root function of *Average Demand*, and the equation of review period contains a square-root function of the inverse of *Average Demand* (see Table 3.1).

As shown in Figure I.3 (c) & (d) for the CR(IOBPCS) operating strategy, number of orders is not a function of *Average Demand*. This is because number of orders is constant (i.e. ordering is done each period \(t\) (see Table3.4)).

b) Changing Item Unit Cost:

As shown in Figure I.1 (c) & (d) for the “current situation” operating strategy, number of orders is not a function of *Item Unit Cost*. This is because number of orders depends on the inverse value of (order-up-to level minus reorder level), on the inverse value of review period, and on consumption, where *Item Unit Cost* is not a variable in the equations of reorder level and order-up-to level (see Table 4.6), whereas, review period is constant.
As shown in Figure I.2 (c) & (d) for the \((R,s,S)\) operating strategy, number of orders is a function of \emph{Item Unit Cost}, such that number of orders follows an S-shaped curve with increasing \emph{Item Unit Cost}. This is because number of orders depends on the inverse value of (order-up-to level minus reorder level), on the inverse value of review period, and on consumption, where both the equation of order-up-to level and the equation of review period contains a square-root function of the inverse of \emph{Item Unit Cost} (see Table 3.1).

As shown in Figure I.3 (c) & (d) for the CR(IOBPCS) operating strategy, number of orders is not a function of \emph{Item Unit Cost}. This is because number of orders is constant (i.e. ordering is done each period \(t\) (see Table 3.4)).

- \textbf{Inventory cost behaviour:}

\textbf{a) Changing Average Demand:}

For all operating strategies as shown in Figure I.1 (e) & (f) for the “current situation” operating strategy, Figure I.2 (e) & (f) for the \((R,s,S)\) operating strategy, Figure I.3 (e) & (f) for the CR(IOBPCS) operating strategy, inventory cost is a function of \emph{Average Demand}, such that inventory cost increases linearly when increasing \emph{Average Demand}. This is because the effect of \emph{Average Demand} on inventory cost combines the effects of \emph{Average Demand} on both average stock and number of orders according to the inventory cost equation (see section 4.3.5).

\textbf{b) Changing Item Unit Cost:}

For all operating strategies as shown in Figure I.1 (e) & (f) for the “current situation” operating strategy, Figure I.2 (e) & (f) for the \((R,s,S)\) operating strategy, Figure I.3 (e) & (f) for the CR(IOBPCS) operating strategy, inventory cost is a function of \emph{Item Unit Cost}, such that inventory cost increases linearly when increasing \emph{Item Unit Cost}. This is because the effect of \emph{Item Unit Cost} on inventory cost combines the effects of \emph{Item Unit Cost} on both average stock and number of orders according to the inventory cost equation (see section 4.3.5).
I.2 Comparison of the three operating strategies in terms of average stock, number of orders, and inventory cost

Figure I.4 to Figure I.14 compare the three operating strategies in terms of average stock, number of orders, and inventory cost when changing Item Unit Cost for the following values of Average Demand, respectively: 1 item/day, 10 items/day, 20 items/day, 30 items/day, 40 items/day, 50 items/day, 60 items/day, 70 items/day, 80 items/day, 90 items/day, and 100 items/day. Discussion of the Figures is provided subsequently.

- Average stock comparison:

For all items (except items with low Average Demand and very low Item Unit Cost) as shown in Figure I.4 (a) & (b) to Figure I.14 (a) & (b), average stock is the highest when using the “current situation” operating strategy. However, for items with low Average Demand and very low Item Unit Cost, average stock is the highest when using the (R,s,S) operating strategy. While for all items, average stock is the lowest when using the CR(IOBPCS) operating strategy.

- Number of orders comparison:

For all items as shown in Figure I.4 (c) & (d) to Figure I.14 (c) & (d), number of orders is the highest when using the CR(IOBPCS) operating strategy, whereas for all items (except items with low Average Demand and very low Item Unit Cost) number of orders is the lowest when using the “current situation” operating strategy. However, for items with low Average Demand and very low Item Unit Cost, number of orders is the lowest when using the (R,s,S) operating strategy.
Figure I. 4: Comparison of the three operating strategies in terms of average stock, number of orders, and inventory cost when \( \text{Average Demand} = 1 \) item/day
Figure I. 5: Comparison of the three operating strategies in terms of average stock, number of orders, and inventory cost when Average Demand = 10 item/day
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Figure I. 10: Comparison of the three operating strategies in terms of average stock, number of orders, and inventory cost when Average Demand = 60 item/day
Figure I. 11: Comparison of the three operating strategies in terms of average stock, number of orders, and inventory cost when Average Demand = 70 item/day
Figure I. 12: Comparison of the three operating strategies in terms of average stock, number of orders, and inventory cost when \( \text{Average Demand} = 80 \) item/day
Figure I. 13: Comparison of the three operating strategies in terms of average stock, number of orders, and inventory cost when Average Demand = 90 item/day
Figure I. 14: Comparison of the three operating strategies in terms of average stock, number of orders, and inventory cost when Average Demand = 100 item/day
• Inventory cost comparison:

For all items (except items with very low Average Demand or items with very low Item Unit Cost) as shown in Figure I.4 (e) & (f) to Figure I.14 (e) & (f), inventory cost is the highest when using the “current situation” operating strategy and the lowest when using the CR(IOBPCS) operating strategy. However, for items with very low Average Demand or items with very low Item Unit Cost, inventory cost is the lowest when using the (R,s,S) operating strategy.

The above comparison results of the three operating strategies in terms of average stock, number of orders, and inventory cost is the same for \( \sigma_D = (1/3)(\text{Average Demand}) \) and for \( \sigma_D = (1/30)(\text{Average Demand}) \). \( \sigma_D = (1/3)(\text{Average Demand}) \) was chosen to represent items with high variable demand, whereas, \( \sigma_D = (1/30)(\text{Average Demand}) \) was chosen to represent items with low variable demand.
REFERENCE
Embedding Generic Employability Skills in Greek Accounting Education Studies: Development and Impediments

Sofia Asonitou

A thesis submitted in partial fulfilment of the requirements of Sheffield Hallam University for the degree of Doctor of Philosophy

11 September 2014
DECLARATION

I hereby certify that this material which I now submit for assessment on the program of study leading to the award of a Doctor of Philosophy is entirely my own work, that I have exercised reasonable care to ensure that the work is original, and does not in the best of my knowledge breach any law of copyright, and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my own work.

Signed: Sofia Asonitou

ID No: 15031075

Date: 11 September 2014
The aim of this thesis is to explore the response of Greek Higher Education (HE) Institutes to the rapidly-changing global evolutions that lead to the introduction of skills and competences (professional skills) within accounting courses.

The introduction of professional skills in HE accounting courses constitutes a "paradigm shift" and signifies the transformation of future accountants (especially management accountants) from "bean counters to business advisors and successful management team members" who will be capable of supporting their employers to overcome global challenges and take informed decisions. The European Union and the Bologna Process have devoted considerable resources and efforts, through the establishment of European Higher Education Area (EHEA) and the European Credit Transfer and Accumulation System (ECTS), to promote professional skills and competences and, through them, the employability prospects of HE graduates.

The thesis employs the New Institutional Sociology (NIS; DiMaggio and Powell, 1983, 1991) combined with the typology of Oliver (1991) with regard to the increasing privatisation of HE (Meyer and Rowan, 2006) and specifically institutional isomorphism (coercive, mimetic, normative) as a tool to analyse the pressures and barriers to skills introduction in HE accounting courses.

The study employs a Mixed Methods Methodology and a 3-Phase Sequential Exploratory Design (Creswell and Plano Clark, 2007) to investigate the views of three groups of stakeholders: accounting teachers, business administration and accounting students and accountants, via interviews, questionnaires, documentary analysis, web-based research, and informal discussions.

The main findings are:

- Professional skills are considered important by all stakeholders in Greece, but a gap exists between the importance assigned to skills and their delivery by the educational process.

- The skill in most need of attention is "the ability for students to identify and solve unstructured problems".

- There are convergent and divergent isomorphic pressures regarding the introduction of professional skills in H.E accounting courses, both internal and external.
The internal divergent isomorphic pressures come from three groups: the educational system (i.e. lack of communication, support and motivation), the teachers (i.e. non-reflective practices, lack of training), and the students (i.e. absenteeism, cultural and educational background). The external divergent isomorphic pressures come from the market (i.e. structure and attitude), the state (i.e. tax system) and the employers (i.e. ignorance).

The convergent isomorphic pressures are exerted on an individual, organisational and national level and are identified as institutional (coercive, normative, mimetic, normative-mimetic and mimetic-coercive) as well as competitive pressures.

Greek HE Institutions have so far adopted strategies of defiance, manipulation, avoidance and compromise in response to skills introduction.
ACKNOWLEDGEMENTS

I wish to acknowledge the contribution made by the Director of Studies Professor Trevor Hassall and the supervisor Professor John Joyce. Especially I would like to express my deep appreciation for Professor Trevor Hassall who has been standing by my side and acted as a mentor and a good friend to this long journey. Also I would like to thank my good friends in Sheffield, Jill, Katie and Ben for their excellent hospitality the past years.

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Thank you also to all those teachers, students and accountants in Greece, who participated in the research interviews or filled in the questionnaires.

Thank you to my family for their support and especially to my mother Vasiliki for her deep love and for showing me years ago the path to my academic journey. Sadly she left us six months ago but I believe she would be proud and happy of my endeavours.

Finally I would like to give special thanks to my good friend Haris Tromaridis for his continuous and sincere support.
I dedicate this thesis to my mother Vasiliki Asoniti Kazakou, who I lost six months ago and to my grandmother, Aspasia Kazakou Zarida.

They were both exceptional women who achieved a lot despite the limited opportunities that were offered to them.
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<th>Description</th>
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<tbody>
<tr>
<td>AAA</td>
<td>American Accounting Association</td>
</tr>
<tr>
<td>ACCA</td>
<td>Association of Certified Chartered Accountants</td>
</tr>
<tr>
<td>AECC</td>
<td>Accounting Education Change Committee</td>
</tr>
<tr>
<td>AIA</td>
<td>Association of International Accountants</td>
</tr>
<tr>
<td>AICPA</td>
<td>American Institute of Certified Public Accountants</td>
</tr>
<tr>
<td>AP</td>
<td>Accounting Profession</td>
</tr>
<tr>
<td>ATEI</td>
<td>Higher Technological Educational Institute</td>
</tr>
<tr>
<td>BA</td>
<td>Business Administration</td>
</tr>
<tr>
<td>BAA</td>
<td>Business Administration and Accounting</td>
</tr>
<tr>
<td>CIMA</td>
<td>Chartered Institute of Management Accountants</td>
</tr>
<tr>
<td>CPA</td>
<td>Certified Public Accountant</td>
</tr>
<tr>
<td>EC</td>
<td>European Commission</td>
</tr>
<tr>
<td>ECGr</td>
<td>Economic Chamber of Greece</td>
</tr>
<tr>
<td>ECTS</td>
<td>European Credit Transfer and Accumulation System</td>
</tr>
<tr>
<td>EEC</td>
<td>External Evaluation Committee</td>
</tr>
<tr>
<td>EHEA</td>
<td>European Higher Education Area</td>
</tr>
<tr>
<td>ELTE</td>
<td>Committee for the Accounting Standardization and Control (EATE)</td>
</tr>
<tr>
<td>EQF</td>
<td>European Qualification Framework</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>FEI</td>
<td>Financial Executive Institute</td>
</tr>
<tr>
<td>HE</td>
<td>Higher Education</td>
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<tr>
<td>HEI</td>
<td>Higher Educational Institution</td>
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<tr>
<td>HQAA</td>
<td>Hellenic Quality Assurance and Accreditation Agency</td>
</tr>
<tr>
<td>IASB</td>
<td>International Accounting Standards Board</td>
</tr>
<tr>
<td>IES</td>
<td>International Education Standard</td>
</tr>
</tbody>
</table>
IFAC International Federation of Accountants
IFRS International Financial Reporting Standards
IMA Institute of Management Accountants
IME Institute of Small Medium Enterprises in Greece
IP Indicator of Priority
KSAs Knowledge, Skills and Abilities
MoE Ministry of Education
QAA Quality Assurance Agency
SAL Students’ Approaches to Learning
SEV Hellenic Federation of Enterprises and Industries (ΣΕΒ)
SME Small Medium Enterprises
MD Ministerial Decision
PD Presidential Decree

List of Laws

2190 & 2191/1920  2905 & 5343/1922
1268/FEK87A/1982  2916/FEK114/2001
3191/FEK258A/2003  3369/FEK171/2005
3374/FEK89A/2005  3404/FEK260/2005
FEK1466/2007 (MD)  2083/FEK159A/2008
FEK78A/2010/38 (PD)  3879/FEK163/2010
4009/FEK195A/2011  4076/FEK159/2012
4152/FEK107A/2013  4186/FEK193/2013
CHAPTER 1 Introduction

1.1 Background to the research

The last few decades have seen a process of change in the field of education in many countries. In the context of this overall change, accounting education has also been affected. Accounting education targets the preparation of individuals to become accountants. In the US and other western countries as well as Australia and New Zealand, it has become apparent that this preparation is insufficient. Academics and accounting employers claim that entry-level accountants are poorly educated and unprepared to enter the profession. In this case, graduates may have the technical expertise but lack communication skills and the proper ethical development (Mathews, 2001).

Accounting education reform started in the US in the early 80’s and continues to date. Even though many changes have occurred and the accounting community, practitioners and academics have cooperated over improving accounting education, there is evidence that many problems remain (Albrecht and Sack, 2000). In each country, accounting education reform had a different origin. In the US, the reform was initiated by market needs while in the UK by academics and the government. In the rest of Europe, education change has been initiated by the local Governments, as indicated by the commitment to the Bologna Declaration in 1999. In this joint declaration, European Ministers of Education recognized that “knowledge” is an important factor for social and human growth as well as an indispensable component when facing the challenges of the globalization era.

By signing the Bologna Declaration in 1999, the EU countries faced an important challenge: the harmonization of their Higher Education (hereafter HE) systems through the establishment of the European Higher Education Area (EHEA). The Bologna process is fostering a change in HE systems to promote the educational convergence, comparability and mobility of students and academics. As a consequence, the structure
of degrees, syllabuses, pedagogy and evaluation and assessment systems (for students, teaching staff and courses) must be revised. Although these objectives are common, the contexts in which they must be achieved differ, since the culture of the individual European countries themselves differ. This study will investigate how Greek Higher Education Institutes (HEIs) are handling the pressure to introduce an educational convergence policy with particular regard to the introduction of generic employability skills in Accounting Education.

1.2 **Significance of the Study**

The first contribution of this study is its potential to improve Greek accounting education and consequently the practice of the Accounting Profession (AP) by offering a broad view of the impact of skills introduction into the learning process, the employability of accounting graduates, the advancement of the country’s economy, as well as the pressures and the impediments for their development. In many other countries, research has indicated that the introduction of professional skills had significantly positive effects on students’ learning and on graduates’ preparation for their professional life (Stanley and Marsden, 2013; Huber and Mafi, 2013; Stone and Lightbody, 2013; Kennedy and Sorensen, 2006). Improved accounting education based on skills development means that graduates:

- are more readily employable
- are able to make a significant contribution to the overall strategy of the business and help employers to make good decisions, especially important for SMEs that are the lynch-pin of many European economies, including Greece
- have developed personal skills and emotional intelligence that can support them in areas other than their professional life
- have all of the professional skills required to rise up the business hierarchy
- have strong perceptions of the ethical values and social responsibilities of the AP, which is a key feature for the advancement of the economy
- have the knowledge, skills and ability to be members of management teams that can support enterprises to gain competitiveness in the global marketplace
A second contribution is to identify how the Greek academic, professional and state executives are responding to European institutions like the Bologna Agreement. A third contribution is to identify the cooperation and/ or connections (if any) between academia, industry and the state in terms of cooperating and adapting educational structures to face global challenges. In addition, this study will help identify the main teaching methods that academics employ when teaching accounting in Greece. To the author’s knowledge, no similar study has been undertaken in Greece on the development and impediments to introduce generic employability skills in Greek Accounting Education Studies.

1.3 Aim

Recently, in Greece, the educational environment has been in almost continuous crisis, as articulated through the complaints, disagreements, strikes and street demonstrations of students and teachers. All participating parties in this crisis have declared that HEIs should adapt in order to face these serious problems. Greek HEIs are under pressure from various directions. They have to struggle for financial support and re-establish their position in Greek society.

The present study focuses on the pressures exerted on Higher Education Institutions (hereafter HEIs), specifically on accounting courses, to comply with the Bologna and EU requirements and specifically the introduction of generic, professional skills in accounting courses.

The present study has three aims. The first is to investigate the views of the stakeholders (accounting teachers, students and accountants) regarding:

- the importance and therefore necessity for accountants to possess professional skills
- the degree to which Business Administration and Accounting (hereafter BAA) students acquire professional skills during their studies
- how to incorporate professional skills into the BAA curriculum

The second aim is to identify the forces that exert pressure on the HEIs as well as those which resist the policy of introducing professional skills into the BAA departments of Greek HEIs. The study will use DiMaggio and Powell (1983)’s theoretical framework on the mechanisms of "isomorphic change" in society, in order to analyse and interpret the results. The third aim is to analyse the strategies undertaken by Greek HEIs to
combat the pressure for institutional reforms to introduce professional skills as well as the institutional characteristics that define these strategies. The typology offered by Oliver (1991) as a conjunction of New Institutional Sociology (NIS) and Resource Dependence Theory will be used. Oliver’s typology will help to predict the HEIs’ future strategies. To achieve the above aims, the thesis will use a wide range of data collection methods, including questionnaires, interviews, documentary analysis, web-site scanning, and informal discussions with stakeholders. A full description of the research strategy and methods is provided in Chapter 5.

1.4 Research Question and Sub-questions

The present study aims to answer the following question: “How are the Business Administration and Accounting Departments (BAA) of Greek Higher Educational Institutions (HEI) responding to the pressure to promote students’ professional skills?”

As discussed above, the study will explore the need for accounting education reform in Greece and the incorporation of the new institutions that have originated due to the Bologna Agreement, the European Commission as well as the global educational reforms.

The specific research sub-questions are as follows:

1. How is the introduction of professional skills into the curriculum of Greek HEI accounting courses affected by the international trend?

2. How has the AP and accounting education evolved in Greece, how is accountancy taught, and what is its relationship to professional skills?

3. Which are the Bologna requirements regarding professional skills and how has the Greek educational and professional system accepted them at the institutional level?

4. How well has the Greek academic and professional community accepted a European institution like the Bologna Agreement and its basic Principles?

5. How do the direct stakeholders (teachers, students, accountants) rate the importance of introducing professional skills into HEI courses in Greece?

6. How do the direct stakeholders (teachers, students, accountants) rate graduates’ performance in relation to professional skills in Greece?
7. Is there a gap between the importance assigned to accountants’ professional skills and those exhibited by graduates in Greece?

8. If it is imperative to introduce professional skills, then what is the best way to incorporate them within the accounting curriculum in Greece?

9. What are the weaknesses (barriers) regarding the policy of introducing professional skills into the HE accounting courses in Greece?

10. Which forces are exerting pressure for professional skills to be introduced into HE accounting courses in Greece?

11. What are the HEIs’ strategic responses to the institutional changes designed to foster the introduction of professional skills into HE accounting courses in Greece?

12. Which antecedents influence the choice of strategy for this and how can these predict the HEIs’ future responses in Greece?

1.5 Methodology

This study adopts Mixed Methods methodology that allows quantitative and qualitative data to be combined using a variety of methods to acquire an integrated picture of the issue investigated. The study has a Sequential Exploratory Design and is conducted in four phases, as described by Creswell and Plano Clark (2007).

A 3-Phase Sequential Exploratory strategy involves a first phase of qualitative data exploration and analysis, a second phase that develops the instrument based on the results and participants’ views (including the mixing of the data by embedding them from the qualitative supporting database to generate a quantitative database) and a third phase, in which the results from phase two are further explored via qualitative data collection. The databases will be separate but connected as the analysis and results of the phase two data will be used to identify participants for the qualitative phase three. Phases two and three are weighted equally (Creswell and Plano Clark, 2007; Creswell, 2009). The primary focus of this model is on initially exploring a phenomenon, and the quantitative data will help us to interpret the qualitative findings. The second purpose is to build a survey instrument to use for generalisation. The study is also characterised as multi-level because the levels of analysis are multiple: international, national, organisational and individual (Tashakkori and Teddlie, 1998) and the units of analysis
are organisations as well as individuals. The research model is shown in the following diagram.

Research Model: Sequential Exploratory Design

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<tr>
<th>qual</th>
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<th>OUAL</th>
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<tr>
<td>Qual</td>
<td>Qual</td>
<td>QUAN</td>
</tr>
<tr>
<td>Data</td>
<td>Data</td>
<td>Data</td>
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<tr>
<td>Collection</td>
<td>Analysis</td>
<td>Collection</td>
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</tbody>
</table>

Interpretation of Entire Analysis

Figure 1-1: Research Model - Sequential Exploratory Design

- In the above figure the arrows indicate a sequential form of data collection, with one form (e.g. qualitative data) building on the other (e.g. quantitative data).

- Capitalization of letters indicate that an approach or method is emphasised.

- “Quan” and “Qual” stand for quantitative and qualitative, respectively, and they use the same number of letters to indicate equality between the forms of data.

The following table summarises the strategies employed for each phase as well as the levels and the expected outcomes from each phase.
<table>
<thead>
<tr>
<th>Phases</th>
<th>Thesis Structure</th>
<th>Level of Research</th>
<th>Expected Outcomes</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>International Level</td>
<td>Explore the emergence of skills in education</td>
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<tr>
<td></td>
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<td>(Chapter 2 &amp; Chapter 3)</td>
<td>Explore Bologna and EU policies on skills and competences</td>
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<td></td>
<td>Literature Review</td>
<td>National Level (Chapter 4)</td>
<td>Explore skills introduction in accounting education</td>
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<td>Organisational Level</td>
<td>Explore accounting education in Greek HEIs</td>
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<td></td>
<td></td>
<td>(Chapter 7)</td>
<td>Explore studies on skills and competences</td>
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<td></td>
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<td></td>
<td>Explore the emergence and framework of Greek accountancy</td>
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<tr>
<td>Phase 1</td>
<td>Qualitative Research</td>
<td>Individual Level</td>
<td>Explore External Quality Evaluation documents on HEIs</td>
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<td></td>
<td>Methods:</td>
<td>(Chapters 8, 9)</td>
<td>Explore Quality Assurance Agency views</td>
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<td></td>
<td>-Documentary Analysis</td>
<td></td>
<td>Explore the application of European Credit Transfer and Accumulation System (ECTS)</td>
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<td>-Interviews</td>
<td></td>
<td>through HEIs’ websites</td>
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<td></td>
<td>-Web based Analysis</td>
<td></td>
<td>Explore the businesses policy on skills through website investigation</td>
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<tr>
<td></td>
<td>-Informal discussions</td>
<td></td>
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<tr>
<td>Phase 2</td>
<td>Quantitative Research</td>
<td>Development and distribution of</td>
<td></td>
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<td></td>
<td>Methods:</td>
<td>Quantitative Instrument</td>
<td></td>
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<td></td>
<td>-Questionnaires</td>
<td>To answer questions like:</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>How do teachers rate the importance of</td>
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<td></td>
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<td>professional skills?</td>
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<td>What is the perceived gap between</td>
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<td></td>
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<td>expected and actual skills for teachers,</td>
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<td></td>
<td>students and accountants?</td>
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<tr>
<td>Phase 3</td>
<td>Qualitative Research</td>
<td>Explore in depth the quantitative data</td>
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<td></td>
<td>Methods:</td>
<td>from phase two</td>
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<td></td>
<td>-Interviews</td>
<td>Identify HEIs’ strategies</td>
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<td></td>
<td></td>
<td>Predict the HEIs’ response to institutional pressures</td>
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</tbody>
</table>
1.6 **Structure of the Study**

This thesis comprises of 12 chapters, followed by the reference list and appendices. **Chapter One** presents an overview of the thesis and research background, aims, and questions, with a brief outline of the significance of the study as well as the methodology followed. It finishes by outlining the structure of the study.

**Chapter Two** investigates the emergence of skills in the working environment and educational settings, especially HE. It also presents the EU and Bologna Agreement efforts to introduce skills in education through the establishment of ECTS and competence-based education.

**Chapter Three** discusses the development of skills and competences in BAA education, including the historical context of the US where this debate first emerged. It also describes briefly the advancement of skills in the UK, Australia and New Zealand (NZ), as well as the areas that are critical to bringing about any proposed changes, such as new teaching methods and approaches.

**Chapter Four** explores the situation in Greece, outlining the educational system, and reviewing the literature on professional skills development before discussing the evolution of the AP and the characteristics of the Greek economy that affect both education and the profession.

**Chapter Five** presents the theoretical framework of the New Institutional Theory (NIS). NIS is widely accepted due to its capacity to explain organizations’ reactions under uncertainty so it will be employed to interpret the research findings. In addition, Oliver’s (1991) typology on strategic responses to organisational pressure is discussed, as it will also be used to explain the phenomena under study.

**Chapter Six** outlines the research methodology, states the reasons why a Mixed Methods strategy was adopted, and describes the methods used, i.e. questionnaires, interviews, discussion, and official documents.

**Chapter Seven** constitutes Phase One of this study, providing an environmental overview of the organisations. It includes qualitative research on HEIs and businesses. Using various data collection methods, like documents, interviews, informal discussions and website investigation, the author explores the status quo regarding the introduction
of skills in HEIs and businesses. The results of Phase One are used to prepare the questionnaires for use in the second phase of the study.

**Chapter Eight** describes the preparation of the data obtained from the survey for the statistical analysis. A series of tests are used to examine the internal and external reliability assessment, normality assessment, validity and factor analysis.

**Chapter Nine** presents the outcomes of the quantitative data analysis. The data is analysed using SPSS and the results are outlined. Descriptive statistics as well as several tests (ANOVA, T-TESTS) are carried out, revealing significant results. In addition, the Indicator of Priority – IP (or Importance Indicator Factor) is drawn from these findings.

**Chapter Ten** illustrates the background information and interview procedure, including the sampling techniques, reliability and validity issues and the interview design.

**Chapter Eleven** portrays the research findings produced by all of the date collection methods and attempts to integrate them into a final context before interpreting them through the lenses of NIS and Oliver’s typology on organisations’ strategic responses.

**Chapter Twelve** concludes this thesis by summarising the study and reviewing the main findings. It states the research contribution to the academic community as well as its potential practical implications for the professional community. Finally, the limitations of the study and recommendations for further research are presented.

1.7 **Chapter Summary**

This chapter has presented the research background and the study’s significance for the Greek academic and professional environments, as well as the research aim and methodology. Next chapter discusses the emergence of skills and competences in Higher Education and how they may affect graduates’ employability.
CHAPTER 2 The Emergence of Skills and Competences in Higher Education

2.1 Introduction

This chapter reviews the emergence of skills and competences in HEIs, and also outlines the special efforts of theorists and policy-makers to investigate the word “skill” in view of its complexities and the impact it has on people’s professional lives. In the current study, the focus is on the skills and competences that affect employability, and the extent to which these can be acquired or developed through HE. In the next section 2.2, the thesis describes the relationship of “skill” to the knowledge economy, while section 2.3 analyses the evolution of the working context and the “skills gap”. Section 2.4 outlines the connection between HE and graduate employability, and section 2.5 reviews the endorsement of skills and competences under the EU and the Bologna Agreement. Section 2.6 summarises the chapter.

2.2 Skills in the Knowledge Economy

2.2.1 Definition and meaning

The world economy is changing at an unprecedented rate. The forces of globalisation and technological progress are altering the way in which people all over the planet live and work. Within this framework of continuous change, the notion of skills has attracted the attention of researchers from various disciplines. Among these, policy-makers and educationalists are examining how the development of skills can contribute towards HE graduates’ employability and professionalism. The basic definitions of skills and competences are provided below, but these will be analysed in more detail in the next chapter.

The American Heritage Dictionary defines the word ‘skill’ as a proficiency, facility, or dexterity that is acquired or developed through training or experience, an art, trade, or
technique, particularly one requiring the use of the hands or body, a developed talent or ability i.e. writing skills. It defines “competence” as: a) The state or quality of being adequately or well-qualified, and b) a specific range of skills, knowledge, or abilities. The European Centre for the Development of Vocational Training (CEDEFOP, 2011) define skill as the ability to perform tasks and solve problems.

The term “skill” is a multi-dimensional and dynamic concept yet its meaning remains ambiguous. For this reason, proxies are used to measure skills, usually in the form of formal qualifications and occupations. For example, in the UK, the NVQ (National Vocational Qualifications) programme has categorised occupations according to the skills required. In Greece, the corresponding NQF (Hellenic Qualifications Framework, HQF, Εθνικό Πλαίσιο Προσόντων) is currently being established. However, the real meaning of skill in people’s lives appears more complicated that the dictionary definition implies, and the ambiguity over its meaning is increasing as people in different countries give it varying definitions (Clarke and Winch, 2006). A skill is a concept that seems to have attracted considerable attention from researchers who have sought to define its meaning and, more importantly, impact on the workforce and society (Lloyd and Payne, 2010). The notion of a “skill” is complex, however, and requires careful consideration. Attewell (1990, p. 422) mentions that, apart from sociology, the concept of skill is important “in economics, psychology, education, computer science’s “artificial intelligence”, and in the area known as human factors or ergonomics”. Lloyd and Payne (2004, p. 220) stress the need for a multi-disciplinary approach to analyse skills by “drawing upon the insights from fields as diverse as economics, politics, industrial relations, sociology, history and cultural studies”. Ashton (1999) describes the process of skill formation as a “paradigm shift” involving “the culmination of a number of different intellectual developments” working towards a “genuine interdisciplinary perspective and the abandonment of the restriction on thinking imposed by conventional academic disciplines” (p. 347). Theorists connect the word skill with Aristotle’s use of the term techne or technique, which he appears to employ with a double meaning (Dunne, 1993); firstly as the rigid application of a rule and secondly as following a rule in a way that demands interpretation, the assessment of the materials being used and situational awareness. In the latter aspect, the word techne is closely related to the word phronesis or practical wisdom (Carr, 2003). However the modern notion of technical work implies something more than craft skills in the traditional sense, exercised in a
flexible and reflexive way, implying instead that a skill involves the application of a body of theoretical knowledge to a practical problem (Clarke and Winch, 2006).

Attewell (1990) states that, at the core of all definitions of skills, is the idea of competence or proficiency - the ability to do something well. It encompasses both mental and physical proficiency (i.e. it implies understanding or knowledge) but also connotes physical dexterity (Polanyi, 1958). Etymological analysis reveals an additional ambiguity - a skill involves the ability to do something, but the word also connotes a dimension of increasing ability. While a skill is synonymous with the word "competence", it also implies that the person with a specific skill also possesses expertise, mastery, and excellence. Therefore, for Attewell (1990), it is unclear whether the term indicates mere adequacy or superior, extraordinary ability. He notes that this distinction is not trivial. “Distinguishing between skill as mundane accomplishment and skill as virtuosity can give us theoretical insight into the mechanisms that underlie skilled activities. Not distinguishing between these two senses of the work can lead to conceptual confusion.” (p.423). This is especially true for the European framework of Lisbon Agreement (EC, 2000), where the EU set the targets for comparing different national vocational frameworks. The concepts of skill, competences, knowledge, and qualifications need to be addressed carefully since they have different foundations and implications for the relationship between occupations and wages in each nation (Clarke and Winch, 2006).

Policy-makers, theorists, and Educational Ministries in many European and other countries (CBI, 2003; Council for Industry and Higher Education1), the European Commission (EC, 2006; EC, 2010) and international organisations (OECD, 2011), have approached the notion of skill assuming there is a single, objective “logic” of skills waiting to be discovered, measured and used for cross-national and historical comparisons. Other theorists approach the concept of skills as a social phenomenon that develops in specific social contexts, for example between groups, rather than being the possession of a specific person (Brown, Collins and Duguid, 1989; Brown and Duguid, 1991; Fenwick, 2006).

1 http://www.cihe.co.uk
2.2.2 The Knowledge Economy

As technology has progressed in recent decades, society and working conditions have been transformed. Manufacturing has given more space to service industries and white-collar workers outnumber blue-collar workers (Bell, 1974). Above all, power is no longer derived from property and position but from knowledge, particularly theoretical knowledge. The financial-industrial elite is being replaced by a professional-scientific elite. Entrepreneurs are being replaced by scientists, engineers and technicians. Education is playing a crucial role as the means of attaining technical skills. Skilled jobs require “perceptual and conceptual skills” that need to be renewed if workers wish to remain employed. Knowledge and learning are the means to continuous upskilling and consequently the “learning force” is already greater than the “workforce” (Trist, 1974, p. 112).

2.3 Work Context Evolution and the Skills Gap

2.3.1 The Changing Work Context

Intense knowledge advancement tends to dominate certain sections of the economy but there exist significant imbalances, according to employers and policy-makers, between the workforce’s capability and skills to keep up with the working environment’s constant flux and evolution. Among the reasons for the imbalance, researchers include the globalisation of the economy, technological advancement and the changing work process. Globalisation has led industries to operate on a far shorter timescale. It is clear that there is a faster pace in every aspect of business life, from the private to the public sector. In the private sector, stockholders expect better returns on their investments and much more information, pressing managers to achieve short-term performance targets (Keep, 2000a). In the public sector, the changes include voters’ demands to receive greater services at lower cost (taxes). This post-Fordist working environment can be aptly described by two terms: “delayering” and “empowerment”. “Delayering” reflects the restructuring process by removing layers of management from organisations’ charts. In this way, more people are doing rather than supervising, but those doers should be able to supervise themselves. “Empowerment” reflects the culture of giving more responsibility to workers who should have greater discretion over how they manage their job. Both terms imply that workers can work in self-directed work teams which are appraised by the target outcomes of their performance rather than being told exactly how
to do their job with constant supervision (Herbert and Rothwell, 2005). Organisations are better organised in terms of teamwork and work discretion. Hammer (1996, p. 43) argues that, in the post-industrial era, in a process-centred organisation, self-managed workers are responsible for both performing work and ensuring that it is of high quality. “There is no longer a great divide between “doing” and “managing”. Management is no longer an esoteric and inaccessible skill reserved for the remote and privileged elite. It becomes part of everyone’s job.” In the past, workers and professionals would stay in the same job perhaps for a life-time. Today, firm must quickly adjust to the changing market conditions and become “a flexible firm” that will hire skilled personnel who can respond to the firm’s needs. On the other hand, the employees themselves want to be prepared for their next job and try to acquire the necessary skills for this. Handy (1990) coined the term “portfolio worker” to describe someone who takes responsibility for his own career, seeking opportunities and developing the right skills that will prepare him for the next stage of his working life. “Process-centred jobs have virtually nothing in common with traditional industrial era jobs, whether blue, pink, or white collar. They do have a great deal in common with the kinds of jobs normally held by professionals. The inevitable consequence of process-centering an organisation is professionalising its work” (Hammer 1996).

2.3.2 The Skills Gap

Several authors describe anomalies in the capitalist economies that are, more or less, connected to the workforce skills gap. The relationship between globalised operations and industrial innovation has shifted the need for a different set of expectations by the workforce. This becomes apparent from the gap in the skills and competences of the workforce in order to fully support industry. Barrett, Burgess and Campbell (2005) describe the major problems in Australia as the skills shortage, underemployment, hidden unemployment and unpaid overtime. Cook, Downie and McMullen (2004) and Livingstone (1999) found that, in Canada, trade liberalisation and market globalisation have been accompanied by skills shortages, underemployment, and continued precarious, low-wage employment. Factors like the technological reshaping of operations, the new literacy demanded by the implementation of internationalised standards, and accelerated innovation in product and processes to compete globally are directly related to the skills transformation of the workforce (Belfiore et al., 2004). These factors are perceived by the industry leaders and policy-makers as the skills and
knowledge gaps between what the existing workers can do and what is the desired performance. Recent research on a variety of professions including geology (Griffiths, Diver and Williams, 1997), accounting (Albrecht and Sack, 2000; Hassall et al., 2003; Palmer, Ziegenfuss and Pinsker, 2004), international management (Demir and Söderman, 2007), software development (Marks and Scholarios, 2008), marketing (Walker et al. 2009), engineering (Stiwne and Jungert, 2010), geography (Wall and Speake, 2012) and aviation (Bates and O’Brien, 2013) reveals that the pace of technology and global business expansion is falling behind that of professionals’ skills development. Policy-makers, employers and commentators point to education’s main contribution to skills development.

This study focus is on the “Soft” or “Professional” skills gap and how Greek HE can promote its development in order to support graduates’ employability. More specifically, the study explores the professional skills that Higher Accounting Education should provide for accountancy undergraduates in order to become successful professionals in a continuously changing and demanding globalised business context. Due to language restrictions, the literature review is limited to material published in English or Greek, and so it tends to focus on Anglo-Saxon countries’ perspectives (the UK, US, Australia, NZ, and EU).

2.4 HE and Employability

The skills phenomenon is of concern to the developed as well as developing nations, since capitalist economies are pursuing a competitive advantage based on high skill, knowledge-driven economies and production. The development of mass HE, the knowledge-driven economy and the culture of life-long learning are promoted as the answer to employability and the solution to the economic and social problems of most nations (OECD, 1993; The World Bank, 1994; UNESCO, 1995; Frank and Meyer, 2007). The terms that describe the new era and the current trends include “post-industrial society”, “post-Fordist society”, “globalisation age”, “risk society”, “information society”, and a “highly educated society” but also “social skills”, “soft skills” “employability skills”, “transferable skills”, professional skills”, etc.

2.4.1 Employability

In the last few decades, the term “employability” has become closely related to the acquisition of skills by the workforce, especially “employability skills” or “transferable
skills". This term mainly indicates the skills that an employee can “transfer” from job to job and includes, among others, personal and interpersonal skills, communication skills, ethical behaviour, critical thinking, problem-solving skills and teamwork ability. In this subsection, the main characteristics of the term “employability” are presented with the consequences for the modern age and employees’ skills development.

The term “employability” was first coined by the economist Beveridge in 1909 but remained hidden until the 1970’s (Misra and Mishra, 2011). Over the years, employability has been approached through different dimensions (Hillage and Pollard, 1998; Baruch, 2001; Harvey, 2001; Knight and Yorke, 2003; Misra and Mishra, 2011). Employability is ultimately “the ability to be employed”. Three key elements of employability have been identified (Finn, 2000). Firstly, it is the ability to gain initial employment, hence the interest in ensuring that “key skills”, careers advice and an understanding of the world of work are embedded in the education system. Secondly, it is the ability to maintain employment and make “transitions” between jobs and roles within the same organisation to meet new job requirements. Thirdly, it is the ability to obtain new employment if required; that is, to be independent in the labour market through being willing and able to manage employment transitions between and within organisations. For Knight and Yorke (2003), employability is: “A set of achievements, understandings and personal attributes that make individuals more likely to gain employment and be successful in their chosen occupations”. At the empirical level, Baruch (2001) argues that employability is now a substitute for “loyalty”. In the past, “loyalty” to the organisation was a prerequisite for the employees’ career evolution but this became open to discussion during the last decade. New terminology has appeared in the working lives of employees; boundaryless careers, protean careers, psychological contracts and transferable skills. These terms indicate important changes in the employment and employability status of the modern workforce (Clarke and Patrickson, 2007). It is possible that the general or specialised problems that arise can be resolved if the employees and employers work together so employees develop a range of generic, transferable skills, such as interpersonal skills, communication skills, problem-solving skills, teamwork and decision-making skills. Employees will also need assistance to develop competences in self-evaluation, self-promotion and career management skills. Individuals will need to learn how to evaluate their skills, knowledge and abilities and how to market these skills either within or outside the organisation (Bridgstock, 2009).
HE is recognised as the prime agent that will teach future employees and current students how to become “employable”; that is, how to develop a range of generic, transferable skills, such as interpersonal, communication, problem-solving, teamwork and decision-making skills.

2.4.2 Vocationalism within HE

The important changes to the graduate labour market in the 1970s and IT advancements have made employers more selective about the type of qualifications they consider suitable to particular jobs. Professions like law, accountancy and banking “began to recruit graduates and showed a preference for those with what was considered to be a training directly related to the particular occupation” (Williams, 1985, p. 185). Gradually, the rates of return for the study of literature and philosophy fell below those for engineering and accountancy. As the graduate labour market became more complicated in the 1970s, and graduates found it increasingly difficult to find employment, “students and university planners put more emphasis on subjects which appeared to offer skills that were immediately applicable in the job market” (p. 186).

Social and work changes signalled a move in the UK towards “the new vocationalism in Higher Education”. However, criticism of these new institutions soon emerged. In the new era, professional bodies gained power to the point of becoming seriously involved in the validation of university courses as appropriate professional preparation. The increased power of the professional bodies raised the status of the old established professions, such as law and medicine, and a few newer professions, such as accountancy and pharmacy (Williams, 1985, p. 189; Sikka and Wilmott, 2002).

Researchers from various disciplines are exploring the relationship between skills, HE curricula and employability (Saunders and Machell, 2000; Harvey, 2001; Morley, 2001; Knight and Yorke, 2003; St. George, 2006; Mason, Williams and Cranmer, 2009). HEIs are assumed to have increased responsibility for preparing graduates to become “employable”. Mora, Garcia-Montalvo and Garcia-Aracil (2000) examined the employment opportunities of Spanish graduates and found that the Spanish economy was unable to create the 0.2 million jobs that would be necessary to avoid graduate unemployment. One of the reasons for this is the fact that Spain’s HE system focuses almost exclusively on specialised competence; on knowledge rather than skills. When professions and job qualifications change very quickly, this system is too rigid to adapt to the changing labour market. The skills needed for entrepreneurship (like leadership
and flexibility) have been the subject of several studies (Rae, 2010; Rae et al., 2012). For example, Hartshorn and Sear (2005) examined employability in relation to the enterprise skills that business owners should possess. They argue for a growing recognition of the difference between the “old” and “new” employability skills sets required to compete in an increasingly flexible labour market. The UK government reports, for example the HE White Paper of June 2011 (Department for Business, Innovation & Skills, 2011) and Confederation of British Industry report (CBI, 2009) all work to promote entrepreneurship among students and graduates. The CBI report recommended that “business and universities must ensure that all students develop employability skills while still at university. These skills are self-management, teamworking, business and customer awareness, problem solving, communication and literacy, numeracy, and the application of information technology”. Tomlinson (2008), meanwhile, confirmed that students clearly understand that employers place increasingly less emphasis on academic credentials while the so-called “soft” currencies are growing in importance. Increasingly, researchers have begun to consider the conditions under which employers and practitioners can contribute to the HE curriculum (Wilton, 2008; Jameson et al., 2011). Jameson et al. (2011) considered the tension that can be created when practitioners are brought into the academy to contribute directly to the curriculum, and advocate that practitioner contribution to the curriculum has the potential to support other HE initiatives revolving around research-engaged teaching in which the student becomes more independently and actively engaged in the research process. However, other studies indicate that teaching employability skills may be less effective than originally supposed. Cranmer (2006) and Mason et al. (2009) cast doubt on the assumption that employability skills can be effectively developed within the classroom. Two wide concepts have proven, implicitly or explicitly, essential to this discussion; the importance of soft/transferable skills and the learning methods needed to acquire them.

2.5 The EU and the Bologna Process

European countries have been heavily influenced by the Bologna Declaration of 1999, which was based on the Sorbonne Declaration of the previous year (1998). In fact, it was the Bologna Agreement that sparked the large-scale educational reforms in Europe, as it states that universities should accept the challenge to construct the European Area of Higher Education (EAHE) in the wake of the fundamental principles laid down in the Bologna Magna Charta Universitatum of 1988. By 2010, 47 countries were involved in
the Bologna Process, the objectives of which, by that time, concerned the comparability of degrees, the adoption of two main cycles (undergraduate and graduate), the establishment of a credits system, such as the ECTS, the promotion of student, teacher, researcher and administrative staff mobility, the promotion of European co-operation over quality assurance, the promotion of the necessary European dimensions in HE, particularly curriculum development, inter-institutional co-operation, mobility schemes and integrated programmes of study, training and research.

At the European level, two types of cooperation exist that work towards the development of HE to achieve high employment and growth rates: the European Commission and the Bologna Process. The support of European governments and universities has been sought in order to meet the targets of the next decade. Evidently, the national HE policies are becoming increasingly subject to European-level decision-making.

The EU education strategy was formulated through the Lisbon Strategy initiative in 2000 (EC, 2000), which promoted the reform of the fragmented European HE system into a more powerful, better integrated, knowledge-based economy. In March 2000, the EU countries committed themselves in the Lisbon Strategy to the objective of becoming “the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion”. European policymakers’ intentions took a more concrete form in 2003 when the operational goal of raising EU-countries’ investment in R&D to 3% of GDP was outlined in Barcelona.

In 2010, the Lisbon strategy evolved into the EU Commission’s ‘Europe 2020’ strategy. The scope of this report was to overcome some of the failings of the previous initiatives and reshape the objectives in the light of the economic crisis (Beerkens and Vossensteyn, 2011). The Bologna Declaration of 1999 followed a series of meetings, working groups, seminars, conferences and reports within the European area in order to investigate and explore a range of objectives and promote the integration of the education systems. The focus of these seminars and working groups included issues of comparability, quality assurance, accreditation, the credit transfer system (ECTS), learning outcomes and the development of European students’ skills and competences.
2.5.1 **ECTS and Learning Outcomes**

The issues that this thesis investigates in relation to the Bologna Requirements and EU recommendations are the introduction of skills and competences into HE courses, through the establishment of a transfer system of credit units (ECTS) and the specification of learning outcomes from the students’ educational experience. The European Commission and the Bologna Working groups, over the last 15 years, have issued many reports (EC, 2003; Vukasovic, 2004; EU, 2006, EU, 2008; Tuning, 2010) in order to disseminate their objectives, recommendations, or the results of studies of employability and the skills regime of European countries and in relation to non-European nations.

In several Bologna seminars (Bologna, 2002; Bologna, 2003), the credit system was discussed in depth. The Bologna seminar (Bologna, 2008a) in Edinburgh on learning outcomes endorsed the proposition that “learning outcomes are the basic building blocks of the Bologna package of educational reforms” and that this methodological approach is at the heart of the paradigm shift from teacher to student-centred learning.

During the Bologna seminar (Bologna, 2008b) on ECTS and student workload participants from European universities, student bodies, national ministries and international organizations, agreed that ECTS credits are based on learning outcomes and the appropriate workload that will allow students to achieve the expected learning outcomes. The seminar emphasised the need for a cultural shift at all levels, concerted action by the authorities and stakeholders, the involvement of students in the verification of the workload and the regular monitoring of the whole process within the framework of an internal and external quality review.

The ECTS’ guide provides the following specific recommendations:

1. Educators should aim to develop competences in all course units that are assessed at different stages of a course.

2. Some competences are subject-area related (specific to a field of study), while others are generic (common to any degree course). Competence development tends to proceed in an integrated and cyclical manner throughout a course.

3. Learning outcomes are the basis for the estimation of the workload and hence credit allocation. When those responsible for designing educational courses establish the qualification profile together with the course’s expected learning outcomes and their
components, ECTS credits help them to be realistic about the required workload and choose learning, teaching and assessment strategies wisely.

4. Stakeholders, such as learners and employers, may provide useful input to the formulation of learning outcomes.

5. The allocation of credits to single educational components is part of the curriculum design with reference to national qualifications frameworks, level descriptors and qualifications descriptors. Generally, this is the responsibility of HE institutions and academic staff, but in some cases may be decided by external bodies (EU, 2009).

The ECTS guide defines learning outcomes as: “A dynamic combination of cognitive and metacognitive skills, knowledge and understanding, interpersonal, intellectual and practical skills, ethical values and attitudes”. Two approaches exist: learning outcomes may be either threshold statements (showing the minimum requirements to obtain a pass), or reference points describing the typical (expected) level of successful learners’ achievement. In any case, statements on learning outcomes must clarify which definition is being used. The EU report (2007a) on NQF/EQF explicitly states that the Learning Outcomes approach is a fundamental part of a paradigm shift in the relationship between HE and the outside world. It emphasises that it is an approach that provides the basis of a dialogue between HE and employers, and also provides a tool, and a language, for accountability to the wider society. The implementation of the NQF and use of learning outcomes should not be presented as 'yet another reform to be tackled'. Providing academics with substantial information about the need for an NQF and a learning outcomes-based approach is needed to encourage commitment. The information should also include examples of good practice in other countries/sectors/HEIs, such as the Tuning project. This implies the need for the more structured dissemination/availability of information. In order to promote this, efforts on the part of the Commission and the national competent bodies may be appropriate. For instance, the Bologna experts can play an important role in this (EU, 2007b, p. 27). The Tuning project in Europe addressed the issue of skills and competences through research projects for subject specific areas such as business, chemistry, mathematics, history, and geology. Over time Tuning has developed into a Process, an approach to (re-)designing, developing, implementing, evaluating and enhancing quality first, second and third cycle degree courses.
2.5.2 *The European Qualifications Framework*

The European Qualifications Framework (EQF) is an overarching framework that makes transparent the relationship between European national (and/or sectoral) educational frameworks of qualifications and the qualifications they contain. It is an articulation mechanism between national frameworks. Currently, two European Qualifications Frameworks exist. One focuses only on HE and was initiated as part of the Bologna Process, while the other focuses on the whole span of education and was initiated by the European Commission. The first is called a Framework for Qualifications for the European Higher Education Area (QF-EHEA), while the second extends across all areas, including HE, and is called the European Qualifications Frameworks for Lifelong Learning (EQF-LLL; Tuning, 2010). Many reports and studies have appeared, often financed by the EU or in cooperation with other institutions that explore the concepts of skills and competences and their impact on citizens’ education and life (EU, 2007a,b). An important project is the New Skills for New Jobs, that attempts to predict the emerging sectors of the economy and the corresponding needs for new skills in future years (EU, 2008e), issued with the help of CEDEFOP (2013).

2.6 *Chapter Summary*

In this chapter, the notions of skills and competences related to working life as well as the HE environment were analysed. The definitions of the terms “skill” and “competence” were discussed, as well as how skills are connected with the Knowledge Economy and Knowledge Society. Policy-makers and analysts have examined in depth the skills gap between industry’s needs and those possessed by the workforce. HE and vocational education undertook the responsibility to fill this gap by preparing students better for the knowledge economy. The EU and Bologna Initiative have paid special attention to the development of skills and competences.
CHAPTER 3  Skills and Competences in Accounting Education

3.1  Introduction

This chapter focuses on accounting education and its reform in the light of the “skills phenomenon”. After this introduction, Section 3.2 presents the conceptual dimensions of skills and competences, especially in relation to accounting. Section 3.3 refers to the competency-based approaches in the Accounting Education. Section 3.4 outlines the evolution of the AP within the globalised business environment. Section 3.5 presents the history and evolution of accounting education in the US as well as the main reports and committees which demanded reforms that are conducive to process learning in accounting. Section 3.6 examines the gap between accounting practice and accounting education while Section 3.7 presents the challenges that the accounting pedagogy is facing. Section 3.8 investigates the research areas that have emerged in accounting pedagogy as well as the reactions to skills development in the UK, Australia, New Zealand and Spain. Section 3.9 presents different aspects of professional skills development, including the ranking of the importance of skills, the focus on specific skills, and the barriers to skills development. Section 3.10 presents the most important teaching and learning approaches and faculty issues, before describing the first accounting course and its significance for students. Section 3.11 focuses on the criticism of the skills and competences strategy and the “marketisation” of HE accounting. Section 3.12 summarises the chapter. Due to language constraints, the literature review was restricted to publications in English and so it mainly refers to Anglo-Saxon countries.

3.2  Conceptual Dimensions

3.2.1  The notion of competence

Competence-based education is specified in terms of outcomes, or what an individual can accomplish, rather than an individual’s knowledge or capabilities. This type of
education has been the subject of HE (and Accounting Education) change in the last few decades. However, defining competences has not been easy. There are alternative definitions and philosophies underlying competence-based approaches and visions on how to assess competences.

- The International Federation of Accountants (IFAC, 2001, p. 5) views competency as “being able to perform a work role to a defined standard with reference to real working environments”.

- European Commission (Tuning, 2010) in the definition of “competences” includes the whole spectrum of abilities and capabilities, from the purely theoretical/methodological to vocational knowledge and skills: “Competences represent a dynamic combination of cognitive and metacognitive skills, demonstration of knowledge and understanding, interpersonal, intellectual and practical skills, and ethical values. Fostering these is the object of all educational programmes. Competences are developed in all course units and assessed at different stages of a programme. Some competences are subject-area related (specific to a field of studies), while others are generic (common) to any degree programme” (p. 21). The same study also distinguishes between the terms “competence” and “learning outcome” as follows:

  - “A competence is a quality, ability, capacity or skill that is developed by and that belongs to the student”. Also, the study states that “a learning outcome is a measurable result of a learning experience which allows ascertaining to which extent/level/standard a competence has been formed or enhanced”.

  - Learning outcomes are not unique to each student, but statements which allow HE institutions to measure whether students have developed their competences to the required level (p. 21).

  - A generic competence is one which is transferable between subject areas; for example: research ability, teamwork, management ability, problem-solving, creativity, communication skills, and the communication of information.

  - A subject-specific competence is one that is performed in and is typical of a specific subject area; for example, the ability to demonstrate knowledge of, and the ability to use, research techniques and technology (p. 39).
In Tuning (2010), it is argued that the definition of competence provided is due to the fact that, in an increasingly knowledge-based and technologically-driven world, it is "less and less appropriate to make a sharp distinction between HE and vocational training. In today's world, theoretical studies contain vocational elements (for example work placements), while vocational studies increasingly include theoretical and research components" (p. 37). The Dearing Report (1997) agrees, stating: "We see the historic boundaries between vocational and academic education breaking down, with increasingly active partnerships between HE institutions and the worlds of industry, commerce and public service".

In the context of the European Qualifications Framework for Lifelong Learning (EU, 2008c), competences are distinguished from knowledge and skills and described in terms of responsibility and autonomy.

- "Competence" means a proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development. In the European Qualifications Framework context, a competence is described in terms of responsibility and autonomy.

- "Knowledge" means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices related to a field of work or study. In the context of the European Qualifications Framework, knowledge is described as theoretical and/or factual.

- "Skills" means the ability to apply knowledge and use know-how to complete tasks and solve problems. In the European Qualifications Framework context, skills are described as cognitive (involving logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments).

In the UK the National Council for Vocational Qualifications defined competence as the ability to perform to the standards expected in employment (Thompson, 1996).

The definitions of competence range from cognitive skills to workplace outcomes and personal attributes. Overall, most authors refer to the idea that competences must contribute in some way to performance and be outcome-focused. Outcomes are the larger results of many detailed actions and the application of specific skills. "Defining competences as the results of activities or skills, rather than the activities or skills
themselves, appear to be partly motivated by an attempt to keep competences more holistic than atomistic” (Boritz and Carnaghan, 2003, p. 9). IFAC (2001) refers to the outcome-based functional analysis approach favoured by ACCA and the input-based capability approach (whereas the inputs include knowledge, skills and professional values) favoured by AICPA. These differences between the definitions are important because they can affect the content of competence-based standards as well as the assessment methods. Boritz and Carnaghan (2003) introduced several different dimensions in the meaning of competences (Figure 3.1 below).

![Figure 3-1: Competency Definitions – Differing Dimensions (Boritz and Carnaghan, 2003, p. 10)](image_url)

The figure above illustrates the range of dimensions: (1) competences as skill/abilities alone versus including personal attributes or traits; (2) competences as solely outcome-based versus including knowledge; (3) competences as activities/skills versus the results of activities/skills; (4) competences as necessary qualities for effective performance versus superior performance; (5) competences as generally holistic (high-level) versus atomistic (detailed); and (6) competences as observable qualities versus hidden/inferred
qualities. A possible reason for the existence of this variety of definitions and understanding of competences is the context in which they are considered (the general educational context, vocational educational context, or in a professional or employment role). For example, in a general educational context, the emphasis tends to be on abilities and skills because these presumably are taught or acquired. In a recruitment office, the emphasis would be on screening for rather than developing the required or attractive attitudes and personality traits. Boritz and Carnaghan (2003, p. 10) note that “even though such attributes are acknowledged as being inherent qualities of individuals rather than skills, they have been labelled as competences in employment models”.

3.3 Competency-based approaches in the Accounting Education

Competency-based approaches have been initiated for either the education or accreditation of accountants. In the UK, the NVQ project was initiated by the government and level 5 applied to professionals. ICAEW has indicated that it would not adopt competency-based assessment, while ACCA completed a competency map consisting of nine key areas subdivided into 68 elements (IFAC, 2001, p.1). ACCA’s approach appears to focus on competences as observable skills, with less consideration of personal attributes. In Canada, the underlying competency definition includes personal attributes as well as skills, proposes that knowledge plays a secondary role, views competences as observable skills rather than skill outcomes, and takes an atomistic view of competences (Boritz and Carnaghan, 2003).

3.3.1 The notion of generic/transferable skills

The development of core/personal transferable skills, such as the ability to cooperate, communicate and solve problems has been advocated by many researchers (Green, 1990; Tribe, 1996; Bennett, 2002; Bath et al., 2004; Prestwich and Ho-Kim, 2009; Green et al., 2009; Biggs, 2012). These skills are assumed to transfer readily across a range of contexts and also between careers. Several statements by the government, academia and industry agree that working life is about continued learning, skilling and re-skilling to stay ahead. Several researchers have emphasised the proliferation of synonyms and meanings that has made the conceptualisation of skills problematic. The synonyms include personal, transferable, key, generic, soft, common, work-related, employment-related, professional, vocational, social skills, generic attributes, and generic attitudes (Bennett, Dunne and Carré 1999; Guile, 2002; Barrie, 2006; Jones,
3.3.2 Types of generic skills

Frequently, core skills are referred to as competences, capabilities, attributes, elements or learning outcomes (IFAC, 2008a). Barrie (2006) investigated the nature of generic graduate attributes. In Australia, these have come to be accepted as “the skills, knowledge and abilities of university graduates, beyond disciplinary content knowledge, which are applicable in a range of contexts and are acquired as a result of completing any undergraduate degree” (p. 217). He emphasises that several terms are used to describe graduate qualities, such as generic, core, key, personal and transferable skills or generic attributes. Some authors describe variations between outcomes that are “skills” and outcomes that are “attitudes”, although in most cases there terms are used interchangeably. The HE Council (1992) of Australia argues that generic attributes should represent the core achievements of university education, while Yorke (2006a, p. 8) suggests that students, in addition to mastering specific discipline knowledge, should also possess “a set of achievements – skills, understandings and personal attributes – that makes graduates more likely to gain employment and be successful in their chosen occupations, which benefits themselves, the workforce, the community and the economy”.

Endless lists of attributes and/or skills have been generated in many universities not only in terms of which attributes are included but also with respect to the nature and level of the attributes described. In addition, there is a variety of pedagogical approaches which might suggest a similar variety in the understanding of the intended outcome (Bennett et al., 1999). Barrie (2006) concluded that, despite the assumption of a shared understanding, “the lists of attributes appear to mean very different things to the individual academics charged with developing such outcomes” (p. 239). Reaching an agreement about these attributes would be a vital precursor to successful curriculum reform to facilitate the achievement of such outcomes.

3.3.2 Types of generic skills

Two major contrasting conceptions are associated with the concept of generic skills: a) one views a skill as though it were the property of an individual; and b) the other explicitly recognises the contextual basis of a skill. A summary of skills’ conceptions is presented and categorised below according to the previous basic conceptions (Guile, 2002):
A common use of the concept of generic skills is to describe the extent of a young person’s “work readiness” – a demand for basic motivational skills and habits, such as honesty, punctuality, and the ability to follow instructions. It may also reflect a demand for the “aesthetic skills” associated with routine employment in certain sections of the service industry.

