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## Designing for Design Activity

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### Abstract

The area of graphic design has expanded since digital media was introduced, and it requires new creative thinking skills in the design process. This paper proposes a design process for a graphic design graduate class using activity theory as a theoretical background. This design process consists of three phases to solve the design problems within diverse design projects. Each phase was examined in terms of how the elements of activity theory could apply to the design process. As a research method, Engeström's activity system model was adapted and explored in the design processes. A case study is presented to see how the proposed design process applied to a design project.

### Keywords

Graphic Design Project, Design Process, Activity Theory, Prototyping

Over the past two decades, the field of graphic design has greatly expanded its scope. Graphic design has begun to be viewed, not only as a discipline that produces aesthetically pleasing forms, but also as a discipline that produces effective communication tools. As graphic design has incorporated more technological changes, there has been a corresponding need for an interdisciplinary approach for graphic design courses that can meet the needs and expectations of people in the digital age.

Cognitive psychology has been in the mainstream of Human computer Interaction (HCI) and it has been useful and helpful in understanding human information processing, especially in the area of Human computer interaction. The aim of the cognitive psychology, according to Scane, " is to understand behavior by providing clear and accurate descriptions of internal cognitive events in order to predict behavior" (1987, p.58). Thus cognitive theory is based on the internal elements and process within the brain that direct human behavior. To understand human behavior, not only cognitive processes, but also culture and the social environment should be considered.

Activity theory originated with Lev Semenovich Vygotsky and was developed by his followers. Vygotsky argued that environment and culture could not be separated from an individual's behavior (1978, p.40). Engeström viewed an activity as a system, which integrates the subject, object, and instruments into unified whole. According to Engeström, context itself is an activity system. He developed a model of the human activity system (1993, pp.67-68) and Ryder as well summarized Engeström's activity systems to explain the relationships between the elements of activity theory (2007) as follows.

*An activity is undertaken by a human agent (subject) who is motivated toward the solution of a problem or purpose (object), and mediated by*

*tools (artifacts) in collaboration with others (community). The structure of the activity is constrained by cultural factors including conventions (rules) and social strata (division of labor) within the context.*

Bringing audience research to the graphic design process is not new to the graphic design disciplines. Tarbox introduces activity theory as a model for design research (2006, p 75):

*We can easily define how an activity system works within a graphic design paradigm. The subject is the main person involved with a specific activity that is trying to work toward the object, which is a specific goal. In a design paradigm, the subject is the designer, and the object is the creation of a total piece that is effective conveying information, not just aesthetic purposes.*

Tarbox sees the subject as a 'designer' and the tools as a 'source of information' (2006, p78). In this research, the 'design process' is considered as a "tool" and the subject as the 'audience'. If we see the design process as a "tool" with an understanding of both internal and external mental processes within a cultural and social context, then activity theory could provide an alternative way of thinking about the graphic design process to enhance visual communication in human-computer interaction.

The purpose of this paper is to discuss a graphic design graduate course that examines how graphic design can improve human-computer interaction and communication while focusing on meeting the needs and expectations of people and society in the digital age.

As a research method, this paper explores how activity theory can be incorporated into a graphic design process to enhance human-computer interaction and user experience. Activity theory is used as a metaphor to explain complicated relationships between humans and their environment and is used to present how context and situation affects the actions and activities in visual communication. In this study, Engeström's activity system model is applied to the design process. This method is examined and presented with a case study.

## **Overview of Activity Theory**

Lev Semenovish Vygotsky (1896 –1934) who was educated as a lawyer and philologist was interested in brain mechanisms, which deciphered forms whether simple or complicated, that led to the same behavioral result. According to Cole and Scribner, Vygotsky is considered as the first modern psychologist who suggests culture as a part of a person's nature (1978, p.6). Vygotsky extended the concept of Marx and Hegel's theory of society to the concept of mediation in human-environment interaction (Cole and Scribner, 1978, pp.6-7). Vygotsky argued "against artificial separations between mind and behavior and between mind and society" (Gary and Hembrooke, 2004, p.2). The concept of Vygotsky's model (Figure 1) shows his idea of mediation between a stimulus and the response.

