HUMAN COMPUTER INTERACTION ANALYSIS
AND
PROTOTYPING STUDIES

Thesis submitted to the
Institute for Graduate Studies in the Social Sciences
in partial fulfillment of the requirements for the degree of

Master of Arts
in
Management Information Systems

by
Çağla Özen Şeneler

Boğaziçi University
2007

Human Computer Interaction Analysis
and
Prototyping Studies

The thesis of Çağla Özen Şeneler
has been approved by

Assoc. Prof A. Nuri Başoğlu
(Thesis Advisor) _____

Assist. Prof. Hande Kımıloğlu _____

Assoc. Prof. Tuğrul U. Daim _____

June 2007

Thesis Abstract

Çağla Özen Şeneler, "Human Computer Interaction Analysis and Prototyping Studies"

There is an increased interest in developing better user interfaces by means of different technologies because capabilities of user interface add a lot to the information technology (IT) adoption process. The purpose of the study is to develop a taxonomy for the characteristics of technology adoption process and a research framework that addresses how the product design features and various aspects of technology adoption process influence user preference and intention towards using a product.

This study is based on a theoretical background review, prior empirical studies, previously defined technology acceptance models, and user satisfaction models. Proposed taxonomy and framework have been developed by series of observations: in-depth interviews, a brainstorming session, and an expert focus group. In order to test the proposed framework, an experimental study including a questionnaire was designed.

The study' results highlight the effects of product design features on user preferences and antecedents of user intention about using the product. The results will be important to developers who want to create interfaces that stimulate mental processes of users, improve an effective, efficient, and intelligent machine interaction, facilitate user acceptance, and assist product utilization.

Tez Özeti

Çağla Özen Şeneler, "İnsan ve Bilgisayar Etkileşimi Analizi ve Prototiplendirme Çalışmaları"

Değişik teknolojilerin vasıtasıyla daha iyi kullanıcı arayüzleri geliştirmeye ilgi gittikçe artmaktadır çünkü kullanıcı arayüzü yetenekleri bilgi teknolojilerini benimseme sürecine çok fazla katkı sağlamaktadır. Çalışmanın amacı, teknolojiyi benimseme sürecinin özelliklerini sınıflandırmak ve ürün tasarım özelliklerinin ve teknolojiyi benimseme sürecinin değişik taraflarının kullanıcının ürün tercihini ve ürünü kullanma konusundaki niyetini nasıl etkilediğine hitap eden bir araştırma çatısı oluşturmaktır.

Bu çalışma, teorik altyapıya, önceki deneysel çalışmalara, önceden tanımlanmış teknolojiyi benimseme modellerine ve kullanıcı memnuniyeti modellerine dayanmaktadır. Sunulan sınıflandırma ve çatı, bir dizi inceleme ile oluşturulmuştur: derinlemesine görüşmeler, beyin fırtınası oturumu ve uzman fokus grup. Sunulan çatıyı test etmek için anket içeren deneysel bir çalışma tasarımlanmıştır.

Bu çalışmanın sonuçları ürün tasarım özelliklerinin kullanıcı tercihleri üzerindeki etkisini ve kullanıcının ürünü kullanma konusundaki niyetinin geçmişini öne çıkarmaktadır. Sonuçla, kullanıcının zihinsel sürecini uyaran, efektif, verimli ve akıllı makine etkileşimini arttıran, kullanıcının teknolojiyi kabullenmesine yardımcı olan ve ürün kullanımını destekleyen arayüzler yaratmak isteyen geliştiriciler için önemlidir.

ACKNOWLEDGEMENTS

I would like to thank my dear husband Güçlü, who has encouraged me throughout my thesis with patience and for sharing every moment of life with me.

I would also thank my dear sisters, brother, mother and father for their lovely support.

Special thanks also to my dear friends Gonca and Gülçin for their motivation and for being my best friends.

Personal thanks must go to my dear friend Sedef for her valuable comments and sharing her experiences.

Thanks also to my class friend Banu for her concern and cooperation.

I am also grateful to all the staff members of MIS department, to my instructors and colleagues, especially Ümit, Tamer, Ahmet, İsmail, Arzu and Figen for their understanding.

Last but not least; I would like to express my gratitude to my master thesis' advisor, Assoc. Prof. A. Nuri Başoğlu for his extreme support, motivation, and encouragement.

TABLE OF CONTENTS

FIGURES

TABLES

PREFACE

Information technology (IT) has the potential to play a critical role in improving the lives of people. While advances in IT continue rapidly, the use of new technologies has fallen since not all technologies have resulted in user acceptance.

Previous research has attempted to explain and predict user preferences, user acceptance, intention, and behavior and product utilization of new information technologies. User preferences, user acceptance, user intention and product utilization models are still proposed, evaluated and tested, extended, and combined.

For the acceptance and utilization of new technologies, the technical improvement of the man-machine interface is of great importance. This thesis aims at exploring, understanding, and classifying the characteristics of product design features and different aspects of technology adoption through qualitative and quantitative techniques with the intention of achieving product utility, usability, and acceptability.

The study is organized as follows. In Chapter 1, an introduction is presented. Chapter 2 reviews the literature in terms of theoretical background of the study. Chapter 3 provides a research framework and research hypotheses. Chapter 4 explains the methodology used in developing this framework. The findings and implications of the study are presented in Chapter 5. Moreover, the study ends with a conclusion drawn from the overall study in Chapter 6.

CHAPTER 1

INTRODUCTION

"A picture is worth a thousand words...
An interface is worth a thousand pictures...
Ben Shneiderman, 2003"

Information technology (IT) offers the potential for improving the quality of life. Nonetheless, IT has the potential to provide tactical and operational advantages to organizations. With the growing importance of IT, a competitive environment is rapidly changing. In today's competitive world, giving the emerging importance to IT plays a critical role and is essential for gaining a better position in the fierce competition and growth of the business. However, no matter how IT benefits the organizations, technology adoption problems may be faced and hinder IT advantages.

Alternatively, IT vendors in order to achieve a competitive advantage and sales force in the market, should apply various product differentiation policies to satisfy different customer segments. This thesis focuses on one of these policies: the area of human computer interaction (HCI).

HCI is essential to take advantage of IT to achieve competitive IT product designs. Besides, the development of successful and adaptive user interfaces has been a strong research issue in HCI for many years.

HCI is a discipline that designs, evaluates, and implements computer-based interactive systems for human use that aims to provide a good interaction between the user and the computer. Users communicate with computer-based interactive

systems via user interfaces. Thus, user interface has a critical role during the interaction. A user interface should provide optimum communication between the user and the computer.

Acceptance, utility, and usability of system designs have become a focal interest in HCI research, yet at present there is a lack a detailed understanding of which system design features and technology adoption aspects influence them. Developing adaptive and usable systems should be investigated in order to overcome technology adoption problems and help organizations to derive benefit from IT in the light of HCI.

This thesis aims at exploring, understanding, and classifying characteristics of product design features and aspects of technology adoption with the intention of achieving system utility, usability, and acceptability.

Considering the facts above, based on theoretical background review, previous empirical studies and technology adoption models, a series of observations; in-depth interviews, brainstorming session, an expert focus group study were conducted. In addition, taxonomy and a research framework for technology adoption have been developed. With the purpose of testing the research hypotheses, an experimental study including a questionnaire was designed and carried out.

CHAPTER 2

LITERATURE REVIEW

Human Computer Interaction (HCI)

Human-computer interaction (HCI) (alternatively man-machine interaction (MMI), human-machine interaction (HMI) or computer-human interaction (CHI)), is a discipline concerned with design, evaluation and implementation of computer-based interactive system for human use and with the study of the major phenomena surrounding them (ACM, 1992). A computer-based interactive systems might be a single PC, an embedded device, a wireless access protocol (WAP)-enabled device, or software.

According to Hartson (1998), HCI is a field of research, development, methodology, theory, and practice, which has an objective of designing, constructing, and evaluating interactive computing systems so that people can use them efficiently, effectively, safely, and with satisfaction. HCI can also be defined as a study of how people interact with computers and what happens when a human and a computer work together.

User, computer, and interaction are the three main components of HCI. The phrase “user” may refer to one user, a group of users working together, or a line of users in an organization, each working with one part of the task or process. The phrase “computer” may refer to any technology, hardware, or software, and, lastly, the phrase “interaction” may refer to any communication between a user and a computer, or the ways the user and computer work together (Dix et al., 1993).

HCI is a cross-disciplinary field that relates to and adapts from several other fields; human factors, ergonomics, cognitive psychology, behavioral psychology and psychometrics, systems engineering, and computer science (Hartson, 1998). Moreover, social and organizational psychology, linguistics, artificial intelligence, philosophy, sociology, and anthropology are disciplines that are contributing to HCI.

The range of topics, which form the area of HCI, has currently no agreed upon definition but the core orientation is towards users. According to this, user problems with computers, the effect of computers upon users, the collaboration between computers and users, considering the user at first for a better system design, and accommodating the computer to the characteristics and needs of the user, systems' utility, usability and acceptability are part of the scope of work and areas for HCI . HCI aims to develop or improve the safety, utility, effectiveness, efficiency, usability, and appeal of systems that include computers (Eason, 1988).

Usability

One of the goals of HCI that has been widely studied in both academic and practitioner literature is to improve the usability of computer-based systems.

Usability refers to the grace and clearness of interaction in HCI. Definitions for usability are "the capability to be used by humans easily and effectively" (Shackel, 1991), "quality in use" (Bevan, 1995), "how well the intended users can interact with a technology to carry out the assigned activity" (Zimmerman & Muraski, 1995), "ease of use plus usefulness" (Hartson, 1998), the effectiveness, efficiency, and satisfaction with which specified users can achieve goals (ISO, 1998), and "the extent to which the user and the interface can communicate clearly, without misunderstanding through the interface" (Chou & Hsiao, 2007). The definition of a

usable system can be a system that enables users to perform their job effectively, efficiently and with satisfaction. Primarily, usability is concerned with making systems easy to learn and easy to use. Usability is the quality of a user's experience when interacting with a system.

Butler (1996) emphasizes the importance of usability; "Usability has become a competitive necessity for the commercial success of software". There is an increasing end-user population with little or no computer expertise. As a result, there is a growing need for highly usable computer-based systems (Schaik & Link, 2003). Information systems' (IS) usability began to get the recognition it deserved back in the 1980s when the developers and vendors acknowledged the importance of usability. Now, usability teams, usability labs appear in organizational structure, and organizations have started to employ HCI/usability specialists. Specialized HCI profiles in education programs are formed in order to train up these usability specialists. Besides, there are virtual communities and associations instituted to provide support for usability and define the profession of usability professionals (Gulliksen et al, 2006).

Topics that are currently studied by researchers are techniques for usability testing of systems (Lewis, 1982), guidelines for improving the usability of systems (Smith & Mosier, 1986), methods for predicting usability problems (Molich & Nielsen, 1990; Wharton et al., 1994), and how to measure usability (Nielsen & Levy, 1994; ISO, 1998; Frøkjær et al., 2000).

User-centered Design (UCD)

Consistent with usability definitions, the idea behind user-centered design (UCD) is to put the user first in the design process. UCD is an iterative design

process that concentrates on users' needs, wants, and limitations in each stage until the project's usability objectives have been attained. In UCD, users have a deep impact on the design by being involved as partners.

Requirement gathering, requirement specification, design and evaluation are the mandatory activities that ISO 13407 outlines. Some popular UCD methods can be used through these activities. Questionnaires and interviews can be used in both requirements gathering and evaluation activities. In addition, focus group method can be used for requirement gathering. Usability testing, card sorting, and participatory design methods can be applied in design activity. Moreover, usability testing, questionnaires, and interviews can be used in evaluation activity.

With the assistance of UCD, usable interfaces can be created the need for teaching, help and manuals can be reduced, and unmet needs can be discovered.

User Interface

Users interact with systems and computers via user interfaces. Hence, an interface should be able to support successful interaction between users and computers. The main objective of user interface design is to make the user's interaction as good as possible.

During the ensuing decade, research and development activities increased for interface design. There have been attempts to help developing a more rigorous science of user interface design (Shneiderman & Plaisant, 2005).

According to Benbasat et al. (1981), user interface characteristics are under the control of the developer. For that reason, the designer should have the knowledge of the type of interface characteristics, which would be the most appropriate for a

specified set of user, environment, and task variables to get better interaction between the user and computer.

The design of the user interface has an enormous influence on the usability of the system, because the functionality of a computer system is used by its user interface (Jaspers et al., 2004). Therefore, developing a successful and usable user interface is a critical success factor for a good interaction. Some catastrophic problems can arise when usability of the interface design is overlooked.

Nevertheless, it is undeniable that interface design is important for users' learning time, performance and satisfaction. Even so, a user interface can play a key role in the acceptance or failure of a software product.

According to Sutcliffe (1988), "Interface design became important because pleasant, attractive, easy-to-use software sells well". Good user interface design can make a product more marketable because of its influence on the acceptance of a product.

Prototyping

Prototyping is an iterative design approach involving both systems analysts and end users that creates a model and simulates all parts of a product in order to test various aspects of the design. Iterative design progresses until realizing the desired performance or achieving usability. Prototyping is essential in the early steps of the invention process for clarifying information requirements.

As Alavi (1984) says, prototyping has some perceived benefits and shortcomings.

The first benefit of prototyping comes from its feasibility. Users can analyze and evaluate the proposed system with tangible means and easily give feedback on their needs and requirements. Second, it provides a common base line for both users and designers in order to identify potential problems and opportunities in the early stages of the development process. Third, it enables the involvement and commitments of users on a project. Fourth, it provides better communication between user and data processing personnel. Last, it makes certain that the nucleus of a system is right (Alavi, 1984).

The first shortcoming of prototyping is the creation of unrealistic user expectations by overselling the product that leads to dissatisfaction. Second, it is difficult to manage and control because it does not have a proper management. Third, it has a limited capability. It is powerless for large IS. Last, it is difficult to maintain user desires. Sometimes, users' interest in the prototype decreases and users do not want to spend time to conclude it after it was developed with high priority needs and requirements (Alavi, 1984).

The majority of prototyping is that it has the advantage of working out usability problems before the implementation phase.

Early studies found that the prototyping approach resulted in fewer time pressures on the development teams (Boehm, 1984) and higher user satisfaction and acceptance (Alavi, 1984).

Diffusion & Technology Acceptance Models

There is an increasing concentration on developing better user interfaces. Although user interface is believed to be the tip of the iceberg, capabilities of user interface help IS adoption process a lot (Özen & Başoğlu, 2007).

A growing body of academic research has studied the factors that influence IS acceptance and usage among users (Taylor & Todd, 1995; Chau & Hu, 2002; Sun & Zhang, 2005). These early efforts produced a long list of factors. According to Legris et al. (2001), for practical reasons, the factors should be grouped into models in a way that would assist the analysis of IS usage. The diffusion and infusion of IS is a complex process that is affected by several factors (Chiasson & Lovato, 2001). Consistent with this work, in the past decade, research has already been undertaken and some adoption models were proposed to explain user technology acceptance.

Theory of Reasoned Action (TRA) Model

Theory of reasoned action (TRA) is one of the most primary and leading theories of human behavior. TRA is the study of attitude, and behavior that was proposed by Fishbein & Ajzen in 1975.

In its simplest form, the individual's intention is the unique direct determinant, and the individual's attitude and subjective norm are jointly indirect determinants of an individual's behavior in TRA model (Fig. 2.1). In accordance with this model, the individual's behavior is determined by his/her intention to perform the task.

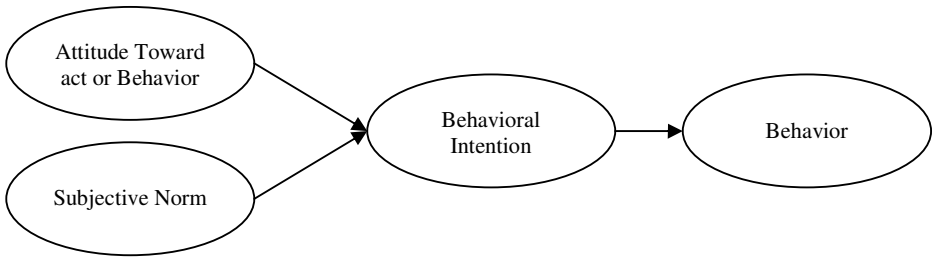

Fig. 2.1 Theory of reasoned action (Fishbein & Ajzen, 1975)

Attitude toward the act or behavior is defined as “the individual's positive or negative feelings about performing a behavior”. This can be classified as the feelings that are about whether the outcome of his/her action will be positive or negative.

Subjective norm refers to “an individual's perception of whether people important to the individual think the behavior should be performed” (Fishbein & Ajzen, 1975). An individual behavior can be easily influenced by the people around. A subjective norm can also be explained as what other individuals around believe that the individual should do. Subjective norm and attitudes toward the behavior can strongly influence the intention and eventually the behavior.

The model has some limitations including misunderstanding between attitudes and norms, and the assumption of acting freely without any constraint when there is an intention to act. The theory of planned behavior (TPB) attempts to overcome these limitations.

Technology Acceptance Model (TAM) & TAM2 Model

Technology acceptance model (TAM), which was proposed by Davis (1986) in his doctorial thesis and tested by Davis et al. (1989), concentrates on accepting and using a particular "Information Systems Product" based on perceived usefulness and ease of use of the product (Fig. 2.2).

Davis et al. (1989) described perceived usefulness as ''the degree to which a person believes that using a particular system would enhance his/her job performance'' and perceived ease of use as ''the degree to which a person believes that using a particular system would be free of effort''. Along with the model, the person shows positive attitudes towards using the system if, and only if, he/she thinks that the system is useful and easy to use.

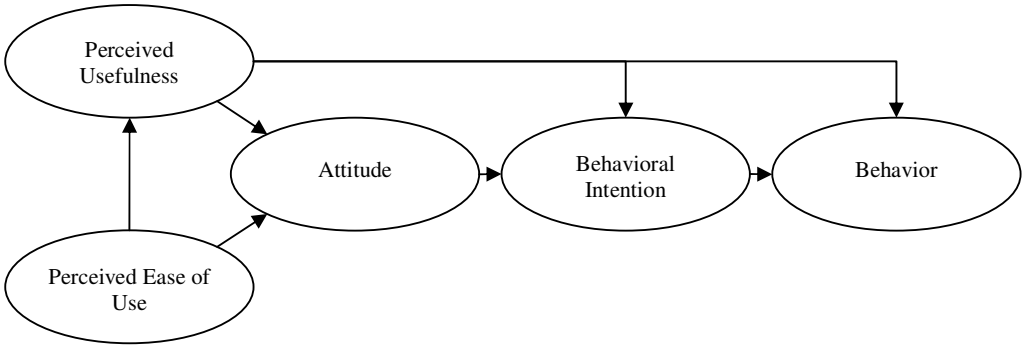

Fig. 2.2 Technology acceptance model (Davis, 1986)

TAM can be accepted as an adaptation of the TRA model (Fishbein & Ajzen, 1975) and the TPB model (Ajzen, 1991). TAM has been successfully applied in studying the adoption process of different technologies and users (Jackson et al., 1997; Venkatesh & Davis, 2000).

Later, Venkatesh and Morris (2000) proposed a new version of TAM model, TAM2, to explain perceived usefulness and individual's intention to use in terms of social influence and cognitive instrumental processes with longitudinal research design (Fig. 2.3).

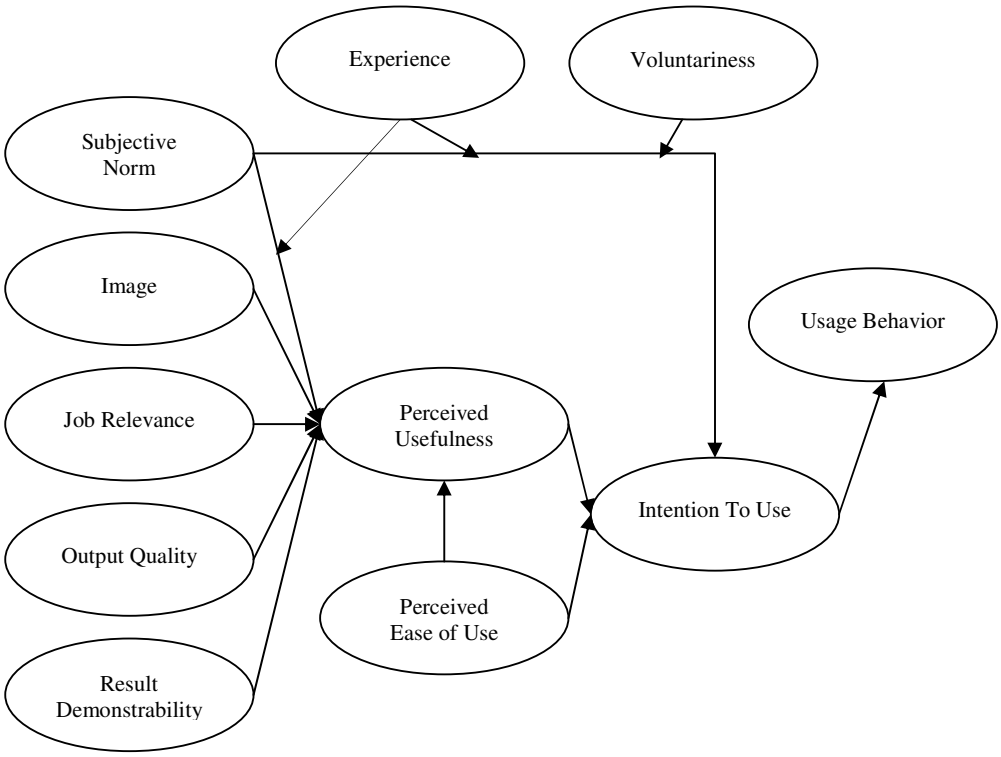

Fig. 2.3 Original version of TAM2 (Venkatesh & Morris, 2000)

The perception of experience and voluntariness were included in the analysis of the factors that influence usage behavior in the new version of TAM.

Theory of Planned Behavior (TPB) Model

Ajzen (1991) is a successor of the TRA model developed as theory of planned behavior (TPB). The TPB model considers individuals' perceived behavioral control as a third direct determinant of individuals' behavioral intention that differentiates TPB model from TRA model (Fig. 2.4).

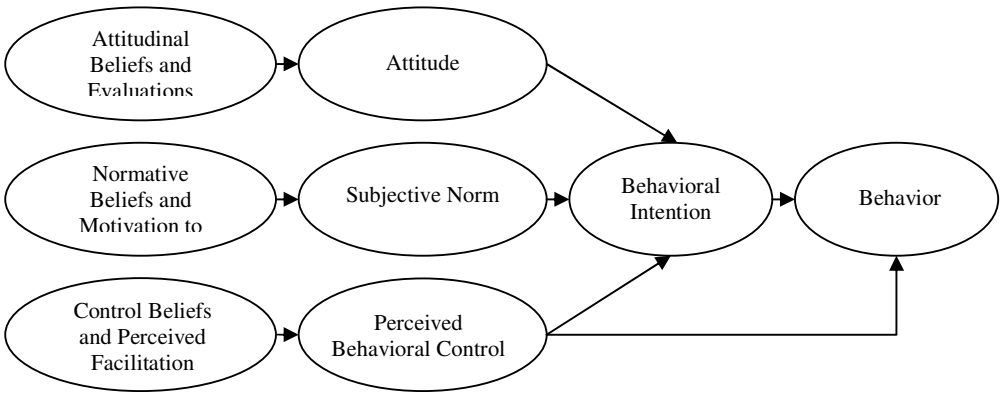

Fig. 2.4 Theory of planned behavior (Ajzen, 1991)

Perceived behavioral control is defined as "people's perceptions of their ability to perform a given behavior" (Ajzen, 1991), which is determined by two factors: control beliefs and perceived facilitation. The person will have a high-perceived control behavior if he/she holds strong control beliefs about the existence of factors that will facilitate a behavior.

Information Systems (IS) Success Model

Delone and McLean developed the information systems (IS) success model in 1992, and then updated it in 2003. Along with the model, system quality and information quality jointly affect both use and user satisfaction which can have a positive or negative impact on each other. Use and user satisfaction are direct determinants of individual impact and indirect determinants of organizational performance via individual performance (Fig. 2.5).

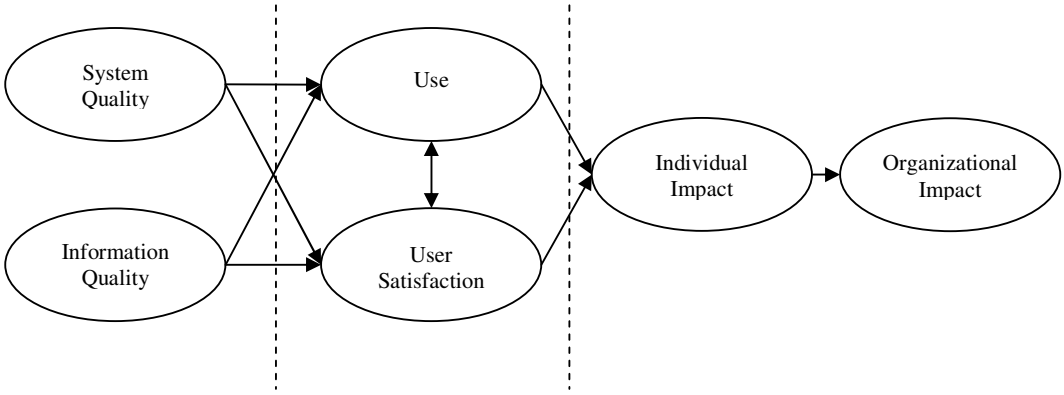

Fig. 2.5 The original IS success model (Delone & Mclean, 1992)

The IS success model is widely used in literature because of its multidimensional view.

Task-technology Fit (TTF) Model

A weakness of TAM alone is that it does not consider user task needs. The task-technology fit (TTF) model attempts to solve this limitation. The core of a TTF model is a formal construct known as TTF, which is matching of the capabilities of

the technology to the demands of the task, that is, the ability of IS to support a task (Goodhue & Thompson, 1995). According to TTF, IS will be used if, and only if, the functions support the user tasks (Fig. 2.6).

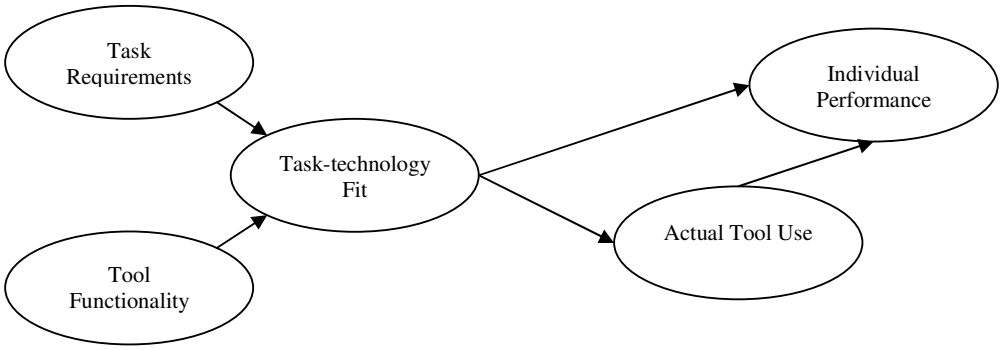

Fig. 2.6 Task-technology fit model (Goodhue & Thompson, 1995)

TTF model has task characteristics, which is the weakness of TAM, and TAM includes attitudes towards IS, which is the core of TAM. In line with this, one approach Dishaw and Strong (1998) state is just that of combining TAM and TTF in order to clarify much more variance with the intention of understanding the user.

Unified Theory of Acceptance and Use of Technology (UTAUT) Model

Venkatesh et al. (2003) developed the unified theory of acceptance and use of technology (UTAUT) model in order to integrate the main eight competing user acceptance models; theory of reasoned action, technology acceptance model, motivational model, theory of planned behavior, a combined theory of planned behavior/technology acceptance model, model of pc utilization, innovation diffusion theory, and social cognitive theory.

UTAUT posits that there are four direct determinants of intention for use and behavior; performance expectancy, effort expectancy and social influence and facilitating conditions (Fig. 2.7). Performance expectancy is defined as “the degree to which an individual believes that using the system will help him or her to attain gains in job performance”. Effort expectancy refers to the degree of ease related with the use of the system. Social influence is defined as “the degree to which an individual perceives that important others believe he or she should use the new system”. Facilitating conditions are defined as “the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system” (Venkatesh et al., 2003).

The model also highlights the importance of key moderator factors; gender, age, voluntariness, and experience in order to gain a better understanding of the complexity of technology acceptance by individuals.

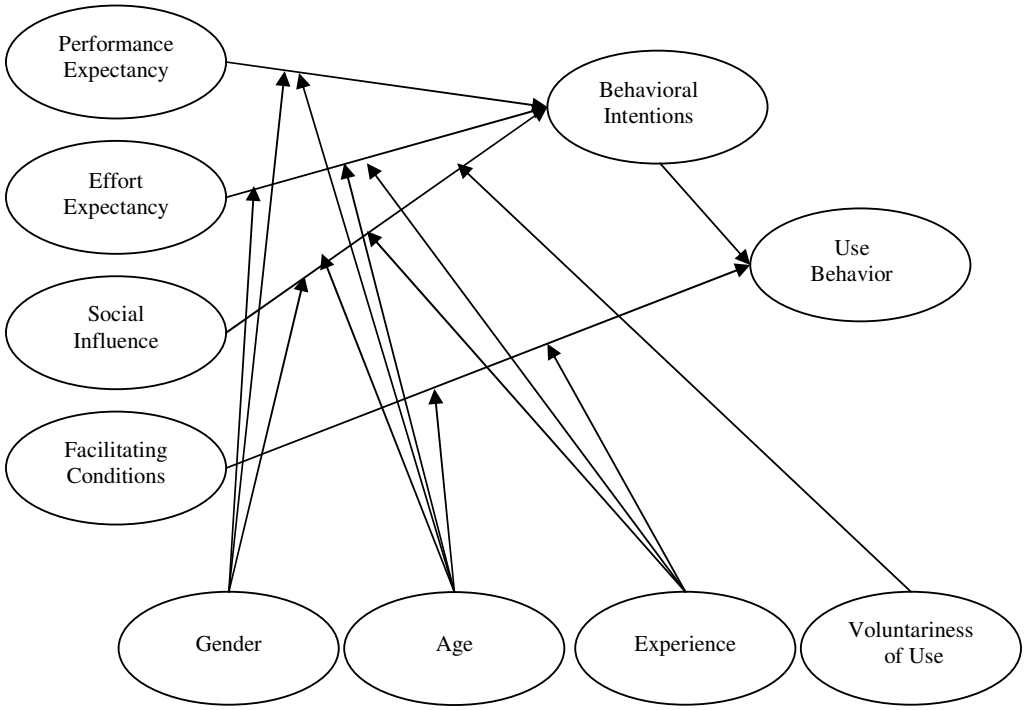

Fig. 2.7 UTAUT model (Venkatesh et al., 2003)

Evaluation of the possibility of success for new technology presentations, and understanding the factors of acceptance, especially for users that may be less disposed to adopt or accept a new technology is provided by UTAUT for managers (Venkatesh et al., 2003).

End-user Satisfaction Models with ERP Applications

Çalışır & Çalışır (2004) proposed a conceptual model of factors affecting end-user satisfaction with enterprise resource planning (ERP) systems that explores the influences of interface usability characteristics, perceived usefulness, and perceived ease of use to end-user satisfaction with ERP systems (Fig. 2.8).

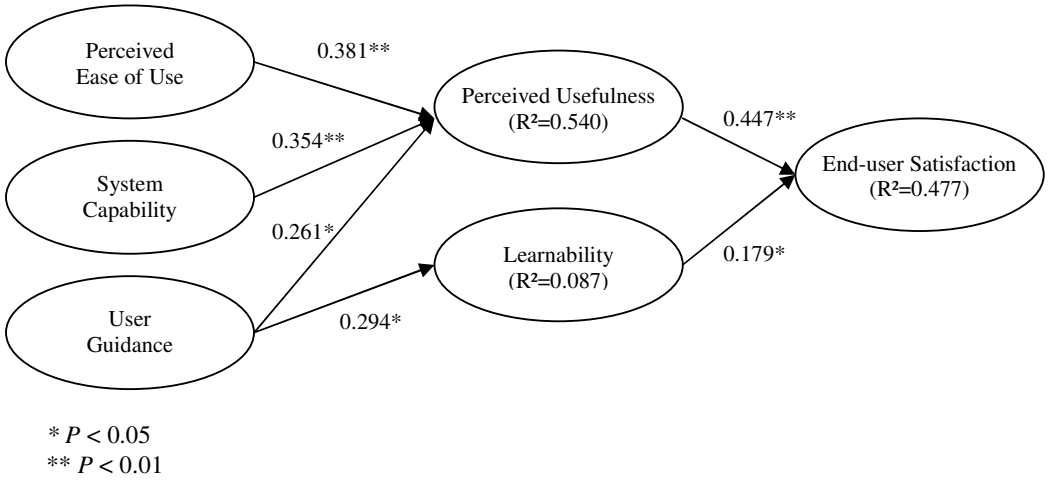

Fig. 2.8 A Model of user satisfaction with ERP systems (Çalışır & Çalışır, 2004)

The model indicates that both perceived usefulness and learnability are determinants of end-user satisfaction with ERP systems. Additionally, perceived ease of use and system capability affect perceived usefulness, whereas user guidance influences both perceived usefulness and learnability.

The most noticeable aspect of the study is that perceived usefulness has the strongest impact on end-user satisfaction.

A different model evolved from Çalışır and Çalışır's (2004) model, TAM and TTF was proposed by Özen & Başoğlu (2006) (Fig. 2.9).

In accordance with this model, usefulness and ease of use are the determinants; and task-technology fit, navigation, learnability through ease of use, visual factors, minimal memory load, and data quality through usefulness are the indirect impacts of end-user satisfaction.

End-user satisfaction explained by the model is 69 %. Among all constructs, usefulness, which is one of the direct determinants of end-user satisfaction, has the strongest impact on end-user satisfaction with a R^2=0.845. That means the user is satisfied if and only if he/she benefits from the ERP system.

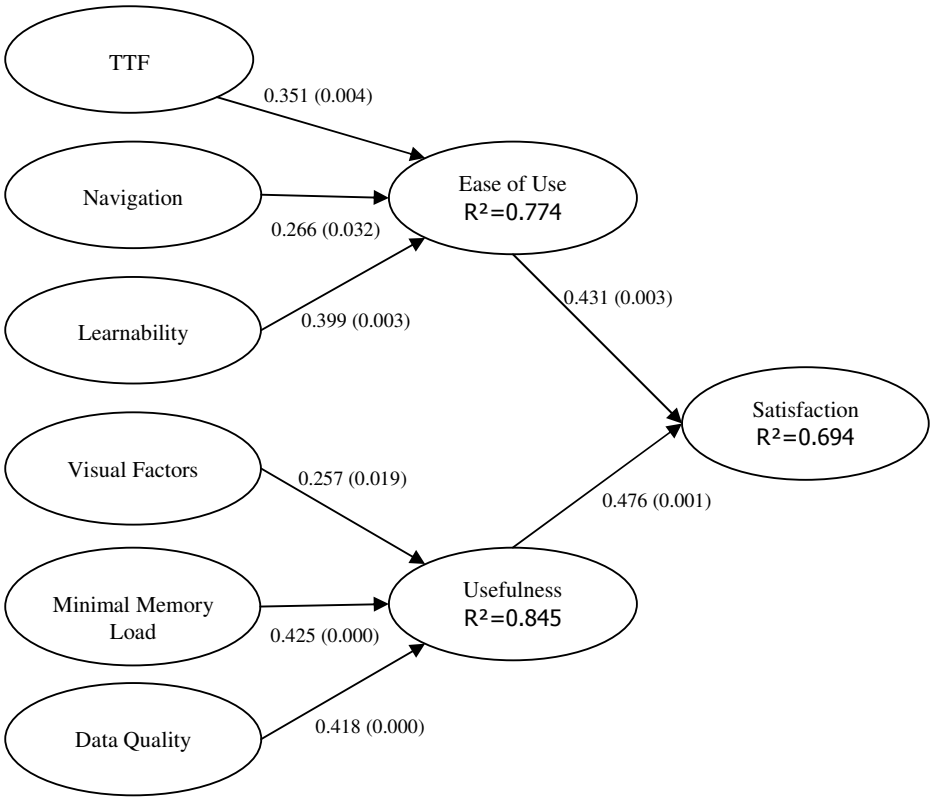

Fig. 2.9 A Model of user satisfaction with ERP systems (Özen & Başoğlu, 2006)

The most obvious aspect of the model is that minimal memory load has a strong indirect effect on end-user satisfaction via usefulness, which means that ERP system users are more satisfied if what the system affords is simply recognized with

adequate and required detailed user interfaces and offers uncomplicated solutions. Also, two interface characteristics visual factors and navigation have a significant indirect impact on end-user satisfaction.