- This concept may also be employed to refer to the qualities which are assumed to be required in the modern workplace. However, different national education, training and social partnership traditions result in real differences between the underlying approaches to skills development and assessment.
  
  - In the UK, the term “key skills” describe the generic skills which are assumed to be relevant to most forms of modern work and which can be developed in the field of education. One group includes communication, the application of numbers, and the application of ICT, and another group includes such things as improving one’s own learning and problem-solving. In the UK, a skill is defined in a highly individualistic way that fails to take into account the influence of the context on development and performance.
  
  - In Germany and the Netherlands, the use of the term “key qualifications” refers to a far more holistic notion of skills. It explicitly embraces the relationship between the formal component of education (school/college) and the context (i.e. the workplace) in which the skills are acquired. The competence/skill development presupposes that young people have opportunities to explore the relationship between “codified” and “everyday” knowledge. In this sense, the idea of “key qualifications” implies a more contextual, less individualistic conception of skills.

- In industrial sociology and political economy, the concept of generic skills refers to specific capabilities which are required for professional and technical work:
  
  - Intrapreneurial skills describe skilled workers’ ability to combine “technical” skills (i.e. a knowledge of products and operational systems), “functional skills” (i.e. managing personal performance) and “motivational skills” (i.e. commitment to the organisational goals) in order to ensure continuous improvements in modern production systems (Flecker and Hofbauer, 1998, cited in Guile, 2002).
  
  - Reich (1991) has identified the type of generic skills required by graduates who are seeking employment in the knowledge economy. Symbolic analyst is the term used
to describe graduates’ capability to solve problems, take risks, broker solutions and maintain a systems perspective on their work roles (Reich, 1991, cited in Guile, 2002).

The latter two conceptions (Intrapreneurial and symbolic analyst) see knowledge and skills as inextricably connected to one another. However, they define a skill as though it were the property of an individual.

• In organisational studies and socio-cultural activity theory, researchers have taken greater account of the influence of the context of work upon skills development:
  ➢ An intellective skill refers to the type of skill required when working in environments that provide access to encoded knowledge (i.e. symbolic data) compared with those that do not provide access to such data. A defining characteristic of intellective skill is working collaboratively with others to interpret “embedded” or “situated” knowledge and use it to broker solutions to problems that arise within workplaces (Zuboff, 1988, cited in Guile, 2002).
  ➢ A polycontextual skill is the type of skill required to work in flat, team- and network-based organisations. Polycontextual skills presuppose that people have the capability to cross “organisational boundaries” in order to collaborate with other “communities of practice” and so mediate between different forms of knowledge (Engeström, Engeström and Karkkainen, 1995; Green, 1999, cited in Guile, 2002).

Both previous aspects of skill (intellective and polycontextual) are more conscious of the social, cultural and communicative basis of skills than the other writers discussed. Obviously, there is a diverse range of meanings and demands for generic skills and this concept clearly serves as an all-inclusive umbrella term to encapsulate the skills required in different work contexts. In Table 3-1 below, the basic conceptions of skills are presented as well as the work contexts in which they are applied.
Table 3-1: A typology of generic skills (Guile, 2002, p.266)

<table>
<thead>
<tr>
<th>Conception of skills</th>
<th>Nature of Work Activities</th>
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<tbody>
<tr>
<td></td>
<td>Routine problems</td>
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<tr>
<td>Typology of skills according to the individual or contextual basis</td>
<td></td>
</tr>
<tr>
<td>Individual conception of skill</td>
<td>Key skills (i.e. certified evidence of literacy, numeracy and IT)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Contextual conception of skills</td>
<td>Key qualification (i.e. using technical, socio-cultural and participative competence in the workplace)</td>
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Table 3-1 presents the individualistic and the contextual conception of skills. Key skills are defined in a highly individualistic way and are assumed to be relevant to most forms of modern work that can be developed in education. Key skills are used in routine problems. Intrapreneurial and symbolic analytical skills are also defined in an individualistic way and are important qualities needed in novel problems at workplaces. All above skills are assumed to be developed in formal education. In contrast, the use of the contextual conception of skills includes ‘key qualification’, which are skills applied in routine type of work and polycontextual, intellectual and boundary crossing skills which are necessary for novel problems at workplaces.
3.4 The Accounting Profession

In the last 30 years, the globalization of businesses, coupled with technological advancements, has brought about many changes in the way accountants carry out their tasks (Holtzman, 2004; Walker, 2004). They are asked to work in a very complex, demanding, and ever-changing environment (Parker, 2001; Elliott and Jacobson, 2002). Consequently, they need to adjust in order to be successful and responsive to increasing customer demands. Software development has given accountants more time to allocate to the interpretation of financial information, and correspondingly become more involved in strategic planning. Management accountants tend to spend more time as internal consultants, analysts and valued business partners (Olivier, 2001; IMA, 1996; Wilder and Stocks, 2004; Krause, 2007; Järvenpää, 2007). This has resulted in a competitive advantage for companies that can now use their accountants in ways that add value to the company. Consequently, the future of the profession appears to be one in which accountants put their skills to new uses (Albrecht and Sack, 2000; Parker, 2001; Emsley, 2005).

It is clear that the profession is moving from traditional accounting work activities to newer, more value-added activities, including long-term strategic planning, process improvement, and customer and product profitability (Brock and Powell, 2005; Goretzki, Strauss and Weber, 2013). Management accountants work in cross-functional teams and are actively involved in decision-making. This necessitates them spending more time communicating with others, meaning that good interpersonal skills are essential for success. The most important knowledge, skills and abilities (KSAs) necessary for success are communication skills followed by team-work ability, analytical skills, technical accounting knowledge, and an understanding of how a business functions (IMA, 1999; IFAC, 2002) As Covaleski, Dirsmith and Rittenberg (2003) highlighted, accountants should “become symbolic analysts equipped with the skills of abstraction and ability to get behind the data and ideas in order to develop a holistic understanding of economic changes and information technologies”.

The most important product of the 21st century will not be physical goods or services but rather knowledge and the ability to manage it. This is now a “knowledge age” rather than an “information age”. In this context, where knowledge is the commodity of the future, accountants are ideally placed to seize the opportunity to be the main player in this commodity. In this competitive environment, accountants need effectively to
position themselves as the “gurus” of knowledge management by thinking globally and in a way that provides clients with value added services (Howieson, 2003). The emergence of “gold-collar” workers, who will become the elite top advisors to businesses, means that, in order to fulfil this role, future accountants will be required to act as “generalists” and “specialists” simultaneously, have specialist knowledge about a specific industry and also know how to interpret information within the context of an employers’ organization and strategy (Howieson, 2003).

Accountants are not the only profession which competes for information services. The point is whether the profession will recognize the need to adapt its body of knowledge that will facilitate its wider claim to the information service markets. Otherwise, the status of accounting in modern society will decline. Business and organizational knowledge, together with knowledge of IT, information systems and decision science, form part of the body of knowledge that should be included in accounting education (Elliott & Jacobson, 2002). The new skills required by organizations have been described in the White Paper (Big 8, 1989) as: Communication skills, Intellectual skills, and Interpersonal skills. This is in line with the statement in the American Accounting Association report (AAA, 1986, p.172) that “a growing gap exists between what accountants do and what accounting educators teach”. Therefore accounting education must change in order to meet the needs of the expanding profession as it moves towards the broader, overt acquisition of diverse knowledge. Accountants must acquire, maintain, and continuously promote higher levels of competence to meet the expanding and increasingly diverse demands for services. Only by meeting such demands and offering newly-developed services will they be offered opportunities in the business world, while accountants who remain narrowly educated will find it far more difficult to compete in this expanding profession.

3.5 The Accounting Education

3.5.1 History and Evolution

In 1987, Beaver William, then President of American Accounting Association (AAA), defined accounting education as consisting of three elements: research, education and practice. To examine the role of accounting education, it is necessary to examine the research, teaching and practical aspects of this discipline. The history of accounting education is interconnected with that of the AP. The nature of the AP puts it at the heart
of the globalised business changes and therefore obviously needs a strong educational background level if it wants to succeed in the knowledge economy. What constitutes a strong, proper educational background for accountants has been the subject of much discussion and controversy among academics and practitioners, and the cause of continuous reforms. Education for accountants takes place at a range of institutions, formal and informal, post-secondary, vocational or further education, HE or post-experience education.

Education for accountants in the US began as apprenticeships under experienced accountants in the early 1800s (Langenderfer, 1987). This method of learning and entering a profession was common in the US and elsewhere not only for accountants but for other professions too. Its origin can be traced back to the functions of the guilds. Between 1800 and 1870, independent commercial schools specialised in business training, teaching basically bookkeeping, arithmetic and penmanship, with the later addition of typing and shorthand (Van Wyhe, 1994). Accounting education in universities began in the US in 1883 (Previts and Merino, 1998). In 1896, the US government issued legislation for the CPA profession which protected and established the title of certified public accountant (Flesher, Miranti and Previts 1996). The bill required accountants to pass a qualifying exam in order to become certified. This requirement made accounting a government-recognized profession and acknowledged that accountants should possess a specified body of knowledge (Van Wyhe, 1994). Liberal arts colleges had a strong prejudice against the introduction of business and accounting courses into the curriculum and it was the practitioners who worked hard to convince New York University to establish the first School of Commerce in 1900.

In the UK, accounting education developed from the traditional method of part-time, non-university study within an apprenticeship system. The British tendency was not to use state-based HE facilities to enhance professionalism. Only in Scotland was this significant policy, with the provision of compulsory university classes in law and the creation of part-time chairs of accountancy at Scottish universities (filled by leading practitioners). Only recently has the US accounting educational system been introduced in the UK (Lee, 1995). Accounting education became far more widespread during the next few decades.
3.5.2 Criticism and Reforms

The criticism of accounting education in US universities and colleges started early, in the 1900s. The practitioners who pioneered the establishment of the first university accounting courses envisioned broad theoretical and conceptual teaching of accounting. The profession asked educators to develop accounting students' analytical ability. Sells (1915, 11) described how practitioners acknowledged the need for students to think critically because the "instruments of commerce, capital, labour, laws, politics, insurance, economic organizations, money, credit, and accounts...demand a wide range of knowledge and minds trained to think analytically and constructively". In the early 20th century, the academic world was influenced by Dewey (1916), who introduced the phrase "education through occupation", which requires education to be progressive and intellectually challenging, with the social good as its aim. He contrasted this phrase with "education for occupation", a type of schooling that is boring, technical, passive and unacceptable. Dewey (1915, p. 42) defined a vocation as a direction in life, an occupation that balances the distinctive capacity of an individual with social service. He argued that education through occupation must acknowledge the full intellectual and social meaning of the vocation. The leaders of the AP welcomed Dewey's message. Dewey provided the philosophical basis that justified the inclusion of accounting on university curricula by combining academic and practical skills. Also, the "progressive" practitioners had a further argument to support their fight for a broad, liberal education for accountancy (Merino, 2006).

The practitioners wished to elevate accounting into a learned profession, similar to law, medicine and engineering. However, the university teachers promoted a technical education and the accounting curriculum was geared toward the passing of the CPA exam. Unfortunately, "progressive" education was interpreted as meaning a kind of vocationalism, with little sympathy or use for the so-called "classical" subjects (Previts and Merino, 1998; Merino, 2006). The traditional model for teaching accounting remained a textbook-driven curriculum that concentrates on the more mechanical aspects, i.e., bookkeeping, and the lower levels of theoretical understanding.

A gap began to emerge between the teaching of accounting and what practitioners believed students should be taught. This gap in perception created the need for reform. Several reforms and calls for reforms have occurred in the history of US accounting education. In the course of these calls for reform, the notion of skills and competences...
was central, along with the idea of a broad liberal education. Since the 19th to the end of the 20th century, there have been several calls for reform, including the Progressives’ call, the Pierson and Gordon and Howell reports (1959), the Carnegie Report (1986) and AAA (1986), the Treadway Commission (1987) and the AECC reports (1990).

The AAA Committee in 1986 made 28 specific recommendations, all aimed at achieving two main goals: (1) approach accounting education as an information development and distribution function for economic decision making, and (2) emphasize students’ learning to learn as the primary classroom objective. The authors recommended that the successful educational preparation of future accountants should extend beyond technical skills to include the ethical standards and commitment of a professional, concern for the overall advancement of society, emphasis on career-long professional learning, the capacity for creative thinking and problem-solving, effective communication and interpersonal relations. Teachers should adjust the curriculum content and learning methods to match the professional skills, personal capacities, and general knowledge they expected students to develop. Five years of college training, liberal arts exposure, IT integration, and a commitment to lifelong learning were other AAA recommendations (Black, 2012).

The Big 8 Managing Partners in 1989 issued a report calling for changes to the way accounting education was delivered, emphasizing their strong interest in enhancing accounting students’ capabilities before they enter the profession (Big 8 White Paper, 1989). Technology, regulations, the globalisation of commerce and complex transactions make the environment in which public accountants practice extremely challenging. Therefore, successful practitioners need to develop and apply a wide range of professional capabilities. Learning by doing is a far more effective way to learn than experiencing an isolated course. The skills and knowledge, comprising the required capabilities, must be integrated throughout the curriculum. For example, written assignments must be an important, accepted, and natural part of most, if not all, courses. To relegate writing to a single course implies to students that that skill will not be useful throughout their career and does not require continuing attention. As most practice requires group work, the curriculum should encourage the use of a team approach. The textbook-based, rule-intensive, lecture/problem style as the primary means of presentation should be de-emphasised and new methods, both those used in other disciplines and those that are totally new to university education, must be explored.
A fundamental declaration of the Accounting Education Change Commission (AECC, 1990) concerned the fact that they would “address the preparation of accountants for careers in public accounting as practiced in large, medium and small firms, corporate accounting (including financial management, controllership, treasury, financial analysis, planning and budgeting, cost accounting, internal audit, systems, tax, and general accounting), and governmental and non-profit accounting”. The basic capabilities are similar for all accounting career tracks. Differences arise only in specialised education which comes late in a student’s academic course. The expanded knowledge base related to accounting entails moving from a knowledge-based educational course to a process-oriented approach, as the Law schools realised a century ago. In this new learning environment, intentional learning (learning to learn) becomes a very important skill for students. AECC defined learning to learn as “a process of acquiring, understanding, and using a variety of strategies to improve one’s ability to attain and apply knowledge, a process which results from, leads to, and enhances a questioning spirit and a lifelong desire to learn” (AAA, 1993). In order to help students to develop intentional learning, faculties will need to plan courses accordingly and help students to mature intellectually.

Criticism of AECC

Several criticisms of the AECC recommendations have emerged. For example, Dyer (1999) argues that teaching “soft skills”, as suggested by those advocating change, might result in graduates leaving university with inadequate technical abilities. Boyd Boyd and Boyd, (2000) agreed that entry-level accountants would possess only a generalised education if schools did not teach them the basic accounting concepts and procedures. Herring (2003) questions whether accounting is taught too much from a practical rather than a conceptual basis. The author emphasises the need for accounting academics to take care not to dilute the rigour of the courses to the extent that students graduate without sufficient analytical skills. Auditors who can write, talk, and present themselves as appealing professionals will not prevent audit failures if they lack the tools to carry out an audit effectively. Some authors raise the possible existence of bias and hidden interests in the process (Barefield, 1991; Poe and Bushong; 1991; Mathews, 1994; Davis and Sherman 1996; Hendrickson 2001). Davis and Sherman (1996) raise the issue of the AECC independence and the likelihood that it has been “captured” by the accounting firms which have financed its operation. Mintz (1993) points out that the biggest disservice that AECC has done regarding its grant programme is to award so few grants.
to a limited number of universities, expecting that the results of change would be transferable to other institutions. Also, the Commission missed the opportunity to encourage meaningful ethics education in accounting by failing to identify or target proposals that incorporate values education into the university curriculum.

3.6 The Gap between Accounting Education and Accounting Practice

The criticism that inspired the most prominent reports (AAA, 1986; Big 8, 1989; AECC, 1990, 1992; 1993) included a lack of relevance to the needs of the profession (mainly those in public and management accounting), inadequate teaching, an over-emphasis on particular types of research, and an inability to attract and retain the best quality students. The gap between the expected and actual skills of accountants has been identified as being caused by the insufficient preparation of accounting students. The university courses are failing to prepare future accountants adequately to face the turbulent global environment of the future. Consequently, graduates from other disciplines take advantage of this gap and present themselves as business advisors with the necessary market knowledge to promote business and help the decision-making process of enterprises. The AAA (1986, p.174) signalled the danger which is emerging from other professions: “If accountants do not respond to the opportunities of the global business requirements, individuals from other disciplines will provide the required services, thus limiting the scope of accounting practice”. Significant reform of the curriculum was suggested to include the capacity for inquiry, abstract logical thinking, critical analysis, speaking and listening skills, historical consciousness, and international and multicultural knowledge. In general business education, the curriculum should also include courses on finance, marketing, operations, organizational behaviour, and how general managers integrate all of these functions. The AP has become so broad that accounting education is now, arguably, synonymous with citizenship education. “There is no aspect of education that may not be a relevant aspect of an accountant’s education” (Wheeler, 1991, p.131) This raises an important question: what should ideally be included in the education of accountants? The previously-analysed reports and surveys have considered this question, mainly through the work of the American Accounting Association as well as the Professional Bodies and Committees they have appointed. These reports emphasise a new accounting pedagogy that includes a totally new perspective of the skills required by future accountants. A rule-based curriculum has been identified as failing to prepare students for actual professional life and increasing
their passivity in the classroom. Zeff (1989) also emphasized process learning, arguing that accounting is not considered an interesting subject because it is presented as a collection of rules that needs to be memorized uncritically. Emphasis should be paid to multi-disciplinary knowledge, problem-solving in practice (Ijiri and Sunder, 1991) and critical thinking skills which are equivalent to abstract reasoning, as described in the 1940’s by Glaser (as cited in Smith and Smith, 1991).

3.6.1 Professional Bodies

The professional bodies have been the pioneers of the reform efforts for advancing the skills and competences of their new members. American Institute of Certified Public Accountants (AICPA), Institute of Management Accountants (IMA), Financial Executive Institute (FEI) and International Federation of Accountants (IFAC) issued important reports about the capabilities that competent accountants need as well as the prospects of the profession. IMA issued three important studies in 1994, 1996 and 1999. The respondents believed that entry-level management accountants are falling short for several reasons: a lack of practical experience, little understanding of the “big picture” or how the “real world” works, poor communication and social skills and insufficient preparation in manufacturing accounting. The second IMA study (“The Practice Analysis of Management Accounting”) indicated that management accountants are expected to possess a thorough knowledge of basic accounting. Beyond these basics, management accountants need excellent communication, interpersonal skills, analytical, and spreadsheet skills. This essential knowledge is part of the minimum requirement for working in the field of management accounting. Nearly half of the respondents in both the large and small companies reported that they are members of cross-functional teams, bringing the financial perspective to bear on corporate decisions. The role requires excellent communication and interpersonal skills, an understanding of all phases of business, and an appreciation of the interrelatedness between the financial function and marketing, engineering, production, and other functional areas. Management accountants spend the bulk of their time as internal consultants or business analysts within their companies. Their role has evolved from serving internal customers to becoming a business partner, and they have the authority and responsibility to tell an operating executive why particular types of information may or may not be relevant to the business decision at hand. They are also expected to suggest ways to improve the quality of the decisions. This survey identified the most important skills for success as
an ability to communicate well, both orally and in writing, team-working, analytical skills, and a solid understanding of both accounting and how businesses function. AICPA (1999) recognised the importance of transferable skills for professional accountants in the USA in their publication entitled *The Core Competency Framework for Entry into the Accounting Profession*. Similarly, the International Federation of Accountants (IFAC, 2001) has produced an international standard for the subject, namely International Education Standard 3 (IES3). IFAC (2010) suggests that the employers, clients and public’s rising expectations regarding professional accountants’ contribution at work and to society generally have prompted an increased emphasis on professional (transferable) skills. One of the key categories of transferable skills which the accountancy profession and employers demand of their recruits is interpersonal skills, including communication skills. Palmer et al. (2004) found that entry-level accountants’ knowledge, skills and abilities should include: communication skills, interpersonal skills, general business knowledge, accounting knowledge, problem-solving skills, IT skills, personal attitudes and capabilities, and computer skills.

### 3.7 Challenges in Accounting Pedagogy

The discussions and reports on competence-based accounting education in the US have had a direct or indirect influence in other countries, mainly in the Anglo-Saxon zone (the UK, Australia and NZ). Other countries in the European region or Asia (Hong Kong, China, Russia) have seen a similar wave of change in their educational systems. However, in each region, a different stimulus initiated the reforms. In the US, the AP took the lead in providing the stimulus for universities to redesign their accounting courses, as evident from the various reports discussed above (AAA, 1986; AECC, 1990). Accounting professionals, who had experienced the global nature of business, visualized the increasing need for new entrants into the AP to experience a broad competence-based accounting and business education (Ijiri and Sunder, 1991; Zeff, 1989).

Following the initial studies and calls for reform, the research on accounting education expanded in a wide range of areas to cover skills development. These areas included the analysis of problems and future movements, curriculum development to enhance competence-based education, the ranking of skills and competences in relation to their importance to stakeholders, teaching methods to support changes (case studies,
simulation, role play), students’ learning methods (experiential learning, service learning, internships), the detailed analysis and exploration of specific skills (communication, interpersonal skills, critical thinking, ethics, etc.), emotional intelligence (Cook et al., 2011; Boyatzis, 2009) and the exploration of the barriers to skills development (Herring and Bryan, 2001; Palmer et al., 2004). Teaching under the new recommendations of AECC and other Committees has not been easy and remains incomplete. Accounting educators have found it difficult both to teach the rules for practical applications and to develop a conceptual foundation for students to aid lifelong learning due to the large number of regulations and procedures. A dichotomy has emerged between the breadth of knowledge and depth of knowledge on accounting courses, given the limited number of credit hours available (Bolt-Lee and Foster, 2003; Herring, 2003; Nelson, 1995). Academics met this challenge by providing input on a variety of issues, including the content as well as the methods of teaching accounting under the new conditions of the globalised economic environment. Some of the themes researched were the new accounting curricula designed to meet the challenges for the profession, including the “liberal education of accounting” to enhance students’ knowledge and skills (Lin Jun and Hunter, 1992), the accounting faculty’s perceptions of their students’ skills and motivations (Tanner, Totaro and Wilson 1998), teachers’ role as mentors and role models for their students (Hanno, 1999), accounting teachers’ competence to teach under the new AECC position (Lux, 2000), the importance of introductory courses in accounting, and suggestions about improving teaching through the use of visual aids and a conceptual approach (Boyd et al., 2000).

3.8 Research Areas in Accounting Education

Mayer-Sommer (1990) argued that academics should cover fewer traditional accounting topics and concentrate on problem resolution procedures that are transferable to the workplace where the role of uncertainty is a major factor in professional decision-making. Two problems arise; how to develop valid tests for measuring this component of the accounting curriculum and how to change the conventional teaching model to convince students that critical thinking, not just recall, is valued. Geary and Rooney (1993) used Jung’s theory of the two psychological types: sensate and intuitive. Accounting education is characterised by highly-structured problem-solving (sensate) activities. In Carl Jung’s typology, sensate thinking emphasises facts, patterns, rules, and procedures, while intuitive thinking focuses on new possibilities and unstructured
problems. Geary and Rooney (1993) used the MBTI questionnaire (Quenk, 2009) to conduct research that confirmed the expectation that accounting students reflect the sensate preference associated with the AP. Historically, the AP has been closely identified with sensate thinking. Accounting education, reflecting this bias, has relied primarily on a sensate style of pedagogy. However, the complex forces reshaping the profession demand the application of intuitive thinking. To meet the changing demands, accounting education should complement the emphasis on sensate thinking with an equally strong emphasis on the development of intuitive thinking. Although Smith (2005) suggests that Sarbanes-Oxley Act of 2002 requirements resulted in an increasing demand for financial accounting, internal auditors and cost accountants, other surveys have agreed with Albrecht and Sack (2000) that there is a decreasing trend of students majoring in accounting and that students regard professional accountants in a negative way, perceiving them as number crunches and not very personable. Courtis and Zaid (2002) explored the problems that newcomers face when entering the AP. They found that written and oral communication, and working with others, was among the first six problems identified (p. 325).

In other studies, several issues were identified concerning the deficiencies of the present curricula and how it should be transformed (Beaver, 1992; Jennings, 1998; Previts, 1991; Steadman and Green, 1995; Burton and Sack, 1991). Nelson, Bailey and Nelson (1998), influenced by Porter's strategic management literature and Hofer and Schendel (1978), outlined a sequential process that might help accounting departments to manage the inevitable changes successfully\(^2\). In an influential study, Albrecht and Sack (2000) argued that "accounting education as currently structured, is outdated, broken and needs to be modified significantly” (p.1). The problems identified at that time were:

- the course content and curricula are too narrow and often outdated or irrelevant
- the curricula are driven by faculty interest rather than market demands
- students are never exposed to globalization, technology, and ethics
- the pedagogy is based on memorization and lacks creativity
- content is emphasized rather than skills

\(^2\) The steps in Nelson et al. (1998, p. 319) sequential process are presented in Appendix 1.
• technology is taught as if information is still costly
• the faculty’s development and reward systems are isolated from their business-school peers and business professionals
• business schools lack strategic direction

The authors offered suggestions about overcoming the problems and recruiting the brightest students for the AP.

The practitioners’ community also raised concern about the issues facing accounting educators and whether accounting should be taught by PhDs or CPAs. Practitioners argued that, while the academic community is proficient in teaching theory, it has become increasingly out of touch with the real world of accounting. Grumet (2001) suggested that the focal issue is that accounting faculty members do not need to possess either a CPA certificate or relevant practical experience in order to be qualified to teach.

Research and publication expectations in addition to teaching and service requirements place high demands on the faculty’s time, which often come at the cost of maintaining an active dialogue with the accounting practitioner community (Marshall et al., 2010). It has been suggested that hiring more accounting practitioners, funding PhD courses for new practitioners, incorporating case studies and simulations of business models could inculcate students in research skills, critical thinking, teamwork and oral and written communication.

Ainsworth (2001) provided a model for accounting curriculum development that is consistent with the AECC proposals, employing Bloom’s taxonomy (1956). Bloom’s taxonomy\(^3\) is a hierarchy that assumes that each level of cognition is built upon the previous ones. Many other studies have researched the process of creating a new curriculum to include the AECC recommendations (Agyemang and Unerman, 1998; Gammie, Gammie and Cargill, 2002; Freck, Morris, and Ramanan, 2004; Taylor, Rudnick and Paterson, 2005; Willcoxon et al. 2010).

Paisey and Paisey (2007) stressed the need to create a balance between the vocational and academic dimensions of the accounting curriculum. They proposed that the accounting curriculum could follow the path of medicine by giving institutions the

\(^3\) Bloom’s taxonomy can be found in Appendix 1
freedom to define their core curriculum. However, this may not be feasible due to the accounting professional bodies’ increasing ability to “issue detailed guidance on the subjects to be covered in accredited degrees” (p. 101). Gallhofer, Haslam and Kamla, (2009) examined the education and training of accountants in Syria, a country which is in a transition context. The authors concluded that, although the rate of HE participation is increasing, there is concern over the quality of accounting student output. The interviews highlighted the underdevelopment of a broad range of skills and the overtly technical emphasis as distinct from the interdisciplinary character of current tertiary accounting education.

The transition to International Financial Reporting Standards has been researched due to its impact on accounting education. The issuance of IFRS by IASB has served “to develop a single set of high-quality, understandable, and globally accepted financial reporting standards based upon clearly articulated principles” (Jackling, 2013). IFRS involves a change in teaching approach to a focus on judgment. A shift from rules to principles-based standards does not cater for “black and white” or “right and wrong” answers, but helps to attract abstract thinkers to the AP. As such, it is suggested that the accounting educator’s role is shifted to an environment of student-centred pedagogy (Jackling, De Lange and Natoli, 2013; Hilton and Johnstone, 2013).

3.8.1 Skills in the UK

In the UK, the discussion was initiated by the government in cooperation with academics. In the early 1980’s, concern about the UK’s decreasing competitiveness, the rising youth unemployment and increase in the number of people employed in the commerce and service industries were the major reasons for the initial turn in competence-based education (Thompson, 1996). The government and other organisations issued several reports calling for the efforts to upskill the workforce to support the inclusion of skills on the HE agenda in order to enhance graduates’ employability and prepare them for the knowledge economy (DES, 1987; CBI, 1989; Dearing Report, 1997; NCVQ, 1991). Competence-based education started in the field of vocational education and training, because it was acknowledged that “to be taught the underpinning knowledge and theory and given training in essential techniques did not guarantee that individuals were capable practitioners – “to know what to do is not the same as being able to do what is required” (Thompson, 1996, p. 5). These concerns led to the establishment of the National Vocational Qualifications (NVQs) system, based on
"a statement of standards clearly relevant to work and assessment of skills to specified standards, relevant knowledge and understanding, and the ability to use skills and apply knowledge and understanding to the performance of relevant tasks". The National Vocational Qualification Framework was the first nationwide system of qualifications to be based on competence for employment, ranging from level 1 (routine and predictable work activities) to level 5 – the professional level (complex techniques, personal autonomy, responsibility for others, analysis, planning, execution and evaluation). Industry bodies and standing conferences provide the standards for the NVQ framework, which are “generic” standards, since they are intended to be applicable to anyone working in a particular occupation – e.g. management accountants in general rather than management accountants working in the engineering industry or for the X organisation (Hardern, 1996, p. 18). At the same time, concerns were raised about universities and whether students should be required to undertake “Know How” as well as “Know What” tasks. Case studies were stressed as a useful approach for courses wishing to move towards a competence orientation (Murphy, 1996). Several papers were published in the UK on accounting education’s assessment (Bates and Hoskin, 1995; Fox and Wood, 1995), curriculum development (Kaye and Mathews, 1995) and the use of case studies (Hassall and Lewis, 1995; Slack, 1995). The influence of the professional bodies on academic courses started to appear. The reform movement resulted in many publications indicating how accounting education should promote a global business perspective and how the profession has been transforming from bookkeepers to business advisors. According to UK professional bodies, academics and practitioners, HE accounting education should change in order to reflect the transforming profession and skills required by accountants (Lovell, 1992; Hassall et al. 2001, 2005; Milner, 2008; Green, 2009).

3.8.2 Skills in Australia and New Zealand

In Australia, there are two professional accounting bodies (CPA Australia and the Institute of Chartered Accountants in Australia – ICAA), which approve and accredit three-year university degree courses nationwide, periodically reviewing their structure, facilities, processes and procedures. Separate criteria have been set about the staffing levels and composition of each course. In NZ, there is one professional accounting body - the Institute of Chartered Accountants of NZ (ICANZ) (Mathews 2001). In both countries, the tertiary level accounting educational system has undergone substantial
transformations. Following the trend in the UK and US, there is ongoing research into this issue and how it could best be redefined (Howieson, 2003; Carr and Mathews, 2004; De Lange and Watty, 2011). Research suggests that innovative teaching methods should be used to stimulate class discussions (Tippett, 1992) and, for example, Mathews (2001) proposed moving accounting education towards a graduate-entry course, whereby students would undertake an accounting course after having acquired broad study perspectives from their first degree. NZ is one of the countries which are actively engaged in improving the HE accounting curriculum. The reforms were initiated by practitioners and the accounting bodies, who issued reports influenced by the AECC recommendations about the need to improve students’ interpersonal, communication and thinking skills (Adler and Milne, 1997).

### 3.8.3 Skills in Spain

In Spain, the pace of change has been slower and primarily initiated by Europe-wide initiatives, such as the Bologna Agreement. The University Organic Law was introduced in 2001 with the aim of reorganizing the Spanish HE system and bringing it into line with the Bologna Declaration. Although the Law generated considerable controversy and widespread protest, it was finally approved at the end of 2001. In Spain, the accounting curriculum is generally the responsibility of the universities themselves within the government guidelines, while the accounting bodies have no influence on accounting pedagogy. Furthermore, classes contain over 100 students, so methods like active participation and case studies are uncommon and assessment is mainly through 3-4 hour-long written examinations (Gonzalez, Montano and Hassall, 2006). Spain has embraced a mass HE system since the 1980s and Universities have traditionally been professionally-oriented, with a focus on knowledge rather than skills. Extensive studies in Spain have highlighted the need to introduce innovation and additional competences into the accounting curriculum, such as oral communication, teamwork, leadership skills, problem-solving skills, and independent learning (Montano, 2000; Mora et al. 2000). Professionals, students and teachers agree that HE should include not only technical knowledge but also intellectual, interpersonal and personal skills. However, accounting reform has been slower due to both the competitive and institutional pressures on the Spanish university system (Gonzalez, Montano and Hassall, 2009).
3.9 **Professional Skills in Accounting Education**

Skills and competence-based education have been a favourite theme on the HE agenda in the last two decades. In most disciplines and in many countries, there is a growing discussion on how best to transform the curriculum in order to incorporate successfully the proper skills and competences. Studies about skills development in HE include Knight and Yorke (2003), Soontiens (2004), Wilton (2008), Pavlovich, Collins and Jones (2009), Torenbeek, Jansen and Hofman (2011), Penttinen, Skaniakos and Lairio (2013) and many more. Mora et al. (2000) explored graduate employment and soft skills teaching in Spain. Guile (2002) analysed the importance of work experience in providing students with an opportunity to achieve two objectives: to develop both their economic and industrial understanding and also their generic (transferable skills) in order to support their future employability in the “knowledge economy”. Nguyen, Yoshinari and Shigeji (2005) investigated skills teaching in Japan while Hernandez-March et al. (2009) provide a significant literature review of the research on employers’ perspectives of competences.

3.9.1 **Ranking the importance of professional skills**

A plethora of researchers have attempted to rank skills and competences based on their importance for the accounting profession (Estes, 1979; Shoenthal, 1988; Novin and Pearson, 1989; Baker and McGregor, 2000; Burnett, 2003; Hurt, 2007). Deppe et al. (1991) identified 27 competences required for successful practice, at least seven of which were content-based, requiring additional knowledge of accounting, auditing, tax and business. Most of the rest were skill-based competences that can be grouped into five skill categories: written communication, oral communication, group work and people skills, critical thinking, and the ability to work under pressure. May, Windal and Sylvestre (1995) indicated that, among the three groups of skills (intellectual, communication and interpersonal skills), communication skills has attracted the greatest attention in the literature, possibly because the intrinsic nature of accounting tasks involves communicating. Albrecht and Sack (2000) found the most important skills to be: analytical/critical thinking, written and oral communication/ computing technology, decision-making, interpersonal skills, continuous learning, and teamwork.

In the UK, Hassall et al., (2001) and Montano et al. (2001) identified the need for the development of vocational skills in the area of management accounting through strategic
mapping. According to these surveys, for the employers of management accountants, communication, time management and group working skills were the most important. The overall mean of the skills was 8.22 (on a scale of importance from 0 (very low) to 10 (very high)). The studies revealed that the same skills (communication, time management and group working) are key areas to target for future development. Subsequently, Hassall et al. (2003) investigated the views of management accountant employers (CIMA) and management accounting students, and also conducted a comparative study (2005) of management accountant employers' opinions in Spain and the UK, which identified the major constraints to the development of vocational skills in these countries. For the UK employers, the communication skills were the most important factor while, for the Spanish employers, it was a commitment to life-long learning and the organisation's global vision. The study also found that the term "management accountant" is less well-defined in Spain than in the UK and other Anglo-Saxon countries (the US and Australia), due to several reasons. Churiaque (1989, 1992, cited in Hassall et al. 2005, p. 383) refers to three factors that contribute to this lack of professional identity. First, there is a lack of a "direct relationship between the profession and the educational structure. Second, there is a lack of government interest in this specific vocational area, and third, there is a dispersion and lack of association among the practitioners of management accounting. Consequently, management accountants are not so readily identifiable in Spain." Similar conditions exist in the Greek context and this is an area that needs further research.

Jackling and de Lange (2009) compared graduates from an Australian university’s views with the perceived needs of a sample of employers. The graduates nominated the three most important qualities for progression in their career to be communication, problem-solving and personal skills (think independently, creativity, flexibility). Technical skills (key accounting and associated skills) were ranked fifth in terms of the skills required for career progression. This finding concurs with other studies which have found that the AP, which was once driven by a body of specialist technical skills, has now moved on, with technical accounting skills giving way to broader, more generic skills set (Albin and Crockett, 1991; LaFrancois, 1992; Hock, 1994; Morgan, 1997; Howieson, 2003). De Lange, Jackling and Gut (2006) also detected the prominence of communication skills, problem-solving and broader knowledge and experience. Pan and Perera (2012), meanwhile, surveyed market expectations with regard to skills and competences in
Australia, the top three of which were found to be communication, problem-solving, and time management, and compared them with the undergraduate accounting course of a prominent Australian university.

In NZ, Tan, Fowler and Hawkes (2004) found that educators viewed behavioural implications, activity-based costing (ABC), performance evaluation and product costing as the top four most important topics/techniques for management accounting and the skills/characteristics that are considered important for graduates intending to pursue a career in management accounting. In contrast, the practitioners’ top four most important topics were cash flow management, operational budgeting, and variance analysis and performance evaluation. Regarding skills and characteristics, both practitioners and educators placed high importance on thinking, problem-solving, listening and quantitative skills. Carr, Chua and Perera (2006) investigated the design of accounting programmes, including accounting subjects, skills and competences and liberal subjects, and found that the most-frequently cited competences were communication skills, accounting techniques and problem-solving. Local, usually smaller, accounting firms placed more emphasis on competences than non-local accounting firms. Wells et al. (2009) found that the three most important professional capabilities were the ability to: 1) understand and respond to clients’ requirements in a timely manner 2) set and justify priorities; and 3) organise work and manage time effectively. Bui and Porter (2010) interviewed students, academics, graduate trainees and employers, and found that the employers expected the accounting graduates to possess a sound knowledge of accounting principles and concepts, a basic understanding of business, and good communication, teamwork and interpersonal skills. The expectations of the employers varied according to the size of the firm. Those from the Big 4 firms placed particular importance on well-developed analytical, critical and creative thinking skills, oral presentation, and writing skills, but largely ignored technical accounting skills. Employers from medium and small firms “emphasised the importance for graduates possessing good technical accounting skills, and good interpersonal (face-to-face communication) skills. While the Big 4 firms seek graduates with a high level of intelligence, medium and small firms, aware of their inability to compete with the big firms in terms of salary, challenge and training opportunities, tend to seek graduates with average intellectual ability” (p. 45).
Accounting education in China is undergoing extensive reform too. New demands for professional accounting services have emerged in practice, such as financial planning, data analysis, consultation on business strategy formulation and implementation, management information system design and business decision-making. Lin, Xiong and Liu (2005) surveyed the required knowledge, skills, and pedagogy for accounting education as perceived by accounting practitioners, educators and students in China, and found that the knowledge items (financial accounting, finance, management accounting, tax, business/law) are substantially higher than the skill components (professional demeanour, computing techniques, interpersonal, analytical/critical thinking, communication skills). This may indicate that, in general, the emphasis within current accounting education in China is upon knowledge training, and certain technical accounting knowledge subjects are emphasised while the skills components have received less attention. The low scores that most of the broader-type knowledge and skill items attracted from the respondents indicate that, in China, accounting education is relatively narrow-focused at present, and that it tends to neglect the multi-disciplinary subjects in general business management and other social and humanities areas, as well as skills development. Cheng (2007) investigated the changes required in the accounting curriculum in order to decrease the expectation gap between business and academics. Lin (2008) showed in his study that the most important factor to the respondents relates to business/management skills, such as leadership, analytical and critical thinking, change management, customer-orientation, entrepreneurship, project management, interpersonal skills, negotiation, professional demeanour, salesmanship, decision-making, resource management. Soft skills such as ethics and social responsibility, communication skills, teamwork motivation, and role-playing were identified as the fourth most significant component of the curriculum.

In Ghana, Awayiga, Onumah and Tsamenyi (2010) surveyed accounting graduates and employers about the accounting knowledge and skills required by graduates. Analytical/critical thinking was rated as the most important professional skill by both the employers and graduates. In terms of IT skills, the use of spreadsheets was rated by both groups as the most important skill.

González, Montano and Hassall (2009) conducted a comparative analysis of accounting education in the UK and Spain, identifying differences in their institutional characteristics, cultural traits and other areas.
3.9.2 Focusing on specific skills

The concept of skills development has been discussed and several aspects have been further investigated such as the impact on the accounting curriculum or proper teaching methods. Several studies have concentrated on how to develop specific skills like computer literacy, communication skills, team-building, problem-solving, case studies and critical thinking skills.

Accounting is widely acknowledged to be an information discipline. A plethora of studies over the last few decades have supported the various uses of IT, like computerised business simulations (Romney, Cherrington and Denma, 1996; Marriott and Marriott, 2003; Marriott, 2004; Broad, Matthews and McDonald, 2004; Stoner, 2009) information research and Internet use (Selwyn et al., 2000; Kowalczyk, 2001; Loraas and Searcy, 2010; Marriott, Marriott and Selwyn, 2004), online accounting courses (Duncan, Kenworthy and McNamara, 2012), web-developed case studies (Crawford, Helliar and Monk, 2011), digital games (Yang and Chang, 2013), media and multimedia (Kaidonis, 2004; De Grez, Valcke and Roozen, 2009), and blended learning approaches (Dowling, Godfrey and Gyles, 2003; Love and Fry, 2006; Jones and Chen, 2008; Osgerby, 2013).


Research on graduates’ transferable skills has been extended to include implications for Small Medium Enterprises (SMEs) (Stewart and Knowles, 2000, 2001; McLarty, 2000). On accounting, Marriott and Marriott (2000) have studied the barriers to the provision of management accounting services by small firms, while Stone (2011) has studied the communication readiness of accountants regarding small businesses.

3.9.3 Barriers to skills development

Although the need to develop skills and competences in HE has been systematically promoted, academia has not responded adequately and the barriers to change towards student-centred teaching that would facilitate skills development have been assessed.
Nelson (1995) summarised the factors that are impeding change in accounting education, that lie outside the control of accounting academicians, as follows:

- Economic reasons: change is expensive both financially and in terms of faculty time
- The declining student population and financial support in the 1980s
- University-wide faculty reward structures and increased research expectations
- Increasing volume and complexity of the common body of knowledge
- Constraints on CPA exam content and structure
- Over-dependence on textbooks of accounting courses
- Lack of faculty reward structure to motivate change
- Influence of CPA exams
- Accreditation (which may act as a deterrent to curriculum experimentation)
- Influence of regulatory bodies (FASB, SEC, IRS) (due to the tendency continually to expand the common body of knowledge)
- The increasingly complex business environment

Regarding the reality in universities, Nelson (1989b, p. 50) states that “Teaching is regarded as something that is done only after the “important” work has been done”, while Patten and Williams (1990, p. 177) note that “We praise good teaching, but we reward research”. Nelson (1995) offered four more reasons why accounting educators have long favoured technical training at the expense of a classical education:

- Accounting educators as a group fail truly to recognise the value of a liberal education, possibly because they themselves followed technically-oriented accounting courses. PhD studies that specialise in one or two areas of teaching and research lead to relative ignorance among faculty members about accounting subjects that lie outside their own individual specialty, not to mention other disciplines. It would be unrealistic to expect narrowly-educated specialists to appreciate the value of a broad education.
- Technical training is comparatively easy to provide. Most teachers feel more comfortable lecturing on “how to” than assigning a student group to debate “why”.
- Critical thinking takes students out of their comfort zone, so most professors who have experimented with change testify that their teaching evaluations have suffered. Consequently, professors have an incentive to “play safe” and avoid making changes.

- There is inadequate preparation to teach in a non-technical manner. New professors have received little or no formal teacher training, and very few have attended even a single course in educational psychology.

Hassall et al. (2000) investigated “communication apprehension” (CA), defined as “an individual’s level of fear and anxiety associated with either real or anticipated communication with another person”, among UK and Spanish BAA students. Their findings indicated that the extent to which CA affects individuals determines both the effectiveness of their communication skills and the efficacy of the efforts devoted to their development. Thus, if progress is to be made in enhancing BAA students’ communication skills, it is first necessary to deal with CA, which from the available evidence would appear to be widespread. Adler et al. (2000) identified three groups of impediments: a lack of student readiness, inadequate educator support mechanisms, and non-reflective teacher practices. Ainsworth (2001) stressed that, among other barriers to change, accounting teachers typically find discussing research with colleagues a far more common and easy endeavour than discussing the curriculum, pedagogy, and learning. Hassall et al. (2005) compared accounting, engineering and business students’ CA and found that the first two groups had higher levels than students from the more general area of business studies. This result is unsurprising given the similarities between the two professions in terms of the educational system and numeracy requirements. The accountants showed higher levels of CA regarding formal oral communication (presentations), which confirms prior research by Hassall et al. (2000). Joyce et al. (2006), Montano et al. (2007) and Gardner et al. (2011) also studied CA. Students’ rate of absenteeism was identified as another barrier to the development of skills. Koppenhaver (2006) studied the impact of absenteeism on team performance and found that it has a significant negative effect on both individual exam and homework scores. Stoner and Milner (2010) found that students are reluctant to take responsibility for learning to learn or adopt a positive attitude towards it, but appear to want to shift responsibility for the quality or correctness of their work to others and report difficulties with time management and problem-solving. Aliakbari and Sadeghdaghighi (2013)
conducted a study of English teachers’ perceptions of the barriers to critical thinking skills of students, and found that the highest barrier was related to student characteristics (lack of motivation, resistance to active learning, concern about getting good grades), followed by self-efficacy constraints. The majority of teachers agreed that they were not sure of their ability to teach critical thinking skills.

3.9.4 Investigating skills and competences under a theoretical framework

The theoretical framework which has been widely used to interpret changes in educational contexts including accounting education and skills introduction is the New Institutional Sociology (NIS) (Meyer and Rowan, 1977; DiMaggio and Powell, 1983; Powell and DiMaggio, 1991). González and Hassall (2008), González et al. (2009) and Crawford et al. (2011) all employed NIS in their research. NIS argues that organizations need to conform to institutional rules and norms in order to establish their legitimacy in the society and maintain their power (Deephouse, 1996). Organisations tend to become isomorphic among them and towards societal norms and behaviours if they want to secure their survival. In this framework, institutional isomorphism is very useful in explaining the politics, the interest as well as the behaviour of modern organizations.

González and Hassall (2008) used an institutional theory approach to analyse the pressures exerted by the external institutional constituents on the Spanish HE system in order to implement the EHEA, and found that the changes in accounting education and educators are a consequence of the search not only for greater efficiency but also for legitimacy, that can often conflict with efficiency.

NIS was used to analyse the pressure to introduce a policy that consists of the incorporation of skills in BAA students’ education in Spain by González et al. (2009). They also investigated the strategic response adopted by Spanish universities and the institutional characteristics which determined it. They found that there have been both competitive and institutional (coercive, mimetic, normative) pressures on the Spanish university system to introduce skills into the BAA curriculum. However, the institutional characteristics have caused the Spanish universities to implement, until approximately 2005, an “avoidance” strategy. After 2005, the obligation for Spain to converge towards the EHEA has caused the Spanish universities to adopt a “compromise” approach, implying the negotiation of a balance between the interests of universities and the pressures of the environment. Crawford et al. (2011) investigated which are the most
important generic skills for a competent accountant and auditor. Academics listed the following skills as most important: 1) oral communication skills 2) analytical skills 3) written communication skills 4) teamwork 5) numeracy. Auditing academics listed the top five skills as: 1) analytical skills 2) written communication skills 3) teamwork 4) problem-solving 5) self-study/research skills. Audit academics have an institutionally different view from other accounting academics. Practitioners and academics share similar views on the importance of teaching generic skills, and the extent to which they should be (or are) taught at universities. They appear to share the same institutional beliefs about the skills necessary to become an accountant and auditor. More research is required to explore the factors that influence academics’ beliefs, which may be either external (i.e. professional bodies, International Educational Standard issued by IFAC (IES), benchmark statements that have moulded academic thinking) or internal networking between academics that has institutionalised these views.

3.10 **Teaching and Learning Approaches**

3.10.1 **Active Learning and Teaching Strategies**

The new important skills which are characterized as necessary for accountants’ professional development cannot be gained through traditional classroom methods. Changes in instructional methods are imperative in order to help students to acquire communication, interpersonal, and intellectual skills, as well as knowledge and professional orientation. Extensive literature has focused on how effective teaching, teaching methods and teachers’ instructional development can affect student learning and performance (Hartnett, Römeke, and Yap, 2003; Devlin and Samarawickrema, 2010; Stes et al., 2012; Barabasch and Watt-Malcolm, 2013). A teaching process which adopts the lecture method together with routine-problem-solving is usually seen as focusing on the acquisition of the knowledge needed to pass professional examinations. However, such methods are inadequate, primarily because they are not conducive to creative thinking and do not motivate students’ self-development. The teaching process should be expanded to ensure that students not only learn the technical professional accounting body of knowledge, but also develop the ability to use that knowledge analytically, in creative and innovative ways in accordance with high standards of professional ethics (AECC, 1993; IFAC, 1996; Adler and Milne, 1997; Hassall, Lewis and Broadbent, 1998a; b; Hassall and Milne, 2004).
In accounting education, there have been calls for a pedagogic shift from a teacher-oriented content to a student-learning orientation (Leveson, 2004) and an active learning approach (Lucas, 1997; Davis, 1997; Bashir, 2000; Swain and Stout, 2000). Brown and Guilding (1993) found that accounting teachers rely more heavily on prescribed textbooks than non-accounting faculties. Teachers should use particular techniques in order to promote critical thinking, innovation and professional skills, and finally a holistic education should be provided that can have a significant effect on the students’ perceptions of the skills and abilities important for success in accounting (Friedlan, 1995).

These particular techniques may include lectures and demonstrations, case analysis and discussion (Hughes and Berry, 2000; Dennis, 2003; Montano et al., 2004; Ballantine and McCourt Larres, 2004; Cullen et al., 2004; Crittenden, 2005; Drake, 2011; Alford et al., 2011), problem-based learning (Milne and McConnell, 2001; Kern, 2002), role play in decision situations (Crumbley, Smith and Smith, 1998), group research projects (Tonge and Willett, 2009), work experience as a course requirement (Beard, 2007; Sapp and Zhang, 2009; Gault, Leach and Duey, 2010; Marriott et al., 2011; Wilton, 2012) new assessment techniques and peer evaluation based on written and oral reports (Crossouard, 2010).

The teaching methods should encourage teamwork (Ballantine and McCourt Larres, 2007; Keyton and Beck, 2008; Reining, Whittenburg, and Horowitz 2009; Riebe et al., 2010), should use textbooks that are relevant to student needs and course objectives, promote argumentation and the effective use of teaching equipment, investigative research projects to encourage self-learning (Paisey and Paisey, 2003; Carr and Kemmis, 2005; Belghitar and Belghitar, 2010; Hadfield, 2012;), sensitivity teaching through discussions of ethical cases (Hassall et al., 1996; Largay, 2002; Ravenscroft and Williams, 2004; Hurtt and Thomas, 2008; O’Leary, 2009; Carnegie and Napier, 2010 Graham, 2012; Apostolou, Dull and Schleifer, 2013), classroom discussions with practising professional accountants, field trips and visits, work shadowing, project work, cooperative learning and computer-assisted instruction.

Several different learning strategies have been recommended and assessed, including internships or work placements, simulation games, task-based or practice-based, experiential, and service learning. All of these methods target the maximum interaction of students with businesses of all sizes, community groups and government development.
agencies. This interaction with multiple stakeholders will guide the design of more relevant educational courses which emphasise skills and competency development in addition to subject specific knowledge acquisition. Work placements have become an institutionalised practice in many HEIs and their positive effects have been noted in several studies, as mentioned above. Several studies and reports (AECC, 1992, 1993; AAA, 1986) have stressed the need for students to be active participants in the learning process rather than passive recipients of information. Active student learning involves “learning tasks which embody generic skills and attitude development, as well as the acquisition of a knowledge base, and in which the learners take some control and responsibility for their own learning” (Adler and Milne, 1997, p. 273). Such active learning calls for different instructional approaches from the traditional lecture format. Morton and Troppe (1996) noted that an approach based on direct experience motivates lasting learning. The AECC (1993) in statement No 4 underscored the importance of experiential learning as follows: “Students should seek opportunities to obtain firsthand knowledge of the business world and practice environment”. Service-learning is a specialised form of experiential education that combines academic study with community service. Community service is described as providing a service to improve the quality of life of the residents of a community, especially low-income individuals, or to solve specific problems facing a disadvantaged community. For service-learning to be effective for accounting students, accounting educators should be able to select and carefully structure the service work according to the curriculum. Another defining characteristic that can be used to differentiate service-learning from community service is reflection. This is an important component of experiential learning – enhancing the technical, discipline-specific and broader goals related to social awareness and civic responsibility. Service-learning is a subset of experiential learning (McCoskey and Warren, 2003; Still and Clayton, 2004; Rama, 2007).

Practice-based or task-based learning involves the synergy of the faculty, students and businesses, as an alternative approach to service-learning. Students work in teams and possess complementary knowledge and experience. The student teams are not placed in the firm but can visit it (the client) throughout the process to observe the business practice in operation. The student team under the guidance of their teacher undertake to discuss the demands of the project, and devise a research proposal, methodology and
solutions as well as proposals to manage the project (Mech, 2007; Hynes, Costin and Birdthistle, 2011).

Among the pedagogies that educators have designed to equip students with relevant transferable skills are cooperative-learning activities which constitute part of experiential education (Cottell and Millis, 1993; Ravenscroft, Buckless and Zuckerman, 1997). The terms “cooperative learning” and “group learning” are often used synonymously in the literature, despite their differences. A cooperative learning environment exists when groups are structured in such a way that they achieve five basic elements, namely: positive interdependence where the group members perceive that they need each other in order to complete the group task; individual accountability whereby each member of the group must be held accountable for completing the group task; face to face interaction where group members support each other’s productivity; the development of interpersonal and small group skills; and group processing where group members are responsible for monitoring the group’s performance (Ellis and Fouts, 1997; Ballantine and McCourt Larres, 2009). It is an instructional mode consisting of four-cycle learning featuring concrete experience, reflective observation, abstract conceptualization and active implementation (Kolb, 1985). The cyclical approach takes the learner through a sequence of learning stages in which each sequence has specific objectives and builds upon the knowledge, skills and abilities learnt in the previous stage (Baker, Simon and Bazeli, 1987). The student “is gaining experiential knowledge of the world he or she will be participating in and acquiring the necessary life skills to be successful within that world” (Kolb, 1984, p. 25-38). Within this framework, Dellaportas and Hassall (2013) conducted a study involving first-year accounting undergraduates visiting prisons, and found that the students were intellectually and emotionally engaged in the experience due to the novelty of entering closed walls and meeting former professional accountants. Webb, De Lange and O’ Connell (2009) planned an International Study Tour (IST) with site visits to world class global organisations in which students were addressed by senior personnel, and found that the IST provided the students with global and life experience that are impossible to find in the classroom.

Assessment is highly important in the learning process. Ramsden (1992) stated that perhaps the most influential signal that can be sent to students that affects their learning approach is their perception of assessment. Most students try to deliver what they predict
their tutors will reward, so assessment has a strong influence on the quality of the learning outcomes (Gibbs, 1992).

Educational research strongly suggests that academics should move from summative to formative assessment methods. Whereas summative assessment mainly measures short, memorised data, formative assessment aims to assist students to develop as learners. It informs learners about their performances and, ideally, also offers them pointers on to how to “do better next time”. Formative assessment can make an important contribution to student learning (Yorke, 2006b).

3.10.2 Students’ Approaches to Learning (SAL)

Accounting educators have developed different methods and constructs to help students to learn how to learn. The calls to develop personal and interpersonal skills cannot be accomplished without understanding students’ styles and preferences. In this framework, theorists have developed two models to explain students’ learning approaches. The first, developed by Ramsden (2003), is motivated by a need to understand learning in context, to understand students’ perspectives and value their voices. SAL contrasts with traditional methods of educational research that use constructs such as intelligence or ability, personality, or learning "style" to classify students. These approaches are criticised as being “top-down” and “acontextual” (Ramsden, 2003). Faculty that understands SAL will be able “to promote more conceptual, deeper forms of learning, and support enjoyable and effective learning within accounting” (Duff and McKinstry, 2007). Other important studies have been conducted to investigate students’ approaches to learning (Hassall and Joyce, 2001; Davidson, 2002; Byrne, Flood and Willis, 2002, 2004; English, Luckett and Mladenovic, 2004; Duff, 2004; Ramburuth and Mladenovich, 2004; Lucas and Meyer, 2005; Michael and Marriott, 2008).

Research has identified two main ways in which students approach learning: the surface and the deep approach (Craik and Lockhart, 1972; Marton and Säljö, 1976). A surface approach to learning is characterised by an intention to acquire only sufficient knowledge to complete the task or pass the subject. In this case, the student relies on memorisation and the reproduction of material and does not seek further connections, meaning or the implications of what has been learnt (Eley, 1992; Biggs, 1987a; Sharma, 1997). Students are unlikely to experience high-quality learning outcomes, or develop
appropriate skills and competences, through a surface approach to learning (Hall, Ramsay and Raven, 2004).

A deep approach to learning is characterised by a personal commitment to learning and an interest in the subject. The student approaches learning with the intention of understanding and seeking meaning, so consequently searches for relationships among the material and interprets knowledge in the light of previous knowledge structures and experiences (Gow et al., 1994; Beattie et al., 1997). A deep approach to learning is more likely to result in the better retention and transfer of knowledge and may lead to quality learning outcomes, such as a good understanding of the discipline and critical thinking skills (Booth et al., 1999). Entwistle and Ramsden (1983) developed the Approaches to Studying Inventory (ASI) while Biggs (1987b) developed the Study Process Questionnaire (SPQ) questionnaire. In the SPQ instrument, three approaches to learning are identified as a combination of the students’ motives (why?) and strategies (how?) that they use in learning (Biggs, 1987a, Biggs, Kember and Leung, 2001).

The second model that explains students’ learning approaches is described by Furnham (1995) and considers Cognitive Learning Style to be a central and powerful moderator variable in the relationship between personality, learning, memory, and academic achievement (Duff, 2004a). Researchers in this case draw from cognitive psychology to explore how learning takes place as the students process information.

Another approach to investigating students’ learning styles is the Cognitive information processing models, the best-known of which is Kolb’s Experiential Learning Model (ELM) (1976). This describes learning in terms of processes rather than outcomes. Four learning styles are identified through the Learning Style Inventory (Kolb, 1976, 1985): reflective observation (RO), abstract conceptualization (AC), active experimentation (AE), and concrete experience (CE). The four stage cycle of learning forms a continuum as the learner moves through time. Four types of learners are identified: Divergers, who combine concrete experience and reflective observation, considering specific experience from several different perspectives; Assimilators, who combine reflective observation and abstract conceptualization, excelling in developing theoretical frameworks; Convergers, who combine abstract conceptualization and active experimentation to test theory in practice; and Accommodators, who combine concrete experience with active experimentation. The evidence seems to suggest that accounting students are “Convergers”, preferring the practical application of ideas, focusing acquired knowledge
about specific problems, preferring things rather than people and having narrow technical interests (Baldwin and Reckers, 1984; Baker et al., 1986). Other studies identified that accounting practitioners were "Convergers" also (Brown and Burke, 1987; Collins and Milliron, 1987). Other studies investigating accounting students' learning styles include McKee, Mock and Ruud (1992), Hand, Sanderson and O’Neil (1996), Duff (1998, 2001), Marriott (2002) and Adler, Whitting and Wynn-Williams, (2004).

3.10.3 Academic Faculty Issues

Raelin (2011) argues that US state universities and colleges, in order to gain respectability and sustain their prestige, have focused on research at the expense of the more time-consuming teaching strategies. Lectures, routine-based problems and textbook rule learning should give way to interactive learning. Students should be active participants rather than passive receptors of information. Learning by doing is the most appropriate method and so case study, simulations, role-playing and other interactive teaching methods must become a routine part of accounting pedagogy. Faculty members should acquire and maintain a high level of knowledge about practice issues and the non-academic accountants’ workplace, for example:

- Read journals that cover changes in the practice environment
- Participate in faculty internships (compensated employment as a professional accountant) that provide experience in current business and professional issues and decision-making
- Request information from employers about the work environment
- Attend recruitment events on campus and discuss issues with employer representatives

Doctoral courses could be one of the main sources of preparation for teaching responsibilities. However, the literature indicates that most endeavours to develop teacher skills appear to rely on the efforts of the individual rather than the systematic effort of doctoral courses or academic employers (Swain and Stout, 2000).