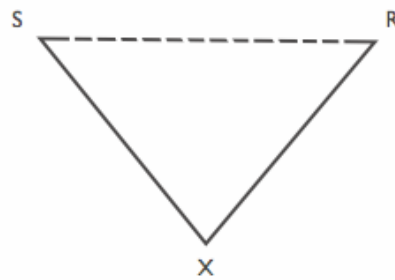


Figure 1. Vygotsky's model of mediated action (1978, p.40)

Vygotsky's idea was developed by his followers, Alexei N. Leont'ev and A.R. Luria. Alexei N. Leont'ev outlined the major points of activity theory (Wertsch, 1981, p.17). Leont'ev's basic principles of activity theory are summarized as six features (Leont'ev, 1981, pp.37-71; Kaptelinin, 1996, p109-110; Wertsch, 1981, pp.17-33); the unity of consciousness and activity; object-orientedness (goal and goal directness); hierarchical structure of activity (activity, action, and operation); internalization and externalization; tool mediation; and continuous development. All activities are tied to the goal/object and all activities have intentions that reflect the individual's social and cultural background. Activity theory emphasizes that mind and behavior as well as mind and society could not be separated to understand the meaning of an individual's actions. Human beings are culturally and socially mediated and human action should be understood in the activity systems.

Engeström's human activity model is built fundamentally on Vygotsky's model of mediated action (Figure 1). Engeström represents the stimulus as a subject, the response as an object, and mediated action as mediating artifacts (tools). Engeström expanded the model as shown in Figure 2 (Engeström, 1999, pp. 30-31).

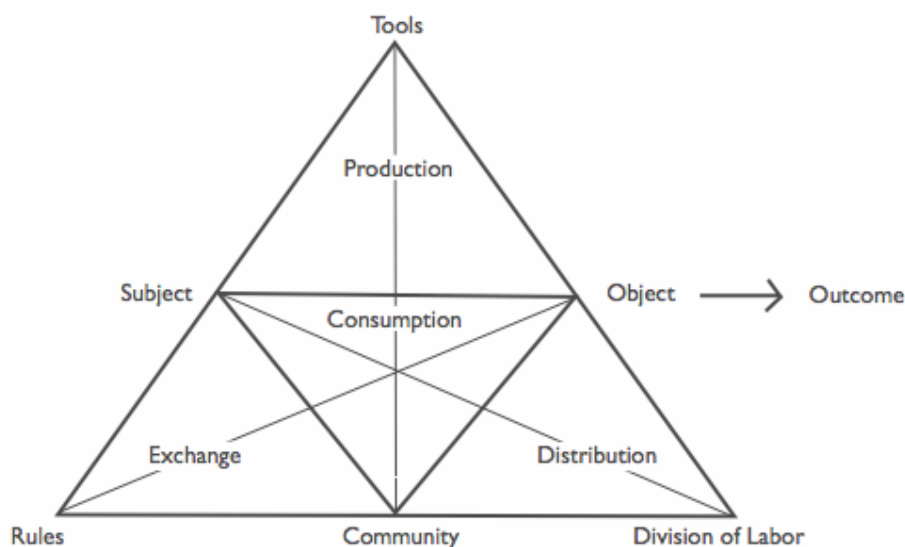


Figure 2. The basic structure of human activity

Engeström's model (Figures 2) explained each activity component in an activity system. Also, his model presented the relationships between each activity component in the activity system (Engeström, 1993, p.68). According to Engeström, "the community comprises multiple individuals and/or subgroups who share the same general object (1993, p.67)." and the rules indicates "the explicit and implicit regulations, norms and conventions that constrain actions and interactions within the activity system (1993, p.67)." The subject and the object in the middle level are mediated by the tools in the top level. The six components of an activity theory system are continuously developed, and reformulated by the rules in the activity system.

