FACTORS INFLUENCING NEW PRODUCT ACCEPTANCE: A STUDY ON MILITARY CONTEXT

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ABSTRACT

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Attitudes of users towards new Information Technology products have been the matters of consumer research studies. Factors that affect user behavior in terms of IT acceptance have been modeled by different researchers with an attempt to predict the actual usage. This study aims to analyze these factors and their significance in military context. One of the robust models, namely Unified Theory of Acceptance and Use of Technology (UTAUT) is used as the study model with required modifications in order to augment its compatibility. Therefore an exploratory survey study is conducted within the target user group of two rugged mobile computers with the participation of 37 Turkish sergeants. The study used both qualitative and quantitative instruments. The results showed that, for military products, users acceptance criteria mainly concentrate on the performance of the new product and its relative ease of use.

Keywords: User Behavior, Product Acceptance, Innovation and Technology Adoption, UTAUT, Military Product Usage

ÖZ

ASKERİYEDE YENİ ÜRÜN KABULÜNÜ ETKİLEYEN FAKTÖRLER ÜZERİNE BİR ÇALIŞMA

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Kullanıcıların yeni ürünlere karşı tavırları, tüketici araştırmaları alanında ilgi konusu olmuştur. Kullanıcı davranışlarını ürün kabulü bağlamında etkileyen faktörler, ürünün gerçek hayatta kullanılıp kullanılmayacağını öngörmek için farklı araştırmacılar tarafından farklı şekillerde modellenmiştir. Bu çalışma, söz konusu faktörleri ve etkilerini askeri ürünler üzerinden incelemeyi hedeflemektedir. Bu çalışmada model olarak en güvenilir ürün kabulü teorilerinden biri olan Teknoloji Kabulü ve Kullanımı Bileşik Teorisi kullanılmıştır. Modelin askeriye bağlamına uygunluğunu artırmak için bazı değişiklikler yapılmıştır. Bu kapsamda, iki adet el bilgisayarının hedef kullanıcıları arasında, 37 askeri kullanıcının katılımıyla açımlayıcı bir araştırma gerçekleştirilmiştir. Araştırmada nitel ve nicel yöntemler bir arada kullanılmıştır. Elde edilen sonuçlara göre, askeri ürünlerde kullanıcı kabulü kriterlerinin, yeni ürünün performansı ve görece kolay kullanılabilirliği üzerine yoğunlaştığı gözlenmiştir.

Anahtar Kelimeler: Kullanıcı Davranışı, Ürün Kabulü, Yenilik ve Teknoloji Adaptasyonu, UTAUT, Askeri Ürün Kullanımı

To My Family

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1. Background to the Problem

The possibility of a commoner can easily kill a nobleman once had shaken the cultural, social and political foundation of the aristocracy. Hence, the introduction of firearms into usage in fifteenth century was responded with a great resistance. Here; the functionality of the tool was dominated by the side effects of its usage, however; the earlier versions of firearms were also poor in their performance as it took the ruling class of Mamluks a long time to accept using firearms on their feet rather than the ineffective forces of cavalry armed with mechanical artillery (Creveld, 1989). From the era of this medieval cross-section through information age, many of similar innovative products and their diffusion process in people's lives have been matters of interest; such as electricity, cars, computers, internet, ATM's, mobile electronics and so on.

The academic studies about the diffusion of innovations into social domain can be traced back to 1940's in sociology science. The subject of the issue was the diffusion of new corn-seeds among farmers of Iowa in that time. Then, early in 1960's, diffusion issues have become the concerns of market researchers; because the failure rates of the new consumer products of that era were so high, and that was the time when companies try to find how to launch new products more efficiently (Rogers, 1976).

This is how consumer research or acceptability research emerged from marketing studies. Rogers (1976) pointed out that the marketing point of view was generally by the side of the producer rather than the consumer. However, it was an effort in order to surpass selling strategies of the product rather than the qualities of the product itself; the idea of gathering user desires before starting to design, produce and launch of a new product was invented (Rogers, 1976).

Since then, product design issues have shifted from the efforts to achieve functionality and user friendly products to the efforts to achieve usability and user-centered design.

The increasing consumer population and accordingly increasing demand and developing technology challenge producers to be distinctive in order to survive in a competitive market. Consumer research and user analysis are made to predict probable rejection or acceptance to risky product investments. Thus, the product-oriented design was replaced with the user-centered design in R&D departments of the companies.

Dillon and Morris (1996) define user acceptance as “the demonstrable willingness within a user group to employ information technology for the task it is designed to support”. As the definition implies, the term generally used for the products of information technology (IT) and it is one of the present issues of today’s researches for various IT products such as computers, mobile electronics and internet services, which carry the materialistic reality into an abstract level hidden in circuits and codes. As long as they intent, people can shop on-line, conduct video-conferences among countries thousands of miles away or detect a possible enemy attack on the screen; thanks to the light-speed development of technology.

The current academic interest in the diffusion phenomenon stems from the growing importance of computer based IT within professional domain. In the organizational level, the utilization of IT in the age of “global, digital and networked economy” is inevitable even to perform daily routine activities (Agarwal, 2000, pp.85). Hence, the implementation of such technology into an organization via individuals directly affects the success of organizational processes (Behrens et al., 2005).

The prominence of the consumer attitude towards products issue significantly increases through information age with the diffusion of technology into different

contexts. For instance, the usage of IT for military purposes has similar reflections. Given the fact that countries invest a great portion of their budgets in defense, the procurement or development of weaponry and its effective usage is an important issue. This is because “each country desires to enhance its military power to maintain supremacy over its adversaries and deter them from undertaking any proactive action” (Jaiswal, 1997, p.1). In order to repeat the importance of IT, this time in the context of military usage; with the growing technology and diffusion of it in military context, the face of these weaponry and human-product interaction herein evolve into a more complex structure. Jaiswal (1997) states that, with the availability of modern computers, commanders are capable of utilizing any received information even out of the battle field. “To a certain extent, computers have also helped in supplementing human decision making through knowledge-based systems and expert systems” (Jaiswal, 1997, p.2); such as command, control, communication, computer, intelligence (C4I) systems.

Indeed, technology changes the culture of the war. The *significance of a military man* is defined as “a technically competent and educated expert” in the wars of 20th Century (Avanesova, 2006, p.92). From the culturological viewpoint:

> “… [experts] believe that mass destruction weapons, military equipment and information technologies are about to substitute the essence of the entire military activity concept. The matter also concerns a possibility of war virtualization (war waging through the Internet and via other global networks), transition to non-contact operations, classical-type war replacement with an information war or with a war between different cultures (mass culture expansion and consumer guidelines distribution).” (Avanesova, 2006, p.92)

Although IT products offer countless advantages by automating functions or being faster and multifunctional for example; the diffusion of such products is still problematic because of their perceived complexity (ISO 20282-1.2, 2003). Since “new” means differentiation from the “old” at varying levels; the users’

apprehensiveness about the unknown qualities of the product or their own efficacy with the product at the end of a usage experience is understandable.

The user acceptance defines whether the product will be used in the real world (Bevan et al., 1991) whereas; the contrary situation is the rejection of the product or the user resistance (Jiang et al., 2000) which can be observed as non-purchase or non-use. These consequences are unbearable for producers and users because in both situations, the money invested for the product is a waste. Thinking of military systems consisting of computers, radios, radars, communication systems, weaponry and so on, and countless software systems that run in these devices, the prominence of user attitude towards IT systems is evident.

There are many research studies deal with the individual and organizational adoption of IT products in terms of voluntary and mandatory usages in different contexts. But the military context is out of the perspective except for the study of Mackie and Wylie (1988; in Kantowitz et al.; 1997) who conceptualized a military acquisition model in which the factors that affect product acceptance from both organizational and individual perspectives are analyzed. Apart from this study however, there are no other significant attempts try to create an acceptance model for specifically military products since their characteristics and usage context is quite different than civilian user products.

As the literature review of the study shows, the design literature seems to exclude military product research from its scope. This is most probably because of both the secrecy of military applications and the relatively small numbers of production in defense sector with regard to the large market of industrial products. Furthermore, the military product requirements have different aspects than industrial products, but still the human factors can not be overestimated. On the other hand, military literature deals with the acceptability in terms of the quality of the fulfillment of system requirements. However, the issue has been analyzed regarding specific product groups, both literatures lack of an inclusive

analysis of user acceptance in military context and its dimensions in general. From that perspective, this study aims to contribute to filling the gap between design literature and military context in terms of user acceptance.

Because of the scarce works dealing with the issue in military domain, this study benefited from the literatures of design, psychology, marketing and other relevant disciplines in order to shed light to the untouched extensions of it.

1.2. Aim of the Study

The aim of this study is to make a contribution to military product development by defining a framework through analyzing the factors that influence user behavior which in return affect the acceptance of new products in military context. In order to achieve this, the nature of military context and human-product interaction herein should be examined. Consequently, the main research question of this study is as follows:

- What are the factors influencing user acceptance of new products in military context?

Through the study, the following questions and their potential answers will also be analyzed.

- What are the dimensions of user behavior towards new products?
- What are the factors influencing user acceptance of new products?
- What are the features of military context by means of product acceptance?

In this study, referring to scanned literature, *user resistance* and *product/user acceptance* are used as opposite but identical concepts.

Outcome of this study is an efficiency scale of the factors that affect new product acceptance in military context, therefore, a reference input that may well contribute to the design process of military products.

1.3. Significance of the Study

It is obvious that the existing prominence of IT in both individual and organizational levels is remarkable. There are attempts in military literature to analyze user acceptance of specific products such as software, internet usage and some consumables, however, there is a need for overview of the factors that affect consumer behavior towards new products in terms of IT usage. The factors that affect the acceptance of the new products in military are unfamiliar for both industrial design and military literature. It is possible to make some assumptions on those factors according to the structure and the features of military context but without an research study any suggestion would be null and unreliable.

This study is unique in terms of its approach to user acceptance from the perspective of industrial design. It analyzes the correspondence of related user acceptance models with the military context in order to define the validity of the offered determinants within. As an attempt to reveal the effects of these determinants, a survey study is conducted with the motivation of a recent user acceptance model, namely *Unified Theory of Acceptance and Use of Technology* (Venkatesh et al., 2003).

1.4. Structure of the Thesis

The thesis is constituted of five chapters. The upcoming Chapter presents the results of the reviewed literature for the study and starts with exploration of related concepts. The analysis of the drives of consumer response to new or innovational products in terms of their effects on product acceptance will be discussed next. Theories and models that build methodologies for predicting

consumer behavior towards new products; basically information technology products, are summarized in the following sections. The internal dynamics of military context in comparison with its civilian counterpart and the understanding of human-product interaction and acceptance therein are also discussed in the last sections of the Chapter 2.

The theoretical discussion is supported by a survey study in the third Chapter with an attempt to define the dominancy of the drives behind product acceptance in the military context. After defining the objectives and exploring the overall design of the study, the procedure and the venue of the study is described.

In the Chapter 4, the responses of the participants are analyzed in detail; results of the study are discussed in relation with the findings of the literature review study.

The last chapter presents a brief summary of the thesis and the findings of the survey study. Limitations are explored and the thesis is concluded with the implications for both practice and further research.

CHAPTER 2

LITERATURE REVIEW

As it is stated in the first Chapter, this study benefits from different literatures such as; psychology, sociology and consumer research for *user behavior*; industrial design for *human-product interaction*; information technology and management for *diffusion of technology*; and military literature for the analysis of *military product requirements*. A broad variety of keywords including; *consumer behavior, product/user acceptance, technology adoption, innovation, information technology, TAM, UTAUT, military requirements, perceived usability, product/user resistance, prior/past knowledge, usability in military products, military products, military product design, military usage, military environment, military psychology, human factors in military, product appearance, expertise, expert and novice, cognition, product experience, past experience of users, product familiarity, command & control systems*, are scanned for the time period of 1960-2008 through *METU and Aselsan Inc. Libraries* and various electronic databases; namely *EbscoHost, ACM Digital Library, Elsevier, Wiley InterScience, Science Direct, Taylor & Francis Online Journals, Ebrary, Defense Technical Information Center* etc and varying defense magazines either with direct access or via search engines like Google-Academic and METU Library On-line Search.

However there are scarce sources explaining the features of military context. It is a difficult domain to explore for an outsider by examining varying sources where the context is rather a tacit knowledge. Thus, where considered necessary, some personal observations of the author, who is a practitioner in defense industry, are included in order to support the arguments of the study.

Before examining the theories and models related with the thesis subject, the key concepts are needed to be analyzed in detail. This chapter begins with the

elaboration of related concepts which are *innovation* by means of new products and the *adoption of information technology* phenomenon. Differences between individual and organizational levels are also compared. The following sections will explore the theories and models both related to consumer behavior and user acceptance studies. The measures of product acceptance will be synthesized and at the last sections of the chapter, the particular features of military context by means of product usage and the extension of acceptance issues herein will be analyzed.

2.1. Innovation and Technology Adoption Phenomenon

With the guidance of diffusion research of which technological innovation is the major interest so far, consumer adoption of technological innovation has been a striking issue for consumer research. What makes IT so critical is its diffusion into society and organizations that causes an increasing dependency (Dillon and Morris, 1996). Because the aspects of innovation relate to the reactions towards new products, innovation and its effects on product encounters should be analyzed firstly.

2.1.1. Innovation and Levels of Innovativeness

Being similar with its definitions, there are different innovation types and the levels of innovativeness expressed by different researchers. For example, Rogers (1976, p.292; 2002, p.990) defined *innovation* as “an idea, practice or object perceived as new by an *individual* or other *relevant unit* of adoption”. According to him, the characteristics of an innovation that determine the rate of its adoption are *relative advantage*, *compatibility*, *complexity*, *trialability*, and *observability*. Correspondingly, Becker and Whisler (1967; in Wu and Wu, 2005, p.305) state innovation as “the first or early use of an idea by one of a set of organizations with similar goals”. From the product companies’ point of view innovation is “…’a solution’ that identifies and addresses the unmet needs of consumers” (Kantrovich, 2004, p.26).

In order to narrow down the subject of the concept, Schumpter's (1930; in Rogers, 1998) categorization of innovation according to the context may be useful:

- Introduction of a new product or a qualitative change in an existing product
- Process innovation new to an industry
- The opening of a new market
- Development of new sources of supply for raw materials or other inputs
- Changes in industrial organization (Shumpter, 1930; in Rogers, 1998, p.6)

Technological product innovation that this study deals with, falls into the first innovation category and involves "either a new or improved product whose characteristics differ significantly from previous products" (Rogers, 1998, p.7). Mobile computers vs. personal desktop computers and on-line shopping vs. traditional shopping are the examples of that innovation category.

As it is mentioned before, the growing technology and the complexity of the products launched to the market bring upon a need to learn new information for the consumers. Herein, the degree of innovation; thus the amount of new information to be learned are essential for the success of new products. But the degree of innovation is a subjective phenomenon because of the varying user expertise levels that effect perceived innovation level (Saaksjarvi, 2003).

Moore (1991 in Saaksjarvi, 2003) categorizes innovational products into three according to their impact on user behavior; *continuous products* with slight modifications for existing products, *dynamically continuous* products involving the ceration of a new product such as widescreen TV's and tele-conferencing and *discontinuous* products which require "a significant amount of new learning" such as digital cameras and video-conferencing (Saaksjarvi, 2003, p.91). Hence the continuity refers to the result of the amount of modification applied to the product. As the modification increases, the continuity declines. Technological innovations which are the kind of a software and hardware mixture fall into the third category; that is *discontinuous* innovations (Saaksjarvi, 2003). Where as,

discontinuity of a product, in other words; innovativeness of the product as Kuleli (2005) proposes, has a limit in terms of its acceptance. The difference between innovativeness and complexity is so slight that; if it has pushed more, the user will be overwhelmed by it (Kuleli, 2005).

Veryzer (1998) analyzes the degree of innovation from the perspectives of both producers and users as he anticipates a multifaceted categorization which involves *technologically discontinuous* and *commercially discontinuous* products. As the Veryzer's types of innovation are shown in the Figure 2.1; *technological capability* dimension refers to the functional features of the product which expands the existing technological boundaries, and the *commercial capabilities* dimension refers to the perceived and experienced benefits of the new product by the user.

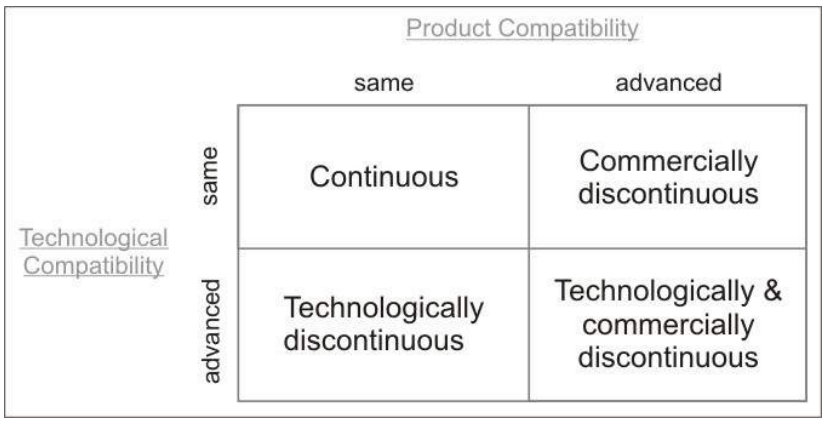


Figure 2.1 Veryzer's types of product innovation (1998)

According to Veryzer (1998), the designers' assumption of innovation level sometimes conflicts with the users' perceptions of innovations. He acknowledges that the users' point of view; that is commercial discontinuity of the product should be taken into consideration when driving long term design processes that address future usages. The consumers may not be ready for a new product or service which cast down all product related knowledge and usage habits, unless it offers a perfect solution for a vital necessity. Indeed, even such perfect products may be responded with rejection at the beginning of their introduction.

Moreau et al. (2001) explain that existing knowledge and innovation affect the consumer adoption process. Their studies examining the relationship between expertise and adoption connote that experts compared to novice users report higher comprehensions, more benefits and higher preferences for continuous innovations, on the other hand, with respect to discontinuous innovations; results indicate the opposite.