This model emphasizes user interface and usability characteristics by conducting a survey to thirty-five ERP system users. The sample was predominantly aged between twenty-six and forty, and worked in different departments. Regarding daily ERP usage, the respondents used ERP system more than five hours a day. Last, 80 % of the respondents was well off and had a minimum two-year experience in ERP systems. The questionnaire had six-point Likert-type scale with anchors ranging from "strongly disagree" to "strongly agree".

New Product Development (NPD) & Innovation

Innovation is the introduction of new ideas, goods, and services into the marketplace in the form of a new product or service that intends to improve current practices. Innovation is important to keep customers buying the products and services and increase sales, revenues, shareholders' return, stock prices.

All processes of creating and taking a new product or service to market are called new product development (NPD), which aims to improve the chances for a new product success. According to Hart (1996), NPD is vital for company survival and growth.

HCI is an attractive area for innovation and creativity because of its multi-disciplinary nature. For the last 25 years, HCI brought about new solutions for the benefit of the user. Additional focus during new product development can improve

HCI studies, which also needs new methods to increase the success and usability of its new products.

Market orientation is one of the business strategies, which has two components: customers and competitors. Understanding the customers' needs, preferences and desires are important for innovativeness and have an impact on new product success.

IS capabilities are changing product development (PD). The PD process itself is turning into a global activity with cross-functional PD team members across multiple locations and time zones. These changes bring the necessity of fast and accurate input from customers. With the help of capabilities of IS, PD teams reach customers more quickly by input methods (Dahan & Hauser, 2001).

NPD tools are used in order to identify problems, increase the success of new product and collect data to provide company's sales force at different stages of the NPD process (Nijssen & Frambach, 1998).

Basic NPD questions that should be answered during NPD process are "What product to produce?", "How must the product be designed?", "How to introduce the product?" and "What is the new product's anticipated success?" There are suitable NPD tools for basic NPD questions. Brainstorming, morphological analysis, synectics, focus group, user-observation, and the Delphi method are some of the suitable tools that can be used to determine what product to produce. Conjoint analysis, quality function deployment, concept test, prototype test, and in-home-use test are suitable tools that can be used in designing the process of a product. Mini test, simulated market test, limited rollout, scanner market, test marketing are some of the suitable tools that can be used in introduction of a product. Market prediction models, diffusion models, and economic models (ROI-analysis/pay back time) are

some of the suitable tools for anticipating the success of a new product (Nijssen & Lieshout, 1995).

In conclusion, the NPD process and appropriate tools for the phases of the process allow product developers to understand customer needs, requirements, and desires accurately in the early stages of the development.

Brainstorming

Brainstorming was proposed and designed with some rules to stimulate creative ideas in the 1940s by the American advertising executive Alex Osborn.

As expressed by Alex Osborn, brainstorming is "a conference technique by which a group attempts to find a solution for a specific problem by amassing all the ideas spontaneously by its members".

A brainstorming session is a NPD tool in which eight to twelve members sit around generating, refining, and developing ideas, by letting the mind think without interruption and free from fixed-ideas. However, brainstorming is not just an unsystematic activity. Brainstorming rules should be followed during the session. For example, ideas should not be rejected no matter how irrelevant they appear until they have been thoroughly evaluated.

There are two phases of the activity. In the first phase, participants generate ideas, and in the second phase they evaluate them. An experienced facilitator is useful for moderating the session that can make the session run smoothly and according to brainstorming session rules. The facilitator should explain to the group: first the problem or the idea to be investigated; and second, the chain of events that

will take place during the method. Another important role of the facilitator is to encourage everyone to contribute to the discussion.

Participants that have different backgrounds and expertise can develop ideas. Sometimes a student with little expertise can produce a creative and bright idea. With too homogeneous participants, creative ideas may be inhibited and group thinking may be obtained.

Session should not last more than 120 minutes. After 120 minutes, the participants can get too tired to create new ideas. Breaks can be given in order to relax the participants.

When setting up the meeting, a brief explanation and history of the problem should be sent via e-mail or post to participants in order to prepare and help them focus mentally, help them to understand the problem and clarify the objectives for the session to get better results. In addition, directions for the meeting place, date, time and duration should be sent. The participants should be reminded of the meeting before the deadline.

The meeting that will take place should be prepared before the session. A "U" shaped table can be preferred to let participants see what is happening during the session and provide a facilitator to remain in control of the field. Moreover, a tape recorder and a video camera can be used for recording the session to make sure no ideas are lost. In addition, colored pens can be put on the table not only for note taking but also to increase participants' creativity. Every participant should have a post-it to note down the ideas not to forget them if that moment another participant is talking. Additionally, cookies and some drinks can be served because participants may not be creative if they feel hungry or thirsty. A graceful perfume can be used to avoid bad smells in the place. Furthermore, some peaceful music CD's can be played

during the session. Last, a whiteboard can be used to write ideas and discuss at the end of the session.

Rules should be distributed or read by the facilitator at the beginning of the session. Main rules are; critics of ideas are not allowed as mentioned before, ideas should be encouraged and large numbers of ideas should be built on others' ideas.

Participants should introduce themselves at the beginning of the session. Turning off the mobile telephones should be reminded. Participants should be welcomed to the brainstorming session and they should be all appreciated at the end of the session.

Brainstorming session should be analyzed and reported when all the information is gathered.

Conjoint Analysis

One of the most widely used quantitative methods in marketing research is conjoint analysis, which was developed in the 1970s. Conjoint analysis is a multivariate statistical technique that has been used for consumer-centric studies for more than two decades. It is well suited to developing a new product or improving the existing one that better meets customers' underlying needs for the market. Mainly, this technique is concerned with understanding customer attitudes, preferences and needs by measuring how customers value components of a product or service with trade-off questions.

First, in conjoint analysis, attributes and levels of the product or service are depicted in order to see what is traded off. The attribute refers to the feature of the product, or service and level can be described as possible values for each attribute.

For example, color can be an attribute of a product and red, yellow, and blue can be classified as its levels. An alternative can be deemed as a set of attributes and its levels.

An instance of an alternative can be a personal computer (PC) using the attributes brand, memory, screen size, and price. A specific PC alternative can be described as DELL, 512 megabytes RAM, 17 inches and $ 1,199 (Fig. 2.10).

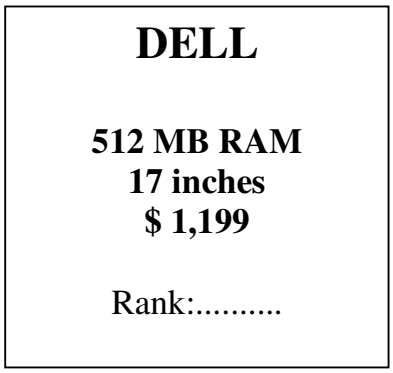

Fig. 2.10 Card example with traditional full-profile ranking method

Number of levels' products calculates the number alternatives. For example, some research that has four attributes each of which has three levels is composed of eighty-one (3×3×3×3) alternatives.

Second, customers are asked to rank/rate these alternatives. For each level of each attribute, a mathematical "part-worth utility" (PWU) value is computed from the rankings, which is better when it is higher. These values emphasize the desirability of each attribute and the influence of each attribute on choices of the respondents.

The total of the PWU values makes up the product utility:

Product Utility=Utility for attribute # 1+ Utility for attribute # 2+… + Utility for attribute # N

PWU values of each attribute level can be gained without asking direct questions to the respondents. For that reason, results that are more reliable can be provided by conjoint analysis than in commonly used techniques (Decker & Hermelbracht, 2006).

With the support of conjoint analysis, what product design characteristics are important and unimportant for the user; what levels of product design characteristics are the most and the least desirable ones for the user; in addition, what are the market shares and market segmentation for these products are can be found.

The main difference of conjoint analysis from the other multivariate techniques is that it specifies both the independent variables (attributes) and their values (levels). The only input provided by the respondents is dependent measure. Afterwards, conjoint analysis divides these inputs into effects for each level (Hair et al., 1998).

With the assistance of conjoint analysis, software tools, large numbers of different items, large samples, and implementation of web-based questionnaires with adequate visualizations can be handled (Decker & Hermelbracht, 2006).

Sawtooth Software, Inc. is perhaps the best-known company in conjoint analysis software and advanced analytics, which has software tools for the design of web-based interviewing systems (Dahan & Hauser, 2001). Online interviewing software, SSI Web is a powerful platform. With the aid of this tool, complex prototypes can be easily prepared and implemented.

In addition, SPSS (Statistical Package for the Social Sciences) is a statistical tool that provides conjoint analysis by using a traditional, full-profile approach. Conjoint analysis can also be made by using SPSS easily but in a poor manner

compared with SSI Web. In order to decrease the number of alternatives, SPSS Conjoint provides fractional factorial designs. Fractional factorial designs are the suitable fraction of all potential alternatives, which still tolerate the estimation of PWU's for all main effects.

Variations of Conjoint Analysis

According to Lockhart and Knain (1998), there are three major categories of conjoint analysis methodologies: traditional conjoint analysis, choice-based conjoint and derivatives of conjoint.

Traditional conjoint uses a rating scale or card sorting method in order to take respondents' choices. In rating scale method, respondent rates the cards from the most desired to the least desired. On the other hand, in the sorting method, respondent sorts the cards from the most desired to the least desired.

Traditional conjoint has three major variations of the methodology: full-profile, paired comparison matrix, and adaptive conjoint analysis (ACA). In traditional full profile methodology, participants were asked for a product profile that includes a description of all the attributes. Alternatively, in traditional paired comparisons matrix methodology, participants were asked to respond to and rate pairs of attributes. Last traditional conjoint methodology, ACA methodology is the most popular approach, which was developed by Sawtooth Software, Inc. Other two traditional conjoint methodologies can be applied on paper, computer or the Internet for both product design and pricing issues even with small sample sizes, but they are limited to studies with not more than six attributes. ACA resolves this problem.

ACA has the capability to study with many attributes, without bothering, but rather entertaining and engaging the respondent. Like other traditional conjoint methodologies, ACA can measure attributes even with small sample sizes. One of

the most important weaknesses of ACA is that it must be computer-administered. Besides, ACA tends to understate the importance of price. For that reason, ACA is generally not used for pricing issues.

Second major category of conjoint is the choice-based conjoint (CBC) which represents alternatives that are choices between available products. Therefore, CBC mimics the real world. Beside these alternatives, none or multiple constant alternatives can be represented. Unlike ACA, CBC can be administered on paper. It can also be computer or web-based. Unlike traditional conjoint methodologies, CBC needs larger samples in order to measure attributes. Other vital weaknesses of CBC are that it has a more complex analysis and processes with fewer attributes than traditional conjoint methodologies.

Derivatives of conjoint refer to the alternatives of conjoint, which are fixed sum, self-explicated and sum stated importance techniques (Lockhart & Knain, 1998).

Diffusion Model & Bass Model of Diffusion

The diffusion model is a method that tries to model and forecast the level and speed of diffusion by the market. Mainly, this method focuses on the adoption process supposing that customers adapt with a different speed due to different characteristics and perceived advantages of the new product process (Nijssen & Frambach, 1998).

One of the diffusion models is the Bass model of diffusion, which was proposed and tested by Bass (1969). The Bass Model indicates how a new product or idea broadens through the user community by measuring the introduction of new

technologies relying on the take-up by innovators and imitators. The model is used to expect technology introduction rates from a set of estimated values for the innovation and imitation factors.

With the aid of the Bass model of diffusion, several theories have been developed concerning the factors influencing individuals' acceptance or resistance behavior towards new technologies that represents a major field in HCI literature (Tanoğlu, 2006).

Focus Group

The focus group is a form of qualitative research that lasts for 1-2 hours in which six to twelve individuals are brought together, are considered representatives of the target segment to discuss and share ideas about a certain issue.

Traditional focus group has some steps and rules like writing the purpose and questions of the study, identifying the participants and gathering their contact information for further connection, identifying the facilitator to moderate the session, sending and following the invitations, arranging a meeting room, reminding them of the session before the deadline and afterwards, and conducting the session. Finally, participants should be appreciated and an analysis of the session should be reported.

Because of the condition provided by information systems (IS), focus group could be conducted over the Internet. Besides, people can be invited to the focus groups via e-mail. In addition, participants can answer and send back questionnaires via e-mail. Focus groups via e-mail can also be performed to obtain expert ideas in different locations.

Focus group enables organizations to discover their customers' needs, preferences, attitudes, emotions.

In-home Use Test

The in-home use test is an approach in which customers are able to use and test new products for a while at home; and share their experiences and problems (Nijssen & Frambach, 1998).

Market Prediction Models

Market prediction models attempt to estimate the market share of the new product by evaluating some factors like customer preferences (Nijssen & Frambach, 1998).

Mini Test

In the mini test, the main objective is to gain insight of "awareness-trail-repeat purchase" activities and the positioning of the new product in order to optimize its commercialization (Nijssen & Frambach, 1998).

Morphological Approach

In the Morphological approach, problems are divided into sub-problems and solutions for the sub-problems are generated. Finally, all sub-problem solutions are linked together to solve the main problem process (Nijssen & Frambach, 1998).

Quality Function Deployment (QFD)

Quality function deployment (QFD) compares the fit between customer needs and product features. It is a process for determining customer needs, requirements, and desires and translating them into product/service technical requirements for design, development, implementation, and delivery of a product.

Means-end Chain Theory

Means-end chain theory or attribute-consequence-value (A-C-V) model is trying to explain user needs & requirements (Reynolds & Gutman, 1988). System analysts cooperate with end users to identify and specify materials needed, so that a more precise and comprehensive definition of the information requirements is formed in the requirements analysis part prior to the development of a product (Robey & Farrow, 1982; Byrd et al., 1992; Sofuoğlu, 2006).

Simulated Market

The simulated market test is a method that meets customers with a product using an interview and virtual store-environment process (Nijssen & Frambach, 1998).

In-depth Interviews

In-depth interviews have a flexible, dynamic, and discovery-oriented style of questioning and discussions directed toward understanding the interviewees' experiences in deepth.

In-depth interviews are semi-structured, starting with predefined questions. The lengths of the interviews can be varied from 20 minutes to 120 minutes. Unlike brainstorming and focus group, in-depth interviews take place with one interviewee

at a time. The interviewer should be a good listener. The interviews should be recorded on audio tape, even videotaped with the permission of the interviewees. Interviewees should be appreciated at the end of the interview and recorded speech of the interviewee should be reported after each meeting.

Questions such as "Why have you answered this way?", “What comes into your mind for …?”, "Could you state your point of view?", “What does … bring to your mind?”, "Do you have any special reasons?" can be used during the interview.

In-depth interviews can be conducted face-to-face or over the telephone.

CHAPTER 3

FRAMEWORK

Technology Adoption Taxonomy

Before constructing the model framework and hypotheses, technology adoption taxonomy was developed and extended to classify the factors that affect technology acceptance and user's intention to use the product based on literature review and a series of observations; in-depth interviews, brainstorming session, and expert focus group.

According to this taxonomy (Fig. 3.1), technology adoption has five main aspects; "task", "product", "information content", "social" and "intermediary". In this taxonomy, characteristics of task, product, information content, social and intermediary refer to the characteristics that influence technology adoption process.

Some of the aspects have categories and sub-categories. Product aspect has three categories; "non-interface characteristics", "interface characteristics" and "high-interaction characteristics". Interface characteristics category has three sub-categories; "visualization", "audio" and "interaction characteristics". On the other hand, social aspect has two categories; "system context", and "user characteristics & mental and emotional state".

In Fig. 3.1, the characteristics that were gained in only during literature review are labeled as "(L)". Label "(I)" refers to the characteristics that were obtained by in-depth interviews study. Similarly, "(B)" refers to the brainstorming session study.

Lastly, “(E)” refers to the characteristics that were mentioned as important characteristics by experts in expert focus group study.

Task aspect of the taxonomy can be defined as all the technology adoption characteristics that are related to the objectives or desired end-result of activities a user wants to accomplish.

Second, product aspect of the taxonomy can be termed as all the technology adoption characteristics that are related to the features of a tool that has been created for some specific intention.

Third, information content aspect of the taxonomy can be described as all the technology adoption characteristics that are related to the information, materials, and functions contained.

Fourth, social aspect of the taxonomy can be defined as all the technology adoption characteristics that are related to the user, users’ society and interaction between its members.

Last, intermediary aspect of the taxonomy can be termed as all the technology adoption characteristics that emerge when user interacts with product.

The definitions of technology adoption taxonomy’s characteristics have been included in Appendix A (in English) and Appendix B (in Turkish), respectively.

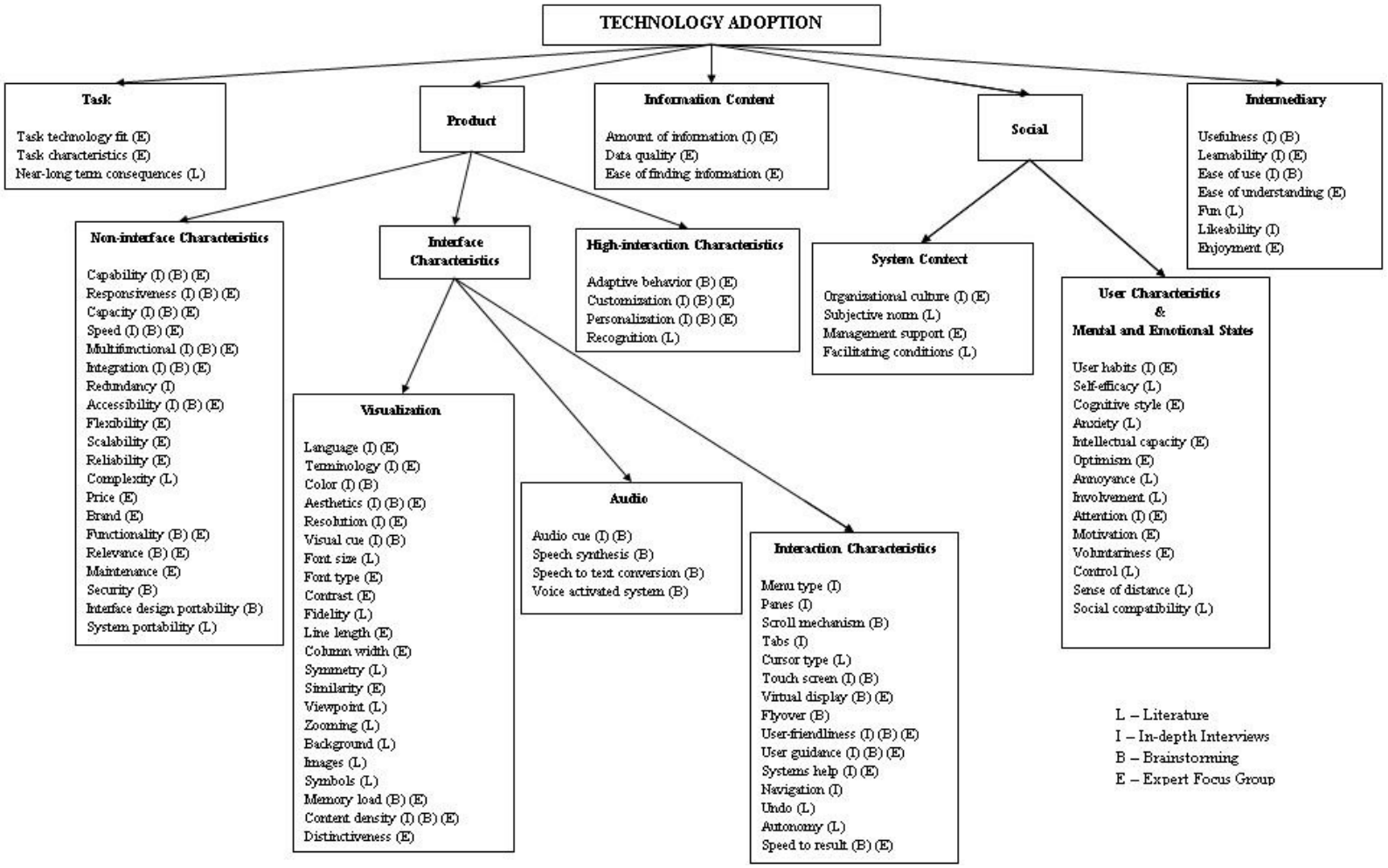

Fig. 3.1 Technology adoption taxonomy

Research Framework & Hypotheses

The research framework is composed of two models. Product design characteristics framework and antecedents of user intention framework were formed with six and thirteen constructs, respectively. These frameworks are explained in depth in the following sections.

Product Design Characteristics Framework & Hypotheses

Fig. 3.2 represents the first research framework. The product design characteristics framework consists of six constructs; customization, adaptive behavior, memory load, content density, speed, and user preference.

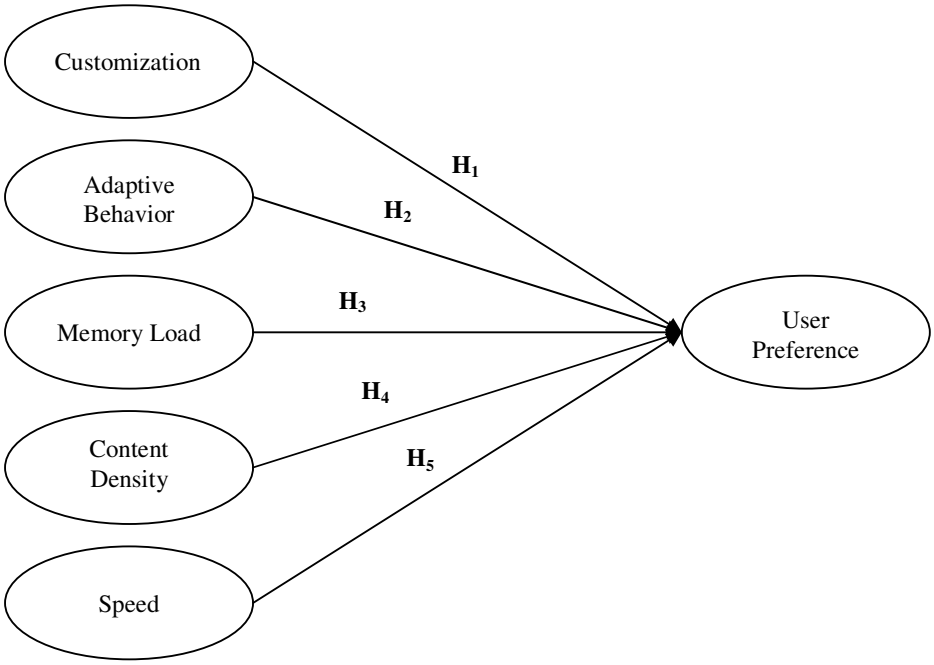

Fig. 3.2 Product design characteristics framework

Hypotheses drawn from the first part of the research framework are formulated as follows (Table 3.1).

Table 3.1 Product Design Characteristics Framework's Research Hypotheses

Hypotheses	Dependent variable	Independent variable	Relationship
H_1	User preference	Customization	Positive
H_2	User preference	Adaptive behavior	Positive
H_3	User preference	Minimal memory load	Positive
H_4	User preference	Low content density	Positive
H_5	User preference	Low-speed	Negative

User interfaces are becoming more complex. For that reason, research has concentrated on adaptable and adaptive user interfaces. Previous studies have presented that users prefer interfaces that they can adapt to.

Although user interfaces are becoming more complex with more features, most of the users use only a small subset of functionalities. Most of the user interfaces present all features available all the time that leads to decreasing the space of the working area. In order to overcome this problem, flexible and customizable user interfaces should be developed (Stuerzlinger et al., 2006).

Customization, which is a product's high-interaction characteristic in technology adoption taxonomy, is the design and creation of content that meets a user's specific needs and requirements. Definitions of customization are as follows; "it takes place after the original design and implementation of the application" (Mørch, 1997), "any capability that makes generic programs suitable to a specific user need, for example, templates, automated activities like macros, etc." (Weld et al., 2003), "it allows interfaces to be adapted to particular user preferences, and specialized to the specific tasks that users need to perform" (Bergman & Lau, 2004), "it is the capability of adapting the user interface by end users to meet their specific task requirements" (Rivera, 2005).

Customization can be realized by allowing users to organize panes and toolbars, select templates and themes, define macros, hide, and show buttons.

According to Bentley and Dourish (1995), there are two types of customization; surface customization and deep customization. Surface customization lets users choose between a predefined set of options. In contrast, deep customization lets users customize deeper features of a system, such as integrating an external translation program with a word processor.

As expressed by Bunt et al. (2007), adaptable and adaptive customization differs in terms of who performs it; the system or the user. Adaptable interfaces give full control to the user for customization. Alternatively, adaptive interfaces perform the customization automatically derived from user-specific information, such as the user's work patterns and preferences. According to Bunt et al. (2007), the optimal solution lies somewhere in the middle.

Developers can develop user interfaces that meet users' requirements and needs; however, it is better to give choices to the user and allow customization. Users should be allowed to choose from user interfaces with a variety of characteristics instead of developers assigning them and thinking what would work best for them (Xiao et al., 2007). As stated by Stuerzlinger et al. (2006), users should be in control of customization, not the developers, because user interfaces can be assimilated to more complexes by developers during the idea of adding adaptation functionality. Moreover, users may use different hardware devices that the user interfaces are running on (Gajos et al., 2004) or want different functionalities (Bunt et al., 2004) from the user interfaces.

There have been attempts to examine the effect of product customization on user performance (Findlater & McGrenere, 2004; Rivera, 2005), learnability, user

satisfaction (Findlater & McGrenere, 2004), perceived workload (Rivera, 2005), usefulness, effectiveness and user perceptions or behavior (Hui & Craig, 2006; Xiao et al., 2007) of different technologies.

Customizable user interfaces can help users to deal with the scope, complexity, potential, intrusiveness, and ever-changing nature of software (Hui & Craig, 2006).

For the reasons mentioned above, user preference about using the product will be affected positively if product's design and creation of content meets a user's specific needs and requirements.

The study hence makes the following inference:

H_1: Customization significantly and positively affects user preference concerning the use of the product.

During the past years intelligent and adaptive human-computer interfaces were studied and they gained much interest, with the terms often used interchangeably.

Adaptive behavior of user interface, which is a product's high-interaction characteristic in technology adoption taxonomy, is the user interface's ability to understand the user profile and tailor these to the product's interactive behavior.

Adaptive behavioral user interface firstly observes users, learns users' interests, preferences, beliefs, purposes, needs, and requirements. Then, it models the users' usage patterns and behaviors. Finally, it customizes their own behaviors to the users' behaviors. Therefore, an adaptive user interface executes the adaptation for the user during the product usage.

With the assistance of adaptive behavioral user interface, amount of work expected from the user can be reduced. Saving time, the user can focus on his/her goals with the interface. While adaptive behavioral user interface works on its own, it enables the user to pay attention to their work. Adaptive behavioral user interfaces

are suitable when users cannot customize their interfaces effectively according to their preferences (Bunt et al., 2004).

There have been attempts to build adaptive behavioral user interfaces (Shavlik et al., 1999; Yoo et al., 2003; Kumar et al., 2006), examine the effects of adaptive behavioral user interfaces on learnability and ease of use (Paymans et al., 2004), propose approaches for adaptive behavioral user interfaces to improve adaptation (Kristofic & Bielikova, 2005; Pittermann & Pittermann, 2007).

For the reasons mentioned above, user preference about using the product will be affected positively if user interface has the ability to understand and learn the intentions and preferences of the user, and recognize the user and convert to implicit commands.

Thus, the study conducts the following hypothesis:

$H_{2:}$ Adaptive behavior significantly and positively affects user preference concerning the use of the product.

Working memory refers to the short-term storage and processing of information during complex cognitive activities (Trbovich, 2005). Furthermore, cognitive load refers to the load on working memory during problem solving, thinking, and reasoning. As an example, consider the difference between having to study a subject in one's native language versus in a foreign language. The cognitive load is much higher in the second case because the brain must work to translate the language while simultaneously trying to understand the new information.

Cognitive load theory was proposed by Sweller (1988) that is defined as optimum learning occurs in humans when the load on working memory is kept at a minimum. Cognitive load theory appropriately predicted that as interfaces headed off more from familiar work practice, users would experience larger cognitive load so

that performance would retreat in speed, attention focus, meta-cognitive control, correctness of problem solutions, and memory (Oviatt et al, 2005).

There have been attempts to reduce the cognitive load (Baddeley, 1986; Takeuchi & Nagao, 1993; Mousavi et al, 1995; Lucarella & Zanzi, 1996; Paas et al., 2003; Merrienboer & Seweller, 2005; Eng et al., 2006), optimize user interfaces, thereby minimizing cognitive load (Mu et al., 2003), examine the effect of the cognitive load on performance (Oviatt et al, 2005), and examine the effect of minimal memory load on end-user satisfaction (Özen & Başoğlu, 2006).

Memory load, which is a product's interface characteristic in technology adoption taxonomy, will be used in the research framework as a paradigm to explore the use of working memory.

Minimal memory load is the ability of user interface that provides easily recognized, sufficiently and necessarily detailed interfaces and offers simple solutions (Özen & Başoğlu, 2006).

For the reasons mentioned above, cognitive load should be minimized. Therefore, user preference about using the product will be affected positively if user interface minimizes users' cognitive load.

As a result the following hypothesis is developed:

$H_{3:}$ Minimal memory load significantly and positively affects user preference concerning the use of the product.

Content density, which is a product's interface characteristic in technology adoption taxonomy, is the density of materials and contents on products' user interface.

Use of materials and content should be optimized in order to facilitate users to accomplish their goals with the user interface. An important phase of the user

interface design is to organize its content. It is essential to let users find the information that they are looking for.

User interface that has high content density may bear some undesirable conditions. It may decrease loading speed of user interface. In addition, it may cover the things that the user is trying to see. Likewise, it may occupy most of the page, so, the user cannot find the information that he/she is looking for. Furthermore, blinking and off materials may distract user attention.

There have been attempts to examine the effects of interface content density on performance (Pirolli, 2001; Rivera, 2005) and density on search performance (Jenkins & Cole, 1982; Treisman, 1982; Jacobs, 1986; Rayner & Fisher, 1987; Staggers, 1993; Vlaskamp et al., 2002).

As a measurement, Vlaskamp et al. (2002) use search performance, defined as search time divided by number of elements on the interface, found that search performance decreased significantly.

For the reasons mentioned above, user preference about using the product will be affected positively if content of user interface has low density.

So, the study makes the following inference:

$H_{4:}$ Low content density significantly and positively affects user preference concerning the use of the product.

Speed, which is a product's non-interface characteristic in technology adoption taxonomy, is the measurement of how fast a product is running.

A problem with information systems (IS) may be the considerable time required for the interface to respond to user input. According to Lightner & Eastmen (2002), the number and quality of graphics or pictures presented influence speed greatly.

There have been attempts to examine the effects of product speed on satisfaction (Chin et al., 1988; Nielsen, 1997; Ramsay et al., 1998; Sears et al., 2000; Kotelly et al., 2000), indicate the sensitivity of users to download speed (Lightner, 2001; Rees, 2001), find out the user's tolerable waiting time for computer response speed (Shneiderman, 1984; Nielsen, 1996), find out the user's tolerable waiting time for web site response speed (Ramsay et al., 1998; Selvidge, 1999).

For the reasons mentioned above, user preference about using the product will be affected positively if it is fast.

Consequently, the study conducts the following hypothesis:

$H_{5:}$ Low-speed significantly and negatively affects user preference concerning the use of the product.

Antecedents of User Intention Framework & Hypotheses

Fig. 3.3 represents the second research framework. The antecedents of user intention framework consist of thirteen constructs; user habits, internal influence, external influence, self-efficacy, anxiety, involvement, complex-task characteristics, risky-task characteristics, enjoyment, usefulness, ease of use, attitudes, and user intention.

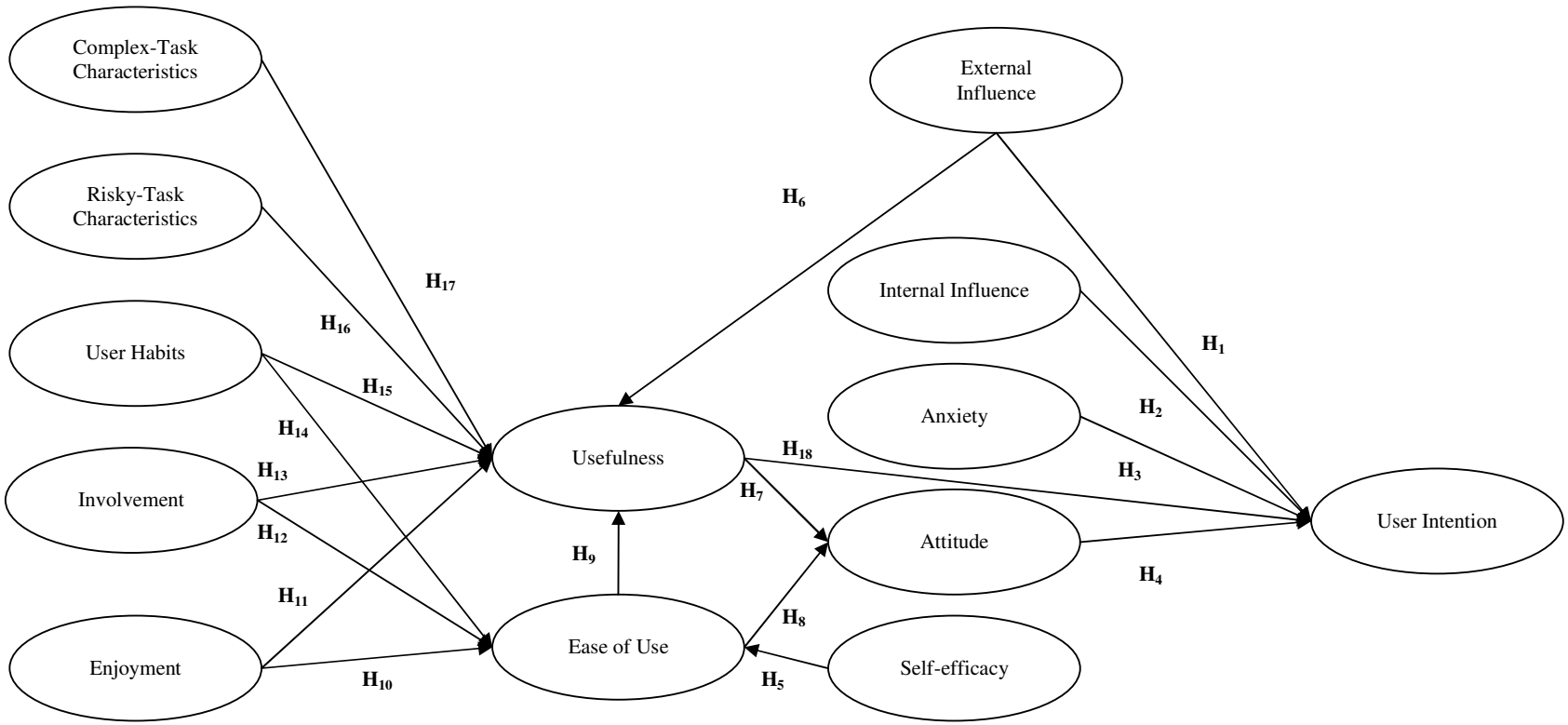

Fig. 3.3 Antecedents of user intention framework

Hypotheses drawn from the second part of the research framework are formulated as follows (Table 3.2).