There is a continuous need to improve the instructional methods and materials, which can be realized through effective teaching which in turn needs measurement, an evaluation system, recognition and rewards (Tourna, Hassall and Joyce, 2006).
successful implementation of the above will entail the faculty being trained to apply appropriate instructional and innovative methods.

The European Commission has repeatedly stressed the impact of HE on citizens' employability and cultural development. For example the EU high-level group (2013) on the Modernisation of HE has published its first report on improving the quality of teaching and learning in HEIs, making 16 recommendations which include a call for mandatory certified training for professors and other HE teaching staff, more focus on helping students to develop entrepreneurial and innovative skills, and the creation of a European Academy of Teaching and Learning led by stakeholders, and inspired by the good practices reflected in this report.

The major recommendations were that every institution should give teaching due parity with research, all staff teaching in HEIs in 2020 should have received certified pedagogical training, the heads of institutions and institutional leaders should recognise and reward (e.g. through fellowships or awards) HE teachers who make a significant contribution to improving the quality of teaching and learning, whether through their practice, or through their research on teaching and learning. Recommendation No 13 refers to the EU’s actions in order to support the implementation of these recommendations, particularly through promoting:

- innovative teaching and learning methodologies and pedagogical approaches;
- guidance, counselling and coaching methods;
- improving course design, taking account of the latest research on human learning;
- the professionalization and development of teachers, trainers and staff;
- the mobility and exchanges of academic staff for long term teaching assignments;
- systematic and regular data collection on issues affecting the quality of teaching and learning.

### 3.10.4 The First Course in Accounting

The importance of the first course in accounting has been noted by many authors (AAA, 1986). Its primary objective, according to AECC (1992), is to enable students to learn about accounting as an information development and communication function that supports economic decision-making. The knowledge and skills fostered by that first course in accounting should “facilitate subsequent learning even if the student takes no
additional academic work in accounting or directly related disciplines” (AECC, 1992, p. 249). The significant role of the first course imposes that the most effective instructors should teach the course, prioritising their interaction with students as well as the interaction among students. Teaching methods such as case studies, simulations, and group projects should be used to enhance student involvement. The first course in accounting serves as a primary means of attracting students to, or discouraging students from, an accounting career (Friedlan, 1995). The introductory course teachers should help the students to identify the profession as an information development and communication function that supports economic decision-making. The course objectives should be to teach students how to perform financial analysis, derive information for personal or organizational decisions, and understand business functions (Boyd et al. 2000). However, there are studies like the one by Lucas (2002) in which it was investigated the lecturers’ conceptions of teaching introductory accounting and a tension was identified between a professed priority for conceptual understanding, a difficulty in articulating concepts and an emphasis upon the technical mastery of topics and problems.

3.11 Criticism of Accounting Education

3.11.1 The Marketisation of Accounting Education

During the 21st century, HE has stood at the centre of a debate about its scope and mission in society. This debate, alongside the emerged terminology from markets such as “university accountability” and “the university as a market-driven business”, has dominated the studies, research and policy-makers’ discourse. The issues discussed are not only the content and aim of courses but also the structure of the educational organisations and their pattern of functioning. It is argued that universities have become “dominated by accountancy procedures and measured by the products they produce” (Atiyah, 1992 cited in Craig and Amernic, 2002). Universities are schools of education and schools of research, but the primary reason for their existence is not to be found either in the mere knowledge conveyed to the students or in the mere opportunities afforded to the faculty members. The justification for a university is that “it preserves the connection between knowledge and the zest of life, by uniting the young and the old in the imaginative consideration of learning” (Craig and Amernic, 2002, p.138). Globalisation is reinforcing the “market ideology” with which universities are currently
entranced (Menzies and Newson, 2001). The embracing of entrepreneurial endeavour and the adoption of the “business model” by universities now appears mandatory, especially for publicly-funded universities, operating under conditions of extreme financial stringency. Boyce (2004) argues that universities have taken on the role of meeting the needs of business as their core mission and so have come increasingly to resemble businesses themselves. Accounting educators should respond to and expose the “deleterious consequence of the current financially-derived model of audit” and the “assumption that market forces provide the best model of accountability” (Salter and Tapper, 2000, p. 571). Public-supported organisations like the Quality Assurance Agency (QAA) are identified as the carriers of the market ideology. The London School of Economics (LSE) has accused the British government’s university audit body, the QAA, “of infringing academic freedom, imposing its own bureaucratic and pedagogical agenda, neglecting students’ intellectual development, and using incompetent and unprofessional reviewers” (Craig and Amernic, 2002).

3.11.2 Liberal Education versus Vocational Education

Accounting education has not escaped the dilemmas and trends that face HE in the developed world after globalisation and the changed working conditions. The debate on the content and scope of education is present in accounting education also. Should education prepare students for the working world or equip them with a liberal education that will support their personal development and hence improve their working life in the future?

Boyce (2004) refers to the reform efforts of accounting education as driven mainly by the professional accounting bodies (AAA, 1986; AECC, 1990), which called for changes in accounting education to make it more “relevant” to the (changing) needs of the AP. The perceived problems with accounting education were associated with a narrow, technical view of the discipline (Needles and Powers, 1990; Patten and Williams, 1990; Johns, 1996). Since the very start of academic courses in the 19th century to date, accounting educators have focused on passive, teacher-centred teaching and learning approaches transferring an ever-growing, technical-regulatory content (Parker, 2001). The criticism of this “putative” reform agenda is the same as that of the traditional curricula; a vocational agenda is based on the assumption that university education has no obligations beyond preparation for working life. Accounting academics have a particular responsibility arising from “the central role of their discipline in creating and
sustaining social reality, including the present dominance of economic rationalism” (Boyce, 2004). Accounting educators should decide whether their commitment is to the accounting profession or to accounting education (Tinker and Feknous, 2001). Two important issues arise. The first is the question of whether accounting as a process portrays a “truthful” or “fair” representation of the financial and economic reality, while the second refers to the wide recognition that the power of accounting and its techniques of notation, computation, calculation, and evaluation are indispensable in the operation of power and rule in society. The practicing of accounting is tied to and reproduces the present social and economic injustice (Miller and Rose, 1990). Dominant forms of accounting promote, naturalise and universalise economically rational, profit-centred, corporatist values. Alternatives are systematically denigrated, marginalised, and obscured (Chua, 1996; Mitchell, Sikka and Willmott, 2001). Students are rarely given the opportunity to discover that accounting is less the neutral language of business serving the economic good than the partial language of social power serving particular interests (Boyce, 2004). However, the development of generic skills as requested by the accrediting bodies (analytical and critical thinking, judgement and synthesis, personal and interpersonal, management and organisational skills, and the ability to apply these skills in a range of unique situations) “preclude the adoption of a narrow objective-based, vocationally oriented training model” (Boyce, 2004, p. 577).

3.12 Chapter Summary

The chapter first presents an overview of the changes that have occurred within the AP due to globalisation, technology and new working relations. The new profile of accountants demands broader aspects of education that include important skills of communication, personal, interpersonal, ethical, and critical thinking skills. Accounting education has evolved through consequent calls for reform (in the US) which have also influenced other countries, mainly the Anglo-Saxon area. The conceptual dimensions of skills and competences are examined and research on ways to transform the curriculum to include professional skills, the teaching methods that support skills development, the barriers to skills development in HE as well as issues pertaining to the accounting faculty have been presented.
CHAPTER 4 Skills and Competences in the Greek Context

4.1 Introduction

The chapter describes HE in Greece, provides a picture of the AP and explores the development of professional skills in accounting courses. After this introduction, the following section 4.2 presents the structure of the Greek educational system, and section 4.3 describes accounting education, the teaching and assessment methods as well as issues related to teacher training in HEIs. Section 4.4 traces the research on skills and competences in HE and describes the Greek paradox. Section 4.5 reviews the literature specifically on skills and competences in accounting education. Section 4.6 examines the evolution of the AP and the structure of the Greek economy while a summary of the chapter is given in Section 4.7.

4.2 The Educational System in Greece

The general structure of the formal educational system includes 9 years of mandatory education, consisting of 6 years of primary school and 3 years of high school. The next 3 years include Lyceum studies followed by 4 years of HE. Medical school lasts 6 years and engineering 5 years. The second cycle of HE is a Master’s degree and the third cycle is a PhD. Also, vocational education is covered by two-year courses after Lyceum (post-secondary education). The formal tertiary educational system in Greece consists of two parallel sectors: Universities and Higher Technological Educational Institutes (ATEIs) (Law 3549/FEK/69/2007 and Law 4009/FEK195A/2011).

Article 16 of the Constitution defines HEIs as public, self-governing organisations that function under the supervision of the State and the Minister of Education. Education in Greece is a social benefit and is provided free of charge at all levels (Primary, Secondary, and Tertiary) to all Greek citizens. There are also many private schools that cover all sectors of education but private colleges are not recognized as providers of tertiary level degrees by the Greek State. In the past, efforts to change article 16 and
permit the functioning of private HEIs has been the centre of extreme debate and street demonstrations. This law may change in the near future due to demands coming from private funded Colleges, transnational education organisations and other groups in society. We should clarify that in Greece the term “public” schools refer to Government funded organisations which are the equivalent of the UK “state” schools. Therefore from here on when we refer to public schools in Greece we refer to the state funded organisations.

The HE entrance examinations (which are national examinations) constitute a highly-selective procedure, and exam success grants the candidate a prestigious place at a Greek University or ATEI (Gouvias, 1998). The significant reforms during the summer 2013 concerned the decrease in the number of HEIs through “Plan Athena”4 through mergers, transfers and the abolishment of departments and faculties nationwide in an effort to rationalise the spread of institutions across the country and cut the public expense.

Greece participates in the European Union plan “Europe 2020” for the strategic promotion of education and skills development. One of the European targets for 2020 is to decrease the percentage of young people who leave school early to 10%. In Greece (shown as EL in the figure below), this percentage is currently close to the European average of 14.1%, Figure 4-1). The statistics are given by the International Standard Classification of Education (ISCED) which is a statistical framework for organizing information on education maintained by the United Nations Educational, Scientific and Cultural Organization (UNESCO).

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Europe bases its economic development on knowledge and innovation. One of the primary targets of “Europe 2020” is to increase the percentage of people aged 30-34 years old who hold a HE degree or equivalent to 40% by 2020. In 2010, the average percentage of HE degree holders, for the 27 members of EU, was 33.6%. In Greece currently, around 29% of young people aged 30-34 hold a HE degree (Figure 4-2).

Figure 4-2: Percentage of HE graduates and the EU target for 2020, Eurostat
Universities and ATEIs are closely connected to the state and its regulations. They are financed by the state directly through the public budget and indirectly by the EU through the Ministry of Education. Although educational institutions are totally self-governed (article 16 of the Constitution), the close connections and dependence between the state and the Ministry of Education is visible in many cases. Examples of state dependence apart from funding are: a) the state defines the number of new students for each Institute and b) the state defines the academic credentials for the election of a candidate for a teaching position in an academic institute. Funding from other sources, although not prohibited, has not really been promoted by the state so far. Apart from the state, students and society in general would view with suspicion and react strongly to any private funding by enterprises, especially for research purposes or any kind of involvement within the Institutes’ processes. However this attitude is changing fast especially in light of the current economic crisis.

After the 1990s, new ideas emerged in the HE environment, such as the need to connect universities with the labour market, as well as the concepts of competitiveness, effectiveness, and flexibility. New forms of curricula and teaching methods appeared, like e-learning and the concept of programme studies, however these were limited within the operations of the Hellenic Open University (Law 2083/FEK159A/21 September 2008). E-learning has been adopted by other Institutes in the meantime to provide professional training, for example the University of Athens’ Centre for Professional Training.

4.3 Accounting Education in Greek HEIs

In Greece, accounting courses exist either as part of a business (or related) degree or independently leading to an accounting degree. Specifically, accounting courses are taught in 28 departments of 13 universities including the Open University (data before reorganisation of HEIs due to “Plan Athena”). Two of these 28 departments are autonomous departments of Accounting and Finance leading to accounting degrees (Athens University of Economics and Business and the University of Macedonia). Also, accounting courses are delivered in 40 departments of the 15 Technological Educational Institutions of Greece. Eleven of these departments offer autonomous accounting degrees.
4.3.1 Teaching Methods

HE teaching is principally traditional in Greek universities and Technological Institutions. The teaching of accounting, like other disciplines, is delivered in large classes, often containing over 100 students. Laboratories are widely-used for computer classes, especially in Technological Educational Institutions. The main teaching method is lectures and the teacher-centred concept dominates accounting classes. Other methods, like peer teaching, group projects, role-playing, case studies, active participation and simulations, are rarely used and depend on the teacher’s initiative. The curriculum design and course development are the responsibility of the teachers. Each faculty member is responsible and decides upon the exact content and teaching method of his courses and the basic or applied research he conducts. The professional accounting bodies and government have not been involved so far in the methods, materials or overall pedagogy of the courses. In accounting classes, the teachers aim to establish a good technical background for the students. Interpersonal skills are not a priority or consideration with regard to accounting courses. A capacity for inquiry, abstract logical thinking, critical analysis, speaking and listening skills, historical consciousness, and international and multicultural knowledge are not among the objectives of HE courses and deserve special consideration. It is obvious that the creative use of technology, ethical issues and the shift to process learning also demand particular attention. The students themselves are not receptive to change or working autonomously (Touma-Germanou, 2006). They are trained to be passive learners from primary school until they graduate from university. The successful implementation of alternative teaching methods needs the synergy of all participants: the teachers, students, and the overall environment, a combination which is rarely found.

4.3.2 Assessment methods

Student assessment is via a written assignment at the end of the semester and students have to pass this exam in order to progress to the next accounting modules on the curriculum. The assessment of accounting courses varies between different institutes and instructors, although typically consists of technical questions and problems to be resolved with one correct answer. The written materials employed are either textbooks concentrated on the technical and mechanical aspects of accounting or handed-in material with additional exercises.
Written exams are rarely combined with personal or group projects which contribute to the overall student mark. During the semester, in most Institutions, there are no obligatory projects or any kind of formal assessment. Students have the right to register on an unrealistically high number of courses which they may not attend and for which they merely sit the exams for an unlimited number of times. Any variations to the teaching methodology, techniques (i.e. case studies) or content are occasional and depend solely on the teacher. All students enrolled in a BA department are required to take 4-6 accounting courses to graduate. These usually include: Financial Accounting, Management Accounting, Tax Accounting, Accounting Information Systems, Financial Statement Analysis and Auditing. Students in accounting departments are required to take 16 or more accounting courses plus 14-15 more general business subjects, like management courses, microeconomics, macroeconomics, marketing and statistics.

4.3.3 Teacher Training

Teacher training on pedagogy and methodological issues in the field of HE requires detailed examination. Teacher training on educational methodology in reality does not exist among Greek academics and is never discussed at any level apart from the sporadic efforts made mainly by the Open University. Teacher training courses exist for primary and secondary level teachers (Liakopoulou, 2011).

However, adult education, has become well-organised in the last decade and is expanding through the work of the Ministry of Education, Ministry of Labour, the National Accreditation Centre (EKEPIS), and the Hellenic Open University in cooperation with the Hellenic Adult Education Association (HAEA). Lifelong learning courses have been organised through several private and public organisations with EU support (Kokkos, 2008; Karalis and Pavlis-Korres, 2009; Karadinos, 2009). The state recognised very early the potential role of universities in lifelong learning, and so published a series of Laws as early as 1922 (Law 2905) and 1932 (Law 5343) to assign rights and responsibilities to universities related to adult education. The most recent law was 3369/2005, giving HE the right to establish learning units and offer relevant courses in continuing education to adult learners. However, this Law was never established in universities alongside other laws of educational concern (Karipidou, 2012). The reasons why laws that are voted by Parliament never come into effect are investigated by several studies. For example (Bouzakis, 2006; 2008) argues that this inertia is due to the fact that these laws are imposed from the top down, and so do not incorporate the views of
the stakeholders. Further factors that lead to the failure of educational policies include the adoption of models that do not consider the educational and historical context of the country that accepts them.

Academia has not yet recognised the need to train academic teachers of tertiary education. The teachers’ scientific knowledge is considered adequate to educate future scientists so far in the Greek HE system. The idea that they need training in teaching methodology in order to teach would cause a strong reaction of embarrassment and offence among many university teachers, whilst, other teachers realise the need to improve their approach to teaching and make personal efforts to find and implement new methods and practices despite the unsupportive environment. Some academic teachers, in order to fill the gap, attend either adult or secondary education teacher training courses. Obviously, this is not the best solution and a system of targeted HE teacher training courses needs to be institutionalised.

4.4 Skills and Competences in HE

The history of the Greek educational system is based on the Classical-Hellenic and Byzantine-Christian traditions, and is a manifestation of the nation’s strong efforts to modernise, expand economically and catch up with the current trends of the Bologna and EU processes. The harmonization with the Bologna Process produced great controversy within society, especially in 2005-2007. Part of students, teachers and other organisations reacted strongly against the Bologna principles with strikes, demonstrations and occupations of school buildings. Some of these issues still provoke reactions and challenges for research (Papailias, 2006a, 2006b; Kladis, Kontiadiis and Panousis, 2007; Veremis and Papazisis, 2007; Alivizatos, 2007; Aggelopoulos, 2007; Asderaki, 2009; Papadimitriou and Westerheijden, 2011).

4.4.1 The Greek Paradox

Greek people highly appreciate education and Greek parents have been extremely supportive of their children’s education and training. Greek parents usually direct their children towards HEIs in order to attain social status (Tsoukalas, 1977) and a high income, although recent studies show that HE graduates face severe unemployment in Greece (Liagouras, Protogerou and Caloghirou, 2003). Studies have shown that the earnings advantage of HE was reduced by some 40% between 1975 and 1987 (Lambropoulos and Psacharopoulos, 1992 cited in Liagouras et al. 2003), and
Kanellopoulos (1997) estimated that the wage premium of HE/secondary education declined from 1.5 in 1974 to 1.23 in 1994. There is a clear tendency for students to select HE disciplines that are regarded as “prestigious” or as acting as a passport for entry into the historically large, and superior in terms of overall working conditions, Greek public sector (at least before the economic crisis) (Kokosalakis, 2001; Katsanevas, 2002; Papamatthaiou, 2003; Liagouras et al., 2003; OECD, 2005; Psacharopoulos and Papakonstantinou, 2005). Greece has the highest rates of students studying abroad as well as a high rate of graduates who work in different areas than the one they studied (Papadimitriou, 2011).

Saiti and Prokopiadou (2008) refer to this pattern as being a characteristic associated with less-developed countries in response to political pressures (Glytsos, 1989; Dabalen et al., 2001), and also emphasise that even an increase in higher skills and knowledge of an organisation’s personnel does not necessarily guarantee a rise in productivity. OECD (2006) revealed that an increase in the educational level of Greek employees had not been accompanied by a corresponding increase in the skills necessary to match a profession/job description (cited in Saiti and Prokopiadou, 2008). In all cases and taking into consideration previous studies (Liagouras et al., 2003; Kokkos, 2013), it is clear that there is a vicious circle between the increased supply of HE graduates, employers’ inability to upgrade their productive methods and investments to absorb the excessive, highly-educated labour force, and a highly bureaucratic, centralised state that is clearly functioning under the regime of political “clientelism” (Liddle, 2009). In the last few decades, in Greece, not only have graduates turned towards the state to find employment but even the private sector firms appear to have a strong dependence on the public sector as a business partner. The controversy between the high tertiary education qualification rate and low employment rates is not evident in any other European country, and it constitutes a paradox in Greek society that has been interpreted as being due to social, political and economic reasons.

Additionally, strong family ties constitute a further reason for young people’s lack of skills (Kokkos, 2013). The Greek family, with its strong traditional relations and old-fashioned needs for safety, guides its offspring to find employment in the Greek public sector. Parents struggle to support their children to become HE graduates by spending excessive amounts of their household budget on preparatory courses, language tutors, and out-of-school support (Sianou-Kyrgiou, 2008). Family protection prevents children
from acquiring a range of skills like problem-solving, identifying alternatives, risk-taking, persistence, independence and self-awareness. Employment in the Greek public sector is an extreme case of the parent-child relationship where the employer (Greek state) takes full responsibility for the employee throughout his life (Waterman et al., 1994, p. 87). Possibly a different approach from the family, coupled with a modern, open educational system, could create a dynamic future pool of extrovert entrepreneurs or competent executives who would function well under the “new covenant” between employer and employee (Hall, 1996a; Hall and Moss, 1998; 2002; Garavan, 1999; Hall, 2002).

The paradox of the Greek labour market is presented in the OECD study (2009), which shows that, the higher the qualification of young individuals in Greece, the more they face unemployment. In Greece, the demand for HE graduates is limited because this group is only demanded by the advanced sector of the Greek economy, which represents around 2% of all enterprises. Consequently, HE graduates are either unemployed or underemployed. Even when businesses employ HE graduates, they complain about their skills and competences. The responsibilities of the HE system to promote marketable skills in its graduates are highlighted also in the studies of Mihail and Karaliopoulou (2005), Katehi et al. (2011) and Panagiotakopoulos (2012). They argue that the curricula in HE courses are outdated, the assessment methods are summative based on numerical data and there is absence of any work-based learning opportunities. Kokkos (2013) agrees that the educational and training system does not help students to compete successfully in today’s changing environment. The educational system is highly teacher-oriented, and directed towards theoretical knowledge rather than practical learning. Teacher training is not within the system’s horizon and the teaching methods are mostly traditional and obsolete.

Engineers seem to move fast in the competitive arena for employability. Liagouras et al. (2003) found that the increasing application of scientific knowledge and new technology in managerial tasks has given engineers an advantage over economics and business graduates. In the new interdisciplinary areas of employment, skills take a significant precedence over knowledge. Amongst the preferred required skills are analytical thought, adaptability, the capability to learn how to learn, the initiative in taking decisions, etc. New organisational methods (project management, customization) by organisations and the expansion of the economic/managerial responsibilities in
engineers’ work have upgraded the non-technical skills which, until recently, were considered of minor importance (Liagouras et al., 2003, p. 421; Papayannakis et al., 2008). Dafou (2009) investigated the selection strategies from the employers’ perspective and how these are connected to graduates’ qualification criteria. A notable result of the study is that employers group together knowledge (know what) and skills (know how) and consider these to depend on the institute and type of subject that the graduates have studied. This result seems to coincide with Sofoulis (1991)’s view that the Greek labour market relies heavily on paper qualifications, taking for granted the coexistence of the desired substantive qualities (Dafou, 2009). Candidates’ personal and interpersonal skills are considered part of their personality elements, and created through the Institutional “habitus” and social class from which they come. Employers prefer theory because they believe that it is theory that creates flexibility of mind and dexterity in dealing with new environments and situations. Thus, theoretical knowledge constitutes graduates’ passport to higher level jobs. Here, again, there is the inference that theoretical knowledge is accompanied with a number of skills, such as decision-making, interpersonal skills, assuming leading roles, etc.

The Hellenic Federation of Enterprises and Industry (SEV, 2004) investigated, among other things, the knowledge and skills that employers demand from newcomers. The employers ranked first graduates’ adequate knowledge of the scientific field, a capacity to continue learning, communication skills, knowledge of a foreign language, teamwork skills, decision-making skills, entrepreneurship, ICT skills, leadership skills, and management skills. Employers believe that the graduates’ knowledge and skills are below average. Other studies that investigated graduates’ skills and competences include Patiniotis and Stavroulakis (1997) on the vocational education and training system (VET), Christou (2002) on the tourism industry, Zambarloukos and Constantelou (2002), Nikolaou (2003), and Giavrimis et al. (2009) on lifelong learning. An important study that investigated ways to bridge the gap between knowing-doing and academics-practitioner interaction is that of Nicolaidis and Michalopoulos (2004) based on Nonaka and Takeuchi’s model (1995). Their proposed theoretical background could be of interest to all business disciplines, including accounting.
4.5  **Skills and Competences in Accounting Education**

4.5.1  **History of Accounting Education**

According to Filios (1995, 1998) the use of double entry bookkeeping started in the Ionian Islands in the 16th century along with the wide use of Italian terminology for accounting books. The systematic teaching of accounting started in the private schools of Greece in 1894 (Niforopoulos, 2012). After 1903, the government established business schools which provided accounting courses in Athens, Patras, Syros, Corfu and Volos. Two events have been the cornerstones for the advancement of Accounting to a scientific level in Greece; the first is the establishment of a University School that included accounting within its curriculum in 1920 and was named “Higher School of Economics and Commercial Sciences” (Law 2191), while the second was the issuance by the state of Law 2190 which regulated all relevant issues about Societes Anonymes (SA companies).

4.5.2  **The Accounting Education Curriculum**

In recent accounting history, the research includes mainly technical accounting subjects. Few studies have explored accounting education in relation to social issues. Relevant study is that of Papailias (2002) on the accounting curriculum at ATEI Piraeus and more recently the study of Tourna-Germanou (2006) on accounting education and specifically the factors that influence students of BA departments to follow an accounting career.

4.5.3  **Research on Skills Development and the Bologna Process**

Very few studies have explored accounting education in relation to skills development as dictated by the international trends and required by the Bologna Process. Among these is the study of Asonitou and Hassall (2008), which investigated the case of Greek accounting education especially in relation to the Bologna Requirements. The learning approaches of accounting and management students were explored in two studies. The first was by Asonitou, Tourna and Koukouletsos, (2009), who examined BAA students’ learning strategies of ATEI Athens and ATEI Piraeus. The research used the Revised Two Factor Study Process Questionnaire (R-SPQ-2F) (Biggs et al., 2001) and the deep and surface learning approaches as theorised by Marton and Saljo (1976). The second study was comparative research between Spain, the UK and Greece. Its aim was to compare the learning approaches (deep and surface learning strategies) of accounting and business students in the three countries (Montano et al., 2010). Byrne et al. (2012)
examined accounting students’ motivations, expectations and preparedness for HE in Ireland, the UK, Spain and Greece. Two studies were conducted in order to promote management students at ATEI Athens’ professional skills (communication, teamwork and critical thinking skills). The first was conducted by Asonitou and Koutoulas (2013) and attempted to enhance management students of ATEI Athens’ research awareness and critical thinking during an Accounting Information Systems course. The second aimed to reverse management students’ negative view of teamwork on a business communication course and enhance active student participation (Asonitou, 2013).

4.6 The Accounting Profession in Greece

4.6.1 The evolution of the accounting profession

The late emergence of the advanced industrial and economic structures (1920s) with the influx of Western capital (mostly loans) resulted in the development of the AP 100 years after the Anglo-Saxon ones (Tourna and Kapadaidakis, 2006). Not only did the Greek AP emerge later but it was also shaped differently than in the West. It has not grown and matured as a result of business needs and the market function but was mainly constructed by the legislators (Brugge, 1963).

Despite the rapid economic expansion and development of the Greek business environment after the 1960s, the AP was still an “open access” profession until 1991. No specific laws had been introduced requiring educational qualifications, professional exams or certification to practise as an accountant. The attempts to reform the AP have been a highly controversial issue among Greek accountants. The expansion of the role and jurisdiction of the Economic Chamber of Greece (ECGr) to undertake the regulation of issues related to the practice of economic occupations was sanctioned by Presidential Decree 475/1991 (based on article 3, paragraph 6 of Act 1100/1980). Through the inclusion of the accounting and tax-accounting professions with business and commerce occupations (Article 1, paragraphs 2, 4, 5 and 7 of P.D. 475/1991), accountancy now falls under the ECGr’s jurisdiction. All accountants are obliged by law to register with the ECGr. The Chamber was officially given the right to grant licences to qualified and non-qualified accountants for the practice of all classes of accounting books. Therefore, practising financial accounting now presupposes the holding of an ECGr licence.

Accountancy has been for years an extremely “open” profession due to the variety or lack of entry standards to the profession. In Greece, the term “accountant” is used more
broadly than in Anglo-Saxon countries in the sense that it includes all occupations within the AP. In Greece, accountants range from self-employed practitioners who do bookkeeping and complete tax forms for their customers, usually micro or small companies, with limited other responsibilities to highly skilled financial and tax accountants, auditors and management accountants working for large firms or multinationals. Due to the small size of companies in Greece, the financial accountant may also undertake a wide range of duties, from tax accounting to resolving complex labour issues. An “accountant” in Greece may work as:

- A financial and tax accountant in micro, SME and large enterprises
- An external “auditor”, named an “orkotos-elegktis-logistis”, that corresponds to the occupation of the CPA
- An internal auditor in medium and large companies
- A self-employed accountant working from home
- A salaried accountant in the industry and service sector
- A management and cost accountant usually in medium and large enterprises

The term ‘management accountant’ is rarely used in Greece, as happens also in Spain (Hassall et al., 2003). This title is referred to more often nowadays but very often the persons who act as management accountants are called financial analysts. It seems that, accountants’ roles and responsibilities are poorly-determined and there is some confusion about the titles and duties of accounting practitioners. It is confusing also when attempts are made to compare Greece with other European and Anglo-Saxon countries.

### 4.6.2 Professional Bodies and Professional Rights

In Anglo-Saxon countries, the title of ‘accountant’ is given to those who have passed the examinations of the relevant Professional Bodies. In Greece, the Professional Body of external auditors (SDOE – Soma Orkoton-Elegkton Logiston) require its members to take examinations in order to obtain a license to practise the profession. The auditing profession functions under the regulations and institutional frame of the Committee for the Accounting Standardization and Control (EATE) (Caramanis, 1998). There is no separate professional body for management accountants. The professional body that represents financial-tax accountants is the Economic Chamber of Greece (ECGr) which represents all economists, including accountants. Law 4152/2013 (FEK 107/A/2013) has
enlarged the field of people who can become accountants and has minimised the presuppositions required to acquire a professional identity. There are two types/levels of accounting professional identities, each providing different professional rights to their holders. Identity level B gives its holder the professional right to be responsible and sign financial statements for companies with an annual turnover of up to 1.5 million Euros, while identity level A provides its holder with the professional right to be responsible and sign financial statements for companies with an annual turnover of over 1.5 million Euros (Papadeas, 2009). Accreditation by the international accounting bodies (ACCA, CIMA, and AIA) has increased their presence in the country in recent years through private educational organisations. Only very recently, in June 2014, the ECGr introduced 3-hour online examinations for the provision of professional identity level A.

4.6.3 The Economic Context

4.6.3.1 The structure of the Greek economy

Accounting occupations have been directly dependent on the structure of the Greek economy. This is characterised by the domination of small to medium sized companies and a few large, multi-nationals. Other characteristics of the economy have been the long-lasting tax evasion phenomenon alongside the perception that companies need accountants not to act as economic advisors or economic information providers, but to help them “face” or “escape” the tax authorities and regulations (Markozos, 2006). People argue that the responsibility for the creation of this distorted economic reality that contributed to the current financial crisis is shared among many societal groups, mainly the politicians, financial professionals including accountants and the firms’ owners.

According to the Institute of Small medium Enterprises of Greece (IME) (2013) 745,000 SMEs operate in Greece, which employ on average 11 people. Micro enterprises employ 0-9 employees, small enterprises employ 10-49 employees, and medium-sized firms employ 50-249 employees. The big enterprises, with over 250 employees, comprise only 14% of the employment nationwide. It is easy to see how critical the SME and micro enterprises are for the national economy since they constitute Greece’s main business model. Their contribution to development, employment and social coherence is also evident.
4.6.3.2 Greece and Europe

Greek entrepreneurship is shown in the statistics of the European Commission’s report on the Small Business Act, 2010/2011 (IME, 2013). The following data have been extracted from Eurostat and Cambridge Econometrics and presented by IME (2013). They include an analysis in 2010 based on data for 2002-2007, including data from construction companies, commerce, service companies and the manufacturing sector (table 4-1). SMEs employ over 2 million of Greece’s active population, and contribute 55% of the added value to the economy. There are around 750,000 SMEs (including micro companies) in total in contrast to only 563 large companies. It is striking that the total percentage of SMEs in Greece and EE27 is similar (99.9% vs. 99.8%). The difference is that the Greek SMEs employ a much higher percentage of the population and function with much higher added value (71.7%) compared to the EU average (58.4%).

Table 4-1: Comparison of SMEs and Large Companies in Greece and the EU

<table>
<thead>
<tr>
<th></th>
<th>Number of enterprises</th>
<th>Employment</th>
<th>Added Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Greece</td>
<td>EU27</td>
<td>Greece</td>
</tr>
<tr>
<td>Micro</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>719,952</td>
<td>96.5%</td>
<td>92.1%</td>
</tr>
<tr>
<td>Small</td>
<td>22,832</td>
<td>3.1%</td>
<td>6.6%</td>
</tr>
<tr>
<td>Medium</td>
<td>2,893</td>
<td>0.4%</td>
<td>1.1%</td>
</tr>
<tr>
<td>SME</td>
<td>745,677</td>
<td>99.9%</td>
<td>99.8%</td>
</tr>
<tr>
<td>Large</td>
<td>563</td>
<td>0.1%</td>
<td>0.2%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>746,240</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

In Greece, a similar percentage of micro firms operate compared with the average EU27. However, their significance is reflected in their percentage of participation in employment (57.6% vs. 29.8% EU27) and added value in the economy (35.3% vs. 21.8% EU27). One in two people in Greece who are employed in non-financial services works for a micro company. In total, SMEs employ more than 85% of the active population which is significantly higher than the average EU27 (66.9%). The
The contribution of SMEs to added value is more than 70% compared with the average EU (58%). The current crisis has influenced primarily the SMEs within the economy. The total number of SMEs has decreased significantly. Between 2003 and 2010, 30,000 fewer companies were in operation and at least 135,000 people lost their job due to the financial crisis. The relative added value has also been reduced (ICAP, 2012).

4.7 Chapter Summary

The chapter outlined Greece’s educational and professional structure. An in-depth literature review was conducted on the introduction of skills and competences in HE. The chapter included an analysis of the professional and economic context from the accountants’ perspective, and also the evolution of the AP in relation to the companies’ size, employment and added value to the economic output. Next chapter presents the theoretical framework of the study, New Institutional Sociology (NIS) and specifically the concept of isomorphism ((DiMaggio and Powell, 1983). The author explains why it constitutes the most widely used perspective in order to interpret and analyse changes in organizational fields under uncertainty as is the case with the educational field currently in Greece.
CHAPTER 5  Theoretical Framework

5.1  Introduction

This chapter focuses on the theoretical framework that is used in the study. This framework is the New Institutional Sociology (NIS) and especially the notion of "isomorphism" as expressed by Meyer and Rowan (1977), DiMaggio and Powell (1983) and Powell and DiMaggio (1991) in conjunction with Oliver's (1991) typology on strategic responses to pressures. Following this introduction Section 5.2 presents the basic concepts of the New Institutionalism, Section 5.3 investigates the concept of isomorphism, Section 5.4 discusses New Institutionalism in Education, Section 5.5 describes Oliver's typology on responses of organisations to pressures for change and Section 5.6 provides a summary of the chapter.

5.2  The New Institutional Sociology

The New Institutional Sociology is one of the most widely used perspectives in organizational analysis that can help analyse and understand change in organizational fields (Dacin, Goodstein, and Scott, 2002). New Institutionalism is most suitable for analysing organizations that are threatened by the environmental uncertainty under change conditions and, according to DiMaggio and Powell (1983) they are obliged to compete, not only for resources and customers, but also for political power and institutional legitimacy, for social and economic fitness.

NIS has been used to explore institutional changes in frameworks similar to this study. González, Montano and Hassall (2009) used NIS to analyse the pressures to introduce the policy that consists of the incorporation of skills in Business Administration and Accounting education in Spain. González et al. (2009) investigated also the strategic responses adopted by Spanish Universities as well as the institutional characteristics which have determined these responses. Spain is a Mediterranean country which apart from cultural similarities to Greece, has also adopted the Bologna Agreement and faces
the challenge to harmonise its HE system in order to promote the educational convergence, comparability and mobility of students and academics.

In institutional economics, an early definition of “institution” was given by Veblen (1919, cited in Scott 1995), who saw institutions as settled habits of thought common to the generality of men. Hamilton (1932, p. 84) used the word “institution” to connote “a way of thought or action of some prevalence, which is embedded in the habits of a group or the customs of a people”. Hodgson (1993b) links the ideas of habits and institutions: he defines “habits” as more or less self-actualizing dispositions or tendencies to engage in previously adopted or acquired forms of action. Scott (2001, p. 49) refers to institutions as “multifaceted, durable social structures, made up of symbolic elements, social activities and material resources that enable or impose limitations on the scope for human agency by creating legal, moral and cultural boundaries”.

Institutional Changes

Cultural frames establish the means and the ways that people behave, act and shape their interests. Cultural frames (institutional constructs) lead business people to pursue profits, bureaucrats to seek budgetary growth, and scholars to strive for publication (Powell and DiMaggio, 1991). In their effort to examine causes and ways of institutional changes, authors consider the degree of coupling among institutions as change factors. Zucker (1987) states that the dependence of professionals on organisations is preventing them from acting as a source of change. Powell (1985a) argues that the competing claims of professionals create conflicts and heighten ambiguity. DiMaggio (1982a) describes how museum professionals who behaved docilely in their home organisations sponsored radical reform from field-level platforms.

Institutional change is not merely an endogenous process. Institutionalisists refer to factors that induce change like networks of social behaviour and relationships (Meyer and Rowan, 1977) or other factors like exogenous shocks that induce change (Fligstein, 1991), collective action as a separate erode mechanism (Jepperson, 1991), interests and improvisation or the power of the state and the collective mobilising efforts of the profession. DiMaggio and Powell (1983) stress how coercive processes and subtle pressures for conformity, limit variability. They also emphasise how little attention is given on how incumbents maintain their dominant positions or respond to threats during periods of crisis or instability. The idea of how power affects institutions is obvious in
the following two arguments: 1) actors in key institutions realize considerable gains from the maintenance of those institutions; and 2) when organisational fields are unstable and established practices poorly formed, successful collective action often depends upon defining and elaborating widely accepted rules of the game. Consequently, the acquisition and maintenance of power within organisational fields requires that dominant organisations continually enact strategies of control, most notably through either the socialization of newcomers into a shared worldview or via the support of the state and its judicial arm (Powell and DiMaggio, 1991, p. 30).

**The New Institutional Sociology**

Different arguments have been developed in the context of institutional theory. However, there are a few central issues, which unify the institutional approach. Early statements of the theory emphasized the symbolic and ceremonial transformation that organizations undergo, changes that reflect myths in the institutional environment rather than a strict calculus of costs and benefits (Meyer and Rowan, 1977). Other early work focused on processes such as isomorphic transformation (Tolbert and Zucker, 1983), persistence, diffusion (Tolbert and Zucker, 1983), contradictions (Friedland and Alford, 1991) and institutionalization. Early work by Meyer and Rowan (1977) portrayed organizational structure as loosely coupled with work activity and saw roles, myths, and ceremonies as emerging and spreading within organizational fields. Organizational fields rich in myths and ceremonies are constructed when pressure is exerted on organizations by forces in the surrounding environment. Government agencies are some of the most potent and influential environmental actors, which come into contact at some level—be it through laws or regulations—with most organizations. New institutionalism argues that organizations need to conform to institutional rules and norms in order to establish their legitimacy in the society and maintain their power (Deephouse, 1996). Thus, organizations tend to become *isomorphic* among them and towards societal norms and behaviours if they want to secure their survival. In this framework, institutional isomorphism is very useful in explaining the politics, the interest as well as the behaviour of modern organizations.

5.3 **Isomorphism**

The notion of isomorphism in organisations is not a new one. The idea is that organisations are affected by phenomena in their environment and tend to become
isomorphic with them. One reason is given in the works of Aiken and Hage (1968) and Hawley (1968). These theorists assert that formal organisations become matched with their environments by technical and exchange interdependencies. A second explanation is that organisations structurally reflect socially constructed reality (Berger and Luckmann, 1967). Meyer and Rowan (1977) argue that the two explanations are not entirely inconsistent between them: “organisations both deal with their environments at their boundaries and imitate environmental elements in their structures”. Isomorphism with environmental institutions has some crucial consequences for organisations. As Meyer and Rowan (1977) report for organisations: “a) they incorporate elements, which are legitimated externally, rather than in terms of efficiency b) they employ external or ceremonial assessment criteria to define the value of structural elements and c) dependence on externally fixed institutions reduces turbulence and maintains stability.

The overall benefits of organisations that become institutionally isomorphic are the success and survival, the increasing commitment of internal participants and of external constituents and protection of failure as they have gained successfulness by “social definition”.

Organisations that incorporate societally legitimated rationalised elements in their formal structures maximize their legitimacy and increase their recourses and survival capabilities. For example, in the US, schools, hospitals and welfare organisations show considerable ability to survive, precisely because they are matched with – and almost absorbed by-their institutional environment. Organisations that deviate from the prescriptions of institutionalised myths risk failing. Organisations that innovate in important structural ways bear considerable costs in legitimacy and may fail too (Meyer and Rowan, 1977).

Figure 5-1 summarises the above arguments alongside the established view that organisations succeed through efficiency.
Elaboration of rationalised institutional myths

Organisational conformity with institutional myths

Survival

Legitimacy and Resources

Figure 5-1: Organisational survival (adapted from Meyer and Rowan, 1977)

Organisations that try to conform to external institutionalised rules will confront several problems. First, technical activities and demands for efficiency create conflict with the organisation's effort to conform to the ceremonial rules of production. Second, because these ceremonial rules are transmitted by myths that may arise from different parts of the environment the rules may conflict with one another. Organisations can resolve conflicts between ceremonial rules and efficiency by employing two interrelated devices: decoupling and the logic of confidence. Meyer and Rowan (1977) form the following three propositions to describe the consequences of conflict arising from institutional isomorphism. The first proposition states that "because the attempts to control and coordinate activities in institutionalised organisations lead to conflict and loss of legitimacy, elements of structure are decoupled from activities and from each other". The second proposition states that "the more an organisation's structure is derived from institutionalised myths, the more it maintains elaborate displays of confidence, satisfaction, and good faith, internally and externally" (p. 57. The third proposition refers to inspection: "Institutionalised organisations seek to minimize inspection and evaluation by both internal managers and external constituents" (p. 59).

The above arguments on the effects of institutional isomorphism on organisations are displayed in Figure 5-2:
The decoupling of structural subunits from each other and from activity

Isomorphism with an elaborated institutional environment

Rituals of confidence and good faith

The avoidance of inspection and effective evaluation

Figure 5-2: The effects of institutional isomorphism on organisations (Meyer and Rowan, 1977)

Hawley (1968) defines isomorphism as the process that “forces one unit in a population to resemble other units that face the same set of environmental conditions”. Consequently, organizations become more similar in their effort to gain access to those who control the resources. DiMaggio and Powell (1983) identified two broad types of pressures for isomorphic change in organizations: competitive and institutional. Competitive isomorphism is more related to the search for efficiency within competitive situations. Institutional isomorphism is a useful tool for understanding the politics and ceremony that permeate much modern organisational life. Powell and DiMaggio (1991) have identified three distinct types of institutional isomorphism (Figure 5-3):

- Coercive isomorphism that stems from political influence and the need for legitimacy,
- Mimetic isomorphism resulting from standard responses to uncertainty, and
- Normative isomorphism associated with professionalization.
Coercive isomorphism

Mimetic isomorphism

Normative isomorphism

**Institutional Isomorphism**

<table>
<thead>
<tr>
<th>Coercive isomorphism</th>
<th>Mimetic isomorphism</th>
<th>Normative isomorphism</th>
</tr>
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</table>

**Competitive Isomorphism**

Figure 5-3: Institutional and competitive isomorphism

*Coercive isomorphic pressures* occur when organizations depend on the external environment for resources to survive. In this case, there are pressures from resource providers including the state and even pressure from larger society to conform to cultural expectations (Dacin, 1997; Carpenter and Feroz, 2001). Institutional constituents that exert pressures and expectations include not only the state and professions, as institutions, but also interest groups and public opinion (Scott, 1987b, p. 114).

In some cases, organisational change may be a direct response to government mandate. Examples are manufacturers that adopt new pollution control technologies to conform to environmental regulations, nonprofits that maintain accounts and hire accountants to comply with tax law requirements. Schools hire special education teachers and promulgate curricula that conform to state standards (Meyer, Scott and Deal, 1981). The fact that these changes may be largely ceremonial does not mean they are inconsequential. Employees support the functions of their organisations that can change power relations within organisations over the long run (Ritti and Goldner, 1979) (cited in Powell and DiMaggio, 1991, p. 67). Legal and technical requirements of the state like the budget cycle, the fiscal requirements, and the annual reports, the financial reporting.
requirements that ensure eligibility for the receipt of federal contracts or funds – also shape organisations in similar ways.

Large institutionalised organisations expand and dominate social life. Their organisational structure reflects rules that are institutionalised and *legitimated by and within the state* (Meyer and Hannan, 1979). The result is that organisations become increasingly more homogeneous and increasingly organised around rituals of conformity to wider institutions. At the same time, technical activities and output controls are decreasingly participating in the structure of organisations. As Powell and DiMaggio (1991, p. 68) argue, “under such circumstances, organisations employ ritualised controls of credentials and group solidarity”.

*Mimetic isomorphism* occurs when organizations feel uncertain about what is the appropriate action and they tend to imitate other organizations, which they perceive to be more successful or legitimate. “When organisational technologies are poorly understood, when goals are ambiguous, or when the environment creates symbolic uncertainty, organisations may model themselves on other organisations” (Powell and DiMaggio, 1991, p. 69).

Model organisations may have no desire to be copied or be unaware of the modelling. The diffuse of the modelling structures may become unintentionally and indirectly through employee transfer, or explicitly by organisations such as consulting firms or industry trade organisations. In other cases the modelling happened intentionally through modelling from one country to another; Spanish accounting teachers tried to model the teaching techniques of their counterparts U.K colleagues by carrying long stays in U.K universities (Gonzalez et al. 2009).

Extended mimic processes occurred when the Japanese state in the late nineteenth century decided to model governmental agencies on successful Western prototypes. The Japanese government sent its officers to study the courts, army and police in France, the navy and postal system in Great Britain, and banking and art education in the United States (Westney, 1987). These efforts have a ritual aspect also because as companies adopt “innovations” and approved institutionalised rules, this process proves that they are at least trying to improve working conditions and this action enhances their legitimacy.
New organisations are modelled upon old ones throughout the economy and managers actively seek models upon which to structure their own enterprise (Kimberly, 1980). When organisations ask for advice from the big consulting firms, they spread a few organisational models throughout the land. Re-organisation of a slow public organisation, under the advice of a consulting firm, may signal a major turn to more business-like orientation (Powell, 1988). Mimicry can apply not only to large organisations but also to peripheral, newly emerging nations’ administration and economic pattern. They tend to be more isomorphic than anyone would expect (Meyer, 1981). The evidence of mimicry is provided in the work of Katz (1975), Swidler (1979) and Meyer et al. (1981).

Finally, normative isomorphic pressures for change happen when organizations seek institutional legitimacy and they relate to professionalization (Meyer and Scott, 1983, DiMaggio and Powell, 1983). Powell and DiMaggio (1991, p. 70) define as professionalization, “the collective struggle of members of an occupation to define the conditions and methods of their work, to control “the production of producers” and to establish a cognitive base and legitimation for their occupational autonomy”. The same authors point to two characteristics of professions in large organisations. One is that although various kinds of professionals in the same organisation may differ from one to another, there is considerable similarity to their professional counterparts on other organisations. The second characteristic is that the professional power to each profession comes from two directions: from the state and from the activities of the profession.

Professional isomorphism is generated from two sources: the growth of professional networks that span organizations and formal education produced by university specialists and by professional training organizations. Professional and trade associations define the normative rules about professional behaviour for managers and their staff. These mechanisms “create a pool of almost interchangeable individuals who occupy similar positions across a range of organisations and possess a similarity of orientation and disposition” (Perrow, 1974) (cited in Powell and DiMaggio, 1991, p. 71). The filtering of the personnel is the mechanism that promotes normative isomorphism. This filtering happens when organisations hire individuals from firms within the same industry or through the recruitment from specific institutions, or by using common promotion practices. Socialisation within the same organisational field, creates common expectations about their personal behaviour, appropriate style of dress, organisational
vocabularies, standard methods of joking, speaking or addressing others (Cicourel, 1970; Williamson, 1975; Ouchi, 1980) (cited in Powell and DiMaggio, 1991, p. 71). The consequences of the personnel filtering and “the homosexual reproduction of management” (Kanter, 1977), are that organisations tend to hire managers that have the same attributes, the same views about problems, and apply the same policies, procedures and structures as normatively sanctioned and legitimated.

Normative pressures from professionalization encourage a structural homogenisation of a field. They spread among organisations and affect their structuration. Information flows between managers and personnel movements across organisations help create a commonly recognised hierarchy of status, of centre and periphery of an organisation field. Governments play an important role in structuration. When a government provides grants or funding to an organisation it provides at the same time recognition and legitimacy. Other competing firms will copy aspects of their structure or operating procedures in hope of obtaining similar rewards from the state (Powell and DiMaggio, 1991). In the non-profit sector, the structural homogenisation is even easier and faster to proceed. When organisations (i.e. a theatre), receive from government, corporate or other foundation funding sources, grants, then their director usually will lead the professional association committee, or sit on government and foundation grant award panels. He/she may even consult as government financial adviser to other similar organisations. Peripheral organisations will copy the central organisation with the hope to receive grants too. Managers who want to advance their career paths will socialise according to the rules and norms of the organisations they hope to join. The existence of common career titles and paths with meanings broadly agreed and understood (such as assistant, associate and full professor) further promote structural homogenisation.

These three isomorphic mechanisms can overlap and intermingle, but they tend to derive from different conditions. At an analytic level, only coercive isomorphism is linked to the environment surrounding the organizational field. Mimetic and normative processes are internal to the field and help explain the spread of roles and structures. When organizations are subjected to outside coercive scrutiny, evaluation, and regulation, they tend to react defensively and move toward isomorphic transformation. As the pressures from the outside grow, organizations are led to find ways to either diffuse or eliminate this pressure by changing their practices. One of the easiest ways to change is to adopt
those routines and structures that are defined by law or government agencies as legitimate. To do so may ensure survival by minimizing conflict.

Powell and DiMaggio (1991) define organisational field as “those organisations that in aggregate, constitute a recognised area of institutional life: key suppliers, resource and product consumers, regulatory agencies, and other organisations that produce similar services or products”. This unit of analysis directs attention to the totality of actors. The field idea comprehends the importance of both connectedness and structural equivalence. Connectedness is the existence of transactions tying organisation to one another: such transactions might include formal contractual relationships, participation of personnel in common enterprises such as professional associations, labour unions, or boards of directors, or informal organisational-level ties like personnel flows. Structural equivalence is the similarity of position in a network structure (Powell and DiMaggio, 1991, p. 81).

Organisational fields are the ultimate product of coercive, mimetic, and normative isomorphism, and they reflect the slow homogenization and convergence of organizational forms. DiMaggio and Powell (1983) take a strong position on the emergence of fields, arguing that they are constructed and that they serve as information networks fuelling standardization and professionalization.

In some organisational fields, the pressures for competitive efficiency are very restricted. This is because the number of organisations is limited and there are strong fiscal and legal barriers to entry and exit. Hospitals fall in this category (Lee, 1971). Fennell (1980) argues that hospitals represent a “very poor market system” since the patients do not have the needed knowledge of prices and choices. Physicians and hospital administrators are the actual consumers. A general pattern is concluded here. Organisational fields that have employees professionally trained and well educated consider as very important the status and image of their organisation. Their actions may be driven primarily by status competition. They strive to obtain resources and to raise organisational prestige in order to attract higher status professionals. This procedure encourages homogenisation as organisations seek to ensure that they can provide the same benefits and services as their competitors.

The NIS instead of asking why there is such diversity in organizations, poses the question why there is such homogeneity in organizational forms and practices. They seek
to explain homogeneity and not variation. They argue that in the initial stages of their life cycle, organizational fields display considerable diversity in approach and form. However, once a field becomes well established, there is an inevitable push toward homogenization expressed with the notion of isomorphism.

Since the work of Meyer and Rowan (1977) and DiMaggio and Powell (1983) on isomorphic pressures for conformity (coercive, mimetic and normative isomorphism), other related studies have emerged. These studies analysed further the response capabilities to pressures for conformity, homogeneity and change degree of organisations (Powell, 1991). Organisations, especially public organisations (schools, hospitals) are not passive receivers of the state decisions. Although they are dependent mainly on the state for funding, they may show extraordinary resistance to the enforcement of the external rules.

5.4 **The New Institutionalism in Education**

Public schools (and public hospitals) are used as representative examples in the work of early theorists (Meyer and Rowan, 1977) to evidence the stability these organisations enjoy irrespective of their efficiency. Whether schools educate students or not, whether hospitals cure patients or not, people and governmental agencies remain committed to these organisations, funding and using them almost automatically year after year. The state buffers organisations like schools and hospitals from turbulence and guarantee their clienteles. Large industrial fields may enjoy similar institutional protection such as automobile sector or public utility firms. Still, customers and governments can inspect each automobile and can evaluate and even legally discredit it. Legal action cannot as easily discredit a high school graduate (Meyer and Rowan, 1977). Schools, hospitals, R & D departments, all are organisations that use variable and ambiguous technologies. They produce outputs that are difficult to appraise. In this case, internal and external constituents refer to the institutionalised rules that promote trust and confidence in outputs and buffer organisations from failure (Emery and Trist, 1965). Activities in this kind of organisations may have ritual significance; they maintain appearances and validate the organisation. For example, a university must maintain appropriate departments independent of the departments’ enrolments. On several occasions, categorical rules conflict with the logic of efficiency. Hiring a very high status professor, brings to the university great ceremonial benefits like research grants, brighter students
or reputational gains. However, this expenditure lowers immediate income and in the end may not prove as efficient for the university. Schools, especially public schools, in the 1970s when new institutionalism developed, were highly institutionalised, stable organisations that nearly monopolised their product. Institutional rules were taken-for-granted; they provided stability and legitimation in a highly protected and institutionalised organisational field. Since then many things have changed in education worldwide.

5.4.1 Evolution of institutional theory

Since the early formation of new institutional theory in the 1970s, new ideas have emerged in the study of institutions. First, the scope of institutional theory has expanded and now institutional theorists study both the public and private organizations, emphasising both institutional conformity and technical efficiency. New actors shape institutional environments and bear pressures on organisations. Once theorists talked about the state and the professions as the dominant actors in institutional environments, politics and ceremonial conformity were the forces that animated institutional change. Institutional theorists today concentrate on many agencies and actors in the social environment including private firms, political interest groups, and families. They study both markets and politics and analyze how institutional environments can promote both efficiency and conformity (Rowan, 2006).

Education in many western countries has changed since the decades of 1970 and 1980. These changes question some of the ideas conveyed by new institutionalism. A traditional organizational sector like public (state) schools that was used as an example of stability and of high institutionalisation has been under significant reforms. Institutional perspectives look at the development of societal sectors as leading to isomorphism in organisational populations, typically as a result of coercive, normative and mimetic processes.

5.4.2 Decoupling and the Logic of Confidence

Institutionalised organisations must not only conform to myths but must also maintain the appearance that the myths actually work. To lessen conflicts between rules (myths) and efficiency, organisations employ decoupling and the logic of confidence. Schools produce students, not learning. Inspection and evaluation are not welcome because they
may uncover events and deviations that undermine legitimacy. So institutionalised organisations minimize and ceremonialise inspection and evaluation.

The notion of “loosely coupling” has held considerable sway in education research. It implies the existence of rather weak ties between policy and administration, on the one hand, and classroom work, on the other. Efforts to align organizations with societal norms and values frequently come into conflict with technical activities. Schools in the US were pointed to as a prime example of loose coupling (Meyer and Rowan 1977; Weick 1976). Fragmented, multi-layered, and pluralistic governance characterizes the educational sector in the US. Schools are struggling to conform to many different, and potentially inconsistent, rules and regulations in order to gain societal support. However, “faithful implementation of these diverse rules was thought to be impossible, since it would produce conflict and uncertainty in classrooms or would be impossible to implement given the great variability of local instructional activities” (Spillane and Burch, 2006, p.88).

However, there is evidence that loose coupling is not always what happens in educational organizations. A new era of educational organisations has emerged in the US. This era is characterised by the following elements: a) a growing market of educational organisations in differing forms like the Elite schools, the third sector schools, the tutoring franchised, the independent tutoring business (Davis et al. 2006), b) a growing concern for nationwide test scores comparisons and c) an effort to promote common curricula in schools. Spillane and Burch (2006) argue that “complex patterns of both loose and tight coupling exist within the American educational system” (p.89) depending on the subject matter. Usually mathematics and language get higher attention and more support from teachers and administrators. This happens because urban districts established high-stakes accountability systems that targeted arts and mathematics in particular. Another aspect that has not received proper attention is the dimensions of instructional practice and how much they are coupled with institutional rules and administrative norms. The challenge is to “develop an understanding of what people do, how they do it, and why they do it, while simultaneously attending to the institutional structures at various levels of the system that enable and constrain that activity” (Spillane and Burch, 2006, p. 98).
5.4.3 The “socially embedded model”

The phenomena of isomorphism, coupling and privatization concern also the Higher Education sector. Ramirez (2006) argues in favour of the ever-increasing isomorphism between universities that follow the demands of a world society. He analyzed the growth pattern of western (N=21) and non-western countries (N=64) between 1965 and 1995. For both sets of countries, the pattern has been one of growth. In the West, the growth was from a national average of twenty to thirty-one universities. For the rest of the world universities grew from a national average of six to eleven during the same period. During that period the certification society became a reality in much of the world (Collins, 1979), and has become a highly legitimated reality as well as a source of legitimacy itself. Life chances are contingent on obtaining a higher education degree and an educational certification guarantees the occupational allocation and opportunities of university graduates (Brint, 1998). In the US universities have always been more opened to society, including business, industry, religious and ethnic groups, local associations, foundations, racial minorities, women, environmentalists and so on. American universities are more dedicated to producing knowledge through fieldwork, extensive research, and patent offices and with collaborations with industry. European universities in contrast, were in the past most oriented in “preserving the knowledge”. American universities are “embedded in society” and not “buffered from it” as their European counterparts especially the German ones (Flexner, 1930; Ben-David and Zloczower, 1962). This greater openness leads to “earlier curricula innovations as regards not only business subjects but also engineering, the social sciences, computer sciences, ethnic and ecological studies” (Ramirez 2006, p. 128). European and American universities have historically differed on a series of basic issues like curricular, sources of funding for research and organizational autonomy. A basic question is whether the public goals of universities are compatible with private funds and non-state influences. They also differ in fundamental issues such as what constitutes a university and university-based knowledge, what is valid university research, teaching and other activities. (Stichweh 1999) (cited in Meyer and Rowan, 2006, p.128). “Many American universities have been heavily engaged in the business of society and its upgrading. On the contrary with few exceptions, the older European universities were expected to be more distant from society and more linked to high centres of canonical knowledge and value, to the institutions of church and state, for instance” (Ramirez 2006).
However, today European HEIs move to the direction of the transnational “socially embedded model” of higher education institutions. This is apparent from the declaration of the Bologna Agreement, which calls for more socially useful and inclusive universities. An enormous amount of discourse in conferences and international organizations are in favour of the opened university to society which is considered as a carrier to world models of progress and justice. Criticisms to the “embedded model” have appeared to the defence of the “socially buffered” university as a protest against the Americanization associated with university changes (Weiler, 2005). The university / industry ties associated with the “socially embedded” university have been mostly criticised and called “academic capitalism” (Slaughter and Leslie, 1997; Press and Washburn, 2000) (cited by Meyer and Rowan, 2006, p. 130). However big the criticisms towards university-industry ties, Higher Education Institutions enact world models of the progressive and egalitarian university. This enactment leads to organizational change that disseminates the pattern of a socially embedded university. It is easy to recognise cross-national changes in university organisation in the direction of greater institutional isomorphism (Ramirez, 2006).