Activity Theory has had the attention of the HCI community since Bødker introduced the basic ideas of activity theory and its potential benefits in 1989 (Kaptelinin, 1996, p.105). Bødker's approach focused on how to apply human activity to computer applications, especially in user interfaces, and how to apply the psychology to computer science (Bødker, 1991, p.4). She sees the user interface as an artifact that mediates between the user and the user's objects. However, her study did not consider human activity within social and cultural contexts.

Recently, attempts to incorporate activity theory in interaction design produced the idea of 'activity-centered design' (Gay and Hembrooke, 2004). Tarbox introduces activity theory as a 'heuristic device' (2006, pp.78-80). Nardi and Kaptelinin extend this idea to understand human interaction with digital technology (2006, pp. 3-13). Thus, activity theory has become aware by other disciplines and has expanded its scope from psychology and education to HCI.

## **Design Process**

Because the design process is a problem solving process, it requires creative inspiration and ideas. The learning objective of the class, which was comprised of graphic design graduate students, is how graphic design can enhance human interaction in the digital age. The design process of the previous research (Kang, 2006, pp.165-168) started with usability testing. From the students' project, the author found that the design solution relied upon usability results rather than creative approaches. The design process presented in this paper has a different emphasis. It emphasizes a designer's ideas and inspiration in order to come up with creative design solutions. This design process consists of three-phases; Problem solving through creativity; understanding activity in contexts; and refining the design.

### ***Problem Solving through Creativity***

Design is a communication tool to mediate between the subject and the object. Design research is always helpful to develop and utilize ideas. Figure 3 shows how Engeström's model was adapted to the design process. The design research includes planning for outcomes from a given object and target audience research (subject). The audience research includes an analysis of the target audience's cultural and social backgrounds (community), regulations and requirement (rules) in both design elements and contents, and involvement of decision makers (division of labor). In this phase, the role

of the designer is to be a mediator between the subject and the object. The design research that relates to the rules, community, and division of labor are explored but not evaluated with the end audience.

Though general conceptual approach of activity theory differs from cognitive information processing, the solutions offered by both areas could be coordinated to provide better services to the audience. Therefore, the design problems are defined not only in the cognitive information processing but also with the context of users' activities and actions (Kaptelinin, 1996, p46) before the design ideation starts.

The design research, which included literature review and audience survey, provides relevant resources to create a design concept and solve the given design problem. From design research, design problems are identified. Also scenarios that predicted audience's action and activities were developed with considering rules and social and cultural aspect within the community. In this design phase, design problems are identified especially related to graphic design in that context.

Based on the design research, prototypes are developed. Students actively share the personal stories in a given subject and participate in the design process. Classmates act as a focus group for the initial research. Action as a goal-directed process is dynamic and different action may be performed to meet the same goal (Nardi, 1996, p73) or "the same action can appear in different activities" (Bødker, 1996, p 149). Design solutions consider this dynamic aspect of activity and action by providing alternative choices for the audience to reach the goals. Also design solutions consider the design principles and guidelines from human factors and cognitive psychology.

In the traditional design process, the design outcome based on the design research is accepted as a final solution. However, the design outcomes for interactive computer applications need to be verified through empirical study to see if the proposed solution is usable. Paper prototypes and three-dimensional models are explored in the design process. To conduct usability evaluation with the prototype design, a working prototype is required in this design phase.