Table 3.2 User Intention Framework's Research Hypotheses

Hypotheses	Dependent variable	Independent variable	Relationship
H_1	User intention	External influence	Positive
H_2	User intention	Internal influence	Positive
H_3	User intention	Anxiety	Negative
H_4	User intention	Attitude	Positive
H_5	Ease of use	Self-efficacy	Positive
H_6	Usefulness	External influence	Positive
H_7	Attitude	Usefulness	Positive
H_8	Attitude	Ease of use	Positive
H_9	Usefulness	Ease of use	Positive
H_{10}	Ease of use	Enjoyment	Positive
H_{11}	Usefulness	Enjoyment	Positive
H_{12}	Ease of use	Involvement	Positive
H_{13}	Usefulness	Involvement	Positive
H_{14}	Ease of use	User habits	Positive
H_{15}	Usefulness	User habits	Positive
H_{16}	Usefulness	Risky-task characteristics	Negative
H_{17}	Usefulness	Complex-task characteristics	Negative
H_{18}	User intention	Usefulness	Positive

Subjective norm can be defined as "an individual's perception of whether people important to the individual think the behavior should be performed" (Fishbein & Ajzen, 1975). Subjective norm has two aspects. An individual behavior can be easily manipulated by the people around or by the environmental activities like news, and advertisements. These two aspects of subjective norm can be classified as internal influence and external influence, correspondingly.

The degree to which an individual perceives what important others believe he or she should do, or manipulation of individual's beliefs by the news or advertisement. can strongly influence the users' intention (Fishbein & Ajzen, 1975).

Nevertheless, anxiety, which is a user characteristic that can be felt by the user while using the interface, can influence users' intention to use the product strongly (Day & Makirinne-Crofts, 1997).

Attitude toward the act or behavior can be defined as “the individual's positive or negative feelings about performing a behavior” (Fishbein & Ajzen, 1975). Additionally, attitude towards using the system can strongly affect user intention to use the product (Fishbein & Ajzen, 1975; Davis, 1986; Ajzen, 1991; Carlsson et al., 2006).

The study hence makes the following inferences:

$H_{1:}$ External influence significantly and positively affects user intention.

$H_{2:}$ Internal influence significantly and positively affects user intention.

$H_{3:}$ Anxiety significantly and negatively affects user intention.

$H_{4:}$ Attitude significantly and positively affects user intention.

Self-efficacy is the user judgment of one’s capability to use a product (Thong et al., 2004). In other words, self-efficacy is the user’s perception about being satisfactory, effective, and efficient while using the product. Besides, Davis (1989) described perceived ease of use as ‘‘the degree to which a person believes that using a particular system would be free of effort’’.

Thus, users evaluate the product easy to use if they feel that they have the capability of using the product (Seyal & Pijpers, 2004).

Consequently, the study performs the following hypothesis:

$H_{5:}$ Self-efficacy significantly and positively affects ease of use.

Davis (1989) described perceived usefulness as ‘‘the degree to which a person believes that using a particular system would enhance his or her job performance’’. News, advertisements can make it easy for the individual to perceive the usefulness of the product (Venkatesh & Morris, 2000).

In addition, an individual shows attitudes towards using the product if, and only if, he/she thinks that the product is easy to use and enables him/her to accomplish his/her goals (Davis, 1986).

Moreover, an individual finds the product useful if they find out it is easy to use (Davis, 1986; Venkatesh & Morris, 2000; Çalışır & Çalışır, 2004) and intend to use it if the product enables him/her to accomplish his/her goals (Venkatesh & Morris, 2000; Venkatesh et al., 2003).

Therefore, the following hypotheses are constructed:

$H_{6:}$ External influence significantly and positively affects usefulness.

$H_{7:}$ Usefulness significantly and positively affects attitude.

$H_{8:}$ Ease of use significantly and positively affects attitude.

$H_{9:}$ Ease of use significantly and positively affects usefulness.

$H_{18:}$ Usefulness significantly and positively affects user intention.

User's happiness, pleasure, or joy can strongly affect user's perception about finding out the system is useful and is easy to use (Thong et al, 2006).

As a result, the following hypotheses are developed:

$H_{10:}$ Enjoyment significantly and positively affects ease of use.

$H_{11:}$ Enjoyment significantly and positively affects usefulness.

Involvement is the person's perception of the importance and personal relevance of a product, which can also strongly influence user's perception about finding the system useful, and easy to use (Xie, 2003).

The study hence conducts the following inferences:

$H_{12:}$ Involvement significantly and positively affects ease of use.

$H_{13:}$ Involvement significantly and positively affects usefulness.

User habits can strongly hinder or foster perceived usefulness and ease of use. In line with user's habits, user's perception about finding out the system useful and easy to use can be changed (Özen & Başoğlu, 2007).

Accordingly, the study conducts the following hypotheses:

$H_{14:}$ User habits significantly and positively affects ease of use.

$H_{15:}$ User habits significantly and positively affects usefulness.

Different task characteristics can hinder user from deriving benefit from product like risky and complex tasks (Chaomei & Roy, 1996).

Hence, the following hypotheses are made:

$H_{16:}$ Risky-task characteristics significantly and negatively affect usefulness.

$H_{17:}$ Complex-task characteristics significantly and negatively affect usefulness.

CHAPTER 4

METHODOLOGY

In the development method of technology adoption taxonomy, research framework and experimental study, chain of observations was administered; in-depth interviews, a brainstorming session, and an expert focus group. Afterwards, to facilitate research hypotheses testing, an experimental study including a questionnaire, and its pilot study designed and carried. Details of these studies are presented in the following (Table 4.1).

Table 4.1 Summary of Research Studies

Study	n	Date	# of characteristics
In-depth interviews	14	February, 2007	33
Brainstorming session	8	April, 2007	28
Expert focus group	11	April, 2007	51
Experiment-pilot	11	May, 2007	13
Experiment	150	May, 2007	18

As mentioned before, to construct technology adoption taxonomy, characteristics were investigated from literature. Next, the first study following literature review; in-depth interviews were conducted to expand technology adoption taxonomy by examining how user is affected by the characteristics. In addition, user requirements, wants, and needs were examined. Second, brainstorming session study was performed to expand technology adoption taxonomy with participants' creative ideas. In-depth interviews and brainstorming session studies were attended in by fourteen and eight participants, respectively. The third study was designed as an expert focus group via e-mail to eleven experts. The intention of the study was to check the technology adoption taxonomy's characteristics that carry weight for the

experts and hold their consultation. The fourth study was administered as a pilot study in order to try out, test, and improve the experimental study. Pilot study was applied on eleven participants. Last, 150 participants attended the experimental study. The experimental study was designed with the purpose of testing the research hypotheses.

These studies will be explained in detail in the following sections.

Qualitative Studies

In-depth Interviews Study

The purpose of face-to-face semi-structured in-depth interviews study was to widen technology adoption taxonomy with technology adoption characteristics that are not experienced during literature review and examine how user technology adoption is affected by the characteristics.

The fourteen interviewees consisted of five less experienced users, four experienced users and five IS developers. A retired teacher, a housewife and three secretaries were grouped as less experienced users; an academician, a businessman, a master student, an industrial designer were grouped as experienced users; three research assistants, a programmer/analyst and an enterprise resource planning (ERP) systems consultant were grouped as developers according to their computer experience and computer usage in a number of hours per week.

The lengths of the interviews varied from 20 minutes to about half an hour. Interviews were held in different days and places along with interviewees' convenient times.

The interviews were semi-structured, starting with predefined questions. The first question, “What do you do in a day mostly?” was asked to the respondents. The purpose in asking the first question was to understand which interface the interviewee interacts with in a day mostly to discuss the characteristics of that interaction.

Technology adoption characteristics are explored discussing different user interfaces, applications, and technologies with interviewees. Examples of spoken areas are interfaces of operating systems, text editor, internet browsers, e-mail systems, digital displays (automobile, washing machine, and weighting machine), mobile telephones, and blackberry.

Interviews were recorded on audio tape with the permission of the interviewees and reported after each meeting by listening to the records in an Office Word document. The summary of characteristics, which were highlighted by the interviewees, was listed in an Excel worksheet. Afterwards, strength percentages of the characteristics, sub-categories, categories, and aspects of the technology adoption taxonomy were calculated according to the following formula (Özen & Başoğlu, 2007).

$$\frac{\text{Number of comments about the characteristic (from all interviews)} * 100}{\text{Number of comments about all characteristics (from all interviews)}}$$

Complete predefined questions have been included in Appendix C (in English) and Appendix D (in Turkish), respectively.

Brainstorming Session Study

The aim of the brainstorming session study was to expand technology adoption taxonomy with the participants' creative ideas about their interactions with technology and technology adoption characteristics.

The eight participants were chosen according to their age, gender, occupation (technical/ not technical) and education to form a heterogeneous brainstorming group with the intention of facilitating creativity.

Number of steps had been performed before the brainstorming session took place.

First, an experienced facilitator was found to moderate the session. Next, participants were called via telephone in order to learn their willingness about attending the study. Then, in advance information including the aim and directions of the study along with instructions about the brainstorming session place, date, time, and duration was sent via e-mail to the participants and the facilitator a few days before the brainstorming session date.

The aim and directions were written in an Office Word document, which had three parts. In the first part, "human computer interaction (HCI)" was explained in detail. Next, the definition of "interface" was given. Thirdly, the directions for the study were clarified and an example of a new technology picture was inserted into the document in order to let participants think about the issue. A number of known and new technology pictures were presented through the brainstorming session in order to invoke creative ideas. The method will be discussed later in this section.

In the next step, participants and the facilitator were reminded of the brainstorming session study via e-mail one day before the brainstorming session date.

On the brainstorming session day, the room was prepared for the study according to brainstorming rules that were discussed in literature review section (Fig. 4.1). Preparation steps are listed in the following:

- A room that has a “U” shaped table was preferred
- Notebook, projector, tape recorders, video camera were located in appropriate places
- A perfumed candle was placed
- A music CD was made ready
- Foods and drinks were prepared
- Post-its, colored pens and pictures of new technologies were put on the table

Fig. 4.1 View of brainstorming session study place

Following the preparation, participants were welcomed. After participants took their places, the facilitator started the session reminding them to turn off their mobile telephones. Then, participants introduced themselves. Next, the aim of the study was defined again and the first familiar technology screen shot was presented.

The study was composed of three parts. In the first part, standard, familiar technologies' pictures were presented and discussed to remind participants of product design characteristics. In the second part, new technology pictures were presented in order to stimulate creative thinking. In the first and second part of the study, six and eight pictures were presented to the participants, respectively. In the last part, the product design characteristics that were discussed during the session were written on the whiteboard by the facilitator. Participants were asked to choose three design characteristics that they think a successful and usable interface should have.

The session took about three hours with three ten minute breaks. All of the participants were appreciated at the end of the session and were sent off.

This study was reported in an Office Word document by listening to the records and looking at the notes that were taken throughout the session.

Brainstorming session's documents including e-mails that were sent to the participants and the facilitator, screen shots and pictures that were used in the study, and photographs that were taken during the session have been included completely in Appendix E.

Expert Focus Group Study

The intention of the expert focus group study was to check the technology adoption taxonomy's characteristics that carry weight for the experts and hold their consultation.

This study was performed with eleven participants. The participants were three academicians, four system analysts, two programmers, and two enterprise resource planning (ERP) consultants.

The questionnaire form, which was sent via e-mail, was prepared in an Excel worksheet. The questionnaire form consisted of three questions. The characteristics of the technology adoption taxonomy were covered in these questions. The characteristics were given by both their terminology names in English and Turkish with their description in order to avoid confusion. In addition, a column was allowed for the participants called "Additional Explanations" to let participants make comments. Moreover, questions were asked in Turkish, as the participants' native language is Turkish.

In the first question, participants were asked to prioritize the characteristics that were listed with respect to using a product in a useful and efficient way by grading the characteristics from the most important (1) to the least (10). Listed names in the first question were some of the aspects, categories and sub-categories of the technology adoption taxonomy.

The product aspect's characteristics of technology adoption taxonomy were covered in the second question of the questionnaire. In the second question, participants were asked to choose the most important eight characteristics from the list in order to use a product in a useful and efficient way.

The rest of the technology adoption taxonomy's characteristics which were not covered in the second question were listed in the last question with the intention of asking the participants to choose four characteristics from the list that are important for them to facilitate the use of a product in a useful and efficient way.

The collected questionnaires were summarized and examined in an Excel worksheet.

Expert focus group study's documents including an e-mail that was sent to the participants and the questions that were asked have been included completely in Appendix F.

Quantitative Studies

Pilot Study of the Experimental Study

Pilot study was administered in order to assist, try out, test and improve the experimental study. Pilot study was applied on eleven participants via e-mail including the web link of the experiment.

The participants' feedbacks of this study were used in order to improve the experiment. According to the feedbacks, some modifications were made. Most importantly, participants complained about complexity of the experiment. Questions and the structure of the experiment were modified to avoid and wipe out confusion. Furthermore, some aesthetics modifications like modifying colors were made consistent with the feedbacks.

Finally, no execution problems were experienced during the pilot study.

Experimental Study

In order to test the research framework, both product design characteristics framework and antecedents of user intention framework, an experimental study was designed.

The experimental study was conducted on the Internet via a web site, which is designed by using Visual Studio 2005 Framework and was coded in Visual Basic as a web application.

Participants were informed by e-mail including web site's link for experimental study. An e-mail was sent to some Yahoo E-groups, students, academicians, people employed in the private sector. in order to reach many people. People were also asked to forward the e-mail. Participants attended the study through the Internet by clicking on the web site's link in the e-mail.

The web site is composed of four main pages. In the first page, general questions were asked which are designed to provide demographic information. The second and third pages were created in order to test the product design characteristics framework and antecedents of user intention framework, respectively. In the last page of the web site, attendees were appreciated for their participation. The screen shots of pages have been included in Appendix G.

The second page was formed in order to test the hypotheses of product design characteristics framework. To test these hypotheses, conjoint analysis as the statistical analysis and traditional full-profile methodology with ranking method as collecting data approach was seen as appropriate. Rating method was not used because the ranking method has more capability on differentiating the user

preferences. In the rating method, participants may give similar rates to the alternatives. That situation is useless and not desirable.

With the aim of finding out what product design characteristics are important and unimportant for the user, what levels of product design characteristics are the most and least desirable ones for the user, in addition, what the market shares of the most preferred products are, and what the market segments for these products are, a conjoint analysis was used.

Five constructs of product design characteristics framework; customization, adaptive behavior, minimal memory load, content density, and speed will be referred to as attributes in the remaining part.

For the five attributes of product, levels were defined as, customization (absent, present), adaptive behavior (absent, present), minimal memory load (absent, present), content density (low, high) and speed (low, high).

SPSS (Statistical Package for the Social Sciences) conjoint was used for the creation of alternatives with these five attributes and its levels. SPSS conjoint was composed of thirty-two alternatives for five attributes and their levels in a traditional way. In order to decrease the number of alternatives, fractional factorial designs were used. Finally, SPSS conjoint formed eight alternatives (Table 4.2).

Table 4.2 SPSS Conjoint Alternatives

Alternative #	Speed	Dense	Other characteristics
1	High	High	Customization Adaptive behavior
2	High	High	Adaptive behavior Minimal memory load
3	Low	High	-
4	High	Low	Minimal memory load
5	Low	Low	Adaptive behavior
6	Low	High	Customization Minimal memory load
7	Low	Low	Customization Adaptive behavior Minimal memory load
8	High	Low	Customization

Participants were requested to rank these alternatives. These alternatives were not presented as classical card view. Prototypes were generated for each alternative with the right attributes and levels. The screen where the prototypes were presented can be seen in Fig. 4.2.

Fig. 4.2 Experimental study's second main screen (scrolled down)

In each prototype, booking an online flight ticket from Istanbul to Antalya was simulated through an airlines' web site. The scenario steps of the seventh prototype are mentioned below. Each screen of the prototypes was the simulation of each step.

Step 1:

Web site's reservation page:

Pictures and advertisements are removed from the web site (low content density characteristics).

Flight information is inputted automatically by adaptive behavioral interface that has learned user before (adaptive behavior characteristic).

Inputted information is suitable for the user, thus user is positively affected.

Step 2:

User enters date information.

Step 3:

User completes flight information and clicks "Your Settings" button.

Step 4:

The interface where the user can create default settings loads.

Step 5:

User checks the "remove" checkbox about the child and baby passengers' information for once only in order to not be asked again.

Step 6:

Child and baby passengers' information is removed by the user from flight information screen through "Your Settings" button (customization characteristic).

User clicks "List Flights" button.

User waits because of website's response delay.

Step 7:

The Flights are checked automatically by adaptive behavioral interface that has learned user preferences before as “the user prefers fair prices” (adaptive behavior characteristic).

Inputted information is not suitable for the user, thus user is negatively affected.

Step 8:

User makes flight choice and clicks “Continue” button.

User waits because of website’s response delay.

Step 9:

For the reservation, approval user has to enter passenger and contact information.

Step 10:

User enters passenger and contact information.

Step 11:

When user entered his/her, name into name field, adaptive behavioral interface that has learned the user before, inputs the other information for the user (adaptive behavior characteristic).

Inputted information is suitable for the user, thus user is positively affected.

User controls flight information correctness (minimal memory load characteristic). User clicks “Approve” button. User waits because of website’s response delay.

Step 12 (last step):

Web sites last page:

User reads reservation information and closes the web site’s page.

Participants were not able to use these web sites but were able to watch the simulation by clicking on screens and able to read the explanations systematically which are listed in each screen. Participants were requested to rank these web sites with respect to their preference about using the web sites from the most (1) to the least (8) desirable.

One of the conjoint analysis outputs is part-worth utilities (PWU) of attributes that were helped to understand what product design characteristics and what levels of product design characteristics are important and unimportant and also the most and least desirable ones for the user.

SPSS conjoint also provided each participant's unique score on each alternative depending on the level's PWU's. This second output of the conjoint analysis was used to find out the market shares of the most preferred products by taking the average of participants' scores for each alternative divided by the sum of average scores of the eight alternatives.

The assumptions for conjoint analysis are listed below (Carson et al, 1994; Hensher, 1994):

- Conjoint analysis assumes that the product is a collection of attributes and the important attributes of a product can be identified. Model design should be theory driven.
- The attributes and its levels are assumed as strictly discrete.
- Participants evaluate the choice alternatives in terms of these five attributes and tradeoffs are assumed.

The five attributes and their levels were assumed to be of high relevance to users' successful and usable interface definitions. The combinations of qualitative studies' results were used to generate attributes as inputs for the conjoint analysis.

Last, participants were alerted during the experimental study that attributes of prototypes not shown are “held constant”.

The third page was built in order to test the hypotheses of antecedents of user intention framework. In order to test the hypotheses, two sets of questions were arranged. Questions will be referred as items in the remaining part.

The questionnaire’s items used in this research are asked to indicate the extent of agreement and disagreement with various statements concerning the intention framework’s constructs on a four-point Likert scale ranging from (1) disagree to (4) agree.

The first set’s twelve items that are related to user habits, self-efficacy, anxiety, involvement, internal influence, external influence, risky-task characteristics, complex-task characteristics and enjoyment constructs were asked by considering online ticket booking. These first set items are also used with PWU’s of levels for market segmentation by cluster analysis.

The second set’s eleven items that are related to usefulness, ease of use, attitude and intention constructs were asked by considering seventh prototype that has low-speed and content density, customization, adaptive behavior and minimal memory load characteristics.

The original two set of items have been included completely in Appendix H (in Turkish). The two sets of items in English are listed in the following (Table 4.3).

Table 4.3 Questionnaire Constructs & Items

Construct	Item
User habits	I do online ticket reservation
	I do not have a habit like doing online ticket reservation
Self-efficacy	I can easily do online ticket reservation
Anxiety	I feel anxious while I am doing online ticket reservation
	I do not feel any anxiety while I am doing online ticket reservation
Involvement	I look over online ticket reservation systems on the Internet
Internal influence	My acquaintances foster me about doing online ticket reservation
External influence	Advertisements and news about online ticket reservation positively influence me
Risky-task characteristics	There is no risk about doing online ticket reservation
Complex-task characteristics	Doing online ticket reservation is very complex
Enjoyment	I enjoy doing online ticket reservation
	Doing online ticket reservation is cheery
Usefulness	This reservation system will make my life easier
	This reservation system will save time
	I need this reservation system
Ease of use	I find this reservation system easy and understandable
	Using this reservation system is very difficult
Attitude	I want to use this reservation system
	It is a good idea to use this reservation system
	I do not think of using this reservation system
Intention	I am planning to use this reservation system
	I am advising people to use this reservation system
	I will use this reservation system or substitutes in the near future

Web site is visited by 300 participants. Because of the lengthy structure of the experiment, only 150 participants accomplished it as a whole.

The collected data from this study was transferred from Office Access database to an Excel worksheet to arrange the data. Then the organized data were transferred to an SPSS file for analyses.

The experimental study's documents including e-mail that was sent to participants, screen shots and scenarios of prototypes that were used in the experiment have been included in Appendix G. Furthermore, questionnaire items that were used in the experiment have been included completely in Appendix H (in Turkish).

CHAPTER 5

FINDINGS

This chapter summarizes the findings of in-depth interviews, brainstorming session, expert focus group and experimental studies. At the end of the chapter, implications are mentioned.

In-depth Interviews Study

In the development method of technology adoption taxonomy, chain of observations was performed. In-depth interviews study was the second study between these observations following literature review. At the end of this study, technology adoption taxonomy had taken the following shape (Fig. 5.1).

In this study, interviewees were grouped as less experienced users, experienced users, and developers according to their computer experience and computer usage in a number of hours per week.

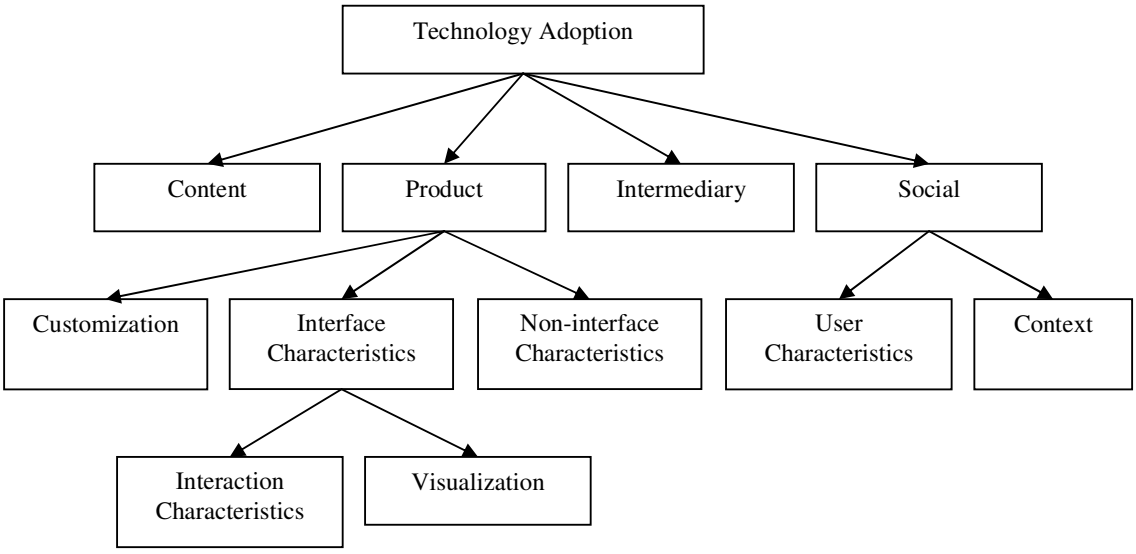

Fig. 5.1 Technology adoption taxonomy (Özen & Başoğlu, 2007)

In line with this taxonomy, technology adoption has four aspects: content, product, intermediary and social. Product aspect of the technology adoption taxonomy had the highest strength, which means 69 % of the interviewees' comments were about the product aspect. Social, intermediary, and content aspects had 20 %, 6 %, and 5 % strengths, correspondingly (Table 5.1) (Özen & Başoğlu, 2007).

Table 5.1 Strengths of Technology Adoption Taxonomy's Aspects

Aspect	Strengths (%)
Product	69
Social	20
Intermediary	6
Content	5

Based on category strengths, product aspect was again the most important aspect. Among categories, interface characteristics had the highest strength. The interviewees' comments of 37 % were about interface characteristics. Secondly, non-

interface characteristics had the second highest strength, which was 18 %. Customization had the third highest strength among categories, which was 14 %. Other categories' strengths are listed in the following (Table 5.2) (Özen & Başoğlu, 2007).

Table 5.2 Strengths of Technology Adoption Taxonomy's Categories

Category	Strengths (%)
Interface characteristics	37
Non-interface characteristics	18
Customization	14
Context	11
User characteristics	9

Interface characteristics were the most emphasized category of the technology adoption taxonomy, which had two sub-categories in the taxonomy; interaction characteristics and visualization. Interviewees' comments of 21 % were about interaction characteristics, which was the most mentioned sub-category.

Product aspect of the proposed taxonomy was the most commented aspect. Among its categories, interface characteristics category was the most mentioned category by interviewees. Besides, interaction characteristics were the most highlighted sub-category during interviews. Based on interviewees' groups, developers dwelled up on interaction characteristics' sub-category, experienced users highlighted non-interface characteristics category and less experienced users stressed visualization sub-category mostly. Interviewees had emphasized that technology adoption taxonomy's categories and sub-categories had an influence on their performance, satisfaction, attention, preferences, and attitudes toward using the system; system's performance, likeability, ease of use, usefulness, and learnability (Özen & Başoğlu, 2007).

To sum up, interviews emphasized the importance of product aspect of the taxonomy, hence should draw attention for a smoother user adoption. Further, the technology adoption characteristics that were mentioned by interviewees can be seen in the following (Table 5.3).

Table 5.3 Characteristics Gained in In-depth Interviews

Characteristic
Capability
Responsiveness
Capacity
Speed
Multifunctional
Integration
Redundancy
Accessibility
Language
Terminology
Color
Aesthetics
Resolution
Visual cue
Content density
Amount of information
Customization
Personalization
Audio cue
Menu type
Panes
Tabs
Touch screen
User-friendliness
User guidance
System help
Navigation
Organizational culture
User habits
Attention
Usefulness
Learnability
Ease of use
Likeability

Brainstorming Session Study

Brainstorming session study was composed of three parts. During the first and second part with the assistance of familiar and new technology pictures' presentations, participants declared, discussed and highlighted many product design characteristics that they think a successful and usable interface should have. These characteristics can be seen in the following table (Table 5.4).

Table 5.4 Characteristics Gained in Brainstorming Session Study

Characteristic
Capability
Responsiveness
Capacity
Speed
Multifunctional
Integration
Accessibility
Functionality
Relevance
Security
Interface design portability
Color
Aesthetics
Visual cue
Memory load
Content density
Adaptive behavior
Customization
Personalization
Audio cue
Speech to synthesis
Speech to text conversion
Voice activated system
Scroll mechanism
Touch screen
Virtual display
Fly-over
User-friendliness
User guidance
Speed to result
Usefulness
Ease of use
Ease of understanding
Enjoyment

In the last part, participants were asked to choose three design characteristics from the characteristics that were written on the whiteboard by the facilitator during discussion, which they think a successful and usable interface should have.

The first three characteristics that were chosen by the participants mostly are listed in the following (Table 5.5).

Table 5.5 Third Part of Brainstorming Session Study's Results

Design characteristics	# of selection
Adaptive behavior	5
Easy to use	5
Customization	4

Other design characteristics participants declared in the last part of the study as the characteristics that they think a user interface should have were security, user interface portability, content density and multifunctional.

According to the brainstorming session results, participants evaluate interface as a successful and usable interface if they can adapt to it, use it easily and customize it. Nevertheless, technology adoption taxonomy was expanded with the characteristics that were gained during the brainstorming session study.

Expert Focus Group Study

Expert focus group study was composed of three questions. In the first question, experts were asked to prioritize some of the aspects, categories and sub-categories of the technology adoption taxonomy that were listed with respect to using a product in a useful and efficient way by grading the characteristics from the most important (1) to the least (10). According to eleven experts' answers, the following ranking is deduced (Table 5.6).

Table 5.6 Results of Expert Focus Group Study Question # 1

Rank #	Aspect/category/sub-category/characteristic
1	Non-interface characteristics
2	Interaction characteristics
3	Interface characteristics
4	Task
5	Customization
6	Information content
7	Visualization
8	System context
9	User characteristics-mental and emotional states
10	Audio

The first three ranks were non-interface characteristics, interaction characteristics and interface characteristics, which are the categories and sub-categories of technology adoption taxonomy's product aspect. In line with in-depth interviews study, again the product aspect of the technology adoption taxonomy was highlighted in expert focus group study.

In the second question, experts were asked to choose the most important eight-product aspect's characteristics of technology adoption taxonomy from the list in order to use a product in a useful and efficient way.

The most desired product aspect characteristic was speed, which is a characteristic of product aspect's non-interface category. Compatible with the results, experts gave importance to the rate of product functioning mostly for using a product in a useful and efficient way.

Other characteristics that were chosen by experts in the second can be seen in Table 5.7.

Table 5.7 Results of Expert Focus Group Study Question # 2

Characteristic
Speed
Reliability
Capacity
Functionality
User-friendliness
Speed to result
Content density
Capability
Customization
User guidance
Integration
Virtual display
Language
Column width
Responsiveness
Price
Maintenance
System help
Adaptive behavior
Terminology
Resolution
Font type
Contrast
Line length
Similarity
Memory load
Distinctiveness
Multifunctional
Accessibility
Flexibility
Scalability
Brand
Relevance

The rest of the technology adoption taxonomy's characteristics which were not covered in the second question were listed in the last question with the goal of asking experts to choose four characteristics from the list that are important for them to facilitate the use of a product in a useful and efficient way.

The most desired characteristic was task-technology fit, which is a characteristic of task aspect of the taxonomy. Consistent with the results, experts

gave importance to the technology to be fit to do tasks mostly for using a product in a useful and efficient way.

Other characteristics that were chosen by experts in the last question can be seen in Table 5.8.

Table 5.8 Results of Expert Focus Group Study Question # 3

Characteristic
Task-technology fit
Ease of finding Information
Ease of understanding
User habits
Learnability
Data quality
Enjoyment
Motivation
Management support
Task characteristics
Voluntariness
Attention
Optimism
Intellectual capacity
Cognitive style
Organizational culture
Amount of information

The technology adoption characteristics that carry weight for the experts can be seen in Fig. 3.1 as a whole.

Findings of Qualitative Experimental Study

The Profile of the Participants

The data was recoded in order to gather small values together. The profile of the respondents before recoding is illustrated in the following table (Table 5.9).

Table 5.9 Profile of Experimental Study's Participants before Recoding

Question	Frequency	Percentage
Age		
15-19	4	2.7
22-24	57	38
25-29	49	32.7
30-34	26	17.3
35-39	8	5.3
40-44	2	1.3
45-49	1	0.7
50-54	1	0.7
55-59	1	0.7
60-64	1	0.7
Gender		
Male	78	52
Female	72	48
Education		
High school	3	2
Upper school	5	3.3
Undergraduate	92	61.3
Graduate	50	33.3
Occupation		
Technical	65	43.3
Not technical	85	56.7

The profile of experimental study's participants after recoding is presented in Table 5.10. The results indicate that the sample predominantly aged twenty-nine and lower, under graduated and has an occupation that is not technical. The gender is approximately dispersed equal. Out of 150 respondents, seventy-eight of them are males and seventy-two of them are females.

Table 5.10 Profile of Experimental Study's Participants

Question	Frequency	Percentage
Age recoded		
24 and lower	61	40.7
25-29	49	32.7
30-34	26	17.3
35 and higher	14	9.3
Gender		
Male	78	52
Female	72	48
Education recoded		
Undergraduate	100	66.7
Graduate	50	33.3
Occupation		
Technical	65	43.3
Not technical	85	56.7

Findings of Product Design Characteristics Framework

Product design characteristics framework's hypotheses were tested with conjoint analysis of SPSS (Statistical Package for the Social Sciences) with the aim of finding out what product design characteristics are important and unimportant for the user, what levels of product design characteristics are the most and least desirable ones for the user, in addition, what the market shares of the most preferred products are, and what the market segments for these products are.

The first output of conjoint analysis, which shows the importance of attributes and its associated levels, is below.

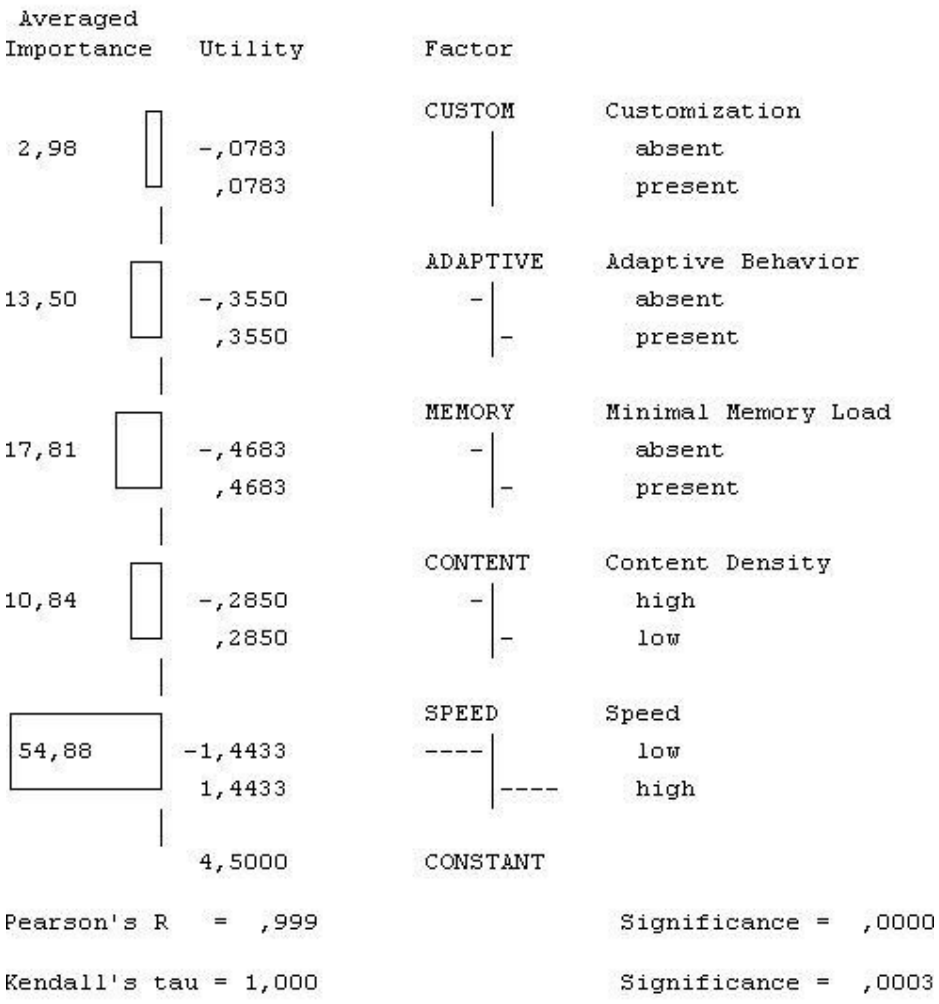

Fig. 5.2 Conjoint analysis output of experimental study

First output represents the preferences of all the 150 participants' responses at an aggregate level. Output indicates the importance of the attributes and associated levels of these attributes that influence the user preference under averaged importance and utility labels, respectively.

As shown in Fig. 5.2, the important factor that influenced participant's preference is speed (55 %). Minimal memory load is the second important attribute with a considerably lower average importance value of 18 %. The adaptive behavior

and content density attributes have a slightly lower average importance than minimal memory load, which are 14 % and 11 %, correspondingly. The last attribute, customization has the lowest averaged importance value which is 3 %.

When attention is focused on each of the ten levels, high-speed level has the highest utility value, which is 1.4. Second highest utility value is achieved by present-minimal memory load with 0.47 (present means that minimal memory is available). These levels are followed by present-adaptive behavior, low-content density, and present-customization.