5.4.4 Privatization of Higher Education

Privatization of higher education has posed questions on the widespread belief of isomorphism in new institutionalism. The new institutionalism emphasises and explains the growing “startling homogeneity of organisations forms and practices” (DiMaggio and Powell, 1983, p. 148). Institutions appear to have a routine, repetitive, habitual and unreflective behaviour (Powell and DiMaggio, 1991, p. 8-14). Institutional constraints, rules, norms contribute to the emulation of established organisations. The new institutionalism rejects the traditional concepts of purposeful, utilitarian, technically functional, rational action in a context free choice for diverse organizations operating in a competitive marketplace. However, the concepts of diversity and rationality dominate the literature on private higher education’s growth and functioning (Levy, 2006). Evidence of market growth in education is not setting new institutional theory as obsolete or impoverished or irrelevant for the case of the private higher education internationally. “On the contrary, the new institutionalism can help us appreciate the isomorphism that is truly associated with higher education privatization. The worthy tasks in analyzing sets of organisations are not usually to establish that there is basically isomorphism or diversity but to identify and understand where, why, and how each is at
play" (Levy, 2006, p. 155). Maybe some modifications will need to be done to the new institutional theory that either will limit or enlarge its appropriate applicability.

Observing the overall world trend, it is evident that we witness a "softening" of the traditional configuration in which the state is the taken-for-granted supplier of education. There is a growing acceptance for education whose legitimacy does not derive from the state. Changes so far occur on the periphery of the entrenched core institutions of education; however, a small but dynamic alternative institutional sector can under certain circumstances, become the take-off point for more massive metamorphoses (Meyer, 2006).

However, public education is unlikely to suffer total loss of legitimacy. The reason is that public education institutions are deeply anchored in a society’s norms and expectations, “tied down by myriads of constituents holding myriads of expectations” (Meyer, 2006, p. 218). Educational institutions are “the most change resistant among the large-scale public institutions because they are supported by the deepest sentiments of tradition, habit, and identity held by the largest number of people” (p.219). Non-institutional organisations are judged by their effectiveness and efficiency while the support of institutionalised organisations is guaranteed almost independent of their performance and despite the availability of apparently superior models. The answer to the question on the institutions’ inertia lays more on the beliefs, the values and the feelings of people than “lock-in” explanations and “vested interests”. Institutions are not judged by how well they reach their goals but how much they contribute to social order and stability. Key institutions like educational institutions provide people with emotional, social and cognitive supports. Institutional inertia is the “flipside” of “social stability”. When organizations become inefficient, they either die or reinvent themselves. Institutions, however, only change when they produce instability instead of order. People will be able to act on their feelings about public educational institutions gradually as they recognize new forms and new order for schooling. The new schooling forms constitute pressures for change that are increasing and coming from many different directions. Meanwhile other causes exert pressures on the traditional educational forms. Teachers "the knowledge workers" will gradually seek for themselves new roles away from the “subaltern positions that leave them with less rather than more autonomy and discretion over their work (Smith, 1998, cited in Meyer, 2006, p. 221).
The knowledge economy we live in demands from teachers more than *guidance to rote learning*. Schools cannot act as a mechanistic organisation to diffuse just literacy to children. Modern times demand more from the HE and the graduates they produce. Today’s students and graduates need to learn how to become leaders in teaching, learning, and self-management. This requires that teachers themselves have acquired these skills.

Meanwhile, higher education is shifting centre of gravity from liberal arts undergraduate education to returning adult professional education (Brint, 2002; Lanham, 2002; Duderstadt and Womack, 2003). This suggests a growing demand for job-related courses such as management, education, health sciences, and applied technology. It also means that an increasing number of adult students will be interested in “*just-in-time*” learning experiences rather than the traditional four-year degrees. Additionally to these changes, World Wide Web is evolving to a dynamic field of educational entrepreneurship for the new for-profit entrepreneurs. These entrepreneurs focus on the “cash-cows” of courses like business or education courses and provide slices of excellence versus the mediocre comprehensive universities.

All the above reasons add up to the pressures for change to the established system. People will have more options to choose among alternative models of legitimate education. As that happens, the current trickle may ultimately produce sizeable streams (Meyer, 2006).

### 5.5 Oliver’s typology on responses to pressures

The privatization of higher education, the intense competitive globalised environment and the urging for comparability of European educational systems by the EU and the Bologna Agreement, create severe pressures to HEIs in Europe. They operate in an ever changing globalised environment in which they need to constantly adapt. However, Oliver (1991) suggests that there are differing degrees of adaptation to the institutional changes and organisations can adopt a range of strategies and tactics in order to respond to institutional changes and expectations.

Oliver’s work (1991) has contributed much to the New Institutional theory and has been used by educational researchers to explain changes and pressures in higher education (e.g. Etherington and Richardson, 1994; Gonzalez *et al.* 2009). She suggested that organizations have the capability to respond to institutional pressures by adopting
various different strategies and are not obliged to always blind mimic or acquiesce in front of environmental forces. She combined the two theories (new institutionalism and resource dependence theory) and concluded to five strategic responses of organizations towards environmental pressures and expectations. These strategic responses are acquiescence, compromise, avoidance, defiance, and manipulation. In addition, Oliver (1991), considered ten institutional characteristics (antecedents) which are related to the cause, constituents, content, control and context of institutional pressures and which can explain the choice of one strategy over another by organizations. New Institutionalism and resource dependence theory accept both that organizations are not constrained from choice within the context of external pressures, but institutional theorists focus on conformity than resistance, passivity rather than activeness and preconscious acceptance than political manipulation in response to external pressures and expectations. As Oliver states (1991, p. 149) “institutional and resource dependence theorists, have attributed different degrees of resistance, activeness, and self-interested awareness to the behaviour of organizations responding to external constraints and demands”.

Resource dependence theorists argue that organizational stability is achieved through the exercise of power, control, or the negotiation of interdependencies to maintain stable inflow of vital resources. Institutional perspective reassures that organisations’ conformity to social norms of acceptable behaviour provides it with a variety of rewards, for example, increased prestige, stability, legitimacy, social support, internal and external commitment, access to resources, attraction of personnel, acceptance in professions, and invulnerability to questioning (Meyer and Rowan, 1977; DiMaggio and Powell, 1983; Meyer and Scott, 1983; DiMaggio, 1988; Zucker, 1988). Resource dependence theory elaborates the virtues of noncompliance. These virtues include the ability to maintain discretion or autonomy over decision making, the flexibility to permit continual adaptation as new contingencies arise, and the latitude to alter or control the environment in accordance with organizational objectives. The previous comparison suggests that organisational responses can vary from conforming to resistant, from passive to active, from preconscious to controlling, from incapable to influential, and from habitual to opportunistic, depending on the institutional pressure toward conformity that are exerted on organisations. Oliver proposes five types of strategic responses in reaction to pressures exerted on organisations from the institutional environment. The strategies vary in active agency by the organisation from passivity to
increasing active resistance: acquiescence, compromise, avoidance, defiance, and manipulation. The acquiescence of organizations to institutional pressures may take alternative forms: these forms include habit, imitation and compliance. The compromise strategy may take the form of balance, pacifying or bargaining tactics. The avoidance may take the form of concealment, buffering or escape. The defiance strategy may take the form of dismissal, challenge or attack. The manipulation strategy may include tactics like co-optation, influence or controlling.

Oliver presents 10 dimensions (two per one category of the five categories) that can be used to predict the behaviour of organisations. The range of possible behaviours is shown in the following table. For example, the first raw of table 5.1, suggests that acquiescence is more likely to occur when the degree of legitimacy attainable from conformity is high. The strategies of compromise, avoidance, defiance, and manipulation are more likely to occur when anticipated legitimacy is low (see Table 5-1).
Table 5-1: Institutional Antecedents and Predicted Strategic Responses (Oliver 1991, p. 160)

<table>
<thead>
<tr>
<th>Predictive Factor</th>
<th>Strategic Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acquiesce</td>
</tr>
<tr>
<td>Cause</td>
<td></td>
</tr>
<tr>
<td>Legitimacy</td>
<td>High</td>
</tr>
<tr>
<td>Efficiency</td>
<td>High</td>
</tr>
<tr>
<td>Constituents</td>
<td></td>
</tr>
<tr>
<td>Multiplicity</td>
<td>Low</td>
</tr>
<tr>
<td>Dependence Content</td>
<td>High</td>
</tr>
<tr>
<td>Consistency</td>
<td>High</td>
</tr>
<tr>
<td>Constraint Control</td>
<td>Low</td>
</tr>
<tr>
<td>Coercion</td>
<td>High</td>
</tr>
<tr>
<td>Diffusion</td>
<td>High</td>
</tr>
<tr>
<td>Context</td>
<td>High</td>
</tr>
<tr>
<td>Uncertainty</td>
<td>High</td>
</tr>
<tr>
<td>Interconnectedness</td>
<td>High</td>
</tr>
</tbody>
</table>

5.6 The Greek framework

The Greek HEIs are under pressures from multiple directions in the last decades. These pressures are economic, social and institutional (Kladis et al., 2007). Economic pressures come from the continuously decreasing amount of funding that HEI receive from the state and at the same time the increasing number of students in their classrooms. Social pressures and expectations are coming from the society which demands integrated, modern and compensating education that guarantees employability for its citizens within a globalised environment. Institutional pressures come from the participation of Greece in the Bologna Agreement and the EU which advocates for comparability of educational structures and mobility for teachers and students. EU through the creation of EHEA urges participating countries to introduce skills and competences into the academic
curricula and to use tools like the ECTS and the learning outcomes concepts. An additional pressure to public (state-funded) HEIs is the requirement for privatisation of Higher Education as discussed in Section 4.2 which adds market competition to the existing pressures.

The factors discussed above coupled by the current economic recession create an uncertain environment in which Greek HEIs are demanded not only to function efficiently and legitimately but also to compete for resources, recognition and economic fitness in order to survive. The above discussed pressures as well as the required institutional changes that affect the educational field in Greece can be well analysed and interpreted by the New Institutional Sociology (DiMaggio and Powell, 1983; Powell and DiMaggio, 1991) framework as was done in other contexts (González et al. 2009). Additionally Oliver’s typology (1991) can help us explore the degree of conformity to the pressures as well as the adopted strategies of HEIs towards these pressures.

5.7 Chapter Summary

This chapter has presented New Institutional theory and Oliver’s (1991) typology on strategic responses to institutional pressures for change. The thesis analysed in detail a very important concept of new institutionalism, the isomorphism within public institutions as presented by Powell and DiMaggio (1991). The study referred to the new institutionalism in education and explored all the new trends and reforms in the educational sector globally. Criticisms and new developments in institutional theory were presented along with an extensive discussion on strategic choices of organisations to resist institutional pressures for reforms (Oliver, 1991). Next chapter refers to the methodology and the research methods of the study as well as the justification for using Mixed Methods Research. It also analyses the research process and presents the strategy model undertaken by the study.
CHAPTER 6  **Methodology and Research**

**Methods**

6.1  **Introduction**

This chapter describes the methodology and the research methods employed to answer the research questions. After this introduction Section 6.2 describes the type of research, Section 6.3 analyses paradigms in social science research, Section 6.4 presents the main philosophical assumptions and implications for the research and Section 6.5 describes the pragmatic philosophy and worldview alongside the Mixed Methods Research Design. In Section 6.7 the reason for using Mixed Methods Research is explained and in Section 6.8 a full description of the research process is presented. Section 6.9 discusses in detail the phases of the research. Section 6.10 presents the sampling techniques that were used in this study and finally Section 6.11 provides a summary of the chapter.

6.2  **Type of Research**

The purpose of a research project, the research questions and the research objectives, classify the research study as exploratory, descriptive or explanatory and descriptive (Collis and Hussey, 2003). As the research questions can be both descriptive and explanatory, the research project can have more than one purpose (Saunders, Lewis and Thornhill, 2007). **Exploratory research** is conducted when there are few or no earlier studies to which we can refer for information about the problem under examination. The focus is on gaining insight and familiarity with the subject area, finding out what is happening and assessing new phenomena or old phenomena under a new light. The same researcher or another researcher could use the insights and information gained from an exploratory study to conduct a more rigorous investigation at a later stage (Robson, 2002; Collis and Hussey, 2003;). The principal ways of conducting exploratory research are (Saunders *et al*, 2007): a search of the literature, interviewing experts in the subject (experience survey or key informant survey), conducting focus group interviews, analysis of selected cases (Churchill, 1999).
Descriptive research describes phenomena and it is used to gather information on the characteristics and elements of a particular problem or situation. It aims to provide an accurate profile of persons, events or situations (Saunders et al, 2007). Collis and Hussey (2003) define explanatory or analytical research as a continuation of the descriptive research. The researcher’s aim is to go further from describing the characteristics of a situation and analyse and explain why or how a phenomenon is evolving or happening. The way to understand a phenomenon is by discovering and measuring the causal relations among them. Predictive research goes further than the explanatory research. It aims to “generalise from the analysis by predicting certain phenomena on the basis of hypothesised, general relationships (Collis and Hussey, 2003).

The purpose of this study is both exploratory and descriptive. It attempts to investigate the situation in Greece regarding the introduction of professional skills in the accounting courses taught in Higher Education. Since there is minor or no previous literature on this topic the main purpose of the study is to describe the situation as it is now and find ways to explore if, why and how professional skills could be included in the curriculum of accounting courses. The research will evolve in three phases and each phase will be exploratory and descriptive. Time horizon is one more criterion to classify research. In the case that a research is conducted as a “snapshot” taken at a particular time then it is called a cross-sectional study. In the case that a study acts as a representation of events over a given period then it is called a longitudinal study (Saunders et al. 2007). Based on the classification of Collis and Hussey and on the time criterion this research is described in Figure 6-1:

<table>
<thead>
<tr>
<th>Basis of Classification</th>
<th>Type of Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose of research:</td>
<td>Exploratory and Descriptive</td>
</tr>
<tr>
<td>Process of research:</td>
<td>Quantitative and qualitative</td>
</tr>
<tr>
<td>Logic of the research:</td>
<td>Inductive</td>
</tr>
<tr>
<td>Outcome of the research:</td>
<td>Basic research</td>
</tr>
<tr>
<td>Time criterion</td>
<td>Cross-sectional</td>
</tr>
</tbody>
</table>

Figure 6-1: Classification of present research
6.3 Paradigms in Social Science Research

The term "paradigm" was made popular by Kuhn (1970) in his analysis of natural science where he defined the term as "universally recognised scientific achievements that for a time provide model problems and solutions to a community of practitioners" (p. viii). Paradigms offer a framework with an accepted set of theories, beliefs, and methods of obtaining data (Collis and Hussey, 2003). Business and management research has been dominated by two distinct and incommensurable research paradigms or philosophies: positivism which is associated with quantitative studies and phenomenology / interpretivism which is associated with qualitative studies (Easterby-Smith, Thorpe and Lowe, 1991; Gill and Johnson, 1997; Hussey and Hussey, 1997; Bryman, 2004). Recently another group of researchers (Cherryholmes, 1992; Tashakkori and Teddlie, 2003; Morgan, 2007; Creswell, 2009) is advocating the presence of pragmatism as a philosophical worldview underpinning and associated with the mixed-methods research design (MMR). These authors support the notion that mixed-methods choices are used not only as a data collection technique and procedure but as a distinct Research Design called the Mixed-Method Research (MMR) in correspondence to Quantitative and Qualitative Research.

This study adopts the philosophical stances of Pragmatism and the usefulness of applying the Mixed-Methods research. Pragmatism as a worldview arises out of "actions, situations and consequences" (Creswell, 2009, p. 10). For pragmatists truth is what works at the time and they believe both in an external world independent of the mind as well as that lodged in the mind. Investigators use both quantitative and qualitative data because they work to provide the best understanding of a research problem. For the mixed methods researchers, pragmatism "opens the door to multiple methods, different worldviews, and different assumptions, as well as different forms of data collection and analysis (Creswell, 2009, p. 116).

6.4 Philosophical assumptions and implications

If we consider paradigms as epistemological stances (Morgan, 2007) then the definitional characteristics for each paradigm are the ontology, the epistemology, the methodology and the axiological concerns (Burrell and Morgan, 1979; Creswell, 1994; Collis and Hussey, 2003; Bryman and Teevan, 2005). These assumptions are related to the nature of reality (the ontology issue), the relationship of the researcher to that being
researched (the epistemological issue), the role of values in a study (the axiological issue), and the process of research (the methodological issue).

6.4.1 Ontology

Ontology is concerned with the nature of reality. A researcher should consider whether the world is objective and external to the researcher, or socially constructed and can be understood by examining the perceptions of the human actors (Collis and Hussey, 2003). Two aspects of ontology, which are both accepted to produce valid knowledge by many researchers, are: objectivism and subjectivism or social constructionism.

For subjectivism or social constructionism or constructivism or nominalism, reality is subjective and multiple, as seen by participants in a study. Social phenomena are created from the perceptions and the consequent actions of social actors. Phenomena are in a state of constant negotiation and revision through the process of social interactions between human actors (Saunders et al, 2007). For the nominalists there is no such thing as “real” structure of the world (Burrell and Morgan, 1979). The term constructionism includes the notion that researcher’s own accounts of the social world are constructions. The subjectivist or qualitative researcher “needs to report these realities, needs to rely on voices and interpretations of informants, and advance evidence of different perspectives on each theme” (Creswell, 1998, p. 76). The subjectivist ontology has been associated with qualitative research strategies where the researcher attempts to lessen distance between him or her and that being researched. The paradigm associated with subjectivism is the phenomenological or interpretivist paradigm.

Objectivism or realism is an ontological position that implies that social phenomena and reality are external facts beyond the reach and the influence of individuals. Realism for Burrell and Morgan (1979) is the position that considers the external world to individual cognition to be a real world made up of hard, tangible and relatively immutable structures. The individual is being born and lives within a social world which has a reality of its own. It is not something that the individual creates – it exists “out there”. The authors state that (1979, p. 102) “objectivists treat the social world exactly as if it were the natural world; they treat human beings as machines or biological organisms, and social structure as if it were a physical structure”. In business and management research the majority of studies that examine organisations, are being conducted upon the objectivist assumption that organisations are concrete, hard empirical phenomena
which can be measured. Objectivism has been associated with quantitative research studies and positivism is the paradigm associated with the objectivist ontology.

6.4.2 Epistemology

The epistemological assumption is concerned with the study of knowledge and what constitutes valid knowledge (Collis and Hussey, 2003). In the centre of epistemological considerations is whether the social world can and should be studied under the same procedures as the ones we use for the natural sciences. The research position that assumes that social and natural world should be examined under the same assumptions is known as positivism (Bryman and Teevan, 2005). Positivism’s epistemology is based on the belief that knowledge exists independently of our consciousness and that only phenomena which are observable and measurable can be validly regarded as knowledge (Collis and Hussey, 2003). Positivists try to keep distance from the research object and act independently from that being researched. On the contrary, interpretivism attempts to minimise the distance between the researcher and that being researched.

6.4.3 Axiological Assumptions

Axiological assumptions are concerned with the role of values. Positivists believe that science and the process of research is value-free. Consequently they are detached from what they research and are able to observe measure and describe relationships between characteristics of the phenomena they are researching in an independent way. The objects of their study are not affected by their study and will be in the same condition after the study is finished, in the same way that research happens in natural sciences. The other extreme position is that of phenomenologists who consider that researchers have values that bring into the research process, even if this is not made explicit. Researcher acknowledges that research is value laden and that biases are present (Collis and Hussey, 2003).

6.4.4 Methodological Assumptions

Methodological assumptions are concerned with the process of the research. The term methodology refers to the overall approach to the research process. The main differences in methodological debate have been so far between deductive and inductive approach or as Burrell and Morgan (1979) describe a nomothetic and an ideographic approach. The deductive (nomothetic) approach puts emphasis on the systematic protocol and technique. Research begins by developing a theoretical and conceptual
structure which later is tested by using empirical investigation. The researcher wishes to explain causal interrelationships, so he develops hypotheses referring to specific relationships which are tested against empirical data obtained from large samples. A deductive approach moves from the general to the specific. The inductive (ideographic) or phenomenological approach begins with the observation of empirical reality (data) and concludes to a theory or patterns of behaviour or construction of explanations (Gill and Johnson, 1997). In the inductive approach the investigator moves from the specific to the general, from the analysis to subjective accounts to general patterns and interpretations (Burrell and Morgan, 1979). The researcher uses inductive logic, studies the topic within its context, and uses an emerging design.

6.4.5 Rhetorical Assumptions

Rhetorical assumptions are concerned with the language of the analysis. The two distinctive approaches, positivism and phenomenology, use different style and wording. Each style mirrors the overall attitude of the researcher and his philosophical stances. The positivists use a distant language and the passive voice. They also use formal language that emphasises the distance and objectivity of researcher towards the objects of his research. In a phenomenological study many writers wish to show the immediacy of the research and the researcher’s involvement. Researcher writes in a literary, informal style using the personal voice and uses qualitative terms and limited definitions. However this practice is not very clear or spread to all disciplines. Discipline context may as well define the use of language (Collis and Hussey, 2003).

6.5 The Pragmatic Worldview

Johnson and Duberley (2000) present Pragmatic philosophy from his archaic origins of Ancient Greece up to today’s pragmatist primarily North American in origin and character. Plato made distinctions between “episteme” (genuine knowledge) and “doxa” (knowledge only suitable for the conduct of everyday affairs or personal opinion). There were many criticisms to this distinction, especially from Carneades (213-129 BC) who argued that “Plato’s quest for a foundationalist episteme was an unrealizable chimera because of the inherent fallibility of sense-experience. For Carneades all that could be achieved was knowledge that might guide human practice and purposes. Hence the derivation of the term “pragmatism” – the Greek word “pragma” which means “deed” or “action”. Johnson and Duberley associated pragmatism with critical realism (2000, p.
157). Pragmatism is a philosophy that can take many forms and may refer to a variety of different epistemological positions. This lack of unity has made Schiller (1907) to admit that there are as many "pragmatisms" as there are pragmatists. Pragmatism principles derive from the work of Peirce, James, Mead and Dewey (Cherryholmes, 1992). As Bhaskar indicates "... although social theory and social reality are causally interdependent this is not to say that the social theorist "constructs" social reality. But it is to say that social theory is practically conditioned by, and potentially has practical consequences in society (1989b, p. 5). Management research has been dominated up to mid 20th century by positivist epistemology, which encouraged exclusively deductive and quantitative methodologies. This dominance has been confronted by an interpretative challenge which shifted methodology to the inductive and qualitative. Pragmatism supports the position that the most important determinant of the research philosophy adopted is the research question – one approach (positivistic or interpretive) may be more appropriate than the other for answering particular questions. Especially in the case that the research questions do not suggest categorically that either positivist or interpretive approach should be adopted, then according to pragmatists is perfectly possible to work with both philosophies. Consequently, mixed-methods, both quantitative and qualitative, are not only possible but highly appropriate (Saunders et al. 2007). According to Creswell (2009), Cherryholmes (1992) and Morgan (2007) pragmatism provides a philosophical base for research.

6.6 Research Strategies

Research strategies or strategies of inquiry provide to researchers specific directions for procedures in a research design (Creswell, 2009). Alternative terminologies are: research methodologies (Mertens, 1998), or approaches to inquiry (Creswell, 2007). Creswell (2009) identifies three main types of research design within social sciences: qualitative, quantitative and mixed methods. Qualitative and quantitative approach should be seen as the two end parts of a continuum (Newman and Benz, 1998) while mixed methods stand in the middle of this continuum and incorporates elements of the other two approaches.

Quantitative design in broad terms entails the collection of numerical data, a deductive relationship between theory and research, and an objectivism conception of social reality and the use of closed-ended questions (quantitative hypotheses). Quantitative design was
the dominant form of research during the end of 19th century up to mid 20th century. Main strategies used in quantitative analysis are experimental and survey research.

*Qualitative design* is concerned with words rather than numbers, has an inductive view of the relationship between theory and research, a subjectivism conception of world by examining the participants’ interpretation of their world and the use of opened-ended questions (Bryman and Teevan, 2005; Creswell, 2009). Interest and usage of qualitative design in research has increased considerably in the second half of 20th century. Qualitative research for Corbin and Strauss (2008) is the process that allows examining and interpreting data in order to extract meaning and understanding and develop empirical knowledge. The definition of a qualitative research study as given by Denzin and Lincoln (1994, p. 2) is “…multimethod in focus, involving an interpretive, naturalistic approach to its subject matter. Qualitative research involves the studied use and collection of a variety of empirical materials – case study, personal experience, introspective, life story, interview, observational, historical, interactional, and visual texts – that describe routine and problematic moments and meaning in individuals’ lives”. Qualitative research adheres to the interactionism and pragmatism philosophical assumptions (Corbin and Strauss, 2008, p. 1-8). The first reason that a researcher would choose to undertake a qualitative research is the nature of the research question that should start with a *how* or a *what*. Quantitative questions ask *why* and look for a comparison of groups. Second reason would be the limited information or theories on the topic that needs exploration. Other reasons include the difficulty to identify variables or there are no available theories to explain behaviour of participants. Main strategies of qualitative research design include ethnography, grounded theory, case studies, phenomenological and narrative research.

*Mixed methods design* is an approach that combines quantitative and qualitative elements. In recent years, mixed methods approach has received considerable attention and has evolved to “the third avenue of doing research” as a distinct research approach between quantitative and qualitative research designs (Tashakkori and Teddlie, 2003; Morgan, 2007; Johnson, Onwuegbuzie and Turner, 2007; Creswell, 2009). Alise and Teddlie (2010) report a prevalence rate of 15% for mixed-method (MM) research studies

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5 Major differences between deductive and inductive approaches to research are in Appendix 1.
in applied disciplines (education and health and medical sciences). Education discipline had a combined prevalence rate of QUAN and MM above 50%. Education articles were associated with pragmatism at a rate of 19% and with constructivism in a rate of 30%. Triangulation in its original form referred only to the use of multiple forms of qualitative research methods, not the combination of quantitative and qualitative methods. Mixed methods research involves specific philosophical assumptions and its advocates claim that it is more than simply collecting and analyzing both kinds of data. By using mixed methods approach the overall strength of a study is greater than either qualitative or quantitative research (Sieber, 1973; Rossman and Wilson, 1985; Creswell 2009). Mixed methods approach is increasingly advancing and encouraged between business and management research (Curran and Blackburn, 2001). The combination of different methodologies and methods has been defined as “methodological pluralism” (Jill and Johnson, 1997; Johnson and Duberley, 2000). The combination of methods would provide a trade – off of perceived weaknesses of any method and would resolve problems of reliability and validity (Sieber, 1973). In social research we can distinguish four categories of triangulation: theoretical, data, investigator, and methodological. In theoretical triangulation researchers can explain situations in one discipline by borrowing theoretical models from another discipline. Data triangulation entails collection of data from different sources or over different time frames. Triangulation by investigators refers to collection of data on the same situation by different people and the results are then compared. In methodological triangulation researchers use both quantitative and qualitative data and these can include interviews, questionnaires, telephone surveys and field studies (M. Easterby-Smith, et al., 2002). For Jick (1979) triangulation may be used not only to examine the same phenomenon from multiple perspectives but also to enrich our understanding by allowing for new or deeper dimensions to emerge. More recent advocates of paradigm peace and mixed methods research, as a distinctive research strategy, include: Firestone (1987), Tashakkori and Teddlie (1998, 2003), Creswell (2003), Onwuegbuzie and Leach (2005), Johnson et al. (2007), Morgan (2007), Tashakkori and Creswell (2007), Castro et al. (2010), Torrance (2012). Other terms that describe mixed methods research are: blended research, integrative research, multimethod research, multiple methods, triangulated studies, ethnographic residual analysis, and mixed research (Johnson et al. 2007). Table 6-2 summarises the pragmatic approach in reference to the main methodological issues and
in comparison with the other two philosophical approaches, qualitative and quantitative approach (Morgan, 2007, p. 71).

Table 6-2: The pragmatic alternative to key issues in methodology (Morgan, 2007, p.71)

<table>
<thead>
<tr>
<th></th>
<th>Qualitative Approach</th>
<th>Quantitative Approach</th>
<th>Pragmatic Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection of theory and data</td>
<td>Induction</td>
<td>Deduction</td>
<td>Abduction</td>
</tr>
<tr>
<td>Relationship to research process</td>
<td>Subjectivity</td>
<td>Objectivity</td>
<td>Intersubjectivity</td>
</tr>
<tr>
<td>Inference from data</td>
<td>Context</td>
<td>Generality</td>
<td>Transferability</td>
</tr>
</tbody>
</table>

Mixed method strategies of inquiry

Creswell (2009) identifies three general mixed-method strategies: Sequential mixed methods, Concurrent mixed methods and Transformative mixed methods. The present study adopts a sequential mixed-methods design, as this embraces the author’s beliefs about pluralism and provides complementary methods. Creswell describes the sequential mixed-methods strategy as one in which researchers seek to expand or elaborate on the findings obtained by using one method by using another method. The study may begin either with a qualitative interview for exploratory purposes followed by a quantitative survey to generalize the results, or with a quantitative method to test a theory or concept followed by a qualitative method and detailed exploration of a few cases or individuals.

6.7 Justification for using Mixed Methods Research

On a continuum with positivism and phenomenology at each end and pragmatism in the middle, the stance adopted for this research lies between pragmatism and phenomenology. Human inquiry in everyday life and through daily interactions with the environment is analogous to experimental and scientific inquiry, since people try to see what works and what solves problems that will help us to survive. In the end, the everyday solutions, the practical epistemology, move us towards larger truths. The author believes in the collective knowledge that evolves within time, space and personal efforts and decided to undertake mixed methods research, firstly, because of the nature of the research problem that demands multiple approaches and, secondly, because my own philosophical stance is a conjunctive rather than a disjunctive position towards most
situations in life. The research area is very complicated. It has origins and implications that span the stakeholders’ educational, political, psychological and social life, individually and collectively. Consequently, this is a very complicated situation, which is difficult to interpret only through one or the other approach. Additionally, no previous studies have been conducted in this specific field in Greece. The theme under research involves multiple stakeholders: teachers, students, accountants, as well as groups, institutions, political parties, professional bodies, and the local government as well as the European institutions and regulations. Hence, the units and levels of the investigation are multiple, multi-layered and diverse.

6.8 Research Process

The research process involves the procedures of the research. The study will be conducted in three phases and at four different levels: a) international b) national c) organisational and d) individual level (accounting teachers, BAA students and professional accountants). According to Creswell (2009), it is important to consider the following issues:

Timing: The data collection proceeds sequentially from a qualitative phase one that explores the topic through official and other documents (Law and various reports) at a national level, to a quantitative phase two. The data obtained from phase one is used to inform the second research phase and helps build the survey research instrument.

Weighting: Equal weighting is given in all phases.

Mixing: Two issues need consideration here. The first is when the mix occurs. The mixing of the two types of data might occur at several stages: the data collection, analysis, and interpretation stages, or all three. The data mixing occurs during the collection and interpretation phases.

The second issue is how the mix occurs. The two databases are separate but connected. The data analysis and results of phase two is used to identify participants for the qualitative data connection in the follow-up phase three. Accordingly, the quantitative and qualitative data are connected during the research phases. The data is embedded as follows: from the first phase, qualitative data documents and interviews are used to provide supportive information with the aim of collecting quantitative data by building the survey instrument. In this way, this study proceeds by embedding a secondary form
of data within a larger study having a different form of data as the primary database. The qualitative database of phase one plays a supporting role in the study.

**Strategy Model**

In mixed methods research, the following six major strategies (Creswell, 2003, 2009) for designing research have been identified: Sequential Explanatory, Sequential Exploratory, Sequential Transformative, Concurrent Triangulation, Concurrent Embedded, and Concurrent Transformative Designs. In this framework of strategies, studies are conducted within two phases and the data collection happens either concurrently or sequentially. This study has a Sequential Exploratory Design conducted in three phases, as described by Creswell and Plano Clark (2007).

A **3-Phase Sequential Exploratory** strategy involves a first phase of qualitative data exploration and analysis, followed by a second phase of quantitative data collection and analysis that builds on the results of the first phase. The results and participants' views help to develop the instrument for phase two. Weight is placed on the second quantitative phase and the data is mixed through being embedded from the qualitative supporting database to generate the second phase quantitative database. The results from phase two are further explored by qualitative data collection in phase three. The databases are separate but connected as the phrase two analysis and results are used to identify participants for the qualitative phase three. The weight is equal between phases two and three (Creswell, 2009; Creswell and Plano Clark, 2007). The model's primary focus is initially to explore a phenomenon and quantitative data helps us to interpret the qualitative findings. Its second purpose is to build a survey instrument to use for generalisations. The study is also characterised as **multi-level** because it has several levels of analysis: international, national, organisational and individual (Tashakkori and Teddlie, 1998), and the units of analysis are organisations as well as individuals. A visual representation of the strategy employed can be found in Table 1-1 (pp. 18 and 19, Section 1.5).

**6.9 Research Phases**

The study initially explored on an international and national base the emergence and spread of the skills discourse especially in HE. The methods used are an extended literature review and documentary analysis relevant to the skills and competences
development of EU and Bologna Policy. This stage of the study is covered in chapters two, three and four.

6.9.1 Research Approach for Phase One

Phase one of the research which is qualitative in nature includes the analysis at the national level of the laws relevant to the skills introduction in Greek HEIs (chapter 7). Archives and documents as method of data collection will be used to contextualize the drivers as well as the barriers to change. The documents will be found through Internet searches and will include directives and documentation from the Bologna and EU policies, the laws issued by the Greek Ministry of Education (MoE), HEI’s External Evaluation Committee reports (EEC) and official websites. This part of the study aims also to explore on an organisational level if and how the HEIs have accepted and applied the relevant laws in Greece. Also, the thesis will explore the opinions of the QAA and views of a person identified as “Bologna Expert”. Finally, the thesis will try to find indications of how businesses treat the notion of the skills of their prospective employees by exploring the websites of a number of Greek SME and large enterprises.

6.9.2 Research Approach for Phase Two

The second phase of the project will be quantitative and will investigate the main stakeholders’ views: teachers, students and accountants. Data from the previous qualitative phases will help to formulate the instrument. The study is an exploratory and descriptive piece of research using a mixed-methods design. Saunders et al. (2007) explain that, in most management and business research, data collected via questionnaires will be used for either descriptive or explanatory purposes. If the purpose is to describe the population’s characteristics and attitudes either at a fixed time or at a series of points over time to enable comparisons, then the questionnaire should be administered to as representative a sample as possible so that generalisations can be drawn for the total population. The findings should be related to earlier research. Consequently, the quantitative part of this research that will be addressed through the questionnaires is not concerned with the identification of variables because it is not looking for causal relationships as would be the case with an explanatory study. The aim of this quantitative part of this study is twofold: firstly, it will identify and measure characteristics and tendencies and quantify the opinions and views of three groups of stakeholders. Secondly, the tool will help to create an Indicator of Priority (IP) for each
group of participants (teachers, students and accountants) regarding the required skills that will be compared via statistical analysis in the second research phase. Important issues regarding phase two are presented below like preparation of research instruments, translation of the source instrument, cognitive interviews, pilot testing, cover letter and on-line versions of the questionnaire.

**Preparation of research instruments**

The survey research instrument has been combined and adapted from a similar tool created by Hassall *et al.* (2005). Considerable explorative work is required in order to adjust the instruments. The researcher kept the main body of the questions and adapted/completed other parts to include issues that reflect the Greek reality and problems. The main body of the three instruments that the author used for the three groups was almost the same, apart from the demographics and a few questions. The preparatory stage took place from June 2009 to September 2010. Two components were involved in the design of a survey instrument: deciding what to measure and designing and testing questions that will be good measures. A pool of questions was formed that represented the obstacles and pressures related to the incorporation of skills into accounting courses. These questions were not designed to measure facts or objectively measurable events. Rather, they were questions designed to measure subjective states, such as attitudes, opinions, and feelings. For this kind of question, apart from the fact that there is no objective way to validate the answers (Fowler, 2009), the syntax can prove challenging, requiring repeated correction. The pool of questions was assessed by a panel of experts (key informants), such as experienced accounting educators, PhD students in accounting, and professional accountants, who evaluated the items in terms of their representativeness and suitability and suggested changes to eliminate repetitive, ambiguous and confusing items. This technique, that improves, among other things, the structure of the instrument, helps to establish *content validity* (Saunders *et al.* 2007).
Translation of the source instrument

Translation of questions and associated instructions can pose severe difficulties. Usunier (1998) (cited by Saunders et al. 2007, p. 377) refers to four important points when translating the source questionnaire:

- Lexical meaning (the precise meaning of individual words),
- Idiomatic meaning (the meaning of a group of words that are natural to a native and not deducible from those of the individual words). For example the English expression for informal communication, “grapevine” meaning literally “mouth propaganda”.
- Grammar and syntax (the correct use of language and well-formed sentences), and
- Experiential meaning (the equivalence of the meanings of words and sentences for people in their everyday experiences, e.g. the term “dual career household” may be unfamiliar in the target questionnaire’s context).

The above points revealed a few special difficulties in the translation of the source questionnaire. For example the translated questionnaire (the “target questionnaire”) ended up longer than the original tool in English. This happened because certain concepts and expressions in English may require one small sentence while its Greek translation may need two long sentences to provide for the exact meaning of these same concepts. People who are bilingual in Greek and English helped with the translation and sought to overcome the problems mentioned above.

Cognitive interviews

The author paid close attention to the questionnaires distributed to students which were the first to be pilot-tested. The overall process resulted in several substantive amendments being made to the questionnaires. A cognitive interview procedure was conducted with two students from the Business Department of ATEI Athens. The respondents’ comments were incorporated into the first draft of the Greek questionnaires that were produced immediately after these procedures finished. Key informants rechecked them and they were finally pre-tested (pilot tests) using an approximation of the proposed data collection procedures.

Pilot-testing of the Students’ Questionnaire
Three pilot tests were conducted before the instruments were finally distributed. A pilot test or field pre-test of the instrument is considered necessary so that researchers can assess how the questionnaire works under realistic conditions. A particularly important function is to test the usability of the instrument in terms of both the questions and the layout (Fowler, 2009). Bryman and Teevan, (2005) states that pilot tests are useful for several reasons: firstly, to ensure not only that individual questions work well but also that the questionnaire as a whole is suitable for its intended purpose. Secondly, they can be very helpful in the case of self-administered instruments, since there will be no interviewer to clarify any confusion. Thirdly, serious wastage will be avoided if there are deficiencies that are not anticipated before the pilot test. The questionnaires need to be tested several times before their final distribution. In our case, this was relatively easy because the student participants were very willing to participate in this procedure.

**Pilot test 1**

Draft questionnaires were distributed to two classes of 15 students at ATEI Athens in November 2010. The researcher was present and the students’ subsequent discussion centred on items that were badly expressed, translation issues, ambiguous concepts, what they thought a question was asking, the clarity of the instructions, the clarity of the questions, and the students’ understanding of what kind of answers were expected (Dillman and Redline, 2004). An important problem that was revealed during the first pilot study was that the students had difficulty with the 11-point Likert scale; therefore, this had to be converted to a 7-point Likert scale. The instruments were revised accordingly and prepared for the second pilot test.

**Pilot test 2**

The second pilot study took place in December 2010. 120 questionnaires were distributed to BA students in ATEI Athens who were in the fourth and sixth semester of their studies. A number of questions were eliminated and an improved draft of the questionnaire was produced after taking into account all of the suggestions and results from the statistical analysis. A third pilot test was deemed necessary in order to ensure that the instrument was free of discrepancies and that all misunderstandings had been eliminated (Goode and Hatt, 1952).

**Pilot test 3**
The third pilot test was conducted with 80 students from the BA department of ATEI Athens, who were beyond the 7th semester of their studies in May 2011. Final amendments were made after the questionnaires were given to friends and family to complete and report their views. Although they were not relevant to the subject, they made useful common-sense comments. This technique adds to the face validity of the questionnaire: that is, whether the questionnaire appears to make sense (Saunders et al. 2007).

**Cover letter**

Self-administered questionnaires should be accompanied by a cover letter in which the messages contained can affect the response rate (Dillman, 2000). Our questionnaire included a one-page cover letter designating clearly and concisely the title and topic of the research, the purpose of the research, anonymity and confidentiality, optional availability to participate in the interviews with the researcher, and the name, work address and e-mail of the researcher. In June 2011, the final printed version of questionnaire B (students) was ready to be administered to the students.

**On-line version**

The researcher deemed it necessary and useful to prepare the questionnaire in an on-line format as well. The on-line format was produced through “Google documents” which is a web-based application of Google that allows the creation and distribution of relevant documents. A web-based approach paid attention to netiquette (internet culture and conventions) and, most importantly, the respondents remained anonymous and are unable to modify the questionnaire (Witmer, Colman and Katzman, 1999). Pilot tests for the internet and intranet-mediated questionnaires are also crucial because, unlike paper questionnaires, the designer and respondent may see different images displayed on their monitor (Dillman, 2000). Therefore, following the changes suggested by experts, the questionnaires were also sent to ten students to complete. For the second pilot test, the on-line address was sent to another cohort of around 5 students. This time, all of the

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6 A copy of the cover letter is included in Appendix 2.

7 The on-line questionnaire can be found at: https://docs.google.com/spreadsheet/viewform?formkey=dG43VzhWYI4tTVYeU5INC0tWVE6MA.
syntax errors were eliminated and the students found the instrument easy to complete and well-designed. Around the end of August 2011, both paper and on-line versions of student questionnaire B were ready to be administered.

**Teacher Questionnaires**

The pre-piloting of the teacher questionnaire A followed the same procedure as for student questionnaire B. A cognitive interview was conducted with another accounting teacher which was extremely helpful for clarifying concepts and providing the researcher with a picture from the respondent’s perspective. Regarding the pilot tests of questionnaire A (teachers), the researcher followed the same procedures and the first draft was sent to key informants, mainly other accounting teachers and PhD accounting students. After all the amendments had been made, the questionnaire was sent to the panel of experts for final consideration. An on-line version of questionnaire A was created following the same procedures and tested with the students’ questionnaire.

**Practitioners’ Questionnaire**

The pre-piloting of the accountant questionnaire C followed the same procedures as the student and teacher questionnaires. The researcher easily identified practising accountants who acted as the panel of experts. A cognitive interview was conducted with an accountant who is the manager of an auditor firm who serves on the Educational Committee of Auditors Professional Body (SOEL). His input was valuable as, after completing the questionnaire, he examined each item, one by one, and clarified the concepts. The pilot test involved the questionnaire being distributing to three accountants. After all, following the amendments, the questionnaires were given to the panel of experts for final consideration. No further testing was deemed necessary for this instrument. An on-line version of questionnaire C was created following the same procedures and tested with questionnaires A and B.

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8 The on-line teacher questionnaire can be found at: https://docs.google.com/spreadsheet/viewform?formkey=dFpfWmxlY2FGU3daNGZrYjRJdUxvREE6MA.

9 The on-line accountant questionnaire can be found at: https://docs.google.com/spreadsheet/viewform?formkey=dFppWlf2aU9Ia0FtNFVzWNjajhiz3c6MQ
Final versions of the questionnaires

On the last page of all three questionnaires, the participants were given the option to provide their name and contact details if they wished to take part in the interviews with the researcher. By September 2011, the questionnaires were ready for distribution at the beginning of the new academic year, on 1st October. However, the distribution started later, around November 2011 and finished in June 2012 (a total period of 8 months). This delay was due to the students' faculties occupation and street demonstrations in protest against the implementation of the New Law for Higher Education that was voted in September 2011. The final version of the instrument consisted of six parts and used a 7-point Likert scale. It was distributed via various methods: hand to hand, web-based questionnaires and via e-mail.

Limitations of questionnaire surveys

Survey research, although widely accepted and used in social sciences, has possible weaknesses, including a low response rate, non-responses and response errors. Low response rates may imply problems with the representativeness of the sample (Saunders et al. 2007). Non-responses may be due to four interrelated problems: a refusal to respond; ineligibility to respond; inability to locate respondents; and respondents are located but impossible to contact. The possible reasons for low response rates, according to Edwards et al. (2002), include the incentives for participants, the length of the instrument, the appearance, the method of postal delivery, and the content (interesting, user friendly, relevant), and they are usually due to ambiguous wording and bad instructions. For this study, most of the limitations are minimised because the students filled in the questionnaire in the presence of the researcher during class time and the subject of the research was of direct interest to the participants: teachers, students and accountants. Also, the hand-to-hand approach employed for the accounting teachers minimised the non-response rate.

6.9.3 Research Approach for Phase Three

The aim of the third phase of the study is to explore in depth the results obtained from the statistical analysis conducted in phase two. The method employed is semi-structured

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10 The final versions of the questionnaires are included in Appendix 2.

11 A description of the instruments is included in Appendix 2.
interviews. The author conducted interviews with: 6 accounting teachers, 2 students and 5 accountants. All of the interviews were tape-recorded with the participants’ consent. Further details and an analysis of the interview method are provided in chapter 10. All phases, levels of research and outcomes can be found in Table 1-1 (pp. 18 and 19, Section 1-7).

6.10 Sampling design and techniques

This study adopts a three-phase mixed methods sampling strategy, following the principles of a pragmatic sequential mixed methods approach. With this strategy, one type of data informs the collection of another type in a subsequent phase (Mertens, 2010).

In the literature review section, the author collected and analysed data from documents related to the introduction of skills and competences in HE at both the international (including EU and Bologna level) and national levels. The sampling strategy was to collect as much representative data as possible relative to the study. The collected qualitative data informed the author about which points to explore in the ensuing qualitative phase.

In Phase One, qualitative data were collected about the extent that HEIs have applied national laws to promote the introduction of skills by examining the whole population of HEIs with BAA departments. Regarding the documentary analysis, qualitative and purposive sampling was employed, the results of which will help to shape the quantitative tool for phase three. The same sampling technique was used to investigate businesses’ policy regarding skills by examining their websites.

In Phase Two, the author created and distributed the instrument for the quantitative approach. Three surveys were conducted with three different groups: accounting teachers (group A), BAA students (group B) and accounting practitioners (group C). The author employed the cluster and quota sampling technique for the students, the census technique for the teachers and the random selection technique for the accountants. Data from all of the previous phases will help to form the interview guide and identify potential interviewees for phase three.

In Phase Three, interviews will be conducted with the three groups. The interviewees were self-chosen by those who volunteered from phase two. The analysis of the
qualitative data from this phase alongside that of the previous results helped to form
conclusions on the divergent and convergent factors related to the introduction of skills
and competences in Greek HEIs’ accounting courses.

Sampling for the Teacher Group

The author conducted a census of all BAA departments’ websites, then listed all
permanent and contract accounting teachers’ details. Where email addresses were
lacking, the author contacted the administration office to request these. From this
procedure, a final list of 85 ATEI teachers and 36 university teachers throughout Greece
was drawn up, covering nine universities and ten ATEIs. The following table shows that
there were a high percentage of returned copies from the teachers (50%).

Table 6-1: Details of the teacher questionnaire response rate

<table>
<thead>
<tr>
<th>Teacher List</th>
<th>Sent</th>
<th>Returned</th>
<th>Percentage returned</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATEI</td>
<td>85</td>
<td>42</td>
<td>49%</td>
</tr>
<tr>
<td>Universities</td>
<td>36</td>
<td>19</td>
<td>53%</td>
</tr>
<tr>
<td>Total</td>
<td>121</td>
<td>61</td>
<td>50%</td>
</tr>
</tbody>
</table>

Sampling for the Student Group

The students were sampled using multi-stage cluster sampling. The author targeted
students at the end of their third year; that is, in their 6th semester or beyond. These
students were dispersed throughout Greek HEIs. Due to the budget and time constraints,
selections were necessary. Cluster sampling is a multi-stage approach involving
clustering followed by either further clustering or population units. This method may
reduce the representativeness but also decreases the cost; a compromise must be reached
between these two factors, because one cannot have both (Bryman and Teevan, 2005).
Clustering entails grouping participants according to several criteria. Initially, the author
grouped institutions by region and type (Universities or ATEIs). For the following stage,
the criteria of convenience and responsiveness were considered. Students were contacted
during class time and were not notified in advance, the researcher having obtained
permission from their teachers to do so. The students outside Attica were contacted
through their teachers, who agreed to distribute, collect and return the completed
questionnaires to the researcher. The final list of the participating institutions included four universities and five ATEIs.\textsuperscript{12}

**Sampling for the Accountant Group**

The distribution to professionals was done electronically through the Economic Chamber of Greece (ECGr) and the HR department of two of the five private companies that were contacted: PriceWaterHouseCoopers (PwC) and a local auditor’ company (SOL AE). ECGr, that holds the address of accredited accountants in Greece, forwarded 13,549 questionnaires. In total, 15499 questionnaires were distributed to professional accountants nationwide. Although the accountants’ return rate appears relatively low (5%), this represents a satisfactory absolute number of 791 valid returned copies.

6.11 *Ethical Considerations*

In the context of a research study ethics are related to the appropriateness of the researcher’s behaviour in relation to the rights of those who become the subject of the study or are affected by it (Saunders et al., 2007). Research ethics should be taken into consideration during all phases of a research: during strategy design and gaining access to the data, collection of data, process and storage of data, analysis and writing up. The researcher should reassure that this is done in a moral and responsible way (Robson, 2002). The most important key ethical issues across the stages and duration of a research project relate to the privacy of participants, the voluntary nature of participation and the right to withdraw from the process, consent of participants, confidentiality of data provided by individuals, anonymity, and avoidance of embarrassment, stress and harm to participants and finally objectivity of the researcher.

The researcher of the present study has kept high ethical standards by ensuring that no harm was caused to the participants in all phases of the research. The qualitative phase of the study included interviewing of participants. Individuals volunteered to participate in the interviews and they decided on a convenient place and time to their own schedule. The researcher asked for their consent for using the data collected and reassured them for the confidentiality and anonymity of their participation. For this reason pseudonyms were used throughout the study. The researcher exercised great care not to reveal their

\textsuperscript{12}A list of the participating schools can be found in Appendix 5.
identities in any way in the process. The interviewees agreed to the tape-recording of the discussions in order to avoid misunderstandings and misinterpretations of the responses. Before the beginning of the interview the researcher explained again the aim of the study and reminded to the participants that they had the right to withdraw from the process at any time they felt like it. The researcher was careful not to include questions that would be demeaning to the participant or make him/her feel embarrassed in any way. The processed data were sent back to the interviewees in order to verify that the researcher had accurately and precisely interpreted and presented their beliefs and opinions. During quantitative phase the researcher included in the questionnaire a cover letter explaining the aim of the study and reassuring the participants for the confidentiality and anonymity of their responds. Confidentiality and anonymity were also kept during the collection of data from accounting practitioners through internet. The researcher had no access to the electronic addresses of the participants. All questionnaires were sent to participants and responses were received through the Economic Chamber of Greece which withholds the personal electronic addresses of all accountants in Greece. Finally the researcher made every possible effort to treat data objectively that is not being selective about which data to report or misrepresent its statistical accuracy.

6.12 Chapter Summary

The chapter has presented the philosophical assumptions and paradigms that social scientists adopt when designing research strategies. The pragmatic worldview, which is the basis of the mixed methods research strategy, is adopted in this study because it is the one best suited to the researcher’s philosophical stance, the complexity of the research issue and the absence of previous studies. The research strategy, preparation of the instruments for phase three and sampling techniques for each research phase were described in detail. Next chapter presents the national and organisational level analysis based on documentary and web-based data on the response to the introduction of skills and competences in HEIs and enterprises.
CHAPTER 7 National and Organisational Level Response to Skills Introduction

7.1 Introduction

This chapter describes Phase One of the research, during which the qualitative data were collected and analysed in order to explain the actions, reaction and policies at the national and organisational levels. After this introduction, Section 7.2 presents the aim and strategy used in phase one. Section 7.3 presents the analysis at the national level (legislation), the Bologna Process and the educational reforms in Greece. Section 7.4 describes the research and analysis at the organizational level, which includes public (HEIs) and private organizations (businesses). Section 7.5 includes the conclusions and interpretation of the previous research through the lens of NIS and the isomorphic pressures exerted at the national, organizational and individual levels. Section 7.6 summarizes the chapter.

7.2 Aim and Strategy of Phase One

The aim of phase one is to collect data at the national and organizational levels in order to explore how the state and organizations “respond” to the introduction of skills and competences, as well as design and structure the quantitative (questionnaire) and qualitative (interview guides) tools to be distributed to the three groups (teachers, students and accountants) in the following research phases.

National Level: At the national level, documentary analysis is employed to explore the laws issued from 2003 to 2012 that were connected, directly or indirectly, with skills introduction. Documents from the political parties are examined, from the ECGr, the International Committee of Experts and the National Report submitted to the EC meeting in 2011.

Organisational Level: At the organisational level, the author conducted documentary analysis of the reports issued by the External Evaluation Committee (EEC) which was
appointed by the Hellenic Quality Assurance and Accreditation Agency (HQAA). The reports comment on the evaluation results of certain BAA departments. An in-depth interview with a member of the HQAA provided further insights into the issues affecting the establishment of learning outcomes and skills developments. Web based research on HEIs’ official websites provides a picture of the extent to which the educational organisations have implemented the learning outcomes and ECTS, as recommended by the Ministry. Skills introduction is not only a concern for HEIs; businesses are also an important stakeholder, so the author examined the employers’ side and investigated, through web based research, a sample of 36 companies to explore whether skills and competences are included within the qualities required of prospective employees.

7.3 Analysis at the National Level

7.3.1 The Bologna Process and HE Reforms

Greece is one of the European countries which signed the Bologna Agreement in 1999. Consequently, education reform was initiated by the Government, which has been attempting, since that time, to introduce the necessary changes in order to harmonize the Greek education system with the Bologna requirements. The transition has not been easy and remains incomplete. The government’s efforts have faced considerable resistance in the form of students’ occupations of faculties and street demonstrations, and teachers’ strikes. The government has made substantive efforts to bring about change since 2003 and it continues to issue relevant laws and presidential decrees. In July 2005, the Law on Quality Assurance in Higher Education was passed, transferring credit points and Diploma supplements (L. 3374/2005). This was followed by attempts in subsequent years to pass a Frame Law to bring Greek universities’ function closer to the European model. However, 2006 and 2007 were characterized by continuous mobilization against the introduction of this new Frame Law. The principal causes of the mobilizations were, firstly, the reform of article 16 of the Greek Constitution that would allow private universities to operate in Greece and, secondly, the wider innovations initiated by the Bologna Process, such as the evaluation of HEIs, skills introduction, the abolishment of “asylum”, HEI financing according to 4-year projects, the introduction of financial assistance for students, the provision of more than one manual to students, and a limit on to the total number of years spent studying. The New Frame Law, which attempted to bring the Greek educational system into line with the Bologna Agenda and the European
model, was finally introduced in March 2007. The whole issue of undertaking educational reform in order to harmonise with the Bologna Agenda became a hot political topic that initiated turmoil that led to countless missed teaching hours in HEIs. Many university teachers, the Hellenic Federation of University Teachers13 (POSDEP), students, the Federation of Greek Accountants, the Economic Chamber of Greece, political parties (mainly on the left), as well as other sectors of society joined forces to oppose university reform. Informal discussions and interviews with stakeholders revealed that even the word “Bologna” creates negative feelings among a large proportion of the Greek population. In summary, those who oppose the reform regard the Bologna Principles as creating the “marketisation” of education. The skills introduction through ECTS and Diploma Supplements are treated as the specific cause of the obsolescence of knowledge and graduates’ continuous efforts to renew their knowledge and skills in “life-long” learning institutions – providing they pay the required fees, of course (The Hellenic Federation of University Teachers’ Associations, POSDEP, 2006). Similar opinions were expressed by political leaders, the Economic Chamber of Greece and other professional accountants’ unions (Federation of Greek Accountants, 2007).

Despite the various disagreements among interested parties, there is a wide consensus that the major, long-term problems of Greek HE have damaged the quality of the education system. The issues that demand immediate attention according to the majority of academic teachers are: the low state funding, prohibition of private universities, disproportionate increase in the number of students compared to funding and equipment, HEIs’ low autonomy levels, university asylum, and students’ political unions (Veremis and Papazisis, 2007; Paboukis, 2007; Alivizatos, 2007).

7.3.2 Relevant Legislation in Greece

Greece is currently in the process of realising the National Qualification Framework (Zaheilas, 2012; EOPPEP, 2013). The process of harmonisation with the Bologna Requirements started in the previous decade in Greece, for which a series of laws have been introduced. Law 3191/FEK 258/A/2003 on the National Connection System of Vocational Education and Training with Employment and Law 3369/ FEK 171/A/ 2005

13 posdep@cs.ntua.gr
on Lifelong Learning and Law 3549/FEK69/2007 prepared the frame for the introduction of laws on Quality Assurance and ECTS.

_Law 3374/FEK189A/2005_ This law relates to the Quality Assurance of Higher Education, the establishment of ECTS and the diploma supplement. It describes the function of the internal and external quality assurance procedure and defined the criteria for quality assessment, as well as designating the establishment of an independent body, the “Hellenic Quality Assurance and Accreditation Agency” (ΔΑΙΠ), to be responsible for the coordination and support of HEIs’ assessment at a national level. The Ministerial Decision in _FEK 1466/2007_ complemented this law, which states that the European system of transfer and accumulation of credits is based _on the workload_ that a student must complete in order to achieve the course objectives, according to the _learning outcomes, skills and competences required for successful course completion_. The learning outcomes should be described in detail in every HEI prospectus in both English and Greek, and also on the Institute’s website. The law states explicitly that the credits assigned to every autonomous educational element or educational activity _should not be based exclusively or basically on the basis of the teaching hours or attending hours_ or the minimum number of credits required to obtain an undergraduate or postgraduate degree. The law refers the reader to the official EU website for further guidance, information and examples, along with the full catalogue of National Counsellors of the European Credit and Transfer System (ECTS/DS Counsellors). Detailed instructions on ECTS and learning outcomes are included on the IKY’s (State Scholarship Foundation) official website. In order to ensure the proper, full implementation of ECTS in every HEI, the law defines the assignment of coordinators at both the institution and departmental levels with the required experience and knowledge of European educational programmes and the capability to fulfil their duties effectively. The HEI-level coordinator is responsible for the successful implementation of the credit transfer system as well as the publication of the HEI’s full prospectus. Additionally, the law explicitly defines that the prospectus should contain, among other information, the expected learning outcomes, the teaching and learning methods as well as the assessment criteria and methods. The Law refers the academic coordinators for ECTS establishment to the EC’s official website for further information. The author believes

\[14\text{http://portal.iky.gr/IKY/portal/gr/news}\]
that the Law is clear and complete regarding the definitions and instructions relating ECTS introduction, and assures its proper application through the efforts and support of HQAA and the Bologna Experts.

*Law 4009/FEK195A/2011.* This is a very important Frame Law that abolished most of the previous laws and aimed to bring a new perspective to HE through reforming the institutions' management and the years of study, introducing skills and competences in HE courses, and laying down criteria for academic teachers' promotion and other important issues. The following points summarise the most important factors connected directly or indirectly to the introduction of skills and competences in HE teaching:

► In its first article, the Law describes the mission of HEIs, for the first time making explicit reference to their role in preparing graduates *to apply knowledge in the professional field.*

► It refers to lifelong learning and modern teaching methods.

► It urges academics to help students to develop critical thinking and skills.

► It refers to HEIs’ responsibility to consider their graduates’ *employment status.*

► It states that HEIs should respond to the *needs of the labour market* and the professional fields as well as to the national development prospects.

► Further reforms with immediate relevance to this study are the HEIs’ increased *autonomy* due to their right to decide the credentials and qualifications of candidates for teaching positions, *including their teaching competence.*

► For the first time, the Law includes within the teaching area a) the independent teaching of subjects in order to enhance and deepen knowledge *to small groups of students* b) the organisation of *seminars or relevant activities* which aim further to *support deep comprehension of knowledge* by students.