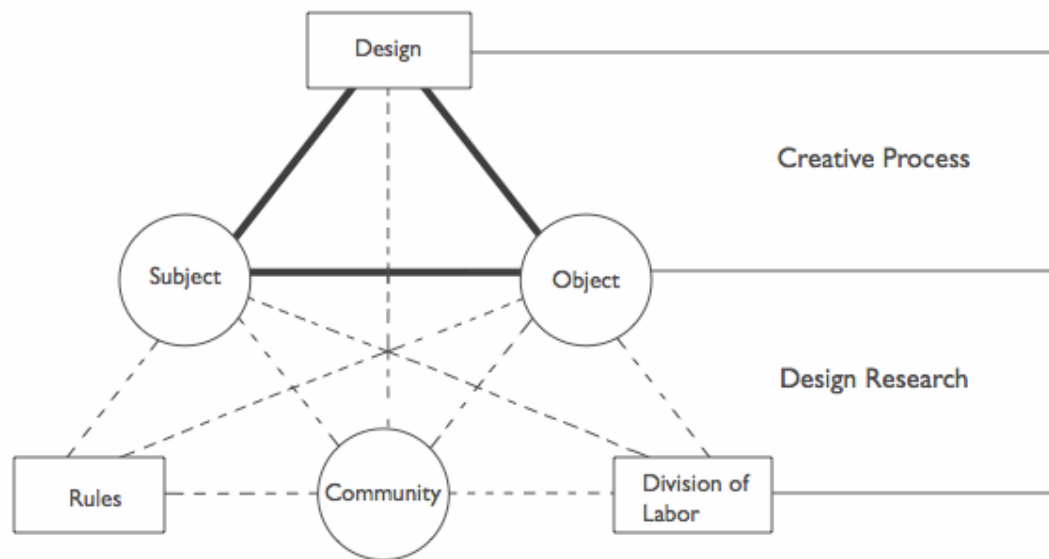


Figure 3. Adapted Engeström's model for the creative design process

### ***Understanding Activity in Contexts***

The goal of this phase is to verify the proposed design solutions from real world audience through empirical study. Then activities and actions are set by the hierarchical structure of activity to perform the tasks (Gay and Hembrooke, 2004, p 3). Figure 4 showed the bottom level of activity theory, which provides a framework of audience study in social and cultural contexts. Satterfield (2007) defined the bottom level of activity system as a work place in her healthcare experience research. Satterfield's research shows the hierarchical structure of activity system mediated with student expectations of the student health center and its medical staff to better serve the students and to establish better trust on a student's visit to the health center.

In this phase, the prototype design is evaluated within the hierarchical structure of relationships between social and cultural contexts and the subject and the object. Several questionnaires are developed for audience test, survey, and interview to investigate the proposed design prototype. A user profile and the activity-based tasks are also developed to investigate proposed hypothesis and to observe audience's behaviors and actions. Think aloud method is encouraged to users during audience testing because it is possible to observe behaviors or activities, but it is difficult to know the meaning of the behavior or the actions without asking the users (Nardi, p12). An exit interview also helps to find the meaning behind the audience's behavior and actions.

The audience's actions and activities differ from each other because of their habits, preferences, previous knowledge of the object they are seeking, or cultural background. These differences are analyzed by a user profile that includes gender, age, education, language and cultural background. The qualitative and quantitative data are analyzed to explain and understand audience activities and action. In this phase, an explanation of audience

activity and action is developed in conjunction with the audience profile. The descriptive data shows the problems but could not explain why the action and activities occur during the course of audience evaluation. Through the data analysis, a matrix to map the source problem and recommended solutions is developed for the final design solution.