The definitions of innovation categories give the chance to combine product familiarity and experience with the features of a product which is 'new'. That is; when a product is new in terms of its technology and usage patterns, it is not familiar and is perceived as commercially new. Correspondingly; Gardner et al. (2000) categorize technological products into two with an attempt to clarify the difference between their marketing strategies; "Traditional or low technology products are those that employ familiar and accepted technology and whose acceptance and use are generally understood. Likewise, high technology products are those that employ turbulent technology in their use, manufacture and/or distribution, and are seen to require significant changes in usage patterns." (Gardner et al., 2000, p.1056).

In summary, technology and innovation change the usage practices of products and in return affect user acceptance. This relationship will be explored in detail in the following section.

2.1.2. Product Familiarity

In many consumer researches the effect of product familiarity and prior knowledge on the product choice and the processing of new information were explored (Johnson and Russo, 1984; Cordell, 1997; Chéron and Hayashi, 2001; Dahl and Hoeffler, 2004; Paxton et al., 2002 and Kuleli, 2005).

Alba and Hutchinson (1987) define product familiarity as “the number of product related experiences that have been accumulated by the consumer” (p.411). For a brief explanation; it is the *knowledge of a product class* (Johnson and Russo, 1984). Moreover, “Increased product familiarity results in increased consumer expertise. However, different tasks require different types of expertise and, therefore, task performance is improved by different types of experiences” (Alba and Hutchinson, 1987, p. 411).

Familiarity with the product was anticipated as the degree of globalization of the product in Chéron and Hayashi (2001)’s work, that is, the more a product is global, the more the consumers are familiar with that product category. This proposing means that a global product is known by many consumers however, it does not contribute to the level of familiarity with the product of each consumer.

Most of the time, product familiarity or consumer knowledge is discussed with *brand familiarity* and *country of origin*. For example, Park and Stoel (2005) state that familiarity with a web site’s brand affect the customers’ purchase decision in a positive way while decreasing perceived risk. Similarly country of origin is said to be effective on consumers’ product evaluations (Schaefer, 1995; Zain and Yasin, 1997).

Dahl and Hoeffler (2004) on the other hand, examine the prominence of *visualization with self-related images* versus *visualization with others related images* of the consumers on the product choice regarding two product categories: (1) incremental products -a new product builds on an established product; and (2) really new products -innovational products. It is concluded that: “… familiarity with the product category from which an incremental product extension is generated enables individuals to produce images easily where they can see themselves using the new product” (Dahl and Hoeffler, 2004, pp. 264). Thus the evaluation of incremental products was higher than the new products for familiar users. Herein, easier image producing ability was linked to the relevant prior experience of the user. In the same way, the study results showed

that the consumers got difficulty in “visualizing the full application of a really new product to their current consumption behavior.” That difficulty is the result of the burden of extra learning necessary for utilizing the new products (Dahl and Hoeffler, 2004). Similarly ISO 20282-1.2 (2003) suggests an evolutionary design process which maintains a positive knowledge transfer in order provide ease of use.

According to Cordell (1997), the measures of product knowledge affects consumers’ product evaluation. He states that the product familiarity operationalized by *accumulated purchases, product usage, search, ownership* and *experience*. Similarly, Leek et al. (1998) state that since past behavior influence future behavior, the variety and the number of users’ prior purchases determine the users’ attitude towards new products.

If demoted to the specific contexts such as military, the importance of product familiarity and user knowledge about product categories increase because; the complex, task specific products require expertise. The user roles and required tasks in such contexts are definite; thus the users are only familiar with the product groups they use in the context.

2.1.3. Diffusion-Adoption Phenomenon and the Prominence of Information Technologies

In literature, adoption and diffusion concepts are generally used for each other regarding the launch of new products; diffusion/adoption of new products/innovations. Indeed, diffusion is a more general concept that has its roots in sociology. It is also used for general concepts such as ideas, life styles, trends and philosophies. Rogers (1975; in Rogers, 2002) defines diffusion as “the process through which an *innovation* is *communicated* through certain *channels* over *time* among the members of a *social system*”. He proposes innovation, communication channels, time and social system as the components of diffusion. On the other hand, from the marketing point of view, it is defined as

“the adoption of new products or services over time by consumers within social systems as encouraged by marketing activities” (Robertson, 1971; in Woodside and Biemans, 2005, p. 387). Hence, the product adoption can not be analyzed by isolating individual from the surrounding social network. Communication as a conveyer of information and time aspects are identical for diffusion research.

Adoption, on the other side, is studied as a technology related concept and defined by Benbasat and Moore (1992) as “a behavior exhibited by individuals or organizations when they first put a new technology to use” and this issue “has been of interest to information systems researchers since the early days of computerization” (p.315). With this perspective, the prerequisite of adoption; that is acceptance, has been studied in two different but interrelated approaches. The first one deals with the adoption of information technologies in the organization level, and the second one tries to examine the adoption of IT through personal purchase behavior of the end user. Both aim to define measures for product acceptance in different contexts as it will be discussed in following sections.

In the literature, resistance to change and accordingly the product resistance/acceptance are the phenomenon rather problematic for information technologies and their implementation within organizations. Defining information technologies as “any artifact whose underlying technological base is comprised of computer or communications hardware and software” (Cooper and Zmud, 1990, p. 123), overwhelming complexity, innovation overloads and hard to learn interfaces of such products may cause a change apprehension on the user, thus; there occurs a resistance to new product, system or process. Such a resistance may be observed as non-purchase, non-use, modification and even the sabotage of the system. Hirschheim and Newman (1988) state that even beneficial changes may be assessed in a similar way.

Mack (2005) states that “a driver of change will often elicit a resulting counter-force that supports the status quo” (p.74). Difficulty of re-learning may be the

most important reason to that counter-force (Coch and French, 1948). That is, pre-learned knowledge, in other words; experience of the user may obstruct new information (Feltovich et al., 1997 in Degler and Battle, 2000). Correspondingly, relating with the military context, Perrin et al. (1997) find soldiers reluctance to use a new interface design on systems understandable, where life critical decisions are made.

2.1.4. Individuals and Organizations as Adopters

As it is mentioned before, in the literature, the issues related to the adoption of technology innovation covers two main categories of consumer: *individuals* as consumers and *organizations* as consumers. This kind of a categorization is similar of Heijden's (2004) categorization of information technologies; *productivity-oriented* (*utilitarian*) information technologies and *pleasure oriented* (*hedonic*) information systems. According to him; the utilitarian IT usage is for instrumental value and job related whereas, the hedonic IT usage is for self-fulfilling, home and leisure related, fun-oriented and prolonged practices. However, major acceptance measures are valid for both, since the individuals are the unit of diffusion research, the usage of products and the reactions to the technology have different aspects in organizational level than the aspects of individual level.

Organization is "a social system which is goal directed has a deliberately structured activity system, and has an identifiable boundary" (Przemieniecki, 1993, p.46). It is social because it composes of individuals or groups of individuals structured in order to attain specific goals of the organization. In achieving these goals, the organizations are divided into separate divisions which have separate tasks. Organizational boundary on the other hand refers to the extensions of its inside and outside elements in order to clarify division of labor.

From that perspective, organizational practices, such as the procurement of an IT system, are performed by specific groups in the organization. Individuals may have different roles in an organizational purchase process like *initiator, user, gatekeeper, influencer, decider* and *buyer* (Woodside and Biemans, 2005). The separation of decider and user in the process of purchase activity may cause ill-defined requirements in large organizations that; the consequences of an individual purchase decision is most likely to be satisfactory than the consequences of a purchase decision made by an individual for another. The situation is natural when thinking of large amounts of investments for a particular new system, but it is fundamental that the end-user requirements should be realistic.

Woodside and Biemans (2005) notify the parallelism between purchase practices and the adoption of technology in individual and organizational levels. Technology adoption is a more complex and gradually evolving process in organizations like hospitals, military or large companies. As Monk (2002; in Cila, 2008) states that users in a work environment are paid in order to use IT at office putting up with the problems they may cause, but individual users pay for themselves, and their expectations are high in terms of the product's features.

Regarding an individual in an organizational context; his or her decision to adopt new products depends on several variables such as; one's *attitude* toward the new product which is influenced by the factors shown in the Figure 2.2.

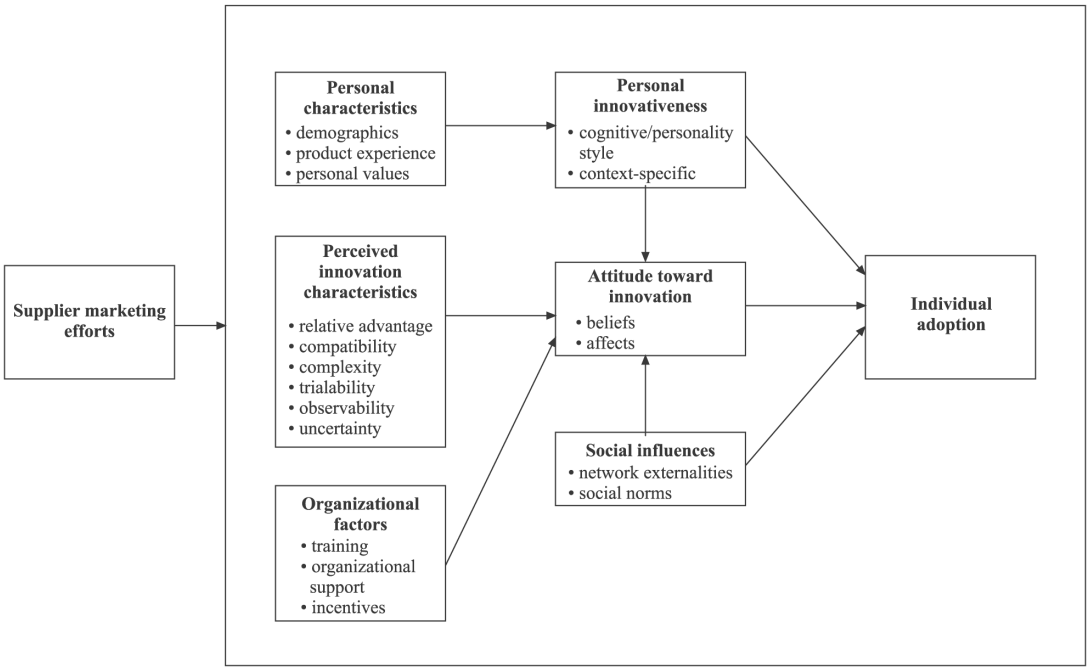


Figure 2.2 Framework for individual innovation adoption in an organizational context (Woodside and Biemans, 2005)

One's personal innovativeness or tendency to accept innovations influenced by his/her demographics, product experience and personal values; innovation's perceived relative advantage, perceived compatibility, complexity, observability and trial-ability; and additionally social context and social norms in the organization (Woodside and Biemans, 2005).

On the other hand, many organizational adoption models propose two phases for adoption; *initiation* and *implementation* or *primary* and *secondary* adoption phases (Zaltman et al., 1973; in Woodside and Biemans, 2005). Most rejection is likely to occur in the initiation phase, when the innovation's benefits are not fully comprehended. Wood and Elgie (1976; in Woodside and Biemans, 2005) call this phenomenon as start-up problems. However in primary adoption process; the decision makers of the organization decide whether or not no adopt product and then if the innovation is decided to be adopted; in the secondary adoption phase, the end-users/individuals in the organization are adopted by

means of three fashions: mandatory force, adaptor facilities or pilot project initiatives (Gallivan, 2001; in Woodside and Biemans, 2005).

As the Figure 2.3 represents, the factors that affect the organizational innovation adoption process are mainly related to the characteristics of the organization itself and external factors, rather than the individuals in the organization.

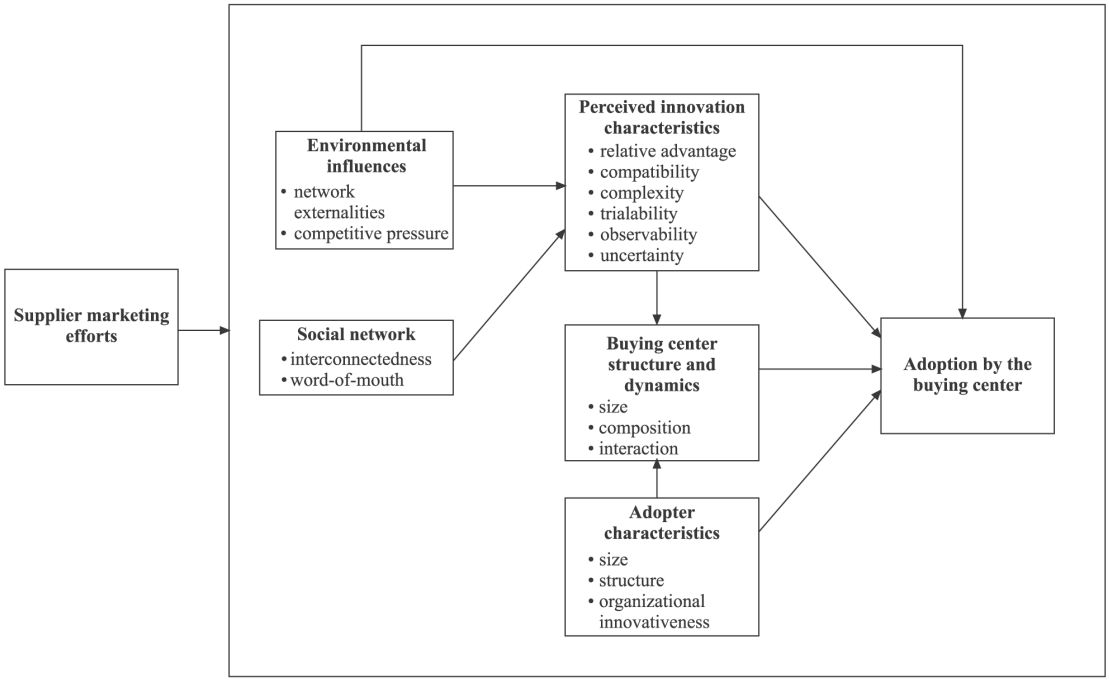


Figure 2.3 Framework for organizational innovation adoption in an organizational context (Woodside and Biemans, 2005)

According to Woodside and Biemans' (2005) model for organizational innovation adoption, environmental influences and social network in the organization affect the perceived characteristics of an innovation; whether the innovation is perceived relatively advantageous, compatible, complex, trial-able and observable or not. These perceived characteristics determine the adoption decision together with the characteristics of the adopter organization; whether it is a large organization which has a sophisticated buying center that makes the adoption decision according to the organizational considerations.

Regarding the factors that affect IT adoption of organizations, researchers develop implementation models in order to prevent new products from being resisted. For example, Cooper and Zmud's (1990) model in Figure 2.4, concurring with Woodside and Biemans' (2005) model, offers that the compatibility of a new product with the organization regarding its task and technology characteristics affects the implementation in a positive way. On the other hand the complexity of the product and technology affects the implementation process in a negative way.

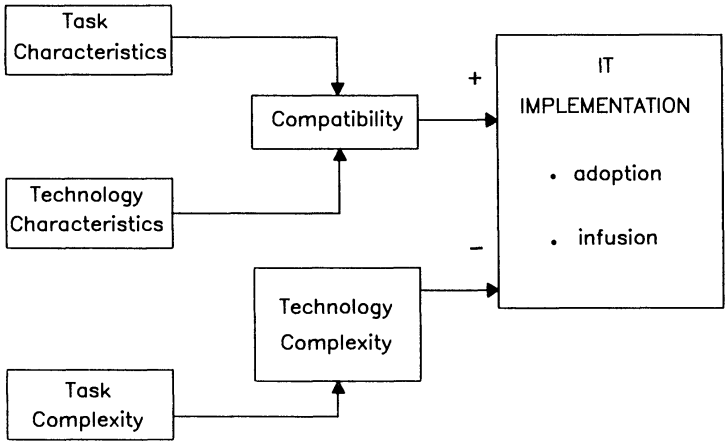


Figure 2.4 Cooper and Zmud's (1990) Information Technology Implementation Model

In organizational level, radically new products may create negative influences on acceptance such as *technological uncertainty, technological inexperience, business inexperience* and *technological costs* (Green et al., 1995 in Woodside and Biemans, 2005). Similarly, Bevan et al. (1991) explain the factors affecting individual acceptance in the organizational level as the *context of use* and the *characteristics of the user* together with *cost, convenience, availability, pre-requisite training, dislike of computers* and *organizational constraints*.

Thinking of the main concern of this thesis, that is military and its product usage context which will be analyzed in detail at the final sections of this Chapter; so called factors such as context of use, user characteristics like familiarity with

technology, dislike of computers and experience, cost, pre-requisite training and organizational constraints are determinant factors on the usage of new products.

So far, the conceptual domain of the study is educed. Hence; it is clear that the literature regarding the acceptance studies is dominated by the information technology researchers. For its obligated usage in both individual and organizational practices, the importance of the users' reactions towards innovational IT products is evident. In order to better understand the factors that affect user reaction towards new products, the following section will review the related theoretical findings about user behavior.

2.2. User Attitude and New Product Acceptance

For brand-new military products, this thesis study deals with the individual acceptance of users regarding organizational and contextual factors. In order to understand product acceptance within this perspective, it is essential to explore consumers' attitudes toward new products and the drives of these attitudes; by asking questions like "What is going on in customers' mind when they are introduced with new products?" and "How they are intrinsically convinced to use them?"

In overall understanding, the factors behind users' positive or negative behaviors towards objects are stimulated by both personal and external factors. The findings of psychology–studies regarding the aspects of these factors and their relationships will be analyzed in the following sections.

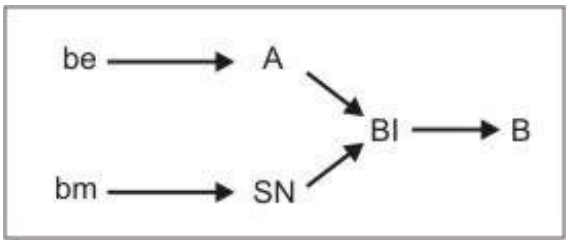
2.2.1. Attitude and Behavior

Thinking acceptance as a behavioral response towards new products; researchers benefited from the varying behavior models in order to predict whether a product will be accepted and used in the real world. Defining attitude as the user's cognitive process which depict positive or negative affection

towards the new product (Au and Enderwick, 2000); in these models, attitude-intension-behavior relationships are emphasized the most. The significant works can be drawn as; *instrumentality, expectancy, social learning* and *utility* models (Ryan and Bonfield, 1975) and more recently *Theory of Reasoned Action* (Fishbein and Ajzen, 1975), *Social Cognitive Theory* (Bandura, 1986), and *Theory of Planned Behavior* (Ajzen, 1988) as the attempts to understand user behavior.