► In every Institution, an Office for *the support of teaching* can be established, especially regarding the use of new technologies.

► *Funding* further to the predefined funds are provided to the HEI according to special criteria, like the quality and effectiveness of the educational procedure, *the evaluation of the teaching process* by the students and graduates’ *employment rate.*
The Hellenic Quality Agency is renamed the Hellenic Quality and Accreditation Agency and is assigned the duty of accrediting courses according to specific and predetermined criteria (articles 65-72) and the issuance of a final decision.

The accreditation criteria of courses include, among others, the learning outcomes and intended skills according to the National Qualifications Framework, the connection between teaching and research, the degree of acceptance by the market of the acquired skills, and the quality and effectiveness of the teaching.

Special criteria are laid down to enable the accreditation agency to verify that the specific course responds effectively to the relevant professional fields’ educational and institutional demands. For this reason, the HQAA cooperates with the corresponding professional chambers and professional bodies.

The Institutes’ management is undergoing significant changes due to the introduction of a 15-member Management Board consisting of nine internal members who teach at the Institute and 6 external members from society. External members may be personalities from the arts or science fields, recognised for their social, political or economic activities at a national or international level.

The Law has significantly reduced the students’ involvement and voting rights in the collective bodies of AEIs in an attempt to reduce their unions’ participation in the governance of AEIs (Psacharopoulos and Kazamias, 1980; Grigoriadis and Kamaras, 2012).

The above reforms are highly innovative for the Greek educational system and, clearly, the government is attempting to bring the system into line with other European and Anglo-Saxon educational systems, as well as the Bologna Requirements and the European Higher Education Area. Unfortunately, the reforms that concerned primarily the new management scheme and secondarily the skills introduction caused an extreme reaction on the part of the management (Rectors and Deans). Therefore, the Law remained inactive until August 2012. During this period:

- Repeated funding threats by the Minister had no effect on the opposing HEI management.
- Chancellors of certain HEIs proceeded to take further judicial actions against the Minister of Education and Lifelong Learning’s decisions.
A year of demonstrations, students' occupations of faculties, riots and turmoil ensued. The reforms coincided with the sudden, intense economic crisis in Greece.

The new Minister of Education (who opposed the Law) of the mid-term government (April to June 2012) attempted to retrieve articles to satisfy the HEI management but met strong reaction from society and retrieved his plans.15

After the national elections (June 2012) and appointment of the new Government Cabinet, the new Minister of Education and Lifelong Learning, appointed his Deputy Minister, a former opponent of the Frame Law 4009/11.

On 10 August 2012, the Law amended some of its articles to satisfy the Chancellors of Institutes’ demands (4076/FEK159/2012). This ended the turmoil and the students returned to the classroom.

The Management Board was assigned fewer duties and less power than originally was planned for.

There are no institutionalised teacher training seminars or similar prerequisites for the promotion of academic teachers, so the inclusion of this prerequisite in Law 4009/2011 would be a positive evolution. A similar article has been introduced to the equivalent Spanish law (Gonzalez and Hassall, 2008).

Conclusions from the documentary analysis at the national level

Documentary analysis of the Laws as well as the National Reports and other documents reveals that the state took the initiative in introducing reform in Greece. Although governments usually act following a delay, they undertook the responsibility to adjust the legislative context within which the introduction of quality assurance could be realised. An important aspect of the Quality Assurance in education was the introduction of ECTS and learning outcomes (knowledge, skills and competences) into the HEI curriculum. Delays on the legislative side were translated into delays in the production of outcomes within the EU context, and Greece has been always among the last states to adjust their practices. The Laws have gradually brought the Greek legislation into line with the rest of Europe, where the market needs and requirements are important and taken into consideration during curriculum design. The introduction of Quality and

Accreditation Assurance also constituted a major step towards complying with the European and International standards. One could conclude that the legislative aspect of the HE reform has been almost finalised, broadly, and the state has introduced the proper institutional structures (i.e. HQAA) to support it. Additional activities to promote reform include the **International Advisory Committee on Higher Education**, consisting of distinguished members of internationally-recognised universities and academics. This Committee’s main task was to evaluate the Greek HEIs’ management and operation in order to harmonize their mission with that of other European universities. Additionally, nationwide **sensitisation meetings in Greek HEIs** were organised by IKY16 acting as the National Agency of the LLP/Erasmus course in Greece, with EC support and in close collaboration with the Ministry of Education. These meetings aimed to help HEIs effectively to implement the ECTS system, the Diploma Supplement and Quality Assessment principles. **Analysis at the Organizational level**

### 7.3.3 Documentary analysis of the External Evaluation Committee Reports

The HQAA was established by the issuance of Law 3374/2005 on Quality Assurance in Higher Education. The difference between Law 3374/2005 and Law 4009/2011 regarding the participation of a professional body in the accreditation process is striking. In the former, participation is mentioned as "desired" while, in the latter, the professional bodies’ participation is considered indispensable especially in cases where the degrees provide access to professions which require a professional licence to be issued by the chambers or professional bodies (i.e. doctors, nurses, architects, engineers, lawyers, accountants) (article 3, PD 38/2010, FEK 78A). The specific article signifies a major change in the culture and attitude of the educational law and system towards the market needs as they are expressed through the corresponding professional bodies. This could be the beginning of a closer relationship between academia, the market and the wider society. This evolution could be characterised as a move towards a "socially-embedded model" for HEIs (Ramirez 2006). The state appears to recognise the professional bodies as stakeholders in the formation of courses of study. The **accreditation criteria** for courses of study include, among others, the learning outcomes and intended skills according to the National Qualifications Framework, the degree of

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16 State Scholarship Foundation (IKY) at: http://www.iky.gr/
connection between teaching and research, the degree of acceptance by the market of the acquired skills and the quality and effectiveness of the teaching. The Agency predefined a specific format for a course outline, with a detailed explanation of the learning outcomes, statement of credits assigned to each educational element, analysis of the teaching methods, and a description of the assessment criteria and methods. The new course outline format, introduced in September 2013, is described, together with the credits assigned to every educational element, and provides space to describe the teaching and assessment criteria and methods. By October 2013, there were a total of 13 evaluation reports of HEIs’ BAA departments. The author analysed five of these published documents and highlighted specific comments that are relevant to our study; the development of skills and competences, innovative teaching methods to support them, learning outcomes, possible barriers to developing skills and possible drivers of change. The reports were accessed via the HQAA’s official website. A representative number of remarks were selected to represent the Agency’s recommendations within the framework that affects the shift towards a student-centred learning environment (HQAA, 2013).

Overall, the reports represented a wide variety of evaluations, from very good to poor performance. In many instances, the evaluators were impressed with the teaching staff’s quality and performance, despite the inadequate resources available, especially during the recent economic crisis. The author would like to emphasise here that Greek HEIs possess a strong knowledge base and excellent scientists. Greek HEI graduates are “tested” in international contexts and receive high awards. Quality assurance and efforts towards improvement will increase the number of graduates who go on to succeed in their professional and personal lives. The study has gathered mostly “low performance” cases and recommendations for improvement. There follows a short list of these, together with conclusions from the documentary analysis.

Conclusions from EEC reports

17 For an example of the predefined format for a course outline, both before and after September 2013, see Appendix 4.

18 http://www.hqaa.gr/.

19 For a full analysis of the documents, see Appendix 2.
➢ Big size classes are recognised as a major barrier to the introduction of innovative teaching methods.

➢ HEIs should enhance their connection with industry, their external stakeholders and society in general.

➢ The teaching methods and materials should be re-evaluated in some cases, as should the examination methods. The assessment criteria should be made clear and continuous, with mid-term assignments, mini projects and group work.

➢ The introduction of skills and competences will enhance graduates’ employability. Teachers should consider reducing the modules and replacing them with work placements.

➢ Incentives should be provided for students to excel, such as prizes. In addition, more information and connections should be established with recognized accounting professional certification (i.e. ACCA).

➢ Teachers and students’ lack of major mobility has a negative effect on the transfer of knowledge for both students and faculty.

➢ Departments should consider modifying the courses to include continuous assessment (mid-term assignments) that count towards the final mark, ideally (mini) projects and group work. The faculty should monitor closely and openly the students’ participation in the educational process and initiate corrective action by providing better information to students, incentives and appropriate continuous assessment.

➢ Staff should include clearly-articulated learning outcomes and assessment criteria with students’ learning guides.

7.3.4 Research of Official HEI Websites

The author conducted website research to all Greek HEIs’ BAA departments. In total, 33 departments were visited online to establish how many and which departments had followed the rules of the Ministry of Education and EU recommendations about ECTS and the learning outcomes framework, according to their website.

A well-structured module should demonstrate a clear alignment between the courses’ learning outcomes and assessment criteria. In order to achieve this alignment, teachers must design appropriate assessment tasks and deliver the module in a way which enables
students to achieve the required outcomes. This alignment between the learning outcome, learning and teaching method and assessment tasks and criteria should be explicitly stated and easily-accessible via the HEIs’ websites.

The target was to determine whether the ECTS calculation was a “technical/mechanical” calculation of credits or accompanied by relevant teaching methods leading to the desired learning outcomes. Accordingly, the curriculum guide (course of studies) was compared to the course outline. The curriculum guide is revised every 2-4 years and is adapted collectively by the teaching staff. A description of the ECTS and learning outcomes in the curriculum guide is mandatory and can be expected to be included 6-7 years after the issuance of the relevant law. The apparent absence of obvious link between courses’ learning outcomes and credits, and the actual description of each course’s learning outcomes, teaching methods and assessment, suggest that a superficial approach and mechanical calculation of credits may be in operation.

Method of analysis

Bryman and Teevan (2005) refer to the websites and web pages as potential sources of data which are fairly underused by social researchers. The vastness of internet and its accessibility create huge potential for examining documents for both quantitative and qualitative data analysis. However there are limitations to the use of websites content that need to be kept in mind like authenticity, credibility, sampling, caution for “webspeak”. Webspeak refers to the “special language” that may be used so that it may be difficult to comprehend what is being said without some insider knowledge. In this study all the above criteria were satisfied because of the “official” character of websites.

- Authenticity: the websites examined were the official sites of the relevant HEIs
- Credibility: there are no obvious reasons that any kind of distortion or manipulation of data was present
- Sampling: the sample was representative since all existing BAA departments were examined
- Webspeak: official language was used in all examined texts

The researcher located 33 Business Administration and Accounting (BAA) departments both in Universities and ATEIs in operation at the time of the research (summer 2013). A qualitative approach through documentary analysis of the contents of their websites
was conducted by the researcher. The content of the course, the aim and description of all relevant material was concentrated and analyzed carefully looking for references on the development of skills and competences of students. A matrix was built to help create themes, categorize data and make comparisons between departments. The matrix that was drawn included columns for curriculum guide, course outline, learning outcomes, ECTS, teaching methods employed while last column referred to the gap between curriculum guide and course outline\textsuperscript{20}. The whole process of analysis and categorization was guided by the research purpose: the development of skills and competences within accounting courses of BAA departments.

**Conclusions from web-based research of HEI**

The following results were found from the assessment of 33 BAA departments of HEIs:

- The majority of the 33 websites varied greatly in terms of their structure and overall cannot be characterized as user-friendly.

- In general, the 26 TEI websites were better structured and responded more closely to the requirements under examination.

- In a very few cases, no information at all about credit units and learning outcomes was included, although most of them provided basic, unstructured information about studying in the department and made minor reference to skills and competences.

- On most of the websites that included a course outline, there was no reference to the learning outcomes, although the courses' aims and targets were stated.

- In general, no uniform for presenting a course outline was found. In most cases, the information was incomplete and/or dispersed across the website, far from the HQAA's predefined format.

- In 14 HEIs, there is an explicit reference to skills and competences in the curriculum guide but not in the course outline. This gap suggests that the course does not incorporate the teaching of skills and that probably the only or the main teaching method is lecturing.

\textsuperscript{20}The results are summarized in table-form in Appendix 2.
- In 4 HEIs, skills and competences are mentioned in both the curriculum guide and course outline, but the latter contains only a partial reference (i.e. regarding only a few courses), possibly signifying that efforts have been made to include the teaching of skills in these courses.

- In 15 HEIs, skills and competences are not referred to in either the curriculum guide or the course outline, so there is no gap between them.

The overall conclusion is that the HEIs have paid insufficient attention to the formation of the course outline and the description of the learning outcomes, instead adopting a superficial approach with the sole aim of complying with the Ministry of Education’s requirements without making any real changes. The same failure to introduce credits that correspond to the learning outcomes was noted during a pilot programme of five vocational schools in Greece in 2007 (Zaxeilas, 2012, p. 210). Inertia, a lack of flexibility, stakeholders’ unwillingness, and a lack of central policy were identified as the main reasons for the pilot programme’s failure to connect credits with learning outcomes.

However, one must exercise caution here as it is possible that the teachers have introduced skills and competences into their courses but have neglected to update the relevant websites. Specific research should be conducted in order to analyze the situation from within the Institutions. The results coincide with the External Evaluation Committee’s external evaluation reports and also one of the interviewees’ (an HQAA member) comments, that 70% of HEIs have made efforts to establish ECTS but not in a proper, integrated way.

7.3.5 Interview analysis of the Accreditation Agency member

A member of the HQAA was interviewed in-depth in order to investigate further the reasons for HEIs’ slow implementation of quality processes. The analysis was performed by hand in order to interpret the results under NIS and the isomorphic pressures introduced by Powell and DiMaggio (1991) and DiMaggio and Powell (1983).

The analysis supports the finding from the web-based analysis of HEI websites that full ECTS implementation, eight years after the first relevant law was issued, has not yet been achieved. Fear of the unknown provokes reactions against the Bologna Reforms, although continuous meetings and the provision of information have reversed the situation regarding evaluation at least:
“Six years ago, when we started this effort, it was something totally unknown in universities...there was fear and ignorance, they thought it was like a punishment...But through communication and information they’ve understood things have changed and now we are much busier with applications for evaluations”.

The interviewee provided an assurance that the HEIs were properly and timely informed of all ECTS procedures and the relevant quality issues. The delay attitude coupled with the other characteristics of the system, like the promotion criteria, which do not include high quality teaching, prohibit the establishment of reform. The interviewee argues that the problem associated with poor implementation rests with the Institutes and the lack of initiative to disseminate the information to the lower levels. Also, some responsibility lies with the HEIs’ middle management and the teachers themselves:

“We go to an Institution and have a conference with 20 or 50 persons present. To disseminate the information, then the department supervisor or the director of the school should call a second meeting and ask for the implementation of the given directions of the law...the management of every Institution should push for the application of the Law. No one will apply the law by itself”.

As the participant notes, if HEIs desire autonomy, then they should be able to take initiatives and apply quality policies without expecting the state to “push” reforms. Adulthood and maturity should mean undertaking responsibilities not on paper but in action. This applies at both the collective and individual levels. Academic teachers’ freedom and power, both as individuals and as a group, in Greece is emphasised here, in agreement with other researchers (Papadimitriou, 2011; Bouzakis, 2008). The creation of laws that are voted for but not followed by the citizens is an open secret in Greece. Education is no exception. Teachers need training in order to introduce new ideas and methods. However, teachers with a strong sense of duty find ways to introduce innovations and skills. The majority of teachers either have no skills themselves or fear the workload, as the interviewee notes. Students’ evaluation through specific questionnaires has proved ineffective for many reasons, including the high rate of absenteeism in HE and the supervisors and directors of departments’ inertia. Once again, a new initiative remains “on paper”, without having any real impact on the activities. It remains a “ritual” without substance. The HEIs’ existing relationship with their external stakeholders should become a priority, especially considering the funding necessity. The
lack of self-awareness and difficulty in accepting criticism is an attribute that is found not only at the individual but also at the collective level.

“We as a Quality Agency, decided not to initiate a quality ranking of the Greek HEIs...because of the strong reactions to evaluation...we hesitated to say that the ATEI of this city is first while the ATEI of that city is second...”

This attitude does not permit the easy adoption of new practices from abroad.

“I would say not very often, we believe that we know everything, that we are the best!...and this is why we see so much reaction to evaluations... “Why do we need evaluation since we are the best!!!!?” (laughs)

Contact with other civilizations and colleagues create a positive impact and drives change. The need to take part in the global evolution will also drive the reforms. Legislation and the Bologna Process aim to fill the current gap between employers’ needs and graduates’ abilities. The educational system and teaching methods and material should change so that Greece can compete with other nations. HEIs have started to realise the pressures, but the resistance remains strong. Older, low-skilled people resist change. The drivers of changes are young, skilful teachers who demand from the system new opportunities. The crisis can be faced with pessimism or with new plans and the reorganisation of the present structures that will bring about improvements.

7.3.6 Interview with the Bologna Expert

After struggling to arrange an interview with either a Bologna Expert from an HEI, a member of the Ministry of Education or a member of staff of IKY (the organisation responsible for Erasmus), the author managed to have a telephone interview/conversation with a Bologna Expert due to time constraints on his part. The author was advised by the interviewee to treat the issue carefully, as this is a very delicate matter. The main point that arose from our discussion was that HEIs “want to have the title of Bologna Expert but not the workload”. Local Bologna Experts fail to disseminate information on Bologna issues as they should. Consequently, the whole burden rests on one person. The interviewee has visited other institutions to make presentations about learning outcomes, even though the local Institution has its own Bologna expert. As he explained,”40 Institutions cannot be informed and served by one person”. Secondly, he stated that IKY has given many presentations to explain how to introduce skills and write learning outcomes, and has invited all Bologna Experts to
attend seminars; the experts should return to their institution and disseminate this
information. “Unfortunately, they have not done so...The Rectors welcome innovations
when they hear about them but there is no continuity to their excitement.” Usually,
learning outcomes are not introduced and “even if they are introduced they contain
either the contents or only the technical-theoretical knowledge but not skills and
competences”. Although his Institute’s teachers are given guidelines on the issue, they
continue to write about their course contents only, either because the “teachers have no
motive to do extra work to care about learning outcomes”, or this is an “absence of
information dissemination within the institutions”. He added that “The Ministry
considers that all Institutions are adequately informed so far and no further activities
are needed in this direction”.

7.3.7 Web-based research of Businesses

Employers constitute one of the basic stakeholders in the educational process although
this has been a controversial issue in Greek society. Law 4009/11, as noted above,
explicitly included the professional bodies in courses’ accreditation process, signifying a
major change in the Greek educational system towards market needs.

In order to assess the importance assigned by employers to their prospective employees’
professional skills, the official websites were assessed. According to a recent study,
businesses’ websites’ career pages constitute an important means of creating a corporate
profile and attracting competent, skilful candidates, with the qualities in most demand
among potential employees being a willingness to learn, ethical integrity, high academic
skills, initiative, flexibility and adaptation as well as change management (Alba, 2013).

Method of analysis

The same method of analysis was used in this case as used in the analysis of the official
HEIs websites (see Section 7.4.2). A search of the websites of 36 enterprises was
undertaken to investigate whether they refer to the skills and competences that
prospective employees should possess. A convenience and qualitative sample of
enterprises was selected from among those providing Internships linked to BAA
departments. Of the 36 enterprises, seven were micro companies, nine small-medium
companies, and 20 large companies. The company types\textsuperscript{21} spanned every economic sector. Information about companies without a website was found through an on-line business directory. A matrix was built to help categorise and analyse the documents.

**Conclusions from web-based research of businesses**

A detailed investigation of these companies’ websites revealed that only six of the 36 described the skills and competences required of potential employees. These are large companies that employ over 250 people. The analysis shows that two of them clearly state the knowledge, skills and competences that they demand from prospective candidates, although only one (SingularLogic) listed the necessary skills according to the department to which the candidate is applying.

The micro companies which offer financial (accounting) services did not have their own website but provided information via business directories. Although space was available, they made no reference to prospective employees but merely provided the company’s basic contact information (address and telephone number). The other micro companies offered limited information about their activities and did not include any information about the skills required of future employees. The small and medium companies provided extensive information about their products and services. Most of them also included information on the benefits they provide to their employees, especially the training opportunities available, but there were no career web pages or any reference to the skills and competences required of future employees. Among the group of large companies, seven financial services (i.e. tax, audit, consulting, and accounting) companies’ websites were assessed. Two of these were local firms and did not provide any information about the required profile of prospective employees, while one was the local division of a multinational, which also failed to provide any relevant information.\textsuperscript{22}

7.4 *Conclusions and Interpretation under NIS*

**Organisations (public and private)**

**HEIs:** The research at the organisational level included the HEI departments and enterprises. As mentioned above, the web-based research was indicative and cannot be

\textsuperscript{21}The sample of companies can be found in Appendix 4

\textsuperscript{22}For the website analysis, see Appendix 2.
conclusive. However it further supports the documentary and interview analysis results. As Bryman and Teevan (2005, p. 130) suggest “employing both printed and website materials can provide a basis for cross-validating sources”. In summary, one can see that, at the organisational (HEI) level, those reforms that were adopted were rather superficial. There are no clear course descriptions on most of the HEIs’ official websites. The introduction of skills and competences may be announced but was implemented only in four of the 33 departments and only in a few accounting modules. Consequently, the implementation of ECTS has been merely superficial, aiming to appear to comply with the law without making any real change. In 14 of the 33 HEI departments examined, a gap was found between what the departments claim to teach on their courses (knowledge, skills and competences) and what they really teach (according to the prospectus). In 15 of the 33 departments, there was no gap because there was no reference at all to skills and competences in the course description or the prospectus. Further investigation is needed to identify the reasons for these discrepancies and identify the HEIs’ responses to the strategic reforms imposed by the state.

**Businesses websites:** A few studies in the Greek context have referred to the gap between graduates’ expected and actual skills and competences (Asonitou, 2013; Alba, 2013; SEV, 2012). This investigation of organisations examined a sample of 36 Greek companies’ websites to explore whether these organizations are effectively projecting their need for highly-skilled employees with transferable or soft skills. Only six of the 36 companies’ websites referred to their prospective employees’ transferable or soft skills, all of which were large companies, perhaps suggesting that the larger enterprises are more involved in the global evolution so receive the messages earlier, and also have the resources to make the relevant adjustments. However, only 16% of the large companies in our sample have a devoted careers page and refer to the required skills and competences. One would expect many more large companies’ official websites to contain a careers page and describe in detail the expected qualities of potential employees. None of the sample of micro or SME companies’ websites made any reference to this area. However many of the SME and large companies’ websites referred to the benefits for prospective employees for example they referred to internal training. It is possible that future employees’ skills and competences, although desirable, are not yet fully understood and “explicitly demanded” in the Greek market and so do not yet merit a specific mention on the companies’ websites. On the contrary, the issue
of internal training is well-established. It is of great importance to job candidates and therefore extensively used by employers from SMEs as well as large companies.

**Isomorphic Pressures at the National Level**

At the national level, coercive, mimetic and normative pressures were identified as the drivers of change. Mimetic pressures arise from Greece’s participation in the Bologna Agreement. Coercive pressures arise from the EEC (External Evaluation Committee) comments and recommendations and the Bologna Objectives. It might be argued that the Bologna Agreement and EEC recommendations are not binding or that the Committee does not have the tools to impose its decisions and therefore its recommendations do not constitute coercive pressures. However, the official and public acceptance of the impact of nations’ decisions and policies on quality assurance is, in itself, “binding” in the sense that new educational practices of quality cannot be implemented without reforming Greece’s policies and decisions. Otherwise, a vicious circle is created and the local government cannot blame the HEIs for failing to follow the quality practices prescribed by the Law. The Ministry should explain to academics how to introduce teamwork and critical thinking within a classroom containing over 150 students. The EEC’s published reports fall under the “follow-up structures and tools” coercive mechanism, which will be discussed in detail in Chapter 11 alongside the isomorphic pressures to change (DiMaggio and Powell, 1983).

**7.5 Chapter Summary**

In this chapter, qualitative data were collected at the national and organisational level. Official documents (Laws) and HQAA reports were analyzed, together with announcements by politicians, the Economic Chamber of Greece and the Association of Academic Teachers. Additionally, 36 businesses’ websites were analyzed in order to investigate the enterprises’ attitudes about prospective employees’ skills and competences. These data will support the conducting of quantitative phase two of the study.
CHAPTER 8 Quantitative Data Preparation

8.1 Introduction

This chapter prepares the data collected via questionnaires for the statistical analysis which takes place in the next chapter. After this introduction Section 8.2 presents an overview of the questionnaire themes (main parts) as well as the plan of the quantitative data analysis procedures and techniques. Section 8.3 illustrates the creation of appropriate databases for statistical analyses. Section 8.4 describes the criteria for assessing measurement scales (internal and external reliability). Section 8.5 includes the normality assessment techniques. Section 8.7 describes the validity assessment techniques used in the study. Section 8.8 describes the assessment of suitability of data for factor analysis and Section 8.9 presents the factor analysis for the overall group D. Section 8.10 summarises the chapter.
Figure (8.2) presents the model of the quantitative procedures and techniques that are used in chapters 8 and 9.

- Questionnaires A: Database Teachers
- Questionnaires B: Database Students
- Questionnaires C: Database Accountants

- Data Preparation
- Reliability Analysis
- Validity Assessment
- Normality Assessment

Development of United Database D

- Reliability Analysis
- Validity Assessment
- Normality Assessment

- Profile analysis
- Descriptive Statistics
- Importance Indicator
- Factor

- T-tests,
- One-Way ANOVA
- Strategic Map

Figure 8.2: Model of quantitative data analysis procedures
Three questionnaires (A, B, C) were created and distributed to the three groups. Table 8-1 presents in detail the number of distributed questionnaires for each group, the number and the percentage of the returned copies. There were a high percentage of valid returned copies from teachers. Regarding accounting professionals the author sent the questionnaires by e-mail (through the electronic address of Economic Chamber of Greece) to 13549 certified accountants. In addition the multinational company of business advisors and auditors PriceWaterHouseCoopers (PwC) and a local auditors company (SOL S.A.) forwarded the questionnaire to their employees. In total 15499 questionnaires were distributed to professional accountants.

Table 8-1: Total distributed and returned questionnaires per group

<table>
<thead>
<tr>
<th>Groups</th>
<th>Numbers of distributed questionnaires</th>
<th>Valid returned questionnaires</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Percentage</td>
<td>Male (%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Copies</td>
<td>(%)</td>
</tr>
<tr>
<td>Group A</td>
<td>121</td>
<td>61</td>
<td>50%</td>
</tr>
<tr>
<td>Accounting teachers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group B</td>
<td>864</td>
<td>(undergraduate=700</td>
<td>610</td>
</tr>
<tr>
<td>Accounting &amp; BA students</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(postgraduate^164)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group C</td>
<td>15499</td>
<td>791</td>
<td>5%</td>
</tr>
<tr>
<td>Accounting professionals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL 3 GROUPS</td>
<td>16,484</td>
<td>1462</td>
<td>8.86%</td>
</tr>
</tbody>
</table>
The students participating in this study were from 5 large Technological Educational Institutions of which 2 were at Attica, 4 at North Greece and 1 at the island of Euboea. In addition the author contacted students from 4 Universities of which 1 at Athens, 1 at Macedonia, 1 at Chios (Aegean island) and 1 at Peloponnese (city of Patras)²³.

*Preparation for statistical analysis:* During the process of entering data, mistakes were possibly made that could distort the statistical results. The data file needs to be carefully prepared before its use. An appropriate database will provide meaningful results (Pallant (2007). In order to check for categorical variables mistakes at the entering data stage, the author conducted two checks. From the output of descriptive statistics, she checked for the minimum and maximum values so that they make sense and be in the range of possible scores. In addition, the number of valid and missing cases was checked. In order to check for continuous variables mistakes through descriptive statistics analysis, the author checked minimum and maximum values as well as the mean score to make sense for the sample.

*Questionnaire editing:* Pallant (2007) stresses how important it is to observe completed questionnaires for possible bias. These biases can include: a) not fully completed questionnaires and b) questionnaires that respondents provided the same answer for all questions. In this study it was decided that all questionnaires with many missing values for important items would be rejected. In addition all questionnaires were visually scanned for obvious response bias. The same procedure was followed for all three groups of questionnaires (teachers, students, professionals). The final number of valid questionnaires from teachers was 61. The final number of valid questionnaires from students was 610. The final number of valid questionnaires from professionals was 791. All questionnaires were classified and given an identification number (1,2,3…etc.).

*Creation of appropriate database:* Four different databases were created: Database A for teachers, database B for students and database C for professional accountants. Each one of them was carefully examined for errors, missing values, and biases. One full database (D)

²³ Detailed table with participants per school can be found in Appendix 5.
was created by adding all three databases and more statistical measures (means, standard deviation, range, etc) could be computed from all participants (teachers, students and professionals).

**Codification and data entry:** A codebook was created where all variables were defined and labelled before creating the database. Numbers were assigned to all possible answers and were used to create the database in SPSS. In addition all variables in questionnaires A, B, and C were abbreviated and provided with a code. For example: the variables concerning the curriculum were coded as Cur1, Cur2, Cur3, etc. The variables concerning the barriers for change were coded as Bar1, Bar2, Bar3 etc. The variables concerning pressures to change were coded as Press1, Press2, Press3, etc. All answers from questionnaires A and B were transferred to SPSS 20 (Statistical Package for the Social Sciences). Answers from (professional accountants) were completed directly on the on-line version of instrument (Google docs). This program provides the option to transfer answers to Excel program and from Excel all answers were transferred to SPSS 20. Thirty five randomly selected cases (answered questionnaires) were selected to check for the accuracy of entry in each group of questionnaires. A very low entry error frequency was revealed and corrected accordingly.

**Reversal items and missing data:** In the SPSS program there is the option of assigning a specific value for missing cases. In almost all cases the items are worded in a positive direction (high scores indicate high agreement on the statement). Two items in the database were negatively worded (high scores indicated high agreement of the opposite). One item was reversed in scale 2: Accounting Curriculum: “Skills development is not the responsibility of Higher Education”. One item was reversed in scale 5: Pressures to change: “Teaching experience from a European University will not improve the overall studies program”. The items were reversed into different variables and with different names.

### 8.3 Criteria for assessing measurement scales

The researcher should ensure that the instrument used and the data obtained from that instrument represent and measure the concepts and the constructs in an accurate and consistent manner (Hair et al., 2007). Two common terms that are used in the assessment of scales is reliability and validity. When the researcher manages to address properly these two
issues then measurement errors are reduced. Measurement errors are minimised "when the observed numbers accurately represent the characteristics being measured and nothing else" (Hair et al., 2007, p. 241). The following criteria are presented by Hair et al. (2007) for assessing measurement scales: **Reliability**: Test-retest reliability, Alternative-forms reliability, Internal consistency reliability. **Validity**: Content validity, Construct validity (Convergent validity and Discriminant validity), Criterion validity (Concurrent validity and Predictive validity).

### 8.3.1 Reliability assessment

Reliability of a scale indicates how free it is from random error. Pallant (2007) refers to two ways to assess reliability of a scale: a) **the internal consistency** and b) **test-retest assessment** (also referred to as "temporal stability").

*Internal consistency* is the degree to which items that make up the scale are all measuring the same underlying attribute (i.e. the extent to which the items "hang together"). Bryman and Cramer (2001) refer to internal reliability as the measure to ascertain if the scale measures one single idea and whether the items that make up the scale are internally consistent. There are different ways to measure internal reliability. The most commonly used statistic is Cronbach’s coefficient alpha. This statistic provides an indication of the average correlation among all of the items that make up the scale. Values range from 0 to 1, with higher values indicating greater reliability. Nunnaly (1978) recommends a minimum level of 0.7. However Cronbach alpha values depend on the number of items in the scale. When there are fewer than 10 items in the scale, Cronbach alpha values can be quite small. In this case it is better to calculate and report the mean inter-item correlation for the items. Optimal mean inter-item correlation values range from 0.2 to 0.4 (as recommended by Briggs and Cheek, 1986). External consistency is evaluated by the test-retest method. Several factors may cause problems with the use of test-retest assessment. The first time respondents respond to the survey may influence their response the second time they take it. This is called the **practice effect**. **Alternative forms reliability** provides one way to reduce the problems caused by the practice effect. It refers to changing the form, the order and the phrasing of the questions so that the respondents do not connect the second measurement with the first measurement.
In this study, the questionnaires were built partly using the instrument in the studies of Hassall et al. (2005) and partly using results from documents analysis, informed experts and literature review. Only one item was excluded which created confusion to the participants as was shown from the pilot tests. Although scale 3 (professional skills) was used with the same content (only change has been the exclusion of one item which repeatedly caused questions and looked similar to others) reliability analysis was conducted again. Pallant (2007) explains that irrespectively of good reports about the reliability and validity of a scale, pilot tests should be made with the intended sample. It may happen that scales are reliable with some groups (e.g. adults with an English speaking background), but are totally unreliable when used with other groups (e.g. children from non-English-speaking backgrounds). Therefore checking for reliability and validity issues was deemed necessary. Scales and subscales were checked using Cronbach’s alpha coefficient and the results are presented in the following sections.

8.3.2 Internal reliability analysis

Internal reliability analysis for group C of accounting practitioners was conducted and for overall group D. Reliability analysis for questionnaires A (teachers) and B (students) was not conducted. The reason for this is that since the instruments were almost the same, reliability analysis for the other two groups would provide similar results given the fact that it concerned adults that activate in the same working place (academic institutions) and at the same country. In the following sections reliability analysis for overall group D is presented.

Internal reliability analysis for Overall Database D

The scales of the total database D (all three groups’ databases in a united database) were evaluated using inter-item correlation and coefficient alpha. All the items were measured using a 7-point Likert scale, where 1 represented “totally disagree” and 7 represented “totally agree”. In Table 8-2 there is a summary of the results from reliability analysis for all scales of overall database D (united data from teachers, students and accounting practitioners). The analytical results and tables can be found in Appendix 5.
Table 8-2: Summarised Results from Reliability Analysis

<table>
<thead>
<tr>
<th>Scales</th>
<th>Cronbach's Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha coefficient and item-total correlation for Overall Bologna Agreement Scale</td>
<td>0.811</td>
</tr>
<tr>
<td>Alpha coefficient and item-total correlation for Overall Professional Skills Importance Scale</td>
<td>0.882</td>
</tr>
<tr>
<td>Alpha coefficient and item-total correlation for Overall Professional Skills Exhibited Performance Scale</td>
<td>0.950</td>
</tr>
<tr>
<td>Alpha coefficient and item-total correlation for Overall Curriculum Scale</td>
<td>0.450</td>
</tr>
<tr>
<td>From the above scale one item was deleted that presented negative correlation. Alpha co-efficient for this scale is low and almost all the items have item correlation &lt;0.3. Therefore the items in the scale do not measure according to the test what the scale intents to measure. However it was decided to keep this scale in the instrument in order to test against other studies with similar content (i.e. Hassall et al, 2005).</td>
<td></td>
</tr>
<tr>
<td>Alpha co-efficient and item-total correlation for Overall Barriers to skills incorporation Scale</td>
<td>0.819</td>
</tr>
<tr>
<td>Alpha co-efficient and item-total correlation for Pressures Scale</td>
<td>0.750</td>
</tr>
</tbody>
</table>
8.3.3 External reliability analysis

External reliability can be verified through the “Test-retest” method (Bryman and Cramer, 2001). This involves administering a test or measure on one occasion and then re-administering it to the same sample on another occasion. Stability of a scale means that there will be little variation over time in the results obtained over time (Bryman and Teevan, 2005).

Test-retest reliability is most often used for entire survey instruments or for scales within survey instruments as is the case here. When measuring test-retest reliability, the researcher should consider the possibility that respondents become familiar with the items and their answers are based on their memory and their responses of the first time. This is called the practice effect and it constitutes a problem if the instrument is administered in between short periods of time because this can distort test-retest reliability figures (Litwin, 1995). It is difficult or sometimes impossible to have the same respondents to take a survey twice (Hair et al., 2007). In the study in order to measure external reliability and stability, the instrument was distributed to 34 students of ATEI Athens at two different points in time. In order to avoid the practice effect, the instrument was administered at the beginning and the end of the semester assuming that within this long period the practice effect will not appear. Approximately five months later the same questionnaires were distributed to the same cohort of students and the results were analysed for external consistency. The results are presented in Table 8-3.
Table 8-3: Mean and Standard Deviation of first and second measurements of scales

<table>
<thead>
<tr>
<th>Pairs and Measurements</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pair 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second measurement Importance of Professional Skills</td>
<td>6.2670</td>
<td>.49443</td>
<td>.08479</td>
</tr>
<tr>
<td>First measurement Importance of Professional Skills</td>
<td>6.2936</td>
<td>.44785</td>
<td>.07681</td>
</tr>
<tr>
<td><strong>Pair 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second measurement Exhibited level of Professional Skills</td>
<td>4.7957</td>
<td>.91223</td>
<td>.15645</td>
</tr>
<tr>
<td>First measurement Exhibited level of Professional Skills</td>
<td>4.7724</td>
<td>.76717</td>
<td>.13157</td>
</tr>
<tr>
<td><strong>Pair 3</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second measurement Bologna Agreement</td>
<td>6.1457</td>
<td>.57832</td>
<td>.10067</td>
</tr>
<tr>
<td>First measurement Bologna Agreement</td>
<td>6.1984</td>
<td>.47135</td>
<td>.08205</td>
</tr>
<tr>
<td><strong>Pair 4</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second measurement Accounting Curriculum</td>
<td>4.9783</td>
<td>.62984</td>
<td>.10802</td>
</tr>
<tr>
<td>First measurement Accounting Curriculum</td>
<td>4.9543</td>
<td>.54839</td>
<td>.09405</td>
</tr>
<tr>
<td><strong>Pair 5</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second measurement Barriers to Skills Introduction</td>
<td>4.9294</td>
<td>.77519</td>
<td>.13294</td>
</tr>
<tr>
<td>First measurement Barriers to Skills Introduction</td>
<td>5.0752</td>
<td>.82768</td>
<td>.14195</td>
</tr>
<tr>
<td><strong>Pair 6</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second measurement Pressures for skills introduction</td>
<td>4.4443</td>
<td>.78196</td>
<td>.13411</td>
</tr>
<tr>
<td>First measurement Pressures for skills introduction</td>
<td>4.5006</td>
<td>.75058</td>
<td>.12872</td>
</tr>
</tbody>
</table>
Paired samples T-test was conducted and measured for each scale in two instances the standard deviation, the means and p value. The results (Table 8-4) showed that for each scale of the instrument calculations resulted in p>0.05 which shows that there were no significant differences in scores from the first and second measurement, consequently the instrument has high external reliability.

Table 8-4: Paired Samples T test for all scales and p values

<table>
<thead>
<tr>
<th>Pairs - Measurements</th>
<th>Paired Differences</th>
<th></th>
<th></th>
<th></th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Deviation</td>
<td>Std. Error Mean</td>
<td>t</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pair 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second - First</td>
<td>-.02657</td>
<td>.40313</td>
<td>.06914</td>
<td>-.384</td>
<td>33</td>
<td>.703</td>
</tr>
<tr>
<td>Scale: Importance of Professional Skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pair 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second - First</td>
<td>.02322</td>
<td>.78228</td>
<td>.13416</td>
<td>.173</td>
<td>33</td>
<td>.864</td>
</tr>
<tr>
<td>Scale: Exhibited Professional Skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pair 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second–First</td>
<td>-.05267</td>
<td>.58412</td>
<td>.10168</td>
<td>-.518</td>
<td>32</td>
<td>.608</td>
</tr>
<tr>
<td>Scale: Bologna Agreement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pair 4</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second –First</td>
<td>.02406</td>
<td>.48151</td>
<td>.08258</td>
<td>.291</td>
<td>33</td>
<td>.773</td>
</tr>
<tr>
<td>Scale: Accounting Curriculum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pair 5</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second –First</td>
<td>-.14574</td>
<td>.73339</td>
<td>.12578</td>
<td>-1.159</td>
<td>33</td>
<td>.255</td>
</tr>
<tr>
<td>Scale: Barriers to Skills Introduction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pair 6</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second –First</td>
<td>-.05633</td>
<td>.71382</td>
<td>.12242</td>
<td>-.460</td>
<td>33</td>
<td>.648</td>
</tr>
<tr>
<td>Scale: Pressures for Skills Introduction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8.4 Normality Assessment

Many of the statistical tests and techniques assume that the distribution of scores is "normal". Normal is used to describe a symmetrical, bell-shaped curve, which has the greatest frequency of scores in the middle, with small frequencies towards the extremes (Gravetter and Wallnau, 2004). Normality can be partly assessed by skewness and kurtosis values. However, SPSS provides other techniques also which this thesis will use to assess normality for total scores of scales.

For the assessment of normality the following tests were examined as suggested by Pallant (2007): The difference between mean and the 5% trimmed mean, the skewness and kurtosis values, the Kolmogorov-Smirnoff statistics, the Histogram, the Normal Q-Q Plot, the Detrended Normal Q-Q Plot and the Boxplot. This study examined normality for scales in Group C – Accounting Practitioners and in Overall Group D, which is the United Database of three groups. The following section presents the results from normality tests of the United Database D of three groups of all six scales of the questionnaire.

Normality for Overall Group D

In order to calculate normality for overall Group D the total scores of variables were calculated. The overall variables were named; Overall Curriculum, Overall Bologna, Overall Professional Skills Importance, Overall Professional Skills Exhibited, Overall Barriers, Overall Pressures.

Below a summary of the results on the normality tests is presented.
Normality for Professional Skills Importance Scale

Mean 119.2138
5% Trimmed Mean 120.0750

Kolmogorov-Smirnov test of normality presents no significant difference (Sig. value=.000 <0.05) suggesting violation of the assumption of normality. The histogram showed that there is negative skewness indicating a clustering of scores at the high end (right-hand side of graph). This reveals the great responsiveness of participants to the importance of professional skills for accountants.

Histogram

Normality for Professional Skills Exhibited Performance Scale

N=1580

Mean 82.8175
5% Trimmed Mean 83.0394

Kolmogorov-Smirnov test of normality presents significant difference (Sig. value=.007 <0.5) suggesting violation of the assumption of normality. However this is quite common in larger samples as is this sample (1580 cases). The histogram below indicates a clustering of scores around the centre of diagram, very close to the normal distribution.
Normality for Bologna Scale

N=1589

Mean 42.4273

5% Trimmed Mean 43.1688

Kolmogorov-Smirnov test of normality presents significant difference (Sig. value=.000 <0.5) suggesting violation of the assumption of normality. However this is quite common in larger samples as is this sample (1589 cases). The histogram below shows that there is negative skewness indicating a clustering of scores at the high end (right-hand side of graph). This reveals the great responsiveness of participants to the Bologna Agreement propositions.
Normality for Barriers Scale

N=1553

Mean 101.4958

5% Trimmed Mean 101.7310

Kolmogorov-Smirnov test of normality presents significant difference (Sig. value=.000 <0.5) suggesting violation of the assumption of normality. However this is quite common in larger samples as is our sample (1553 cases). The histogram below indicates a clustering of scores around the centre of diagram, very close to the normal distribution.
Normality for Pressures to Incorporate Skills Scale

N=1565

Mean 79.0530

5% Trimmed Mean 79.1606

Kolmogorov-Smirnov test of normality presents no significant difference (Sig. value=.000 <0.05) suggesting violation of the assumption of normality. The histogram below indicates a clustering of scores around the centre of diagram, very close to the normal distribution.

Regarding the two scales which deviated from normal distribution the author decided to proceed with further statistical tests that assume normality based on the opinion that normality is critical only for small samples (Hanushek and Jackson, 1977; Berry and Feldman, 1985).

8.5 Validity assessment

A Factor Analysis (FA) was undertaken to identify latent dimensions within the items included in the scales of the research instrument. FA is a statistical procedure, which enables the underlying dimensions of a questionnaire to be determined. A FA test can be used to assess the factorial validity of the questions, which make up a scale by telling us the extent to which they will be measuring the same concepts or variables.
Factor Analysis was used for three main purposes:

1. To assess the degree to which items were tapping the same concept
2. To determine the degree to which they could be reduced to a smaller set
3. To try to make sense of the complexity of the social behaviour by reducing it to a more limited number of factors.

**Two main methods to FA: exploratory and confirmatory.**

Exploratory Factor Analysis is often used in the early stages of research to gather information about the inter-relationships among a set of variables. In contrast, confirmatory FA is a more complex set of techniques used later in the research process to confirm specific hypothesis or theories (Pallant, 2007).

An Exploratory Factor Analysis based on the principal component analysis (PCA) with **Oblimin rotation**, was conducted using the SPSS package version 20 to detect the factor structure in the scales of the study. FA involves various steps (Pallant, 2007). In this study, five separate factor analyses were undertaken, firstly for group C and then for overall group D. Factor analysis for the three scales of the questionnaire were conducted: professional skills, barriers to skills and pressures to introduce skills. The other two scales are comprised with very few items that would make separate factors.

### 8.6 Assessment of suitability of data for factor analysis (FA)

The completed questionnaires from Google documents were downloaded to an Excel spreadsheet and from there were transferred to SPSS (version 20). There are three main steps in conducting factor analysis:

- Assessment of the suitability of the data for factor analysis
- Factor extraction
- Factor rotation and interpretation

**Step 1: Assessment of the suitability of the data for factor analysis**
In order to consider a data set for factor analysis there are two issues: the sample size and the strength of the relationship among the variables (or items) (Pallant, 2007). Although there is no agreement between researchers on the sample size, the generally recommend is the larger the better. In this case, two of the three databases are more than 700 cases. One dataset group (teachers) consists of 61 cases. The second issue to consider is the strength of the inter-correlations among the items. Correlation matrix identifies all variables lower than 0.3. If few correlations above this level are found, factor analysis may not be appropriate (Tabachnick and Fidell, 2007). Two more measures can help to identify factorability of data. These are the Bartlett’s Test of Sphericity which should be significant (p<0.05) for the factor analysis to be considered appropriate and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. The KMO index ranges from 0 to 1, with 0.6 suggested as the minimum value for a good factor analysis (Tabachnick and Fidell, 2007).

**Step 2: Factor extraction**

“Factor extraction involves determining the smallest number of factors that can be used to best represent the inter-relations among the set of variables” (Pallant, 2007, p. 181). There are a number of techniques that can be used to assist in the decision concerning the number of factors to retain (Pallant, 2007). Among them are the Kaiser’s criterion (the eigen value rule) and the Scree test.

**Step 3: Factor rotation**

Rotation is a statistical procedure that helps the researcher to interpret the factors that were identified in the earlier stage. It is a procedure that presents the patterns of loadings in a manner that is easier to interpret. There are two main approaches to rotation, resulting in either orthogonal (uncorrelated) or oblique (correlated) factor solutions (Bryman and Cramer, 2005; Kim and Mueller, 1978, 1994). There are a number of different rotational techniques provided by SPSS (Orthogonal, Varimax, Oblique, Equamax, Direct Oblimin, Promax). The most commonly used technique is the Direct Oblimin. It is recommended to start always with Direct Oblimin technique because it provides additional information about the degree of correlation between the factors (Pallant, 2007, p. 184).
8.7  Factor Analysis for Overall Group D

The factors that were identified through factor analysis are presented below24.

FACTOR ANALYSIS FOR OVERALL PROFESSIONAL SKILLS IMPORTANCE SCALE

Factor 1: Applied Accounting Skills includes 8 items with loadings between 0.510 and 0.835. This factor had the Eigen value of 6.767 and explained 35.617% of the total variance while internal consistency test obtained the Cronbach alpha of 0.839. The items included in the factor are the following:

1. Knowledge of information sources
2. Use of relevant software
3. Comprehensive and global vision of the organisation
4. Social and ethical responsibilities
5. Organise workloads to meet coinciding deadlines
6. Knowledge of the accounting profession
7. Develop methods of effective learning
8. Commitment to life-long learning

Factor 2: Managerial Accounting Skills includes 7 items with loadings between 0.417 and 0.733. This factor had the Eigen value of 1.460 and explained 7.683% of the total variance while internal consistency test obtained the Cronbach alpha of 0.805. The items included in the factor are the following:

1. Identify and solve unstructured problems,
2. Team work,
3. Find creative solutions,

24 The full presentation of tables and results is included in Appendix 5.
4. Assume leadership,
5. Organise and delegate tasks,
6. Integrate multidisciplinary knowledge to solve problems,
7. Organise workloads to meet conflicting demands

**Factor 3:** *Business Communication Skills* includes 4 items with loadings between 0.435 and 0.791. This factor had the Eigen value of 1.117 and explained 5.880% of the total variance while internal consistency test obtained the Cronbach alpha of 0.599. This value is low for Cronbach alpha so the author computed mean inter-item interrelation which was between the optimal range of 0.2 and 0.4. The items included in the factor are the following:

1. Critical thinking
2. Listen effectively
3. Use of visual aids in presentations
4. Defending opinion verbally and in writing

**FACTOR ANALYSIS FOR OVERALL BARRIERS TO INCORPORATE SKILLS**

Factor analysis was applied to 19 items of the Overall Barriers to skills scale. One item was omitted from the original scale because reliability analysis of scale revealed that this item ("Bureaucracy as a barrier to incorporate skills") did not measure what the scale intended to measure. Suitability of scale for factor analysis was tested using the Kaiser-Meyer-Okin (KMO) measure and Bartlett’s Test of Sphericity. The results below (table 8.62) revealed that KMO was 0.817 at a very good point. Bartlett’s Test of Sphericity was significant (chi-square=7756.512, df=171, p<0.000) respectively, which means the appropriateness of Factor Analysis was confirmed.

**Factor 1:** *Barriers from accounting teachers* includes five items with loadings between 0.560 and 0.782. This factor had the Eigen value of 4.617 and explained 24.3% of the total variance while internal consistency test obtained the Cronbach alpha of 0.741. The items included in the factor are the following:
1. Traditional methods of assessment and examination (lack of ability to simulate real world situations)

2. Lack of educational development training for accounting teaching staff

3. Lack of relevant practical accounting experience of lecturers

4. Reluctance of lecturers to change teaching methods

5. Consequences on the teaching quality due to other personal remunerative activities outside university

Factor 2: Barriers from the HEI administration includes eight items with loadings between 0.259 and 0.855. This factor had the Eigen value of 1.897 and explained 9.985% of the total variance while internal consistency test obtained the Cronbach alpha of 0.717. The items included in the factor are the following:

1. Lack of funding as an obstacle

2. Lack of proper equipment

3. Large class sizes

4. High quality teaching is not rewarded as it should be

5. High proportion of teachers on short-term contract

6. Lack of effective partnerships of HEI with external organisations

7. Teachers not informed on Bologna requirements about skills

8. High teaching loads of lecturers

Factor 3: Barriers from students includes six items with loadings between 0.372 and 0.770. This factor had the Eigen value of 1.723 and explained 9.071% of the total variance while internal consistency test obtained the Cronbach alpha of 0.742. The items included in the factor are the following:

1. Students expect to receive their degree with the lowest efforts possible

2. Students' lack of maturity
3. Resistance and inertia of the students to changes in teaching methods

4. Absence of fees may lead students to lose their interest

5. Absence of fees may lead students to have low requirements

6. The "specific" way that students' political organisations function

**FACTOR ANALYSIS FOR OVERALL PRESSURES TO INCORPORATE SKILLS**

Factor analysis was applied to 17 questioned items regarding the pressures to incorporate skills into the accounting curriculum. Suitability of scale for factor analysis was tested using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett’s Test of Sphericity. The results below (table 8.66) revealed that KMO was 0.791 and Bartlett’s Test of Sphericity was significant (chi-square=2823.187, df=136, p<0.000) respectively, which means the appropriateness of Factor Analysis was confirmed.

**Factor 1: Pressures coming from society, coercive and mimetic forces (European Universities’ practices)** includes 6 items with loadings from 0.533 to 0.703. This factor had the Eigen value of 3.682 and explained 21.658% of the total variance while internal consistency test obtained the Cronbach alpha of 0.672. This reliability value is considered low (<0.7) but expected given the limited number of items. The items included in the factor are the following:

1. Evaluation of teachers and HEI
2. Assessment system should be continuous and include case studies, presentations, written reports, etc
3. External check of sample tests and assessments
4. Convergence of Greek and European HEI
5. Higher Education Institutions should pay attention to workplace requirements
6. Teaching awards as motivation to accounting teachers

**Factor 2: Pressures coming from Private Sector Business Schools** includes 5 items with loadings from 0.566 to 0.820. This factor had the eigen value of 2.384 and explained
14.021% of the total variance while internal consistency test obtained the Cronbach alpha of 0.775. The items included in the factor are:

1. Academic Level of Private Business Schools and Colleges
2. Studying in Private Business School
3. Private Business Schools and market place requirements
4. Private Business Schools and students' immigration to study in other countries
5. Studying in European University

**Factor 3: Pressures coming from normative forces (professions)** includes 3 items with loadings from 0.413 to 0.755. This factor had the Eigen value of 1.147 and explained 6.745% of the total variance while internal consistency test obtained the Cronbach alpha of 0.368. The items included in the factor are:

1. Higher Education Institutions do pay attention to workplace requirements
2. Qualified accountants need only technical knowledge
3. Approval by the Ministry of Education of a 4year financial budget program in order to fund HEI

8.8 **Chapter Summary**

Chapter 8 includes the statistical preparation of the data in order to perform some further statistical tests in the following chapter. All questionnaires, from all groups were coded, edited and entered in SPSS version 20. Internal reliability analysis was conducted which provided an alpha coefficient (Cronbach a) more than 0.75 for all scales. External reliability analysis (test-retest) was performed as well as paired samples t-test which resulted in p>0.05 which shows that there were no significant differences in scores from the first and the second measurement. Consequently the instrument has high external reliability. Normality assessment for the scales in the overall group D was performed also. Out of the six scales of the questionnaire four of them had normal (or close to normal) distribution of scores suggesting that that analysis can proceed further (for example ANOVA tests). Finally a Factor Analysis was conducted in order to test the construct validity of the scales. Next
Chapter 9 contains the statistical analysis of data with descriptive statistics, paired samples t-test and ANOVA tests.
CHAPTER 9 Analysis of Quantitative Data

9.1 Introduction

This chapter constitutes Phase Two of the present study, which plans to collect and analyse data at the individual level from teachers, students and accountants. After the data preparation (see chapter 8), the thesis proceeds with statistical analysis and tests that provide answers to the research questions. This chapter consists of 12 sections. After this introduction, section 9.2 presents the Indicator of Priority (IP) as a method for prioritizing skills development in Greek classrooms. Section 9.3 presents the statistical tests that will be used and their related prerequisites and assumptions. Sections 9.4, 9.5 and 9.6 present the analysis of the teacher, student and accountant groups, respectively, such as the participants’ profile analysis, some descriptive statistics, the results for the research questions regarding acceptance of the Bologna Principles, opinions on professional skills, the barriers and pressures related to skills introduction, as well the IP ranking. Section 9.7 explores further comparisons across the total sample (united database). Separate strategic maps are presented in section 9.8 for the teacher, student and accountant groups, respectively, illustrating the results using a scatter plot combining two attributes: the importance and exhibited performance of skills. Section 9.9 refers to the proper methods for designing the accounting curriculum. Sections 9.10 and 9.11 compare the barriers to and pressures regarding skills development, respectively, across the three groups. Section 9.12 summarises the chapter.

9.2 Indicator of Priority – IP

A questionnaire was sent to 15,499 accountants, 61 teachers and 774 students (610 third year undergraduates and 164 master’s students). The questionnaire contained (among other scales) a listing of 19 skills and personal attributes that have been identified as important by
previous researchers in this area (Hassall et al., 2001; 2003). These were arranged into six groups: “communication” (4 items), “group working skills” (3 items), “problem-solving skills” (3 items), “time management” (3 items), “IT” (2 items) and “other skills and professional values” (5 items). The items were coded as follows:

C1 Present and defend points of view and outcomes of their own work, in writing, to colleagues, clients, and superiors
C2 Use visual aids in presentations
C3 Listen effectively to gain information and to understand opposing points of view
C4 Critically read written work, making judgements on their relevance and value
G1 Work with others in teams in harmony
G2 Assume leadership positions when necessary
G3 Organise and delegate tasks-
P1 Identify and solve unstructured problems-
P2 Find creative solutions -
P3 Integrate multidisciplinary knowledge to solve problems
T1 Organise workloads to meet conflicting demands
T2 Organise workloads to meet coinciding deadlines
I1 Use relevant software
I2 Use electronic information sources
O1 Have a commitment to life-long learning
O2 Ability to develop methods of effective learning
O3 Be aware of their social and ethical responsibilities
O4 Have a comprehensive and global vision of the organisation
O5 Have knowledge of the accounting profession (work areas, professional values)
The questionnaire and statistical tests for the three participant groups can be found in Appendix 5 and Appendix 8 respectively. All three groups (teachers, students, practitioners) were asked, based on their experience and personal opinion, to score each of the attributes on a seven-point scale for two different classifications:

- The importance of professional skills for qualified accountants.
- The professional skills' level exhibited by graduates.

The analysis of the "importance of skills" will reveal which ones are identified as necessary for accountants. The results from analysing "exhibited by graduates" will identify those skills for which the performance is adequate (or the educational system's adequacy in delivering professional skills). However, an analysis that could identify those areas that are most in need of urgent remedy would be most valuable. The low availability of resources limits the capabilities and desire of teachers to develop simultaneously a broad range of professional skills. Consequently, teachers need to establish priorities. As educators, they could tailor their capabilities and the future curriculum reforms to satisfy high-priority needs. Thus, in order to identify the professional skills that require immediate, major improvement, the author developed the Weighted Importance Indicator or IP to facilitate a joint analysis of both characteristics ("importance" and "level exhibited"). The formula for the IP is as follows:

\[
IP_i = \frac{imp_i}{\overline{exhib_i}}
\]

Where:

- \(imp_i\) = the importance score for each individual skill
- \(\overline{exhib_i}\) = the mean of the scores for the skill levels exhibited (for all skills)
- \(exhib_i\) = the score for the level exhibited for that individual skill
If two skills have an equal importance score, the IP will be higher for the one with the lower exhibited performance level score. Therefore, the IP statistic designates the priority of a particular skill in relation to the necessity to focus on its development. If a skill presents low importance and a high exhibited level ($imp_i < exhib_i$), then it will provide low IP scores which could possibly be misleading, in the sense that the low IP signifies a low priority. For example:

For skill A

$$IP = \frac{1.5}{1} = 1.5$$

For skill B

$$IP = \frac{1.5}{6} = 0.75$$

Skill B development has a lower priority (=0.75) than skill A, which has priority 1.5, although skill B has higher importance (=3) than skill A, which has importance (=1). Skill A development has a higher priority (=1.5) although it has lower importance (=1) than skill B. This case is represented in the lower right rectangle of the strategic map which is shown in the following diagram:
### Exhibited Performance Level

Cases that belong in area 4 of the strategic map are not usually expected. However, one should be cautious about such cases that may arise. Other studies have developed similar IPs for accounting professional skills (Hassall et al., 2001; Hassall et al., 2003; Hassall et al., 2005). In the following sections, the importance and exhibited ranking for each participant group will be presented, and the IP for each group will be calculated and compared to identify the priorities for each group and the decisions for remedying the skills that require immediate attention.

### 9.3 Statistical Analysis

In this study, the target is mainly descriptive and therefore the statistical analysis will attempt to explore the current status by investigating the respondents' characteristics and also exploring any similarities and differences between their attitudes. It employs:

- descriptives techniques to present and analyse the participants’ profile
- statistical techniques to explore any differences among the participant groups
Differences among groups in social sciences are explored by using parametric and non-parametric statistical techniques. Parametric techniques are more powerful, but make strict assumptions about the population from which the sample has been drawn (i.e. normality of the data). Non-parametric techniques do not make such strict assumptions, but are considered less powerful, and so can be used with smaller samples or when the data collected is measured only at the ordinal (ranked) level (Pallant, 2007). Even though non-parametric techniques have less stringent assumptions (distribution-free tests), they “tend to be less sensitive than their more powerful parametric cousins, and may fail to detect differences between groups that actually exist” (Pallant, 2007, p. 210). Cramer (2003), Pallant, (2007) and Hair et al. (2007) argue that:

- T-tests are used when there are two groups (e.g. males/females) or two time points.
- Analysis of variance techniques are used when there are two or more groups or time points.
- Paired-samples or repeated measures techniques are used when the same people are tested on more than one occasion, or when we have matched pairs.
- Between-groups or independent-samples techniques are used when the subjects in each group are different people (or independent).
- One-way analysis of variance is used when there is only one independent variable (e.g. gender).