Results of this output indicate that the participants intends to use the products that have high-speed characteristic mostly followed by the interfaces that have a minimal memory load, an adaptive behavior, and a low content density characteristics. Among these five characteristics, the least the participants prefer and intend to use the interfaces is the customization characteristic. Nevertheless, the interfaces that have a high-speed, a minimal memory load, an adaptive behavior, a low content density, and customization are more preferable and intended to use by the participants rather than not.

The overall fit of the model is assessed by Pearson's R and Kendall's tau values. The correlation between the estimated part-worth utilities (PWU) for each attribute and the observed ones are highly correlated. The Pearson' R is 0.999 with 0.000 significance value and Kendall's tau value is 1 with 0.000 significance value which show almost a perfect fit.

For each participant's responses, utility output of the conjoint analysis gives the averaged importance and utilities for each attribute and associated levels of these attributes similar to Fig. 5.2. The sixth participant's response is shown in the following (Fig. 5.3)

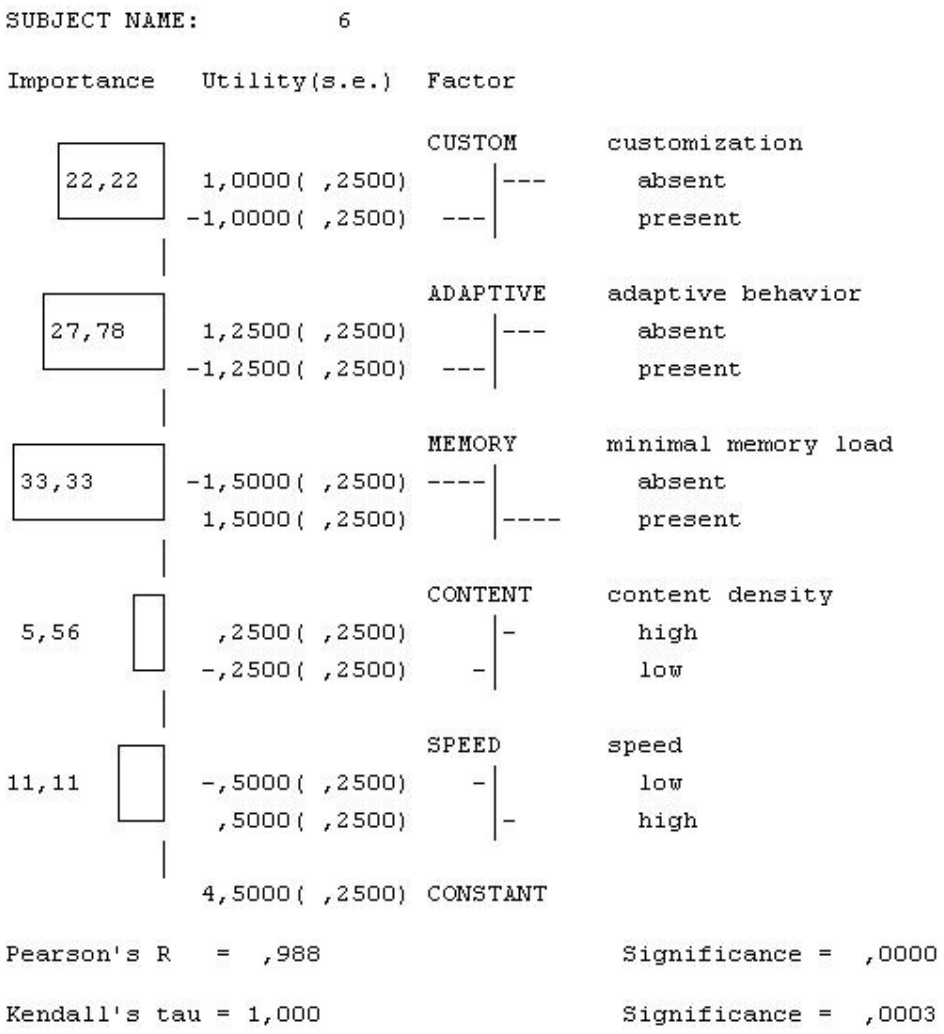

Fig. 5.3 Conjoint analysis utility output for sixth participant

As shown in Fig. 5.3, the important factor that influenced the sixth participant's preference is minimal memory load attribute (33 %). Adaptive behavior is the second and customization is the third important attribute with slightly lower average importance values of 28 % and 22 %, respectively. The last two attributes are speed and content density, which have considerably lower values than the others, 11 % and 6 %, correspondingly.

When attention is focused on each of the ten levels, present-memory load level has the highest utility value, which is 1.5. Second highest utility value is achieved by absent-adaptive behavior with 1.25. These levels are followed by absent-customization, high-speed, and high content density.

Results of this output indicate that the participant intends to use the products that have a minimal memory load characteristic mostly. Nevertheless, the participant prefers the interfaces that do not have an adaptive behavior characteristic to the interfaces that have it. Similarly, the participant prefers the interfaces that do not have the customization characteristic to the interfaces that have it. Besides, participant prefers high-speed products. Furthermore, a high content density is more preferable than a low content density for the participant.

The Pearson' R is 0.988 with 0.000 significance value and Kendall's tau value is 1 with 0.003 significance value for this participant's response which show almost a perfect fit.

Next, the PWU's were used to find out the most preferred products. Table 5.11 shows the list of ranked products according to the preference ability.

Table 5.11 Product Ranks According to Prefer Ability

Rank	Alternative #	Customization	Adaptive behavior	Minimal memory load	Content density	Speed
1	2	Absent	Present	Present	High	High
2	4	Absent	Absent	Present	Low	High
3	1	Present	Present	Absent	High	High
4	8	Present	Absent	Absent	Low	High
5	7	Present	Present	Present	Low	Low
6	5	Absent	Present	Absent	Low	Low
7	6	Present	Absent	Present	High	Low
8	3	Absent	Absent	Absent	High	Low

In agreement with Table 5.11, the most preferable products are the ones that have a high-speed characteristic.

Utilities are also used for calculating the potential market shares for products. The calculation has been included in Appendix I. The market shares of each product are shown in the following (Fig. 5.4).

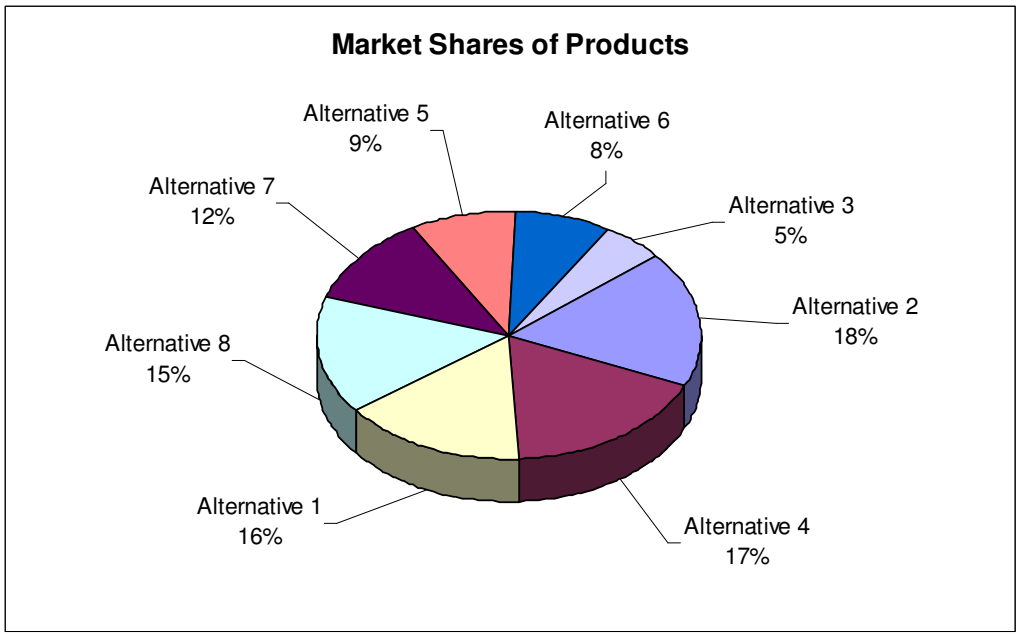

Fig. 5.4 Market shares for each product

According to Fig. 5.4, participants prefer and intend to use the second product mostly, which has an adaptive behavior, a minimal memory load, a high content density and a high-speed characteristics. Even so, participants prefer and intend to use the third product the least, which has only high content density and low-speed characteristics. The second, fourth, first and eighth products have comparable market shares among the products.

Consistent with Table 5.12, the second product (alternative) which has the highest market share percentage was put to first, second and third ranks by most respondents. Another example from the table, eighth product, which has the fourth

highest market share percentage, is mostly ranked as fourth preference by the respondents.

Table 5.12 Rank Frequencies of Products

A no	Customization	Adaptive behavior	Minimal memory load	Content density	Speed	Rank	1	2	3	4	5	6	7	8	Average value	Market share
2	Absent	Present	Present	High	High	2,63	39	40	34	22	8	3	4	0	6,40	17,8%
4	Absent	Absent	Present	Low	High	2,70	52	33	26	16	6	7	7	3	6,26	17,4%
1	Present	Present	Absent	High	High	3,34	15	31	42	38	10	7	2	5	5,62	15,6%
8	Present	Absent	Absent	Low	High	3,55	26	34	14	37	10	11	11	7	5,48	15,2%
7	Present	Present	Present	Low	Low	4,85	13	5	14	11	57	25	16	9	4,24	11,8%
5	Absent	Present	Absent	Low	Low	5,75	3	1	6	13	32	43	46	6	3,15	8,8%
6	Present	Absent	Present	High	Low	5,94	1	2	8	9	24	45	52	9	2,96	8,2%
3	Absent	Absent	Absent	High	Low	7,23	1	4	6	4	3	9	12	111	1,87	5,2%

Findings of Antecedents of User Intention Framework

The entire questionnaire was evaluated in terms of reliability and construct validity by using reliability and factor analyses. Merely multi-item variables' reliabilities were analyzed by reliability analysis. Questionnaire validity is presented in Table 5.13. Cronbach's alphas of the all multi-item constructs have values more than 0.69, even predominantly more than 0.75. Therefore, the questionnaire with strong internal consistency is conducted. Factor analyses can be seen in Appendix I.

Table 5.13 Validity of the Questionnaire

Construct	Items	Cronbach's alpha
User habits	2	0.75
Anxiety	2	0.78
Enjoyment	2	0.94
Usefulness	3	0.82
Ease of use	2	0.69
Attitudes	3	0.92
Intention	3	0.86

As stated in the methodology, the first set's twelve items that are related to user habits, self-efficacy, anxiety, involvement, internal influence, external influence, risky-task characteristics, complex-task characteristics, and enjoyment constructs were asked by considering online ticket reservation system. On the other hand, the

second set's eleven items that are related to usefulness, ease of use, attitude and user intention constructs were asked by considering seventh prototype that has low-speed and content density, customization, adaptive behavior and minimal memory load characteristics. Correlations among these constructs have been included in Appendix I.

Descriptive statistics of summary constructs are listed in Table 5.14. Descriptive statistics of questionnaire items have been included in Appendix I completely.

Table 5.14 Descriptive Statistics of the Questionnaire

Construct	Mean	S.d.	Min	Max
Self-efficacy	3.69	0.66	1	4
User habits	3.60	0.74	1	4
Complex-task characteristics	3.55	0.71	1	4
Ease of use	3.52	0.63	1	4
Attitudes	3.24	0.79	1	4
Risky-task characteristics	2.96	0.91	1	4
Intention	2.94	0.81	1	4
Usefulness	2.93	0.82	1	4
External influence	2.85	1.04	1	4
Involvement	2.69	1.14	1	4
Internal influence	2.50	1.09	1	4
Enjoyment	2.49	0.92	1	4
Anxiety	1.93	0.92	1	4

The results of descriptive statistics reveal that participants have habituation of booking online ticket and they find it satisfactory while they are booking. Booking online ticket is found to be a complex task for them. They agree that the seventh prototype is easy to use but they partially agree that they plan, need and want to use it. Besides, they partially agree that the online ticket reservation is a risky task. Moreover, they partially agree that they are influenced by their acquaintances or news, advertisements about online ticket reservation systems. Furthermore, they

partially disagree that they are enjoying the system and feeling anxiety while they are using the system.

Linear regression analyses were used to assess the direct and indirect effects of user intention. The summary results of regression analyses are given below (Table 5.15).

Table 5.15 Results of Regression Analyses

R^2	Dependent	Independent	Standardized beta	Sig.
0.69	User intention	External influence	0.13	0.01
		Internal influence	0.14	0.01
		Usefulness	0.24	0.00
		Attitude	0.56	0.00
0.54	Attitude	Usefulness	0.60	0.00
		Ease of use	0.24	0.00
0.27	Usefulness	Ease of use	0.44	0.00
		External influence	0.25	0.00
0.06	Ease of use	Self-efficacy	0.27	0.00

Each remaining hypothesized paths examine the significance level. Variance (R^2 value) values of each remaining paths indicate that the model fits the data well. Figure 5.5 demonstrates all structural relationships in the model. The variance in user intention explained by the model is 69 %, which is acceptable.

The first set's twelve items that are related to user habits, self-efficacy, anxiety, involvement, internal influence, external influence, risky-task characteristics, complex-task characteristics and enjoyment constructs were asked by considering online ticket reservation system.

The second set's eleven items that are related to usefulness, ease of use, attitude and intention constructs were asked by considering the seventh prototype that has a low-speed and content density, customization, an adaptive behavior and a minimal memory load characteristics. The characteristics of seventh prototype are also listed in the following table (Table 5.16).

Table 5.16 Characteristics of Prototype # 7

Characteristics
Customization present
Adaptive behavior present
Minimal memory load present
Low content density
Low-speed

Research illustrates that nine of the eighteen hypotheses were significantly supported. Hypotheses: H_3, H_{10}, H_{11}, H_{12}, H_{13}, H_{14}, H_{15}, H_{16}, H_{17} are not empirically supported. These hypotheses are demonstrated with dash lines.

The major cause for the unsupported hypotheses can be the incorrect and inconsistent way of asking the questions. Nonetheless, questions can be understood or perceived mistakenly. Notwithstanding, the order of the questions can influence the respondents. The questions prior to and after can easily manipulate the perception of the question. At the same time, the reversed questions cannot be recognized.

The hypothesis for anxiety effect on user intention was not supported. The mean of responses for the anxiety questions is 1.93. Respondents declared that they partially disagreed about feeling anxiety while they are booking an online ticket. Booking online ticket systems are provided by few companies, which are known and self-assured. Because of that, respondents may not feel anxiety during booking an online ticket.

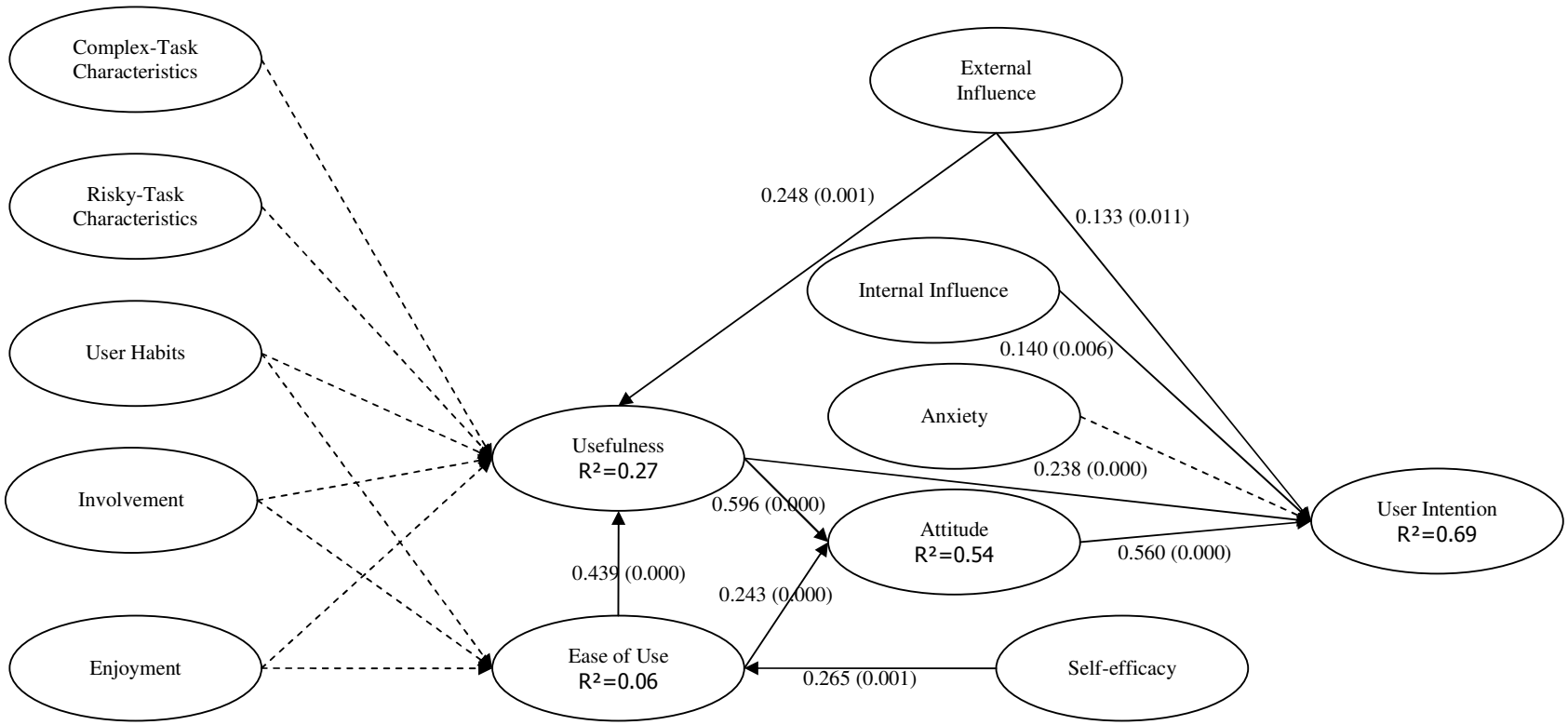

Fig. 5.5 Antecedents of user intention model results

The hypothesis for enjoyment effect on ease of use was not sustained either. The mean of enjoyment construct is 2.49, which means that respondents partially agreed that the system is enjoyable. Booking online ticket may not be the best-fitted scenario for an enjoyment construct. Actually, people use reservation systems due to their needs but they do not use them for enjoyment. For that reason, the hypothesis could not be supported.

In addition, the hypotheses of involvement and user habit constructs' effects on ease of use and usefulness were not supported. The means for user habits and involvement constructs are 3.60 and 2.69, respectively. The respondents declared that they use these systems and partially agreed that they investigate them. The explanation for the unsupported hypotheses can be again the scenario. People do not booking an online ticket permanently. They visit these web sites only when they need them.

Last two unsupported hypotheses are risky-task and complex-task characteristics constructs' effects on usefulness. The mean for risky-task and complex-task characteristics constructs are 2.96 and 3.55, correspondingly which mean that respondents partially agreed about evaluating online ticket reservation systems as risky and agreed about the complexity of the task. These effects on usefulness could not be gained.

The model reveals that external influence, internal influence, usefulness, and attitude are direct determinants, ease of use via attitude, and self-efficacy via ease of use and attitude, are indirect determinants of user intention. In addition, the antecedents of attitude are usefulness and ease of use. Moreover, external influence and ease of use are direct determinants of usefulness. Last, self-efficacy has an

impact on ease of use. Among all constructs, attitude has the strongest and external influence has the weakest impact on user intention.

The hypothesis about attitude's effect on intention is supported with a high beta coefficient (0.238) and a low significant value (0.000). According to this finding, attitude towards using the system can strongly affect user intention to use the product (Fishbein & Ajzen, 1975; Davis, 1986; Ajzen, 1991; Carlsson et al., 2006). Beside attitude, the effect of usefulness, internal influence, and external influence on user intention are sustained with 0.238, 0.140 and 0.133 beta coefficients and 0.000, 0.006, 0.011 significance values, respectively. Along with these results, if the user derives benefit from the product, he/she intends to use it. Besides, individual's beliefs, news, advertisements influence user's intention to use the product.

The antecedents of attitude are usefulness and ease of use with 0.596 and 0.243 beta coefficients and 0.000 and 0.000 significance values, correspondingly. Usefulness has a considerably higher influence than ease of use on attitude. Along the lines of these findings, the benefits that user gains from using the product and product's ease of use affect user's attitude towards using the product. Also a product, which is easy to use, influences user's perceived benefits. Lastly, user's perception about being satisfied, effective, and efficient while using the product affects perceived ease of use of the product.

The significant Anova results for gender, age, occupation, and education are listed in the following tables (Table 5.17, Table 5.18, Table 5.19, and Table 5.20). The whole Anova results have been contained in Appendix I.

Female respondents evaluated seventh product as more useful, easier to use than male respondents did. On the other hand, both of them partially agreed on the usefulness of the product. Although female respondents agreed that the product is

easy to use, male respondents partially agreed. Lastly, both of them partially agreed that they have intention of using the product, which has a low-speed and content density, customization, an adaptive behavior and a minimal memory load characteristics (Table 5.17).

Table 5.17 Anova Results for Gender

Construct	Male	Female	F	Sig.
Usefulness	2.76	3.12	7.57	0.01
Ease of use	3.42	3.63	4.24	0.04
Intention	2.79	3.10	5.76	0.02
Usefulness1	2.94	3.28	6.05	0.02
Usefulness2	2.76	3.14	5.52	0.02
Usefulness3	2.59	2.94	5.03	0.03
Ease of use1	3.31	3.63	6.53	0.01
Intention2	2.68	3.10	8.24	0.01

The Anova results for the age intervals of the respondents are illustrated in the following table (Table 5.18). Respondents aged between twenty-five, twenty-nine are the most; and respondents aged twenty-four, or lower than twenty-four are the least agreed groups that they have the habit of booking an online ticket.

Table 5.18 Anova Results for Age

Construct	24 and lower	25-29	30-34	35 and higher	F	Sig.
User habit	3.41	3.82	3.75	3.43	3.53	0.02
Enjoyment	2.66	2.55	2.33	1.89	3.09	0.03
External influence	2.80	3.04	3.00	2.14	3.06	0.03
User habit1	3.52	3.92	3.88	3.43	4.20	0.01
Enjoyment1	2.61	2.49	2.23	1.79	3.40	0.02
Attitude3	3.43	3.51	3.38	2.57	4.35	0.01
Intention3	2.79	3.22	3.19	2.64	3.23	0.02

Moreover, respondents aged twenty-four, or lower than twenty-four group, that is the youngest group, have the highest value for enjoyment, which is 2.66. This group partially agreed that they enjoy themselves when booking an online ticket. Furthermore, the group of respondents aged between twenty-five and twenty-nine has the highest value for external influence, which is 3.04. The value means that this

group partially agreed about being influenced by the advertisements, news about online ticket reservation systems. In addition, this group is planning more to use a product that is similar to the seventh prototype in the near future among all groups.

The results for the two groups of occupation are demonstrated below (Table 5.19). According to this table, technical group gives more importance to adaptive behavioral interface than not technical respondents. Alternatively, respondents that are not technical give more importance to interfaces that have minimal memory load characteristic than technical respondents do.

Since not technical respondents are more novice users than technical respondents are, they prefer easily recognized interfaces and interfaces that offer simple solutions. Since technical respondents are more experienced users than not technical users are, they prefer more advanced interface characteristics like adaptive behavior characteristic.

Table 5.19 Anova Results for Occupation

Construct	Technical	Not technical	F	Sig.
Adaptive behavior present	0.44	0.29	1.68	0.02
Minimal memory load present	0.37	0.55	3.90	0.05

The education groups' results are shown in the following table (Table 5.20). In line with the findings, graduate respondents have more habits of booking an online ticket than undergraduate respondents. Furthermore, graduate respondents are planning more to use a product that is similar to the seventh prototype in the near future than the other group.

Table 5.20 Anova Results for Education

Construct	Undergraduate	Graduate	F	Sig.
User habit	3.50	3.82	6.71	0.01
User habits2	3.34	3.82	9.65	0.00
Intention3	2.86	3.24	5.78	0.02
Low content density	0.17	0.52	6.49	0.01

Besides, graduate respondents are more likely to prefer interfaces that have a low content density than the other group. These situations may arise because graduate students may have more adequate means for traveling by plane.

Market Segments

In this study, to identify the market segments, Quick Cluster, an SPSS statistical cluster program, was used for clustering the 150 users into groups based on the similarities in their preferences and intentions for the five attributes and the responses for the first set of the questionnaire.

Five attributes were customization, adaptive behavior, minimal memory load, content density, and speed. Alternatively, variables for the first set of the questionnaire were user habits, self-efficacy, anxiety, involvement, internal influence, external influence, risky-task characteristics, complex-task characteristics, and enjoyment.

Next two sections summarize two cluster typologies with cluster analysis.

Cluster Typology-I

As shown in Table 5.21, three groups were constructed from the data. Groups were given the names “speedy”, “lazy”, and “controlling”. Groups have fifty-nine, thirty, and sixty-one members, respectively.

Table 5.21 Cluster Typology-I

Construct	Speedy (59)	Lazy (30)	Controlling (61)
Adaptive behavior present	-0.16	0.23	0.23
Minimal memory load present	0.50	1.06	-0.13
High-speed	0.72	0.34	0.28
Customization present	-0.03	-0.53	0.98
Low content density	1.77	0.43	1.62

Details of the first cluster typology’s analysis can be seen in Fig. 5.6.

Cluster-Speedy: First group has relatively high values on high-speed and low content density constructs. For these group members, the amount of time it takes a product to react to their input, response time is reasonably essential. For that reason, these group members can be labeled as speedy. Also, low content density is more important for this group, because they may think that interfaces mixed with extraneous elements may slow down product's response time. Adaptive, minimizing memory load and customable interfaces are not crucial for the speedy group. Furthermore, they prefer the interfaces, which do not have adaptive behavior and customization characteristics. Again, the thought of slowing down the product's response time can be an explanation for that preference.

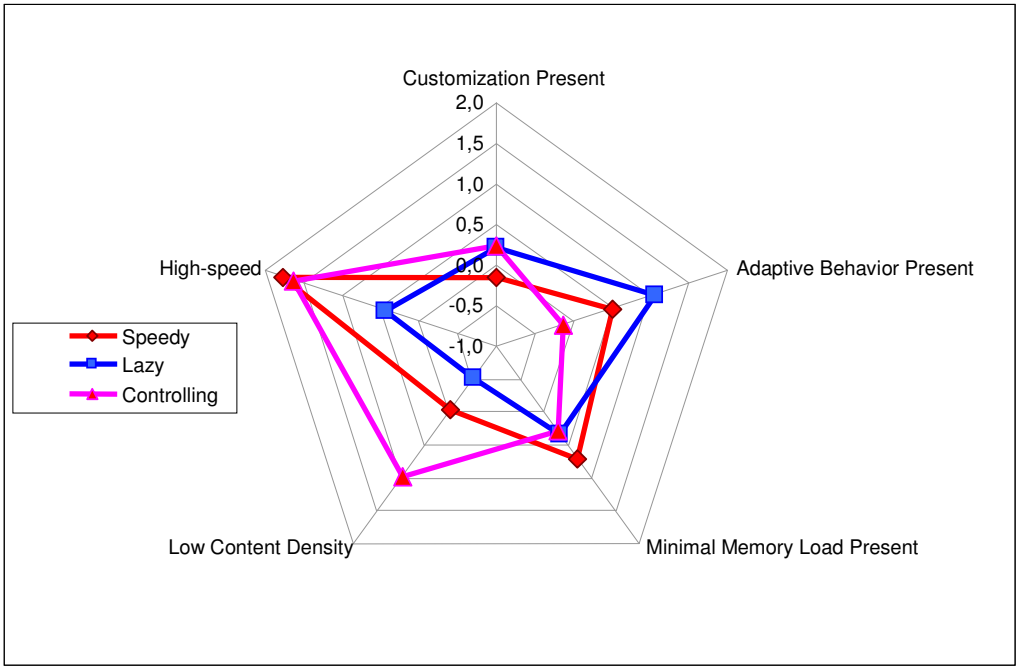

Fig. 5.6 Cluster typology-I

Cluster-Lazy: The highest value for the second group is minimal memory load. These group members prefer interfaces that provide easily recognized interfaces and

offer simple solutions. Moreover, this group favors adaptive behavioral interfaces. They like interfaces, which tailor them and act instead of them. Therefore, these group members can be referred to as lazy. They do not prefer customable products, which is the foreseeable situation. This indolent group prefers products that customize themselves according to their preferences. In addition, low content density is not their interest as much as the other groups. A high content dense interface may foster their searching with photographs and pictures since it may not have the energy or desire for reading texts. Last, they do not long for a speedy product as the first group as lazy people can be characterized as sluggish or they generally act in no hurry.

Cluster-Controlling: Controlling group has a relatively high value on customization construct than the other two groups. These group members like to customize interfaces according to their preferences. On the other hand, adaptive behavioral interfaces are not their interest as much as customization. They want to customize interfaces by themselves instead of interfaces performing this action. They do not like the interfaces that support additional information with adequate screens, or interfaces that have minimized memory load, because they prefer to manage the interfaces, not vice versa. Among the groups, speed is the least important construct for that group. This situation may arise because they may sacrifice speed for the other product characteristics. Last, they like plain content similar to the speedy group since they enjoy remaining in possession of the field.

Table 5.22 illustrates the euclidean distances between the final cluster centers. Distance values that are large indicate clusters that are different from each other. According to these values, lazy and controlling groups are the wide apart groups.

Table 5.22 Distances between Final Cluster Centers of Cluster Typology-I

	Speedy	Lazy	Controlling
Speedy		1.63	1.34
Lazy	1.63		2.26
Controlling	1.34	2.26	

Some of the significant Anova results for cluster typology-I are listed in the following table (Table 5.23). The whole Anova results have been contained in Appendix I.

Table 5.23 Some of the Anova Results for Cluster Typology I

Construct	F	Sig.	Cluster Name	Mean	S.d.
Usefulness	3.66	0.02			
			Speedy	2.72	0.75
			Lazy	3.17	0.86
			Controlling	3.02	0.83
Attitude	4.98	0.01			
			Speedy	3.02	0.62
			Lazy	3.56	0.69
			Controlling	3.29	0.61
Intention	6.07	0.00			
			Speedy	2.68	0.75
			Lazy	3.26	0.86
			Controlling	3.03	0.76

Three constructs that are listed in Table 5.23 were asked by considering the seventh prototype that has a low-speed and content density, customization, adaptive behavior, and minimal memory load characteristics. The Anova results of the constructs with speedy, lazy and controlling groups are significant at 0.05 significance level. As illustrated in Table 5.23, lazy people agree more that the seventh prototype is useful and they show positive attitudes towards using it. Moreover, they have more intention to use it. Lazy group's motivation for this situation can be explained with the seventh prototype's characteristics. As mentioned before, they prefer adaptive behavioral interfaces and the interfaces that have ability to minimize memory load. Alternatively, speedy group has the lowest values for the

significant Anova results. The reason for this may be that the seventh prototype has low-speed characteristics.

Cluster Typology-II

As shown in Table 5.24, three groups were constructed from the data. Groups were given the names “anxious”, “extroverted”, and “conservative”. Groups have sixteen, seventy-six, and fifty-eight members, correspondingly.

Table 5.24 Cluster Typology-II

Construct	Anxious (16)	Extroverted (76)	Conservative (58)
Self-efficacy	3.00	4.00	4.00
Involvement	2.00	4.00	2.00
Internal influence	2.00	3.00	2.00
External influence	2.00	3.00	3.00
Risky-task characteristics	2.00	3.00	3.00
Complex-task characteristics	3.00	4.00	3.00
User habit	2.25	3.76	3.78
Anxiety	3.00	1.50	2.21
Enjoyment	2.16	2.91	2.04

Details of the second cluster typology’s analysis can be seen in Fig. 5.7.

Cluster-Anxious: The main difference of the first group is having the highest value of anxiety construct. This condition can be defined as the first group really feels fear, nervousness, stress, and discomfort during booking an online ticket. For that reason, these group members can be labeled as anxious. The anxious group may feel these emotions because they are less accustomed to online ticket reservation than the other groups. The second reason for that state can be they found themselves less satisfied than the others. Besides, they do not have as much interest and enjoyment like the second group, which has the lowest value of anxiety construct.

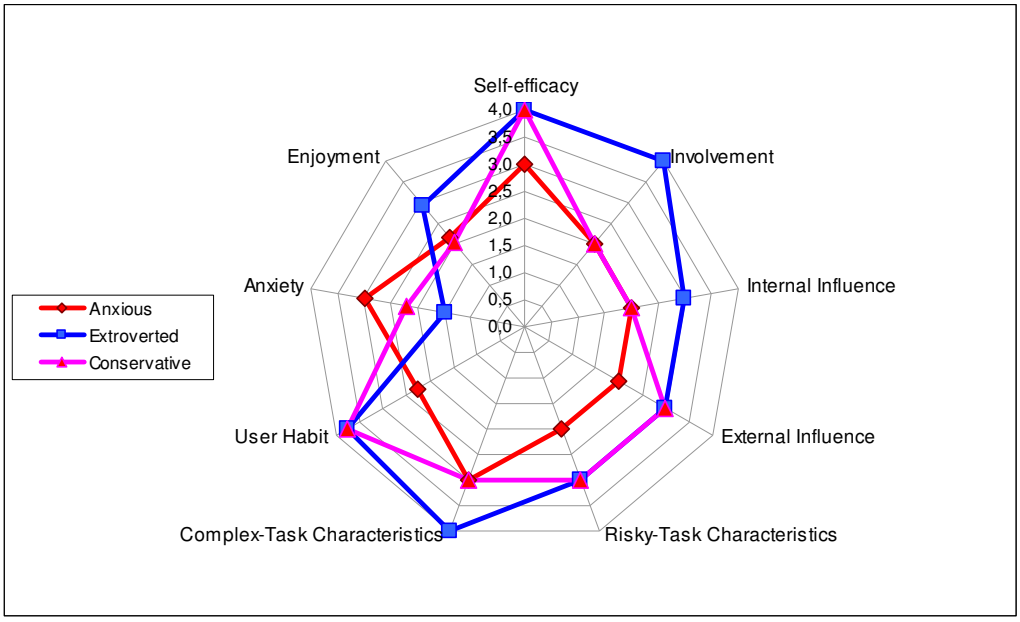

Fig. 5.7 Cluster typology-II

Cluster-Extroverted: Extroverted group has the highest values on involvement, internal influence, complex-task characteristics, and enjoyment and the lowest value on anxiety. These group members are concerned with social environment and they are interested in new systems. For these reasons, the members can be called as extroverted and entrepreneur. Although they evaluate online ticket reservation systems as risky and complex tasks, they enjoy these systems at most among the groups while they are booking. The reasons for that can be that they often do online ticket reservation or since they have a high self-efficacy or as they rarely feel anxiety while they are using the system.

Cluster-Conservative: The last group is conservative which refers to the people that have traditional opinions and ideas. These group members are creatures of habits and they show resistance to change. They dislike revolution, therefore, they show lower involvement than the second entrepreneur group. Besides, the social

environment cannot change their beliefs easily. Furthermore, this group has the lowest enjoyment during booking online. This may be because of their thoughts about the reservation systems. They are not interested in such systems but they are accustomed to using them because they need them.

Table 5.25 illustrates the euclidean distances between the final cluster centers. Distance values that are large indicate clusters that are different from each other. According to these values, anxious and extroverted groups are the wide apart groups.

Table 5.25 Distances between Final Cluster Centers of Cluster Typology-II

	Anxious	Extroverted	Conservative
Anxious		3.67	2.47
Extroverted	3.67		2.37
Conservative	2.47	2.37	

One of the significant Anova results for cluster typology-II is listed in the following table (Table 5.26). The whole Anova results have been contained in Appendix I.