2.2.1.1. Theory of Reasoned Action

According to Fishbein and Ajzen (1972); beliefs, attitudes and intentions are the determinants of behavior towards the object; whether in a positive or negative way. Their prolonged studies lead up to the Theory of Reasoned Action-TRA which summarizes the causal relationships between users' beliefs, attitudes, intentions and behaviors as in the Figure 2.5:



B = Behavior
BI = Behavioral Intention
A = Attitude
SN = Subjective Norms
bm = beliefs about the social expectations of specific others multiplied by the motivation to conform to them
be = beliefs about the specific consequences of behavior multiplied by the evaluation

Figure 2.5 Fishbein and Ajzen's causal model in Liska (1984)

Overall, TRA states that the determinant of an individual's behavior is his/her intentions (Benbasat and Moore, 1992). To explain in detail; *behavior* is triggered by *behavioral intentions* (conation) which are caused by *attitudes* (affective evaluations) that reflect the *beliefs* about the consequences of the behavior. *Subjective norms* (perceived general social norms) on the other hand, reflect "beliefs about the behavioral expectations of significant others", which indirectly affects behavior (Liska, 1984, p.62).

The significance of the theory is stated by Liska (1984) that the TRA has influenced the attitude-behavior research by giving an order to the variables of attitude in a causal model.

Relating the theory with the product acceptance; in order to use a product (as a consequent behavior of the user), there should be an intention to use it. Intention to use a product is related to the users' attitude towards the product which is a result of positive beliefs about the consequences of usage. At this point, this study focuses on the users past experiences that probably affect the beliefs about the consequences of usage behavior.

On the other hand, Thompson and Panayiotopoulos (1999) claim that the theory is applicable for the behavior of individuals where they consider their actions before acting and it is not applicable for organizational behavior, valid for also military as an organization, because of the varying factors that influence users' actions.

2.2.1.2. Social Cognitive Theory

Bandura's *Social Cognitive Theory* (1986; in Bandura and Wood, 1989) asserts that behavior, personal-cognitive factors and environmental factors are the interactive determinants that influence each other. As Figure 2.6 represents reciprocal model, the relationship between these factors are not of equal strength and occur simultaneously but they explore their influence through time (Bandura and Wood, 1989).

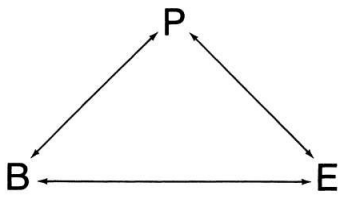


Figure 2.6 Schematization of the relations among behavior (B), cognitive and other personal factors (P), and the external environment (E), in Bandura and Wood (1989)

For the P ←→ B relation in this model; expectations, beliefs, self- perceptions, goals and intentions form and direct behavior. Similarly, for the relationship between E and P, the theory states that social influences enhance one's expectations, beliefs, emotional bents and cognitive competencies. Likewise, people can affect their social environment by their social status and characteristics. Talking about the B←→E relationship on the otherhand, behavior and environmet alters each other in daily life. "People are both products and producers of their environment" (Bandura, 1989, p.4).

2.2.1.3. Theory of Planned Behavior

As a descendant of TRA, Theory of Planned Behavior (TPB) adds another antecedent construct to the model (Figure 2.7); *perceived behavioral control* (Dillon and Morris, 1996).

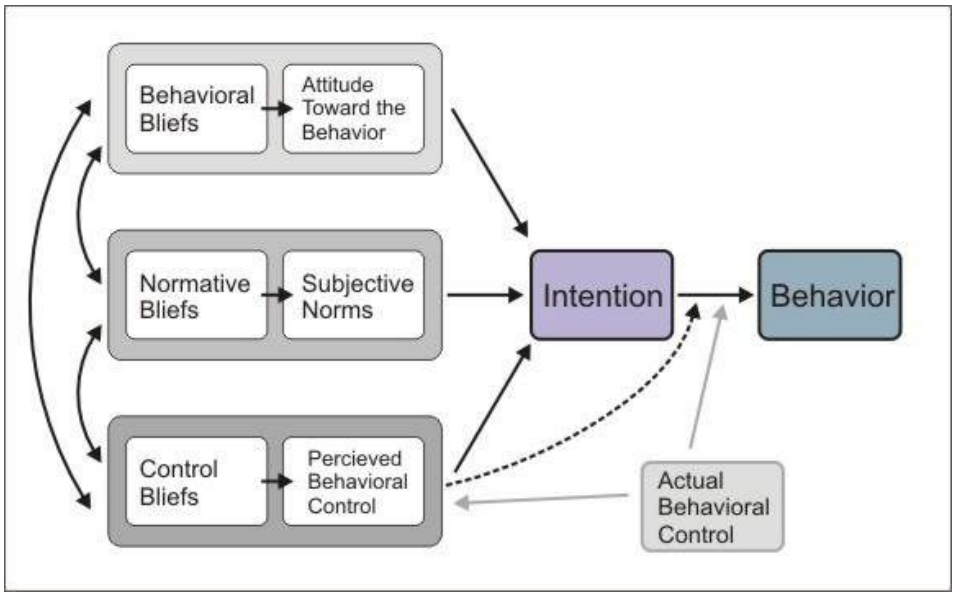


Figure 2.7 Theory of Planned Behavior in Ajzen, 2005

Ajzen (2005) defines attitude as "a hypothetical construct that, being inaccessible to direct observation, must be inferred from measurable responses." Regarding the concept of attitude, so called measurable responses

should be categorized as directed at others or at self; behaviors performed in public or private and actions or reactions. He also claims that the intervention of the determinants of behavior; namely attitudes, subjective norms or perceptions of behavioral control, can be manipulated in order to control behavior; that is acceptance.

Up to now, formulation of user behavior and the influences of personal and environmental factors on this formulation such as attitude, intention, beliefs and external factors and their internal relationships have been explored. Upcoming sections deal with the factors that influence product acceptance as a user behavior and related models that define interrelationships of its dimensions in order to comprehend its possible extensions in military. The two most significant models which have been used to explain product acceptance in both individual and organizational levels of different context will be analyzed: Technology Acceptance Model (Davis, 1989) and Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003).

2.2.1.4. Technology Acceptance Model (TAM)

Davis' (1989) theory of product acceptance, referring to the TRA, is an attempt to develop valid measures of user acceptance in the context of information technology and predict system usage. Although there are many studies which offer extended measures for the model; the theory created a wide range of application area both theoretical and practical that validates the model's efficiency.

Perceived Usefulness and Perceived Ease of Use

TAM claims that the *perceived usefulness* and *perceived ease of use* are the key determinants of computer usage in terms of user attitudes. These two measures of attitude have been tested and mostly justified through many other researches (Davis and Venkatesh, 1995; Adams et al., 1992; Ramayah and Lo, 2007; Yousafzai et al., 2007).

Davis (1989) defined *perceived ease of use* as “the degree to which a person believes that using a particular system would be free of effort” and *perceived usefulness* on the other hand as “the degree to which a person believes that using a particular system would enhance his or her job performance”. Figure 2.8 shows the structural model of the TAM:

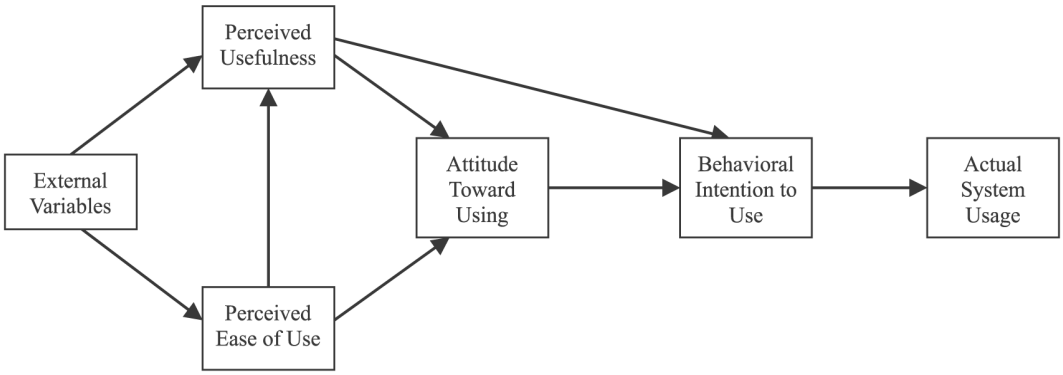


Figure 2.8 Davis’s Technology Acceptance Model in Davis et al. (1989)

According to Davis (1989), perceived ease of use and perceived usefulness have significant correlations with self reported indicants of system use. They determine the attitude toward the use of any given technology (Dillon and Morris, 1996). The studies showed that usefulness regarding perceived ease of use has a greater influence on system use. As a result; “… users are driven to adopt an application primarily because of the functions it performs for them, and secondarily for how easy or hard it is to get the system to perform these functions” (Davis, 1989). The contribution of the study to design practitioners is to remind them not to overemphasize perceived ease of use and overlook the importance of usefulness.

Davis et al (1989) also state that the importance of usefulness increases through system usage while the effect of perceived ease of use diminishes. Thus, the difference of perceived ease of use and usefulness before and after the use of technology is significant (Im et al., 2008; Szajna, 1996).

On the other hand, TAM excludes one of the scales of TRA; which is “subjective norms”. Davis et al. (1989) state that subjective norms is the least understood concept in TRA and it is weak in terms of psychometric standpoint. It may be influenced by the attitude in a reversed direction that TRA proposed. Subjective norms being context-driven can be important in some settings but the system usage is not likely to be driven by social influences in an individual context (Dillon and Morris, 1996). Another difference between TAM and TRA is their determinants of attitude. Davis et al. (1989) claim that TAM’s determinants; namely perceived usefulness and perceived ease of use are more general predictors of system usage rather than TRA’s context related determinants.

One of the difficulties of applying TAM is the usage of the system to be tested should be voluntary (Adams et al., 1992). When the usage is compulsory as a job requirement, perceived ease of use and usefulness would be effective in terms of evaluating usage satisfaction rather than acceptance. This is one input for determining the instrument of this thesis’ survey study that product usage in military context is mandatory.

2.2.1.5. Unified Theory of Acceptance and Use of Technology

One of the most robust models that measure product acceptance is Venkatesh et al.’s (2003) recent study that syntheses existing models and propose a comprehensive method; Unified Theory of Acceptance and Use of Technology - UTAUT (Wu et al., 2007; Qingfei et al., 2008). Although being a novice model regarding TAM, it has also been used and extended by many researches (Henington and Janz, 2007; Wu et al., 2007; Qingfei et al., 2008; Gupta et al., 2008; Anderson et al., 2006) and will be used as the survey model of this thesis study as well.

The success of the model is its utilized content enclosing the constructs and scale items of prior technology acceptance models including TAM. In the flood of replicated, extended and modified acceptance theories in literature, the UTAUT stands as a revised source for the future studies.

The Figure 2.9 represents the Venkatesh et al.'s (2003) understanding of the conceptual summary of the eight leading models that explain individual acceptance of IT (some of them discussed earlier in this study) namely; Theory of Reasoned Action (Fishbein and Ajzen, 1975), Technology Acceptance Model (Davis, 1989), Motivational Model (Vallerand, 1997), Theory of Planned Behavior (Ajzen, 1991), Combined TAM and TPB (Taylor and Todd, 1995), Model of PC Utilization (Thompson et al., 1991), Innovation Diffusion Theory (Rogers, 1995) and Social Cognitive Theory (Bandura, 1986) (Venkatesh et al., 2003).

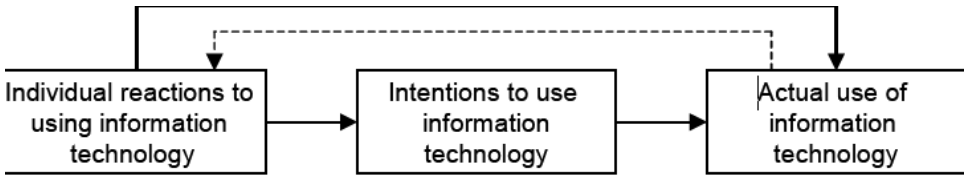


Figure 2.9 Venkatesh et al.'s (2003) basic concept underlying user acceptance models

Overall, the Figure 2.9 represents a cyclic model where all eight models share the *individual reactions* and *intention* to use IT as the determinants of *actual usage*. Actual usage in return affects the individual reactions of users.

Venkatesh et al. (2003) elaborate the determinants of the eight models by utilizing shared ones, modifying the scale items of some and excluding the ones to be inefficient in determining usage, after testing all of eight models' constructs and scale items with an empirical study. The Figure 2.10 represents the research model of Venkatesh et al. (2003):

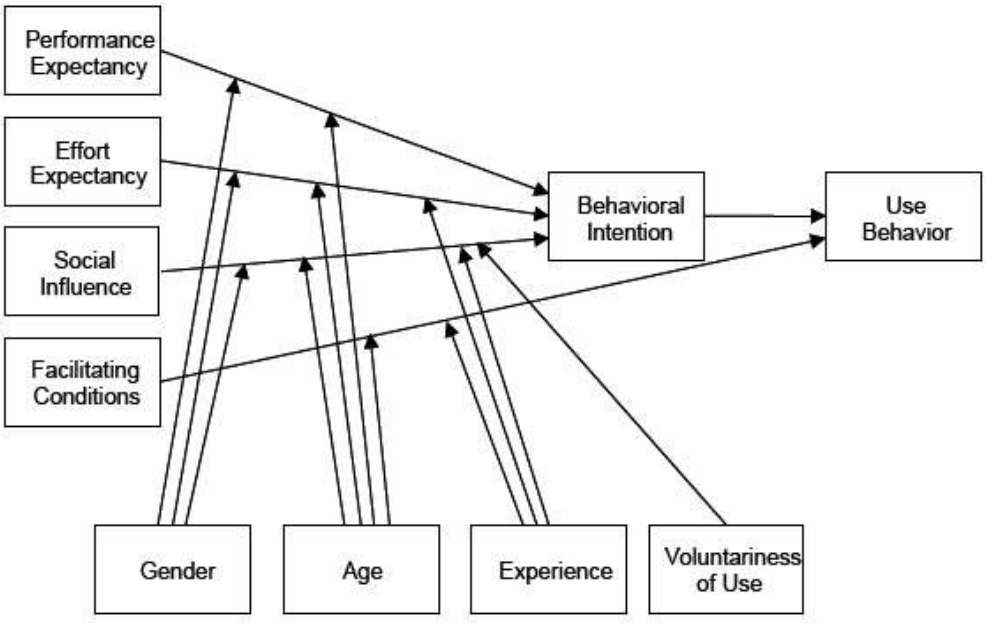


Figure 2.10 The research model of Venkatesh et al., 2003

As it can be followed from the conceptual framework in the figure above, the model anticipates three constructs to be direct determinants of the behavioral intention to use IT (with 70 percent of variance in intention; being practically at the limits of related literature; Venkatesh et al., 2003) and one construct to be direct determinant of usage. These determinants are defined as follows:

> ***Performance Expectancy***: "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" It is similar to *perceived usefulness* of TAM; *extrinsic motivation* of MM; *job-fit* of MPCU*; relative advantage* of IDT and *outcome expectations* of SCT. Performance expectancy is proposed to influence behavioral intention with moderating affects of age and gender, that is; the effect will be stronger for particularly younger men.
>
> ***Effort Expectancy:*** "the degree of ease associated with the use of the system". It is similar to *perceived ease of use* of TAM, *complexity* of MPCU and *ease of use* of IDT. Effort expectancy is proposed to be

effective on behavioral intention for younger women who have relatively decreased experience.

Social influence: "the degree to which an individual perceives that it is important others believes that he or she should use the new system" It comprises *subjective norm* in TRA, TAM2, TPB/DTPB and C-TAM-TPB; *social factors* of MPCU and *image* in IDT. Social influence affects the behavioral intention of particularly inexperienced older women in mandatory settings.

***Facilitating conditions*:** "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" It covers *perceived behavioral control* in TPB/DTPB and C-TAM-TPB; *facilitating conditions* of MPCU and *compatibility* of IDT. Facilitating conditions is proposed to be ineffective on behavioral intention but directly effective on usage specifically for experienced older workers. (Venkatesh et al., 2003).

On the other hand, *gender, age, experience* and *volunteriness of use (voluntary or mandatory usage contexts)* are the moderators of the model. Venkatesh et al. (2003) conducted a longitudinal study for six months in order to scale the effects of experience factor.

Three additional constructs appeared to be significant direct determinants of intention in prior models; *attitude toward using technology*: "an individual's overall affective reaction to using a system" (Venkatesh et al., 2003); *self-efficacy* and *anxiety*. However, UTAUT proposes that these three constructs have no significant effect on intention. Self-efficacy and anxiety being similar in their effects; these three construct are proposed to be captured by effort expectancy construct of the model.

Being consistent with other models analyzed in the study, according to UTAUT, *behavioral intention to use* has a significant direct influence on technology usage.

However there are some other studies that applied UTAUT and offered modifications for the model when applied to specific contexts. One of them is Wu et al.'s (2007) study on the user behavior on 3G mobile communication. The Figure 2.11 presents their research model.

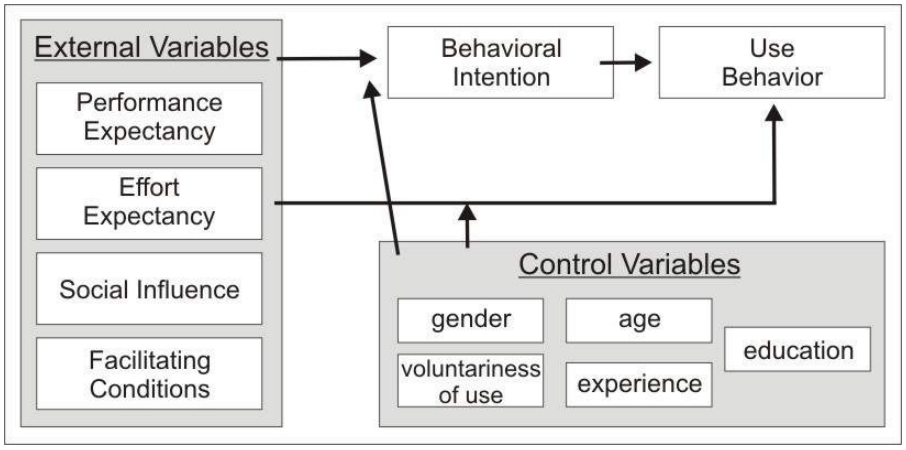


Figure 2.11 Wu et al.'s (2007) Research Framework

Their study showed that effort expectancy did not have an influence on the behavioral intention whereas performance expectancy, social influences and facilitating conditions had. Wu et al.'s (2007) study also revealed a direct influence of external variables on use behavior. They state that the differences in results regarding UTAUT model may be stemming from the industry type and the geographical area and the model should be applied accordingly.