This study uses descriptive statistics for the research questions 1, 2, 4, 5, 6, 7, 8 and specifically it uses descriptive statistical tests per group of stakeholders (teachers, students, practitioners) to identify the ranking of the means of:

- Importance of skills
- Exhibited importance of skills
- Importance Indicator (IP)
- The Bologna Agreement opinions
- The curriculum design opinions
• The pressures to develop skills

Also the study employs Paired sample t-tests for each group of stakeholders to define the difference between the perceived importance of professional skills for accountants and their actual delivery through current accounting education programs.

One way ANOVA test is used in order to make comparisons between the three groups for the following:

• Comparison of Importance Ranking between the 3 groups
• Comparison of Exhibited Performance Ranking between the 3 groups

Additionally by using Paired sample t-tests for overall group (D) the study compares overall differences between importance and exhibited performance rankings.

In order to analyse the data statistically, the Statistical Package for Social Sciences (SPSS) 20.0 is used (Norusis, 2000). A summary of the statistical tests that the study employed per question for each group is summarised in the following table.
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<td>(Exhibited Performance of professional skills by students)</td>
<td>(Gap between importance and exhibited performance)</td>
<td>(Importance Indicator IP)</td>
<td>(Acceptance of Bologna Agreement)</td>
<td>(Proposals on Curriculum Design)</td>
<td>(Barriers to incorporate professional skills)</td>
<td>(Pressures to incorporate professional skills)</td>
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**STATISTICAL TEST**

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9.5 **Group A - Accounting Teachers**

**Profile Analysis**

The author conducted a detailed profile analysis of the participant groups as well as various descriptive tests. A summary of the teacher group’s profile and the descriptive statistics follows\(^\text{25}\). Of the sample, 68.9% were male and 31.1% female. The majority of teachers have 6-10 years’ *teaching experience* (34.4%), followed by, in order, the 11-15 years (19.7%), 21-25 years (18%), and 25 years and over (10%) groups. The highest percentage of participants are instructors on contract (31.1%) who hold non-tenure positions, followed by, in order, lecturers/ATEI instructors (19.7%), and assistant professors (14.8%). More than half of the sample has not participated in any teacher training and only one third answered this question positively. 5% of the sample has not attended any teacher training and believed that they did not need any. 20% of the sample has 7-9 years’ *professional accounting experience*, followed by, in order, the 4-6 years (18%), and over 15 years (18%) experience groups. 13% of the teachers do not have any professional accounting experience. 20% have teaching experience abroad and another 26% would like to have this experience. Regarding professional certification the highest percentage (42.6%) possesses a level A accounting licence (the highest level). The majority (54.1%) has the highest educational qualification (a PhD), followed by those with a Master’s degree (41%).

**Descriptive Statistics**

**Acceptance of Bologna Principles**

Teachers generally gave very high rating to all Bologna requirements which signals their positive attitude towards the Bologna Agreement. Furthermore they rated very high the “life-long learning” principle (mean 6.48 out of 7) whereas “teaching professional skills” comes fourth in their choice (mean 6.20). Mobility of teachers and students come second (6.36) and third (6.33) in importance for the teachers.

\(^{25}\) Detailed information and diagrams are included in Appendix 5
ECTS –Workload Measure
The study investigated accounting teachers on their opinions about how good measure the ECTS is for measuring workload. For the majority they believe that ECTS is a good measure of workload (67.2%). 18% of teachers had no opinion.

Awareness of Bologna Agreement
The study investigated whether accounting teachers were informed about Bologna Agreement. The majority of teachers were informed on the Bologna Agreement (68.9%). However 11.5% declared ignorance about Bologna Agreement.

Importance of Professional Skills
The study investigated the ranking of importance that accounting teachers assign to professional skills. Accounting teachers ranked first in importance the “ability to find knowledge from electronic sources”. Second skill in importance is “the use of relevant accounting software” and third is the comprehensive and global vision of the organisation. Fourth is the ability “to be aware of social and ethical responsibilities” and fifth is the ability to “organise workloads to meet coinciding deadlines”.

Exhibited Performance of Skills by the Students
The study investigated how accounting teachers perceive the exhibited performance of students on professional skills. Teachers believe that graduates have a very good knowledge “in the use of electronic information sources” followed by “the use of relevant accounting software” and in the third position they ranked the “ability to work with others in teams in harmony”. Fourth is the “use of visual aids in presentations” and “fifth is the commitment to life-long learning”.

The Skills’ Gap
This thesis conducted a paired samples t-test to find whether there is a gap between the importance assigned to professional skills and the exhibited performance of students. The results show there are significant statistical differences between the means of each pair (p<0.05). Although teachers in the sample agree that the most important skill for the accountant is the ability to have knowledge of information sources and the most exhibited
skill by the graduates is their knowledge of information sources there is a significant statistical difference in the means of each pair. The importance of each skill is statistically significant different from the possession of the corresponding skill by the student.

**Indicator of Priority**

In the previous analysis (section 9.2) the study introduced the concept of Indicator of Priority (IP). Indicator of Priority shows which professional skill needs immediate attention because it has a very low overall exhibited performance. All the importance means have been calculated in previous sections; all exhibited performance means and the mean of the means of importance and exhibited means. With these elements the study can proceed by calculating the Importance Indicator for accounting teachers. The results showed that the skills most in need of support within classrooms in Higher Education are:

1. To be aware of social and ethical responsibilities
2. To have a comprehensive and global vision of the organisation
3. To organise workloads to meet conflicting demands
4. To identify and solve unstructured problems
5. To organise workloads to meet coinciding deadlines

**9.6 Group B - BAA Students**

**Profile Analysis**

The split between men and women in the students' sample was 45% and 55% respectively. The student group consisted of undergraduate and postgraduate students studying for either a Masters in BA, a Master in Accounting and Finance or an International MBA. 79% were undergraduate students (610 students) and 21% were postgraduate students (164). The majority of them (62.7%) were in the 4th year of their studies (semesters 7, 8 or higher). Only 21% of them had finished an internship. A percentage of 40% had at least 1 year of working experience. Almost 50% have the intention to follow the AP. However a high percentage around 31% has not yet decided on a future career.
Descriptive Statistics

Acceptance of Bologna Principles

Students were asked to rank the acceptance of the Bologna Principles. Students generally gave very high rating to all requirements which signals their positive attitude towards the Bologna Agreement. They rated first the principle that “graduates should satisfy market requirements” whereas “teaching professional skills” comes fourth in their choice as teachers did. This means that they cannot correlate professional skills with employability. Mobility of students and competitive HEI come second and third in their choices.

ECTS – Workload Measure

Students were asked of their opinion on how a good measure the ECTS is for workload. The majority do not know whether ECTS is a good measure of workload. 62.8% did not have an opinion, 22.8% were positive and 13.7% were negative.

Awareness about Bologna Agreement

Students were asked whether they were informed about Bologna Agreement. The majority of students (60.3%) were not informed on the Bologna Agreement. 22.5% answered that they knew little about it.

Importance of Professional Skills for Students

Students were asked to rate the importance they assign to accounting professional skills. The ranking of means shows that for students the most important skill for accountants is “to use the electronic information sources”, the second most important is “the use of relevant accounting software” and the third most important skill is for accountants “to have a comprehensive and global vision of the organisation”. The fourth most important is to “have knowledge of the accounting profession (work areas, professional values)” and the fifth is the ability “to organise workloads to meet coinciding deadlines”.

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Perception of students on students' exhibited performance on skills

Students were asked to rate the exhibited performance of graduates on professional skills. Students believe that their most developed skill is the knowledge of information sources, their second most developed skill is the use of relevant accounting software while the third most developed skill is “the ability to work in teams in harmony”. Students’ views coincide on their first two views. The fourth most developed skill is “to listen effectively to gain information and to understand opposing points of view”. The fifth most developed skill is “the use of visual aids in presentations”.

The Skills’ Gap

A paired samples t test was conducted to identify statistically significant differences between the importance and the exhibited performance of skills by students. The statistical analysis shows that for all pairs p<0.000 which is p<0.05 so there is statistically significant differences between the importance and the exhibited performance of skills for students. Although students may have high skills on knowledge of information sources and use of relevant software they have not yet reached the level of importance of these skills by accountants. The larger gap is in the ability to “Identify and solve unstructured problems”, second larger is “Comprehensive and global vision of the organisation” and third larger gap is “Organise workloads to meet conflicting demands”.

Indicator of Priority IP

All the importance means have been calculated in previous sections, all exhibited performance means, and the mean of the means of importance and exhibited means. Based on this, it is now possible to calculate the accounting students’ Importance Indicator. Students assigned priorities to the development of skill P1: Identify and solve unstructured problems, T1: Organise workloads to meet conflicting demands and P3: Integrate multidisciplinary knowledge to solve problems. Skills P1 and P3 are better developed by the use of case studies, and experiential learning. Skill T1 is better developed through teamwork and continuous assessment throughout the semester than a final written exam at the end of semester. Fourth in priority is “the ability to find creative solutions” and fifth priority is “to have a comprehensive and global vision of the organisation”.

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9.7 **Group C - Accounting Professionals**

Profile Analysis

The split of accountants between men and women who participated in the study was 52.3% and 47.7% respectively. The mean age of participants was 33.8. 39.2% had finished a university Institution and 32.7% had finished a Higher Technological Educational Institution (ATEI). 8.8% had finished postgraduate studies in accounting. 70.5% were practicing tax accounting, 42% were financial accountants, 25.3% were practicing management accounting, and 13.6% were doing auditing. The men had around 10 years of experience and the women had around 8 years of experience. 40% of the sample were working as salaried accountants in private companies, 24% were owners of accounting office, 14.7% were working as salaried accountant in a tax/accounting company, and 7.3% were consultants in an auditing/consulting company. 23.8% owned the highest professional licence (type A). 4.2% had diploma in IFRS\(^{26}\).

**Descriptive Statistics**

**Acceptance of Bologna Principles**

The accountants were asked on how they accepted the principles of Bologna. The accountants gave high means which ranged from 5.50 to 6.41. the high rating signals their positive attitude towards the Bologna Agreement. They rated very high the principle that “the graduates should satisfy market requirements” (mean 6.41) whereas “teaching professional skills” came third in their choice (mean 6.15).

**ECTS – Workload Measure**

Accountants were asked on their opinion on how good measure the ECTS are for workload. In majority they do not know what ECTS represents (69.5%).

---

\(^{26}\) Detailed information is in Appendix 5.
Awareness about Bologna

Accountants were asked whether they were informed about Bologna Agreement. The majority of accountants were not informed on the Bologna Agreement (54.5%). 26% answered that they knew a little, and 19.3% were positive.

Business Advisors

Accountants were asked if and on which topic they were asked to act as business advisors for their employers. Accountants contribute in different areas and subjects. The highest rate of advice is on accounting and tax issues by 85.10%, on labour law issues by 59.9%, on internal auditing by 42.9%, on financing and investment issues by 37.1%, on strategic issues by 27% and corporate governance by 15.4%.

Management advice in reference to the type of employment

The percentage of management advices in reference to the type of their employment are: Salaried accountants in accounting office answered 15.4% no and 14.6% yes or sometimes. Owners of accounting companies answered 6.7% no and 26.9% yes or sometimes. Consultants in an auditing - consulting company answered 20.2% no and 5.3% yes or sometimes. Freelance accountant answered 5.8% no and 17% yes or sometimes. Salaried accountant in a private company answered 33.7% no and 41.5% yes or sometimes. Overall the accountants who own an accounting company and the salaried accountants in private companies are mostly asked for management advice.

Obstacles to the smooth and successful completion of accounting tasks

Accountants ranked the six reasons that mostly prevent them from the smooth and successful completion of their accounting tasks. They ranked first the lack of a stable tax environment (mean 5.96), second the complexity of laws (mean 5.89), third reason the Lack of ethics in the accounting profession (mean 4.21), fourth reason the relationship with the Public Tax Office (mean 3.19), fifth reason the education they received (mean 3.12) and sixth reason the general image of the society about the accounting profession (mean 2.85). Overall, it becomes clear that the education that the accountants receive is in accordance with the duties they are asked to perform.
Importance of Professional Skills by Accountants

Accountants were asked to rate the importance they assign to the professional skills. The most important skill for accountants is “to have knowledge of information sources”, the second most important is “the use relevant software” and the third most important is “the comprehensive and global vision of the organisation”. The fourth most important is the ability “to organise workloads to meet coinciding deadlines” and the fifth most important is “to be aware of their social and ethical responsibilities”. It is impressive to notice that all three groups have indicated as important the same group of skills.

Perception of accountants on students’ exhibited performance on skills

Accountants were asked how they perceive the exhibited performance of students on professional skills. Accountants believe that students’ highest skill is “their knowledge of information sources”, their second higher skill is “the use of relevant software” and their third higher skill is “the ability to work in teams in harmony”. The fourth is “to listen effectively to gain information and to understand opposing points of view” and the fifth is “to organise workloads to meet coinciding deadlines”. Again the first three rankings coincide absolutely with the choices of the other two groups (teachers and students).

The Skills’ Gap

A paired samples t-test was conducted to find whether there is a gap between the importance assigned to professional skills by the practitioners and the actual possession of skills by the graduates (or the actual delivery of skills through current accounting education programs). Results show that p<0.05 which means that there is statistically significant differences between the importance of skills and the possession of skills by the students, according to the accountants. It is also apparent that the gaps are higher in the student group than in the teacher group. Students anticipate higher gaps than teachers did and in much more skills than teachers did. First gap (2.580) is with “Social and ethical responsibilities” second larger gap is for the skill “organise workloads to meet conflicting demands (2.429)”, third larger gap is for the skill “Knowledge of the accounting profession (2.39)” fourth larger gap is for the skill “Identify and solve unstructured problems (2.330)” and fifth larger gap is for the skill “Find creative solutions (2.219)”.  

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Indicator of Priority – IP

The author has already calculated all the importance means in previous sections, all exhibited performance means, and the mean of the means of importance and exhibited means. With these elements she can proceed to calculate the Importance Indicator for accounting professionals. For accountants the skill which is most in need to support is O4: a comprehensive and global vision of the organisation. The second skill most in need skill to support is the social and ethical responsibilities and finally the third most in need skill to support in the classrooms is the ability to identify and resolve unstructured problems. The fourth most in need skill to support is to “organise workloads to meet conflicting demands” and the fifth most in need skill to support is “to have knowledge of the accounting profession (work areas, professional values)”.  

9.8 Overall Group D

9.8.1 Acceptance of Bologna Principles

The mean of overall sample in reference to the Bologna Principles was calculated at 6.05 which signify a high rate of acceptance. The first ranked principle was that “graduates should satisfy market requirements”. Students and accountants agreed with this ranking but teachers disagreed and ranked this principle fifth. Academics have as first priority the teaching of life-long learning. Overall sample ranked second the “life-long learning” principle with which the teachers agreed and the other two groups disagreed. The overall sample rated fourth the teaching of professional skills (mean 6.10) with which students and teachers agreed while accountants ranked this third. Mobility of students within European HEI was ranked third by the overall sample. Fourth principle was ranked the need to have competitive HEI, sixth was ranked the mobility of teachers and seventh was the comparable educational programs of European HEI\textsuperscript{27}.

\textsuperscript{27} Detailed table of comparisons can be found in the Appendix 5.
Listen effectively to gain information and understand opposing points of view.
Organise the workloads to recognise and meet tight, strict, and coinciding deadlines

Use relevant software (e.g. Databases, spreadsheets, word processors)

Use electronic information sources

Have a commitment to life-long learning

Ability to develop methods of effective learning

Be aware of their social and ethical responsibilities

Have a comprehensive and global vision of the organisation

Have knowledge of the accounting profession (work areas, professional values)

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<table>
<thead>
<tr>
<th></th>
<th>Analysis of Quantitative Data</th>
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<tbody>
<tr>
<td><img src="image.png" alt="Image" /></td>
<td><strong>Critically read written work, making judgements on their relevance and value</strong></td>
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<tr>
<td><img src="image.png" alt="Image" /></td>
<td><strong>Work with others in teams in harmony</strong></td>
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<td><img src="image.png" alt="Image" /></td>
<td><strong>Assume leadership positions when necessary</strong></td>
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<td><strong>Organise and delegate tasks</strong></td>
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<td><strong>Find creative solutions</strong></td>
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<td><img src="image.png" alt="Image" /></td>
<td><strong>Integrate multidisciplinary knowledge to solve problems</strong></td>
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<td><img src="image.png" alt="Image" /></td>
<td><strong>Organise the workloads to meet conflicting demands and unexpected requirements</strong></td>
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<tr>
<td><img src="image.png" alt="Image" /></td>
<td><strong>Organise the workloads to recognise and meet tight, strict, and coinciding deadlines</strong></td>
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206
1. Use relevant software (e.g. Databases, spreadsheets, word processors)  

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2. Use electronic information sources  

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3. Have a commitment to life-long learning  

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4. Ability to develop methods of effective learning  

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5. Be aware of their social and ethical responsibilities  

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6. Have a comprehensive and global vision of the organisation  

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7. Have knowledge of the accounting profession (work areas, professional values)  

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</table>

207
The three groups show that they agree over their ranking. Disagreements over the ranking may be due to each group’s self-efficacy, which is the ability to appreciate/measure objectively knowledge or opinions.

9.8.4 Differences between importance and exhibited performance

PAIRED-SAMPLES T-TEST

In order to find out whether there is a gap between the perceived importance of professional skills for accountants and their actual delivery through current accounting education programs, paired comparisons of the mean scores on each survey question were conducted with respect to the two dimensions of the respondents’ views. One dimension is their perception of the importance of skills for accountants and the second dimension is their assessment on the possession of the related skill by the student. Possession of skills by the students corresponds to the notion that the related skill was effectively and sufficiently provided by the present state of accounting education. The overall mean scores for the assessment of the present state of accounting education (exhibited performance) are substantially lower than the perceived importance. This result reveals that the present status of accounting education in reference to the professional skills considered important for accounting practitioners is in lower standards than it should be in order to satisfy market needs.

The author conducted paired t-tests and the results revealed that $p<0.05$ which means that there is statistical difference between the two dimensions (importance and delivery of skills).

The difference between the mean scores indicates the wide of the gap between the importance perception scores and the present-status assessment scores. The lowest differences in the means correspond to the computer skills (knowledge of information sources and use of software), teamwork and use of visual aids. The low differences represent the small gap between the importance and the exhibited performance of the skill or the delivery of the skill by the accounting teachers. Obviously here all stakeholders believe that accounting education has achieved its target between actual delivery and importance of the skill for the market. The same seems to apply for teamwork although
there are studies that prove the opposite. The highest gap between importance and delivery for the overall sample is in the skill “Have a comprehensive and global vision of the organisation (2.358)” second larger gap is about the skill “Be aware of their social and ethical responsibilities (2.288)” the third larger gap is for skill “organise the workloads to meet conflicting demands and unexpected requirements (2.221)” the fourth larger gap is for skill “Identify and solve unstructured problems”.

The author conducted paired samples T-test for the overall group to measure if the mean difference between the importance and the exhibited performance presents statistical significant differences. They revealed that there is significant difference between the importance and the exhibited performance for each pair of skills (Sig. value \( p =0.000<0.05 \)). The table with the results of the paired samples T-test is in Appendix 8.

<table>
<thead>
<tr>
<th>Paired Samples Test</th>
<th>Professional Skills</th>
<th>Paired Differences (Mean)</th>
<th>Std. Dev.</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C₁</td>
<td>Pair 1: Defend opinion verbally and in writing - Accountant – Defend opinion verbally and in writing - Graduate</td>
<td>1.869</td>
<td>1.396</td>
<td>.000</td>
</tr>
<tr>
<td>C₂</td>
<td>Pair 2: Visual Aids in Presentations - Accountant Visual Aids in Presentations - Graduate</td>
<td>.820</td>
<td>1.397</td>
<td>.000</td>
</tr>
<tr>
<td>C₃</td>
<td>Pair 3: Listen effectively - Accountant Listen effectively - Graduate</td>
<td>1.852</td>
<td>1.590</td>
<td>.000</td>
</tr>
<tr>
<td>C₄</td>
<td>Pair 4: Critical read - Accountant - Critical thinking - Graduate</td>
<td>1.951</td>
<td>1.687</td>
<td>.000</td>
</tr>
<tr>
<td>G1</td>
<td>Pair 5</td>
<td>Team work - Accountant - Team work - Graduate</td>
<td>1.410</td>
<td>1.575</td>
</tr>
<tr>
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</tr>
<tr>
<td>G2</td>
<td>Pair 6</td>
<td>Assume leadership - Accountant – Assume leadership - Graduate</td>
<td>1.770</td>
<td>1.564</td>
</tr>
<tr>
<td>G3</td>
<td>Pair 7</td>
<td>Organise and delegate tasks- Accountant - Organise and delegate tasks- Graduate</td>
<td>2.098</td>
<td>1.567</td>
</tr>
<tr>
<td>P1</td>
<td>Pair 8</td>
<td>Identify and solve unstructured problems- Accountant Identify and solve unstructured problems- Graduate</td>
<td>2.180</td>
<td>1.648</td>
</tr>
<tr>
<td>P2</td>
<td>Pair 9</td>
<td>Find creative solutions - Accountant – Find creative solutions - Graduate</td>
<td>1.885</td>
<td>1.714</td>
</tr>
<tr>
<td>P3</td>
<td>Pair 10</td>
<td>Integrate multidisciplinary knowledge to solve problems - Accountant – Integrate multidisciplinary knowledge to solve problems - Graduate</td>
<td>2.016</td>
<td>1.884</td>
</tr>
<tr>
<td>T1</td>
<td>Pair 11</td>
<td>Organise workloads to meet conflicting demands – Accountants Organise workloads to meet conflicting demands - Graduates</td>
<td>2.246</td>
<td>1.670</td>
</tr>
<tr>
<td>T2</td>
<td>Pair 12</td>
<td>Organise workloads to meet coinciding deadlines - Accountants Organise workloads to meet coinciding deadlines - Graduate</td>
<td>2.246</td>
<td>1.650</td>
</tr>
<tr>
<td>I1</td>
<td>Pair 13</td>
<td>Use relevant software - Accountant Use relevant software - Graduate</td>
<td>1.639</td>
<td>1.703</td>
</tr>
<tr>
<td>Pair</td>
<td>Knowledge of information sources – Accountant</td>
<td>Knowledge of information sources - Graduate</td>
<td>1.393</td>
<td>1.615</td>
</tr>
<tr>
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<td>---------------------------------------------</td>
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</tr>
<tr>
<td>12</td>
<td>Commitment to life-long learning - Accountant</td>
<td>Commitment to life-long learning - Graduate</td>
<td>1.770</td>
<td>1.736</td>
</tr>
<tr>
<td>01</td>
<td>Develop methods of effective learning - Accountant</td>
<td>Develop methods of effective learning - Graduate</td>
<td>1.852</td>
<td>1.569</td>
</tr>
<tr>
<td>02</td>
<td>Social and ethical responsibilities – Accountant</td>
<td>Social and ethical responsibilities - Graduate</td>
<td>2.393</td>
<td>1.891</td>
</tr>
<tr>
<td>03</td>
<td>Comprehensive and global vision of the organisation - Accountant</td>
<td>Comprehensive and global vision of the organisation - Graduate</td>
<td>2.361</td>
<td>1.723</td>
</tr>
<tr>
<td>04</td>
<td>Knowledge of the accounting profession – Accountant</td>
<td>Knowledge of the accounting profession - Graduate</td>
<td>2.180</td>
<td>1.638</td>
</tr>
</tbody>
</table>
Overall Importance and Exhibited Performance of Professional skills

Diagram 1: Difference between the Overall Importance and the Overall Exhibited Performance of Professional Skills in Greece

The author conducted paired samples T-test for the overall group to measure if the mean difference between the importance and the exhibited performance presents statistically significant differences (Diagram 1). The results reveal that there is significant difference between the importance and the exhibited performance for each pair of skills (Sig. value p = 0.000<0.05). The table with the results of the paired samples T-test is in Appendix 8.
### 9.8.5 Comparison of differences between importance and exhibited performance

**PAIRED-SAMPLES T-TEST**

Table 9-5: Comparison of importance perception and exhibited performance scores (present status)

<table>
<thead>
<tr>
<th>PROFESSIONAL SKILLS</th>
<th>OVERALL IMPORTANCE</th>
<th>OVERALL EXHIBITED</th>
<th>OVERALL (DIFFERENCE)</th>
<th>TEACHERS</th>
<th>STUDENTS</th>
<th>PRACTITIONERS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>A-B</td>
<td>IMP</td>
<td>EXHIB</td>
<td>IMP</td>
</tr>
<tr>
<td><strong>C1</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Present and defend points of view and outcomes of their own work, in writing to colleagues, clients, and superiors</td>
<td>6.00</td>
<td>4.16</td>
<td>1.845</td>
<td>6.20</td>
<td>4.33</td>
<td>6.07</td>
</tr>
<tr>
<td><strong>C2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use visual aids in presentations</td>
<td>5.45</td>
<td>4.37</td>
<td>1.081</td>
<td>5.67</td>
<td>4.85</td>
<td>5.84</td>
</tr>
<tr>
<td><strong>C3</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Listen effectively to gain information and to understand opposing points of view</td>
<td>6.34</td>
<td>4.61</td>
<td>1.727</td>
<td>6.36</td>
<td>4.51</td>
<td>6.28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.34</td>
<td>4.38</td>
<td>1.965</td>
<td>6.51</td>
<td>4.56</td>
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<tr>
<td>C&lt;sub&gt;4&lt;/sub&gt;</td>
<td>Critically read written work, making judgements on their relevance and value</td>
<td>6.25</td>
<td>4.89</td>
<td>1.362</td>
<td>6.31</td>
<td>4.90</td>
</tr>
<tr>
<td>G&lt;sub&gt;1&lt;/sub&gt;</td>
<td>Work with others in teams in harmony</td>
<td>6.18</td>
<td>4.25</td>
<td>1.930</td>
<td>6.15</td>
<td>4.38</td>
</tr>
<tr>
<td>G&lt;sub&gt;2&lt;/sub&gt;</td>
<td>Organise and delegate tasks</td>
<td>6.26</td>
<td>4.27</td>
<td>1.987</td>
<td>6.41</td>
<td>4.31</td>
</tr>
<tr>
<td>G&lt;sub&gt;3&lt;/sub&gt;</td>
<td>Assume leadership positions when necessary</td>
<td>6.03</td>
<td>3.85</td>
<td>2.179</td>
<td>6.30</td>
<td>4.11</td>
</tr>
<tr>
<td>P&lt;sub&gt;1&lt;/sub&gt;</td>
<td>Identify and solve unstructured problems</td>
<td>6.23</td>
<td>4.15</td>
<td>2.085</td>
<td>6.15</td>
<td>4.26</td>
</tr>
<tr>
<td>P&lt;sub&gt;2&lt;/sub&gt;</td>
<td>Find creative solutions</td>
<td>5.88</td>
<td>3.87</td>
<td>2.013</td>
<td>6.08</td>
<td>4.07</td>
</tr>
<tr>
<td>P&lt;sub&gt;3&lt;/sub&gt;</td>
<td>Integrate multidisciplinary knowledge to solve problems</td>
<td>6.32</td>
<td>4.10</td>
<td>2.221</td>
<td>6.38</td>
<td>4.13</td>
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<tr>
<td>T&lt;sub&gt;1&lt;/sub&gt;</td>
<td>Organise the workloads to meet conflicting demands and unexpected requirements</td>
<td>6.51</td>
<td>4.48</td>
<td>2.039</td>
<td>6.54</td>
<td>4.30</td>
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<tr>
<td>I&lt;sub&gt;1&lt;/sub&gt;</td>
<td>Use relevant software (e.g. Databases, spreadsheets, word processors)</td>
<td>6.68</td>
<td>5.06</td>
<td>1.623</td>
<td>6.67</td>
<td>5.03</td>
</tr>
<tr>
<td>I&lt;sub&gt;2&lt;/sub&gt;</td>
<td>Use electronic information sources</td>
<td>6.73</td>
<td>5.27</td>
<td>1.467</td>
<td>6.74</td>
<td>5.34</td>
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<tr>
<td>$O_1$</td>
<td>Have a commitment to life-long learning</td>
<td>6.29</td>
<td>4.37</td>
<td>1.925</td>
<td>6.43</td>
<td>4.66</td>
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</tr>
<tr>
<td>$O_2$</td>
<td>Ability to develop methods of effective learning</td>
<td>6.09</td>
<td>4.27</td>
<td>1.822</td>
<td>6.26</td>
<td>4.41</td>
</tr>
<tr>
<td>$O_3$</td>
<td>Be aware of their social and ethical responsibilities</td>
<td>6.46</td>
<td>4.18</td>
<td><strong>2.288</strong></td>
<td>6.66</td>
<td>4.26</td>
</tr>
<tr>
<td>$O_4$</td>
<td>Have a comprehensive and global vision of the organisation</td>
<td>6.62</td>
<td>4.27</td>
<td><strong>2.358</strong></td>
<td>6.67</td>
<td>4.31</td>
</tr>
<tr>
<td>$O_5$</td>
<td>Have knowledge of the accounting profession (work areas, professional values)</td>
<td>6.39</td>
<td>4.22</td>
<td>2.178</td>
<td>6.49</td>
<td>4.31</td>
</tr>
</tbody>
</table>
Overall IP for Professional Skills

Diagram 2: Overall Importance Priority for Professional Skills
9.9  **Strategic Maps**

In the previous analysis, two different attributes for each skill (importance and exhibited performance) were combined into one indicator, the IP. An alternative tool for integrating the analysis of two attributes into one item is the strategic map, which is a graphical tool (a scatter graph) used in quality projects to prioritize actions, thereby directing attention to those items that combine a high importance and a low performance level (Smialer, 1995; Walker, 1997). Each attribute can be represented on a strategic map, where the scores for the exhibited performance of the skill are represented on the horizontal axis and the importance scores on the vertical one. Two cutting lines that cross a central point of the scale split the map into 4 areas (figure 1).

![Strategic Map Diagram]

**Figure 9-1: Strategic map**
The attributes or skills in Area 1 are those with high importance but low performance level scores. Area 1 is the high priority zone in terms of our attention as accounting educators. Area 2 (high importance and high performance) and area 3 (low importance and low performance) are zones with lower priority. Teachers could act on these skills if all priorities in area 1 were satisfied or if some skills were moved to area 1. The items in area 4 are characterized by low importance and the performance level is high so they do not need our attention. Educators could even consider moving resources from area 4 to other areas.

9.9.1 Strategic Map for Accounting Teachers (Figure 9-2)

Skills that combine the highest importance and the lowest exhibited performance are:

Assume leadership positions when necessary, be aware of social and ethical responsibilities, have knowledge of the accounting profession (work areas, professional values), Have a comprehensive and global vision of the organisation, Organise the workloads to meet conflicting demands and unexpected requirements, organise the workloads to recognise and meet tight, strict, and coinciding deadlines, Identify and solve unstructured problems, Present and defend points of view and outcomes of their own work, in writing, to colleagues, clients, and superiors, Ability to develop methods of effective learning, Listen effectively to gain information and to understand opposing points of view, Have a commitment to life-long learning, Critically read written work, making judgements on their relevance and value, Have a commitment to life-long learning.

Skills that combine high importance and high performance are:

Use relevant software (e.g. Databases, spreadsheets, word processors), Use electronic information sources, Present and defend points of view and outcomes of their own work, in writing, to colleagues, clients, and superiors

Skills that combine low importance and low performance are:

Find creative solutions, Integrate multidisciplinary knowledge to solve problems, Organise and delegate tasks

The skill that combines high performance and low importance is: Use visual aids in presentations.
Figure 9-2: Strategic Map for Accounting Educators

9.9.2 9.8.2 Strategic Map for BAA Students (Figure 9-3)

Skills that combine the highest importance and the lowest exhibited performance are:

Be aware of their social and ethical responsibilities, critically read written work, making judgements on their relevance and value, Have knowledge of the accounting profession, Have a comprehensive and global vision of the organization, Organise the workloads to recognise and meet tight, strict, and coinciding deadlines.

Skills that combine high importance and high performance are:

Use relevant software, Use electronic information sources, Listen effectively to gain information and to understand opposing points of view.

Skills that combine low importance and low performance are the following:

Integrate multidisciplinary knowledge to solve problems, Identify and solve unstructured problems, Ability to develop methods of effective learning, Present and defend points of
view and outcomes of their own work, in writing, to colleagues, clients, and superiors, Organise and delegate tasks, Have a commitment to life-long learning, Assume leadership positions when necessary, Organise the workloads to meet conflicting demands and unexpected requirements, Find creative solutions

*Skills that combine high performance and low importance are:*

Use visual aids in presentations, Work with others in teams in harmony

![Figure 9-3: Strategic Map for BAA Students](image)
9.9.3  *Strategic Map for Accounting Practitioners (Figure 9-4)*

*Skills that combine the highest importance and the lowest exhibited performance are:*  
Awareness of social and ethical responsibilities, Have knowledge of the accounting profession, Have a comprehensive and global vision of the organization, Organize the workloads to meet conflicting demands and unexpected requirements, Organise and delegate tasks, Assume leadership positions when necessary, Find creative solutions, Identify and solve unstructured problems, Ability to develop methods of effective learning, Listen effectively to gain information and to understand opposing points of view, Have a commitment to life-long learning, Organise the workloads to recognise and meet tight, strict, and coinciding deadlines.

*Skills that combine high importance and high performance are the following:*  
Use relevant software, Use electronic information sources, Work with others in team with harmony, Listen effectively to gain information and to understand opposing points of view

*Skills that combine low importance and low performance are the following:*  
Use visual aids in presentations, Present and defend points of view and outcomes of their own work, in writing, to colleagues, clients, and superiors but marginally close to area 1 (high importance, low performance), Integrate multidisciplinary knowledge to solve problems.

*The skill that combines high performance and low importance*  
There is no skill with these characteristics according to accountants.
Figure 9-4: Strategic Map for Accounting Practitioners

In the figures below, an overview of the three strategic maps is presented, revealing the areas where the majority of skills lie for each group. Clearly, for the teachers and accountants, the majority of skills are concentrated in Area 1 where there is High Importance and Low Performance, and so these require the most attention. For the student group, the majority of skills are shifted towards the centre of the rectangle and Area 3. For the students, many skills are of low to medium importance and performance, respectively. It is important to consider that the students were asked to evaluate themselves and their colleagues and so the results arise from their own self-efficacy rating. Additionally, it should be remembered that “skills discussion” is a relatively new, little understood concept.
Chapter 9

Analysis of Quantitative Data

Teach**ers**

![Chart showing data for Teachers]

**Students**

![Chart showing data for Students]

**Accountants**

![Chart showing data for Accountants]
Chapter 9  Analysis of Quantitative Data

Bar 7 - Reluctance of lecturers to change teaching methods

Bar 8 - High proportion of teachers on short-term contract

Bar 9 - Lack of educational development training for accounting teaching staff

Bar 10 - High quality teaching is not rewarded as it should be

Bar 11 - Absence of fees may lead students to lose their interest

Bar 12 - High teaching loads of lecturers

Bar 13 - Teachers not informed on Bologna requirements about skills

Bar 14 - Lack of relevant practical accounting experience of lecturers

Bar 15 - Consequences on the teaching quality due to other personal remunerative activities outside university

Bar 16 - Traditional methods of assessment and examination (lack of ability to simulate real world situations)

Bar 17 - The "specific" way that students' political organisations function

Bar 18 - Resistance and inertia of the students to changes in teaching methods

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Press 6 - Collaboration of Economic Chamber and accounting teachers

Press 7 - Approval by the Ministry of Education of a 4-year financial budget program in order to fund HEI

Press 8 - Evaluation of teachers and HEI

Press 9 - Assessment system should be continuous and include case studies, presentations, written reports, etc

Press 10 - External check of sample tests and assessments

Press 11 - Teaching awards as motivation to accounting teachers

Press 13 - Accounting students are passive listeners

Press 14 - Academic Level of Private Business Schools and Colleges

Press 15 - Private Business Schools and market place requirements

Press 16 - Private Business Schools and students' immigration

Press 17 - Convergence of Greek and European HEI

Press 18 - Studying in European University

Press 19 - Studying in Private Business School

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9.13 Chapter Summary

This chapter employed statistical analysis to answer the research sub-questions at the individual level. For each group (teachers, students and accountants), the thesis provided a detailed profile analysis. Then, descriptive tests were run and results obtained about the Bologna Acceptance, the opinions about professional skills, and the barriers and pressures regarding the development of these skills. The study used paired sample t-Tests to calculate the differences between the importance and exhibited performance rankings for each group. Paired samples t-tests and ANOVA tests were used to find variations between the overall importance and overall exhibited performance ranking as well as to compare the importance and performance rankings of the three groups. An alternative graphic tool was used, the scatter graph, to design the strategic maps in order to visualize the priorities for skill development within the curriculum.
CHAPTER 10  Qualitative Analysis

10.1  Introduction

This chapter presents the interviews analysis that aimed to explore further the stakeholders’ views. After this introduction, Section 10.2 discusses the interviewees’ background information, the sampling techniques and other verification issues. Section 10.3 focuses on the acceptance of the Bologna Agreement and its principles in Greece. Sections 10.4 and 10.5 present the stakeholders’ opinions on the importance of professional skills for accountants and graduates’ exhibited performance of professional skills, respectively, while Section 10.6 investigates the gap between graduates’ actual and expected level of professional skills. Section 10.7 analyses the stakeholders’ opinions about the best way to introduce skills into the accounting curriculum, while Section 10.8 explores the barriers to this. Section 10.9 analyses the driving forces behind the introduction of skills in HEI accounting courses, and Section 10.10 summarises the chapter.

10.2  Background information and procedures

The quantitative analysis enabled an investigation of the research sub-questions 4-10. Qualitative research using the interview method will provide further insights and deepen our understanding of the issues raised. Saunders et al. (2007, p. 313) suggest that, in an exploratory study, conducting non-standardised (semi-structured and in-depth) interviews can help researchers to “find out what is happening and to seek new insights”. Qualitative data can be used not only to reveal and understand the “what” and the “how” but also to place more emphasis on exploring the “why”. 13 semi-structured interviews were conducted and manually analysed. These will now be discussed. Semi-structured interviews were selected because they can provide researchers with higher level of independence to ask more complex and in-depth questions and to observe important issues related to the topic
under investigation (Bryman, 2001; Creswell, 2003). The questions used in semi-structured interviews are more general and allow researchers to ask different types of questions and collect comparable information from respondents who might feel free to provide wider information (Denzin and Lincoln, 1998c).

10.2.1 Sampling

The sampling of the participants was purposive. Sampling in qualitative research as Silverman (2006) states is neither statistical nor purely personal; it is or should be theoretically grounded. Purposive sampling is about “the wider universe of social explanations in relation to which you have constructed your research questions” (Mason, 1996, p. 85). This type of sampling makes choices more sensible and meaningful than others which can represent a wider population. The researcher decides on purposive choice of a sample of particular type, category, or example which is relevant to or appears within the wider universe (Silverman, 2006). The teachers were chosen from the pool of teachers who volunteered during previous quantitative phase two to participate in the interviews. Among the teachers who volunteered purposeful sampling was used from people who represent the different type of HEI (Universities and Technological Institutions), the capital and the periphery (Athens area and Central Greece), the staff hierarchy (tenured, not tenured, Assistants, Associates and Professors), and the departments (BAA departments). The teachers were in total six persons; Maria and Nikos who teach at ATEI as tenured staff, George and Konstantinos teach at University, all in the Athens area. Vasilis teaches at a rural University as tenured teacher. Andreas is a teacher on contract at both the Athens area and occasionally at the periphery working both in ATEI and University. Accountants were selected from the pool of accountants who volunteered from previous quantitative phase two. These persons have very rich experience at their fields; Despoina with twenty years experience in SME and micro companies, Filippos who works in a multinational as management accountant, Stavros who is an auditor and Vicky who works in a public tax office with experience from a Big4 company. Argyris is a market expert because he is an accountant and executive officer in a company that develops and sells software programs for accountants. His company also provides professional training programs who lead to internationally recognised accounting certificates. Two students were selected, with the
same method, one from University accounting department and one from ATEI BA
department. Konstantinos has finished a 6-month work placement in the financial
department of a large company and Diana has finished a 4-month placement in a public tax
office.

 Verification issues

Kvale (1996) suggests that issues of verification of a study should not be limited to some
separate stage but should be addressed throughout the entire research process. Reliability
and validity are two conceptual issues that are pertinent both to the quantitative and the
qualitative research.

10.2.2 Reliability

Reliability pertains to the consistency of the research findings. Reliability concerns whether
alternative researchers would reach similar results (Easterby-Smith et al., 2002). The lack of
standardisation in interviews may lead to concerns about reliability. Bias problems can also
affect a study’s reliability. There are various types of bias to consider. Interviewer reliability
concerns the leading questions which may inadvertently influence the answers. It is also
possible that the research shows interpretation bias. Related concept is the response bias.
This may appear either when the interviewee does not trust the interviewer or when an
unexplored topic would lead to intruding on sensitive information that the participant does
not wish or is not empowered to provide. The participant may give a partial picture or may
cast himself in a “socially desirable” role (Saunders et al., 2007). In order to deal with the
interviewer bias an interview guide was prepared for each group. It was separated into four
main parts within which the interviewee had the freedom to answer. Most questions were
open-ended that according to Easterby-Smith et al. (2002) should help to avoid bias and
would allow the interviewee to pursue other issues and to introduce new material as deemed
appropriate with the subject. This type of questions also provides plenty of freedom for the
respondents to organise and unfold their opinions. Probing questions were used to further
clarify possible confusions. Appropriate behaviour by the researcher was undertaken in
order to eliminate bias like gestures, comments, and projections of her personal views
(Robson, 2002). A neutral tone of voice was used as much as possible and reasonable time

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was given to respondents to develop their answers. The interviews were tape-recorded in order to avoid misunderstandings and misinterpretations of the responses. Tape-recording provides an accurate and unbiased record of data and gives the opportunity to use direct quotes from the participant phrases.

10.2.3 Validity

Kvale (1996, p. 244) states that “the complexities of validating qualitative research need not be due to an inherent weakness in qualitative methods, but may on the contrary rest on their extraordinary power to picture and to question the complexity of the social reality investigated”. The emphasis on validation for Kvale should move from inspection at the end of the production line to quality control throughout the stages of knowledge production (thematizing, designing, interviewing, transcribing, analyzing, validating, and reporting). On the interviewing process validity “pertains to the trustworthiness of the subject’s reports and the quality of the interview itself, which should include a careful questioning as to the meaning of what is said and a continual checking of the information obtained as a validation in situ”. Regarding the analyzing process the validity claim has to do with whether the questions put to an interview text are valid and whether the logic of the interpretations is sound” (Kvale, 1996, p. 237). To ensure validity of the present study the researcher processed the data and double-checked a part of the material (around 20%) analysed about consistency on coding themes with a second researcher. Furthermore the processed data were sent back to the interviewees in order to verify that the researcher had accurately and precisely interpreted and presented their beliefs and opinions.

The analysis was done by hand and comprised 351 pages of transcribed data. The time, place and duration of the interview were agreed prior to the meeting to be of convenience to the participants and largely were done at their places. The duration of the interviews was between one and two hours. In the first five minutes of the interview meeting the researcher informed again the participants on the scope of the investigation project and reassured them on the confidentiality and anonymity of the data discussed. The interviewer confirmed with them the use of the tape-recorder again and presented the questions by giving the participants complete freedom and time to express their views and flexibility to uncover any hidden dimensions on the subjects under discussion.

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10.2.4 Interview Design

The interviews were designed by consulting several sources, like the literature review, the theoretical framework as well as the findings from phases one and two of the present study. The interview questions were reviewed and discussed with academics and accountants in Greece. The intention of the interviews was to allow the uncovering of new factors or emergence of new explanations and new reasoning about the related issues and relationships. The interview guide was divided into four main parts as follows:

Part One: The need to connect accounting education with market requirements. Participants’ views about the introduction of professional skills in Greek HEIs.

Part Two: Obstacles and endogenous weaknesses related to the introduction of professional skills.

Part Three: Driving forces towards the introduction of professional skills.

Part Four: Attitude and responses of the HEIs towards the reforms.28

10.2.5 Interview Analysis

A common feature of most qualitative data analysis strategies involves organising the mass of qualitative data collected into meaningful and related parts or categories (Miles and Huberman, 1994). The activity of organising the data enables researchers to transform data into a format that makes them easier to comprehend and manage, integrate related data drawn from different transcripts and notes, identify key themes or patterns from them for further exploration, and to draw and verify conclusions. The procedure includes the following activities; categorisation, “unitising” data, recognising relationships, developing categories, and developing and testing theories to reach conclusions (Saunders et al., 2007).

The previous activities were undertaken in order to place the data collected into meaningful categories. In order to proceed to the categorisation process, firstly, we read the interviews to get an overall picture, then read each one again more carefully, seeking to distinguish

28 For a full interview guide, containing the questions, see Appendix 4.
explicit notions or concepts discussed by the interviewees. Through rereading the material, it became possible to identify those parts which were unrelated to our issue. Then the data were read yet again accompanied by labelling the paragraphs, phrases or sentences with the appropriate category (open coding). A matrix was drawn up with a number of columns corresponding to the number of participants in each group. In one column, all of the common themes (categories) identified in the transcripts were listed, then in the next column stated which person referred to this concept and where (for example: George, page 24, paragraph 3, line 17). This analytic process helped to reduce and rearrange the data into a more manageable and comprehensible form. While designing this matrix and placing the data within the cells, the categories were repeatedly integrated or subdivided (Yin, 2003), which led to the creation of larger categories under which were included the most common or relevant themes and concepts. The whole process of categorisation was guided by the research purpose, as expressed through the research question and sub-questions.

The processing of the qualitative data for each group revealed broad categories of interest. The analysis of the teachers’ data produced the following seven thematic categories; the Bologna Agreement, educational system and skills, obstacles to skills introduction, pressures to introduce skills, market characteristics, the New Frame Law 4009/11 and Private HE. The accountants’ interviews revealed five broad categories: practitioners’ professional problems, the political system and economy, education and skills, the present crisis, and good practices and experience from abroad. The students’ data analysis revealed the following categories; problems with the educational system, the teachers’ responsibilities, the introduction of skills, private HEIs, students’ immigration and the current crisis. The above categories were re-organised and re-categorised in relation to our sub-questions. A careful reading of the data led to our interpretation of the participants’ views about each element. In the following, only a summary of the passages is presented due to space limitations.29

29For the full interview analysis, see Appendix 4.
10.3 **Acceptance of Bologna Principles and EU recommendations**

Overall attitude towards the Bologna Principles has proven positive by the quantitative results. This was confirmed also in the qualitative part of the research since most interviewees were positive to the Bologna and EU initiatives. Teachers not only look at the Bologna Process as important to reach European unification but also as a means to improve the educational process within Greece (Bologna is used as an excuse to make internal reforms):

"Definitely I agree, I believe that Bologna is in the right framework, the right direction to improve education at Greece".

Teachers notice that there are objections to the Bologna Process among academic community which are directly related to the educational debate that has started many years ago; education for employment or education for knowledge acquisition:

"Some teachers are against Bologna concept and this is a big thing in Universities ...for some teachers University knowledge should be totally theoretical, while on the contrary, professional skills, is more technical knowledge, and should not be provided by Universities".

10.4 **Importance of Professional Skills**

Teachers generally agreed with the introduction of professional skills in the curriculum of Higher Education:

"We do not live in a world with unlimited resources where we can satisfy all our wishes... and education is expensive... certainly it aims to develop and widen culture to citizens but at the same time it aims to more materialistic targets, to educate people to succeed in the professional field".

Other teachers were not really sure what is included or what is meant by skills:

"Visual aids are useful and some people use them, I use them, and I anticipate them as useful technical tools. I wonder, as a skill, how can we see it besides a technical
tool that supports...ehhh... the teaching of the course? How can we see it behind that ...as a skill provided to students, how we can see it?”

Some of them thought that professional skills were limited to the computer skills and specifically the knowledge of a relevant software and introduction of accounting data in it. So they justifiably saw a risk at this point:

“I agree that skills should be introduced in a more structured system. However there is a risk at this point, a problem. For example, in accounting, what does this mean acquire skills? ... that is, I learn a software package and press the buttons F1, F2, to ask for the trial balance, do this, do that, what is this?...The risk that I refer to is that it is easy to escape from theoretical knowledge and go only towards the practical direction, and this is dangerous, ... so that the student does not understand what he is doing”.

Accountants

Accountants sound more decisive and confident about the importance of skills for the profession and they seem to know well what they talk about. They talk about a wide education in business and further specialisation in a master’s degree:

“Looking back at my studies and at my business experience...I believe there should not be separate branch the accountants with the economists or BA students, these branches should be unified. What I mean is that they should have common departure at their studies. Undergraduate studies should be common and after that those who want to follow accounting should take a specialization either at the last year of studies or in a master’s degree.

A management accountant will need to have equally developed scientific knowledge, working experience and professional skills

“...in my job (management accountant) I would say that an accountant will need to have 1/3 scientific or technical knowledge, 1/3 working experience and 1/3 personal and professional skills...there should be a balance between the three
prerequisites...if you have two of them you are good, if you have the three of them you are very good”.

10.5 Exhibited Performance of Graduates

Teachers

According to interviewees graduates are lower than medium at the scale of skills possession. They emphasise that students are provided only with technical knowledge, they do not solve unstructured problems and do not receive broad spectrum of knowledge that would support them in participating at decision making:

“We prepare good accountants to sign the financial statements, the programs, to know the laws, the tax issues...ehhh...to do well all the accounting postings but we do not teach them how to be supporters at decision making, that is the courses...maybe because they give too much emphasis at the technical training but I have the feeling that there is a lack towards other tools and skills which...ehhh...would help accountant to function as a business advisor”.

Accountants

Professional skills are not covered by the education although accountants need them fifty-fifty with their technical knowledge:

“...nobody teaches you as accountant how to become professional, there are no relevant courses, I do not know why this part is not covered by the education, not at all,...accountant himself should try to acquire some managerial skills because he needs them...and he needs them fifty-fifty to his technical competences and knowledge”.

Students

According to the students the graduates are at a medium level on skills possession and at very good level on technical aspects:

“[...] medium possession...with regards to skills. Their technical level is very good. I believe that graduates from ATEI are better from University at the technical level.
10.6  Actual versus Expected Performance

Teachers

The gap between the importance assigned to skills development and the performance of students signifies a missing link in the educational chain. Teachers provided the reasons for this gap and how the efforts to cover the gap are mainly personal and sporadic. Big size classes are an obstacle to this effort:

“In our university here, we have started to introduce specific courses that aim to the development of personal skills or to introduce at management courses to have... an important part of this material of the total teaching hours. Beyond this, we can say that even in more technical courses, informally...some colleagues have included this...as part of students’ activities, either to present a work study or write a work study or both write and present it... Personally at my course, analysis of financial statements, which is taught at the 4th year, students cannot make presentations because I have 300 students, it is impossible to do it”.

Accountants

It takes time to newcomers to feel comfortable and confident when they enter a company because they miss the professional skills:

“University graduates have not developed communication skills, it takes them at least two years of practice within a company before they start to ...breathe and feel comfortable. This is due to the fact that they... have not been taught...ehhh...if they were taught...apart from technical accounting...on how to present your work, which part should give priority and emphasis, how to classify, how to highlight the important...I think this would be very useful and would be faster...and their opinion would have greater acceptance”.

10.7  Accounting Curriculum

Teachers
Interviews analysis showed that teachers agreed with the teaching simultaneously with the technical-accounting knowledge however they did not agree with the integration into all subject areas. Almost all of them agreed that there should be a separate course to teach skills preferably at the early semesters. Teachers could eventually use the skills development as proper foundations for their courses at a later semester:

"There should be one course dedicated to skills, so that students can realize the importance of this subject... then the rest of the teachers will realize and understand its importance ...and having ensured the foundations, the knowledge background, then the teachers of other courses can make the proper connections of their course to skills..."

**Accountants**

Through teaching skills the students will understand and digest much better their material and the context that this will be used, so their studies will acquire meaning for them. Therefore learning is improved through teaching skills.

"I believe that teaching skills will help students to understand and digest their material much better... students attend several courses and do not understand why or in which context they will need to use this material... you as teachers need to explain why they follow the specific courses..."

**Students**

Students believe that the teaching of technical and professional skills should be done simultaneously.

"These can be done at the same time, that is to show how to develop a balance sheet and further how to present it, is easy is not something difficult to do".

**10.8 Barriers to Skills Development**

Barriers were identified as coming from the system, the teachers and the students. Weaknesses from the system include a wide range of sources like the top and middle management of HEI, the policies, the political activities, the state etc.
10.8.1 Barriers from the system

a) Lack of Communication

Teachers

Teachers talk about the communication problems within HEIs. There is lack of information dissemination about skills development and learning outcomes. It became obvious from the participants that the teachers have not connected ECTS with learning outcomes. Also teachers say that they have not been informed on the laws and their reference to skills development, or that they ignored the connection between ECTS, skills development and learning outcomes. ECTS were introduced rather as a technical calculation “imposed” by the top management for a vague unknown reason:

“I am not aware of the law about introducing skills alongside with ECTS...I do not know how teachers are informed in other countries but here there is a gap on information about changes on education. I know about credit units... all the rest you talk about...ehhh... has never happened any conference or meeting in our department about the issues you are referring to... “.

Students

The students provide their reasoning for the lack of communication about Erasmus, Bologna etc:

“I think that simply HE have not given any attention to this, although it is important, I simply think that they only care about what they give us within the schools and they do not care about what we will do after we finish. They do not care what we do after we finish our studies,...ehhh I do not know if there are any other reasons”

b) Lack of Explicit Policy

Teachers

Teachers emphasise the lack of a systematic and explicit policy that would inform and would support the development of skills. If there is no a master plan with institutionalised procedures then the information stays within closed drawers. This issue was mentioned at least at eleven different instances during discussions with teachers:
“...it is possible that some members of management are aware of them...so it is something that there was not a clear policy and...we can say regarding the application of these was not given through a definite direction... that is somehow to force you to do it, to ask you, to put it as an unambiguous target”.

Students’ views

The students emphasise the optional character of the projects that would develop personal skills of the students. If the project work was obligatory would be better for students.

“I think there should be a combination; I believe that students develop some skills up to a point. Further this depends on the students also. All the project work that I undertook during my studies were optional, I chose to do them...ehhh If they were mandatory would be better, but what it concerns myself... I asked for projects and the teachers were giving me, I did them... and I liked them”.

c) Lack of Planning, Support and Coordinated Efforts – Personal efforts cannot make the difference

Teachers

Teachers refer to the Bologna experts who in most Institutions did not respond to their duties as expected. Teachers either ignored their existence or had never received any information from them:

“These Bologna Experts at the institutional level I have never heard of or never met them”.

Accountants

“I believe in our country we have problem with the judiciary and the educational section not the teachers but higher management within institutions. As an idea, I would find it good to have external members within the management board because I consider positive the idea to connect university...with the outside world”.

Students
Students believe that there should be a coordinated effort and not individual efforts which are not effective:

"[...] one teacher cannot make the difference in a whole Institution; this is the effect of total cooperation. It is certainly good thing that there are efforts but these are not enough. Perhaps there are teachers who make efforts to change, but this is not enough if it is not done simultaneously to all departments".

d) Lack of Motivation – Promotion criteria

Teachers

Teachers insist that in order to apply reforms there should be either motives established (extra rewards) or strict obligations to follow. Since there are no motivations from the system like promotion criteria or some kind of other (financial) rewards the teachers find it normal not to act, not to take initiative and to keep the status quo:

"To do something should either be obliged to do it or to have motivation, here nothing of the two is happening. That is, there is no extra reward".

e) Impunity

Teachers

Impunity, lack of control and sanction system have been some of the most important barriers for reforms since teachers referred to these at least in 25 instances during the interviews. They notice impunity in every case: there are no sanctions if a teacher or administrative employee performs badly and there are no consequences if a person does not perform his duties at all.

The overall tendency to ignore the laws is identified as the reason that skills have not been incorporated in Higher Institutions in Greece:

"One of the reasons that skills have not been incorporated in Higher Institutions is that in Greece several laws are voted but not applied. It is not only the issue that we discuss now but in general issues about education are not applied although the parliament has voted for them".
Accountants

Accountants express the same views as teachers did about the lack of controls and sanctions, the fact that laws are not applied:

"Pressures cannot penetrate the universities, fortresses...fortresses the HEIs are fortresses, therefore ...I consider the academics as state within a state, they decide and they give their orders, there is no...I believe there is no supervision from anywhere. Either for past acts, or...in substance there is no supervision”.

f) The political system

Accountants

The political system and the lack of ethics have affected the economy and the accounting profession. Computerization has helped to reduce cases of special favours and agreements “under the table” between accountants and tax office employees.

These kinds of transactions “under the table” became the rule of the game and were created by a group of public servants. Political parties were again hiding behind these attitudes.

“Due to overregulation and the multilayered procedures there are opportunities for hiding profits and saving taxes in small companies. Personal relationships of the accountant with the public servants can have a role in this”

g) Imported Institutions – Distorted practices

Teachers

There were many instances in the past that the nation has imported institutions which were successfully implemented abroad. These were imported in the country with the hope to alter the status quo and improve local conditions. However this has not been a successful practice in most of the times. Teachers argue that the local “system” will “absorb” or “distort” any practices and efforts which are not in line with the established local interests. The imported practices end up violated and distorted and consequently it looks appalling to the people who may resist them forcefully.:
“In Greece we manage to pillory every ...every institution, anything...we introduce institutions from abroad... and we mangle them, we rape them at the worst degree, consequently there is an impression that...whatever change is coming...is done for bad. While it should be the opposite exactly, we should ourselves ask for change, but when you are supposed to establish something good and you do it in the wrong way and for wrong purposes, it is reasonable that people resist...”

Students

“To be honest when the questionnaires for the teachers’ evaluation are distributed the 60% of the students just write whatever to finish...I do not believe that the evaluation is proper as it is done. Yes it is a matter of maturity from students also”.

h) Equipment and support

Teachers

Lack of space and proper equipment are also recognised as barriers to skills development: It is impossible to work with teams and apply any innovative teaching method when there are more than a hundred students in the classroom:

“In the course that I teach, financial statement analysis, I have 300 students, so there is no possibility to have teamwork and presentations”.

10.8.2 Barriers from the teachers

1) Skills versus Knowledge – Are professional skills proper to teach in HEIs?

Teachers

Discussing with teachers sometimes has not been easy to figure out if they were in favour of skills development or not. There were very often contradictions in their own words. I had the feeling that they agreed to skills introduction sometimes because they felt it was the right thing to say but they did not “really” felt this to be important. For example a teacher said that

“ECTS which were the basics to be introduced is already accomplished”.

Accountants
The accountants point to the fact that the educational system has not yet realised how important skills are in the professional life of accountants or they find skills inferior to teach within HEIs:

"I believe that there is a perception among teachers that teaching more practical issues and closer to reality, discredit the science...we do not need simple accountants...we want economists...they push the students to a more theoretical direction than practical..."

2) Teachers’ professional skills

Teachers

Adopting new teaching methods, being open minded for new initiatives, discussing on teaching issues implies professional attitude and strong professional skills. Many of these qualities are missing from academic teachers although this may sound strange enough. They admit themselves how they miss certain attributes like the ability for team work, coordination skills, time management and other skills:

"We may see as a group the need for change...but we do not act as a group...We have never worked as a group...this never happened”.