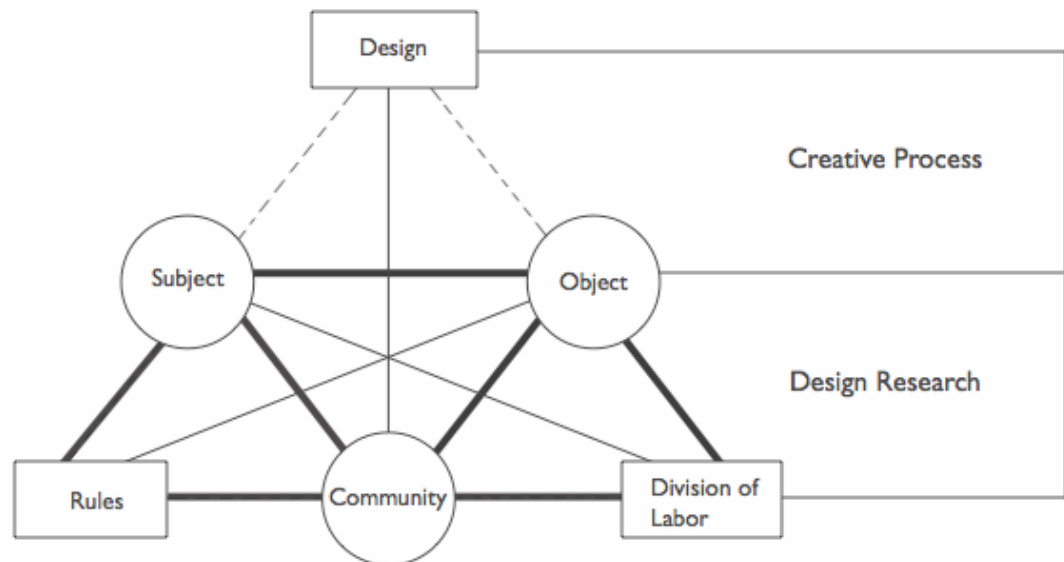


Figure 4. Adapted Engeström's model for the empirical audience study

### ***Refining the Design***

Transforming the object into an outcome motivates the existence of activities (Kuutti, 1996, p 27). In this paper, when the audience reached the desired goal, it is considered to be an outcome. This outcome is mediated between the subject and the object within its community. However rules, tools (design process), and division of labor are invisible to the audience yet they are influenced in their activities and action with the subject, object, and community (Figure 5).

The questions and hypothesis from phase one are answered through audience usability testing, interviews, and surveys. The refining design phase develops based on the recommendations from phase two.

"Activity theory does not predict or describe each step in the activity of the users" (Nardi, 1996, p74) because the relationships of the object and outcomes are subject to changes during the process of an activity (Kuutti, 1996, p27). With an understanding of the cognitive process in human beings and an understanding of the social and cultural background of the audience, a designer can motivate the audience's activities to achieve goals and tasks.