Anderson et al. (2006) studied the drives behind students' adoption of PC tablets in a faculty setting for higher education context. They anticipated experience, age, gender and voluntariness of use as direct determinants of PC tablet usage. Their findings offered that the performance is the most significant determinant of usage between academics and administrators in terms of education. On the contrary, the effort expectance was not significant for acceptance. Moreover, the study results showed that the voluntary usage was influential for the use of given technology.

To put it briefly, given the literature consisted of varying models that explain user acceptance of IT, it is seen UTAUT model is the most robust model in determining individual use of technological products in an organizational context. Hence, this thesis benefits from the UTAUT model as the instrument of its survey study, yet; the model is extended by an additional construct which is *physical characteristics of the product,* assumed to have an influence on *effort and performance expectancy and anxiety* in order to cover all aspects of the predictors of military product usage. The research model of the study will be explained in detail in the next Chapter.

The following sections will be on the other studies that propose different measures including some of aforementioned ones for measuring user acceptance.

2.2.2. Expanded Measures for Technology Acceptance

In contribution to the well-known theories, some other researchers examined different variables for acceptance and system usage. For example, besides the supporters of the TAM, the efficacy of the TAM's measures for technology acceptance; namely perceived ease of use and usefulness have been criticized (Im et al., 2008, Baron et al., 2006, and Heijden, 2004). However their impacts on the system usage are not rejected completely, the efficiency of the constructs in overall is questioned.

Davis et al. (1992) proposed a revised model for TAM that analyzes the influences of users' *extrinsic* and *intrinsic motivations* on behavioral intention to use (Venkatesh, 1999). Intrinsic motivation refers to the "pleasure and inherent satisfaction derived from the specific activity" (Vallerand, 1997; in Venkatesh, 1999) while extrinsic motivation refers to the "performing a behavior to achieve a specific goal" (Deci and Ryan, 1987; in Venkatesh, 1999).

Similarly, Venkatesh and Davis (2000) proposed another extension for TAM, which they called TAM2. In TAM2, perceived usefulness and perceived ease of

use are defined as the direct determinants of intention to use excluding attitude from TAM. Considering the significant influence of perceived usefulness on intention, they concentrate on the drives behind this construct. Therefore they claim that the perceived usefulness is a dependent variable influenced by the social influence processes (subjective norm, image and voluntariness to use) and cognitive instrumental processes (job relevance, output quality and results demonstrability).

Im et al. (2008), on the other hand, claim that TAM is not efficient for all technology types. They explain that the consumers' decision-making criteria vary across different technologies. Their study involved *perceived risk,* which affect user's confidence in making decisions *technology type, user experience* and *gender* as the moderating variables of technology acceptance (Figure 2.12).

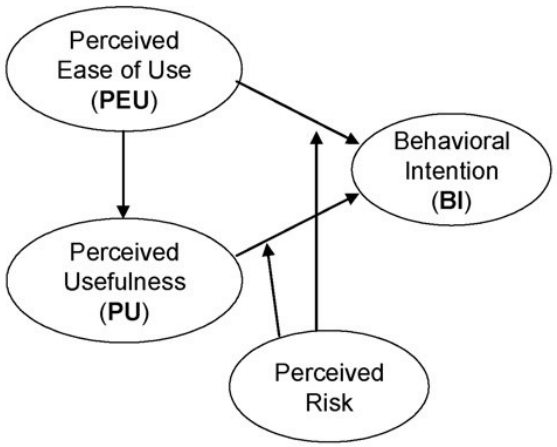


Figure 2.12 The conceptualization of Perceived Risk in Im et al. (2008)

Im et al's (2008) study on the acceptance of MSN Messenger, Webboard and wireless PDA by university students showed that, perceived risk changes the effects of perceived ease of use and perceived usefulness. When perceived risk about the adoption of a technology increases, perceived ease of use declines in return. Although hypothesized otherwise, the user experience and gender had little or no significant effect on users' acceptance of technology. Technology type; namely hedonic (self-fulfilling value to the user) and utilitarian (more job-related) usages on the other hand showed major effects on acceptance.

Regarding hedonic usage of any given technology, perceived ease of use should be emphasized, whereas utilitarian usage requires focus on communicating perceived usefulness through product. This is another input for this study that in military context, where the product usage is job related; the perceived usefulness of the product will have a stronger effect.

As another TAM extension, Wu and Wu (2005) offered a hybrid model for the adoption of Consumer Relationship Management in organizations, because they found TAM incomplete for predicting attitude towards using IS and system use. What they offer is the combination of Diffusion Theory and TAM (Figure 2.13) with an attempt to augment the attributes of innovation.

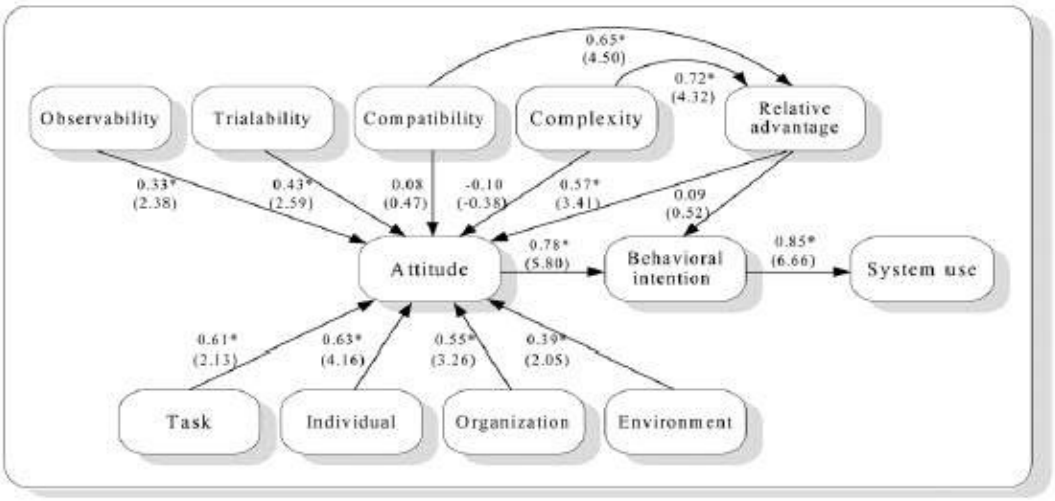


Figure 2.13 Wu and Wu's (2005) hybrid acceptance model

According to the model of Wu and Wu (2005) attitude and relative advantage are the direct determinants of behavioral intention which determines the system use, however the influence of relative advantage on behavioral intention was found to be weak. Observability and trialability of the innovational product together with task type, individual characteristics of the user and organizational and environmental factors affect attitude towards using technology. Compatibility and complexity of the innovation on the other hand were found to be indirect

determinants of intention that they have an influence on relative advantage of the innovation perceived by users.

2.2.2.1. Experience as a Moderator

Since the user-product interaction is a source to create user experience (Cila, 2008), the recent interest in the issue of user experience is not accidental (Hassenzahl and Tractinsky, 2006) in design field. Hence, the past experience of the user and its possible effects on the product acceptance is one of the concerns of this study.

User experience issues have said to be gained momentum as a reaction to the task and work-related usability issues, especially with the pioneering HCI studies (Hassenzahl and Tractinsky, 2006). However Hassenzahl and Tractinsky (2006) are complainants of the lack of empirical studies in user experience, it is a large and complex issue in terms of user-product interaction (Arhippainen, 2003). Researchers try to define theoretically what experience means, how it is created and what factors influence its quality (Forlizzi and Ford 2000 and Arhippainen 2003) as it is hard to make a simple and unique definition of experience.

Hassenzahl and Tractinsky (2006) conclude user experience as:

> "... a consequence of a user's internal state (predispositions, expectations, needs, motivation, mood, etc.), the characteristics of the designed system (e.g. complexity, purpose, usability, functionality, etc.) and the context (or the environment) within which the interaction occurs (e.g. organizational/social setting, meaningfulness of the activity, voluntariness of use, etc.)..." (Hassenzahl and Tractinsky, 2006, p.95)

Therefore, the user experience has three main dimensions which are user, product and the context of the interaction. Similarly Cila (2008) classifies the user experience models developed in order to understand its dimensions in three categories; product-centered, user-centered and interaction-centered models.

To clarify the literature and relate the concept with this study, two different kinds of experience are mostly sited; namely *user experience* (Mason and Bequette, 1998; Rompay et al., 2005) and *product experience* (Forlizzi, 1997; Forlizzi and Ford, 2000; Veryzer and Mozota, 2005; Kuleli, 2005), however in many cases the names are used instead of each other.

For this study, experience is *user experience* which indicates rather a physical interaction and may be replaced with *product knowledge* or *familiarity with the product* (Alba and Hutchinson, 1987). It is mostly a subconscious activity. Arhippainen and Tahti (2003) define user experience as "the experience that a person gets when he/she interacts with a product in particular conditions." It may be anticipated as a product related habit stemming from a "repeated interaction" (Rompay et al., 2005) with the product. For instance, a person who has a cellular phone does not get difficulty in using a new mobile phone while any other person who purchase a cellular phone for the first time would need more time in order to get used to it because he or she has no prior experience with such kind of a product.

In their study based on Lakoff and Johnson's (1980, 1999) works on linguistics and cognition, Rompay et al. (2005) state an interaction between human cognition and his bodily experiences in physical world. This proposition can be explained as having a body with its capabilities and limits draws the way we understand physical surroundings; that is objects. In this perspective, the ways consumers evaluate products highly depend on their previous interactions with other objects.

Hoch (2002) justifies author's two experience classifications by stating that people overrate their consumption experiences and mistake familiarity for real product knowledge, in other words real product experience. Additionally, he claims product experience to be seductive and ambiguous, that it may cause ill-defined analogies. He believes that learning from experience is a wrong statement; learning comes from an individual's own instrumental behavior.

Research Studies on Experience and Product Acceptance

Researchers have studied the influencing effects of user experience, expertise level and cumulated prior knowledge about the products through time on new product acceptability. For example, in an earlier study, Alba and Hutchinson (1987) divide consumer knowledge -assuming that consumers have some experience with particular products- into two: *familiarity* and *expertise* (Jacoby et al., 1986 in Alba and Hutchinson, 1987). Familiarity is "*the number of product related experiences that have been accumulated by the consumer"* while expertise is defined as "*the ability to perform product-related tasks successfully"* (Alba and Hutchinson, 1987). They propose that increased product familiarity results in increased product expertise, thus; success in product-related tasks. With increased *product familiarity,* the aspect of user expertise improves such that; cognitive effort to differentiate products, to analyze information, to elaborate on given information and to remember product information reduces. Similarly, *repetition* provides improved, automated performance.

Taylor and Todd (1995) questioned whether well-known models are predictive of behavior for inexperienced users and whether pre-offered determinants of IT usage are the same for experienced and inexperienced users. In order to examine these factors, they proposed an extended model for TAM, which they called Augmented-TAM. They included *perceived behavioral control* as a determinant and *experience* as a moderator for their study. The theoretical model and the correlations of the constructs can be followed in the Figure 2.14. They propose that ease of use and usefulness may have different influences on product acceptance depending on experience. As it mentioned before, the prominence of ease of use declines through time regarding the influence of usefulness (Davis, 1989). Correspondingly, Taylor and Todd (1995) points experience as the reason for that change.

They also proposed that for experienced users, the effects of behavioral intentions on behavior; perceived controls on behavioral intentions and behavior;

beliefs and attitudes on behavior; perceived usefulness and attitudes on behavioral intentions will be stronger. The effect of perceived ease of use on attitudes will be stronger for inexperienced users.

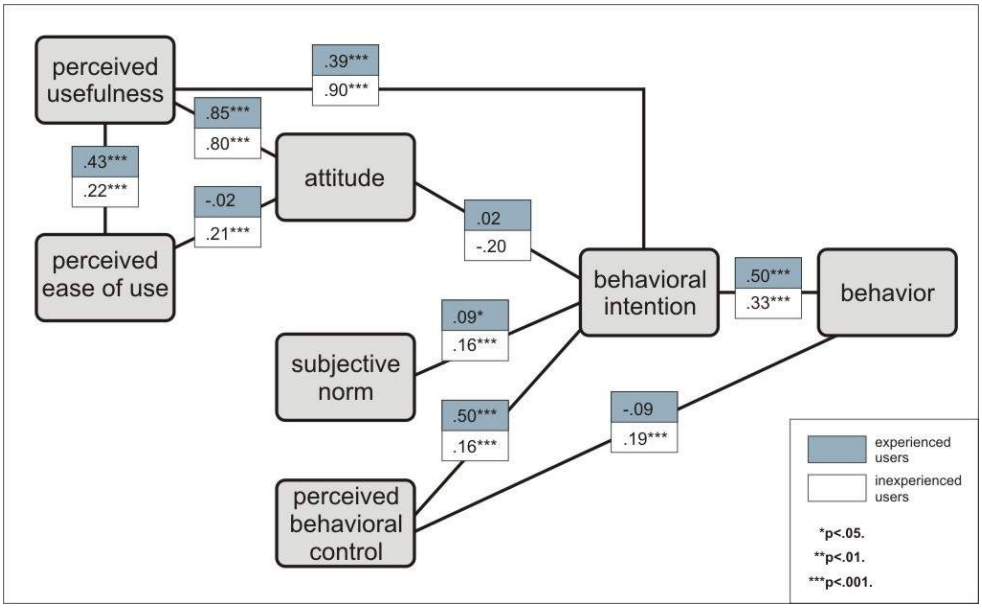


Figure 2.14 Standardized Path Coefficients for the Experienced and Inexperienced Users (Taylor and Todd, 1995)

Taylor and Todd's (1995) study surveyed the business school students' (332 experienced/119 inexperienced) voluntary usage of a computer resource center (CRC). After 12-weeks period, the usage measures are gathered based on *the total number of visits per user, total time spent in the CRC,* and *total number of projects completed in the CRC*.

The results (Figure 2.14) justified the Augmented-TAM as a valid model and what Taylor and Todd (2005) suggested, except from the high correlation between perceived usefulness and behavioral intention for inexperienced users. They were expecting a negative relationship between these constructs for inexperienced users but the study justified the opposite.

Szajna (1996) proposed a revised version of the TAM. Composed of pre and post implementation versions, the model compared the self-reported usage with actual use of the system. The study was longitudinal and aimed to reveal the effects of product experience factor by analyzing self reported system use measure in the pre and post usage responses. The results showed that the self-reported usage of the system is the surrogate of the actual usage and can not be fully representative.

2.2.2.2. Intuitive Use

Intuition means "perception without conscious reasoning" and "intuitive interaction involves utilizing knowledge gained through other products or experience(s). Therefore, products that people use intuitively are those with features they have encountered before" (Blackler et al., 2005, p.1). It is like putting up the light in the dark that you intuitively know where the button is on the wall and which way it is on or off.

According to Blackler et al. (2003) the products that facilitate intuitive usage will be easier to use, because there is no need to re-learn how to interact with the product. Nickerson (1999; in Blackler et al., 2003) states that people tend to misjudge products which are only familiar to be simple. That is to say that the familiar products are likely to be perceived easy to use.

It is possible to link intuitive use to product acceptance via product familiarity. Product familiarity effects perceived usability in a positive manner, and the increased perceived usability strengthens product acceptance.

There are practical applications of intuitive use, regarding the complex civil and military systems such as aircraft and helicopter cockpits, power-plant control rooms or vehicle driver panels. There seems to be a conventional design approach in terms of their interface design. Since these systems are required initial and controlled manipulation in especially emergency situations, such manipulation tools and their layouts are determined according to system-mission

scenarios and constrained refusing even minimal changes. For example, the layout of an ejection limb of a helicopter seat is defined strictly and can not be replaced. The pilots are trained for such emergencies (Wilson et al., 1988) as well as their standard missions and they manipulate such tool intuitively without spending extra time.

Similarly, the drive panels of automobiles are designed with conventional approaches that the critical information about the system progress such as velocity, engine speed or fuel indicators have to be placed in the viewpoint of the driver without obstructing the angle of view.

The sources of general design criteria and requirements of such critical systems are provided by professional and governmental organizations for both researchers and practitioners such as the American Institute of Aeronautics and Astronautics (AIAA); Advisory Group for Aeronautical Research and Development (AGARD-NATO).

2.2.2.3. Usability as a Dimension of Acceptance

Regarding Human-Computer Interaction (HCI) usage and current interest in usability issues, it is assumed that the more usable a technology is, the more it is accepted (Dillon and Morris, 1996). From that point of view, the importance of usability in terms of product acceptance is invaluable.

The emergence of usability as a vital feature of a designed product dates back to early 1980's (Bevan et al., 1991). International Organization for Standardization (ISO 9241-11, 1998; in Bevan, 1991) defines usability as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use." (p. 536).

Nowadays, usability has had new and broader definitions and the usability studies have gained speed parallel to the developments in information technologies. As the complexity and diversity of products increases, it becomes

harder to learn how to use them both effectively and “satisfactorily”. On the other hand, being functional or easy to use does not make a product satisfying anymore (Battarbee and Koskinen, 2005). Its harmony with other objects within its usage context, the purchaser’s personal taste, the experience that product evokes in customer’s mind, touch of its material and several other factors both of consumer and of the product itself are involved in the usability evaluation of that product and the purchasing decision of the customer that will make him a user.

The prominence of usability in terms of computer usage is highlighted by some researchers regarding acceptance such as Shackel and Richardson (1991). In the late 40’s, the users of computers were professionals who trade-off between the benefits of computerization and its difficulties in usage. In other words; the computers were acceptable despite their relative usability problems. Following decades revealed the potential of computers in a broader context and the user profile has changed. Hedonic and discretionary usage of computers rather than utilitarian usage increased and as a result; expectancies form IT products regarding usability issues were grown (Shackel and Richardson, 2001).