Table 5.26 Some of the Anova Results for Cluster-Typology-II

Construct	F	Sig.	Cluster name	Mean	S.d.
Adaptive behavior present	3.10	0.05			
			Anxious	0.09	0.52
			Extroverted	0.48	0.75
			Conservative	0.26	0.63

In line with Table 5.26, these three groups: anxious, extroverted, and conservative have mentioned different thoughts about adaptive behavioral interfaces. Naturally, extroverted group has the highest value for desiring adaptive behavioral product since the group members like innovations. Contrary to this situation, the anxious group has the lowest desire for adaptation. This may be the effect of their insufficient capabilities about booking online.

Implications

Consistent with the study results, it is undeniable that speed is the vital characteristic for people.

Real time delay was used in the experimental study to cause participants to perceive low-speed. Since the experimental study had no rewards for the participants, they may be bored superfluously. Nevertheless, this cannot explain the considerably different averaged importance value of speed among the characteristics. Definitely, participants gave ultimate importance to the speed characteristic.

Response time of the system is essential for the people who use the system frequently. People who rarely use the online ticket reservation system may tolerate the system delay. However, the people who usually book online ticket reservation may get out of booking online. Therefore, e-commerce vendors may lose their sales.

The importance of speed is not a new issue for academic and practitioner literature. It has been studied for approximately thirty years. It was a closed file but it seems it is becoming apart due to the evolving technology. According to Ceaparu et al (2004), slow web sites are the most common complaint of users today.

Computers are getting faster, but there are other requirements for systems to be faster. In addition, you need to consider network's data transmission response and latency, the capability of system's server/s, static and dynamic files, HTTP request and, response size.

Static images, style sheets, and java scripts can be cached by browsers for the users who frequently visit the web site. These will not be helpful for speeding up pages for the users that visit the web site for the first time but the ones that come back.

Furthermore, using scripts, style files externally can greatly improve the web sites' load times. With the aid of these, browsers will be able to cache them only once, not for every page.

Moreover, localizing servers may be used to facilitate speeding up geographically dispersed systems. Local host centers may be increased in order to achieve a quick response.

In addition, developers may endeavor to write clear codes. For example, an open tag may lead to delay on response time. They should optimize their codes for a quick response.

As s result, developers should be aware of optimization of everything in the system and vendors should give importance to web sites' infrastructure in order to fasten the systems.

Speed is crucial but it is not everything for people. The second important characteristic that participants gave importance to is minimal memory load. Minimizing memory load by presenting information to users is crucial in every step of the users' decisions. For example, in the approval step of online ticket reservation, user should be aware of the ticket information. This information should be illustrated, not user should be in for remembering the information. Notwithstanding, necessarily detailed interfaces should be provided to users. There should be a balance between minimizing user's memory load and providing essentially detailed interfaces.

Minimal memory load characteristic has a tradeoff with content density. Minimizing load on user should be carefully applied in order not to do cause an unnecessary increase of content density. To understand which information is crucial for the user, human cognitive architecture should be investigated.

Nevertheless, menu structures, screen layout are important issues for minimizing memory load. Logical menu structures should be provided. Besides labels, buttons should be grouped and placed consistently on every page. For example, buttons like “ok” and “cancel” should be always together and at the same place in all interfaces. Carefully designed interfaces can support users to use systems more easily and efficiently by reducing user memory load.

As a result, the load that is given to user while using the system should be reduced. Reducing a user’s memory load relies on interface ability to recognize information rather than forcing users to recall it.

Corresponding to study results, an adaptive behavior characteristic is the third characteristic that was preferred by participants. Some of the users prefer the systems that have the ability to be fitted to their behaviors. Interfaces can be designed to tailor the needs of users and changing conditions according to their needs, preferences, wants by learning their answers to questions, user navigation behavior.

Adaptive behavior should be applied to interfaces attentively. Adaptive behavioral interface that has learned user incorrectly may induce user dissatisfaction easily. On the other hand, if the interface has learned user successfully, it can assist them or locate relevant information. However, it is quite difficult to learn a user and put this logic to the interfaces for developers. This requires a wide range of knowledge about users. Knowledge discovery techniques can be used to facilitate understanding of user behaviors.

There are tradeoffs between speed, minimal memory load, adaptive behavior, content density, and customization characteristics. Minimizing memory load of the interface may lead to a high content density that may slow down the system. Adaptive behavior and customization characteristics have preferred the ability of

people. In addition, these characteristics have the ability to minimize user's memory load, which can also reduce response speed.

Decreasing content density may achieve faster systems. Needless materials should be avoided. Especially, image materials and advertisements are the ones that greatly decrease speed. Jpeg formatted images may reduce this problem. Multimedia materials, which are graphics, sounds, animations, pictures, should be optimized to fasten the speed of systems.

As an example, Google has a policy about not publishing advertisements in their web sites. People prefer to use Google mostly for that reason. With this policy, Google presents search results in a short period, which leads to end user satisfaction.

Most of the user interfaces present all features available all the time that leads to increasing the complexity of the system. Customizable user interfaces can be developed for users to enable them to choose the features, which are important for them.

Customization ability should be given to users not to developers who can also create interfaces that meet users' preferences and requirements since users are the only ones that can identify their own needs.

Some of the users prefer to make changes by themselves. Alternatively, some of them may prefer the system to perform these modifications or they may not have the capability to perform these alternatives. For these situations, adaptive interfaces can take a part. The best way can be to offer customization and adaptive behavior characteristics together to address all levels of users.

People's judgments about their capability can easily affect their thoughts about finding the system easy to use. Consistent with research results, easiness of interfaces affects system usefulness. To design products that are easily used and useful can be

achieved through design characteristics but also by increasing user confidence about themselves. Their confidence can be braced up through trainings, management support, internal or external influences. System easiness and usefulness should be considered by designers to satisfy users and guarantee their usage. To achieve this, designers should pay attention to interface characteristics according to the research.

CHAPTER 6

CONCLUSION

While advances in IT continue fast, the use of new technologies has fallen since not all technologies have resulted in user acceptance. For the acceptance and utilization of new technologies, the technical improvement of the man-machine interface is of great importance.

This thesis aims at exploring, understanding, and classifying the characteristics of product design features and different aspects of technology adoption through qualitative and quantitative techniques with the intention of achieving product utility, usability, and acceptability.

In this study, technology adoption taxonomy was proposed which was developed through lingering qualitative techniques; in-depth interviews, a brainstorming session and expert focus group studies.

The major distinction of this study from the previous studies is the research framework, which is composed of two parts. In the first part of the framework, product design characteristics framework, six constructs were studied that has not been studied yet in the literature together with using conjoint analysis.

Notwithstanding, instead of classical conjoint cards, prototypes were generated for products in order to test research framework. Second framework's second set questions were also based on one of these prototypes, which was the seventh prototype. In addition, products' market shares were calculated. Furthermore, market segments for these products were identified by cluster analysis based on two frameworks' constructs (cluster typology-I & II).

In line with the first framework results, speed is the most important design and customization is the least important characteristics that affect user preferences about products. Subsequent design characteristics that influence user preferences after speed are minimal memory load, adaptive behavior, and content density, respectively. The importance of these characteristics has been studied in previous literature. The third important factor of user preference, adaptive behavior, is an hot topic for artificial intelligence (AI) researches. Contrary to the expectations, customization has a relatively small importance value in this research. According to participants' responses, interfaces that have high-speed, minimal memory load, adaptive behavior, low content density, and customization characteristics are more preferable than those that do not.

Consistent with market shares calculation, the most preferable products are the ones that have high-speed characteristics. Participants preferred to use the second product mostly, which has adaptive behavior, minimal memory load, high content density, and high-speed characteristics. Alternatively, they least prefer to use the third product which has only high content density and low-speed characteristics.

Developers should be aware of optimization of necessary things in the system and vendors should give importance to web sites' infrastructure with the intention of speeding up the systems. Carefully designed interfaces can sustain users to use systems more easily and efficiently by reducing user memory load. Menu structures, screen layout are important issues for minimizing memory load. Interfaces can be designed to tailor the needs of users and changing conditions according to their needs, preferences, and wants by learning their answers to questions, user navigation behavior. However, it is quite difficult to learn a user and put this logic to the interfaces for developers. This requires a wide range of knowledge about users.

Knowledge discovery techniques can be used to facilitate understanding of user behaviors. Decreasing content density may achieve faster systems. Needless materials should be avoided. Especially, image materials and advertisements are the ones that greatly decrease speed. Most of the user interfaces present all features available all the time that leads to increasing the complexity of the system. Customizable user interfaces can be developed for users to make them possible to choose the features that are important for them.

Corresponding to the second framework findings, external influence, internal influence, usefulness, and attitude are direct determinants, ease of use via attitude, and self-efficacy via ease of use are indirect determinants of user intention. Furthermore, the antecedents of attitude are usefulness and ease of use. Usefulness has a considerably higher influence than ease of use on attitude. Besides, external influence and ease of use are direct determinants of usefulness. Last, self-efficacy has an impact on ease of use. Among all constructs, attitude has the strongest and external influence has the weakest impact on user intention. These findings are consistent with previous studies.

According to these findings, attitude towards using the system can strongly affect user intention to use the product. Besides, if the user derives benefit from product, he/she intends to use it. In addition, individual's beliefs, news, advertisements influence user's intention to use the product. Moreover, the benefits that user gains from using the product and product's ease of use affect user's attitude towards using the product. In addition, a product that is easy to use influences user's perceived benefits. Last, user's perception about being satisfied, effective, and efficient while using the product affects perceived ease of use of the product.

To design products that are easily used and useful can be achieved through design characteristics but also by increasing user confidence about themselves. Their confidence can be braced up through trainings, management support, internal or external influences. System easiness and usefulness should be considered by designers to satisfy users and assure their usage. To achieve this, designers should pay attention to interface characteristics according to the research.

There were limitations for this study. First, conjoint analysis has some limitations. Differently from regression analysis, constructs cannot be eliminated or extended in conjoint analysis. Moreover, traditional conjoint analysis has a limited ability to study many attributes.

The experimental study was found to be too long by the participants. Besides, participants may be bored superfluously for the reason that real time delay was used with no rewards to participants. Although, experimental study's sample was satisfactory and sufficient for the analyses, a large sample could be reached by shortening the experimental study and decreasing real time delay in order to provide results that are more fruitful.

Further studies in the area may also include the extension of the research framework by adding new constructs. Besides, different flavors of Sawtooth Company Inc.'s SSI Web can be used in order to overcome some of the conjoint limitations.

REFERENCES

ACM Specialist Interest Group on Computer Human Interaction Curriculum Development Group (1992). Technical report. *ACM,* New York.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50 (2), 179-211.

Alavi, M. (1984). An assessment of the prototyping approach to information systems development. *ACM,* 27 (6), 556-563.

Baddeley, A. (1986). *Working Memory*, Oxford University Press: New York.

Bass, F. (1969). A new product growth model for consumer durables. *Management Science,* 15 (5), 215-227.

Benbasat, B., Dexter, A. S. & Masulis P. S. (1981). An experimental study of the human-computer interface. *Communications of the ACM*, 24 (11), 752-762.

Bentley, R. & Dourish, P. (1995). Medium versus mechanism: Supporting collaboration through customization. *Proceedings of ECSCW '95*, September 11-15, Stockholm: Sweden, 133-148.

Bergman, L. & Lau, T. (2004). Workshop on behavior based user interface customization. *IUI'04,* January 13-16, Madeira, Funchal: Portugal, 372-373.

Bevan, N. (1995). Measuring usability as quality of use. *Software Quality Journal,* 4 (1), 115-150.

Boehm, B. W., Gray, T. & Seewaldt, T. (1984). Prototyping versus specifying: A multiproject experiment. *IEEE Transactions on Software Engineering,* 10 (3), 290-302.

Bunt, A., Conati, C. & McGrenere, J. (2004). What role can adaptive support play in an adaptable system? *Proceedings of the International Conference on Intelligent User Interfaces*, January 13-16, Madeira: Portugal, 117-124.

Bunt, A., Conati, C. & McGrenere, J. (2007). Supporting interface customization using a mixed-initiative approach. *Proceedings of IUI'07,* January 28-31, Honolulu, Hawaii: USA, 92-101.

Butler, K. A. (1996). Usability engineering turns 10. *Interactions*, 3 (1), 58-75.

Byrd , T. A., Cossick, K. L. & Zmud, R. B. (1992). A synthesis of research on requirements analysis and knowledge acquisition techniques. *MIS Quarterly*, 6(1), 117-138.

Carlsson, C., Carlsson, J. & Hyvönen, K. (2006). Adoption of mobile devices/services-Searching for answering with UTAUT. *Proceedings of the 39th Hawaii International Conference on System Sciences,* January 4-7, Kauai: USA, 1-10.

Carson, R. T., Louviere, J. J., Anderson, D. A., Arabie, P., Bunch, D., Hensher, D.A., Johnson R. M., Kuhfeld, W. F., Steinberg, D., Swait, J., Timmermans, H. & Wiley, J. B. (1994). Experimental analysis of choice. *Marketing Letters*, 5(4), 351-68.

Ceaparu, I., Lazar, J., Besseiere, K. Robinson, J. & Shneiderman, B. (2004). Determining causes and severity of end-user frustration. *International Journal of Human-computer Interaction,* 17 (3), 333-356.

Chaomei, C. & Roy, R. (1996). Interacting with hypertext: A meta analysis of experimental studies, *Human Computer Interaction,* 11 (2), 125-156.

Chau, P. Y. K. & Hu, J. H. (2002). Investigating healthcare professionals' decisions to accept telemedicine technology: An empirical test of competing theories. *Information & Management*, 39 (4), 277-287.

Chiasson, M. W. & Lovato, C. Y. (2001). Factors influencing the formation of a user's perceptions and use of a DSS software innovation. *The Data Base For Advances in Information Systems, ACM,* 32 (3), 16- 35.

Chin, J. P., Diehl, V. A. & Norman, K. L. (1988). Development of a tool measuring user satisfaction of the human-computer interface. *Proceedings of SIGCHI '88*, May 19-25, New York: ACM/SIGCHI, 213-218.

Chou, J. & Hsiao, S. (2007). A usability study on human-computer interface for middle-aged learners. *Computers in Human Behavior,* 23 (4), 2040-2063.

Çalışır, F. & Çalışır, F. (2004). The relation of interface usability characteristics, perceived usefulness, and perceived ease of use to end-user satisfaction with enterprise resource planning (ERP) systems. *Computers in Human Behavior,* 20 (4), 505-515.

Dahan, E. & Hauser, J. R. (2001). The virtual customer. *Journal of Product Innovation Management*, 19 (5), 332-354.

Davis, F. D. (1986). A technology acceptance for empirically testing new end user information systems: Theory and results. *Doctoral dissertation*, Sloan School of Management, Massachusetts Institute of Technology.

Davis, F. D., Bagozzi, R. & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, 35 (8), 982-1003.

Day, D. & Makirinne-Crofts, P. (1997). Computer anxiety and the human-computer interface. *Proceedings of HCI'97 Conference on People and Computers XII,* August 12-15, Bristol: UK, 85-100.

Decker, R. & Hermelbracht, A. (2006). Planning and evaluation of new academic library services by means of web-based conjoint analysis. *The Journal of Academic Librarianship*, 32 (6), 558-572.

Delone, W. H. & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research*, 3 (1), 60–95.

Dishaw, M. T. & Strong, D. M. (1998). Extending the technology acceptance model with task-technology fit constructs. *Information Management,* 36 (1), 9-13.

Dix, A., Finlay, J., Abowd, G. & Beale, R. (1993). *Human-Computer Interaction.* Cambridge: Cambridge University Press.

Eason, K. D. (1988). *Information Technology and Organizational Change.* London: Taylor & Francis.

Eng, K., Lewis, R. L., Tollinger, I., Chu, A., Howe, A. & Vera, A. (2006). Generating automated predictions of behavior strategically adapted to specific performance objectives. *CHI 2006, Proceedings of Automatic Generation & Usability*, April 22-27, Montréal, Québec: Canada, 621-630.

Findlater, L. & McGrenere, J. (2004). A comparison of static, adaptive, and adaptable menus. *Proceedings of CHI'04,* April 24-29, Vienna: Austria, 89-96.

Fishbein, M. & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research.* Addison-Wesley Reading: Massachusetts: USA.

Frøkjær, E., Hertzum, M. & Hornbæk, K. (2000). Measuring usability: Are effectiveness, efficiency, and satisfaction really correlated. *Proceedings of the SIGCHI conference on Human factors in computing systems,* April 1-6, The Hague: The Netherlands, 345-352.

Gajos, K. & Weld, D. S. (2004). Automatically generating user interfaces. *Proceedings of the International Conference on Intelligent User Interfaces*, January 13-16, Madeira: Portugal, 93-100.

Goodhue, D. L. & Thompson, R. L. (1995). Task-technology fit and individual performance. *MIS Quarterly*, 19 (2), 213-236.

Gulliksen, J., Bovie, I. & Göransson, B. (2006). Usability professionals-current practices and future development. *Interacting with Computers,* 18 (4), 568-600.

Hair, J. F., Tatham, R., L., Anderson, R. E. & Black, W. (1998). *Multivariate Data Analysis* (6th ed.). Upper Saddle River, NJ: Prentice Hall.

Hart, S. (Ed.) (1996). *New Product Development: A Reader*. The Dryden Press, London.

Hartson, H. R. (1998). Human-computer interaction: Interdisciplinary roots and trends. *The Journal of Systems and Software,* 43 (2), 103-118.

Hensher, D. A. (1994). Stated preferences analysis of travel choices-the state of practice. *Transportation*, 21 (2), 107-33.

Hui, B. & Craig, B. (2006). Who is asking for help? A Bayesian approach to intelligent assistance. *Proceedings of IUI'06*, January 29-February 1, Sydney: Australia.

ISO (1998). Ergonomic requirements for office work with visual display terminals (VDTs). *Part 11: Guidance on usability (ISO 9241-11:1998*).

Jackson, C. M., Chow, S. & Leitch, R. A. (1997). Toward an understanding of the behavioral intentions to use an information system. *Decision Sciences*, 28 (2), 357–389.

Jacobs, A. M. (1986). Eye-movement control in visual search: How direct is visual span control? *Perception and Psychophysics*, 39 (1), 47-58.

Jaspers, M.W. M., Steen, T., Bos, C. V. D. & Geenen, M. (2004). The think aloud method-a guide to user interface design. *Medical Informatics*, 73 (11-12), 781-795.

Jenkins, S. E. & Cole, B. L. (1982). The effect of the density of background elements on the conspicuity of objects. *Vision Research*, 22 (10), 1241-1252.

Kotelly, C., Farhi, P. & Ahnemann, M. D. (2000). Breaking-up is hard to do: Partitioning information (or not) in over-the-phone, speech-recognition interactions. *CHI 2000*, April 1-6, Hague: The Netherlands, 169-170.

Kristofic, A. & Bielikova, M. (2005). Improving adaptation in webbased educational hypermedia by means of knowledge discovery. *HT'05,* September 6-9, Salzburg: Austria, 184-192.

Kumar, M., Gupta, A. & Saha, S. (2006). An approach to adaptive user interfaces using interactive media systems. *IUI'06*, January 29-February 1, Sydney: Australia, 312-314.

Legris, P., Ingham, J. & Collerette, P. (2001). Why do people use information technology? A critical review of the technology acceptance model. *Information & Management*, 40 (3), 191-204.

Lewis, C. (1982). Using the ''thinking-aloud'' method in cognitive interface design. *Research Report RC9265*, IBM T.J. Watson Research Center.

Lightner, N. J. (2001). Strategies for designing usable interfaces for internet applications. *Usability Evaluation and Interface Design,* Lawrence Erlbaum Associates, New Jersey, 1387-1389.

Lightner, N. J. & Eastmen, C. M. (2002). User preference for product information in remote purchase environments. *Journal of Electronic Commerce Research*, 3 (3), 174-186.

Lockhart, D. & Knain, M. (1998). The research report on overview of alternative conjoint approaches. *Maritz Marketing Research Inc.,* 11(1), 1-6.

Lucarella, D. & Zanzi, A. (1996). A visual retrieval environment for hypermedia information systems. *ACM Transactions on Information Systems*, 14 (1), 3-29.

Merrienboer, J. V. & Sweller, J. (2005). Cognitive load theory and complex learning: Recent developments and future directions. *Educational Psychology Review*, 17 (2) 147-177.

Molich, R. & Nielsen, J. (1990). Improving a human–computer dialogue. *Communications of the ACM*, 33 (3), 338-348.

Mørch, A. (1997). Three levels of end-user tailoring: Customization, integration and extension. *In Kyng, M. and Mathiassen, L. Computer and Design in Context*. MIT Press, Cambridge, MA, USA, 61-76.

Mousavi, S., Low, R. & Sweller, J. (1995). Reducing cognitive load by mixing auditory and visual presentation modes. *Journal of Educational Psychology*, 87 (2), 319-334.

Mu, X., Marchionini, G. & Pattee, A. (2003). The interactive shared educational environment: User interface, system architecture and field study. *IEEE*, 9 (3), 291-300.

Nielsen, J. (1996). Top ten mistakes in Web design. *Jakob Nielsen's Alertbox, Alertbox for May*, Available at "www.useit.com/alertbox/9605.html".

Nielsen, J. (1997). The need for speed. *Jakob Nielsen's Alertbox, Alertbox for March,* Available at "www.useit.com/alertbox/9703a.html".

Nielsen, J. & Levy, J. (1994). Measuring usability: Preference vs. performance. *Communications of the ACM*, 37 (4), 66–75.

Nijssen, E. J. & Frambach, R. T. (1998). Market research companies and their use of new product development tools. *Journal of Product and Brand Management*, 7 (4), 305-18.

Nijssen, E. J. & Lieshout, K. (1995). Awareness, use and effectiveness of models and methods for new product development. *European Journal of Marketing*, 29 (10), 27-44.

Oviatt, S., Arthur, A. & Cohen, J. (2005). Quiet interfaces that help students think. *UIST'06*, October 15–18, Montreux: Switzerland, 191-200.

Özen, Ç. & Başoğlu, N. (2006). Impact of man-machine interaction factors on enterprise resource planning (ERP) software design. *Proceedings of Portland International Conference for Management of Engineering and Technology'06*, July 8-13, İstanbul: Turkey, 2335-2341.

Özen, Ç. & Başoğlu, N. (2007). Exploring the contribution of technology architecture and design characteristics of information systems (IS) user interface to adoption process. *Accepted to Proceedings of Portland International Conference for Management of Engineering and Technology'07*, August 5-12, Portland: USA.

Paas, F., Tuovinen, J., Tabbers, H. & Gerven, P. V. (2003). Cognitive load measurement as a means to advance cognitive load theory. *Educational Psychologist*, 38 (1), 63-71.

Paymans, T. F., Linderberg, J. & Neerincx, M. (2004). Usability trade-offs for adaptive user interfaces: Ease of use and learnability. *IUI'04*, January 13-16, Madeira, Funchal: Portugal, 301-303.

Pirolli, P., Card, S. K. & Van Der Wege, M. M. (2001). Visual information foraging in a focus + context visualization. *CHI'01*, 31 March-5 April, Washington: USA, 506-513.

Pittermann, J. & Pittermann, A. (2007). A data-oriented approach to integrate emotions in adaptive dialogue management. *IUI'07,* January 28-31, Honolulu, Hawaii: USA, 270-273.

Ramsay, J., Barbesi, A. & Preece, J. (1998). A psychological investigation of long retrieval times on the World Wide Web. *Interacting with Computers*, 10 (1), 77-86.

Rayner, K. & Fisher, D. L. (1987). Eye movements and the perceptual span during visual search. In J. K. O'Reagan, & A. Levý-Schoen (Eds.), *Eye movements: From Physiology to Cognition,* Netherlands: Elsevier Science Publishers B. V., 293-302.

Rees, J. (2001). Transaction security in b2c ecommerce: Perceptions and reality. *Usability Evaluation and Interface Design,* Lawrence Erlbaum Associates: New Jersey, 858-862.

Reynolds, T. J. & Gutman, J. (1988). Laddering theory, method, analysis, and interpretation. *Journal of Advertising Research*, 28 (1), 11-31.

Rivera, D. (2005). The effect of content customization on learnability and perceived workload. *CHI 2005,* April 2-7, Portland, Oregon: USA, 1749-1752.

Robey, D. & Farrow, D. (1982). User involvement in information systems development: A conflict model and empirical test. *Management Science*, 28 (1), 73-85.

Schaik, V. P. & Ling, J. (2003). Using on-line surveys to measure three key constructs of the quality of human-computer interaction in web sites: Psychometric properties and implications. *International Journal of Human-Computer Studies,* 59 (5), 545-567.

Sears, A., Jacko, J. A. & Dubach, E. M. (2000). International aspects of World Wide Web usability and the role of high-end graphical enhancements. *International Journal of Human-Computer Interaction*, 12 (2), 241-261.

Selvidge, P. (1999). How long is too long for a website to load? *Usability News*, 1 (2), Available at "http://psychology.wichita.edu/surl/usabilitynews/1s/ time_delay.htm".

Seyal, A. H. & Pijpers, G. G. M. (2004). Senior government executives' use of the Internet: A bruneian scenario. *Behavior and Information Technology*, 23 (3), 197-210.

Shackel, B. (1991). Human factors for informatics usability-background and overview. *Human Factors for Informatics Usability*. Cambridge: Cambridge University Press, 24.

Shavlik, J., Calcari, S., Eliassi-Rad, T. & Solock, J. (1999). An instructable, adaptive interface for discovering and monitoring information on the world-wide web. *IUI'99,* January 5-8, Redondo Beach, CA: USA, 157-160.

Shneiderman, B. (1984). Response time and display rate in human performance with computers. *Computing Surveys*, 16 (2), 65-285.

Shneiderman, B. & Plaisant, C. (2005). *Designing the user interface.* Addison Wesley, USA, 4.

Smith, S. L. & Mosier, J. N. (1986). Guidelines for designing user interface software. *Mitre Report ESD-TR-86-278*, The MITRE Cooperation, Bedford, MA.

Sofuoğlu, E. (2006). Feature analysis of an information systems product development: A case of e-mail systems. *Unpublished Master Thesis*, Management Information Systems Department, Boğaziçi University, 7-8.

Staggers, N. (1993). Impact of screen density on clinical nurses' computer task performance and subjective screen satisfaction. *International Journal of Man Machine Studies,* 39 (5), 775 – 792.

Stuerzlinger, W., Chapuis, O., Phillips, D. & Roussel N. (2006). User interface façades : Towards fully adaptable user interfaces. *UIST'06*, October, Montreux : Switzerland, 309-313.

Sun, H. & Zang, P. (2005). The role of moderating factors in user technology acceptance. *Human-Computer Studies,* 64 (2), 53-78.

Sutcliffe, A. (1988). Some experiences in integrating specification of human-computer interaction with a structured system development method. *Proceedings of the Fourth Conference of the British Computer Society on People and computers IV,* August 5-9, University of Manchester: UK, 145-160.

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science,* 12 (1), 257-285.

Takeuchi, A. & Nagao, K. (1993). Communicative facial displays as a new conversational modality. *INTERCHI'93,* April 24-25, Amsterdam: The Netherlands, 187-193.

Tanoğlu, İ. (2006). Information technology diffusion and managerial decision making. *Unpublished Master Thesis*, Management Information Systems Department, Boğaziçi University, 10-11.

Taylor, S. & Todd, P. A. (1995). Understanding information technology usage: A test of competing models. *Information Systems Research*, 6 (2), 144-176.

Thong, J. Y. L., Hong, W. & TAM, K. Y. (2004). What leads to user acceptance of digital libraries? *Communications of ACM,* 47 (11), 78-83.

Thong, J. Y. L., Hong, W. & TAM, K. Y. (2006). The effects of post adoption beliefs on the expectation-confirmation model for information continuance. *International Journal of Human-Computer Studies,* 64 (9), 799-810.

Trbovich, P. L. (2005). Phonological and visual working memory in processing of route guidance information. *CHI'05*, April 2-7, Portland, Oregon: USA, 1132-1133.

Treisman, A. (1982). Perceptual grouping and attention in visual search for features and objects. *Journal of Experimental Psychology: Human Perception and Performance*, 8 (2)*,* 194-214.

Venkatesh, V. & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46 (2), 186–204.

Venkatesh, V. & Morris, M. G. (2000). Why do not men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior. *MIS Quarterly*, 24 (9), 115–139.

Venkatesh, V., Morris, M. G., Davis, G. B. & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27 (3), 425-478.

Vlaskamp, B., Hooge, I. & Over, E. (2002). Stimulus density does not affect saccadic search performance. *The 25th European Conference on Visual Perception*, 25-29 August, Glasgow: Scotland.

Weld, D. S., Anderson, C., Domingos, P., Etzioni, O., Gajos, K., Lau, T. & Wolfman, S. (2003). Automatically personalizing user interfaces. *Proc of the International Joint Conference on Artificial Intelligence (IJCAI03),* August, Acapulco: Mexico, 159-166.

Wharton, C., Rieman, J., Lewis, C. & Polson, P. (1994). The cognitive walkthrough method: A practitioner's guide. In: Nielsen, J., Mack, R. L. (Eds.). *Usability Inspection Methods.* Wiley, New York, 105–140.

Xiao, J., Stasko, J. & Catrambone, R. (2007). The role of choice and customization on users' interaction with embodied conversational agents: Effects on perception and performance. *Proceedings of Augmentation, Automation & Agents'07*, San Jose, CA: USA, 1293-1302.

Xie, H. (2003). Supporting ease of use and user control: Desired features and structure of web-based online IR systems. Information Processing and Management: an International Journal, 39 (6), 899-922.

Yoo, J., Gervasio, M. & Langley, P. (2003). An adaptive stock tracker for personalized trading advice. *IUI'03,* January 12–15, Miami, Florida: USA, 197-203.

Zimmerman, D. E. & Muraski, M. L. (1995). *Usability testing-dan evaluation technique.* Phoenix, AZ: Oryx Press, 173.

APPENDICES

APPENDIX A

Definitions of Technology Adoption Taxonomy Characteristics

Table A.1 Definitions of Product Aspect's Characteristics

Characteristic	Description
High-interaction characteristics	Advance mode of interaction: Interface ability to understand user needs, wants, etc. and ability to behave according to these understandings
Adaptive behavior	Interface's ability to learn a user
Customization	Product ability of creating and designing the interface that meets the user's needs
Personalization	The process of tailoring interfaces to users' characteristics or preferences
Recognition	Recognition of user by interface
Interface characteristics	All interface characteristics of the product like visualization, user-friendliness
Audio	The characteristics of technology about the audio like sound management and sound alerts
Audio cue	Audio cues at the interface like giving sound alerts when the message comes to the screen
Speech synthesis	The interface has the ability of creating speech signs which is vocalizing from written text like ability of reading e-mails to user by the interface
Speech to text conversion	The interface ability of understanding speech signs and translating these to text
Voice activated system	Having the ability of interface to be activated with voice signals
Interaction characteristics	The characteristics that appear while user interacts with interface like menu types, touch screen
Menu type	Menu types of interface like icon menu type or text menu type
Panes	Interface ability of using with panes like using folders, contacts, preview panes of Microsoft Outlook
Scroll mechanism	Using scroll mechanism at the interface; moving up and down with scroll mechanism at the interface
Tabs	Interface ability of using more then one tabs at interface like using tabs at Windows Explorer 7.0
Cursor type	Mouse cursor's symbol like arrow shape, plus sign
Touch screen	Using the interface by touching
Virtual display	Using the interface with virtual display like using phone keys as a keyboard by reflecting phone keys to different surfaces
Flyover	Like reading the whole news when getting the cursor on the connection at internet news pages
User-friendliness	Using the interface easily without past experience
User guidance	The interface that has guidance characteristics

Table A.1

Characteristic	Description
System help	Interface has the help menu
Navigation	Having the logical flow of navigation at interface like having connected processes with file at file menu
Undo	Having the ability of undo action which provides to correct mistakes while using interface
Autonomy	Interfaces' ability of making independent decisions
Speed to result	Finding the result quickly like finding result at the first page when making search at Google
Visualization	The characteristics of interface about visualization like resolution, brightness, color
Language	Language of interface, like be Turkish or English
Terminology	Terms and jargons used at interface
Color	Colors used at interface
Aesthetics	Feel and display aesthetics given by interface, like be colors harmonious
Resolution	Resolution used at interface, like 800*600 pixel
Visual cue	Visual cues that appears while using interface, like appearing the size of folder when getting the cursor on the folder
Font size	Font size used at interface, like 10p
Font type	Font type used at interface, like Arial, Times New Roman
Contrast	Using bright and dark divisions at interface
Fidelity	Interface be clear and brilliant
Line length	Line length at interface; like be 100 lines or 1000 lines
Column width	Column width using for texts at interface
Symmetry	The ability of interface being symmetric
Similarity	Like buttons at different interfaces at the system have same functions at same places
Viewpoint	Like viewing road from top-view or inside of car in a car racing game
Zooming	Gradual image scaling operation, like viewing place closer by clicking the cursor more
Background	Like using picture and color at background of interface
Images	Using electronic projections of scanned document at interface
Symbols	Using agreed projections of concepts at interface
Memory load	Not giving memory load to user while using the interface
Content density	Interface to be crowded or plain
Distinctiveness	Having distinctive visual characteristics of interface
Non-interface characteristics	The characteristics of product like capability, capacity or price
Capability	The characteristics like capacity, flexibility of the system
Responsiveness	The ability of the product to answering the user input without delay
Capacity	The abilities and capacity of the product
Speed	The product be functioning speedy
Multifunctional	The product be multifunctional, like listening music and making call at the same time with a mobile phone

Table A.1

Characteristic	Description
Integration	The ability of the product to operate without problems at all operation systems like Windows, Linux
Redundancy	Product ability of doing one operation in different ways, like recording a file in several ways
Accessibility	The product be accessible by users in frame of determined rules
Flexibility	Having the ability of meeting all users' wants
Scalability	The product be continue to functionalize at upper or lower platforms in terms of speed and capacity; like the product be functioning without problems when increasing the number of users from 100 to 1000
Reliability	The ability of product of making operations under given conditions, like the system be operating without collapsing
Complexity	The degree of difficulties about understanding and using the product and its components by user
Price	The cost of the technology
Brand	The brand of the technology
Functionality	The facilities providing by product to user
Relevance	The characteristics of the product be relevant to expectations of user
Maintenance	The service which contains necessary maintenance in order to operate more productive and to continue its operation
Security	Work that involves guarantying the confidentiality, integrity, and availability of systems
Interface design portability	The quality of the interface being light enough to be carried
System portability	A measure of system independence that supports programs to be moved to a new system by recompiling without having to make any other modifications

Table A.2 Definitions of Intermediary Aspect's Characteristics

Characteristic	Description
Usefulness	Technology ability of providing benefits to user
Learnability	Technology ability of providing new users an effective interaction
Ease of use	User use technology easily during interaction
Ease of understanding	User understands technology easily during interaction
Fun	User has fun during interaction
Likeability	User likes technology during interaction
Enjoyment	User enjoys technology during interaction

Table A.3 Definitions of Task Aspect's Characteristics

Characteristic	Description
Task-technology fit	Technology be fit to doing task
Task characteristics	Characteristics of the task like technical-no technical, risky - not risky, easy- hard
Near-long term consequences	The results stem from using technology at near or long period

Table A.4 Definitions of Information Content Aspect's Characteristics

Characteristic	Description
Amount of information	The amount of information presented by technology
Data quality	Like presenting complete, timely, accurate, reliable, current, precise data by technology
Ease of finding information	Ease of finding information when using the technology

Table A.5 Definitions of Social Aspect's Characteristics

Characteristic	Description
System context	Context that the technology is being used, like organizational culture
Organizational culture	Organization culture that technology is being used like innovative organization
Subjective norm	People's idea about technology around the user or using technology by these people's suggestions
Management support	Support of management of the organization that will use the technology
Facilitating conditions	The support given to user while interacting with technology, like learning the technology from a friend
User characteristics-mental and emotional states	Habits of user, like user attention, user motivation
User habits	Habits of user, like loving listening to music while working
Self-efficacy	User perceive himself/herself as sufficient and effective about the technology
Cognitive style	Cognitive style of user when thinking, perceiving information, reminding or solving a problem
Anxiety	Having anxious user character
Intellectual capacity	Intellectual abilities of user
Optimism	Having an optimistic user character
Annoyance	Having an anger user character
Involvement	Involvement of user while adopting technology
Attention	Attention of user
Motivation	The motivation of user about using technology
Voluntariness	The willingness of user to use technology
Control	User has a sense of control over the technology
Sense of distance	Sense of distance of user to technology
Social compatibility	User's technology adoption by social view