Lack of professional skills and micro-politics could be the reason for an attitude based on envy, vanity and personal quarrels with serious implications for the overall progress and function of faculties. Personal ambitions can sometimes stop or change direction to collective policies as is the case with the credit units:

"There were departments until recently which did not want to have credit units...why?...because teachers did not know which courses would have half credits. In the ECTS system there are half credit units. No one teacher would accept his course to have half credits. So you see it is not only a matter of being informed on a subject, there are other issues behind”.

3) Maintain the Status quo

Teachers
Not only top management is concerned to maintain the status quo but teachers themselves also. Any reforms that would oblige them to work more or to work up to the required standards, or put them under evaluation criteria, are not welcomed and every effort for change will face strong opposition. The following phrase is characteristic:

"I am leaving in 5 years with my pension...I do not need evaluation...

4) Institutional inertia and fear for the unknown

Teachers

The negative reactions lead people to apathy and to “institutional inertia”:

“If a person or a group of persons try to change something it is certain that they will fail. If 10% tries to change things, there will be another... 30% that will react strongly and the rest of the people will stay apathetic and indifferent, because they do not believe in success...or they are not interested...We have reached a level of “institutional inertia” where every reform provokes negative reactions...”

5) Teacher training and Accounting education

Teachers

Teachers identify the lack of training as one of the barriers to skills development. They notice the absence of an academic unit dedicated to academic issues within HEIs:

“I talk with many accounting teachers,...ehhh...there is not a team that we could meet and talk...on where accounting is going...about accounting education and interpersonal relationships and skill in accounting...this never happened. A seminar at country level never happened, I have never heard about it and I do not know ...

6) Not attending Laws - Patriotism

Teachers

The fact that we all accept in Greece is that some laws are voted but not followed or are followed selectively. This has as a consequence some issues to be left with the “patriotism” of teachers. That is conscientious people who want to try for the best only driven by their inner need to see things improved.
"...How can we discuss issues any further, when teaching is left at the feelings of patriotism of the teachers?"

Accountants

Accountants believe that our democracy is not as it should be and that Universities and teachers are a protected field:

"...teachers should have accepted the law [4009/2011]...if there were changes to be done then fine, but the level of Greek university is very low...the environment when you enter...creates feelings...ehhh...I do not know... the knowledge, I mean the teachers, the society should connect to the University, because there is no connection of society with the University, there is no connection generally, it is a closed area as I see it...it is protected since there is no communication with the environment..."

7) Teachers at HEIs are protected profession

Accountants

University is a closed system because teachers want to maintain their privileges

"I believe that there is such big reaction to the participation of external members to the boards because teachers want to have...want to have total control of the Institutions, and they are afraid the possibility that people from the market are more knowledgeable...and they may outweigh the teachers and take their privileges...take their power, management or whatever"

8) The teaching methods

Teachers

The teaching methods are limited basically to lecturing which is a useful method but not appropriate for interactive and active learning:

"Lecturing is the most usual teaching methods that I use and what I hear from colleagues it is also in other institutions".
Students

Students believe that innovative teaching methods will attract the students to attend their classes:

"I believe that students would like them more, would find the course more interesting, maybe the use of technology would like them more, the communication in teams definitely would attract the interest, would be good. Maybe this would be a reason to make them attend their classes, because now in a course where only the teacher talks, ehhh... it is not so interesting. I believe that if there were more dialogue, more talking, power point, pictures, project works, presentation of works, would be much more interesting for the students, they would come more often to the lectures, yes".

9) Can skills be taught or they are traits of character?

Teachers

Teachers may say that professional skills are important however their inner belief is that skills are inherited. Either you are born with it or not. Education would not harm and could help somehow but would not add much to the skills acquisition by a person:

"In principle, I believe that all is dependent on the student and professional skills and everything can be acquired during the teaching of the theory of the course".

10.8.3 Barriers from the students

a. Students' political organisations

Teachers

Teachers believe that the students' political organizations have been a major barrier to Bologna requirements and implementation and to other innovations at HEI. They form groups that have repeatedly used violent means to block meetings, conferences, reward events and career days:

"One of the reasons that university is not connected to the market, is the reaction of the left party organizations, I would say exclusively of the left party, and I do not say that because I have something against left party but it is a fact...ehhh".
Students’ reactions may be very intense and sometimes they lead to destroying conferences, career days and other events:

“Students react exceedingly to any efforts for change. During a day conference that we held in our institution, students from left organizations, came into the conference room and provoked violence and disturbance. The conference was blocked and since then we are obliged to hold our conferences outside University from the fear of riots”.

10.9 **Pressures to Skills Development**

a) **Bologna Requirements**

**Teachers**

Teachers believe that the main driver of change is the Bologna Agreement. However the Greek state delays as much as possible the implementation of the reforms. The same delays characterise the Institutions at the managerial level.

“These come from changes to the international environment or to the institutional framework of European union that...at the framework which is being structured here...all these new changes I have the feeling that they are incorporated at the legislation when things come to their limits...reach a point that we cannot delay it anymore, this is my feeling generally”.

b) **Market requirements**

**Accountants**

Accountants believe that there are pressures which come from the society and the market. However the educational system has “immunity” to the pressures. The educational system lacks flexibility and adaptability.

“Society has expectations from universities, but I do not think that the pressures reach universities, I think these pressures expire out of universities’ doors, I do not think that...they understand that there is pressure outside...to improve the level of studies”
a) The accountants’ duties

Teachers

The duties of accountants in our country include to a high percentage the duties of bookkeeping. The tax laws play an important role on the overall development of the accountancy practice as Vasilis explains.

"In our country the emphasis regarding the content duties of an accounting practitioner, is concentrated at around 40% on bookkeeping. When people refer to accounting they consider that 40% should know tax issues, to know how to fill in the tax forms, to be able to update the accounting books traditionally...it is only the last 15-20 years that accounting has started to develop as a profession at Greece, isn’t it?"

Accountants

Vicky believes that we should distinguish the bookkeeper from the accountant-advisor who needs to acquire broader knowledge

"We should define and distinguish the tasks of ...the person that does the accounting records from the accountant advisor, these are two distinctive concepts. In the first case we talk about the bookkeeper who does not need to have a degree or any special knowledge. In the second case the accountant advisor should be able to function as tax accountant and as advisor at the same time”.

b) We train bookkeepers or accountants?

Teachers

"We all educate “accountants” – no one says that we educate “bookkeepers”, but the accountant is something different, he reads books, articles, his education is completely different, there is huge difference between the accountant and the bookkeeper. As there is difference between “accountancy” and “accounting”, this nobody ... you should know English to understand the difference”.

c) The accounting Professional Body
Teachers

The Economic Chamber according to the teachers is not fulfilling its role. One reason is that its main aim has been so far to collect fees from accountants and then channel them to unknown purposes. Economic Chamber serves only the interests of the politicians and the prospective politicians, as participants argue

"The law mandates that each accountant should pay a high amount of fees to Chamber but the Chamber does nothing than collecting the money... ".

d) The image of the accountant

Accountants

Upgraded accountants can support companies to become internationally competitive and improve society and ethics

"...in Greece the entrepreneurs have the attitude for tax evasion...if the accountants...are scientists...I believe these people will help to move towards a direction...to create a new entrepreneurial culture, about tax evasion and generally at all levels...and this would impact all societal levels...all our moves have economic target and result...there are people who participate at economic events...if these people were better people...I think that the problems could be resolved differently”.

e) Pressures from students

Teachers

Teachers admit they have not felt any pressures from students to change their teaching material or teaching methods or to introduce skills

"I have not felt any forces exerting pressures for change except for your own PhD, I have not seen any other factor pressing for changes”.

f) Pressures from private universities

According to the students the private education is better than the public.
"I have attended classes in a private Institute and I can say that there is no comparison... with the way the lesson is delivered in our Institute. They (the private) use different techniques to deliver the course, ehhh... they assign project work, they use the English language which is very important for our profession. This is not done within the Universities or the Technological Institutions. In the public HEI we do not pay so much attention, anyway the courses in the private Institute are of higher quality... much higher quality".

10.10 Chapter Summary

Chapter 10 presented the qualitative analysis of the 13 interviews conducted with the three groups of stakeholders; teachers, students, and accountants. Rich data were provided by analysing the participants' interviews. A variety of reasons for the barriers to the incorporation of professional accounting skills were identified as arising from the system (educational or political), the teachers and the students. The drivers of changes were identified as the market requirements and evaluation process as part of the Bologna Requirements. However, many voices asked whether the HEIs are feeling pressure from the outside world or will continue to tread the same old pathway, safe within their professional field.
CHAPTER 11 Integration and Discussion of the Findings

11.1 Introduction

In this chapter, the author will integrate and discuss the findings in relation to both the prior literature and the current research questions. The findings will be interpreted using the NIS approach to the isomorphic pressure to reform. After this introduction, the next section (11.2) presents the main research question of the thesis. Section 11.3 describes the findings from the international and national change frame related to skills development in accountancy and accounting education. Section 11.4 refers to the findings about the acceptance of the Bologna Principles at the national and organisational Level. Section 11.5 interprets the academics and professional accountants' stance regarding professional skills. Section 11.6 discusses the importance that stakeholders assign to skills development. Section 11.7 presents the exhibited performance of BAA students. Section 11.8 comments on the gap between accounting graduates' expected and actual skills, as well as the calculation of the Indicator of Priority (IP). Section 11.9 describes the research participants' suggestions about how skills might be introduced into the curriculum, while Section 11.10 discusses the barriers to their introduction. Section 11.11 analyses the pressures to promote skills development and Section 11.12 analyses the HEIs' strategic responses to these. Section 11.13 forecasts HEIs' future strategies, while Section 11.14 draws the final conclusions and presents a schema of all previous analysis. Section 11.15 summarises the chapter.
11.2 **Research Question**

The aim of the present study is to explore the situation in Greece regarding accountants' professional skills and the introduction of these into HE accounting courses. The main research question is: *"How are the Business Administration and Accounting Departments of Greek Higher Educational Institutions responding to the pressure to promote students' professional skills?"* In order to answer this question, twelve sub-questions were developed, which have been answered during the various stages of the study. In the following sections, the sub-questions and the relevant findings are presented in turn.

11.3 **The Educational Change Frame**

11.3.1 **The International Frame**

**Question 1:** *"How is the introduction of professional skills into the curriculum of Greek HEI accounting courses affected by the international trend?"*

The author conducted an “environmental scan” of the international change frame regarding skills development within accounting courses, including an extended literature review firstly of the reasons for the emergence of skills and secondly of the introduction of professional skills into accounting courses. In summary, the emergence of skills is connected to the changing work procedures, from a task to a procedure-driven environment (Hammer, 1996; OECD, 2011). Technological evolution has been decisive in compelling workers and professionals to acquire an advanced knowledge of ICT in order to accomplish their duties. Globalisation has spread the changes and competition around the globe. In the increasingly competitive environment, nations must secure their position and their citizens must secure their jobs. Education at all its levels is being accepted as the way to improve people’s economic and social life. Therefore, great efforts began towards the end of the 20th century to advance the citizens’ skills and competences.

The emergence of professional skills in accounting education has followed the general trend in education. The initiatives came either from the market, for example in the US, or from the government, with support for academics, for example in Australia and Europe, through the Bologna Agreement. Interventions and recommendations for reform have been raised by
the Professional Bodies (AICPA, 1999; IMA, 1999; IFAC, 2006), academics (Hassall et al., 2000, Marriott and Marriott, 2000; Paisley and Paisley, 2003; Montano et al., 2004; Marriott, 2004; Hassall et al., 2005; Belghitar and Belghitar, 2010), governments and the European Union (EU, 2007a, 2008b,e, 2013). This research reviewed the specialised literature on accounting education in relation to skills development, and also analysed EU documents and reports which are directly related to skills development; the ECTS guide (EU, 2007a) and the Tuning reports (2010) for Business Curriculum written by European academics. The main findings from the analysis are as follows:

1. Skills development is characterised as a basic prerequisite in order for accounting students to acquire an integrated and complete educational experience.
2. A combination of knowledge, skills and competences will advance accounting graduates’ employability.
3. HE staff should ensure that the accounting curriculum satisfies accounting graduates’ profiles in accordance with the courses’ learning outcomes.
4. The learning outcomes include the knowledge, skills and competences that should feature in accounting courses, be taught using specialised teaching methods and be assessed according to predetermined criteria.
5. Credits should be incorporated into courses of study and represent and be connected with the predefined learning outcomes.

Concepts and recommendations were employed drawn from international and European reports as a guideline to drive the literature review that concerns the Greek frame.

11.3.2 The Greek Frame

**Question 2:** “How has the accounting profession and accounting education evolved in Greece, how is accountancy taught, and what is its relationship to professional skills?”

This part of the study explores the Greek educational environment as well as the AP in relation to skills and competences. An extensive literature review and documentary analysis was undertaken (see Chapter Four).

The AP in Greece has not grown and matured as a result of business needs and market function but mainly constructed by the legislators (Brugge, 1963). The term “accountant” is
widely-used to describe financial and tax accountants, bookkeepers and auditors. The term “management accountant” is rarely used, while the profession of “auditor-accountant” (CPA) is well-established in Greece, with high status, good benefits and the support of a strong, effective professional body (Caramanis, 2002; 2005; Dedoulis, 2006). On the contrary, the profession of “financial-tax accountant” is considered of lower status, falling under the jurisdiction of the ECG. Its duties and responsibilities have not yet been clearly-defined (for example for management accountants). Accountants in Greece work in an unstable environment that is characterised by continuous tax and labour laws reform, in a corrupted triangle between tax office employees, employers and accountants (Markozos, 2006). The majority of accountants work for micro and SMEs, which constitute 99.9% of all enterprises in Greece. Their duties may be limited to basically bookkeeping, tax and labor issues but they have high workload, as most of the interviewees noted.

In accounting education, the teachers are responsible for the curriculum design and course development. The professional accounting bodies and government are uninvolved in the methods, materials and overall pedagogy of the courses, as is the case in the Spanish educational system (González et al., 2006). There are no institutionalised teacher training seminars or similar prerequisites for the promotion of academic teachers. HEI graduates face unemployment, underemployment and the lowest graduate wages in Europe, due to Greek labour market’s structure (99.9% are micro companies and SMEs) and their own deficiency in terms of core (or generic) skills, due to both their insufficient education and training and the specific societal and family relations in Greece (Kokkos, 2013).

11.4 Acceptance of the Bologna and EU Principles at the National and Organisational Levels

**Question 3:** “Which are the Bologna and EU requirements regarding professional skills and how has the Greek educational and professional system accepted them at the institutional level?”

**Part One: National Level**

The documentary analysis revealed that the state initiated the reforms in Greece following the EU and Bologna requirements. The Greek government, despite the delays, has
undertaken responsibility to adjust the legislative context so that quality assurance can be introduced. The first relevant Law was 3191/FEK 258A on Vocational Education, issued in 2003. This document provided definitions of the terms “skill” and “competence”, with the definition of “skill” appearing to be “limited” compared to other definitions in the literature. Greek Law states that: “Skills are the capability of applying technical knowledge and experience that are required to complete a task or a project”, whereas EQF refers to skills as “cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments)”. Obviously the Greek Law provides a “sterile technical” dimension of the concept of skill in contrast to the “rich and integrated” dimensions of the EQF. The Laws have adequately described and laid the foundations for the proper establishment of learning outcomes and credits. Through Law 3549/FEK69/2007, the state connects the evaluation and accreditation process with HEIs’ funding. The most important Laws have been the Frame Law 4009/11 and Law 4076/12, which brought about important reform in the educational field. The Law connects HEIs’ missions with the market and labour needs, the application of knowledge in the professional field and graduate employability, explicitly referring to the development of skills like critical thinking and modern teaching methods. HQAA is responsible for course accreditation according to specific, predetermined criteria (articles 65-72), including the learning outcomes and intended skills according to the National Qualifications Framework, the connection of teaching with research, the degree of acceptance by the market of the acquired skills, and the quality and effectiveness of the teaching. Special criteria are set so that the Accreditation Agency can verify that specific courses respond effectively to the relevant professional fields’ educational and institutional demands. Follow-up actions (sensitizing meetings) were planned by the state through IKY\textsuperscript{30} as a way to promote acceptance of the reforms.

During the decade 2003-2013, when the main Laws were issued, the state faced considerable, intense reactions against the evaluation process and skills introduction in HE from diverse forces, including the teachers, students, political parties, ECGr, Federation of

\textsuperscript{30} See the State Scholarship Foundation, at: http://www.iky.gr.
Academic Teachers, and Federation of Accountants. Despite the reaction, the new legislation managed to introduce the concepts of:

1. Learning outcomes, skills and competences.
2. ECTS and its connection to learning outcomes.
3. The accreditation process for quality assurance.
4. The connection between quality and the funding process.
5. The openness of HEIs towards society.
6. Professionals’ participation in the educational process

Therefore, it appears that the main findings from the analysis of the international change frame have been incorporated at the national level through the issuance of the proper legislation. Additionally, the state has undertaken follow-up actions to ensure that the information is disseminated to the HEIs.

Part Two: Organisational Level

The HEIs

Website investigation: Thirty-three HEI BAA departments’ official websites were explored to determine whether they had properly established the ECTS, which entails their relation to the learning outcomes, which should include knowledge, skills and competences. The missing information (gap) between the courses’ references to learning outcomes and credits and an actual full description of the learning outcomes, teaching methods and proper assessments within each course outline appears to indicate that a superficial approach has been adopted together with a mechanical calculation of credits. Very few websites contained no information about credits or learning outcomes at all, although most of them provided basic, unstructured information dispersed across the site, with minor references to skills and competences. In 14 departments, a gap emerged between the curriculum guide and the course outline’s reference to skills and competences, and in only 4 departments was this not the case, although there was only partial reference to the course outline (only to a few courses). On 15 of the HEIs’ websites, neither the curriculum guide nor the course outline made any reference to skills and competences. Therefore, this first investigation
found the *mechanical and superficial establishment of credits and absence of professional skills in the curriculum*.

**Documentary Analysis:** In order to obtain detailed, inside information from the HEIs, a documentary analysis of the External Evaluation Committee ECC reports was conducted (HQAA, 2013), which revealed that ECTS was unconnected to the learning outcomes, alongside further problems. The problems that the Committee emphasized are interconnected with the absence of the teaching of skills: big classes, no connection with society and industry, the absence of innovative teaching methods, the absence of rewards for students and teachers, and the failure to articulate the learning outcomes and assessment criteria clearly in the students’ learning guides.

**Analysis of Interview 1:** A member of HQAA was interviewed regarding how they approached the HEIs’ quality issue. The interviewee stressed that the HEIs have been properly and timely informed of all ECTS procedures and the relevant quality issues. The “delay” attitude, coupled with the other characteristics of the system, like the promotion criteria, which do not include high quality teaching, prohibit the establishment of reform. The participant argued that HEIs are responsible for the poor implementation and lack the initiative to disseminate the information further to the lower levels. Also, part of responsibility lies with the HEIs’ middle management and the teachers themselves. Conscientious teachers find a way to introduce innovations and skills. However, the interviewee noted that majority of teachers are either untrained themselves to teach skills or fear the workload involved if the reforms are introduced.

**Analysis of Interview 2:** A Bologna Expert was interviewed about his views of the establishment of learning outcomes and skills. It appears, firstly, that the Bologna Experts have failed to fulfill their duties: “*They like to have the title but not the workload*”, the interviewee commented. Secondly, Rectors and Deans like to hear about innovations but then fail to implement the proper policies to apply them. Finally, the participant commented, “*The teachers are unwilling to do extra work without motives and rewards*”.

Employers
**Website investigation:** Employers constitute a very important stakeholder in the skills issue. An environmental scan was conducted by investigating 36 enterprises' websites to explore whether there were references to the skills and competences that prospective employees should possess. A detailed search revealed that only six of these 36 websites referred to the skills and competences required of future employees, all of which were large companies employing over 250 people. Although further investigation is required, this provides an initial indication that the notion of professional skills has not yet “spread” to the market. Businesses may seek evidence of certain professional (or personal) skills during interviews but do not refer to them explicitly on their websites' personnel pages. The domination of the micro companies might be a reason of this, but further research is required in this direction. Bui and Porter (2010) in a similar study connected firm size with accountants' skills. It should be noted here that while there was no important reference to the professional skills most of the SMEs and large companies in our research made reference to prospective personnel's internal training, which has become widely institutionalised in the private sector (Scott and Meyer 1994).

11.5 **Acceptance of the Bologna Principles by Academia and Accountants**

**Question 4:** “How well has the Greek academic and professional community accepted a European institution like the Bologna Agreement and its basic Principles? ”

This question was included (together with those following) in the survey of 1462 individuals (61 teachers, 610 students, and 791 accountants) and was statistically processed. The participants were asked to express their level of agreement with the Bologna Principles, including the teaching of professional skills, using a scale from 1 (lowest) to 7 (highest). The statistical analysis provided an overall mean for the whole sample of 6.05 out of 7, which shows a high acceptance of the Principles. Of the seven principles, the total group of participants ranked first the principle that “graduates should satisfy market requirements” or otherwise stated “graduates should have high employability skills”. The students and accountants agreed with this ranking but teachers disagreed and ranked this principle fifth.

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31 See Appendix 3 for full details of business firms
Chapter 11: Integration and Discussion of the Findings

The sample ranked second the “life-long learning” principle, while students’ mobility within European HEI was ranked third. The teaching of professional skills (mean 6.10) was ranked fourth, possibly because the sample has not identified professional skills as a prerequisite for graduates’ high employability. The statistical results agree with the interview findings. The participants stated that adherence to the Bologna Principles, as presented on the questionnaire, will positively improve the national educational system and increase the national competitiveness. The combined results from the qualitative and quantitative research highlighted three points.

The first is the contrast between the acceptance rates found in the results and the intense reactions faced by the government during the last decade regarding the issuance of the relevant laws (see Section 7.3.1). Since then, academics and HQAA staff told us, they have avoided making any reference to the word “Bologna”, believing that it creates “negative feelings among students”. The second point is that graduate employability is ranked first by the students and accountants but fifth by the teachers so, although accounting teachers teach a discipline which is closely-connected with the economy and the market, they remain hesitant about the necessity to “make” graduates to be “highly employable”, indicating the inner beliefs and contradictions that persist regarding HE’s mission (Provata, 2002; Papaillias, 2006). The dilemma remains: “should we educate people for a higher humanistic purpose or should train them to be employable according to the market needs?” Firstly, the teachers’ attitudes and beliefs contrast with those of society, which may prove a hurdle to further reform. Secondly, the issue deserves further psychoanalytic research to investigate whether this is a real question or the “reproduction” of other psychological schism of human beings like the “splitting psychology” phenomenon that works as a defence mechanism for humans. A possible answer to this split and relevant study is that of Peach (2010) who

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analysed the notion of “liberal vocationalism” as the act of enabling individuals to act and think more autonomously, critically and responsibly in both their social and working lives.

The third point is a question that emerged from the analysis so far: “does the high stated acceptance of the principles mean that the stakeholders are ready to change their personal attitudes, routines and behaviour in order truly to adopt the Bologna and EU principles?” A positive answer would possibly mean that the stakeholders act as autonomous adults that synchronise their beliefs with their actions. This issue was investigated in greater depth through the following questions.

11.6 Importance of Professional Skills for Accountants

**Question 5:** “How do the direct stakeholders (teachers, students, accountants) rate the importance of introducing professional skills into HEI courses in Greece?”

The total group of participants (N=1626) rated the importance of professional skills for accountants highly. The overall mean was 6.27, very close to 7, which is the highest point on the scale. An ANOVA test was conducted to examine the importance mean between the three groups and found statistical differences between the three groups (p<0.05). The results confirm that the respondents recognise the need to introduce professional skills into accounting courses. This finding accords with other similar studies (Palmer et al., 2004; Carr et al., 2006; De Lange et al., 2006; Jones, 2010), that illustrate that professional skills are recognised in many contexts. Of the 19 professional skills, the total group ranked first in importance the “use of electronic information sources”, followed by, in order, the “use of relevant software” and the acquisition of a “comprehensive and global vision of the organisation”. It is impressive that the three groups agreed on the ranking of the top three positions. The international literature reveals that relevant studies of other countries have shown that computer skills were ranked third in importance, or even lower. These studies usually rank top skills like communication or analytical/critical thinking (Hassall et al., 2005; Albrecht and Sack, 2000; Jackling and de Lange, 2009). Similar results, where the emphasis is placed on communication skills, problem-solving and broader knowledge and experience were obtained by Wells et al. (2009), Bui and Porter (2010), Pan and Perera (2012), and, adding to the growing consensus that the AP, which was once driven by a body
of specialist technical skills, has now moved on, with technical accounting skills giving way to a broader, more generic skills set (Albin and Crockett, 1991; LaFrancois, 1992; Howieson, 2003). Obviously there is inconsistency between the Greek context and that of other Western countries, and even Ghana, where Awayiga et al. (2010) found that the most important professional skill graduates require is analytical and critical thinking. The emphasis on the content type of knowledge seems to be similar to the Chinese educational culture. According to Lin et al. (2005) and Lin (2008), the knowledge items (financial accounting, finance, management accounting, tax, business/law, etc) are considered substantially higher than the skill components (professional demeanour, computing techniques, interpersonal, analytical/critical thinking, communication skills, etc). Also, it seems that Greece’s educational attitude is closer to that of Syria, where Gallhofer et al. (2009), by conducting a related study, found the underdevelopment of a broad range of skills and an overtly technical emphasis as distinct from the interdisciplinary character of current tertiary accounting education. Similarly Mora et al. (2000) found that the Spanish HE system basically focuses almost exclusively on specialised competence; on knowledge rather than skills.

The overall high importance of professional skills was identified through the interview analysis. The teachers believe that professional skills are important: “Personal skills make the difference between success and failure, the difference between finding and not finding a job, the difference between I advance in my job or I stay at the same level...” Despite their appreciation of professional skills, at the same time, a “fear” was detected that the teaching of skills might diminish the “classical-theoretical knowledge” approach. The teachers had a strong tendency to “defend” theoretical knowledge teaching and, as they kept repeating, “professional skills without sound theoretical knowledge equals to zero”. They argued that, especially in introductory courses, the teaching of skills is not feasible because students need to build a theoretical background first. The emphasis upon the technical mastery of topics and problems and the difficulty of articulating concepts was found in other studies (Lucas, 2002). However, the research on accounting education (Needles and Anderson, 1991; Boyd et al., 2000; Albrecht and Sack, 2000) has emphasised that the introductory accounting courses should be based on teaching concepts before rules, on shaping the
students’ perception of the profession, the aptitudes and skills needed for successful careers in accounting and the nature of the career opportunities in accounting (AECC, 1992).

The teaching of professional skills in Greece seems to be mostly associated with computer skills, mastering an accounting software system and solving exercises using pre-defined solutions. The retreat of scientific-theoretical knowledge in the face of the expansion of data entry (technical) knowledge is considered damaging to the learning experience, as seems likely. However, teaching professional skills involves far more than teaching the use of an accounting software program, but the teachers have not yet realised this. The fear of directing HE towards the “technical knowledge of computer skills” is related to the resistance to the “marketisation of knowledge”. Professional skills are related to the educational system’s “market” orientation and therefore oppose the working population’s interests, a view that has been strongly supported by the left parties in Greece (Alavanos, 2005) and the teachers’ association (POSDEP 2006; 2007). The debate about HE’s marketisation is of global concern (Williams, 1985; Meek, 2000; Singh, 2002; Molesworth, 2009; Blum and Ullman, 2012). In other contexts, the debate has transferred on the grounds of accounting education also (Dillard and Tinker, 1996; McPhail, 1999; Tinker and Feknous, 2001; Boyce, 2002; Craig and Amernic, 2002; Boyce, 2004). Researchers clearly acknowledge that the development of professional skills works in the opposite direction to marketisation. Boyce (2004, p. 577) states that “however, the development of generic skills as requested by accrediting bodies (analytical and critical thinking skills, judgement and synthesis skills, personal and interpersonal skills, management and organisational skills, ability to apply these skills in a range of unique situations) preclude the adoption of a narrow objective-based, vocationally oriented training model”. One Greek teacher commented: “It’s clear that we can achieve both, to provide theoretical and philosophical concepts and simultaneously to promote those necessary skills that are used not only in the professional field but also personal relationships. Being able to communicate properly and express my meaning helps me professionally but also personally in my relationships with my family, children, wife, etc.” This view is closer to the “socially critical vocationalism” described by Silver and Brennan (1988) and Peach (2010) who analysed the notion of
“liberal vocationalism” as the act of enabling individuals to act and think more autonomously, critically and responsibly in both their social and working lives.

The accounting teachers lack confidence regarding “what professional skills really are and how these can be taught”. They sounded confused about how to implement and rate them in relation to theoretical knowledge, and tend to correlate these skills either with the accounting working field or graduate studies, failing to envisage teaching professional skills within the HE environment at the undergraduate level, as evident from their reference to certain skills which graduates will certainly acquire in the working field, such as lifelong learning, time management, and work allocation. On the other hand, when the teachers referred to the professional skills within accountants’ working environment, they appeared more decisive about their use, effectiveness and impact.

The accountants sound more decisive and confident about the importance of skills for the profession and appear to understand this phenomenon well. Some of the accountants mentioned the need for accounting students to acquire wide business education and further specialisation by undertaking a master’s degree, a view that is in line with AECC, IFAC and overseas researchers’ recommendations (AECC, 1990; 1991; Mathews 2001). The accountants emphasised that technical accounting knowledge (or “theoretical knowledge”, as they term it), alone is insufficient. Accountants need to know how to work within a management team and how to use language that their employer understands. The accountants underlined the need for professional skills in all areas of the AP and for businesses of every size. A financial-tax accountant, auditor and management accountant need professional skills equally, irrespectively of whether they work for an SME or a large company. They commented: “In SMEs, skills are important because it is a matter of communication, you have to deal with people with a different culture or attitude, other experiences and you have to handle issues competently”. This finding is in line with Marriott and Marriott (2000) and Stone (2011) regarding managers of SMEs and their need for communication skills.

The accountants stated that teaching skills is about “looking at the real world”: “I believe that, for the accounting and economic professions, the courses should be further enriched
with skills and with reality, which would directly connect the University with the enterprises, with the working environment”.

They connected skills with the students’ research ability: “I believe this connection with the market will help both the university and the students…and students’ knowledge acquisition will be easier because they will be in a position to consolidate and assimilate the knowledge they obtain with its direct utility, so they will see that it is not sterile knowledge, therefore it will inspire them to learn and explore, which is natural for young people”.

Professional skills not only help practitioners to succeed in their career but also enterprises and so, through them, the country itself. Well-qualified accountants can help companies to become internationally competitive and improve society and ethics, a view that is also supported by Yorke (2006). Ethics and the economy are intertwined and so accountants with an integrated, holistic education can help to create a new entrepreneurial culture. The accountants argue that there will be an increasing need in Greece for good accountants and that the AP will develop further in future as it has done already in recent years with the introduction of the International Accounting Standards.

11.7 BAA Graduates’ Exhibited Performance

Question 6: “How do the direct stakeholders (teachers, students, accountants) rate graduates’ performance in relation to professional skills in Greece?”

BAA graduates’ actual performance is related to the successful delivery of professional skills by the educational environment. The overall mean of the total group (N=1626) was 4.37, which is low enough and closer to the average point of the 7-grade scale. An ANOVA test was conducted but it failed to find any statistically significant differences between the three groups (p>0.05), indicating that they agreed on the ranking of 14 of the 19 skills. They disagreed on the ranking of skills O3, O4, O5, C2 and P1 (see Section 9.2.).

The statistical result is confirmed by the qualitative research. The teachers stated that graduates possess below medium-level skills; they possess technical knowledge, but do not solve unstructured problems or receive a broad spectrum of knowledge that would enhance their decision-making skills: “We prepare good accountants to sign financial statements,
courses, to know the law, tax issues…er…to perform every accounting task well, but we
don’t teach them how to be good at making decisions, that is the courses…perhaps because
the technical training is overemphasized but I have a feeling that there is a lack of other
tools and skills which…er…would help accountant to function as business advisors”. Accountants argue that skills are not covered by HE although practitioners need them
equally with their technical knowledge: “…nobody teaches you as accountant how to
become professional, there are no relevant courses, I do not know why this aspect isn’t
covered by the education, not at all,…accountants themselves should try to acquire some
managerial skills because they need them…and they need them fifty-fifty to technical
competences and knowledge”. The students’ views are similar to those of the other two
groups.

11.8 The Skills’ Gap

Question 7: “Is there a gap between the importance assigned to accountants’ professional
skills and those exhibited by graduates in Greece?”

A paired samples t-test was conducted to examine the differences between BAA students’
perceived importance and actual delivery of skills. The results revealed that p<0.05, which
means that there is statistically significant difference between these two dimensions
(importance and delivery of skills). The highest gap is for the following skills: a) A
comprehensive and global vision of the organisation (mean difference= 2,358). This great
difference between the actual and expected skills may be due to prospective accountants’
narrow education. Although most BAA departments’ curriculums include a range of courses
besides accounting i.e. marketing, human resources and management, these are not
interrelated or insufficiently related to the wider business environment and the accounting
context. Secondly the teaching methods (usually lectures) do not allow for a deep
understanding of the relationships and the dependences among an enterprise’s different
functions; b) Be aware of social and ethical responsibilities (mean difference=2,288). This
gap may be due to the gap between the learning experience and the reality in Greece. Ethics
are taught mechanically, through lecturing, without any experiential flavour to enrich the
learning context (Dellaportas and Hassall, 2013). Informal discussions with the students
showed that they find this topic boring. On the other side, an “unethical” business society exists today, with high corruption rates, which have influenced every aspect of life i.e. economic, social, personal and cultural. Internal and external stakeholders of the educational system can easily distinguish the gap. c) *Organise the workloads to meet conflicting demands and unexpected requirements (mean difference= 2,221).* This gap signifies a deficit in the organisation and performance of accountants’ working lives, which is related to accountants’ ability to handle pressure and manage their time efficiently. These are highly-appreciated skills in the demanding business environment and also ones that *we do not teach in HEIs*, with a few exceptions that started to appear very recently as part of post-graduate courses. Unsurprisingly, in recent years, private institutions and colleges have emerged in the market and offer course that teach specifically these kinds of professional skills. This signifies the market’s need for this service and that there are customers who are willing to pay for it. The educational system’s loose structure, combined with the complete lack of relevant teaching methods and a willingness to teach these skills, create this deficit for graduates in Greece. The gap in BAA graduates’ actual and expected skills in accounting has been identified in many studies abroad (AAA, 1986; Hassall *et al.*, 2003, 2005; González *et al.*, 2009; Bui and Porter, 2010). The following table illustrates the gap between the importance of skills and accounting graduates’ performance of these skills in Greece.
Overall Importance and Exhibited Performance of Professional skills

Diagram 3: Difference between the Overall Importance and Overall Exhibited Performance of Professional Skills in Greece

The IP

The IP was calculated in order to distinguish the skills that are considered important and at the same time have the lowest exhibited performance by graduates. For the overall group of participants, the skill that needs immediate attention is the ability to identify and solve unstructured problems (mean 6.83). The statistical results are in accordance with the qualitative results from the student and accountant interviews. It is clear that students need to acquire a broad, open education about accounting. They are dissatisfied merely with book-oriented learning and pre-defined solutions. It was stated during the interviews that “the teachers do not follow the market” and that “they teach mechanically”. Therefore, the students are asking for a diversified education via the use of new teaching methods like case studies and experiential learning. The accountants believe that this deficit is evident in the newcomers to a business: "University graduates have not developed communication skills; it takes them at least two years of practice within a company before they start to breathe and feel comfortable. This is due to the fact that they...have not been taught...er...if they were taught...apart from technical accounting...how to present their work, which part should have priority and emphasis, how to classify, how to highlight the important things..."
think this would be very useful and faster...and their opinion would receive wider acceptance". Another finding from the discussion with the accountants concerns the identification of skills on the part of the employer. Professional skills are not easy to identify in a candidate. Therefore teaching these skills in the HE setting would facilitate the hiring process and make it easier for candidates to find a job, thereby enhancing graduates' employability: "...for skills there are no papers to accredit them...[...]...If these skills were included by the universities, it would be far easier for the candidate to find a job and for the prospective employer to evaluate the candidate. Evaluation of candidates is challenging, you can't easily identify whether a person has critical skills or can make good judgments...therefore, teaching skills at university will help employers to identify the best candidate. It is imperative for graduates to acquire professional skills". A portfolio of group assignments, essays, logs or other activities undertaken during university studies would indicate the skills that the job candidate has acquired during his studies.

The students agree, adding that the attitude in Greece is that the graduates will learn "everything they need to learn on the job". A degree does not represent the ability to be effective in a job and possess the relevant qualities but is merely a passport, the “paper” that will allow graduates to start looking for a job. Therefore, a degree does not represent the "ability to gain employment”, which constitutes a considerable difference from the other European educational systems. The second skill that needs immediate attention is to equip students with a comprehensive and global vision of the organisation, while the third is to make them aware of the social and ethical responsibilities of accountants. The second and third skills were already discussed above, as these reflect a wide gap between the graduates' actual and expected rate of their possession. The ability to have a comprehensive and global vision of the organisation was ranked sixth position in the IP. Relative studies abroad produced similar results about the need to teach “the ability to identify and solve unstructured problems (May et al. 1995). Hassall et al. (2001) and Montano et al. (2001) also calculated the IP, identifying the three most important skills as communication skills, time management and group working.
11.9 *Introducing Skills in the Accounting Curriculum*

**Question 8:** "If it is imperative to introduce professional skills, then what is the best way to incorporate them within the accounting curriculum in Greece?"

The overall sample of participants (N=1605) agreed, above all, that it is necessary to "develop skills simultaneously with the teaching of technical accounting knowledge" (mean=5.59), with "skills development should be integrated into all subject areas of accounting" (mean=5.57) being ranked a close second. The statistical analysis showed that the teachers disagree with the ranking of the *integration* of professional skills into all subject areas, ranking this in fourth position. This difference of opinion also emerged during the teacher interviews, in which the teachers suggested that skills development might be achieved by offering a separate course dedicated to the teaching of skills. Some located this in first few semesters to equip students with the necessary skills from an early stage, while others located it in later semesters, when the students are more mature and so better able to benefit from this kind of course.

The accountants believe that skills should be integrated into all subject areas, and convincingly argue that this would enable students to understand and absorb the material and context more effectively: "...in some cases, the need for this type of skills is direct and, in other cases, it is indirect. For example, tomorrow we have a meeting with the management board about the economic results for last year, the market direction, etc...The company president knows nothing about accounting...I have to convince him if he asks, "Why is this 9 and not 12?"...I have to have a complete, clear view of the company and a broad sense of the market...we need broad knowledge..."

They argue that an enriched course with skills brings the student closer to the reality of the profession and connects the universities with the enterprises and the working environment. The need to include courses that enhance argumentation, presentation, communication, and public speaking skills, as these are crucial for accountants and should be incorporated into each subject on the curriculum. Accountants argue that "if you put skills as a separate module then you admit that this is something separate and may be optional to attend and acquire [...] ...I would say that the teaching of skills should be done in parallel with
technical knowledge,...we see that, abroad, they teach case studies...we should find ways to match these things and should have a balanced development of theory and skills”. The students share the accountants’ beliefs about the parallel and integrated teaching of professional skills. The views of the Greek accountants are similar to the recommendations of the Big 8 White Paper (1989): “The skills and knowledge comprising the required capabilities must be integrated throughout the curriculum. For example, written assignments must be an important, accepted, and natural part of most, if not all, courses. To relegate writing to a single course implies to students that the skill will not be useful throughout their careers and does not require continuing attention”. Similar results about integrating skills into all accounting subjects were obtained by González et al. (2009). The Greek students and professionals agreed with the Spanish students and professionals.

11.10 Barriers to the Introduction of Professional Skills

Question 9: “Which are the weaknesses (barriers) regarding the policy of introducing professional skills into the HE accounting courses in Greece?”

The three groups were compared separately and with the overall group D (N=1553) regarding their opinions about the barriers that accounting education faces in its effort to develop skills in HEIs. The statistical analysis revealed the first barrier to be “the lack of effective partnerships between HEIs and external organisations” (mean 5.79). The external organisations are considered industry, local society, the professional bodies, the syndicates and other organisations. The second barrier was “the lack of educational development training of accounting teachers” (mean=5.60) and the third “the lack of proper equipment” (mean=5.33). The interviewees referred to these and many other barriers, presented below. The HEIs have not created open communication channels with society to allow information and knowledge to flow between them. This omission is emphasised also in the EEC reports of HQAA. Most of the evaluated HEI departments lack links with society. European Universities have been gradually changing this attitude and the EU has undertaken considerable actions to advance the links between HEIs and society (Europe 2020). In other relevant studies (González et al., 2009), the barriers identified by accountants and students have been the large class sizes, the lack of educators’ practical
experience, their lack of contact with the business reality, the lack of educators’ training on skills development, the lack of resources and the lack of teachers’ interest.

New Institutional Sociology (NIS) refers to the endogenous process and exogenous shocks that induce change (Meyer and Rowan, 1977; Fligstein, 1991; Jepperson, 1991). In the current case, a series of barriers were identified that hinder change in the Greek educational system. These barriers to develop skills were categorised into endogenous (the barriers arising from a) the system b) the teachers c) the students) and exogenous weaknesses (the barriers arising from a) the market b) the state and c) the employers) of the educational system. All of these factors are closely interrelated, and none can be examined without recognising how one influences the other.

11.10.1 Endogenous Weaknesses

Isomorphic pressures, according to Powell and DiMaggio (1991), push organisations into homogeneity with other organisations in the field. In this study, the barriers to isomorphism that arise from the internal environment of HEIs were identified: the system, the teachers and the students. These barriers are termed Divergent Internal Isomorphic Pressures (coercive, mimetic and normative) because they prohibit, directly or indirectly, the development of professional skills and homogeneity with other units in the (European) organisational field.

Divergent Internal Isomorphic Pressures

Barriers arising from the system — divergent coercive pressures

1) Lack of communication and information dissemination: HEIs’ higher and middle management as well as those responsible (the HEIs’ Bologna experts and the responsible teachers in each department) failed to disseminate information to the other academic staff. Therefore, the majority of the academic staff has not been informed or trained to connect the learning outcomes with the learning components, teaching process and credits assigned to the course. The application of ECTS has been a mechanical numerical exercise that has had absolutely no effect on students’ learning experience. Consequently, the usual teaching and assessment methods remain unchanged. This argument is supported by the respective discussions with the HQAA member and the Bologna expert. The students made
similar complaints. They had never been informed about the Bologna issues, and attribute this lack of communication to the fact that the system does not care what happens to them after they graduate. The teachers and system care only about what happens during the period of their studies. The new law acknowledged this potential weakness, so graduates’ employment rates are included among the HEIs’ additional funding criteria (Law 4009/11/article 63). Again the attitude of ignoring what happens to students after graduation deserves further psychoanalytic investigation. This attitude may reveal the fear of people to accept the “evolution”, the “change” and the “end” of a well-known situation to them).

2) **Lack of explicit policy:** An important weakness of the system is the lack of an established, systematic, explicit policy to promote skills development. Without a master plan or established procedure, the whole issue remains “on paper”, mainly for legitimation purposes. As one accounting teacher commented: “*Things that do not happen, things that do not become part of our daily routine, that we feel them under our skin...these things stay only on the surface...*” Papadimitriou (2011) and Kokosalakis and Kogan (2001) produced relevant findings regarding Continued Education in HEIs.

3) **Lack of Planning, Support and Coordinated Efforts.** The teachers and students report that, without support and coordinated efforts, significant results cannot be expected. Some teachers have made efforts but these are occasional, sporadic and cannot be effective because they require specialised persons’ support and expertise to assist with every step of the process. Inadequate educator support mechanisms were found in Adler et al. (2000)’s study. Another characteristic is the discontinuity of courses when an HEI’s management changes, in which case it is difficult see a project through to a successful conclusion. The Bologna experts who have been assigned by the Law the duty of disseminating information and assisting in the implementation of the reforms have not been up to the standard required, as the teachers and a Bologna Expert admitted. In some cases, the teachers said that they had never heard about the existence of Bologna Experts in their Institute before the discussion with the author of the present research.

4) **Lack of Motivation and Promotion Criteria:** the teachers argue that the only way to apply the reforms is either to provide them motivations/rewards or to make the changes compulsory. In this case, neither measure has materialised. On the contrary, if a teacher
wants to develop his students’ skills, this will take time from his research and publications, which are the only rewards and criteria for promotion in Greece and overseas, as recognised by other studies as well (Nelson, 1995; Karipidou, 2012).

5) **Impunity and Lack of Sanctions:** This barrier was mentioned at least 25 times during the interviews. There are no sanctions for poor performance and no rewards for good efforts. The whole system is based on the personal efforts, “consciousness” and “patriotism” of a relatively few teachers to introduce new ideas into the system. This is considered a problem that the higher and middle management should take care of, as mentioned in the EEC reports and the Bologna expert and HQAA member’s interviews. The lack of sanctions results in a tendency as a nation to disregard the laws and apply them selectively. The teachers commented: “*One reason why skills have not been incorporated into the HEIs is because, in Greece, several laws are voted but not applied.*” The interviewee stated clearly: “*We manage to escape the law because there is no one to control if we apply the law or not*”. This attitude has further implications; namely, the lack of meritocracy, transparency, and trust, combined with the nepotism prevailing in HEIs.

6) **The “Clientele” System:** Teachers identify the political system and politicians as the main barrier to change. The clientele system is present in every Greek organisation, influencing every activity: “*...it is the politicians and vote-chasing that won’t allow education to improve...*” There is a widespread lack of ethics, which influences both students and teachers. Students’ extended voting and participation rights in previous years created severe problems in HEIs between students and teachers. The “clientele” system has deeply affected the economy and the AP. Transactions “under the table” became the norm, originated by a group of public servants. The political parties were again hiding behind these attitudes. “*Transactions between the three accomplices (tax employees, accountants and employers) were the norm, devised by a group of public servants who were supported financially and received a second salary through this procedure*”.

7) **“Imported Institutions” – Distorted practices.** The teachers argue that the local system “absorbs” or “distorts” any practices and efforts which are not in line with the established local interests. The imported practices end up “violated and distorted” and consequently appear appalling to those who may resist them forcefully. Examples of
Chapter 11: Integration and Discussion of the Findings

Occasionally distorted practices within the undergraduate educational system that students have shared with the author in informal discussions include project work (which teachers may use to avoid their teaching duties), undergraduate dissertations (which may lose their research intention and become “a copy-paste” project), the students’ evaluation of the learning experience, the grading of internships, the choice by the students of their semester books among the ones offered by the system.

8) **The System’s Loose Structure**: This disorientates the students, turning their interest outside university life. Informal discussions with students revealed their belief that course attendance should become mandatory to avoid students prolonging their studies.

9) **Lack of Equipment and Support**: The large size classes, lack of proper equipment and ageing academic staff are important barriers to the introduction of innovative teaching methods like teamwork and presentations. This result is in line with other studies (González et al., 2009; De Lange and Watty, 2011).

10) **A “Top-Down” Approach to Reform**: The teachers argue that the reforms are coming from “top-down” and they themselves have had no input regarding the proposed changes. This result is in line with other studies (Bouzakis, 2008; Karipidou, 2012).

**Barriers arising from the teachers – divergent normative pressures**

11) **Skills vs. Knowledge**: The teachers still hesitate to accept that skills should be taught within HEIs. Although they admire teaching skills when they encounter them abroad, at the same time they find it impossible that a graduate might develop critical thinking skills in Greece. Some teachers still believe that these skills are acquired “on the job” and through personal effort *after graduation*. The accountants argue that the teachers have not yet realised how important skills are in accountants’ professional lives. They themselves very successfully describe the need for professional skills: “[...] just like a teacher learns how to teach beyond the knowledge he provides, correspondingly the economic universities should...er...provide their students with courses that will equip them with the proper skills to enable them to stand successfully as personalities in the economic field”. On this point, the accountants *assume* that the HEI teachers have learnt how to teach beyond the (hard)
knowledge they have acquired although, as was seen earlier and experience suggests that this does not correspond to the reality.

12) **Institutional inertia, Lack of Initiatives, Fear of the Unknown:** The teachers regard skills introduction as "a luxury" at present, or fear that they will run into problems one or the other way. Teaching skills is the "unknown", which shakes up the academic world as teachers have known it for many years. The "unknown" brings fear and uncertainty; for example, the fear of appearing ignorant in front of others, that their teaching is not innovative enough, or that they will be evaluated and fail to meet the standards. Institutional inertia is the "flipside" of "social stability". The answer to the question on the institutions' inertia lays more on the beliefs, the values and the feelings of people than "lock-in" explanations and "vested interests" (Meyer, 2006). It is worth noting that not only do the teachers resist accepting and applying the reforms themselves but they also prevent others from introducing any changes. They react very negatively and even aggressively. The teachers spoke of a negative environment towards efforts for improvement that, in some cases, culminated in threats and insults. These negative reactions and micro-politics cause apathy and "institutional inertia". Powell and DiMaggio (1991) argue that institutions persist and reproduce because individuals cannot even envisage appropriate alternatives. Organisational sociologists argue that behaviour and structures that are institutionalised take longer to change than those that are not. On institutional inertia, see Meyer and Rowan (2006, p. 219) on "lock-in and vested interests within institutes".

13) **Teachers' Lack of Professional Skills and Reflection:** Adopting new teaching methods, being open-minded towards new initiatives, and discussing teaching issues implies professional attitude and strong professional skills. It may sound strange, but many academic teachers lack these qualities. They admit themselves how they lack certain skills, like team work, coordination skills, and time management: "We may realise as a group the need for change...but we do not act as a group...We have never worked as a group...this never happened". Teachers lack team spirit and collective activities (Kokosalakis and Kogan, 2000), and Nelson (1995) adds that, in the US, the teachers themselves have been educated by accounting courses that were technically-oriented. A high specialisation during PhD studies in one or two areas of teaching and research has left faculty members relatively
ignorant about accounting subjects outside their own individual specialties, not to mention other disciplines. It would be unrealistic to expect narrowly-educated specialists to appreciate the value of a broad education. As Lortie (1975) noted, teachers teach as they were taught. The academic teachers themselves never received professional training so they miss some important attributes: "As I said, the workload, the difficulty in coordinating the teachers, we are somehow lost, and we have another philosophy when working in Greece than when working abroad, regarding deadlines, teamwork, etc...so the whole system..."

"As I said, the primary step is to be trained, updated and to coordinate teachers..." Accountants and students emphasise that teachers "teach mechanically", without inspiration about their job while they should find ways to make the lessons interesting, participative and rich. An accountant mentioned: "Introducing changes is difficult [...]. It is certainly easier to give the same lecture over and over, it is easier to repeat material which you know very well and you do not need to spend time on, or do any further work...however, teachers are supposed to contribute new things, which they don't...bring easily". Similarly, Nelson (1995) noted that technical training is comparatively easy to deliver. Most teachers feel more comfortable lecturing on "how to" than assigning a student group to debate "why".

All three groups mentioned the need for teachers to dive into the "reflection process" which permits professionals to update their methods, stand back and reflect on their actions, then make corrective moves or introduce innovations. Teachers do not "reflect" on their teaching practice as much as they should (Schön, 1991; Velayutham and Perera, 1993; Kemmis, 2010; Hazleton and Haigh, 2010; Jove, 2011). Accounting teachers’ non-reflective practice was acknowledged by Adler et al. (2000). Furthermore, the students note that accounting teachers “do not follow the market”, as Grumet (2001) also found. Teachers may have been in the same post for years and failed to update their knowledge on modern accounting practices. A sabbatical to update their practical skills or "faculty internship" could be a partial solution to this problem (Marshall et al., 2010; Turner et al., 2011).

14) **Status Quo:** Teachers are interested in maintaining the status quo. Any activities that would add to their workload raise their working standards or add evaluative criteria are unwelcome. Every effort for change faces strong opposition. Additionally, some teachers
are identified with certain courses and have written books on a specific subject. Albrecht and Sack (2000) have also identified in their study that curricula are driven by faculty interest rather than market demands. These teachers are not flexible to change their teaching methods or materials or even consider this, irrespective of what the market needs or competition dictates. Powell and DiMaggio (1991, p. 30) describe how power affects institutions when the key actors in them realize considerable gains from the maintenance of these institutions. Consequently, the acquisition and maintenance of power within organisational fields requires dominant organisations continually to enact strategies of control, most notably through either the socialization of newcomers into a shared worldview or via the support of the state and its judicial arm.

15) **Workload and Volume of Teaching Material:** A profound barrier to reform, identified by the teachers, was the excessive workload that innovative teaching methods and skills development bring. Teachers have a high workload already, and the extra work will take time away from their research and publications. Moreover, the syllabus is already large and there are usually insufficient teaching hours to cover the technical aspects, as it is. Nelson (1995) and Marshall *et al.* (2010) produced similar findings. As the statistical analysis shows, the option to reduce theoretical knowledge in favour of development was ranked low in terms of preference (rank 9, mean 3.04). However, it should be noted here the EEC recommendation that departments should reduce the theoretical knowledge in favour of introducing interpersonal and other soft skills. The international literature has already introduced the concept of "intentional learning" or "learning to learn" due to the ever-increasing knowledge base (AAA, 1986; AECC, 1990, Paisley and Paisley, 2003). Mayer-Sommer (1990) stated that academics should cover fewer traditional accounting topics and concentrate on problem resolution procedures that are transferable to the workplace, where the role of uncertainty is a major factor in professional decision-making.

16) **Teacher Training and Accounting Education Research:** Teachers identify a lack of training as one of the barriers to skills development, which is in line with Nelson (1995). Even if they wish to teach skills, they are unsure how to do so. They notice the absence of a unit dedicated to academic issues within Institutions. A few have attended teacher training for high school teachers, which equipped them with a lot of confidence, knowledge,
planning and organising techniques to use in the classroom. However, most endeavours to develop teacher skills appear to rely on the efforts of the individual rather than the systematic effort of the academic principles and this finding is in line with Swain and Stout (2000). Law 4009/11 identified this drawback and urges HEIs to establish specific courses to support teaching duties. EU (2013) also recommends the mandatory certified training for professors and the creation of a European Academy of Teaching and Learning. It remains to be seen if the Ministry and HEIs management will respond to the above recommendations in future. Another issue is the absence of an association of accounting teachers in Greece that would bring together accounting teachers to talk about themes relevant to educational issues, skills development and innovative teaching methods. This association would inform and spread information, knowledge, and global advances in learning theories or professional behaviour and attitude.

17) The Protected Profession: The participants believe that teaching at HEIs is a protected profession, a closed profession and teachers are not really evaluated by the market since that prospective financial and tax accountants are not obliged to take examinations in order to receive the accounting licence (level A). A university is a closed system because teachers want to maintain their privileges. The accountants, students and teachers themselves made similar comments: “[...] teachers want to have total control of the Institutions, and they are afraid of the possibility that people in the market are more knowledgeable...and they may outrank the teachers and take their privileges...take their power, management or whatever”.

18) The Teaching Methods: These are limited basically to lecturing, which is a useful method but not appropriate for interactive and active learning. The students believe that innovative teaching methods will attract the students to attend the classes. The accountants believe that new methods will guide students to become more confident and more interested in their future profession.

34 However, this has changed very recently (a month ago) and the passage from professional licence of level B to level A requires the successful completion of a 3-hour online examination.
Barriers arising from the students – divergent coercive-mimetic pressures

19) **Students’ Political Unions:** These are students’ organisations that are supported by the political parties and acquired great power within the Institutions under Law 1268/82. The students’ political organizations have been in many instances a major barrier to the Bologna requirements as well as other HEI innovations, and they strongly react to any policy that comes from a European level. They “belong mainly to the left ideology and are supported by a few anarchists who create riots and use any means to express their strong opposition”, the teachers explained. They form groups that have repeatedly used various means to block meetings, conferences, reward events and career days. The teachers argued that students’ unions have occasionally manipulated the votes at general meetings of students in order to get approval for faculties occupations, some of which have lasted for over two months.

20) **Students’ Lack of Readiness:** Students graduate with low grades or extend their studies. Their motivation is merely to obtain a “paper-degree” rather than to acquire the real knowledge and skills behind it. The reasons for the students’ lack of interest are located primarily in the educational system, which does not always permit students to study the subject they desire. Other reasons include Greece’s economic model and the parents’ attitude that “influences” their children to follow their profession, irrespective of their children’s inclination or desire. The students comment that they are bored in class and that the teachers should find ways to trigger their interest. Students adopt a “passive attitude” towards the learning experience. Similar studies include Ainsworth (2001) and Stoner and Milner (2010).

21) **Rate of Absenteeism:** The high absenteeism rate is a further barrier towards skills development. Teachers rarely have the same cohort of students in the classroom. This finding is similar to other studies (Rebele, 2002; Koppenhaver, 2006). Interestingly, the students themselves, in the interviews and informal discussions, express a desire for course attendance to become mandatory for students.

22) **Students’ Learning and Cultural Background:** Students who are unaccustomed to active learning will not easily respond to it. Innovations should start from primary school so
that, by HE, the students will accept and respond to them; otherwise, they will react in a negative way. The students’ reluctance to take responsibility for and have a positive attitude towards learning to learn and a lack of students’ readiness were found by Adler et al. (2000) and by Stoner and Milner (2010).

Some students lack ethics and respond inappropriately to their teachers, who finally prefer to play safe: “I would like to introduce other teaching methods in my class but I would face problems from the students. Students deride, taunt and mock. I do not know if it is a matter of immaturity or lack of a background education which they should have acquired from school”. Teachers who have tried to introduce innovations have had several problems and received low evaluation ratings by the students who prefer to be “passive” that active learners. Similar findings were presented by Nelson (1995).

11.10.2 Exogenous Weaknesses

The thesis identified and categorised the barriers arising from HEIs’ external environment as barriers from the market, state and employers. These barriers are called Divergent External Isomorphic Pressures (coercive, mimetic and normative) because they prohibit, directly or indirectly, the development of professional skills and the homogeneity with other units in the (European) organisational field.

Divergent External Isomorphic Pressures

Barriers arising from the market – divergent normative

23) Attitude and Culture: In Greece, the pressures for skills introduction has not yet appeared, and the participants emphasised that the Greek market has other priorities and different perceptions about the accountants than in other advanced countries. A good accountant in Greece is the one who “escapes” taxes and who does not “takes time” from his employer, while, “in the UK, a good accountant is the opposite, a person that shares creative time with his employer, this is the important difference”. There are also indications that the market system is failing to respond actively to the efforts to organise the professions (Zaheilas, 2012, p. 144).
24) **The Market Structure:** An “introvert” economy and fragmented market, dominated by micro and SMEs, have neither the “margins” nor the “attitude” to act in larger circles. The SMEs, in many cases, strive to survive and the vision is not towards expanding or exporting that would initiate the need for a well-qualified accountant. This becomes a vicious circle, because an “upgraded” accountant-advisor could support the decision-making and broader strategic options and moves. It is believed that the new institution of “mentoring” could provide a solution to the problems of micro organisations and SMEs’ inability to afford to hire an accountant-business consultant (AIA, 2013).

25) **The Professional Bodies:** The auditors have their own professional body (SOEL) which is very well-organised and responds to the needs of the profession. Financial-tax accountants, cost-accountants and management accountants belong to the ECGr, which is the professional body for economists also. The accountants argue that those in charge of the ECGr work mainly for their own political aspirations; they neither serve nor support the professionals and the development of the profession. The fact that there is no specific professional body devoted to the AP indicates the profession’s “gravity” within society.

26) **Definition of Accountants’ Roles and Duties:** The term “accountant” is widely-used by many practitioners with a diverse range of duties. The participants in the study emphasised the need to differentiate clearly bookkeepers from accountant-advisors, who need to acquire broader knowledge. The ECGr, should have worked harder to clarify these issues, the participants noted.

**Barriers arising from the State – divergent coercive**

27) **The Tax System:** The tax system is identified by the participants as the major source of problems. It is multi-layered and extremely complicated, provoking instability and uncertainty because of the continuous changes. Additional problems arise because there is huge gap between business and tax accounting: “In Greece, tax accounting is very different to business accounting...in other countries, these two converge continuously and there are no gaps between, here due to the gap between tax and business accounting, this phenomenon is created. This means that tax accounting uses a mould, into which all companies should fit, both big and small”.