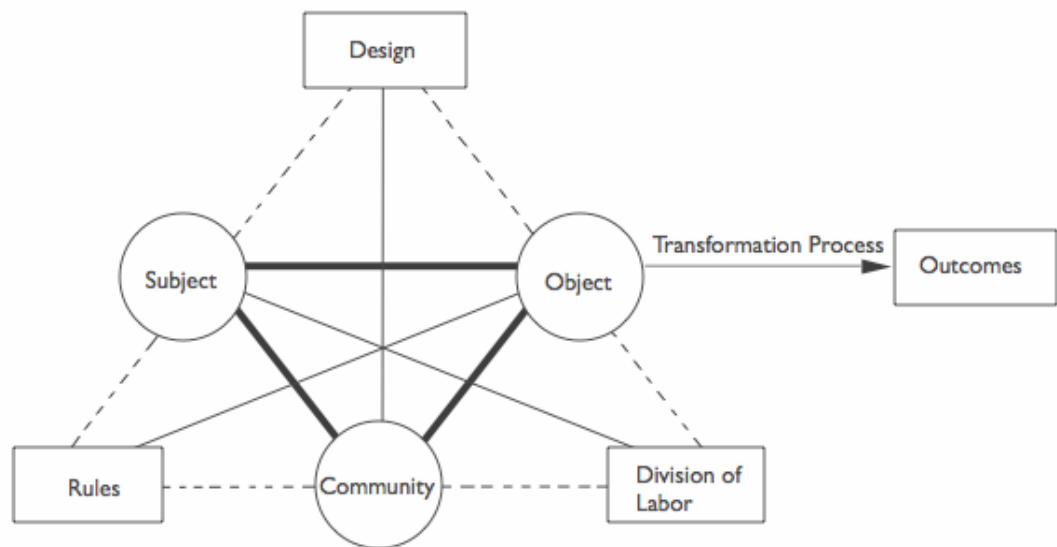


Figure 5. Adapted Engeström's model for the Audience centered design

## A Case Study: Web Design for Senior Citizens

Activity theory is new to most graphic design students and professionals. Activity theory is used to support the creative design process and to provide a theoretical framework of social and cultural contexts in the design process. The author of this paper has introduced activity theory to a graphic design graduate course for two years. This case study is one of student projects done in fall 2006. This case study shows how the systems of activity theory are applied to the process for designing a website for senior citizens. The American Association of Retired Persons (AARP)'s website is selected as a class project. AARP is a well-known non-profit organization for middle-aged and elderly citizens in the United States. The design team was formed with three graduate students; one from HCI and two from graphic design and the project duration was one semester.

## ***Overview of the project***

Aging creates not only physical changes in bodies and mental capacities, but also in social roles and people's social status. The population of senior citizens is growing very rapidly and it brings different experiences and expectations. This web design project was aimed to provide an easy to use website for senior citizens over 50 years old. The major activities of this website was finding information about health care and life style. Based on research of the target audience and their goals, the design goal of providing easy navigation in order to find information was set.

## ***Design Process: Problem Solving through Creativity***

As the first step, existing design guidelines for senior citizen were researched and explored in order to come up with design solutions. Most design guidelines were derived from the World Wide Web Consortium (W3C) and a checklist titled "Making Your Website Senior Friendly" by the National Institute of Aging and the National Library of Medicine. From the research, design goals were established as follows; improving the information architecture to reduce the number of clicks, to provide clear and easier navigation; and applying the design guidelines to make the website accessible for senior citizens. After setting the design goals, various navigation scenarios were explored with an individual's social and cultural backgrounds.

The design elements of type size, typeface, color contrast, and justification were carefully considered for the senior's vision based on not only the literature review but also on visual appeal. Also, the navigation and technical elements that were considered for the senior's mobility and cognitive process were based on the literature review. The original website had eight main categories with 8 different colors. The research team analyzed the information architecture and reduced the main categories to four. An A-Z index and other supporting aids such as sound and text size adjustment functions were added to the new design. The new design added drop down menus with a rollover effect to provide subcategories. Figure 6 shows the first design prototype that was developed based on the design team's proposal and their design guidelines.

## ***Design Process: Understanding Activity in Contexts***

The purpose of this phase was to test the usability and design elements of the AARP website. Web functionality and operability were examined with an audience over fifty years old. The objectives of the usability evaluation were as follows: to test the new information architecture, to compare the efficiency of the pull down menus and help button, and to observe the actions and activities of actual end audience in a real world setting. To evaluate these elements, specific tasks and methodological questions were developed for audience test and interview. Five individuals ranging in age from 50 to 65 years old were recruited for the usability evaluation, interview, and user survey.

Individual ethnographic information such as gender, age, computer literacy, education, income, Internet access location, and Internet usage were collected to understand each individual's background. Eight tasks were created to evaluate web usability and to observe the audience operation of

the website. The tasks were as follows; if you are uncomfortable with font size, adjust it; rent a car with a 10% discount from Budget; find a benefit for being an AARP member; find an AARP state office location in Iowa; return to the homepage without using the task bar; find the meaning of Medicaid and Medicare; find a republican senator for Iowa; and find a long-term care insurance plan for a NY resident.