APPENDIX B

Teknolojiyi Benimseme Sınıflandırması Özelliklerinin Tanımları

Table B.1 Ürün Tarafı Özelliklerinin Tanımları

Özellik (İngilizce)	Özellik (Türkçe)	Açıklama
High-interaction characteristics	Üst-etkileşim özellikleri	Etkileşimin gelişmiş modu: Arayüzün kullanıcı ihtiyaçlarını, isteklerini algılaması ve algıladıklarıyla davranma yeteneği
Adaptive behavior	Uyan davranış	Arayüzün kullanıcıyı öğrenme yeteneği
Customization	Uyarlama	Kullanıcının ihtiyaçlarını karşılayacak ürün içeriğin yaratılması ve dizaynı
Personalization	Kişiselleştirme	Arayüzleri kişinin karakteristik ve seçimlerine göre şekillendirme yöntemi
Recognition	Tanıma	Arayüzün kullanıcıyı tanıması
Interface characteristics	Ürünün arayüz karakteristikleri	Ürünün tüm arayüz özellikleri; arayüzün görsel özellikleri, arayüzün kullanıcı dostu olması gibi
Audio	Ses	Teknolojinin ses ile ilgili özellikleri; sesle yönetebiliyor olması, sesli işaretler veriyor olması gibi
Audio cue	Sesli ipuçları	Arayüzdeki sesli ipuçları; uyarı mesajlarının ekrana geldiği anda sesli uyarı verilmesi gibi
Speech synthesis	Konuşma sentezi	Arayüzün yazılı metinden sesletilen konuşma işaretlerini üretme yeteneği olması; e-postaların arayüz tarafından kullanıcıya okunması gibi
Speech to text conversion	Konuşmadan metine çevirme	Arayüzün girişteki konuşma işaretlerini anlayıp metne çevirme yeteneği olması
Voice activated system	Sesle kumanda edilen	Arayüzün ses işaretleri ile harekete geçirilebilmesi yeteneği olması
Interaction characteristics	Etkileşim karakteristikleri	Kullanıcının arayüz ile etkileşimi sırasında ortaya çıkan özellikler; menü tipleri, ekranın dokunmatik olması gibi
Menu type	Menü tipi	Arayüzün menü tipleri; ikon menü tipi, metin menü tipi gibi
Panes	Pencere gözleri	Arayüzün birden çok bölme ile kullanılabilmesi; Microsoft Outlook'ta "folders", "contacts", "preview" bölmelerinin kullanılması gibi
Scroll mechanism	Kaydırma mekanizması	Arayüzde kaydırma mekanizması kullanılması; arayüzde yukarı aşağıya kaydırma mekanizması ile hareket edilmesi
Tabs	Sekme kullanımı	Arayüzde birden çok sekme kullanımı; Windows Explorer 7.0' daki sekme kullanımı gibi
Cursor type	İmleç tipi	Fare imlecinin ok şeklinde, artı işaretinde olması gibi
Touch screen	Dokunmatik ekran	Arayüzün dokunarak kullanılabilmesi
Virtual display	Yansıtılan arayüz	Arayüzlerin yansıtma yöntemi ile kullanılması; telefon tuşlarının klavye şeklinde yüzeylere yansıtılarak kullanılması gibi
Flyover	Üste hareket	Haber sayfalarında bağlantının üzerine gelindiğinde haberin tümünün okunabilmesi gibi
User-friendliness	Kullanıcı dostu	Arayüzün deneyim gerektirmeden kullanıcı tarafından kolayca kullanılabilmesi
User guidance	Yol gösterme	Arayüzün kullanıcıya yol gösterme özelliği olması
System help	Sistemin yardım menüsü	Arayüzün yardım menüsüne sahip olması
Navigation	Dolaşma	Arayüzde dolaşma özelliğinin mantıksal bir akışı olması; dosya menüsünde dosya ile ilgili işlemlerin bulunması gibi
Undo	Geri alma	Arayüz kullanılırken yapılan işlemlerden geriye dönme özelliğinin olması
Autonomy	Otonomi	Arayüzün bağımsız kararlar alabilme özelliği
Speed to result	Sonuca hızlı ulaşma	Kullanıcının arayüzde sonuca hızlı ulaşması; "Google"'da arama yaptığında sonuca ilk sayfada ulaşması gibi

Table B.1

Özellik (İngilizce)	Özellik (Türkçe)	Açıklama
Visualization	Görsellik	Arayüzün görsellik ile ilgili özellikleri; çözünürlülük, parlaklık, renk gibi
Language	Dil	Arayüzde kullanılan dil; Türkçe, İngilizce olması gibi
Terminology	Terminoloji	Arayüzde kullanılan terimler, jargonlar
Color	Renk	Arayüzde kullanılan renkler
Aesthetics	Estetik	Arayüzün verdiği his ve görüntü estetiği; renklerin uyumlu olması gibi
Resolution	Çözünürlülük	Arayüzde kullanılan çözünürlük; 800' e 600 piksel gibi
Visual cue	Görsel ipucu	Arayüz kullanımı sırasında karşımıza çıkan görsel ipuçları; bir klasörün üstünde imlecimizle geldiğimizde boyut bilgilerin görünmesi gibi
Font size	Yazı boyutu	Arayüzde kullanılan yazı boyutu; 10 punto gibi
Font type	Font çeşidi	Arayüzde kullanılan yazı tipi; Arial, Times New Roman gibi
Contrast	Zıtlık	Arayüzde parlak ve karanlık bölümlerin kullanılması
Fidelity	Netlik	Arayüzün net, berrak olması gibi
Line length	Satır uzunluğu	Arayüzdeki satır uzunluğu; 100 satır, 1000 satır olması gibi
Column width	Kolon genişliği	Arayüzde metinler için kullanılan kolonların genişliği
Symmetry	Simetri	Arayüzün simetrik olması
Similarity	Benzerlik	Sistemdeki değişik arayüzlerde bulunan butonların hep aynı yerde aynı işlevleri görüyor olması gibi
Viewpoint	Bakış açısı	Araba yarışı oyununda yolu arabanın içinden ya da kuşbakışı görmek gibi
Zooming	Zumluma	Aşamalı imge ölçekleme işlemi; arayüzde imlecin tıklatıldığı yerin daha yakından görülebilmesi gibi
Background	Arka plan	Arayüzün zemininde kullanılan resim, renk gibi
Images	İmgeler	Arayüzde bir tarayıcıdan geçirilen belgenin elektronik gösterimlerinin kullanımı
Symbols	Simgeler	Arayüzde bir kavramın üzerinde uzlaşmaya varılmış gösterimlerin kullanımı
Memory load	Hafıza yükü	Arayüzün kullanımı sırasında kullanıcıya hafıza yükü verilmemesi
Content density	İçerik yoğunluğu	Arayüzün kalabalık veya sade olması
Distinctiveness	Ayırt edicilik	Arayüzün ayırt edilebilecek görsellik özellikleri olması
Non-interface characteristics	Ürünün arayüz dışındaki karakteristikleri	Ürünün yetenekleri, kapasitesi, fiyatı gibi özellikler
Capability	Yetenek	Sistemin yetenekleri; kapasitesi, esnekliği gibi
Responsiveness	Yanıt verme	Ürünün gecikmeden kullanıcının girdisine yanıt vermesi
Capacity	Kapasite	Ürünün yapabildikleri ve yetenekleri
Speed	Hız	Ürünün hızlı çalışması
Multifunctional	Çok işlevsellik	Ürünün birden çok işlevselliği olması; cep telefonuyla konuşma yapılabilmesi aynı zamanda müzik dinlenebilmesi gibi
Integration	Tümleştirme	Ürünün bir yazılım olduğunu düşünürsek bütün işletim sistemlerinde (Windows, Linux gibi) sorunsuz çalışması
Redundancy	Artıklık	Üründe bir işlemin biden çok yolla yapılabilmesi; dosyanın kaydetme işleminin birkaç yolla yapılabilmesi gibi
Accessibility	Erişebilirlik	Ürünün kullanıcılar tarafından belli kurallar çerçevesinde erişilebilir olması
Flexibility	Esneklilik	Ürünün tüm kullanıcı isteklerine cevap verme yeteneği olması

Table B.1

Özellik (İngilizce)	Özellik (Türkçe)	Açıklama
Scalability	Ölçeklenebilirlik	Ürünün hız ve kapasite bakımından daha üstteki veya alttaki platformlarda iş görmeye devam edebilme özelliği; 100'den 1000 kullanıcıya çıkıldığında da ürünün sorunsuz çalışması gibi
Reliability	Güvenilirlik	Ürünün işlevi istenilen koşullar altında yerine getirebilme yeteneği; sistemin çökmeden çalışabilmesi gibi
Complexity	Karmaşıklık	Bir ürün ve bileşenlerinin kullanıcı tarafından anlaşılma ve kullanılmasına ilişkin güçlüklerin derecesi
Price	Fiyat	Teknolojinin maliyeti
Brand	Marka	Teknolojinin markası
Functionality	İşlevsellik	Ürünün kullanıcıya sunduğu olanaklar
Relevance	Uygunluk	Ürünün sunduklarının kullanıcının beklentilerine uygun olması
Maintenance	Bakım	Ürünün işleminin sürdürmesi ve yapılabiliyor ise daha verimli çalışmasını sağlamak için gerekli düzeltmeleri içeren hizmet
Security	Güvenlik	Sistem gizliliğini, bütünlüğünü ve kullanırlılığını sağlayan işlerin tümü
Interface design portability	Arayüz tasarım taşınırlığı	Arayüzün taşınabilecek hafiflikte kalitesinde olması
System portability	Sistem taşınırlığı	Programların yeni bir sisteme sorunsuz ve değişiklik yapılmasını gerektirmeden taşınabilmesinin sağlanması

Table B.2 Aracı Tarafı Özelliklerinin Tanımları

Özellik (İngilizce)	Özellik (Türkçe)	Açıklama
Usefulness	Fayda	Teknolojinin sağladığı fayda
Learnability	Öğrenme yeteneği	Yeni kullanıcıların teknolojiyle efektif bir şekilde etkileşime geçebilmesi
Ease of use	Kullanım kolaylığı	Teknolojinin kullanımının kolay olması
Ease of understanding	Anlama kolaylığı	Teknolojinin anlaşılır olması
Fun	Eğlenceli	Teknoloji ile etkileşimin kullanıcıya eğlenceli gelmesi
Likeability	Hoşlanabilirlik	Teknoloji ile etkileşimin kullanıcının hoşuna gitmesi
Enjoyment	Zevk	Teknoloji ile etkileşimin kullanıcıya zevkli gelmesi

Table B.3 İş Tarafı Özelliklerinin Tanımları

Özellik (İngilizce)	Özellik (Türkçe)	Açıklama
Task-technology fit	İş-teknoloji uyumu	Teknolojinin yapılan işe uygun olması
Task characteristics	İş karakteristikleri	Kullanıcının işinin özellikler; kolay-zor, teknik-teknik olmayan, riskli-risksiz gibi
Near-long term consequences	Yakın-uzak dönem sonuçlar	Teknolojiyi kullanmanın yakın ya da uzun sürede doğuracağı sonuçlar

Table B.4 Bilgi İçeriği Tarafı Özelliklerinin Tanımları

Özellik (İngilizce)	Özellik (Türkçe)	Açıklama
Amount of information	Bilginin miktarı	Teknolojinin sunduğu bilgi miktarı
Data quality	Veri kalitesi	Teknolojinin sunduğu verinin tam, zamanlı, doğru, güvenilir,güncel, kesin olması gibi
Ease of finding information	Bilgiyi bulma kolaylığı	Teknolojiyi kullanırken istenilen bilgiye ulaşmanın kolaylığı

Table B.5 Sosyal Taraf Özelliklerinin Tanımları

Özellik (İngilizce)	Özellik (Türkçe)	Açıklama
System context	Sistem ortamı	Teknolojinin kullanıldığı ortam, organizasyonun kültürü gibi
Organizational culture	Organizasyon kültürü	Teknolojinin kullanıldığı organizasyonun kültürünü; organizasyonun yeniliklere açık bir organizasyon olması gibi
Subjective norm	Öznel normlar	Kullanıcının etrafındaki insanların teknoloji ile ilgili düşünceleri veya kullanıcının etrafındaki insanların o teknolojiyi kullanıyor olması gibi
Management support	Yönetimin desteği	Teknolojiyi kullanacak organizasyonun yönetiminin desteği
Facilitating conditions	Destekleyici durumlar	Kullanıcının teknoloji ile etkileşime verilen destek; kullanıcıya arkadaşının teknolojiyi anlatması, öğretmesi gibi
User characteristics & mental and emotional state	Kullanıcı karakteristikleri ve zihinsel ve duygusal durumlar	Kullanıcının alışkanlıkları, dikkatli olması, gönüllü olması gibi
User habits	Kullanıcı alışkanlıkları	Kullanıcının alışkanlıkları; kullanıcının çalışırken müzik dinlemeyi sevmesi gibi
Self-efficacy	Kişisel yeterlilik	Kullanıcının teknoloji konusunda kendini yeterli ve etkin görmesi
Cognitive style	Zihinsel stil	Kullanıcının düşünürken, bilgiyi algılarken, hatırlarken, herhangi bir problemi çözerken kullandığı zihinsel stil
Anxiety	Kaygı	Kullanıcının kaygılı bir karakteri olması
Intellectual capacity	Zihinsel kapasite	Kullanıcının zihinsel yetenekleri
Optimism	İyimserlik	Kullanıcının iyimser bir karakteri olması
Annoyance	Sinirlilik	Kullanıcının sinirli bir karakteri olması
Involvement	İlgililik	Kullanıcının teknolojinin benimsenmesi sırasında ilgili olması
Attention	Dikkat	Kullanıcının dikkati
Motivation	İsteklendirme	Kullanıcının teknolojiyi kullanmak konusundaki motivasyonu
Voluntariness	Gönüllülük	Kullanıcının teknolojiyi kullanmaya gönüllü olması
Control	Kontrollülük	Kullanıcının kendini teknolojiye hakim hissetmesi
Sense of distance	Uzaklık hissi	Kullanıcının teknolojiye kendini uzak hissetmesi
Social compatibility	Sosyal uyumluluk	Kullanıcının söz konusu teknolojiyi sosyal açıdan benimsemesi

APPENDIX C

Predefined Questions of In-depth Interviews Study

1. What do you do in a day mostly?
2. How long have you been using this?
3. Why do you use this?
4. Did you know your needs before using this? Before that, how did you meet your needs?
5. Is there any alternative for it?
6. What are the cons and pros for the alternative?
7. How do you feel while using it?
8. Are you experiencing any problems during the usage?
9. Is there anything that you think should be more?
10. What comes into your mind for “adaptive user interfaces”?
11. What does “using screens easily” mean for you?
12. Is there anything for you to add?

APPENDIX D

Derinlemesine Görüşmeler Çalışmasının Önceden Tanımlanmış Soruları

1. Günün en büyük kısmında ne yapıyorsunuz?
2. Bunu ne zamandır kullanıyorsunuz?
3. Neden bunu kullanıyorsunuz?
4. Bunu kullanmadan önce de buna ihtiyacınız olduğunu biliyor muydunuz? Bunu kullanmadan önce bu ihtiyacınızı nasıl gideriyordunuz?
5. Buna alternatif ne var sizce?
6. Alternatifinde bulduğunuz daha iyi ya da daha kötü özellikler nelerdir?
7. Bunu kullanırken nasıl hissediyorsunuz?
8. Kullandığınız sırada ne gibi problemlerle karşılaşıyorsunuz?
9. Bunu eklemek istediğiniz bir özellik var mı?
10. Uyumlu arayüzler dendiğinde aklınıza ne geliyor?
11. Sizce ekranların kolay kullanıyor olması ne demek?
12. Eklemek istediğiniz bir şey var mı?

APPENDIX E

Brainstorming Session Study Documents

E-Mails of Brainstorming Session Study

Hello,

First, let me tell you about my appreciation for your attendance.

Date and location for the brainstorming session are explained below. Early coming will let us start on time.

Location: Boğaziçi University-Hisar Campus. Since, you all know the location of the University; I am sending only the Hisar Campus map.
Date: June 7, 2007 Saturday
Time: 2 pm
Duration: 3 hours

Since entrance to the building on the weekends is permitted only through magnetic cards holders, I will have to assist you when you arrive at the building.

Finally, I am presenting you with some documents, which explain about the subject of the study.

In advance, I thank you all for your efforts and contributions.
See you on the weekend
Çağla Özen Şeneler

Research Assistant

Boğaziçi University
Department of Management Information Systems
Hisar Campus, 34342, Bebek, Istanbul / Turkey
Tel: +90 212 359 6933
Fax: +90 212 287 3297
E-mail: cagla.ozen@boun.edu.tr
****

Hello,

Let me remind you of the session of brainstorming, which will be held on the campus tomorrow.

Location: Boğaziçi University-Hisar Campus
Date: June 7, 2007 Saturday
Time: 2 pm
Duration: 3 hours

See you on the weekend
Çağla Özen Şeneler

Research Assistant

Boğaziçi University
Department of Management Information Systems
Hisar Campus, 34342, Bebek, Istanbul / Turkey
Tel: +90 212 359 6933
Fax: +90 212 287 3297
E-mail: cagla.ozen@boun.edu.tr
****

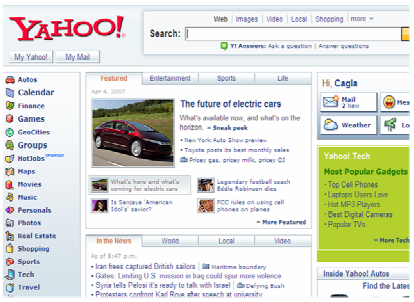

Fig. E.1 Screen shot of Yahoo's homepage

Fig. E.2 Screen shot of Google's homepage

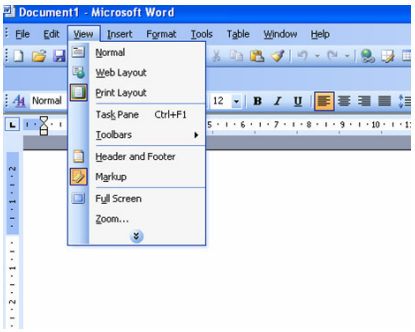

Fig. E.3 Screen shot of Microsoft Office Word's adaptive dynamic menu

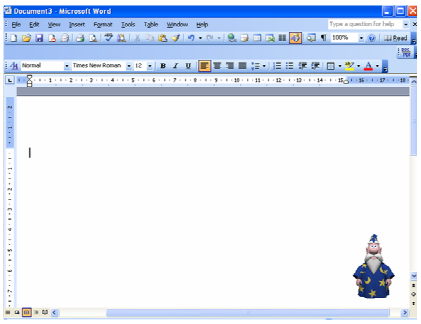

Fig. E.4 Screen shot of Microsoft Office Word's interface agent

Fig. E.5 Screen shot of Garanti Bank's homepage

Fig. E.6 Screen shot of Habertürk's homepage

New Technology Pictures of Brainstorming Session Study

Photographs are available at “http://www.planetgadget.be/”.

Fig. E.7 Photograph of a roll computer

Fig. E.8 Photograph of a laser ray keyboard

Fig. E.9 Photograph of a bracelet GSM

Fig. E.10 Photograph of a wristband GSM

Fig. E.11 Photograph of a GSM with a receiver

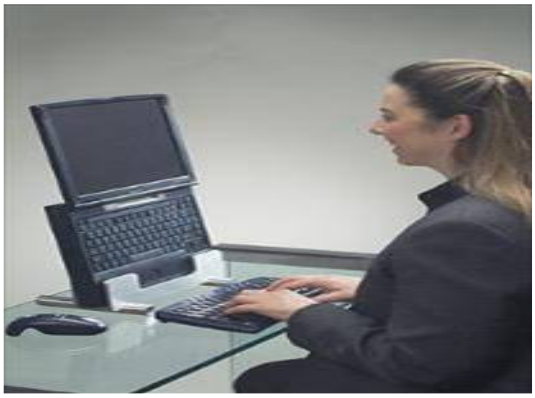

Fig. E.12 Photograph of a footing notebook

Fig. E.13 Photograph of a t-shirt with a digital clock

Fig. E.14 Photograph of an itheather

Photographs of Brainstorming Session Study

Fig. E.15 View of brainstorming session study place-1

Fig. E.16 View of brainstorming session study table plan-1

Fig. E.17 View of brainstorming session study table plan -2

Fig. E.18 View of brainstorming session study place-2

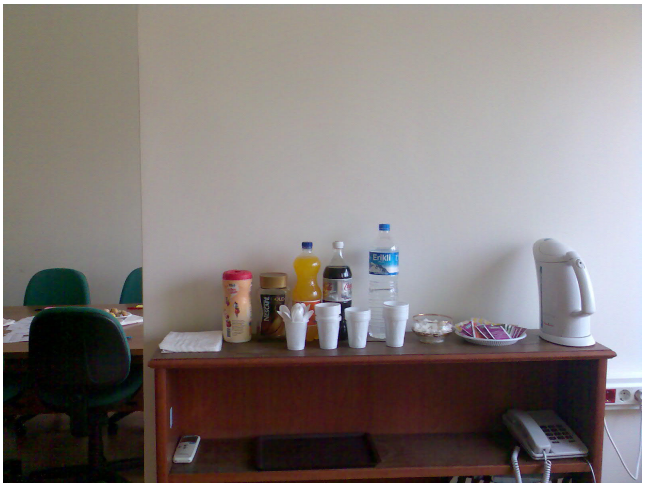

Fig. E.19 View of brainstorming session study drinks plan

APPENDIX F

Expert Focus Group Study Documents

E-Mail of Expert Focus Group Study

Hello,

With leadership of Boğaziçi University Management Information Systems' professor Nuri Başoğlu I am studying on a thesis titled "Human and Computer Interaction Analysis and Prototyping Studies".

Within the context of the thesis, I do expert focus study. This study will be held on the Internet environment. If you like to attend, three questions enclosed should be answered then posted to me.

Subject of the thesis:
Main purpose of the study is to provide a much more efficient human-computer interaction in the light of human-technology interaction.

In advance, thank you all for your contribution
Çağla Özen Şeneler

Research Assistant

Boğaziçi University
Department of Management Information Systems
Hisar Campus, 34342, Bebek, Istanbul / Turkey
Tel: +90 212 359 6933
Fax: +90 212 287 3297
E-mail: cagla.ozen@boun.edu.tr
****

Questions of Expert Focus Group Study

Question # 1

Please prioritize characteristics listed in the following with respect to use a product in a useful and efficient way by grading the characteristics in column D from most important (1) to least (10)

Details of characteristics are given in second and third questions

Characteristic	(1-10)	Additional explanation	Description
Customization			Product ability of creating and designing the interface that meets the user's needs
Interface characteristics			All interface characteristics of the product like visualization, user-friendliness
Audio			The characteristics of technology about the audio like sound management and sound alerts
Interaction characteristics			The characteristics that appear while user interacts with interface like menu types, touch screen
Visualization			The characteristics of interface about visualization like resolution, brightness, color
Non-interface characteristics			The characteristics of product like capability, capacity or price
Task			Characteristics about the task task-technology relevancy
Information content			All characteristics about the content of the technology such as the amount of the information, data quality
System context			Context that the technology is being used, like organizational culture
User characteristics-mental and emotional states			Habits of user, like user attention, user motivation

Question # 2

0 item selected

Please make an “x” mark in the proper box for the most important 8 characteristics that are listed in the following in order to use a product in a useful and efficient way.

Characteristic	x	Additional explanation	Description
Customization			Product ability of creating and designing the interface that meets the user's needs
Audio			The characteristics of technology about the audio like sound management and sound alerts
Audio cue			Audio cues at the interface like giving sound alerts when the message comes to the screen
Speech synthesis			The interface has the ability of creating speech signs which is vocalizing from written text like ability of reading e-mails to user by the interface
Speech to text conversion			The interface ability of understanding speech signs and translating these to text
Voice activated system			Having the ability of interface to be activated with voice signals
Interaction characteristics			The characteristics that appear while user interacts with interface like menu types, touch screen
Menu type			Menu types of interface like icon menu type or text menu type
Panes			Interface ability of using with panes like using "folders", "contacts", "preview" panes of Microsoft Outlook
Scroll mechanism			Using scroll mechanism at the interface; moving up and down with scroll mechanism at the interface
Tabs			Interface ability of using more then one tabs at interface like using tabs at Windows Explorer 7.0
Cursor type			Mouse cursor's symbol like arrow shape, plus sign
Touch screen			Using the interface by touching
Virtual display			Using the interface with virtual display like using phone keys as a keyboard by reflecting phone keys to different surfaces
Flyover			Like reading the whole news when getting the cursor on the connection at internet news pages
User-friendliness			Using the interface easily without past experience
User guidance			The interface that has guidance characteristics
System help			Interface has the help menu
Navigation			Having the logical flow of navigation at interface like having connected processes with file at file menu
Undo			Having the ability of undo action which provides to correct mistakes while using interface
Recognition			Recognition of user by interface
Adaptive behavior			Interface's ability to learn a user
Autonomy			Interfaces' ability of making independent decisions
Speed to result			Finding the result quickly like finding result at the first page when making search at Google
Visualization			The characteristics of interface about visualization like resolution, brightness, color
Language			Language of interface, like be Turkish or English
Terminology			Terms and jargons used at interface
Color			Colors used at interface
Aesthetics			Feel and display aesthetics given by interface, like be colors harmonious
Resolution			Resolution used at interface, like 800*600 pixel

Characteristic	x	Additional explanation	Description
Visual cue			Visual cues that appears while using interface, like appearing the size of folder when getting the cursor on the folder
Font size			Font size used at interface, like 10p
Font type			Font type used at interface, like Arial, Times New Roman
Contrast			Using bright and dark divisions at interface
Fidelity			Interface be clear and brilliant
Line length			Line length at interface; like be 100 lines or 1000 lines
Column width			Column width using for texts at interface
Symmetry			The ability of interface being symmetric
Similarity			Like buttons at different interfaces at the system have same functions at same places
Viewpoint			Like viewing road from top-view or inside of car in a car racing game
Zooming			Gradual image scaling operation, like viewing place closer by clicking the cursor more
Background			Like using picture and color at background of interface
Images			Using electronic projections of scanned document at interface
Symbols			Using agreed projections of concepts at interface
Memory load			Not giving memory load to user while using the interface
Content density			Interface to be crowded or plain
Distinctiveness			The characteristics of product like capability, capacity or price
Non-interface characteristics			The characteristics of product like capability, capacity or price
Capability			The characteristics like capacity, flexibility of the system
Responsiveness			The ability of the product to answering the user input without delay
Capacity			The abilities and capacity of the product
Speed			The product be functioning speedy
Multifunctional			The product be multifunctional, like listening to music and making a call at the same time with a mobile phone
Redundancy			Product ability of doing one operation in different ways, like recording a file in several ways
Accessibility			The product be accessible by users in frame of determined rules
Flexibility			Having the ability of meeting all users' wants
Scalability			The product be continue to functionalize at upper or lower platforms in terms of speed and capacity; like the product be functioning without problems when increasing the number of users from 100 to 1000
Reliability			The ability of product of making operations under given conditions, like the system be operating without collapsing
Complexity			The degree of difficulties about understanding and using the product and its components by user
Personalization			The product ability to take a new shape after perceiving the user
Price			The cost of the technology
Brand			The brand of the technology
Functionality			The facilities providing by product to user
Integration			The ability of the product to operate without problems at all operation systems (Windows, Linux)
Relevance			The characteristics of the product be relevant to expectations of user

Characteristic	x	Additional explanation	Description
Maintenance			The service which contains necessary maintenance in order to operate more productive and to continue its operation

Question # 3

0 item selected

Please make an “x” mark in the proper box for the most important 4 characteristics that are listed in the following in order to use a product in a useful and efficient way.

Characteristic	x	Additional explanation	Description
Task			
Task-technology fit			Technology be fit to doing task
Task characteristics			Characteristics of the task like technical-no technical, risky - not risky, easy- hard
Near-long term consequences			The results stem from using technology at near or long period
Information content			All characteristics about the content of the technology such as the amount of the information, data quality
Amount of information			The amount of information presented by technology
Data quality			Like presenting complete, timely, accurate, reliable, current, precise data by technology
Ease of finding information			Ease of finding information when using the technology
System context			Context that the technology is being used, like organizational culture
Organizational culture			Organization culture that technology is being used like innovative organization
Subjective norm			People's idea about technology around the user or using technology by these people's suggestions
Management support			Support of management of the organization that will use the technology
Facilitating conditions			The support given to user while interacting with technology, like learning the technology from a friend
User characteristics, mental and emotional states			Characteristics of user, like user attention, user motivation
User habits			Habits of user, like loving listening to music while working
Self-efficacy			User perceive himself/herself as sufficient and effective about the technology
Cognitive style			Cognitive style of user when thinking, perceiving information, reminding or solving a problem
Anxiety			Having anxious user character
Intellectual capacity			Intellectual abilities of user
Optimism			Having an optimistic user character
Annoyance			Having an anger user character
Involvement			Involvement of user while adopting technology
Attention			Attention of user
Motivation			The motivation of user about using technology
Voluntariness			The willingness of user to use technology
Control			User has a sense of control to the technology

Characteristic	x	Additional explanation	Description
Sense of distance			Sense of distance of user to technology
Social compatibility			User's technology adoption by social view
Intermediary			Appearing characteristics and provided benefits when user interacts with the product
Learnability			Technology ability of providing new users an effective interaction
Ease of understanding			User use technology easily during interaction
Fun			User has fun during interaction
Likeability			User likes technology during interaction
Enjoyment			User enjoys technology during interaction

APPENDIX G

Experimental Study Documents

E-Mail of Experimental Study

Hello,

With the leadership of Boğaziçi University Management Information Systems professor Nuri Başoğlu I am studying on a thesis titled "Human and Computer Interaction Analysis and Prototyping Studies".

Within the context of the thesis, there will be an experimental study. This study will be held on the Internet environment.

If you like to be in the study, you have to visit the site "www.mis.boun.edu.tr/prototype/index.aspx" and then send me your feedbacks.

Note: Web site is compatible with Internet Explorer.

In advance, thank you all for your contribution
Çağla Özen Şeneler

Research Assistant

Boğaziçi University
Department of Management Information Systems
Hisar Campus, 34342, Bebek, Istanbul / Turkey
Tel: +90 212 359 6933
Fax: +90 212 287 3297
E-mail: cagla.ozen@boun.edu.tr
****

Main Screens of Experimental Study

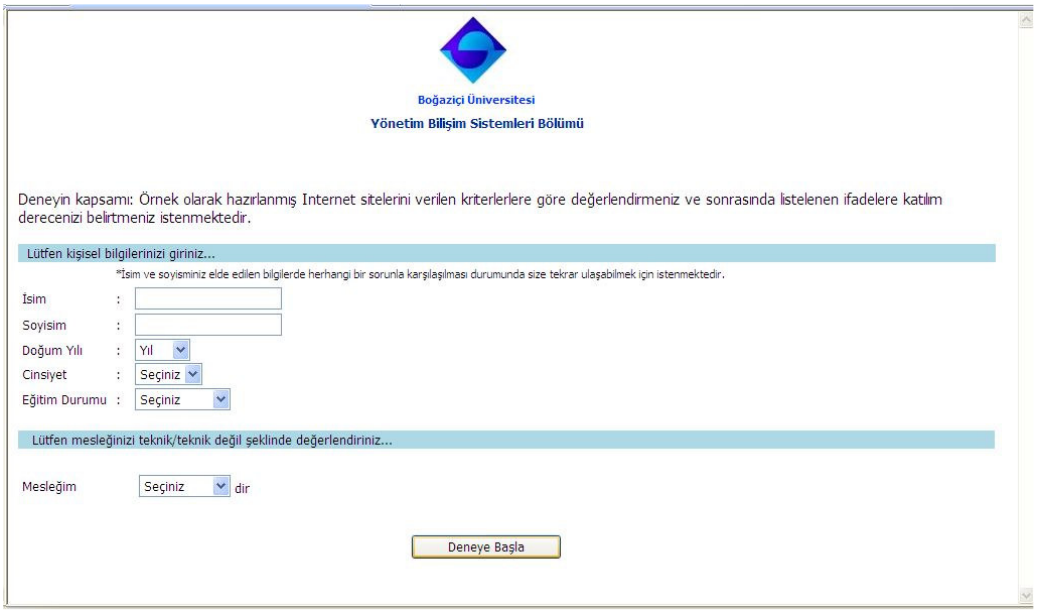

Fig. G.1 Experimental study's first main screen

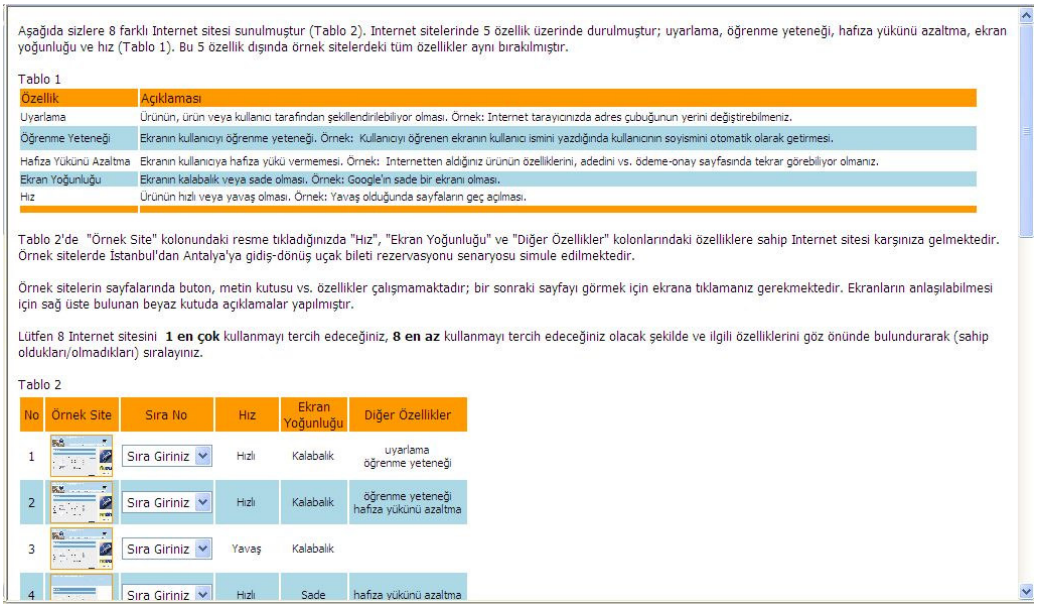

Fig. G.2 Experimental study's second main screen

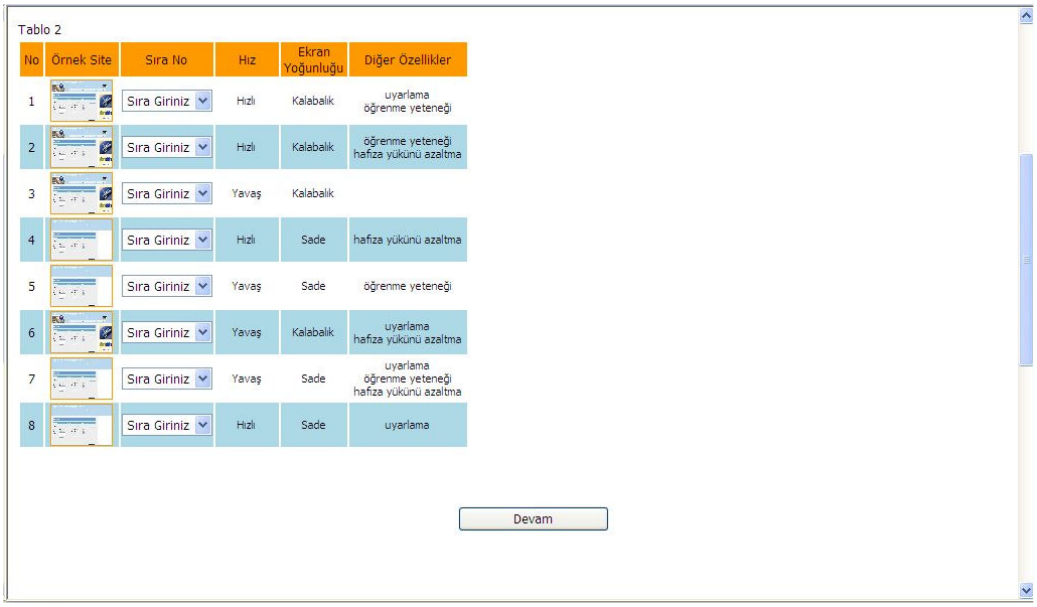

Fig. G.3 Experimental study's second main screen (scrolled down)