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28) **The Tax Office**: Some tax office employees expect to receive a “bonus” through the usual “under the table” transaction and this process is generally infecting entrepreneurship. Who cares about professional skills when the main skill needed by accountants is to be able to “manage their connections” with tax office employees? The participants believe that this happens with the political system’s blessing in order to attract voters. However, in the last two years, there have been indications of partial improvement due to the establishment of the electronic tax system.

**Barriers arising from the Employers – divergent mimetic**

29) **The Employers Undertake Multiple Roles**: The employers act as economic advisors for many reasons; due to uncertainty, because their company is small and an “upgraded” accountant is considered a luxury, because they cannot find the proper executive staff, or because they are unwilling to pay a higher salary to a good accountant.

30) **“Accountants: A Necessary Evil”**: Employers think of accountants as a “necessary evil” for their company: “These employers connect the accountant with the taxes they have to pay and not with the business plan that could make their company “take off”. The accountants are responsible also here because they accept lower fee...in order to keep the job. And they do just the minimum possible tasks”.

31) **Employers’ Ignorance**: Employers may not even know how much accountants can support them with business plans, costing and advisory services because the established view is that accountants mainly do the tax and bookkeeping tasks, especially in micro organisations and SMEs. The owner leave no space for the accountant to take the initiative and the accountant, in turn, does not spend time analysing the company further but undertakes only the basic bookkeeping and tax obligations. Accountants feel disappointed by the reality of their job compared with their expectations when they graduated. Their everyday routine ends up being mechanical, repetitive, without inspiration and finally boring, because the creative component is missing.
11.11 Pressures to Introduce Professional Skills

**Question 10:** "Which forces are exerting pressure for professional skills to be introduced into HE accounting courses?"

The three groups were compared separately and with the overall group D (N=1589) regarding their opinions about the pressure on HEIs to develop skills. The ranking of the pressures revealed that the main one is society's expectation that education "should pay attention to the workplace requirements", followed by, in turn, the internal procedures required to "review student assessment" and "HEIs' external evaluation".

Powell and DiMaggio (1991) identified two broad types of pressures for isomorphic change in organizations: competitive and institutional. Competitive isomorphism is related to the search for efficiency within competitive situations, while Institutional isomorphism is a useful tool for understanding the politics and ceremony that permeate much of modern organisational life. DiMaggio and Powell (1983) identified three distinct types of institutional isomorphism: Coercive Isomorphism that stems from political influence and the need for legitimacy, Mimetic Isomorphism resulting from standard responses to uncertainty, and Normative Isomorphism associated with professionalization. In the following section, the isomorphic pressures identified from the various research levels will be presented.

11.11.1 Institutional Pressures

A. **Coercive isomorphic pressures:** These pressures, exerted at the organisational and individual level, occur when organizations depend on the external environment for the resources to survive. In this case, there are pressures from the resource providers including the state and even the larger society to conform to cultural expectations (Dacin, 1997, Carpenter and Feroz, 2001). Scott (1987b, p. 114) argues that the institutional constituents that exert pressure and have expectations include not only the state and professions, as institutions, but also interest groups and public opinion. In this study, it becomes clear that there are coercive pressures on accounting education that originate from the wider societal expectations, a view that is supported by the statistical results. In the interviews, at least 25 phrases were counted that were connected to the expectations and need of society to have higher-skilled accountants. Education impacts on many aspects of
social life, like graduates’ employability, the functional problems of everyday life, companies’ competitiveness, ethics, tax evasion and a country’s overall progress: “The professional world also has expectations of universities, there are real needs...” [...] It is imperative for graduates to acquire professional skills”. Coercive isomorphic pressures are presented below:

1) The introduction of skills in the curriculum will enhance students’ employability: “...Evaluation of candidates is not an easy thing, you cannot easily identify whether a person has critical skills or can make good judgments...therefore, teaching skills at university will help employers to identify the proper candidate”.

2) For companies of all sizes (micro, SME and large), “upgraded”, skilful accountants are in great demand. Changes towards better accounting education will support entrepreneurs to avoid many problems, and this is appreciated by society: “An entrepreneur can avoid many hazards if he has an accountant-advisor...[...accountants are like doctors...they know the secrets of the business...in order to be a good professional, you should have the proper personality so you can stand...to have ethos, discretion, be a wise person...”.

3) An accountant with a broad education and holistic view of the business environment will help the economy and society to escape the vicious circle of tax evasion and corruption: “...in Greece, entrepreneurs have an attitude towards tax evasion...if the accountants...are scientists...I believe these people will help to move in a direction...to create a new entrepreneurial culture, about tax evasion and generally at all levels...and this would impact on all societal levels...”.

4) Upgraded accountants can support companies to become internationally competitive and improve society and ethics: “If you have an upgraded accountant, you have an upgraded company, the more upgraded professionals a company has, the more competitive it becomes. We often see companies trying to compete abroad and feeling disadvantaged”.

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5) The issue of competitive accountants concerns the future of the country. The safer companies feel to take risks, the more they will expand abroad, and so the higher will Greece’s international competitiveness rise.

The following two pressures are exerted at the organisational level:

6) Coercive pressure arises from the fact that, due to financing constraints, the HEIs will have to turn to private funding. To claim and receive funds from private enterprises, HEIs must first achieve a high quality status which is closely connected to graduates employability.

7) Further coercive pressure constitutes article 71 of Law 4009/11, which clearly states that, if the HQAA decides not to accredit a department’s course, then the Minister of Education has the right to reduce that HEI’s financing as well as new students’ entrance. The quality, effectiveness of the educational procedure, evaluation of the teaching process and graduates’ employment rates are among the criteria for state funding. Learning outcomes and intended skills are included in the accreditation criteria, but it remains to be seen whether the HEIs will apply the Law in a superficial manner or will make radical changes and improvements towards skills introduction.

Pressures are exerted also on the individual level (teachers) through the evaluation and accreditation body (HQAA):

8) As from September 2013, a new format for course outlines was proposed by the HQAA which teachers should follow, which seeks to connect the credits with the learning outcomes. This format is much more detailed than the previous one and “guides” teachers to refer to the specific skills to develop, the assessment criteria and the teaching methods that will be used in order to develop knowledge, skills and competences. The EEC evaluations constitute criteria, among others, for HEIs’ funding and students’ allocation to departments. It would be interesting to see whether the new guidelines for skills introduction will be seriously addressed by faculty.

9) Pressures are exerted at the national level too (the state; see section 7.5) to act as an “Internal Shaming Mechanism” that will trigger further reforms:
10) The EEC refers to the high number of students per class and the low staff/student ratio. These are constraints that prohibit the application of innovative teaching methods, the variability of teaching assessment, and the provision of skills and competences that will enhance graduate employability. The state should take measures to remedy these barriers to quality.

11) The EEC refers to the entrance examination systems as well as the HEIs’ facilities and space allocation. With regards to the entrance examination system, the EEC highlights the need to create a better fit between students’ first degree choice and actual enrolment in a university or ATEI, as this would result in a better learning experience and a motivated student population. Also, regarding space, having two or three teachers sharing a room does not promote personal growth and is not an environment conducive to research activities.

12) The EEC recommends to the State the introduction of a central HE quality assurance policy, with meaningful provisions for rewarding best practices and sanctions for individuals, departments and Institutions that consistently perform poorly. It is notable that the Ministry of Education (MoE) has announced the practice of “excellence” which aims to reward scientific institutions and research teams. It remains to be seen if this initiative will have any impact on skills introduction in HEIs in future.

13) The comparison with the corresponding European academic practices definitely puts “pressure” on the MoE. The EEC uses specific discourse like: “The law should change and should allow Institutions and departments to determine their own teaching loads, in line with internationally accepted standards”.

B. Normative isomorphic pressures

Normative isomorphic pressures for change happen when organizations seek institutional legitimacy and they relate to professionalization (Meyer and Scott, 1983; DiMaggio and

Powell, 1983). Powell and DiMaggio (1991, p. 70) define professionalization as “the collective struggle of members of an occupation to define the conditions and methods of their work, to control ‘the production of producers’ and to establish a cognitive base and legitimation for their occupational autonomy”.

Accounting teachers “belong” or “are influenced” indirectly by three distinct professional networks; *a) the network of public HEIs accounting teachers* (inside and outside Greece), *b) the network of private school accounting teachers and the network of professional accreditation school teachers* and *c) the network of professional accountants*. An accounting teacher should have the qualities of a teacher and at the same time be aware of the theoretical concepts of the science as well as accountants’ practical or applied competences, which can prove difficult to keep up to date with, given the multiple reforms of Greece’s tax and economic environment. Considering the above we could discern the following pressures:

14) Private HE has increased considerably in recent years on a global basis (Meyer and Rowan, 2006). The accounting teachers who teach at these private Institutions constitute a professional network with which the public HEI teachers are expected to fall in line. In some cases we heard both students and accountants to complain about public Institutions and public teachers: “*Definitely, if private degrees are recognized by the state, the (state) teachers will be obliged to learn more things and give more to their students so that they are at the same level as the private universities*”, ‘*In the public HEIs, we pay less attention. Anyway, the courses in the private Institutions are of higher quality...much higher quality*”.

15) The informal discussions with students who have completed their internships and entered the market have identified problems with the state HE teachers’ updated knowledge on the current market changes. This point reinforces the need for professional internships of accounting teachers so they can keep up with the professional practice.

16) Contact with colleagues from abroad reveals different levels and types of knowledge (skills and competences). Therefore, if local teachers wish to match the level they see in
other academics, cultures and civilizations, they will have to adjust to the required reforms.

17) The liberalisation of professions and establishment of licensing exams for accountants by the ECGR would exert pressure on the teachers: "We haven’t been evaluated as teachers, nor do we know the quality of our graduates, we know nothing about what the market thinks of us and we don’t want to find out, because someone else provides the money [the state]. However, soon this will stop"\(^ {36} \) [due to the financial crisis and the privatization of education].

18) The opening up of HEIs to the market and society through the new 15-member management scheme faces resistance because teachers "are afraid that they’ll lose their privileges and that they will not meet the required standards".

C. Coercive and Normative-Mimetic Pressures

At the Organisational level (HEIs), coercive and normative-mimetic pressures are distinguished, between which there may not always exist a clear boundary. Some pressures may fall into both categories, as appears to be the case here.

In relation to the "shaming mechanism" (see section 7.5), it could be argued that normative pressures are exerted on the nation’s team during the intergovernmental meetings. As Ravinet (2008, 365) explains, “the follow-up tools and activities though are not officially binding, they are far from neutral and create effects of socialisation, imitation, and shame”.

19) Ministers will have to explain at the European Ministers’ meeting their stance in relation to their national report and “being the bad pupil in class” can be very embarrassing so, normally, every Minister (individually and every nation, one might say) will try to adhere to the standards, and to be equally successful among his colleagues and the other Ministers of education (and the other nations within the

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\(^ {36} \) As mentioned before, written on-line examinations were established last month by ECGR for the professional financial and tax accounting licence for Level A.
Bologna group of nations). As the Minister\textsuperscript{37} commented: "There are issues like the evaluation of HEIs which put us under pressure because, on 26th May, we have to present ourselves in Bergen, to the political authorities, representatives of Rectors and students, where we have to report what we've done since 1999 to today. However, even if "Bologna" did not state it (the evaluation), we should have done it by ourselves".

20) Greek HEIs have been under the MoE's "protection" and "jurisdiction" since their establishment. In the last few years, they have been requesting autonomy, as enjoyed by the other European HEIs, but this would require certain qualities and behaviour on their part, like self-awareness, taking initiatives, policies, quality mechanisms, information dissemination among HEIs departments and teachers, and feedback for teachers and students.

21) HEIs have not been "ranked" due to the high levels of resistance exhibited at the beginning of the "quality adventure". Obviously, in a small society, it is possible to "know and assume" each HEI's quality and responsiveness by measuring the "preferences" of Pan-Hellenic examinations' candidates each year as well as their members' scientific publications, but this cannot be the only measure of quality. Ranking will be a natural step in the quality procedures, with a high ranking presupposing good quality. Quality presupposes maturity, the acceptance of critique and the improvement of professional skills. Other comparison and ranking tools already exist or are in the process of being published, like the U-Map\textsuperscript{38} tool, which facilitates comparisons of HEI's performance on a global level, based on: serving different student populations; the courses offered; and their involvement in research, knowledge transfer, regional engagement and internationalisation.

D. Mimetic Isomorphic Pressures

\textsuperscript{37} MoE Minister, Ms Giannakou's speech at the start of the national dialogue on education, Friday 21 January, 2005.

\textsuperscript{38} http://www.u-map.org/
There are mimetic pressures at the individual level which act as driving forces for change.

22) Qualified teachers who have studied abroad are in favour of change. They make efforts to introduce innovation into the teaching methods or to change attitudes but they face high resistance or are very few to have an impact on the overall educational settings: "There are people but they constitute...a small oasis in a big desert. Individually there are people, without doubt. There are people who make efforts, who write, who participate in conferences, who show mobility but they are no more than 2-3%, no more". This finding was mentioned by all of the qualitative reviews (interviews, external reports, informal discussions). As Smith (1998, p. 221) argues the "knowledge workers" will gradually seek for themselves new roles away from the "subaltern positions that leave them with less rather than more autonomy and discretion over their work".

23) The comparison with the corresponding European academic practices definitely puts pressure on Greek teachers. The EEC uses specific discourse like: "The number of undergraduate courses is excessive compared with similar courses abroad".

24) The requirement for professional qualifications. "Moreover, given the established global demand for professional accounting qualifications, an increasing number of accounting departments has adapted their curriculum to cover the requirements or even gain exemptions for the awarding of such qualifications (e.g., ACCA, CFA). Evidence that the Department’s Curriculum has been adapted towards this direction has not been established here”.

25) The changes will come from young teachers who have the ability and skills for innovation in contrast to older teachers who lack the skills and prefer to preserve the status quo. "Younger teachers who have the attitude, skills, the knowledge... I believe that these people claim opportunities" [...] "I believe that older teachers or those with lower skills resist change and put up barriers to new activities”.

Mimetic pressures are exerted at the organisational level as well:
26) The willingness to be part of the global evolution will force Institutions to change, and the desire to acquire the ECTS label\(^\text{39}\) will force them to implement reforms properly. It should be noted here that the ECTS Label is an EU initiative.\(^\text{40}\)

E. **Mimetic – Coercive Pressures** exerted at the national level.

Obviously the local governments voluntarily signed the Bologna Agreement. Therefore, one could talk only about the mimetic pressures that originate from the need to mimic other advanced nations and benefit from their experience, technology and success. However a sense of commitment results from participation in the Bologna Project, which became “obligatory” at the European intergovernmental level.

Researchers provide the following reasons to explain why “it is no longer possible to create national HE policies that are anti-Bologna” (Ravinet, 2008, p. 354).

27) The first reason is that the Bologna Objectives have been used as leverage for national reform in most nations (Dyson and Featherstone, 1996; Keeling, 2006), which also applied to Greece. For example, one participant commented: “*My opinion is that Bologna aims to combine good quality education for the social and market needs*”.

28) The second reason is the rhetoric which is used about the “knowledge economy and society” gives HE a new role in participating in the increasing competitiveness of the nations. Attending to the Bologna vision and implementing its objectives provides the national states with “a rational way to act” and, at the same time, supports them with legitimacy and resources. Therefore, the HE systems should become effective and open to the world. The HQAA member supported this by commenting: “*I think the problem is at this point...because we need changes that can make us competitive with other nations...other educational systems...the aim is the product of the process...the graduates...*”. The Knowledge economy requires more than guidance to rote learning and schools should provide more than just literacy to children and sterile knowledge to

\(^{39}\) [http://www.iky.gr/ects-ds-labels](http://www.iky.gr/ects-ds-labels)

students. Graduates need to learn how to become leaders in teaching, learning and self-management and this requires that teachers themselves have acquired these skills (Meyer, 2006).

29) The third reason behind the “binding Bologna obligation” is the follow-up mechanism’s structure and tools, which include the national reports[^41], stocktaking reports[^42] and scorecard approaches[^43], all of which make it easier to compare nations and recognise which ones are falling behind in this “collective Bologna game”. The follow-up mechanism “allows for a naming shaming mechanism to develop, which has been identified by the players involved” (Ravinet, 2008, p. 362).

30) EU funding of the reforms is another reason why the recommendations are binding on the member countries (Zmas, 2012).

### 11.11.2 Competitive Pressures

Powell and DiMaggio (1991) described competitive pressures as applying in the open market. At that time, they had not envisaged the wide expansion of Private HE. State HE is retreating in favour of Private HE globally (Meyer and Rowan, 2006), including Greece, despite the state-imposed restrictions and article 16 of the Constitution. Therefore, there are pressures that come from the market. The market growth in the HE field is not setting new NIS obsolete. On the contrary, NIS can help us appreciate the isomorphism that is truly associated with HE privatization (Levy, 2006). Two reasons are identified for the strong protective measures against HE liberalisation. The first is the public organisational field’s (public educational sector’s) vested interests and, on the other side, society’s widespread culture of opposing the “marketisation” of education. It is possible to distinguish two dimensions in the competitive pressures exerted on Public HE:

[^43]: http://www.ihep.org/Research/thebolognaprocess.cfm
Part of society agrees with HE liberalisation. In Greece, private tertiary education function under the label of Transnational Education or Colleges, and are gradually gaining standing in the market and society. Private tertiary institutions partially contribute towards reducing students’ immigration. Although public tertiary education is deeply anchored in society’s norms and expectations it may happen a small but dynamic alternative institutional sector under certain circumstances, to become the take-off point for more massive metamorphoses Meyer (2006).

31) Private universities are a new professional field for many unemployed graduates with high qualifications, who worked in the public HEIs as contract teachers in the past. The financial crisis has reduced significantly the contracts available in state universities, and these teachers have faced unemployment or underemployment in recent years.

32) At the same time, there have been complaints about the state HEIs’ efficiency from students and parents, as expressed partially through students’ immigration. If young people fail to get a place at a “good” local university, their parents prefer to send them abroad to study, in Europe or the US. Many graduates who can afford it prefer to take masters’ courses abroad. Young middle class people have been able, over the past 30 years, to afford to study abroad, but the recent deep recession has reduced the educational immigration rates. State HEIs already face competition both from overseas universities and the private universities at home. As one graduate argues: “If the competition rises more than it already is...rather the public universities do not know about it, so if the competition increases, it will be obvious that the public universities will have to react and improve the quality of their courses and in general take education seriously, as I said. The law does not provide for the licensing of private universities so they think...we are protected. However, if the private universities’ degrees are recognized, I think this will act as a challenge to the state universities to increase their efficiency, and this will be good, very good”.

The students comment also on the pressures that HEIs do not realise yet: “From everywhere (there are pressures), from private universities, and from universities abroad, in Europe and the US, where they provide very serious degrees. I think that the state university is under pressure from everywhere but simply does not know it yet, has not
realised...I hope that, when HE is privatized, the state universities survive. They should function at the same level (as the private universities) for those students who cannot afford to go abroad or to study at a private university. I don't believe that they're at the same level now”.

One could assume that Greek society admits indirectly that the state university courses are of lower quality than the private ones although we have heard the opposite arguments from informal discussions we had during this research. Some people fear that, if the universities were liberalized, then all students who can afford it would rush to a private one because they offer higher quality studies while the low income students would remain at the degraded state HEI, while others believe that liberalisation will initiate true reform within public HEIs, which will make them more competitive.

11.12 HEIs' Strategic Responses

Question 11: “What are the HEIs’ strategic responses to the institutional changes designed to foster the introduction of professional skills into HE accounting courses in Greece?”

In 2003, the Greek government began efforts to harmonise the local system with the Bologna and EU Requirements, and the HEIs have undertaken different strategies to introduce the reforms. As noted above, this was far from a peaceful process, but there were strong reactions from the start against everything that the word “Bologna” would bring with it, such as evaluation, professional skills, a management board, and reforms of university management. Following Oliver (1991)'s typology, this study classified the strategies adopted by the HEIs as defiance, manipulation, avoidance and compromise.

Defiance: The first of the HEIs’ strategies was to reject any changes. The usual tactic has been to dismiss any new norms by ignoring them. The higher and middle management simply delays the application of any new law or change for as long as possible:

“These (the reforms) come from changes to the international environment or the EU institutional framework...all these new changes I have the feeling that they are incorporated in the legislation when things reach a limit...reach a point that we cannot delay it anymore, this is my feeling generally”.

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“Deans react to the law [4009/2011]...perhaps some people will not have a chance to be elected again, they try to delay as much as possible... 

“Our legislature adopts reforms from Bologna or the EU as late as possible...I’ve a feeling that Greek society is unreceptive to changes...we have inertia or a fear of changes, and we talk about our Institutions here, for all Greek Institutions, for Greek society and the Greek state in general”. 

Also, a lack of sanctions and feedback for not doing things or obeying the rules and norms is also a tactic that shows defiance of reforms:

“The law is not applied because there are no penalties to ensure that a person who does not do something will be punished...because people, teachers from inside have ensured that there are no sanctions...”

“We manage to escape the law because there is no one to control if we apply the law or not”.

Another tactic used by a few HEIs was to attack the reforms using legal means. For example, one university took legal action against the MoE’s decisions. 

**Manipulation:** Another of the HEI’s strategies is manipulation. The tactics that were used in this case was primarily to influence public opinion and the state. Discussions, long deliberations, newspaper articles, press releases, and announcements were used in an effort to influence the decisions for a long time, both before and after the issuance of new laws. Another tactic was control; the effort to dominate the institutional constituents and processes by nominating as Minister of Education during the interim government an academic teacher who openly opposed the reforms and who attempted to change the New Frame Law and abolish some important changes, although the strong public opposition prevented this. The second attempt at control was by electing a Dean who opposed the reforms as Deputy Minister of Education. This time, the control efforts proved successful, important articles were removed from the Frame Law 4009/11, and revised Law 4076/12

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44 http://www.auth.gr/news
was issued. This control tactic was used after Frame Law 4009 was issued between January and July 2012.

Avoidance: A widely-used strategy is avoidance. HEIs manage to avoid changes by concealing the reality, through using different tactics like applying minor changes or hiding problematic areas. Ceremonies are the means to escape the reforms:

“There are people who have the old attitude and any change to an international level “shakes their balance”. They oppose this...so either they will apply change if there is no escape or they will transform the change into a procedure without substance...”

“I imagine that, during external evaluation, the way to avoid reform is to hide aspects which are problematic, or try to apply changes as imperceptibly as possible, or...make it look like the targets have been achieved...while in reality nothing happens”.

“When we look...I think a way to avoid the law is to look at the ceremonies and not go to the substance of situations...this is a way...”

“...we pretend we change, we pretend we change but there is no shame...

Compromise: This strategy was applied for certain reforms. The HEIs accepted certain elements but only on the surface, like ECTS introduction. In this case, an important reform of the educational system was transformed into a procedure without substance. Its application was done mechanically, merely a numerical calculation to placate the state requirements.

Acquiescence: There are certain aspects of the educational innovations which were fully accepted and adopted by the academic world after the initial reaction. Many HEIs have largely complied with the norms and rules and are proud of their efficiency. An example would be the Erasmus program, for which HEIs proudly promote their successful activities and rewards from the European Commission.

González et al. (2009) conducted a comparable study in Spain, a Mediterranean country, similar to Greece, and found that the Spanish universities began with an “avoidance” strategy then moved to a “compromise” strategy with the implementation of ECTS.
11.13 *Forecasting the HEIs' Strategies*

*Question 12: “Which antecedents influence the choice of strategy for this and how can these predict the HEIs' future responses?”*

Oliver (1991) argues that it is possible to forecast the repertoire of behaviours that organizations may exhibit in response to institutional pressures and expectations. Their strategies and tactics will depend on their *willingness* and *ability* to conform to the institutional pressures, which in turn will depend on the specific prerequisites that shape the boundaries of their resistance to conformity. These prerequisites are: the cause, the constituents, the content, the control and the context of the pressures (Oliver, 1991, p. 159). Each of the above five antecedents have two predictive dimensions, as shown in the following table:

<table>
<thead>
<tr>
<th>Antecedents</th>
<th>Cause</th>
<th>Constituent</th>
<th>Content</th>
<th>Control</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predictive</td>
<td>Legitimacy</td>
<td>Multiplicity</td>
<td>Consistency</td>
<td>Coercion</td>
<td>Uncertainty</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Efficiency</td>
<td>Dependence</td>
<td>Constraint</td>
<td>Diffusion</td>
<td>Interconnectedness</td>
</tr>
</tbody>
</table>

The above predictive dimensions, when combined with the specific antecedents (or factors), can be used to predict which strategy an organization will follow. Oliver (1991) presents ten dimensions (two for each of the five categories) that can be used to predict organizations’ behaviour. The range of possible behaviour is shown in the following table; for example, the first row suggests that acquiescence is more likely to occur when there is a high degree of legitimacy attainable from conformity, but the compromise, avoidance, defiance, and manipulation strategies are more likely to occur when the anticipated legitimacy is low. The dominant dimension for each antecedent is underlined.
Predicting HEIs’ Strategic Responses

Table 11-2: Institutional Antecedents and Strategic Responses (Oliver, 1991, p. 160)

<table>
<thead>
<tr>
<th>Predictive Factor</th>
<th>Strategic Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acquiesce</td>
</tr>
<tr>
<td>1. Cause</td>
<td></td>
</tr>
<tr>
<td>Legitimacy</td>
<td>High</td>
</tr>
<tr>
<td>Efficiency</td>
<td>High</td>
</tr>
<tr>
<td>2. Constituents</td>
<td></td>
</tr>
<tr>
<td>Multiplicity</td>
<td>Low</td>
</tr>
<tr>
<td>Dependence</td>
<td>High</td>
</tr>
<tr>
<td>3. Content</td>
<td></td>
</tr>
<tr>
<td>Consistency</td>
<td>High</td>
</tr>
<tr>
<td>Constraint</td>
<td>Low</td>
</tr>
<tr>
<td>4. Control</td>
<td></td>
</tr>
<tr>
<td>Coercion</td>
<td>High</td>
</tr>
<tr>
<td>Diffusion</td>
<td>High</td>
</tr>
<tr>
<td>5. Context</td>
<td></td>
</tr>
<tr>
<td>Uncertainty</td>
<td>High</td>
</tr>
<tr>
<td>Interconnectedness</td>
<td>High</td>
</tr>
</tbody>
</table>

The HEIs’ past behaviour will now be interpreted by examining these five factors (cause, constituent, content, control, and context). The notion of gaining “legitimacy” by accepting the Bologna requirements was relatively low because academia did not consider professional skills and other innovations to fall under the state universities’ remit. Also, academia did not believe, at least in the early years, that responding to the Bologna Requirements would bring prestige to the Institutions. As demonstrated, even the word
“Bologna” inspired (and inspires sometimes) riots. The variable of “efficiency” has not been a target for the state universities’ functioning. Only recently has the economic crisis brought these concepts to the forefront of public policy. Therefore, the “Cause” prerequisite led the universities to adopt negative (resistant) strategies. The “Constituents” prerequisite depends on multiplicity and dependence. The “dependence” dimension is high for the educational system since state funding is almost the HEIs’ only funding source. Normally, this variable should have led the universities to adopt “positive” strategies. However, the results show the funding threat had no impact on the universities or their management. The participants repeatedly expressed doubt about the effectiveness of funding threats so, in real terms, the dependence variable was ineffective. The “Content” prerequisite includes the consistency and constraint dimensions. The “consistency” dimension was low since the innovations (skills, among others) opposed the beliefs and status quo. The “constraint” dimension is linked to the HEIs limited autonomy. The universities’ management has regarded the 15-member management board as constraining their power. Also, the new teaching culture with learning outcomes, skills and competences is absolutely new, imposing borders and guidelines on teachers. This definitely is a constraint for academia, which hitherto enjoyed a wide degree of freedom. Therefore, these dimensions led the universities to adopt negative strategies. The “Control” prerequisite includes the dimensions of Coercion and Diffusion, while the “coercion” dimension does not exist, the participants revealed. The absence of sanctions characterises the absence of the coercion dimension. Diffusion also does not exist. The teachers commented that there was no communication, rewards or explicit policies within HEIs for the implementation of reform. Evidently, this prerequisite led to the adoption of negative strategies. The last prerequisite is the “Context”. It has two dimensions: uncertainty and interconnectedness. It appears that the uncertainty about the methods for developing skills, as mentioned by the teachers, did not affect them in the previous decade because there was no discussion of skills development. Between 2003 and 2010, there was no (economic) uncertainty in society, but since 2011, Greece has been suffering a severe economic crisis, so economic uncertainty has arisen among the teachers. However, despite the harsh economic crisis, academics are maintaining their resistant strategies. Regarding interconnectedness, an important aspect is
the professionals’ participation in accounting education plans development, which is non-existent and unwanted. One teacher revealed:

"The Economic Chamber is trying to defend its own interest. In accounting education, they've not contributed anything. I remember they invited me last year to a meeting and I advised them not to intervene...because what I was hearing from them was...they suggested they should decide on the exam questions..."

"Not only do they not interfere but listening to their intentions...they should not interfere". Consequently, the context antecedent leads to the adoption of negative strategies also.

There are additional factors that reinforce HEIs’ selection of negative strategies. Oliver (1991) identified three further (administrative or semi-institutional) antecedents, called Internal Semi-Institutional Divergent Pressures because they prohibited the establishment of reform:

6. **Locus of control:** Organizational leaders or managers with an internal locus of control (Spector, 1982) and a high need for autonomy (Birch and Veroff, 1966) may be more likely to employ resistant strategies, which had a high impact on Greek HEIs’ adoption of a resistance strategy. As evident from the discussions, resistance to the last Frame Law 4009/11 was due to the HEIs’ leaders’ refusal to relinquish their privileges and full control over the organisations.

7. **Cohesive culture:** Organizations that are highly cohesive and have a strong internal culture may be more prone to resist external expectations and beliefs. This statement is also valid in the present case. The educational sector has its own internal culture, is cohesive and shares the same beliefs. In this case, reforms are likely to meet strong resistance, as proved to be the case in Greece.

8. **Common backgrounds:** Common educational and ethnic backgrounds among status groups in an inter-organizational field may also tend to promote conformity (Galaskiewicz and Shatin, 1981). This research has shown that Greek teachers share the same attitude regarding skills introduction, although they are positive that they propose to introduce them as a separate course, indicating that these are separate from the scientific knowledge of the accounting discipline. They are educated under the same principles that
emphasise technical/scientific knowledge while (soft) skills are treated rather as personality traits. Greece is not a multicultural nation. The foreign/European teachers with varied approaches to teaching are rare in the Greek classrooms of public HEIs. Therefore, the teachers recycle their own way of learning, teaching, culture and attitudes.

Overall, from the above eight antecedents examined in relation to HEIs’ past behaviour, only the “dependence” dimension was identified that could have been conducive to positive strategies. However, other dimensions, like the lack of a coercive mechanism, neutralised this one. If the predictive table above was to be redrawn, attempting to predict the future, differences would emerge in the efficiency, legitimacy, and uncertainty dimensions.

1. Efficiency: The scarcity of resources due to the economic crisis will lead the HEIs to use their funding more efficiently. There are signs from the public management authorities that they wish to “act” according to efficient socioeconomic criteria. For example, it is said that the MoE has assigned a private company to compile a study on “Plan Athena”, which intended to reduce the total number of HEIs and academic departments in an effort to rationalise the inefficient spread of the educational system across Greece. This act by the Ministry could signal the effort to adopt more socioeconomic criteria for the functioning of the educational field, according to Powell (1988) who argued that the re-organisation of a slow public organisation, under the advice of a consulting firm, may signal a major turn to more business-like orientation.

2. Legitimacy: Universities will increase their social gain (legitimacy) by adapting to the changes demanded by the external constituents (in this case, the Greek government) in order to comply with the EU requirements. The EU recommendations are gaining status within HEIs and among teachers. Gradually, society is becoming more “open” to issues like professional skills and new teaching methods, for several reasons, including:

i. Private transnational education uses new methods and adopts a more “European type culture” that spreads and makes them more familiar to society.

ii. The economic crisis is leading teachers to work abroad, where they will acquire fresh perceptions of learning and teaching methodologies.
3. The professionals will have gradually a greater involvement in the educational accreditation, especially so for the degrees of doctors, nurses, architects, pharmacists, but also for engineers, accountants and lawyers (Law 4009/2011). We have seen recently in Greece demands by certain professional bodies to be given more rights to accredit, evaluate and assign professional licences. However in this case care should be taken not to overburden accounting courses with technical material as happened in other contexts (Paisey and Paisey, 2007).

4. Uncertainty: The state’s intention to reduce the total number of academic Institutions and rumours about the closure of departments has spread wide uncertainty among the academic staff, who anticipates immediate risk and uncertainty regarding their positions that had been secure for many years. Public HEIs, due also to the possible opening of education market, will start to compete among themselves to attract students. The successful HEIs will be those that equip their students with the knowledge and skills demanded by the stakeholders. This increased competition among HEIs, coupled with the funding scarcity, will increase the HEIs’ dependence on their students. Therefore, the universities and ATEIs that wish to survive should satisfy the demands of their students for high quality, integrated education that promotes their employability successfully.

The increased uncertainty, combined with the need for legitimation and efficiency, will encourage the HEIs to adopt more neutral or positive behaviour, like compromise and acquiescence. All of the above changes will cause the HEIs to modify their strategies as we have seen in other cases (Oliver, 1991; Etherington and Richardson, 1994; Gonzalez et al., 2009).

11.14 Final Conclusions

This thesis has identified the internal and external isomorphic pressures towards change, named **convergent isomorphic pressures**. These are both the institutional (coercive, normative and mimetic) as well as the competitive pressures that arise from market competition. The thesis also identified the internal and external isomorphic pressures which act as barriers to change, named **divergent isomorphic pressures**. These can be institutional or semi-institutional divergent pressures that remove skills from the learning environment. Finally, the present study identified external divergent pressures that come from the market, state and employers. The EU recommendations and stocktaking reports constitute external convergent isomorphic pressures that support the whole system within a network of comparable systems. All of the forces that exert pressure on the educational system are represented in the following figure.
Figure 11-1: Convergent and Divergent Pressures on Professional Skills Development on Greek HE Accounting Courses (C=coercive, M=mimetic, N=normative)

In the above figure, the rectangular shapes represent all of the convergent institutional pressures (forces) on the development of professional skills within accounting courses. These come from the universities’ internal environment, the external competitive environment (the market) and the “legal” environment (the EU and Bologna Requirements).

The divergent factors are represented by the ellipses and are the internal (institutional and semi-institutional) and external forces (the market, state and employers). The whole analysis has proved that the recommendations of the Bologna seminar on ECTS and student workload in April 2008 in Moscow were of critical importance. Greece failed to follow...
these recommendations and, consequently, to implement the changes (see section 3.5.5.1). It is reminded that the shift from an input- to an output-oriented approach requires a cultural shift at all levels. Also, the proper implementation of ECTS requires concerted action by the public authorities and all of the other stakeholders if it is possible to bridge the gap between commitments and actual practice. Additionally, Greek HEIs have failed to follow any of the recommendations made in the ECTS users’ guide (see Section 2.5.1) and, consequently, the implementation of a credit transferral system has remained a mechanical calculation, with no impact on students’ learning experience.

11.15 Chapter Summary

This chapter has summarised and commented on the present multi-level, multi-method study’s most important findings, which have been integrated and discussed in order to provide answers to the research questions. The findings have been interpreted through the use of NIS and the institutional and competitive pressures exerted on educational process’ participants. On the one side, a plethora of barriers have been identified that constitute serious omissions that prohibit the establishment of reform. On the other side, external institutional (coercive, mimetic and normative) and competitive pressures have been identified that favour reform. The participants repeatedly mentioned the degree of protection surrounding academia, which was described as “a fortress into which no pressures can intrude”. Between 2003 and 2013, the HEIs have accepted or resisted the reforms to differing degrees, employing a range of strategies and tactics to achieve this.
CHAPTER 12 Conclusions and Implications

12.1 Introduction

The purpose of this chapter is to summarise the main findings, discuss potential contributions to existing research and present the limitations of the study. Further directions are provided for prospective research. The following section (12.2) briefly summarises the study. Section 12.3 provides an overview of the main findings of this thesis. Section 12.4 discusses the potential contribution of the study to existing knowledge. Section 12.5 identifies the limitation of the thesis and, finally, section 12.6 makes recommendations for future research.

12.2 Aim, Strategy and Methods

Many countries, starting with the US in the last quarter of the 20th century, have undertaken considerable efforts to reorganise their educational systems in order to make them compatible with the economic changes and technological advances. HE globally is in the process of changing in order to include, among other reforms, the introduction of professional skills that will better equip graduates to succeed and support business in a constantly-changing, demanding working environment.

The aim of the present study has been to explore the situation in Greece regarding accountants' professional skills and their introduction to the HEIs' accounting courses. This gave rise to the following main research question: “How are the Business Administration and Accounting Departments of Greek Higher Educational Institutions responding to the pressure to promote students' professional skills?”

In order to answer this question, 12 sub-questions were developed, researched and discussed in the various stages of this study.
This thesis started by providing an overview of the reasons directing the educational systems towards skills development and the formation of the Knowledge Economy and Knowledge Society concept during the last quarter of the 20th century. A detailed analysis was offered on how accounting education can contribute to the development of professional skills in order to transform accountants into highly successful management team members. The study proceeded by examining the Greek context.

The author adopted a mixed methods methodology, firstly, because of the nature of the research problem that demands multiple approaches and, secondly, because of her philosophical stance which is a conjunctive rather than a disjunctive position towards most situations in life. The author did not find any other studies on skills development within Greek HE courses. Therefore, this study has been exploratory in an unknown field in Greece. The research area has origins and implications that span the stakeholders’ educational, political, psychological and social life, individually and collectively. Consequently, this is a very complicated situation, which is difficult to interpret only through one or the other approach. The theme under research involves multiple stakeholders: teachers, students, accountants, as well as groups, institutions, political parties, professional bodies, and the local government as well as the European institutions and regulations. Hence, the units and levels of the investigation are multiple, multi-layered and diverse.

The strategy that was employed has been a 3-Phase, Sequential Exploratory Mixed Method and Multi-Level Design. Each of the study’s three phases builds on the results of the previous phase. The levels of analysis were: international (mainly Anglo-Saxon and European), national (Greek state Laws), organisational (HEI & businesses) and individual (teachers, students and accountants). The units of analysis were organisations, institutions and individuals. The methods employed were qualitative (documentary analysis, interviews, informal discussions, web-based research) and quantitative (survey research). Using a variety of research methods, the findings produced were interpreted through the Neo-Institutional Theory, specifically the Isomorphic and Competitive Pressures to reform. The New Institutional Theory is one of the most widely-used perspectives in organizational analysis to study and understand changes in organizational fields (Dacin, Goodstein, and
Scott, 2002). New Institutionalism is best suited to analysing organizations that are threatened by environmental uncertainty under change conditions and, according to Powell and DiMaggio (1991), they are obliged to compete, not only for resources and customers, but also for political power and institutional legitimacy, for social and economic fitness. Neo-Institutional Sociology (NIS) proposes a framework of institutional and competitive pressures that act on Institutions during reform periods and shape their behaviours. The Greek educational system has been undergoing a process of essential reform since 1999, when the Bologna Agreement was signed, and particularly since the Lisbon strategy came into effect in 2000. This research has explored the necessity for the reform regarding the introduction of professional skills, the manner in which Greece has accepted the imposed changes and the impact they have had on the educational and business systems. In the following section, a summary of the main research findings are presented.

12.3 Main Findings

The main research findings include the adoption of the Bologna Principles and the importance assigned to accountants’ professional skills, as well as graduates’ actual (exhibited) performance regarding professional skills. The findings also include the barriers to and the pressures that support skills development, as well as the best ways to introduce skills into the accounting curriculum.

International Environment

- HE is becoming more international in nature regarding the development of professional skills.

- Accounting Education is following the educational trend. HEIs’ BAA departments worldwide are making considerable efforts to develop students’ professional skills.

- The Bologna Agreement and the European Commission promote graduate employability through the concepts of learning outcomes and the teaching of professional skills.

- ECTS should be connected to courses’ learning outcomes, which include the “knowledge, skills and competences” that graduates should possess by the end of their learning experience.
The Greek Context

In Greece, the discussion of professional skills has not yet been substantially extended to the HE level, despite the issuance of the relevant Laws by the state (2005, 2007, and 2009), which was accompanied by intense and occasionally violent reactions and riots. However, as from spring 2014 and following the reforms of “Plan Athena”, the new emerging departments were asked to organise their new programme of studies introducing knowledge, skills and competences. The findings of this study suggest that so far the introduction of skills was done superficially to satisfy legitimation issues and the matter of credits is still a mechanical calculation apart from limited cases. Further research will need to be done in the future on this subject.

Importance and Delivery of Professional Skills in Greece

- Professional skills are considered important for all stakeholders (teachers, students and accountants) but graduates’ performance remains low. A wide gap was found between the importance assigned to skills and the delivery of these skills by the educational process.

- Greece’s current educational system and culture, with its emphasis on the technical aspect of education, is closer to that of countries like China, Syria and Spain. Greece’s educational culture is mechanical, book-driven, and non-reflective, with an overt technical emphasis, very different from the western educational systems’ interdisciplinary character that was established decades ago or is in progress.

- The IP index that was compiled revealed that the first skill that needs immediate attention is “the ability for students to identify and solve unstructured problems”, followed by, in order, the need to equip students with a “comprehensive and global vision of the enterprise,”, and an “awareness of the social and ethical skills of accountants”.

- All of the participants agree that Greek HEIs’ should develop skills simultaneously with the teaching of technical accounting knowledge and integrate skills into every subject areas of accounting.
Pressures for Professional Skills Development

Internal and external forces were found regarding the development of skills, which are termed Convergent Institutional Isomorphic Pressures because they exert coercive, mimetic and normative pressures at a national, organisational and individual level to comply with other educational systems. Competitive pressures regarding skills development were also found.

The institutional pressures include:

1) the enhancement of graduates’ employability
2) society and employers’ appreciation of upgraded services from skilful accountants
3) skilful accountants’ contribution towards the reduction of tax evasion and corruption
4) companies’ support of international competitiveness
5) skilful accountants’ contribution to Greece’s future through helping companies to take risks and compete at the international level
6) the need for HEIs to obtain private funding
7) the need for HE departments to obtain accreditation by HQAA and consequently reassure the entrance of new students according to the Law
8) a new course outline that requires teachers to provide detailed descriptions of the learning outcomes, and the teaching and assessment methods
9) the EEC recommendations regarding smaller class sizes and higher staff/student ratios
10) the EEC recommendations regarding an HEI entrance examinations system as well as references to HEIs’ facilities and space allocation
11) the EEC recommendations regarding a sanctions/reward system for teachers, departments and institutions
12) a comparison with the corresponding European academic practices
13) the legitimation of private HEIs and the demands by society for comparable quality
14) the demand for teachers to stay updated on market evolutions
15) the need for teachers to have comparable competences to teachers abroad
16) the establishment of licensing exams for prospective accountants by the professional bodies
17) society’s need for a “socially-embedded model” of HEIs
18) the need for government staff to proceed in parallel to their colleagues at the European level
19) the demand for “autonomy” by HEIs and the “protection” they enjoy from the state
20) the HEIs’ internal “ranking” procedure
21) teachers who have studied abroad
22) the excessive number of undergraduate courses
23) the requirement for accounting professional qualifications
24) young teachers who are ambitious for advancement
25) the HEIs’ desire to be part of the global evolution
26) Bologna Objectives are used as leverage for national reforms
27) the discourse on the “knowledge economy”
28) the “shaming mechanism” at the European level (i.e. stocktaking reports, scorecards, the U-map tool)
29) EU funding

The competitive pressures include:
30) private universities are gradually gaining standing in society
31) private universities constitute a new professional field for unemployed teachers
32) part of society’s complaints about the efficiency of the state universities
Barriers to Professional Skills Development

Internal and external barriers (forces) to skills development were found, which are termed **Divergent Institutional Isomorphic Pressures** because they exert “negative” coercive, mimetic and normative pressures that divert HEIs from complying with other educational systems. The barriers found include:

1) a lack of communication and information dissemination
2) a lack of explicit policy
3) a lack of planning, support and coordinated efforts
4) a lack of motivation and promotion criteria
5) impunity and a lack of sanctions
6) the “clientele” system
7) the distortion of imported institutions
8) the loose structure of the educational system and “loosely coupling” between policy and classroom work
9) the lack of equipment and support
10) the top-down approach of the reforms
11) the prejudice against skills
12) institutional inertia, lack of initiatives, fear of the unknown
13) the lack of teachers’ professional skills, lack of reflection
14) a desire to maintain the status quo
15) the high volume of theoretical or technical material as opposed to skills development
16) the lack of teacher training and research in accounting education
17) the protected profession
18) the lack of innovative teaching methods
19) the students’ political unions
20) the lack of students’ readiness (resistance to active learning, lack of motivation)
21) the rate of student absenteeism
22) the students’ previous learning and cultural background
23) the attitude and culture of the market
24) the structure of the market
25) the professional bodies
26) the unclear roles and duties of accountants – lack of professional identity especially for management accountants
27) the tax system (multiple changes of tax laws in short periods)
28) the tax office (“the corrupted triangle”)
29) the need for employers to control and undertake multiple roles
30) the perception of accountants as a “necessary evil”
31) employer’s ignorance

• Each stakeholder blames the other for the educational system’s problems and omissions. For example, the teachers blame the state and the students, the state blames the teachers, the accountants blame the teachers and the state and the students blame all of the others. However, every stakeholder has the freedom to break the circle and introduce change, even to a limited extent, which could contribute to wider reform. For example, teachers’ freedom to decide on the teaching material, methods and research has been identified by other researchers as exceptional at an international level. However, teachers do not act unless they are rewarded or obliged to embrace reforms. This point reveals that teachers are not as autonomous personalities as one would expect from adults but rather they let others to determine their acts. Adults are expected to “take the future in their hands”, however this does not happen in the Greek HEIs. The situation looks like a vicious circle that perhaps only an external intervention like the EU can break, as one participant suggested.

• The BAA departments fail to prepare students to become accountants (and especially management accountants), but mostly prepare them to comply with the accounting technical requirements set by the state.
• The BAA departments are tailored to the market needs and so “produce” graduates that the market will absorb. The market structure (99.9% micro and SMEs) and attitude “lead” employers to use accountants mainly as bookkeepers and tax accountants. Graduates adapt to their employers’ needs. This is also evident from the statistical analysis when accountants ranked fifth the education they receive as a factor that prevents the smooth completion of their studies (Section 9.7). The employers and the market system are adapted to the economic and the tax environment, which is shaped by the State.

• The State, with the multi-layered and complicated laws, has been identified as the source of all evils by the participants. This extremely complicated labyrinth of laws and the continuous tax reforms keep accountants extremely busy filling in forms and taking care of the high administrative duties created by the public tax office. Also budgeting, forecasting and reporting are becoming particularly difficult under these conditions. The state acts as the biggest barrier and, at the same time, the highest pressure to introduce reforms.

• The high number of barriers to introduce professional skills in the Greek educational system reinforce the views of Meyer (2006, p. 219) when he argued that “educational institutions are the most change resistant among the large-scale public institutions because they are supported by the deepest sentiments of tradition, habit, and identity held by the largest number of people”.

The HEIs’ Strategic Response to the Reforms

• The HEIs’ strategic response to the educational reforms began with a Defiance strategy, then moved to Manipulation, Avoidance and, finally, Compromise.

• Evidently, the implementation of the EHEA in regards to the application of ECTS and its connection to the learning outcomes (knowledge, skills and competences) is helping to maintain appearances by prioritising legitimacy over efficiency.

Predicting the HEIs’ Strategic Responses to the Reforms

• In the future, due to the increasing need for efficiency, legitimacy and the increasing uncertainty, the HEIs’ forecast strategies will move towards more positive or neutral behaviour, like Compromise and Acquiescence.
Comparison with other countries

The comparison of our findings with the international literature demonstrated similarities in the barriers to as well as the pressures for skills development in other countries.

- The author found similarities between the barriers to skills development in Greece and many other countries (the US, UK, Australia), and particularly Spain, which has a comparable social structure and attitudes.

- A wide difference in the importance ranking of professional skills was found. In most western countries, the most appreciated skills for accountants are communication, critical thinking, and interpersonal skills. Computer skills are usually ranked third or fourth on the importance scale. In Greece, however, the most important skills are computer skills. The same results with Greece were found in studies of China, Syria and Spain.

- The author did not find in any other study so many barriers to exert pressure existing simultaneously in one country. Two “unique” barriers were identified: the “lack of sanctions” and the “citizens and authorities do not obey the laws voted by the Parliament”, which of course is related to the previous point.

- Hesitation to embrace an overall change towards a more open, integrated and skills oriented educational model, implies the preoccupation of academics with the industrialised era. This era has long ago being replaced by digital era that demands fresh minds, able to adapt quickly to rapid and unexpected changes, minds that will invent new products and new procedures to our old world.

12.4 Reflections on the findings

Qualitative and quantitative results of this study indicated the need to develop professional skills in the accounting courses of Greek HEIs and at the same time revealed a wide range of pressures and barriers to this development. The analysis of the results highlighted the need to establish changes at the organisational and cultural level of the educational process in order to achieve “real” skills development. Skills introduction should not be seen by the teachers as another “technical achievement” in the classroom. Rather these should be faced as an important stage towards an integrated
model of learning that helps to gain “insight” of the taught material and increases personal advancement of students. Both HEI managers and teachers need to realise that skills introduction cannot be just a “reference” to the programme of studies for legitimating purposes and instead should become an explicit policy that needs planning and coordinated efforts to have an impact on the learning process. In practical terms ECTS credits should stop being a mechanical calculation of teaching hours. Graduates profile should ideally be created before deciding on the curriculum courses and with close cooperation with the market stakeholders. The graduates’ profile will indicate the learning outcomes that graduates should achieve by following the specific programme of studies. After establishing the learning outcomes, ECTS credits should be allocated on the basis of the typical workload necessary to achieve the required learning outcomes (knowledge, skills and competences). At this point research is required among students to find out what the workload of each educational component and each educational method is for them. The workload should then be translated into credits and the credits will reflect the real learning outcomes comparable to the ones of other EHEA countries.

Accounting teachers obviously should be more open to innovations and to new instructional methods. They should put more effort in their teaching duties and reflective practices and establish contacts with the professional networks so they can contribute more creatively to the learning experience. The IP index that was compiled by this study showed that the skill that needs immediate attention is “the ability for students to identify and solve unstructured problems”. The best method to develop this skill is the use of case studies that can be well compiled with the assistance of the accounting professionals. Case studies can be well prepared also if accounting teachers can act as business advisors themselves in the context of their academic role as it happens in other European HEIs. Additionally the accounting teachers could participate occasionally in “work placements” specially created for academic teachers. In this way they could regain contact with the “market” and create case studies to use in the classrooms.

Accounting teachers in state-funded HEIs should realise that they can never exhaust the theoretical or technical material that needs to be covered. Therefore they can well “sacrifice” a small part of this material in benefit to the skills development of their students. Theoretical and technical material can always be covered by professional training at a later stage during the professional life of graduates who have adopted a life-
long learning attitude towards their profession. The Greek society expects from the academic accounting teachers to be pioneers in their field and in close contact with the professional world so they can transform learning into a “living experience” avoiding mechanical knowledge transmission.

Effort should be made to improve existing communication channels and create more efficient channels between higher and lower hierarchy levels within HEIs and reassure that they reach teachers in their everyday activities. Teachers need to be informed and be trained on what constitute “skills” and how these can be taught. Communication channels with industry and market should also be reinforced. All stakeholders should recognize that there is a paradigm shift happening in the learning experience and should be provided with the opportunities to discuss about this through conferences, seminars and workshops that will help eliminate any confusing areas. Teachers will need to attend teacher training seminars that will enhance their own professional skills including soft skills. Bologna experts should be more productive and energetic to their roles. Part of the responsibility to disseminate information that comes from European Institutions belongs to them. The basic prerequisite to the skills development is the proper equipment and the small class size which ultimately is a shared responsibility between higher management of HEIs and the state.

The realisation of the above changes signifies important transformations at the organisational and institutional level. They involve the actual support of teachers in their everyday activities and their continuous professional development. They involve significant improvement on the dissemination of information at all levels. They entail engagement to the laws and at the same time flexibility to move towards unknown areas. They entail autonomous HEIs as well as accounting teachers with autonomous personalities that take initiatives towards the overall benefit of society. They involve the openness of the educational system to the outside world in an accelerated pace. They imply the establishment of an interactive operating model between HEIs and professionals, the increase of market competition in the educational sector, a turn to a more “socially embedded educational model”. In this way the HEIs will stop being “a fortress that no pressures can intrude” as students reported in this study. The needs of society will be more easily identified; ideas and suggestions will flow freely between
HEIs and society resulting in creative, innovative and competitive public educational sector with substantial contribution to the economic development of Greece.

12.5 **Implications**

This thesis offers a number of implications. The overview of accounting professionals’ skills development worldwide makes an important contribution to accounting education. The thesis explores the recognition and establishment of accounting education in Greece as an important part of the Accounting Science there. The accounting education literature is expanded by the investigation of a new context that may provide a reference for other, similar contexts. The study contributes to the understanding and application of mixed methods research design to a new context that could be of benefit to accounting researchers. Also significant is the use of New Institutional Sociology as an interpretation tool to investigate and analyse institutional transformations in a change resistant, state-funded organisational field like the educational sector, which is strongly affected by market competitive forces.

This thesis offers also a number of practical implications for the educational and business practice in Greece. In reference to the significance of the study stated in Section 1.2, the first contribution of this study is its potential to improve accounting education and consequently the practice of the accounting profession by offering a broad view of the impact of skills introduction into the learning process. At the national level, this is achieved by offering further clarification of the notion of “skills”, which is fairly new and unexplored. This thesis has identified the barriers that prevent the introduction of reforms. Although many of these barriers can be identified in other research studies in Greece as endogenous obstacles to the educational system, it is useful to distinguish the broad impact that these obstacles can have on all aspects of the citizens’ educational and social life. Therefore, the policy-makers at the national and organisational level can make use of this study, should they wish to take action regarding skills development. An important implication of the study is that it has identified and collected the pressures on Greece’s HEIs, which have become “invisible” to their main stakeholders due to the protective environment of the institutions’ public character. However, the pressures exist and are growing due to the changing circumstances at the institutional and economic environment. The teachers and other stakeholders should realise the global changes and become more adaptive and reflective towards the reforms because changes
happen so fast that they will run out of time. Greece, as an EU member and a country open to global competition, should be prepared to face the evolutions in the educational sector.

At the individual level, the author offers to accounting teachers an overview of the diffusion of professional skills in other developed contexts and the variability of the teaching methods used to introduce skills in the classroom. Teachers could possibly decide to try some of these or reflect on their own teaching methods. The ranking of the most important skills can help accounting teachers to decide which skills require their immediate attention. This thesis has brought together accounting teachers, practitioners and students’ opinions, so that they can see each other’s views and possibly understand the problems as well as the opportunities for cooperation that each group can offer. Reforms could be realised on a personal or departmental level if the teachers and administrators become more “reflective” practitioners and less mechanical in their everyday teaching or other duties.

The findings can support the students of BAA departments to realise which skills global employers appreciate most and try to acquire and develop these using various sources and methods.

At the business level, it will be useful for employers and executives to realise how valuable their accountants could become to their enterprises. Employers should definitely look at their accountants (especially management accountants) from another perspective, demand more of them at the advisory and strategic levels, and be prepared of course to compensate them for their services. Accountants who wish to keep up with the competition will discover which skills best respond to their employers’ needs. It should be recalled that, in the current open system and globalised environment, local accountants and accounting graduates may be found in a position not only to support local companies but also to work for companies that hopefully will invest locally. This is a useful study also for the accountants’ Professional Bodies, as it provides useful insights on how to support and organise the profession at a higher level, similar to the Professional Bodies of western countries.

Every educational system has its own characteristics which either facilitate or hinder the implementation of changes that come from other contexts, like the EU. The second contribution of this thesis has been the analysis, of the reactions of the Greece and its
stakeholders to institutions which were imported from a supra-national body like the EU and the Bologna Agreement. This is useful as a self-awareness exercise that could possibly help to prevent similar behaviour or reinforce successful behaviour in the future.

The third contribution of this study is related to the cooperation (or lack of cooperation) between academia, industry and the state in order to adapt the educational structures in front of the global challenges and competition. The thesis has shown how these stakeholders act simultaneously as supporters and as impediments to the necessary educational reforms, without real collaboration between them.

This study started before the economic crisis and was finished before the crisis has ended. Most people agree that this is not a purely economic crisis but rather includes a deficit of ethics, professionalism and efficiency within the public and the private sector. Therefore, instead of waiting until the crisis ends to develop professional skills, Greek educational and professional system should promote them in order to accelerate the ending of crisis and prevent other crises to come. The professionals in this study acknowledged that a “skilful”, upgraded accountant can contribute considerably to Greece’s national and economic development and advancement.

The author considers that the overall finding is that an important educational reform, such as the introduction of professional skills, which constitutes a paradigm shift, cannot be achieved without all of the stakeholders’ coordinated efforts and indeed society’s support. Furthermore, the imposition of top-down approaches ends up prioritising legitimacy over efficiency.

12.6 Limitations

Like most studies, this thesis has certain limitations. The key ones are listed below, and the reader should consider these when interpreting the results of this study.

The use of self-reported questionnaires could raise questions about the construct validity of the scales (see, for example, Campell and Fiske, 1959; Spector and Brannick, 1995). However, the application of self-report questionnaires is considered the most valid method of data collection when subjective perceptions regarding an issue are to be addressed (Schmitt, 1994). All of the scales employed in the current study demonstrated high reliability coefficients and, although the study cannot be said to be immune to
various types of bias, there is no real reason to consider that there is a serious risk to the validity of the findings. The only scale with low reliability coefficients was the curriculum scale and, therefore, the results associated with this should be interpreted with caution. However, since the author did not measure relationships but rather used them as an indication of personal beliefs, it was decided to include this scale in the instrument and compare the results with those of similar studies.

The cross-sectional design may be the second potential limitation of the thesis, and a longitudinal study might provide some additional advantages (Bowen and Wiersema, 1999; Schwartz and Teach, 2000). The third potential limitation is the lack of homogeneity among the samples. The research investigated all accountants’ perceptions (financial, tax, auditors and management accountants) to gain an overall perspective of the issue, since Greece is in an exploratory phase of skills development in HEIs accounting courses.

12.7 *Further Research*

Future research could concentrate on different groups of accountants; for example, the importance and priority of skills introduction in the education of auditors, management accountants and financial accountants. Other research could explore the necessity for skills development in relation to firm size or economic sector. Employers are important stakeholders in the process and more detailed quantitative and qualitative research is required to explore their needs in relation to accountants’ professional skills. The professional bodies are critical in shaping the professional environment in which accountants work. Therefore, further, specific research is needed to investigate why and how the professional bodies could act like their counterparts in other developed countries to support accountants. Finally, in educational practice, the research could be extended in various directions, like the approaches to skills introduction in the curriculum, teaching methods, and the advancement of specific skills (i.e. communication skills). Research on the students’ perception of the workload would result in more representative allocation of credits in each educational component. Cross-national studies of the barriers to and pressures regarding the introduction of professional skills would also prove useful, as would be the replication of this study in other countries. Comparative studies might highlight the similarities and differences regarding how various nations accept and adopt new institutional reforms. The author
believes that the investigation of the psychological factors that affect the stakeholders' beliefs, attitudes and activities regarding skills introduction in the educational experience would be particularly important and enlightening for the Greek society.

Hopefully, this study has created the stimulus for the creation of academic units within HEIs to support accounting educators' teaching and research duties in accordance with the practices overseas. Finally, future longitudinal research is recommended to examine the current economic crisis' effects on employers and educators' beliefs regarding the need to re-establish Greece's educational perspectives.