Shackel (1991) defines acceptability as a decision made after the trade-off between *utility* (fulfill the function or not), *usability* (work with successfully or not), *likeability* (suitable or not) and *relative cost* (regarding budget and social/organizational consequences) of the product. The theoretical model can be pursued in the figure below:

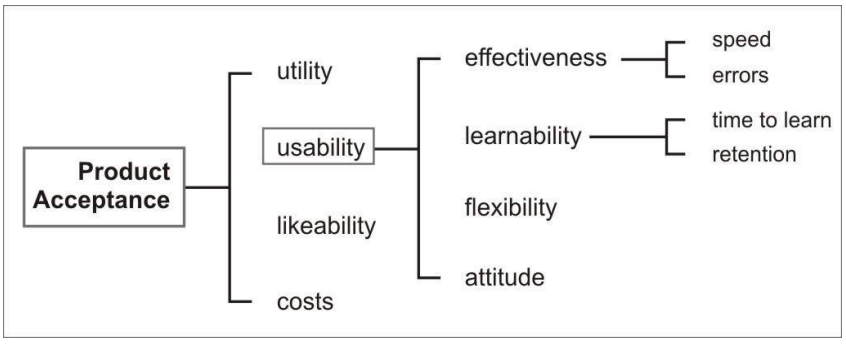


Figure 2.15 Shackel’s product acceptance model; in Keinonen (1998)

Nielsen (1993; in Keinonen, 1998) divides acceptability into two: *social* and *practical*. As the model suggests in the Figure 2.16, utility defined as "*the question of whether the functionality of the system in principle can do what is needed"* together with usability as; *"the question of how well users can use that functionality"* define the usefulness of a product. Usefulness on the other hand influences practical acceptability together with costs, compatibility and reliability.

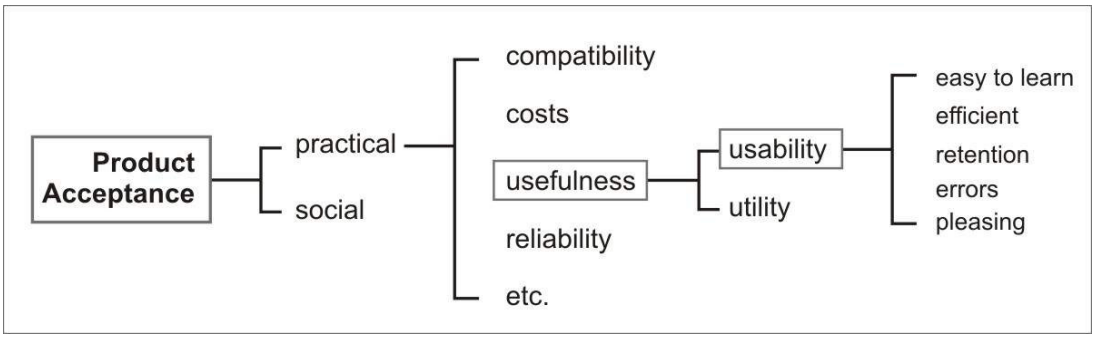


Figure 2.16 Nielsen's product acceptance model; in Keinonen (1998)

Another acceptance model that centralizes usability as an acceptance determinant is Dillon and Morris' (1998) P3 model that they state use of information technology is driven by *utility;* "technical capability of the tool", *usability;* "the extent to which users can exploit the utility of the system" and *user attitude:* users' preference between equivalent alternatives regarding their past experiences. These three factors are conceptualized through three Ps: *Power*, *Perception* and *Performance*.

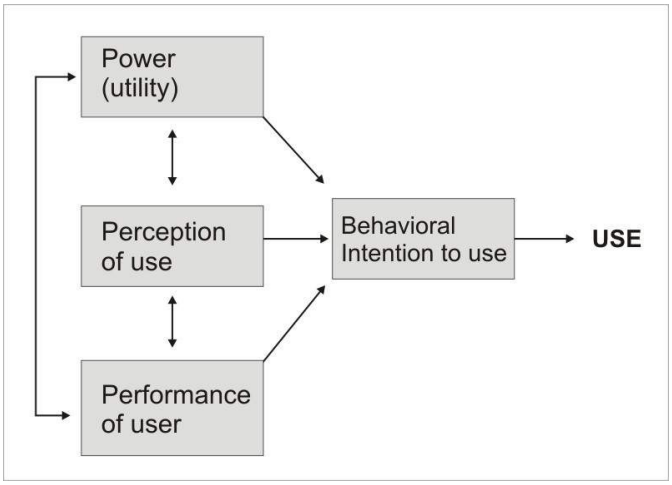


Figure 2.17 Dillon and Morris' P3 Model of Use (1998)

In their model (Figure 2.17); *power* is defined as "an objective measure of the applications capability/functionality"; *performance of user* refers to "behavioral measures of usability" and *perception of use* is "perceptual measures of users like utility, usability etc." (Dillon and Morris, 1998; p.5) These three constructs determine the users' intention towards the use of application.

2.2.2.4. Perceived Usability

In the literature, perceived usability is examined under different denominations, such as; *apparent usability* (Kurosu and Kashimura, 1995) and *expected usability* (Keinonen, 1997). The definitions of the term often address the relationship between aesthetic qualities of the products and the real/actual/inherent usability. In this relationship, the users' attitudes toward products during purchase period are the key motivation for the researchers. It is important to reveal what qualities of a product make it "look" and "perceived" more usable.

Idealized or planned usage of a product may not always represent the actual usage (Dillon and Morris, 1996). However companies provide pre-purchase trials for the products they sell, the actual usage of a product can only be determined totally and correctly by the user after buying and experiencing it in the real usage

environment (Cansızoğlu, 2006). Thus, it can be said that perceived usability is as important as the actual usability of the product. Cansızoğlu (2006) defines perceived usability as "before purchasing and using the product and in a purchase situation, the factor that makes the user perceive the product usable and makes him/her buy the product…" (p.30). However, being usable is not the only criteria to make a person accept a product.

Recently, Cansızoğlu (2006) studied the relationship between perceived usability and the visual appeal of the products. Findings of her study showed that the product familiarity increase the perceived usability of the products. That is; people tend to relate usability with their past experiences. She also stated that, one of the most important factors that affect purchasing decision is the product appearance. People give psychological and behavioral responses to product form related with their emotional states which is triggered by the previous experiences subconsciously linked with products' features.

These psychological and behavioral responses might be positive or negative; whether the purchase of the product or avoiding from the product. Therefore, perceived usability of a product may affect user behavior such as resistance towards products. So it can be said that, aforementioned prior expectations are actually the reflections of the previous experiences of the users and these experiences together with the perceived features of the product; such as perceived usability, may affect user acceptance in positive or negative ways.

On the other hand, satisfaction can be another determinant of user acceptance. Demir (2005) summarizes the dimensions of cognitive aspects of satisfaction as follows:

> "A consumer with high expectations may not be satisfied with a product whereas a consumer with the less expectation may be quite content. Whenever the confirmation of expectation fails theconsumer is consciously dissatisfied." (Demir, 2005; p.14)

Therefore; it makes sense to claim that the acceptance of a new product is committed to the satisfaction level of the user after product trial which is directly related to his or her expectations regarding prior experiences.

Usability and its extensions such as learn-ability and effectiveness together with utility and costs are important factors that users evaluate when they first put up with a new product. On the other hand, the purchase period is sometimes so limited that the product's actual usability is replaced with its perceived usability qualities such as appearance. However, if the user is familiar with the product with refer to his/her previous experiences; he/she perceives product more usable, thus it is more probable for him/her to accept new product since it corresponds with his/her expectations.

2.2.3. Interlude Summary

In the first section of the literature review chapter; the product acceptance and related concepts were explored. Grounded in the psychology and sociology literatures, the users' intentions to use information technology (IT) products; both in individual and organizational levels are explained referring to noted behavior models in other contexts such as marketing and management. The prominence of user attitude, the factors that affect attitude towards new products and varying measures offered by different researchers in order to predict user acceptance is introduced.

Information gained through other disciplines rather than military literature constituted a basis for the upcoming section of the study which analyzes the military context in terms of human-product interaction. So, the differentiation of two separate domains; military and civilian context will be compared and military point of view regarding product acceptance will be understood.

2.3. Military Context and Product Acceptance

Assuming that corresponding product requirements provide acceptance, scrutinizing military products and their evaluation criteria in the military literature shows that the acceptance phenomenon is regarded from the managerial point of view which deals with system efficiency. Military organizations themselves aim to increase the operator performance in order to better overall system efficiency by integrating human factors into systems engineering process; however the content of Military Standards for Human Engineering (DoD MIL-STD-1472F, 1999) highlights that the usability issues herein is limited to ergonomics regarding user requirements for increased system performance.

On the other hand, from the individual acceptance point of view, the acceptance research studies encountered in the military literature mainly deal with the preferences of soldiers for some specific consumable product groups such as food and protective sprays mostly in terms of their “convenience”. Some of these studies were relatively poor in their theoretical background and their methodologies regarding the intensity of the academic studies discussed earlier. The military context is recondite to some extend because of its “secrecy”; thus applications in both practice and theory may not be observable from outside but still it is evident that the military literature lacks of an end-user perspective since the use of a system is mostly evaluated by the upper management of the organization which may extend to governmental level. Therefore it is important to clarify the roles of user and purchaser in military organizations by analyzing the main structure of the context.

Next section begins with the analysis of military context since the characteristics of context are as important as the characteristics of the product itself (Bevan and McLoad, 1994). So, the user, task, environment and product attributes of the context will be explored and also the contents of some significant military standards will be scrutinized. Then, the military product acquisition doctrine will be discussed in order to understand acceptability concerns in organizational

level. Lastly, the place of human factors in military product design will be discussed with regard to relevant studies.

2.3.1. The Essence of Military Context

> "The computer's environment is the set of elements that satisfies all the conditions for a satisfactory "living" relationship to it. This recognition that a physical object exists in an environment which contributes to its value may be compared to our understanding that our own well-being depends on a healthy natural environment." (Margolin, 1988, p. 62)

Margolin's (1988) denotation of product environment suggests that in order to understand the effects of any given phenomenon in any given environment, it is critical to take into consideration the features of the context. Similarly, Arhippainnen and Tahti (2003) state that both features of the product and the context of use affect experiences of the user and his preferences about the use of that product.

To define the context literally, it is "the collection of relevant conditions and surrounding influences that make a situation unique and comprehensible" (Degler and Battle, 2000). Regarding the product usage, well known triad; *user, task* and *environment* are the basic elements of usability (Bevan and McLoad, 1994) and they determine the characteristics of context (Venturi and Troost, 2005). Similarly, Maguire (2001) defines the aspects of context in four main groups; system/product, user, task and environment.

In the literature related to military, the context itself is rather tacit information as stated before. For example, the strict rules and hierarchy in the structure of military which constitute its own existence are mostly assumed to be the matter of common knowledge. For instance, Jaeger and Cardello's (2007) work is valuable in order to derive clues about the features of military context. They mention to military context by means of dietary convenience:

> "Among institutional foodservices, nowhere is the convenience of food more important than in military feeding, where the extreme demands placed on soldiers by physical, psychological, temporal and environmental stressors make the convenience of food and foodservice essential to how much the soldier eats and even whether he/she eats at all. The consumption or non-consumption of military food also has important implications for physiological functioning, mission performance and survival." (Jaeger and Cardello, 2007, p.231)

As the example shows, the military operational context itself urges the formulation of products and their usage practices. Jaeger and Cardello (2007) state that military food mainly consists of ready-to-eat rations; which are shelf-stable, lightweight and portable in accordance with operational requirements. The same limitations are also valid for durable products.

Venturi and Troost (2005), in their study on the usability of naval combat systems, explore the metrics of the usability and the components of operational context together which compose the *quality in use*:

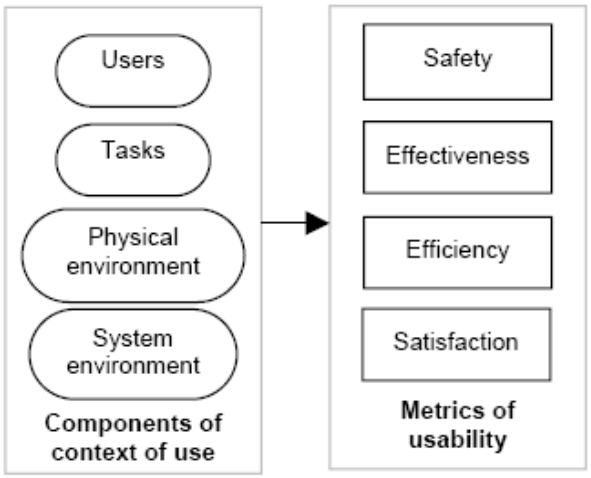


Figure 2.18 Venturi and Troost's (2005) Model of Quality in Use

Venturi and Troost (2005) state that the usability is measurable through its metrics; safety, effectiveness, efficiency and satisfaction, and can be defined only in a specific context which consists of user, task, physical environment and

system environment. It is seen that the safety criteria is fundamental for usability of a product in military context.

To clarify the overall domain, components of context; user, task and environment are analyzed in detail in the following sections in comparison with civil and military perspectives.

2.3.1.1. Soldiers as Users

User Role: As it is stated in Ettinger's (1990) study on the Command and Control Systems (CCS); in military context, the user roles are involved as an integral part of the system. Tasks are defined strictly, thus; the operator initiative is limited. On the contrary, user needs evolve into a more subjective domain in the design of everyday products which puts user in the center. Thus, user preferences play an important role. For example, Jordan (2000) defines the hierarchy of consumer needs as: Functionality → Usability → Pleasure, with reference to Maslow's hierarchy of needs.

U.S. Department of Defense (DoD) develops and publishes guides for the technical requirements of armed forces in different contexts such as electronic requirements, human-computer interaction guidelines and human factors issues with an attempt to increase the quality of systems produced for military usage. One of them; Military Standard for Human Engineering Design Criteria (MIL-STD-1472F, 1999) of DoD states its purpose as;

> "…to present human engineering design criteria, principles, and practices to achieve mission success through integration of the human into the system, subsystem, equipment, and facility, and achieve *effectiveness, simplicity, efficiency, reliability, and safety of system operation, training, and maintenance*." (MIL-STD-1472F, 1999, p.1)

The focal point of military standards seems to be the "mission" itself rather than the "operator" as it is in Jordan's hierarchy of needs. There is an "integration" of human into the system instead of adjusting system components according to user requirements. Recent studies emphasize the lack of a user-centered approach in systems engineering such as Hutchins (2000). Correspondingly, in

military literature, user is generally defined as “human” in order to differentiate it from the other components of the system such as machinery.

As an organization, military systems consist of different divisions which have different roles in the structure to fulfill different tasks. Consequently, roles of the user and their tasks vary according to this multiple structure. While operators are responsible to accomplish practical tasks such as using a computer system to detect an enemy attack; the role of a maintainer is to provide the continuity of the computer’s function.

User Profile: Regarding human-product interaction, the age has been analyzed as moderator in varying studies as stated before. In military context, ranks are generally in proportion with achieved success through professional life. Hence, the age variance can be seen as a determinant of experience in this context. The age of the military personnel reserves the indications of domain experience such as time spend in the profession, frequency of deployment in missions, frequency of product interactions and so on.

Since the physical fitness of soldiers is important in military missions, the average age of the soldiers who participate in operational tasks are relatively low. Thus, elderly soldiers generally hold commanding positions in proportion with their ranks. On the other hand, military schools accept individuals who choose soldiery as a profession. In this context, the age profile may drop to one digit numbers. However these children are rather candidates and excluded from military missions; hence, from the scope of this study.

War is historically thought to be the matter of men, however; the recent participation of females in armed forces and its effects on different variables are the subjects of an inclusive domain, and have been studied in their own right such as by Carreiras (2002). Therefore, the gender issue is out of the scope of this thesis study.

To conclude; in contrast to everyday products', military context naturally excludes a great range of user groups such as a great number of elderly, women and children.

2.3.1.2. Non-traditional Environment

Military environments should be analyzed in two circumstances: peace and battle. Similarly Thomas et al. (2005) categorize these circumstances into three in order to analyze the effects of work overload on soldier performance: *deployment* (battle environment), *garrison* (organizational settlement) and *training* (simulated battle conditions in peace). These three situations have different environmental features which in return require different approaches while examining user attitude towards military product.

Regarding the battle conditions; environmental characteristics of military differ from its civil counterparts with its extremes. It may be defined as "non-traditional" (Connelly et al. 2005 and Bennet et al. 2006). Bennet et al. (2006) define non-traditional environments as "rapidly changing without forewarning and hard to control" (p.1679). Severe weather conditions and high risk factors bring extended safety regulations both for users and system security. For instance; the term "rugged" stems from military requirements and design implementations which seek system durability under extremes.

Being akin for their contextual characteristics such as environment, user expertise levels, safety regulations and stress factor; health care facilities, power plant systems and maintenance areas are grouped in the same category with military systems in usability studies. Connelly et al. (2005) for example, specify military maintenance areas among non-traditional environments which also includes mobile healthcare facilities and emergency response. They also add that conventional field study evaluation techniques can not be used in these non-traditional environments, because they do not account for limited space, testing equipment, privacy concerns, safety, and stress associated within (Connelly et al., 2005).

Psychological and physiological stress is also an important factor for military operations. Regarding the mean effects of combat stress, military managements try to analyze varying stressors and minimize their effects on soldier psychology (Stein et al., 2008). Stress affects operator performance during cognitive activities such as decision making and immediate response to short-term signals. For example, regarding faulty pilot decisions; Wickens et al. (1989) state two important factors; experience level of the pilot and stress level of the environment in which the decision is made. Increasing complexity of the systems, task and environment also increase the stress factor that causes high frequencies of errors and accidents (Hutchins et al., 1996). Emergency situations for example are the most influential stressors in a flight operation since they are rare but may have catastrophic results (Wilson et al., 1989).