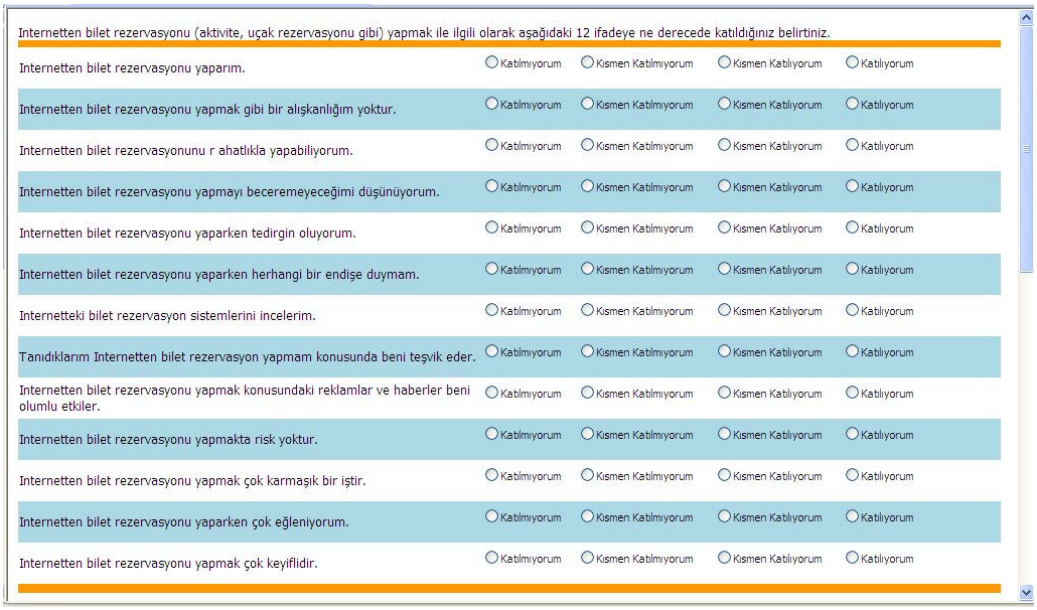

Fig. G.4 Experimental study's third main screen

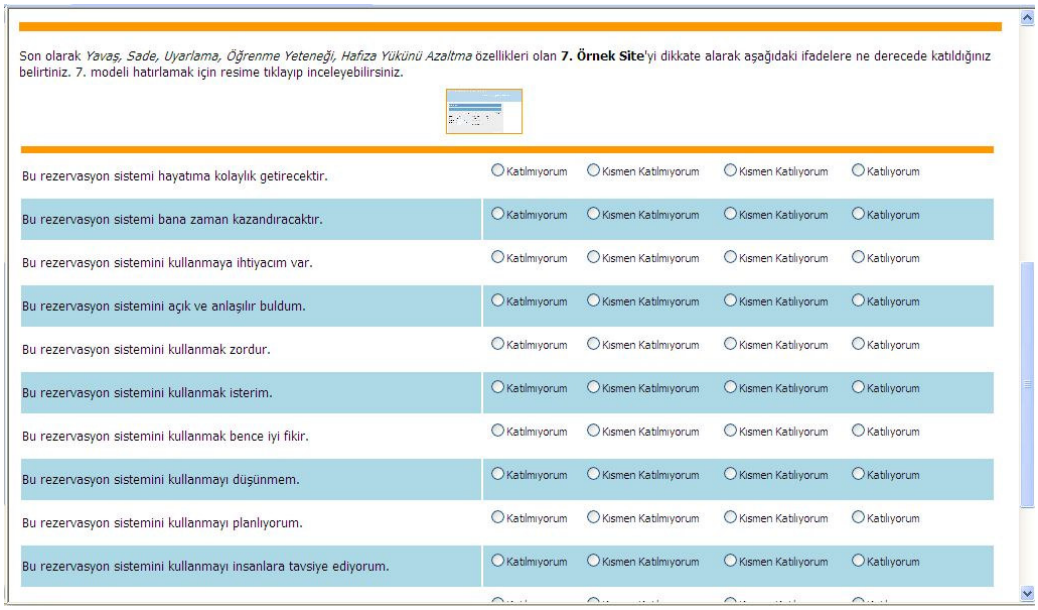

Fig. G.5 Experimental study's third main screen (scrolled down)

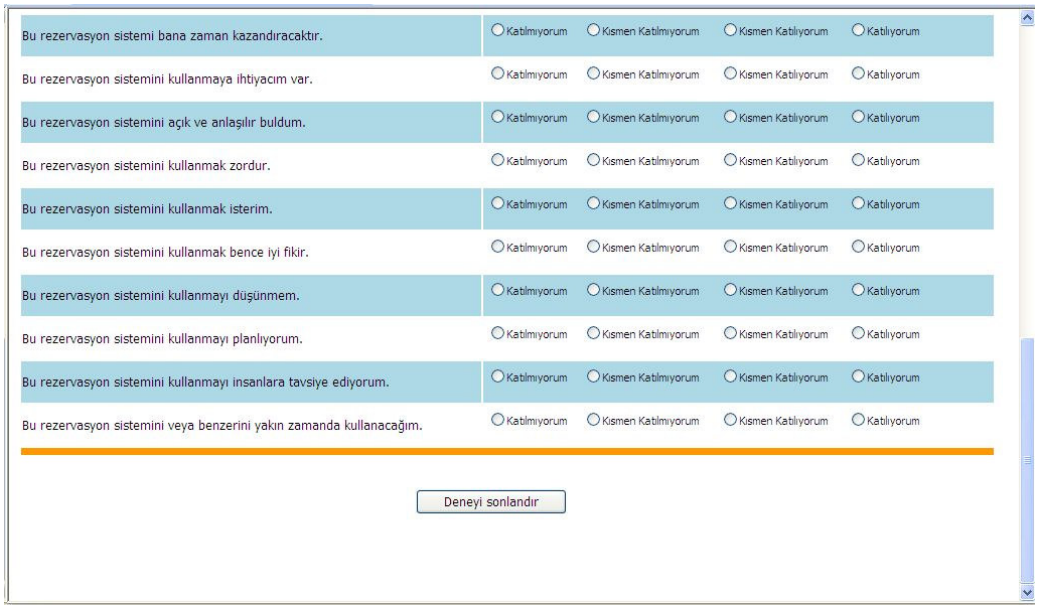

Fig. G.6 Experimental study's third main screen (scrolled down)

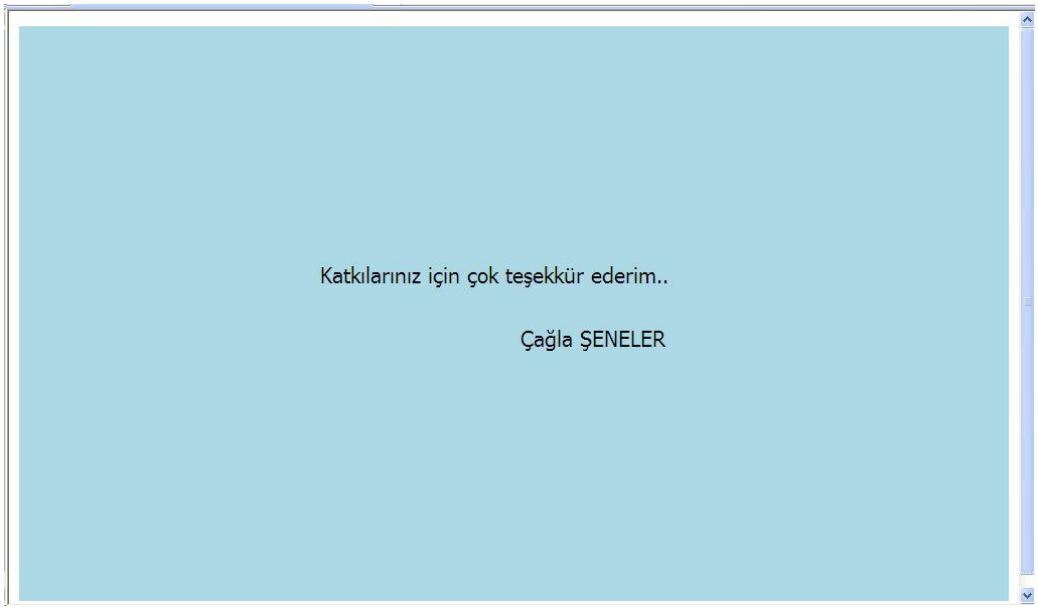

Fig. G.7 Experimental study's fourth main screen

Screens of Experimental Study's Prototypes

Only all screens of seventh prototype and second screen of first prototype is included. In seventh prototype, customization, adaptive behavior, minimal memory load, low content density and low-speed characteristics were adapted and can be seen in the following section. In addition, second screen of first prototype is included as an example of high-density screen.