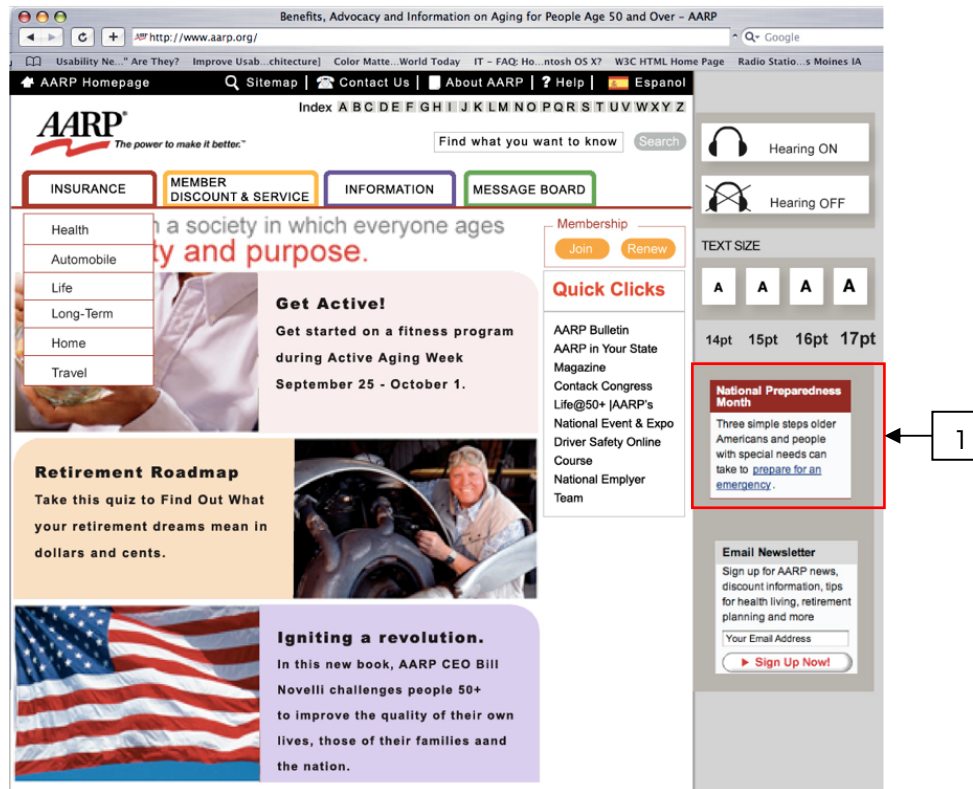


Figure 6. Redesigned AIAP homepage

Through the eight tasks, audience activities and actions were observed. Also mouse movement and voice were recorded with mouse tracking software. This evaluation study found that information (see the # 1 in the figure 6) in the right side bar was ignored as a navigation tool even though the color and size were dominant. The dominant color did not motivate audience action on that menu. The design team expected that the participant would use the text size adjustment function, however, none of participants adjusted the type size. The participants were not motivated to change type size even though it was asked in the task. Most participants were familiar with website conventions and understood how to navigate the website.

The results from the usability test was useful in observing how participant's navigate the website. Through the audience evaluation, the designer team found that the participant did always not follow the designer's model which designers expected their audience to follow. Some findings are from the interview, the survey, and from observation of audience activities, which were difficult to identify during the usability evaluation.

The community of the website included not only the physical community of senior citizens but also a virtual online community which shares their hobbies

and interests. The division of labor of the website included web content providers, web programmers, and service providers. Therefore, the outcomes should consider the invisible features that affect the audience's performance in achieving their goals. The limitation of this case study, the on line community and the division of labor were not fully considered as a part of the web development process.

### ***Design Process: Refining the Design***

All information gathered from audience evaluation was applied to refine the design toward the final solution. Figure 7 shows the refined final homepage. The unused functional elements during evaluation were reexamined and a part of them was eliminated and revised based on the interviews and surveys. The real estate of the website is limited unlike printed materials. Using 14-point text in the narrow column fits only two to three words and it interfered readability. Since none of the participants adjusted to a larger type size, the final design used a 12-point type size for body text instead of the 14-point type that was used in the first design. This audience evaluation showed that the drop down menu works better for the audience in finding information than clicking the main categories to see the sub directories. The activity systems are dynamic and evolving. This refined solution could be iterated with design phase 2 to examine the usability.