2.3.1.3. Task of Expertise

It is explanatory to have a look at Farley's (1999) description of a military pilot's standard mission scenario in order to understand the features of an ordinary military task:

> "The correct weapons need to be chosen and arming procedures initiated, others deselected, the weapon aiming displays will need changing together with the correct mix of external sensors, radar, laser, infrared or low light level TV, target identification and marking as well as defensive equipment selections will vary depending on which of these four jobs is being done, so may self-identification procedures and perhaps data links and radio communications with control authorities and meanwhile, don't forget to fly the aircraft and keep a lookout because your life depends upon it." (Farley, 1999, p. 327)

As it is stated by Farley (1999), in military applications, because of life risk factors, each and every step is defined strictly and users are supposed to apply each step one by one in order to accomplish a given task. Thus, training becomes inevitable for each of these tasks. Similar task requirements may be found in aviation agencies and nuclear plant control systems in civil context. From privates to higher ranks and expertise levels, this application remains the same. For complex systems, however, operator expertise is required and

advanced training is provided mostly by the designer/producer of the system. Availability of training for such systems may result in a positive attitude towards the use of the product. The users may underestimate serious usability problems because of increased perceived usability of the product.

Experience, Training and Expertise

The proportional relationship between experience and expertise is apparent. As Taylor and Todd (1995) state; the knowledge gained from prior behavior shapes intention in part, because experience makes knowledge memorable. However, experience is an intangible concept that can not be relied on (ISO 20282-1.2, 2003) and can not be measured in full. On the other hand, the number of successful task compliance increases the speed of future tasks (Langdon et al., 2007) and consequently increase performance. Therefore with the growing performance through experience, the novice users evolve into experts. Posner (1988; in Koshman, 1996) defines the characteristics of experts as speed and strong self monitoring skills.

Since user performance is the main criteria of military success, training is a daily routine for military organizations in peace conditions in order to increase expertise as a provision for battle. Training helps using technology affectively by assisting users with conceptual and procedural knowledge. Besides the significance of training for military tasks, the training cost is also an important phenomenon. While increased efficiency and effectiveness of training process is needed such as providing virtual simulators; the cost of related technology and equipment, the cost of labor are all problematic issues for military context.

2.3.2. Military Requirements and Standards on Product Development

Pre-mentioned military standards are the bibles of engineers, designers and experts who take part in the development of military products, whether in military or civil defense industry. There are nearly a hundred military standards and handbooks of U.S Department of Defense (DoD) and NATO that technically

state the minimum requirements of military products; from minimum corrosion durability requirements of a mechanic connector to the optimum illumination value of a military shelter and to the minimum dimensions of a submarine stair depth and labeling of an electricity cable. Design Criteria Standard Human Engineering (DoD-MIL-STD-1472F, 1999), Test Method Standard for Environmental Engineering Considerations and Laboratory Tests (DoD-MIL-STD-810F, 2000), Standardization Agreements (NATO-STANAG) and Allied Quality Assurance Publications (NATO-AQAP) are four of the most resorted standards in defense industry.

These standards also benefit from ISO and other sources that guarantee the quality of industrial products and services. Technically, the acceptability of a military product is determined by its compatibility with the requirements defined in military standards and guidelines; however this compatibility does not guarantee the product acceptance in practice. Yet, the formal acceptability measures can be traced from these sources.

There are some significant requirements that these military standards have in common; *performance*, *safety*, *reliability* and *maintenance* criteria. These measures are vital for the quality of a designed product or system in military context.

Performance: The main criteria to explain the success of a military mission is its performance. In order to increase the performance of a system the performance of its components “men” and “machine” should be increased. In order to increase operators’ performance and the overall system performance in return, producers benefit from human factor studies and guidelines as it will be discussed in the coming sections.

Safety: The human-factor studies showed up in military aviation area as a discipline which is benefited for decreasing the incident rates and acquire safety in late 80’s (Harris, 2006). In accordance with aforementioned features of

military tasks, Gilbert et al. (2007) state that “safety in dangerous activities depends on the avoidance and elimination of errors and failures by strict application of the rules and by the control of that application” (p. 961). From that perspective, it is meaningful to state that in order to provide safety especially in battle conditions; both products and their usage are under control in military context. On the other hand, safety of military missions is also directly related with the reliability of the system.

Reliability: With the requirements of safety criteria, the systems used in military operations have to be reliable. The reliability refers to physical and functional features of the product/system in order to maintain its intended purpose. Since the failure of a military system in a battle conditions results in catastrophic consequences such as casualties of men and other values which is defended, the tolerances of military products to such failure is limited.

Physical requirements caused the emergence of the “ruggedness” concept. Literally *rugged* means “rough” and “strongly built” (Longman Active Study Dictionary of English, 1991). The rugged products and ruggedization doctrine originally belongs to military applications where the reliability issue is vital, although some durable products have also been marketed as rugged in civilian markets.

Rugged products have some significant physical attributes in common; such as form, color and material. Regarding the durability and safety requirements of such products for extreme usage contexts, the material and method used for their production and the camouflage regulations makes them different from non-rugged civilian products in terms of their appearance. On the other hand camouflage necessity forms the color ranges of such rugged products. Green for land forces, beige for desert conditions, grey for naval combat systems and camouflage patterns are characteristic for military equipments. Unlike in emergency applications which mainly uses phosphoric colors to make products distinctive in the work environment, shiny and high contrast paints are other

restrictions in military applications in order to protect systems to be detected by enemy forces. Some examples of military products are given in the Figure 2.19 and 2.20.

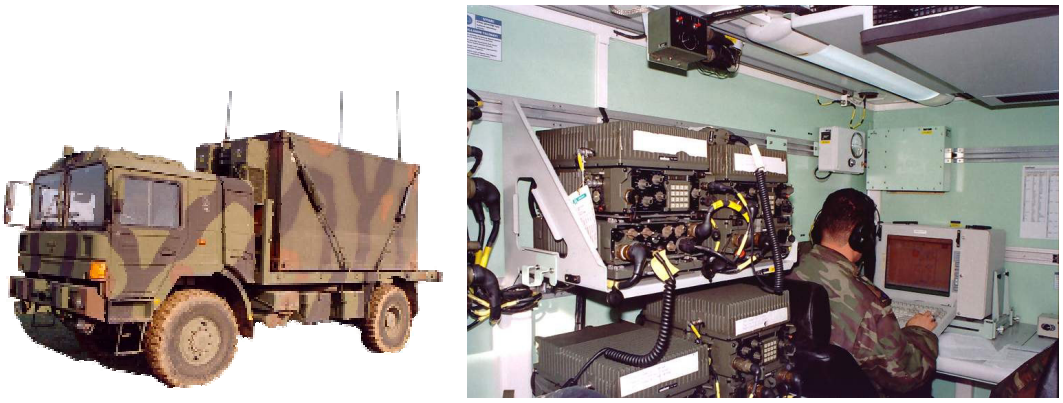


Figure 2.19 Exterior and Interior of a mobile shelter unit and rugged devices (ASELSAN Inc.)

Figure 2.20 Rugged hand held computer and rugged weapon control unit (ASELSAN Inc.)

Being relatively rough, heavy and large; creates a common product language for rugged products. Although today's engineering technology gives researchers to design more durable products in smaller dimensions with neat appearance; the soldiers who get used to read this language may assume an air of opposing

attitude towards relatively a delicate looking product regarding its durability and therefore its appropriateness to be used in extreme conditions.

Maintenance: Maintenance of a system provides the continuity of the mission. Strain and Preece (1999) define the task of a maintainer as a part of logistic support on availability, reliability and maintainability of the system. In MIL-STD-1472 F (1999), the qualities of military systems are mostly defined according to three main states which are normal, adverse and emergency situations. However, military systems are designed to function in battle conditions (adverse and emergency); a greater portion of their life-span passes through training and maintenance activities in peace conditions since real battle conditions are rare. Systems are required to be available in any emergency and this is the reason of the importance of maintenance. Especially in limited conditions such as the shortages of time, personnel or tool, the system should be easy to handle and intervene for the continuation of the task.

2.3.3. Procurement Process and Trade-Offs

At the highest level, countries' armament strategies and the investments quantities on weaponry have been interest for researchers of ethics, politics, sociology and economics. The effect of armed forces on social life is another phenomenon, since policy of armament is vital in terms of both national and international balance. On the other hand, regarding military systems, it is possible to obtain information about product evaluation in military context by means of its organizational procurement process, since the consumers' decision to purchase a product reflects their product evaluation criteria.

Aforementioned features of civil organizational practices are also valid for military. It is important to state that in military context, individuals do not purchase, indeed; it is the governments who make the procurement decision and it is a cost-based regulation (Rogerson, 1994). Being nationwide (also worldwide with regard to globalization issues) organizations consisted of

geologically spread units; decision of purchase in military organizations especially for large scale procurements is committed to governments that regard national strategies and politic influences at the time. Hence, unlike in the civil world, there is no individual ownership of a product in military usage; the users are accountable for the products they use towards management. Furthermore, it is likely to be misjudging or underestimating of a product's usability since the purchase decision is made by the charged personnel who are not actually the end users most of the time.

In a generalized manner, objective of a military operation is expressed as casualties of men and material, loss of territory and achievement of goals (Jaisval, 1997). Correspondingly, the measure of effectiveness in military can not be expressed in terms of cost as it is in civil operations. From that perspective, the procurement process in military can not be evaluated with cost. Instead, the utility of the purchased products and weapons in terms of their efficiency in achieving desired goals should be the priority of procurement decision.

On the other hand, development, production, training and maintenance costs are the most discussed subjects in military context. There are many studies seek the ways to reduce cost for such practices. For example, Rogerson (1990) states that the governments prefer technologically advanced products in small numbers rather than conventional products in large scales. According to him, this situation leads to a less effective defense because the maintenance of such advanced products is relatively high in cost considering compatibility problems and training requirements.

The significant model of Mackie and Wylie (1988; in Kantowitz et al.; 1997) is an attempt to explain the acceptance criteria in the procurement of large military systems which are "expensive, one-of-a-kind systems that were deliberately designed to solve relatively specific problems" (sec1_03). In the model, so called

model of innovation acceptance, cost is proposed as an indirect determinant of acceptance as presented in the figure below:

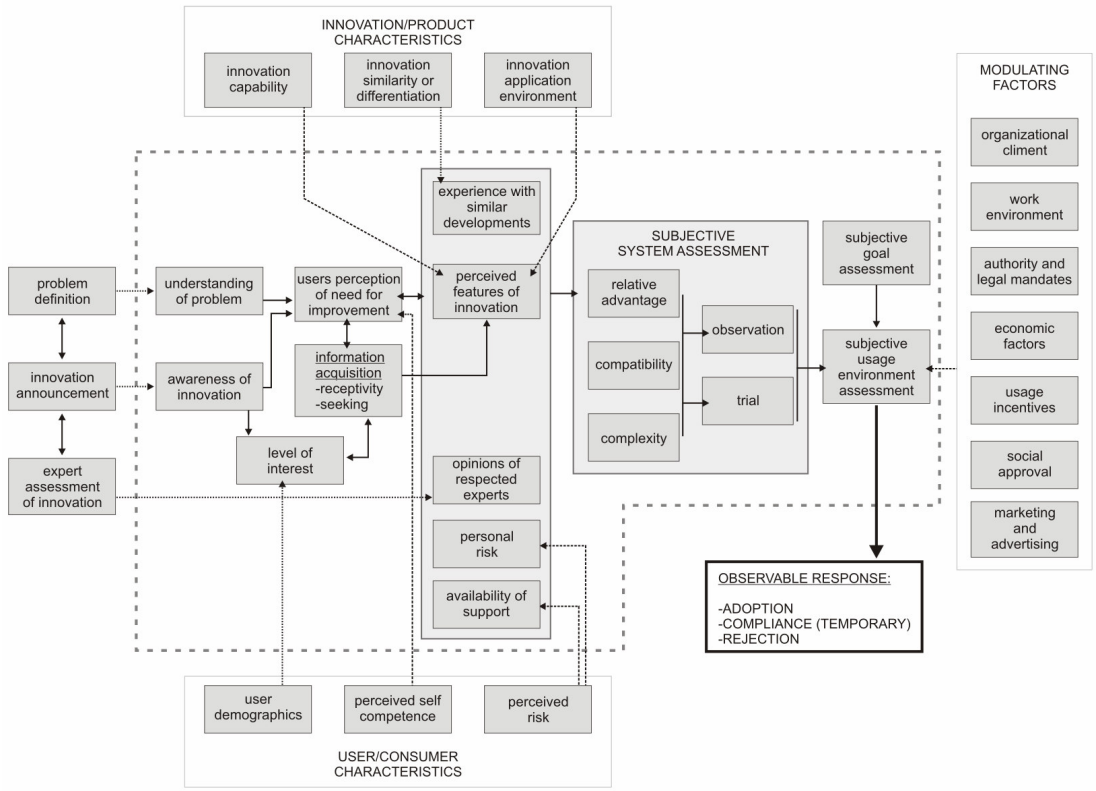


Figure 2.21 Mackie and Wylie's model of innovation acceptance in organizational level (adopted by Kantowitz et al., 1997)

According to Mackie and Wylie (1988; in Kantowitz, 1997), with the introduction of the problem and the offered innovation for this problem provide the user awareness of the situation. After comprehension of the problem, product and user characteristics which involve users' past experiences with similar products, perceived features of the product and the assessments of perceived risk and availability of help all support to determine whether there is a need for the very product and if it is worth further evaluation. In the second stage, the subjective assessment of the system occurs regarding *relative advantage*, *compatibility* and *complexity* of the product by *observation* (source of empirical data) and *trial* (hands-on experimentation with the product) (Kantowitz et al., 1997). Subjective system assessment is the factor that will constitute a result *attitude* of user

towards product; however Kantowitz et al. (1997) believe that attitude is not highly correlated with the behavior. *Subjective goal assessment* on the other hand is another factor that affects user attitude. It refers to the assessment of the factors that are related to the adoption process such as commuting time. *Subjective usage environment assessment* is the last component of the model that determines the response with a trade-off between negative and positive results of the pre-mentioned factors and the utility of the product; whether acceptance or rejection and other alternatives between these two.

Moreover, the moderators that are represented at the right-hand side of the model indirectly affect the response towards the new product. Kantowitz et al. (1997) give the example of mandatory factors which may provide an obligatory use of the product but unwillingly. Additionally, the economic factors may obstruct acceptance of the product although it is perceived as an adequate solution for the need.

To sum up, the model of Mackie and Wylie (1988; in Kantowitz et al., 1997) is a comprehensive and specific method for explaining both individual and organizational factors that determine the acceptance of military products. It resembles the aforementioned individual and organizational adoption models of Woodside and Biemans (2005); where as it is more complicated and difficult to apply for smaller systems. Furthermore, almost all constructs of the model are covered by the UTAUT model of Venkatesh et al. (2003).

2.3.4. Studies on Human Factors and Usability in Military

Usability evaluation dates back to the emergence of HCI studies (Hartson et al., 2000). In 1980's, human factors researches were first integrated into military systems design process by the US MANPRINT program which aims to increase soldiers performances by bettering man-machine interfaces (Strain and Preece, 1999). The necessity of such a renewal stemmed from the increase in design-related usage errors which leaded up to indelible disasters. Since then, in most

of the studies regarding military systems, the human factors and usability is examined in terms of operational performance and efficiency (Strain and Preece, 1999; Harris, 2006; Siegel et al., 2001; Lundin, 2004).

Hence, usability studies on military systems today specifically concentrate on the HCI; mostly via the platforms on which they are used: Command and Control Systems (CCS), vehicle interfaces (Farley, 1999 and Anttila et al., 2003) and mobile electronics.

For example, a study was conducted by Hutchins (2000), in which she analyzes the system use problems of some different military systems including aircraft systems, communications systems, weapon systems etc. with the measures of efficiency: *performance, safety, usability, reliability, maintainability, time and cost to train,* and *workload.* Herein, the usability is stated to be "concerned with the interfaces between the human and hardware, the human and software, the human and facilities" (Hutchins, 2000). Therefore, usability is proposed to be the determinant of efficiency which directly affects system use. On the other hand, the measures safety, reliability, maintainability, time and cost to train and workload was not counted as the determinants of system use in pre-mentioned industrial product researches.

Hutchins (2000) also states that lack of a user-centered design strategy leads to difficulties in operation and training, frustration and workload for the users of such complex military systems. Furthermore, she notes that such systems require highly skilled users to overcome those difficulties and this situation causes availability problems. It is a fact that the performance of such advanced systems is inefficient due to the lack of expert users.

Koshman (1996) conducted a similar usability test in order to evaluate the effects of different expertise levels upon the usability of Visual Information Browsing Environment (VIBE). She used Sneiderman's five measurable human factor goals in order to evaluate usability. They were; *system familiarity time,*

task performance timings, task errors, system feature retention and *subjective satisfaction*. She used three groups of users with different expertise levels which is the independent variable of the study. Novice users, online experts and VIBE experts are the user groups. Although, with reference to different sources; Koshman (1996) states that the participation of novice users is questionable. Accordingly, the participants should be selected among target groups for the sake of test results.

Regarding the scope of usability concept in military context, it is possible to state that the studies in military field regarding the aforementioned extensions of usability are outdated by the studies of consumer products. However, the recent version of Human Factors Design Standard (DOD-HFDS, 2003) defines the user-centered design with an extensive perspective as "focusing on the needs and requirements of the end user throughout the design, acquisition, or development process" (p.2-9), it's observed in practice that, human factors are not integrated well enough into military product design process to achieve both usable and "acceptable" military products. Correspondingly; Venturi (2004), as HCI consultant of Thales Group, one of the biggest military electronics company in the world, made a survey via World Wide Web among the user centered design (UCD) practitioners employed in large companies and small consultancies in the sectors of electronics, communications and finance; in order to explore UCD difficulties they have experienced. The results define the biggest problem as the "usability communication" between producers and costumers. Below enlisted the open ended problems that discovered:

> "P1. In projects there is often hardly any involvement of the customer in the domain modeling; the context of use is seldom used as guidance for the design and, as a consequence, it is impossible to define the usability requirements for the interface.
> P2. It is very difficult or impossible to get feedback from the user after the product is deployed, unless the program clearly specifies it: usability tests are seldom employed in most of the military programs in Europe.
> P3. The Usage-centered approach was accepted because it is fitting quite well in the whole Rational Unified Process and because it is founded on a structured analytical design process (Domain → Task → Interaction →

> Implementation) and therefore culturally close to the traditional engineering culture. Anyway, it does not really impact, as intended, the degree of user involvement in the design process." (Venturi, 2004; p.3)

2.4. Summary

Overview of the literature regarding product acceptance shows that information technology, innovation diffusion and consumer behavior researchers give the issue great importance both academically and practically. The growing dependency of the practices in organizational and individual levels to technology is shown as the reason to that increasing importance (Dillon and Morris, 1996).