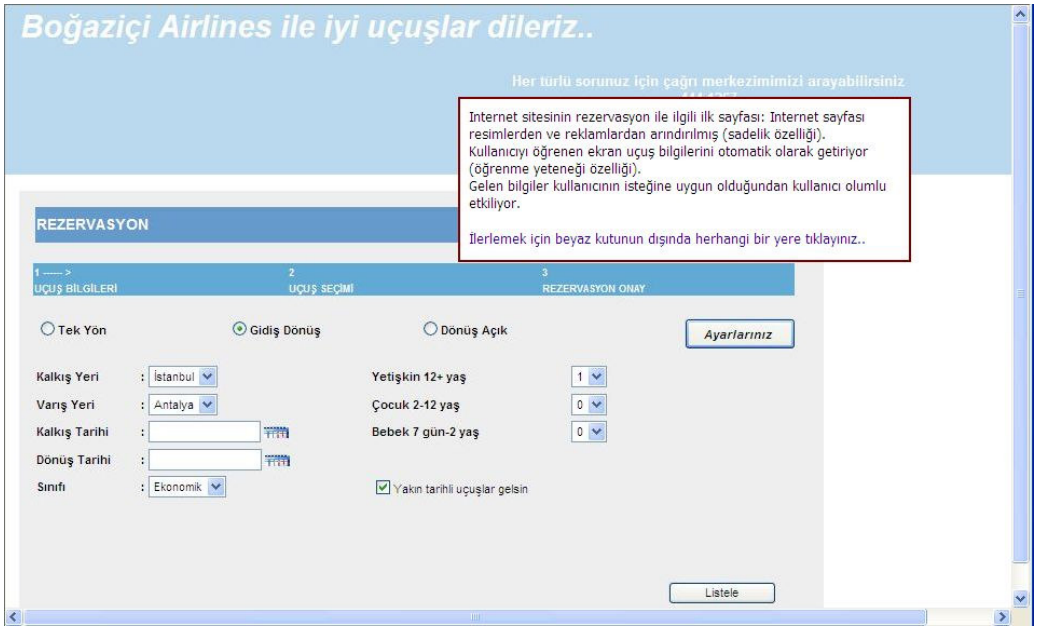

Fig. G.8 First screen of prototype # 7

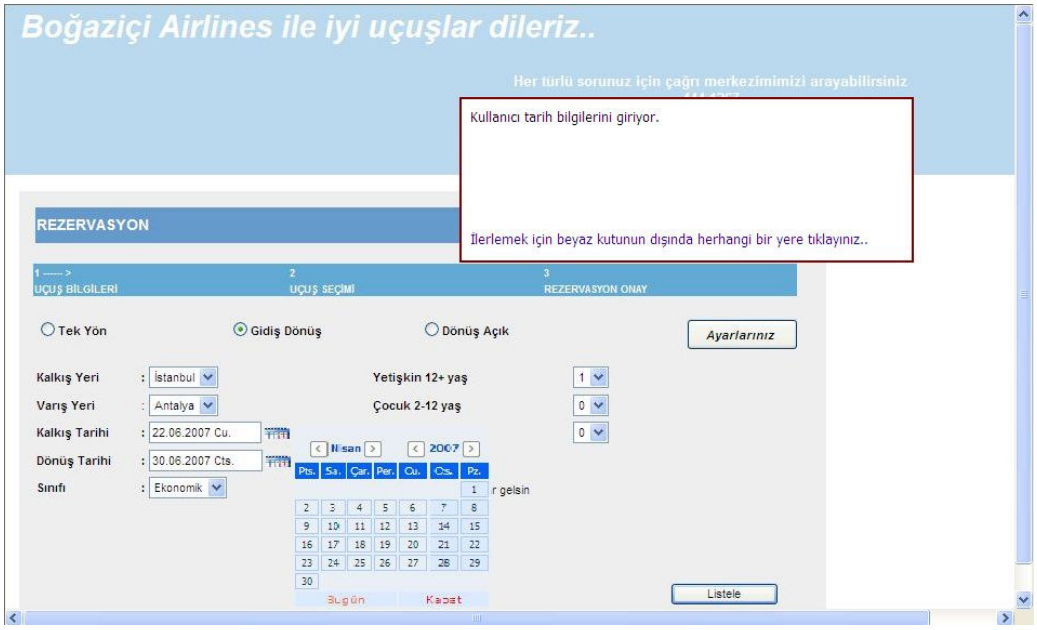

Fig. G.9 Second screen of prototype # 7

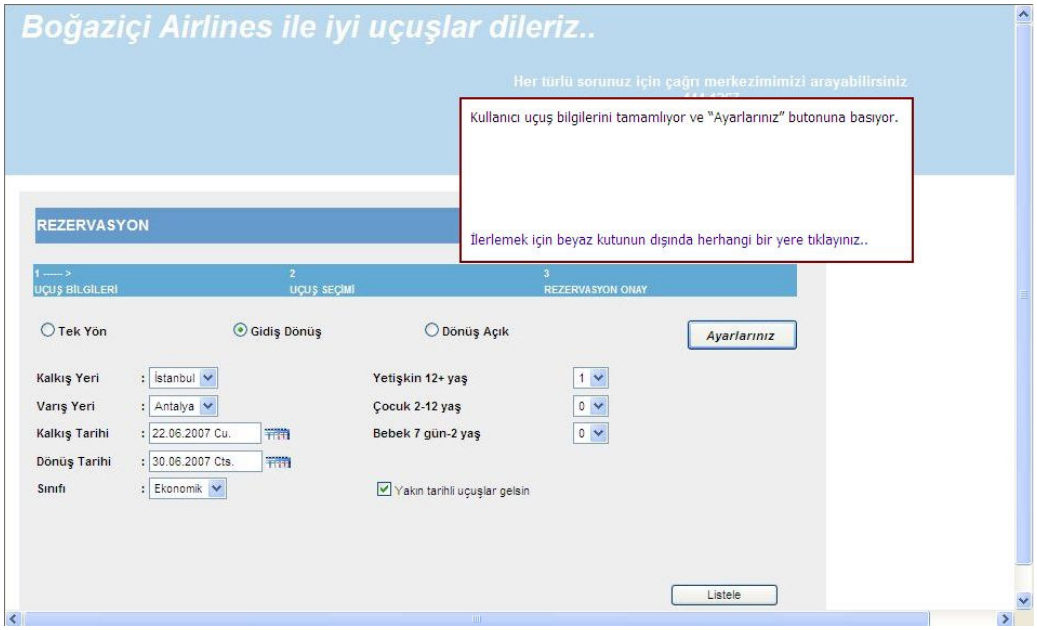

Fig. G.10 Third screen of prototype # 7

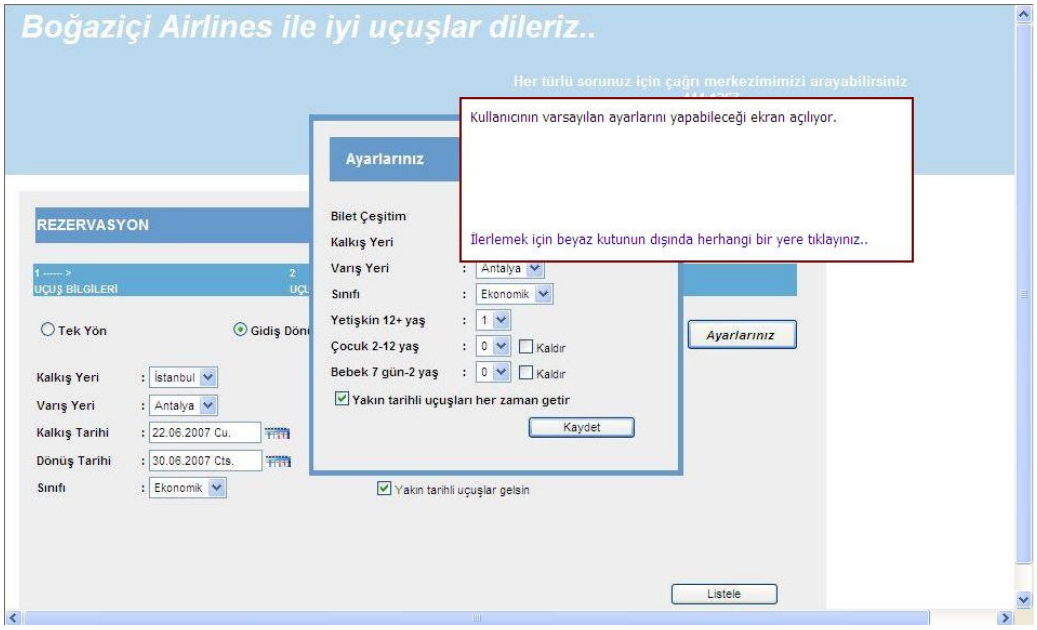

Fig. G.11 Fourth screen of prototype # 7

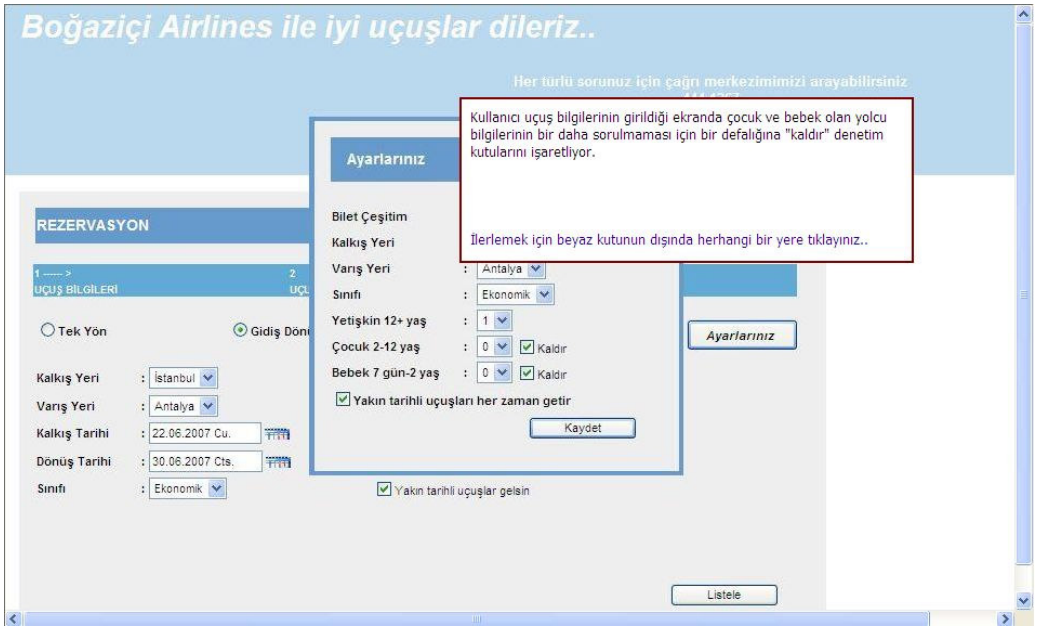

Fig. G.12 Fifth screen of prototype # 7

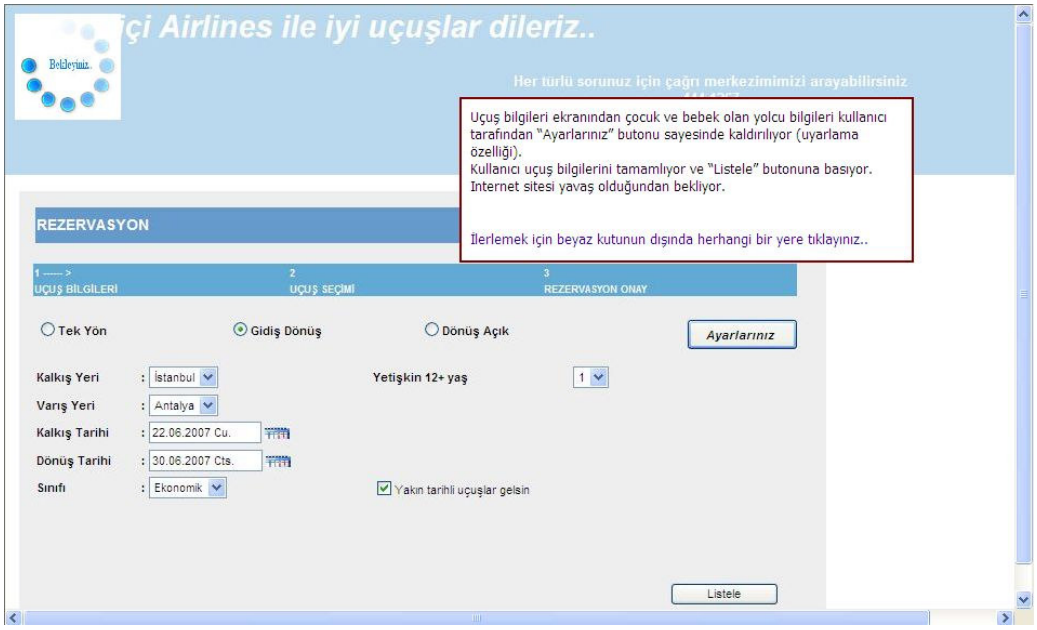

Fig. G.13 Sixth screen of prototype # 7

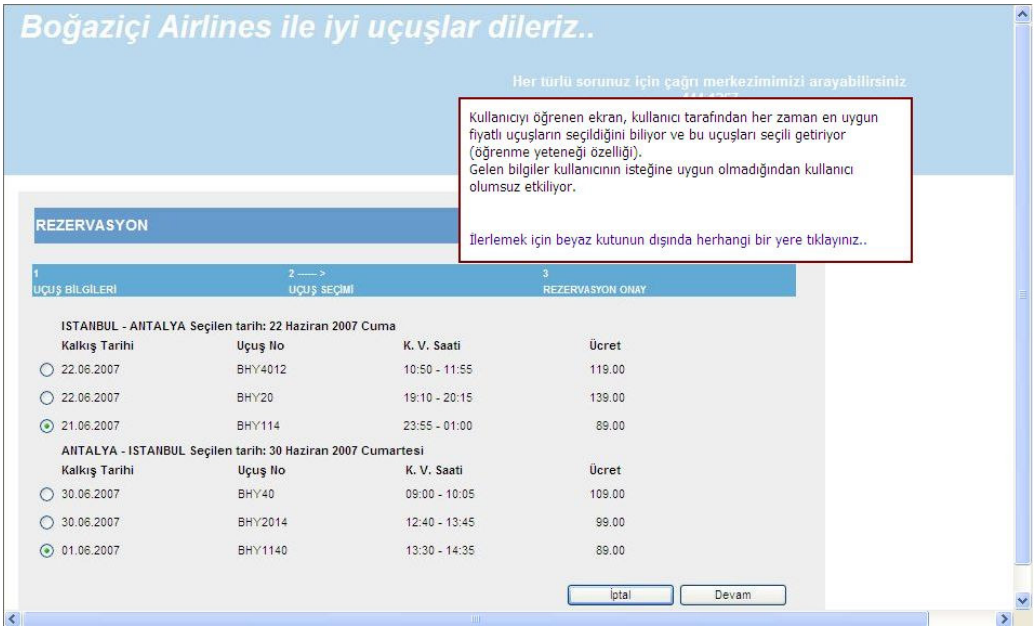

Fig. G.14 Seventh screen of prototype # 7

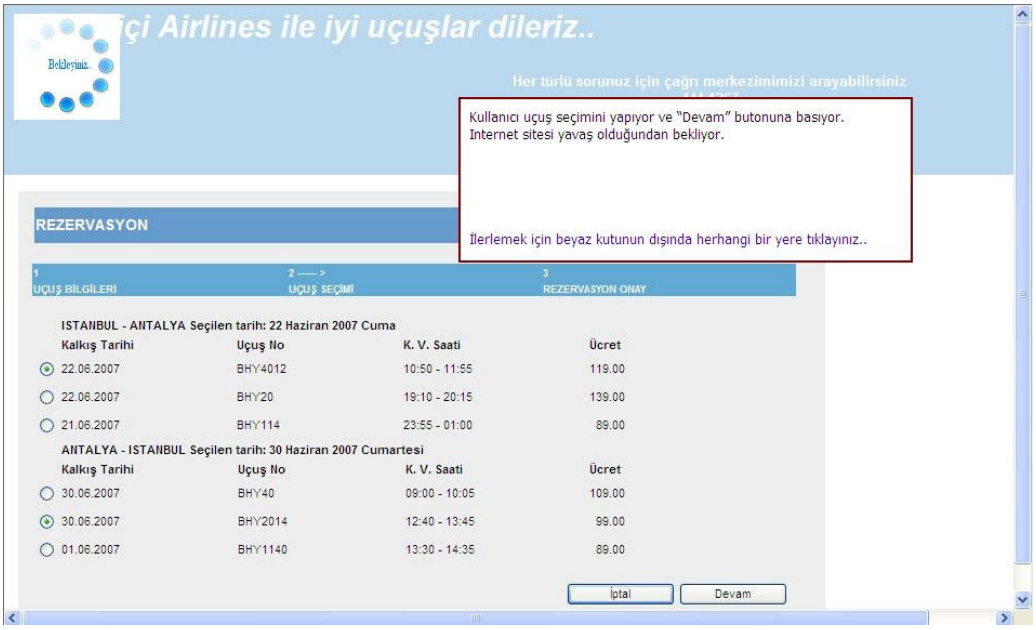

Fig. G.15 Eighth screen of prototype # 7

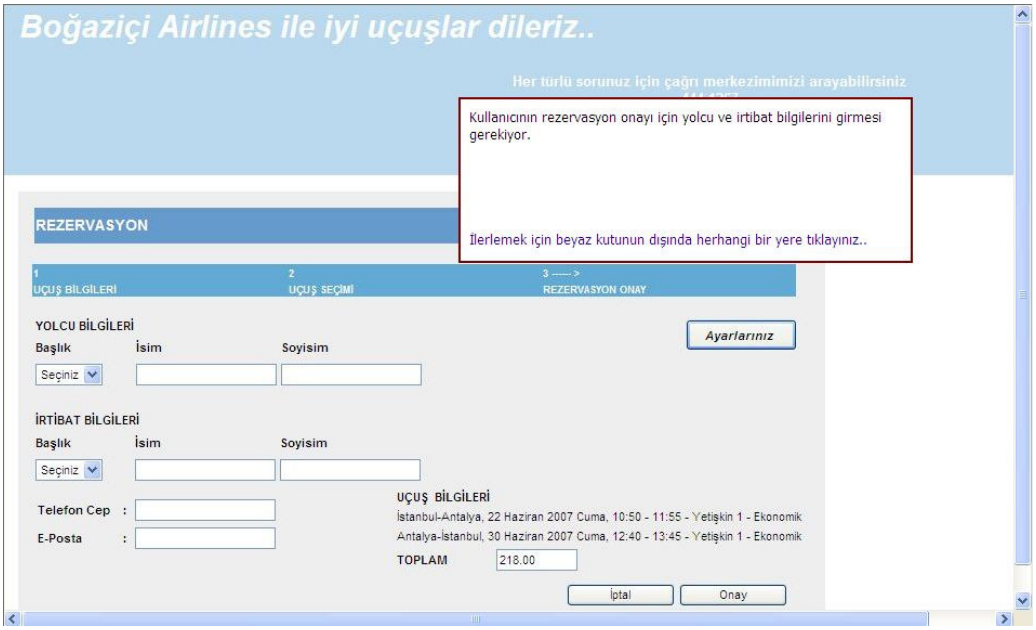

Fig. G.16 Ninth screen of prototype # 7

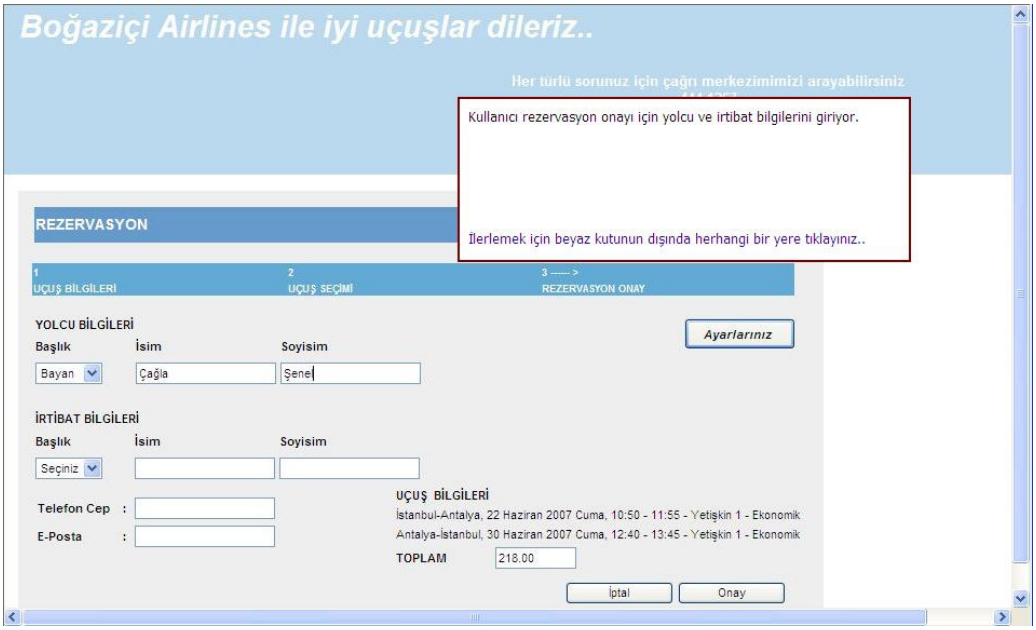

Fig. G.17 Tenth screen of prototype # 7

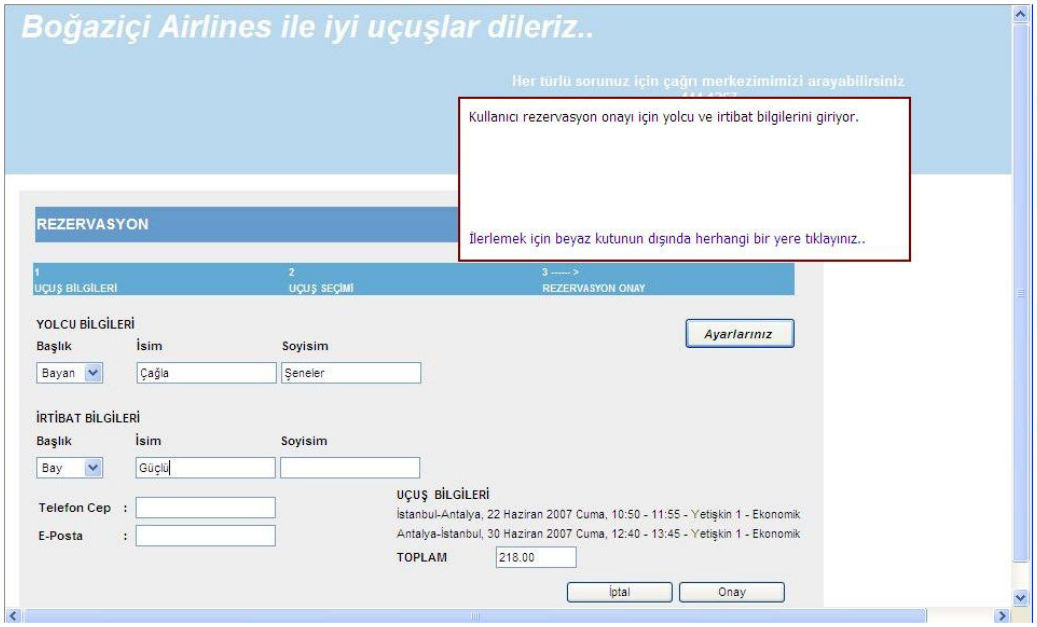

Fig. G.18 Eleventh screen of prototype # 7

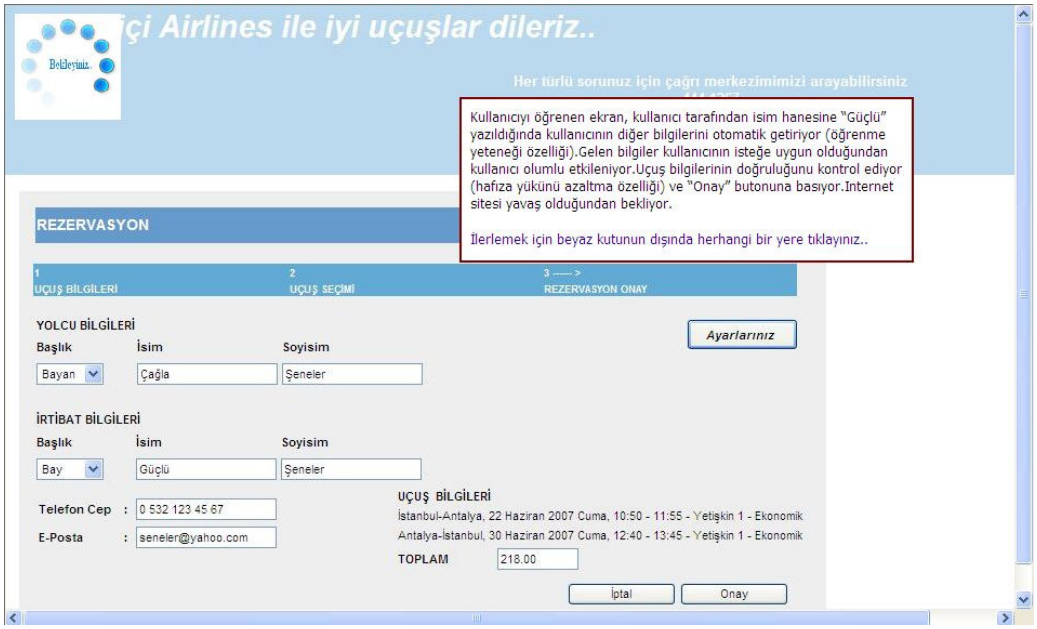

Fig. G.19 Twelfth screen of prototype # 7

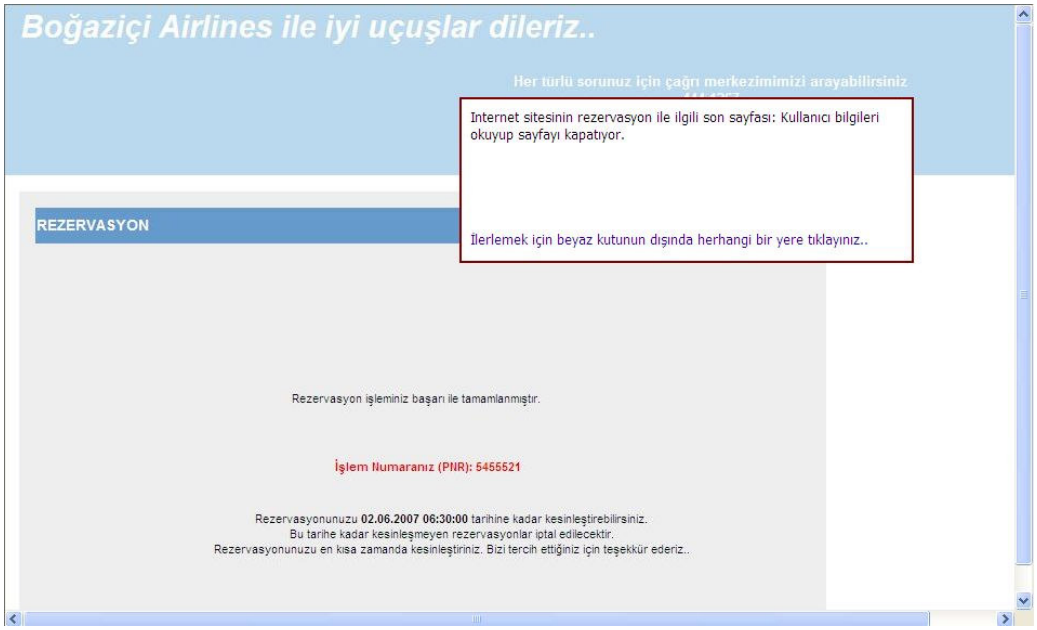

Fig. G.20 Thirteenth screen of prototype # 7

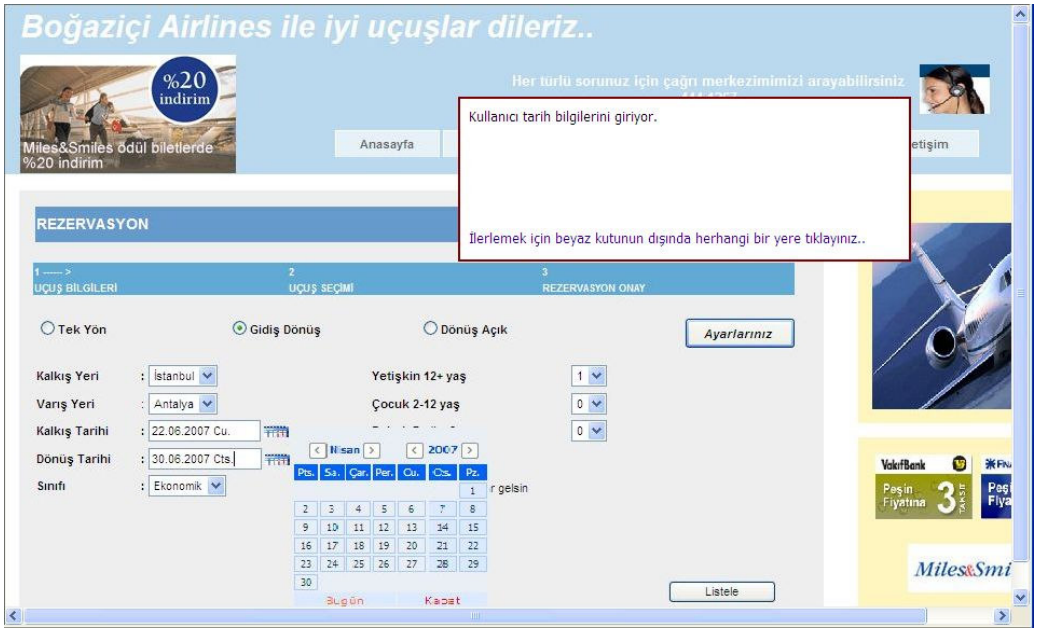

Fig. G.21 Second screen of prototype # 1

Scenarios of Experimental Study's Prototypes

Table G.1 Prototype Scenarios of Experimental Study

Prototype # 1	Prototype # 2	Prototype # 3	Prototype # 4
High-speed High content density Customization Adaptive behavior	High-speed High content density Adaptive behavior Minimal memory load	Low-speed High content density	High-speed Low content density Minimal memory load
Step 1: Web site's reservation page: Flight information is inputted automatically by adaptive behavioral interface that has learned user before (adaptive behavior characteristic). Inputted information is suitable for the user thus, user is positively affected. Step 2: User enters date information. Step 3: User completes flight information and clicks "Your Settings" button. Step 4: The interface where the user can create default settings loads. Step 5: User checks the "remove" checkbox about the child and baby passengers' information for once only in order to be not asked again. Step 6: Child and baby passengers' information is removed by the user from flight information screen through "Your Settings" button (customization characteristic). User clicks "List Flights" button.	Step 1: Web site's reservation page: Flight information is inputted automatically by adaptive behavioral interface that has learned user before (adaptive behavior characteristic). Inputted information is suitable for the user thus, user is positively affected. Step 2: User enters date information. Step 3: User completes flight information and clicks "List Flights" button. Step 4: The Flights are checked automatically by adaptive behavioral interface that has learned user preferences before as "the user prefers fair prices" (adaptive behavior characteristic). Inputted information is not suitable for the user thus user is negatively affected. Step 5: User makes flight choice and clicks "Continue" button. Step 6: For the reservation approval user has to enter passenger and contact information.	Step 1: Web site's reservation page: Flight information has to be entered. Step 2: User completes flight information and clicks "List Flights" button. User waits because of website's response delay. Step 3: Flights are listed upon the information that user has entered. User makes flight choice and clicks "Continue" button. User waits because of website's response delay. Step 4: For the reservation approval user has to enter passenger and contact information. Step 5: User enters passenger and contact information. Step 6: User completes reservation information. Clicks "Approve" button. User waits because of website's response delay. Step 7 (last step): Web sites last page: User reads reservation information and closes the web site's page.	Step 1: Web site's reservation page: Pictures and advertisements are removed from the web site (low content density characteristics). Flight information has to be entered. Step 2: User completes flight information and clicks "List Flights" button. Step 3: Flights are listed upon the information that user has entered. User has to make flight choice. Step 4: User makes flight choice and clicks "Continue" button. Step 5: For the reservation approval user has to enter passenger and contact information. Step 6: User enters passenger and contact information. Step 7: User completes reservation information. User controls flight information correctness (minimal memory load characteristic). Clicks "Approve" button.

Table G.1

Prototype # 1	Prototype # 2	Prototype # 3	Prototype # 4
High-speed High content density Customization Adaptive behavior	High-speed High content density Adaptive behavior Minimal memory load	Low-speed High content density	High-speed Low content density Minimal memory load
Step 7: The Flights are checked automatically by adaptive behavioral interface that has learned user preferences before as “the user prefers fair prices” (adaptive behavior characteristic). Inputted information is not suitable for the user thus, user is negatively affected. Step 8: User makes flight choice and clicks “Continue” button. Step 9: For the reservation approval user has to enter passenger and contact information. Step 10: User enters passenger and contact information. Step 11 : When user entered his name into name field, adaptive behavioral interface that has learned the user before, inputs the other information for the user (adaptive behavior characteristic). Inputted information is suitable for the user thus user is positively affected. User clicks “Approve” button. Step 12 (last step) : Web sites last page: User reads reservation information and closes the web site’s page.	Step 7: User enters passenger and contact information. Step 8 : When user entered his name into name field, adaptive behavioral interface that has learned the user before, inputs the other information for the user (adaptive behavior characteristic). Inputted information is suitable for the user thus, user is positively affected. User controls flight information correctness (minimal memory load characteristic). User clicks “Approve” button. Step 9 (last step): Web sites last page: User reads reservation information and closes the web site’s page.		Steps 8 (last step): Web sites last page: User reads reservation information and closes the web site’s page.

Table G.1

Prototype # 5	Prototype # 6	Prototype # 7	Prototype # 8
Low-speed Low content density Adaptive behavior	Low-speed High content density Customization Minimal memory load	Low-speed Low content density Customization Adaptive behavior Minimal memory load	High-speed Low content density Customization
Step 1: Web site's reservation page: Pictures and advertisements are removed from the web site (low content density characteristics). Flight information is inputted automatically by adaptive behavioral interface that has learned user before (adaptive behavior characteristic). Inputted information is suitable for the user thus, user is positively affected. Step 2: User enters date information. Step 3: User completes flight information and clicks "List Flights" button. User waits because of website's response delay. Step 4: The Flights are checked automatically by adaptive behavioral interface that has learned user preferences before as "the user prefers fair prices" (adaptive behavior characteristic). Inputted information is not suitable for the user thus user is negatively affected. Step 5: User makes flight choice and clicks "Continue" button. User waits because of website's response delay. Step 6: For the reservation approval user has to enter passenger and contact information.	Step 1: Web site's reservation page: Flight information has to be entered. Step 2: User enters flight information. Step 3: User completes flight information and clicks "Your Settings" button. Step 4: The interface where the user can create default settings loads. Step 5: User checks the "remove" checkbox about the child and baby passengers' information for once only in order to be not asked again. Step 6: Child and baby passengers' information is removed by the user from flight information screen through "Your Settings" button (customization characteristic). User clicks "List Flights" button. User waits because of website's response delay. Step 7: Flights are listed upon the information that user has entered. User has to make flight choice.	Step 1: Web site's reservation page: Pictures and advertisements are removed from the web site (low content density characteristics). Flight information is inputted automatically by adaptive behavioral interface that has learned user before (adaptive behavior characteristic). Inputted information is suitable for the user thus, user is positively affected. Step 2: User enters date information. Step 3: User completes flight information and clicks "Your Settings" button. Step 4: The interface where the user can create default settings loads. Step 5: User checks the "remove" checkbox about the child and baby passengers' information for once only in order to be not asked again. Step 6: Child and baby passengers' information is removed by the user from flight information screen through "Your Settings" button (customization characteristic). User clicks "List Flights" button. User waits because of website's response delay. Step 7: The Flights are checked automatically by	Step 1: Web site's reservation page: Pictures and advertisements are removed from the web site (low content density characteristics). Flight information has to be entered. Step 2: User enters flight information. Step 3: User completes flight information and clicks "Your Settings" button. Step 4: The interface where the user can create default settings loads. Step 5: User checks the "remove" checkbox about the child and baby passengers' information for once only in order to be not asked again. Step 6: Child and baby passengers' information is removed by the user from flight information screen through "Your Settings" button (customization characteristic). User clicks "List Flights" button. Step 7: Flights are listed upon the information that user has entered. User has to make flight choice. Step 8: User makes flight choice and clicks "Continue" button.

Table G.1

Prototype # 5	Prototype # 6	Prototype # 7	Prototype # 8
Low-speed Low content density Adaptive behavior	Low-speed High content density Customization Minimal memory load	Low-speed Low content density Customization Adaptive behavior Minimal memory load	High-speed Low content density Customization
Step 7: User enters passenger and contact information. Step 8 : When user entered his name into name field, adaptive behavioral interface that has learned the user before, inputs the other information for the user (adaptive behavior characteristic). Inputted information is suitable for the user thus, user is positively affected. User waits because of website's response delay. Step 9 (last step): Web sites last page: User reads reservation information and closes the web site's page.	Step 8: User makes flight choice and clicks "Continue" button. User waits because of website's response delay. Step 9: For the reservation approval user has to enter passenger and contact information. Step 10: User enters passenger and contact information. Step 11: User completes reservation information. User controls flight information correctness (minimal memory load characteristic). Clicks "Approve" button. User waits because of website's response delay. Step 12 (last step): Web sites last page: User reads reservation information and closes the web site's page.	adaptive behavioral interface that has learned user preferences before as "the user prefers fair prices" (adaptive behavior characteristic). Inputted information is not suitable for the user thus, user is negatively affected. Step 8: User makes flight choice and clicks "Continue" button. User waits because of website's response delay. Step 9: For the reservation approval user has to enter passenger and contact information. Step 10: User enters passenger and contact information. Step 11 : When user entered his name into name field, adaptive behavioral interface that has learned the user before, inputs the other information for the user (adaptive behavior characteristic). Inputted information is suitable for the user thus, user is positively affected. User controls flight information correctness (minimal memory load characteristic). User clicks "Approve" button. User waits because of website's response delay. Step 12 (last step) : Web sites last page: User reads reservation information and closes the web site's page.	Step 9: For the reservation approval user has to enter passenger and contact information. Step 10: User enters passenger and contact information. Step 11: User completes reservation information. Clicks "Approve" button. Step 12 (last step): Web sites last page: User reads reservation information and closes the web site's page.

APPENDIX H

Deneysel Çalışma Anket Soruları

Kullanıcı Alışkanlıkları (User Habits)
- İnternetten bilet rezervasyonu yaparım.
- İnternetten bilet rezervasyonu yapmak gibi bir alışkanlığım yoktur.

Kişisel Yeterlilik (Self-Efficacy)
- İnternetten bilet rezervasyonunu rahatlıkla yapabiliyorum.

Kaygı (Anxiety)
- İnternetten bilet rezervasyonu yaparken tedirgin oluyorum.
- İnternetten bilet rezervasyonu yaparken herhangi bir endişe duymam.

İlgililik (Involvement)
- İnternetteki bilet rezervasyon sistemlerini incelerim.

Riskli-İş Karakteristikleri (Risky- Task Characteristics)
- İnternetten bilet rezervasyonu yapmakta risk yoktur.

Karmaşık-İş Karakteristikleri (Complex- Task Characteristics)
- İnternetten bilet rezervasyonu yapmak çok karmaşık bir iştir.

Eğlenmek (Enjoyment)
- İnternetten bilet rezervasyonu yaparken çok eğleniyorum.
- İnternetten bilet rezervasyonu yapmak çok keyiflidir.

İçsel Etkiler (Internal Influences)
- Tanıdıklarım İnternetten rezervasyon yapmam konusunda beni teşvik eder.

Dışsal Etkiler (External Influences)
- İnternetten bilet rezervasyonu yapmak konusundaki reklâmlar ve haberler beni olumlu etkiler.

Yararlılık (Usefulness)
- Bu rezervasyon sistemini hayatıma kolaylık getirecektir.
- Bu rezervasyon sistemini bana zaman kazandıracaktır.
- Bu rezervasyon sistemini kullanmaya ihtiyacım var.

Kullanım Kolaylığı (Ease of Use)
- Bu rezervasyon sistemini açık ve anlaşılır buldum.
- Bu rezervasyon sistemini kullanmak zordur.

Davranış (Attitude)
- Bu rezervasyon sistemini kullanmak isterim.
- Bu rezervasyon sistemini kullanmak bence iyi fikirdir.
- Bu rezervasyon sistemini kullanmayı düşünmem.

Niyet (Intention)
- Bu rezervasyon sistemini kullanmayı planlıyorum.
- Bu rezervasyon sistemini kullanmayı insanlar tavsiye ediyorum.
- Bu rezervasyon sistemini veya benzerini yakın zamanda kullanacağım.

APPENDIX I

Market Share Calculation of Experimental Study

Table I.1 Calculation of Product's Market Shares

Participant ID	Score 1	Score 2	Score 3	Score 4	Score 5	Score 6	Score 7	Score 8
1	4.75	7.25	0.25	5.75	2.75	4.75	7.25	3.25
2	6	3	1	3	3	6	8	6
3	2.25	0.75	3.25	5.25	4.75	5.75	7.25	6.75
.								
.								
.								
.								
150	6	7	1	3	5	4	8	2
Average scores for each alternative	5.623	6.403	1.870	6.263	3.150	2.963	4.243	5.483
Total of averaged scores	36							

*5.623 / 36 will give the market share for the first product, which is 15.62 %.

Factor Analyses of Experimental Study

Table I.2 Factor Analysis of First Set's Constructs

	Factor*			
Item	1	2	3	4
Risky-task characteristics	0.65			
Complex-task characteristics	0.60			
Involvement		0.53		
Enjoyment1		0.95		
Enjoyment2		0.93		
Self-efficacy			0.76	
User habits1			0.89	
User habits2			0.83	
External influence				0.82
Internal influence				0.77
Anxiety1				-0.08
Anxiety2				-0.06

*Variance explained = 62.79

Table I.3 Factor Analysis of Second Set's Constructs

	Factor*	
Item	1	2
Intention1	0.84	
Attitude2	0.84	
Attitude1	0.82	
Intention2	0.80	
Attitude3	0.78	
Usefulness3	0.76	
Usefulness2	0.76	
Intention3	0.70	
Usefulness1	0.64	
Ease of use2		0.88
Ease of use1		0.80

* Variance explained = 67.82

Table I.4 Factor Analysis of First and Second Set's Constructs

	Factor*				
Item	1	2	3	4	5
Attitude2	0.89				
Attitude1	0.88				
Intention1	0.84				
Attitude3	0.83				
Intention2	0.81				
Usefulness2	0.76				
Usefulness3	0.74				
Usefulness1	0.72				
Intention3	0.69				
Ease of use1	0.61				
Ease of use2	0.52				
Anxiety1	-0.04				
Anxiety2	-0.03				
Risky-task characteristics		0.64			
Complex-task characteristics		0.60			
User habits1			0.89		
User habits2			0.79		
Self-efficacy			0.75		
Enjoyment2				0.94	
Enjoyment1				0.93	
Involvement				0.49	
Internal influence					0.69
External influence					0.58

*Variance explained = 63.51

Table I.5 Factor Analysis of Conjoint Levels

	Factor*				
Item	1	2	3	4	5
Customization absent	0.99				
Customization present	-0.99				
Low-speed		0.99			
High-speed		-0.99			
Minimal memory load absent			1		
Minimal memory load present			1		
Content density low				0.97	
Content density high				-0.97	
Adaptive behavior present					0.97
Adaptive behavior absent					-0.97

*Variance explained = 100

Table I.6 Factor Analysis of Five Conjoint Levels

	Factor*	
Item	1	2
Adaptive behavior present	0.80	
Minimal memory load present	0.36	
High-speed		-0.14
Customization present		0.79
Content density low		0.73

*Variance explained = 55.61

Table I.7 Correlation Matrix of Second Set Constructs

		Usefulness	Ease of use	Attitude	Intention
Usefulness	Pearson Corr.	1.000(**)	0.467(**)	0.709(**)	0.699(**)
	Sig. (2-tailed)	0.000	0.000	0.000	0.000
Ease of use	Pearson Corr.	0.467(**)	1.000(**)	0.521(**)	0.479(**)
	Sig. (2-tailed)	0.000	0.000	0.000	0.000
Attitude	Pearson Corr.	0.709(**)	0.521(**)	1.000(**)	0.779(**)
	Sig. (2-tailed)	0.000	0.000	0.000	0.000
Intention	Pearson Corr.	0.699(**)	0.479(**)	0.779(**)	1.000(**)
	Sig. (2-tailed)	0.000	0.000	0.000	0.000

** Significant at 0.01 level
*Significant at 0.05 level

Table I.8 Correlation Matrix of First Set Constructs with Second Set Constructs

		Usefulness	Ease of use	Attitude	Intention
User habit	Pearson Corr.	0.019	0.047	0.032	0.178(*)
	Sig. (2-tailed)	0.818	0.568	0.695	0.030
Self-efficacy	Pearson Corr.	0.103	0.265(**)	0.174(*)	0.184(*)
	Sig. (2-tailed)	0.212	0.001	0.033	0.024
Anxiety	Pearson Corr.	0.003	-0.010	-0.042	-0.122
	Sig. (2-tailed)	0.971	0.907	0.607	0.136
Internal influence	Pearson Corr.	0.169(*)	-0.002	0.105	0.295(**)
	Sig. (2-tailed)	0.039	0.976	199	0.000
External influence	Pearson Corr.	0.297(**)	0.112	0.266(**)	0.411(**)
	Sig. (2-tailed)	0.000	0.173	0.001	0.000
Risky-task cha.	Pearson Corr.	-0.004	0.113	0.066	0.103
	Sig. (2-tailed)	0.965	0.170	0.422	0.209
Complex-task cha.	Pearson Corr.	-0.060	-0.066	-0.046	0.019
	Sig. (2-tailed)	0.465	0.424	0.579	0.821
Enjoyment	Pearson Corr.	0.091	0.142	0.125	0.168(*)
	Sig. (2-tailed)	0.266	0.082	0.128	0.040
Involvement	Pearson Corr.	0.004	-0.035	-0.024	0.084
	Sig. (2-tailed)	0.963	0.671	0.775	0.305

** Significant at 0.01 level
*Significant at 0.05 level

Correlation Analyses of Experimental Study

Table I.9 Correlation Matrix of First Set Constructs

		User habit	Self-efficacy	Anxiety	Internal influence	External influence	Risky-task cha.	Complex- task cha.	Enjoyment	Involvement
User habit	Pearson Corr.	1.000(**)	0.600(**)	-0.231(**)	0.258(**)	0.090	0.176(*)	0.090	0.078	0.123
	Sig. (2-tailed)	0.000	0.000	0.004	0.001	0.274	0.031	0.274	0.346	0.134
Self-efficacy	Pearson Corr.	0.600(**)	1.000(**)	-0.317(**)	0.137	0.208(*)	0.259(**)	0.226(**)	0.124	0.173(*)
	Sig. (2-tailed)	0.000	0.000	0.000	0.096	0.011	0.001	0.005	0.130	0.034
Anxiety	Pearson Corr.	-0.231(**)	-0.317(**)	1.000(**)	-0.151	-0.157	-0.521(**)	-0.353(**)	-0.205(*)	-0.276(**)
	Sig. (2-tailed)	0.004	0.000	0.000	0.066	0.055	0.000	0.000	0.012	0.001
Internal influence	Pearson Corr.	0.258(**)	0.137	-0.151	1.000(**)	0.417(**)	0.156	0.122	0.188(*)	0.215(**)
	Sig. (2-tailed)	0.001	0.096	.066	0.000	0.000	0.057	0.137	0.021	0.008
External influence	Pearson Corr.	0.090	0.208(*)	-0.157	0.417(**)	1.000(**)	0.100	0.046	0.185(*)	0.171(*)
	Sig. (2-tailed)	0.274	0.011	0.055	0.000	0.000	0.223	0.578	0.024	0.036
Risky-task cha.	Pearson Corr.	0.176(*)	0.259(**)	-0.521(**)	0.156	0.100	1.000(**)	0.169(*)	0.112	0.098
	Sig. (2-tailed)	0.031	0.001	0.000	0.057	0.223	0.000	0.039	0.174	0.233
Complex-task cha.	Pearson Corr.	0.090	0.226(**)	-0.353(**)	0.122	0.046	0.169(*)	1.000(**)	0.021	0.089
	Sig. (2-tailed)	0.274	0.005	0.000	0.137	0.578	0.039	0.000	0.799	0.279
Enjoyment	Pearson Corr.	0.078	0.124	-0.205(*)	0.188(*)	0.185(*)	0.112	0.021	1.000(**)	0.360(**)
	Sig. (2-tailed)	0.346	0.130	0.012	0.021	0.024	0.174	0.799	0.000	0.000
Involvement	Pearson Corr.	0.123	0.173(*)	-0.276(**)	0.215(**)	0.171(*)	0.098	0.089	0.360(**)	1.000(**)
	Sig. (2-tailed)	0.134	0.034	0.001	0.008	0.036	0.233	0.279	0.000	0.000

Descriptive Statistics of Experimental Study

Table I.10 Descriptive Statistics of the Questionnaire Items

Construct	Mean	S.d.	Min	Max
User habits1	3.71	0.72	1	4
User habits2	3.50	0.92	1	4
Anxiety1	1.87	0.98	1	4
Anxiety2	2.00	1.06	1	4
Enjoyment1	2.43	0.96	1	4
Enjoyment2	2.56	0.95	1	4
Usefulness1	3.10	0.87	1	4
Usefulness2	2.94	1.01	1	4
Usefulness3	2.76	0.98	1	4
Ease of use1	3.46	0.77	1	4
Ease of use 2	3.57	0.66	1	4
Attitude1	3.16	0.84	1	4
Attitude2	3.19	0.80	1	4
Attitude3	3.37	0.91	1	4
Intention1	2.95	0.90	1	4
Intention2	2.88	0.91	1	4
Intention3	2.99	0.93	1	4
Self-efficacy	3.69	0.66	1	4
Involvement	2.69	1.14	1	4
Internal influence	2.50	1.09	1	4
External influence	2.85	1.04	1	4
Risky-task characteristics	2.96	0.91	1	4
Complex-task characteristics	3.55	0.71	1	4

Table I.11 Anova Results for Gender

Construct	F	Sig.	Female	Male
User habit	0.97	0.33	3.54	3.66
Self-efficacy	0.02	0.90	3.69	3.68
Anxiety	0.72	0.40	2.00	1.87
Internal influence	1.12	0.29	2.60	2.41
External influence	1.06	0.30	2.94	2.77
Risky-task characteristics	0.31	0.58	2.92	3.00
Complex-task characteristics	0.10	0.76	3.53	3.56
Enjoyment	0.28	0.60	2.54	2.46
Involvement	0.61	0.44	2.61	2.76
Usefulness	7.57	0.01	3.12	2.76
Ease of use	4.24	0.04	3.63	3.42
Attitude	1.84	0.18	3.33	3.15
Intention	5.76	0.02	3.10	2.79
User habits1	0.18	0.67	3.68	3.73
User habits2	1.56	0.21	3.40	3.59
Anxiety1	0.59	0.45	1.93	1.81
Anxiety2	0.59	0.44	2.07	1.94
Enjoyment1	0.53	0.47	2.49	2.37
Enjoyment2	0.84	0.77	2.58	2.54
Usefulness1	6.05	0.02	3.28	2.94
Usefulness2	5.52	0.02	3.14	2.76
Usefulness3	5.03	0.03	2.94	2.59
Ease of use1	6.53	0.01	3.63	3.31
Ease of use2	0.85	0.36	3.63	3.53
Attitude1	0.75	0.39	3.22	3.10
Attitude2	0.87	0.35	3.25	3.13
Attitude3	3.71	0.06	3.51	3.23
Intention1	3.60	0.06	3.10	2.82
Intention2	8.24	0.01	3.10	2.68
Intention3	2.52	0.12	3.11	2.87
Customization absent	0.98	0.33	-0.03	-0.13
Customization present	0.98	0.33	0.03	0.13
Adaptive behavior absent	0.98	0.33	-0.41	-0.30
Adaptive behavior present	0.98	0.33	0.41	0.30
Minimal memory load absent	2.14	0.15	-0.54	-0.40
Minimal memory load present	2.14	0.15	0.54	0.40
High content density	1.47	0.23	-0.20	-0.36
Low content density	1.47	0.23	0.20	0.36
Low-speed	0.34	0.56	-1.40	-1.48
High-speed	0.34	0.56	1.40	1.48

Table I.12 Anova Results for Age

Construct	F	Sig.	24 and lower	25-29	30-34	35 and above
User habit	3.53	0.02	3.40	3.82	3.75	3.43
Self-efficacy	1.21	0.31	3.62	3.82	3.69	3.50
Anxiety	0.94	0.42	2.07	1.78	1.88	2.00
Internal influence	1.43	0.24	2.34	2.59	2.81	2.29
External influence	3.06	0.03	2.80	3.04	3.00	2.14
Risky-task characteristics	1,91	0.13	2.93	3.14	2.92	2.50
Complex-task characteristics	0.23	0.88	3.51	3.53	3.62	3.64
Enjoyment	3.08	0.03	2.66	2.55	2.33	1.89
Involvement	0.41	0.74	2.77	2.57	2.62	2.86
Usefulness	1.07	0.36	2.87	3.01	3.09	2.67
Ease of use	1.03	0.38	3.52	3.62	3.38	3.39
Attitude	2.25	0.09	3.28	3.34	3.22	2.74
Intention	1.94	0.13	2.83	3.10	3.08	2.64
User habits1	4.20	0.01	3.52	3.92	3.88	3.43
User habits2	2.12	0.10	3.30	3.71	3.62	3.43
Anxiety1	0.60	0.61	1.97	1.78	1.73	2.00
Anxiety2	1.23	0.30	2.16	1.78	2.04	2.00
Enjoyment1	3.40	0.02	2.61	2.49	2.23	1.79
Enjoyment2	2.42	0.07	2.70	2.61	2.42	2.00
Usefulness1	0.63	0.60	3.07	3.14	3.23	2.86
Usefulness2	0.72	0.54	2.89	3.02	3.08	2.64
Usefulness3	1.09	0.36	2.66	2.86	2.96	2.50
Ease of use1	2.02	0.11	3.49	3.61	3.27	3.14
Ease of use2	0.34	0.80	3.54	3.63	3.50	3.64
Attitude1	1.05	0.37	3.20	3.22	3.15	2.79
Attitude2	1.14	0.33	3.21	3.29	3.12	2.86
Attitude3	4.35	0.01	3.43	3.51	3.38	2.57
Intention1	1.07	0.36	2.89	3.06	3.08	2.64
Intention2	0.81	0.49	2.80	3.00	2.96	2.64
Intention3	3.23	0.02	2.79	3.22	3.19	2.64
Customization present	0.28	0.84	0.05	0.08	0.17	0.05
Adaptive behavior present	0.39	0.76	0.37	0.35	0.42	0.18
Minimal memory load present	0.44	0.72	0.41	0.53	0.50	0.48
Low content density	1.12	0.34	0.18	026	0.44	0.54
High-speed	0.29	0.84	1.47	1.49	1.35	1.46

Table I.13 Anova Results for Occupation

Construct	F	Sig.	Technical	Not technical
User habit	0.03	0.87	3.59	3.61
Self-efficacy	0.17	0.68	3.66	3.71
Anxiety	0.85	0.36	1.85	1.99
Internal influence	0.05	0.82	2.52	2.48
External influence	0.52	0.47	2.92	2.80
Risky-task characteristics	0.19	0.67	2.92	2.99
Complex-task characteristics	1.62	0.21	3.63	3.48
Enjoyment	0.30	0.59	2.45	2.53
Involvement	1.48	0.23	2.82	2.59
Usefulness	0.16	0.69	2.96	2.91
Ease of use	0.14	0.71	3.54	3.50
Attitude	1.33	0.25	3.32	3.17
Intention	0.53	0.47	2.99	2.90
User habits1	1.86	0.18	3.62	3.78
User habits2	0.65	0.42	3.57	3.45
Anxiety1	1.52	0.22	1.75	1.95
Anxiety2	0.22	0.64	1.95	2.04
Enjoyment1	0.09	0.77	2.40	2.45
Enjoyment2	0.59	0.45	2.49	2.61
Usefulness1	0.01	0.93	3.09	3.11
Usefulness2	1.66	0.20	3.06	2.85
Usefulness3	0.06	0.82	2.74	2.78
Ease of use1	0.04	0.85	3.45	3.47
Ease of use2	0.87	0.35	3.63	3.53
Attitude1	0.81	0.37	3.23	3.11
Attitude2	1.47	0.23	3.28	3.12
Attitude3	1.26	0.27	3.46	3.29
Intention1	0.04	0.85	2.97	2.94
Intention2	0.75	0.39	2.95	2.82
Intention3	0.75	0.39	3.06	2.93
Customization present	1.15	0.29	0.14	0.03
Adaptive behavior present	1.68	0.02	0.44	0.29
Minimal memory load present	3.90	0.05	0.37	0.55
Low content density	0.58	0.45	0.23	0.33
High-speed	0.41	0.52	1.49	1.41

Table I.14 Anova Results for Education

Construct	F	Sig.	Undergraduate	Graduate
User habit	6.71	0.01	3.50	3.82
Self-efficacy	0.49	0.48	3.66	3.74
Anxiety	0.02	0.90	1.94	1.92
Internal influence	1.64	0.20	2.42	2.66
External influence	0.01	0.91	2.86	2.84
Risky-task characteristics	1.30	0.26	3.02	2.84
Complex-task characteristics	0.42	0.52	3.52	3.60
Enjoyment	2.09	0.15	2.57	2.34
Involvement	3.03	0.08	2.80	2.46
Usefulness	0.40	0.50	2.90	2.99
Ease of use	0.41	0.52	3.54	3.47
Attitude	0.57	0.45	3.20	3.31
Intention	3.52	0.06	2.85	3.11
User habits1	1.87	0.17	3.65	3.82
User habits2	9.65	0.00	3.34	3.82
Anxiety1	0.00	0.95	1.87	1.86
Anxiety2	0.03	0.87	2.01	1.98
Enjoyment1	2.89	0.09	2.52	2.24
Enjoyment2	1.51	0.27	2.62	2.44
Usefulness1	0.36	0.55	3.07	3.16
Usefulness2	0.12	0.73	2.92	2.98
Usefulness3	0.50	0.48	2.72	2.84
Ease of use1	0.80	0.37	3.53	3.38
Ease of use2	0.03	0.86	3.58	3.56
Attitude1	1.05	0.31	3.11	3.26
Attitude2	0.13	0.72	3.17	3.22
Attitude3	0.49	0.49	3.33	3.44
Intention1	2.60	0.11	2.87	3.12
Intention2	0.90	0.34	2.83	2.98
Intention3	5.78	0.02	2.86	3.24
Customization present	0.66	0.42	0.05	0.14
Adaptive behavior present	0.19	0.66	0.37	0.32
Minimal memory load present	2.71	0.10	0.42	0.58
Low content density	6.49	0.01	0.17	0.52
High-speed	1.16	0.28	1.49	1.35

Results of Anova with Cluster Typology-I & II

Table I.15 Anova Results for Cluster Typology-I

Construct	F	Sig.
Age	0.36	0.70
Gender	1.09	0.34
Education	2.11	0.13
Occupation	0.14	0.87
User habits1	2.00	0.14
User habits2	0.30	0.74
Anxiety1	0.23	0.80
Anxiety2	0.17	0.85
Enjoyment1	1.75	0.18
Enjoyment2	0.88	0.42
Usefulness1	1.36	0.26
Usefulness2	2.72	0.07
Usefulness3	4.38	0.01
Ease of use1	0.08	0.92
Ease of use2	0.15	0.86
Attitude1	4.18	0.02
Attitude2	7.24	0.00
Attitude3	2.88	0.06
Intention1	4.83	0.00
Intention2	6.30	0.00
Intention3	3.48	0.03
Self-efficacy	1.15	0.32
Involvement	1.06	0.35
Internal influence	0.38	0.69
External influence	1.87	0.16
Risky-task characteristics	0.70	0.50
Complex-task characteristics	0.31	0.74
User habit	0.45	0.64
Anxiety	0.20	0.81
Enjoyment	1.37	0.26
Usefulness	3.66	0.03
Ease of use	0.04	0.96
Attitude	4.98	0.00
Intention	6.07	0.00
Customization absent	8.13	0.00
Customization present	8.13	0.00
Adaptive behavior absent	54.96	0.00
Adaptive behavior present	54.96	0.00
Minimal memory load absent	11.59	0.00
Minimal memory load present	11.59	0.00
High content density	93.20	0.00
Low content density	93.20	0.00
Low-speed	63.06	0.00
High-speed	63.06	0.00

Table I.16 Anova Results for Cluster Typology-II

Construct	F	Sig.
Age	0.14	0.90
Gender	0.12	0.90
Education	1.78	0.17
Occupation	3.08	0.05
User habits1	61.06	0.00
User habits2	24.00	0.00
Anxiety1	22.00	0.00
Anxiety2	24.23	0.00
Enjoyment1	19.30	0.00
Enjoyment2	17.00	0.00
Usefulness1	0.49	0.61
Usefulness2	0.24	0.80
Usefulness3	2.71	0.07
Ease of use1	1.30	0.28
Ease of use2	0.81	0.45
Attitude1	1.90	0.16
Attitude2	1.62	0.20
Attitude3	3.53	0.03
Intention1	2.26	0.11
Intention2	7.67	0.00
Intention3	12.08	0.00
Self-efficacy	42.62	0.00
Involvement	101.03	0.00
Internal influence	13.59	0.00
External influence	14.81	0.00
Risky-task characteristics	16.11	0.00
Complex-task characteristics	3.73	0.26
User habit	49.90	0.00
Anxiety	29.90	0.00
Enjoyment	19.61	0.00
Usefulness	0.83	0.44
Ease of use	1.31	0.27
Attitude	2.45	0.09
Intention	8.36	0.00
Customization absent	1.43	0.24
Customization present	1.43	0.24
Adaptive behavior absent	3.10	0.05
Adaptive behavior present	3.10	0.05
Minimal memory load absent	0.24	0.79
Minimal memory load present	0.24	0.79
High content density	2.35	0.10
Low content density	2.35	0.10
Low-speed	0.39	0.68
High-speed	0.39	0.68