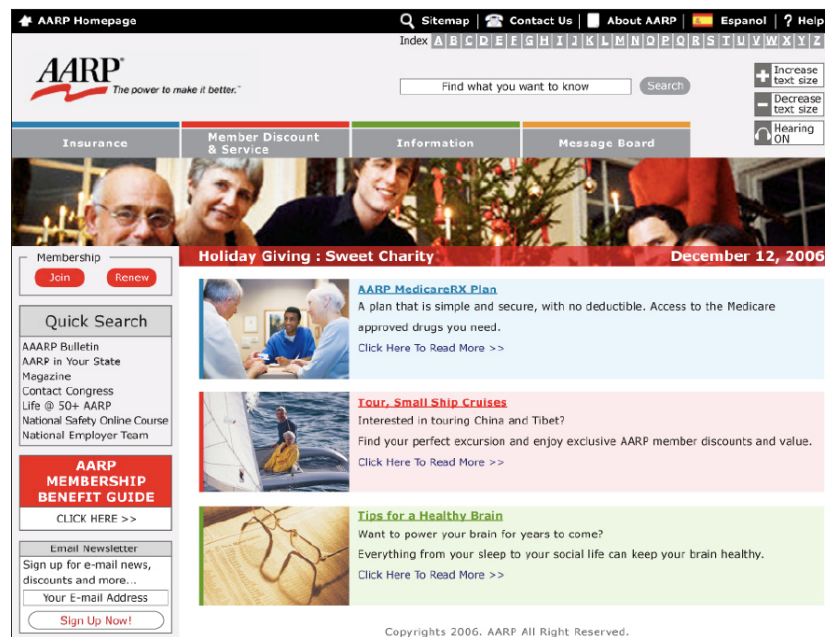


Figure 7. Final design AIAP homepage

## **Conclusion**

Kaptelinin considers "the computer as a special kind of tool mediating human interaction with the world. Meaningful, goal-directed activities constitute context for both mental processes and external actions" (1996, p49).

Kaptelinin's research presents the computer as a good example of a tool that fits the context of activity theory. In this study, the design process is considered to be a mediation tool between audience and object. Activity theory offers a great framework to explain how each component of activity is related and mediates each other. Activity theory provides a way to find the interrelationships between the target audience and their surroundings, how they are related to each other. It provides a broad spectrum for seeing the problems that exist in between the subject and the object. Through the concept of activity theory, designers are able to develop effective design that not only makes design easy to understand, but also motivates users toward the right actions and activities to achieve their goals.

Kaptelinin pointed out that "activity theory is mainly developed as a psychological theory of individual activity" (1996, p63.). One of the main characteristics of the web is accessibility; the audience can access it from anywhere and anytime. It means the web audience is anonymous. To apply activity theory to web design, specifying a target group is necessary. Otherwise, it is difficult to define the social and cultural context of an individual user of a website. How to approach a mass audience with activity theory has not been developed yet (Kaptelinin, 1996, p.63). Thus, activity theory still has problems to solve (Davydov, 1999, pp.39-51). Even with its limitations and problems, activity theory has a potential for integration with other conceptual systems (Kaptelinin, 1996, p64).

Activity theory is fairly new to the graphic design profession. This idea has great potential for bringing a new approach to the creative thinking process, not only in the graphic design profession, but also to professions outside of graphic design, to enhance the interaction between humans and man-made objects. Graphic design, as a problem solving process, needs a theoretical framework to understand the audience better. The design process proposed in this paper is still in the development stage and further investigation is needed to fully adapt the activity systems to the creating thinking process.

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