Assuming that product acceptance and user acceptance are identical concepts, acceptance literature is a bit fuzzy regarding its basis which is a bundle of diverged disciplines listed above. Psychology and sociology seem to be the meta-disciplines in terms of human behavior structure and they constitute a basis for the others.

There are many resembling theoretical acceptance models that define different groups of determinants, as a result; the situation force researchers to "pick and choose" one of them and mostly ignore other alternatives (Venkatesh et al., 2003) or modify them pragmatically by adding or removing some of the constructs. The situation underlines lack of a unified and comprehensive model for user acceptance. The *Unified Theory of Acceptance and Use of Technology* (UTAUT) (Venkatesh et al., 2003) for example, is an attempt to cover this necessity.

On the other hand, experimental studies seem to be divided into two in terms of the subject of the phenomenon; the one that study the product acceptance drives (mainly IT products as mentioned) for individual usage (Saaksjarvi, 2003; Heijden, 2004; Pikkarainen et al., 2004); and the others that analyze the drives of product acceptance and system usage in organizational level (Ramayah and Lo, 2007; Behrens et al., 2005). Most of these studies are the modified

applications of well-known IT acceptance theories; such as Davis's (1989) the most utilized theory of Technology Acceptance Model (nearly 400 times, Yousafzai et al., 2007) which explains the determinants of individuals' IT usage in the organizational level.

The literature review in military domain shows that the usability studies in the field mainly concentrates on the objective usability measurements such as efficiency, task completion and errors. They focus on whether the users can use the products excluding user intention. It can be said that the user intention and acceptance is still an underestimated determinant for military product assessments.

The following chapter will explain the structure of the survey study in which it is aimed to reveal the user response towards new military products. It begins with the elaboration of the motivations behind its formulation process and overall design.

CHAPTER 3

METHODOLOGY

This Chapter presents the survey study conducted in order to explore the main interest of this thesis; the factors that affect user acceptance of new products in military context. In order to identify those factors, the answers of the following sub-questions are examined in design, psychology, sociology, marketing, management and military literatures:

- What are the dimensions of user behavior towards new products?

With the first question, the drives behind the users' attitudes towards the 'new product' concept in the way shaping end behavior towards new products are analyzed.

- What are the factors influencing user acceptance of new products?

With the second question, the theories and models that explain the influences on users' acceptance of new products are explored.

- What are the features of military context by means of product acceptance?

The answer of the third question helps to understand the influences of product evaluation criteria in military context with an attempt to predict the compatibility of aforementioned acceptance models in military context.

In order to see the correspondence of the findings of literature review with military context and reveal other factors that affect user acceptance, a user survey is conducted among the members of this specific context. Pre-mentioned

model of Venkatesh et al. (2003); Unified Theory of Acceptance and Use of Technology (UTAUT) is used as the main structure of the survey. Following sections present this survey study; its formulation and conduct process.

The author had made an unpublished study in 2007 in order to analyze the factors that affect product resistance in relation to perceived usability in the context of military products. A prototype version of an incremental product, namely “New HT” was used as the study material. With an availability sampling, 14 participants were accessed. This preliminary study is presented briefly in the Appendix A, since the results provide some significant outcomes for the preparation of this study’s methodology.

The Chapter starts with the exploration of the methodology, the model used as a frame namely Unified Theory of Acceptance and Use of Technology and its modification means are also discussed. Following chapters explain the study material and the characteristics of the participants and the venue of the study. Lastly, the procedure of the survey is described.

3.1. Overall Design of the Survey Study

In the light of the scanned literature, the literally well-known user acceptance models such as Technology Acceptance Model (TAM), Theory of Reasoned Action (TRA), Theory of Planned Behavior (TBP) and Unified Theory of Acceptance and Use of Technology (UTAUT) were examined in detail according to their applicability for military context. Selecting the model that involves as many measures to scale these constructs as possible was critical, because it was unclear that which factors were dominant for the military context.

Considering TRA and TPB, they are relatively pioneering models which have been basis for recent models and have been modified and extended through academic history. One of the most robust models is TAM which involves two main determinants of acceptance; perceived usefulness and perceived ease of

use. However it is easier to apply; as it is stated before, the model is appropriate for voluntary usage. Since military tasks and product usage is mandatory, TAM was not appropriate for the purpose of this study. Consequently, among the existing models, the UTAUT model of Venkatesh et al. (2003), which is explained in detail previously (Section 2.2.1.5), was found to be fully comprehensive and up to-date in terms of its scope and usage. There are three main reasons of the selection of UTAUT as the quantitative research model:

- It is the most robust model in recent literature.
- It is applicable for both voluntary and mandatory usages.
- It has a comprehensive content that includes the constructs of eight prior models.

3.1.1. Data Collection

As an exploratory study, the survey consists of two main parts respectively; qualitative and quantitative studies. These studies are conducted consecutively.

3.1.1.1. Qualitative Study

The aim of the first part of the survey study is to obtain users' subjective interpretations about the introduced product they met for the first time. Therefore, after the introduction of the product, the participants are requested to use it for a few minutes per se in order to help them evaluate its usage with regard to the preceding products in use. During the trial period, seven group discussions are held with four to six participants. The discussion specifically aims to capture users' expositions about their expectations regarding the usage of introduced products (Knutsen, 2005), since users' in-depth motivations are valuable in terms of the measures which may not be captured by the upcoming questionnaire content. The thought provocative environment of group discussion is preferred in order to enrich the quality of the meeting and also to provide participation of possible invert users in discussion by reducing the stressors such as the psychology of being tested.

The discussion is guided through open-ended questions like:

- What are your general opinions about the product?
- Do you think it is usable in your context? Why?
- What do you expect from such a product?
- What are its shortages?

Where needed, the questions are narrowed down spontaneously such that the respondents are required to give detailed explanations about the reasons of their responses.

Data Analysis Method

The findings of the qualitative session, in which a round-table discussion was held, are subjective declerations of the participants regarding the features of the product they try and its future usage. With special focus on the intrinsic motivations, users' expactations are captured and collected data is used to create a 'clustered summary table' (Knutsen, 2005) which indicates the frequency of users' acceptance criteria. Related keywords are grouped under different categories of measures and their causal relationships are captured. The categories are defined according to Venkatesh et al.'s (2003) study and other studies explored previously. The definitions of the used constructs and their root sources are listed in the Table C.1 in Appendix C. The overall findings are analyzed in comparison with the results of the following quantitative study.

3.1.1.2. UTAUT as a Quantitative Study Instrument

In the second session of the survey, the users are required to fill in a paper-based questionnaire including the scale items of both UTAUT measures and related other measures that are designated as significant in military context. The main purpose of this study is not to scale the validity of the UTAUT or create an alternative product acceptance model for the military context but rather to put forth the pre-mentioned measures of prior models for consideration in this specific context. However, the UTAUT model is not fully applicable for this study

that it needs some modifications in order to provide compatibility. Correspondingly, the UTAUT model was already analyzed in terms of its constructs, scale items and moderators by different researchers and they also made necessary modifications in order to augment its compatibility with the studied context (Allen and Kishore, 2006; Hennington and Janz, 2007; Wu et al., 2007; Qingfei et al., 2008, Gupta et al., 2008).

As mentioned before, UTAUT was formulated with three determinants of intention; *performance expectancy*, *effort expectancy*, *social influence* and one direct determinant of use; *facilitating conditions*. These measures are scaled with four items each and self reported behavioral intention to use is scaled with three items. Additionally, there are four moderators of the model: *gender*, *age*, *experience*, and *voluntariness* of use. (Venkatesh et al., 2003)

These measures will be analyzed in detail in order to better understand their significance for this study.

Performance Expectancy (PE)

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" (Venkatesh et al., 2003). Since performance is one of the most important crieteria in military applications, performance expactancy is tought to have a positive effect on users' attitudes towards the military products.

The measure is scaled using the original items of UTAUT with appropriate wording. On the other hand, one of the construct items which is "*If I use the system, I will increase my chances of getting a raise*" is omitted since it is not a valid attribute in military doctrine.

Effort Expectancy (EE)

Effort expectancy is defined as "the degree of ease associated with the use of the system" (Venkatesh et al., 2003). Due to the military context and positive

influence of percieved ease of use on perceived usefullness (Davis, 1989); effort expectancy is expected to have a positive influence on users attitude towards military products. The measure is scaled using the items of UTAUT with appropriate wording.

Social Influences (SI)

Social influence is defined as "the degree to which an individual perceives that it is important others believes that he or she should use the new system" (Venkatesh et al., 2003). It is said to be significant in terms of user acceptance of a new product in especially mandatory settings (Venkatesh et al., 2003). Thus social influences is expected to have a clear effect on attitude towards the use of military products. The measure is scaled using the items of UTAUT with appropriate wording.

Facilitating Conditions (FAC)

Facilitating conditions is 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). In Qingfei et al.'s study, the FAC measure is replaced with *convenience* and *cost* for its adaption in m-commerce context. For this study; FAC can be explained as the organizational opportunuties (procedural training and maintanance) and acquisitional processes (eg. post-purchase training) that will support the individuals' use of a new product. Therefore, training and maintanance which are counted as important elements of military applications are involved in this construct. Thus it is valuable to state that, positive beliefs about the facilitating conditions should create positive intention to use a product. However, Venkatesh et al. (2003) claim that the facilitating conditions have no significant influence on intentions but on system use, since this study does not measure the real usage it is not possible to see the effect. Instead, the study accepts self-reported behavioral intention to use responses as the determinants of use, therefore the facilitating conditions is believed to have an effect on behavioral intentions however the effect is expected to be weak.

Behavioral Intentions (BI)

As stated before, all eight models of acceptance included in UTAUT, UTAUT itself and other recent studies (Allen and Kishore, 2006; Wu et al., 2007; Qingfei et al., 2008) state intention as the direct determinant of system use. Interestingly, Gupta et al. (2008) found no relationship between intention to use and actual usage of the Information and Communication Technology (ICT) products however they state that the intention is relevant where the technology is new for the users and if they have not used the product before. Since the products tested in this survey study are not launched yet, users' first impressions regarding the introduced material is evaluated with an attempt to predict their future usages. Therefore, regarding the usage of PDA and MPC in military tasks, intention becomes relevant.

One of the major differences between UTAUT and this survey is the role of behavioral intention. While UTAUT takes system use as dependent end-variable, this study takes behavioral intention as the dependent end-variable. This study does not measure real usage. Because the usage is mandatory and the users are obliged to use any given product in one way or another; it is more important to see if the products will be used willingly and therefore more effectively. Hence, users' self-reported behavioral intentions are accepted as the determinants of their future usage.

On the other hand; the original items of this construct were not applicable for the study because they were referring to the personal decision to buy and personal owning of the products in the future which are not valid circumstances for military context. For this study, two of the original items are rearranged so that they scale the user requisition for organizational procurement of the products in the near future and one item is omitted since it was overlapping with another when translated accordingly.

Apart from PE, EE, SI and FAC; this study includes four more measures which are *attitude*, *self efficacy*, *anxiety* and *physical characteristics of the product*.

Attitudes (ATT)

Another major difference between UTAUT and the structure of this survey is the role of attitude. Defined as “an individual’s overall affective reaction to using a system” (Venkatesh et al., 2003, pp.455); attitude is excluded from the UTAUT model. Combining the constructs of previous models such as “attitude toward behavior” of TAM, TRA and C-TAM-TPB, “intrinsic motivation” of MM, “affect toward use” of MPCU and “affect” of SCT, attitude refers to “an individuals liking, enjoyment, joy and pleasure associated with technology use” (Venkatesh et al., 2003, pp.455). Its effects are said to be captured by PE and EE since ATT was found to be affective only when these two constructs were removed from the UTAUT. Thus the relationship between attitude and intention is a spurious one (Venkates et al., 2003). On the other hand there are other researchers who emphasize the importance of attiudes in terms of mobile products. For example, Knutsen (2005) claims that expectancies are the determinants of attitudes and therefore attitude concept should be more effective in predicting future usages in terms of mobile services.

Regarding the novelty of PDA and MPC use in military context, it is resonable to analyze the effects of users’ expectancies on their attitudes towards this new products. Therefore, attitudes are included in this study and the measure is scaled using the items of Venkatesh et al.’s (2003) study with appropriate wording.

Self Efficiacy (SE)

Defining self efficacy as “judgment of one’s ability to use a technology (e.g., computer) to accomplish a particular job or task” (Bandura 1986; in Venkatesh et al.; 2003, pp. 432), Venkatesh et al. (2003) could not find a significant effect of SE on system use. Indeed, their findings indicated that SE effects were captured by the effort expectancy. However, for military context, SE is decided to be significant for its own in determining one’s attitude towards the use of a new product. Since the personal expertise and performance of the users are critical for the success of military tasks, the users’ SE is thought to be effective when

evaluating a new product. Therefore, the SE is included with the appropriate wording of the items stated in Venkatesh et al. (2003).

Anxiety (ANX)

Defining anxiety as "evoking anxious or emotional reactions when it comes to performing a behavior" (Venkatesh et al., 2003), ANX like self efficacy was also found to be mediated by effort expectancy (Venkatesh et al., 2003). Thus, it is proposed to have no effect on intention. Whereas the military context itself is intolerable for user mistakes since these mistakes may cause fatal loses. That's why safety of both user and the system is essential. In terms of military usage, the users' anxiety related to possible mistakes is thought to be effective on their attitudes towards usage. Therefore, anxiety is re-added to the model and it is expected to have a negative effect on attitude. The measure is scaled through the original items stated in Venkatesh et al. (2003) with appropriate wording. Additionally, an item of the ANX has been excluded in order to prevent repetition.

Physical Characteristics of Military Products (PCoP)

With regard to the previous study that conducted in 2007 (Appendix A), one independent variable that is not considered by any of the prior models is included in the model: *physical characteristics of the product*. As stated before, military products have different aspects than civilian products in terms of their appearances such as form, material and color. Soldiers expectations regarding product form is essential due to the usage context. Hence, it is important to see the effect of military products' physical characteristics on user attitude. But the effect of PCoP on attitude is expected to be indirect via performance expectancy, effort expectancy, self efficacy and anxiety constructs.

Consequently, the following items "*Thinking of its purpose and usage context; (1) The product form is appropriate, (2) The color of the product is appropriate, (3) The material of the product is appropriate*" and *(4) The general form of the product is appealing*" are added to the questionnaire.

Experience (EXP) as a Moderator

In UTAUT, the experience of the users is regarded as the experience with the tested material since the longitudinal study aimed to measure differences between the responses and usage statistics through time. It is seen that experience mediated the effects of effort expectancy, social influences and facilitating conditions. Through time and gained experience, the significance of experience increased in terms of its effects on social factors. For this study, experience is analyzed in two aspects: *domain experience* which refers to users' experience with procedural usage of IT products in military context; and, *technology experience* which refers to users' familiarity with computer usage for hedonic purposes. These two measures are used to scale the experience level of the participants. Assumed to have equal strenght; the mean values of work experience, frequency of product usage for job related tasks, ownership of IT products and frequency of their usage data are gathered in order to measure experience level for each respondent. As Venkatesh et al. (2003) suggested, user experience is expected to moderate individuals' acceptance of IT products.

Age variance is expected to have a slight moderating effect on user responses since age influence is thought to be partially captured by experience of the users as it is expleined before. Therefore, the moderators of UTAUT, which are age, gender and voluntariness of use, are excluded from this study regarding pre-mentioned limitations of military context.

Additionally, the validation of the material selection is provided by the personal opinions of the participants about the *innovativeness of the used material*. Since it was the first time that they used military MPC and PDA, the participants are asked to rate five scaled item; "I find the product innovative", in order to determine whether the products are also innovative from the users' perspective.

Therefore, the initial research model of the study is formulated as schematised in the Figure 3.1:

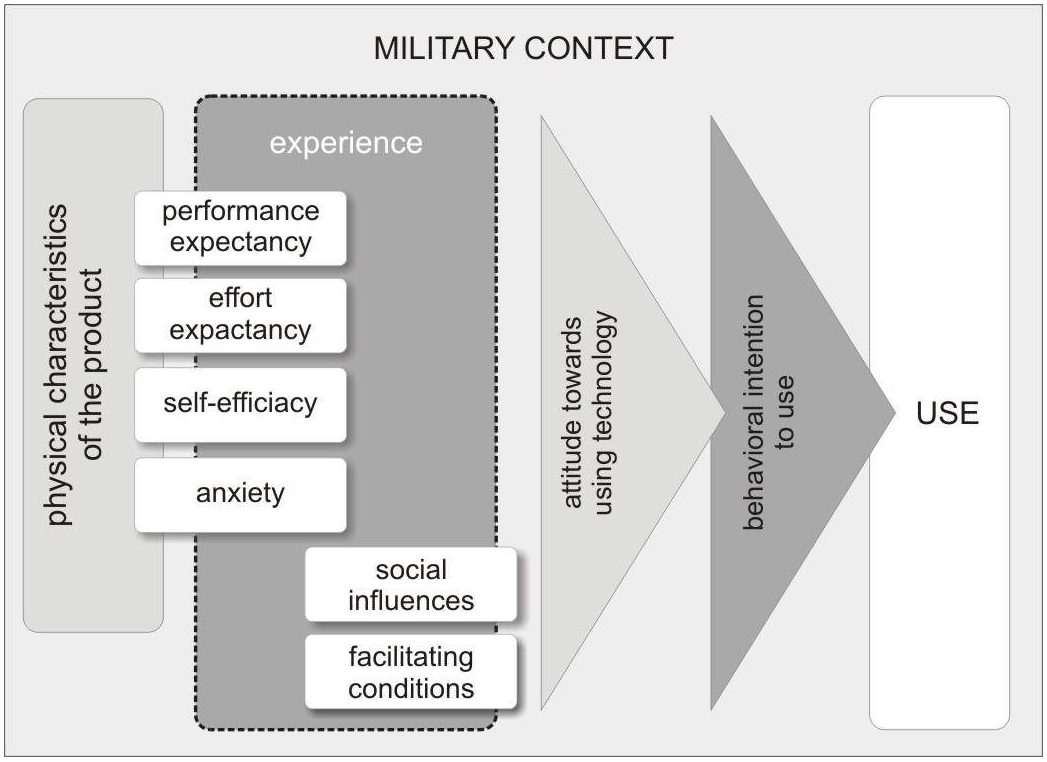


Figure 3.1 Initial Research Model

To sum up, the main instrument of the quantitative study is a paper-based questionnaire for each participant containing five point Likert-scaled items. There are a total of nine measures and 33 items to be scaled. Respondents are asked to rate each item on the scale; where “1” refers to “strongly disagree” and “5” refers to “strongly agree”.

The survey was conducted in Turkish which is the native language of all the participants. The interpretations were done regarding the tense used in (constructing) the items. Since the participants were going to use the product for the first time, scale items were in a combination of future and simple present tenses (Venkatesh et al., 2003). Original items were used directly without any modification except from the necessary interventions for the sake of interpretation.

Data Analysis Method

Indeed, complex analysis method combinations were used in order to analyze the results of quantitative session. Firstly, a factor analysis (with *SPSS v.13*) was used in order to scale the validity of the constructs (The item loadings can be found in the Table D.1 in Appendix D). It is seen that even the original items of UTAUT were not distributed clearly. Especially for performance and effort expectancies, the items loaded in the same construct which means that the items scale the same variant. The results were also evaluated according to the responses for both PDA and MPC separately in order to see if the problem is caused by the differences between the used products. However the distribution was better for PDA, the same problem was still valid for the loadings of MPC results. Although the additional measures resulted in an acceptable loading for the items, the situation indicated a further evaluation of the scale items.

Secondly, a Structural Equation Modeling is conducted with *Lisrel (v.8.51)*, in order to formularize the UTAUT and the initial model proposed, however the results showed nearly any significant relationships except from the physical characteristics of the product – performance expectancy and performance expectancy – behavioral intenion. Therefore the data is analyzed with the regression analysis method (Gupta et al., 2008) in order to bring out the relationships into open.

3.1.2. Population and Sample

With respect to the civilian, military population is too small. Especially regarding the user group of a special military product, it is difficult to accumulate a large number of test participants. Therefore, in this study an availability sampling was made.

The target user group of chosen products were occupied in a garrison of Turkish Land Forces. So, the seniors of that garrison were informed about the study and the procedure. After getting permission for the study, the determinants of sampling such as the usage experience of preceding products of MPC and PDA

were explained. Doing so, a number of 37 participants were accessed. They are the practitioners of a military Command Control System (CCS) and the potential users of MPC (21 participants) and PDA (16 participants). Users' reactions towards these new devices are important in terms of predicting the real usage and the success of their future implementation in the system. They have varying experience levels regarding CCS and the preceding products namely Hand Terminal (HT) and Fire Direction Computer (FDC).

The mean age of the participants are 30,4 and whole participants are men with regard to the Turkish military doctrine. Additionally, the voluntary participation of the users was not cogent, since the study was conducted in a military settlement by the regulation of senior management. However, the participants were informed about their ethical rights and academic purpose of the study.

3.1.3. Products Chosen to be Used in the Study

The products used in this study are two different rugged hand-held military devices; namely Mobile Personal Computer (MPC) and Personal Digital Assistant (PDA) (Figures 3.2 and 3.3). However, the materials are working prototypes in the final stages of their development processes.

Figure 3.2 MPC and its usage (Aselsan Inc.)

Figure 3.3 PDA and its usage (Aselsan Inc.)

These devices are small ruggedized computers with embedded software used in a CCS for communication and data transfer between different military units of hierarchical levels such as command control centers and operators of weaponry who are spread out in a territory. For a brief description, the CCS's in general allow users of weapon units to transmit location and situational data to the center unit and allow center unit to transmit tactical data to multiple weaponry in different locations. These units generally consist of weaponry, electronic devices such as radars, receivers, antennas, radios, computers to control weaponry against threats and the operators who manipulate overall system. Automation, speed and accuracy of the information transfer is essential for the success of such military systems.

As it is explained in military context section, the technological military products are the components of large systems. A single device is mostly inert in order to accomplish complex tasks, so are MPC and PDA. For example, the generators for system power, power distributors, screening monitors, antennas and radios

for communication and countless cables between those are mostly the minimum configuration for the fulfillment of a specific task in a CCS system.

The selection of MPC and PDA for the study in this perspective is reasonable because they are both innovative in terms of their technical capabilities and usage practices regarding the preceding devices in use which are Hand Terminal (HT) and Fire Direction Computer (FDC) (Figures 3.4 and 3.5). HT is a rugged laptop-like computer with embedded mechanical keyboard and micro joystick. Rugged FDC, on the other hand, is rather like a desktop PC with separate rugged monitor and keyboard with embedded trackball. Both devices are used fixed in a mobile or stable military unit such as shelters, vehicles or weaponry.

Figure 3.4 FDC and its usage (Aselsan Inc.)

Figure 3.5 HT and its usage (Aselsan Inc.)

There are some advantages of MPC and PDA regarding their preceding versions; firstly, wireless communication enables mobility for the users which is thought to be practical in battle conditions. The users are free of the cables that require a physical connection between different components of the surrounding environment (Schwarz et al., 2004). Regarding an enemy attack or invasion, such key devices containing secret military information are easy to reassemble and protect instead annihilation of the system. Secondly, the touch screen usage provides a precise interaction with the software rather than embedded joystick or trackball which are widely used in the preceding devices. Being relatively too small and light, they are also easy to operate in deployment conditions.

MPC and PDA used in this study have slight differences in terms of their technology. MPC is rather a recent technology for its processor and high capacity internal hard disk in a small size. PDA on the other hand being relatively smaller in size has also a smaller processor capacity and run a simpler operating system than standard PCs and MPCs. However the products are designed to be used in the same military system, they have different usage purposes because of their embedded software. The MPC software is more complicated since it has to make some complex mathematical calculations in the background and therefore it needs a stronger processor. It also has a few more screens on the user interface. However, overall designs of both user interfaces

are similar. The appearance of the screens, the architecture of the menus and the placements of the buttons and so on are identical (Figures 3.6 and 3.7). Indeed, it is possible to use MPC instead of PDA with the exchange of software since it is more capable.

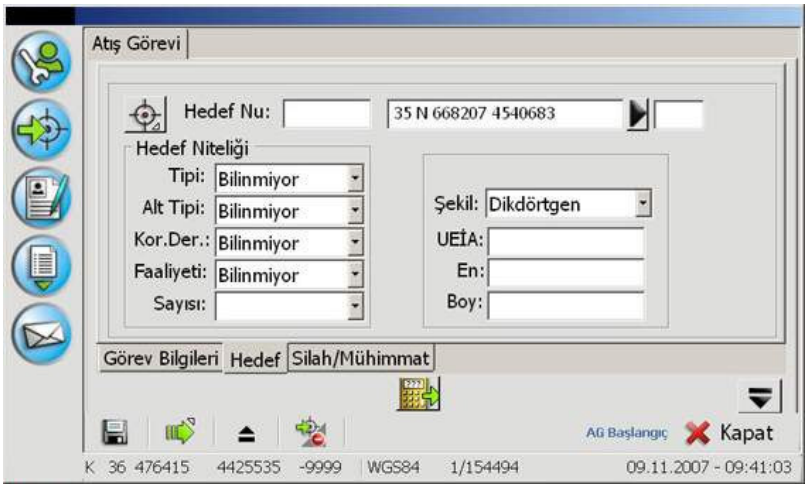


Figure 3.6 Sample screen-shot from MPC software (Aselsan Inc.)

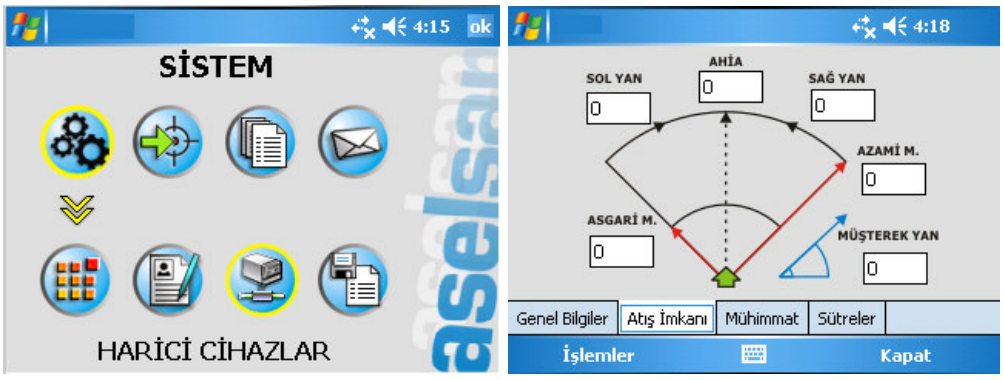


Figure 3.7 Sample screen-shot from PDA software (Aselsan Inc.)

In practice, the industrial PDAs and MPCs are widely used in different contexts. Usability issues related to mobile computing discussed in both civil and military domains (ie. Rao and Troshani, 2007; McCabe, 2004; Kjeldskov and Skov; 2003; Kjeldskov et al., 2004). Especially the introduction of PDAs into military

usage has attracted attention in recent years. Being light, mobile and simple make them advantageous in many circumstances. For example, the usage of PDA's by American army in Iraq operation has been discussed in military journals. Advantages and limitations of this technology in a battle environment have been criticized.

However, there are some shortages of the used material in this study. Being prototypes, their technical capabilities are unrefined that hinders their full capacity performance during trial. Whilst the participants are informed about these shortages, they may still effect the users' evaluations.

3.1.4. The Conduct of the Survey

The study was conducted in a military garrison in where the participants are employed. The management of the organization was informed about the study one week earlier before the test date. The participants were gathered in the facility at the pre-arranged date and time.

At the beginning, the participants are gathered in a conference room and two conductors, including the author of this study, made a speech about the intention of the study after introducing themselves. Regarding the number of the participants, a time schedule was arranged for one and a half work days; nearly twelve hours.

3.1.4.1. Participants

The user sample consisted of 37 sergeants of different work definitions namely; weapon commanders (16), fire direction experts (15) and forward observers (6) of a fire direction system. Weapon commanders are the target users of PDA (16), whereas fire direction experts and forward observers are the target users of MPC (21). They have different domain expertise varying between one to five years experience in fire direction systems.

Since the participants are the members of Turkish Army, the whole test population were men. Thus, as stated earlier, the gender is not counted as a variable for the survey study.

3.1.4.2. Environment

The test room was a 10-seated simple meeting room with basic furnishing and it was sun-lighted. A rounded meeting table and chairs were available. The setting layout of the test room can be seen in the Figure 3.8.

As the military policy regulates, one of the senior managers of the organization attended to the meetings as an observer.

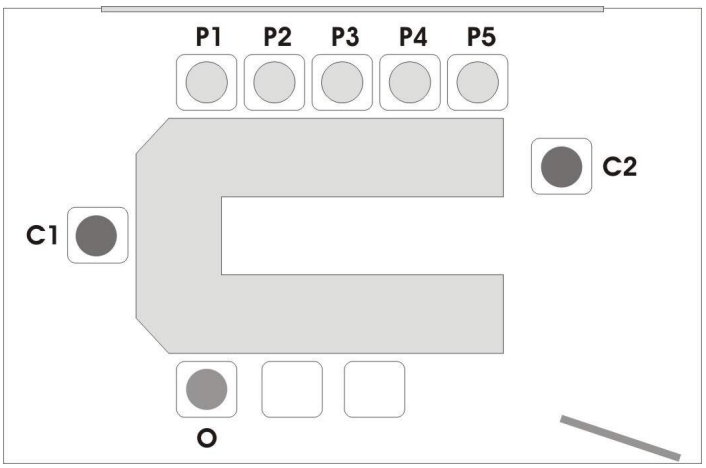


Figure 3.8 Layout of the Test Environment
(*P: Participant, O: Observer, C: Test Conductor*)

3.1.4.3. Procedure

The study is composed of three sessions. The total duration was approximately 30 minutes for each group.

1-Warm-up Introduction

At the first session, the participants are accepted in the test room as groups of four to six people according to their job definitions in the organization. These groups were consisted of target users of MPC or PDA. After the warm-up period

of nearly five minutes including a brief description of the procedure and its objective, the related product, MPC or PDA is introduced to the participants. Technical and usage differentiations of the product are described and they are requested to test the material for approximately two or three minutes per se.
The participants are allowed to ask questions about the usage of the product at any stage of the test procedure.

2-Round-table Discussion

The first session was followed by a simple brain storming discussion in order to obtain users' subjective oral evaluations of the product. The discussion was oriented by the conductors' spontaneous questions regarding the usage of the product. Featured attributes of the products are tried to be revealed from the participants' point of view. Since the study was conducted in a restricted military facility, the audio-visual data recording was not allowed. Thus, one of the conductors had to note down main arguments discussed on the paper.

3-Questionnaire Study

At the final stage, each participant was asked to fill in a paper based concluding questionnaire. The questionnaire is consisted of afore-mentioned demographic informations and five point Likert scaled items. The questionnaire form -both native and english versions- can be found in the Appendix B.

In the upcoming Chapter, the results of aforementioned survey study will be explored and the findings of the study will be discussed.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1. Survey Results

In this section of the Chapter, the results of the survey study will be explored. The statistical findings will be analyzed regarding the qualitative and quantitative studies respectively. In the second section of the Chapter, the statistical results will be discussed with refer to the findings of literature review study.

4.1.1. Results of the Qualitative Discussion

The raw data gathered from the qualitative discussion is the participants' self-reported statements regarding the usage of PDA and MPC with refer to the preceding products in use; HT, FDC or any other product they have used in the same category. The statements of the participants during discussion were noted down and these statements are analyzed in terms of their intrinsic motivations. For instance; the statement of one participant "…*with the previous product [HT] it was difficult to move…*" is categorized in both relative advantage (RA) and effort expectancy (EE) measures. Furthermore, a causal relationship is formed between these two measures through RA→EE. It means that, the product is evaluated according to the participant's effort expectancy by means of its relative advantage. In Figure 4.1, the frequency of the measures mentioned during whole discussions can be followed. Those measure categories are selected from UTAUT measures and Venkatesh et al.'s (2003) study in which pre-mentioned acceptance models and their constructs are evaluated.

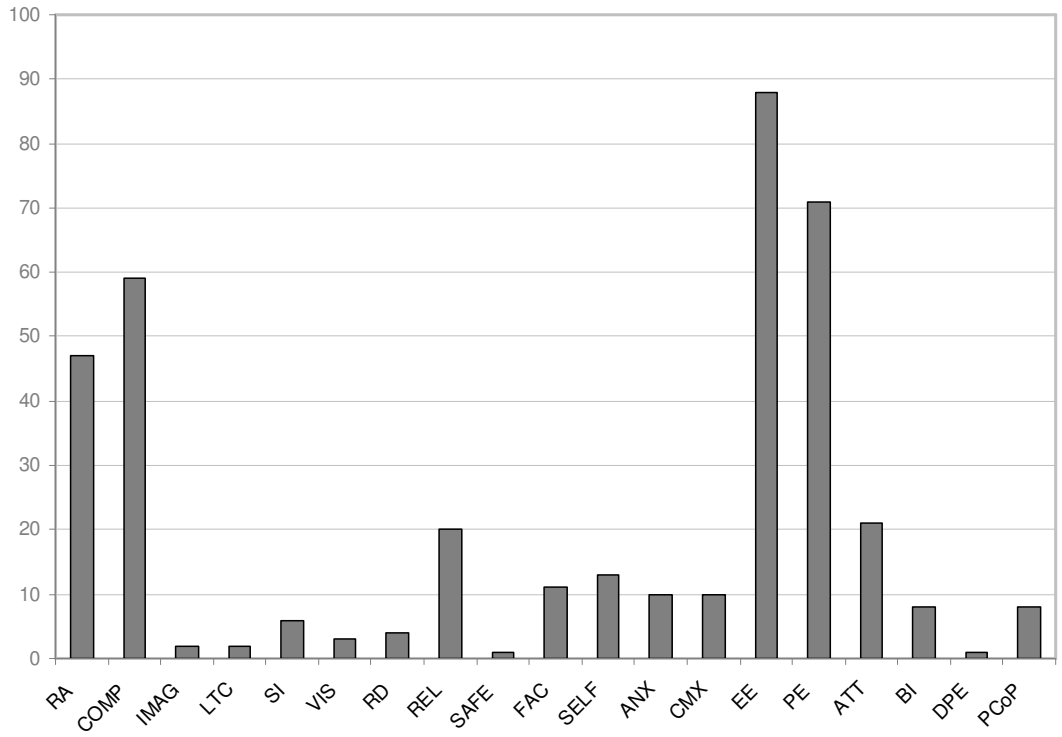


Figure 4. 1 Frequency of the measures mentioned during discussion

As Figure 4.1 shows, out of 192 statements including a total of 385 measures; the leading measures were effort expectancy (with %23), performance expectancy (with %18), compatibility (with %15) and relative advantage (with %12). However, many of the responses were not direct statements naturally. When they evaluate the product in comparison with preceding products, or when they evaluate them with regard to the aspects of military usage context, the responses automatically fell into the relative advantage and compatibility measures. On the other hand, compatibility and relative advantage were indirect measures moderating the evaluation, since they refer to effort and performance expectancies of the users. For compatibility, %27 of the responses referred to performance expectancy and %36 of the responses referred to effort expectancy. Similarly, for relative advantage; %15 of the responses referred to the performance expectancy of the users while %43 of the responses referred to the effort expectancy. The results were similar for other measures stated during

the discussion. Clustered summary table of the constructs summarizes the causal relationships between major constructs (Figure 4.2).

On the other hand, it is seen that the image (IM), long term consequences (LTC), social influences (SI), visibility (VI), results demonstrability (RD), reliability (REL), safety (SAFE), facilitating conditions (FAC), self efficacy (SE), anxiety (ANX), complexity (COMP), attitude (ATT), behavioral intention to use (BI) and the effect of direct prior experiences (DPE) are expressed with relatively low frequencies (%0,5 for IM, %0,5 for LTC, %2 for SI, %1 for VI, %1 for RD, %5 for REL, %0,3 for SAFE, %3 for FAC, %3,5 for SE, %3 for ANX, %3 for CMX, %5,5 for ATT, %2 for BI, %1 for DPE and %2 for PCoP).

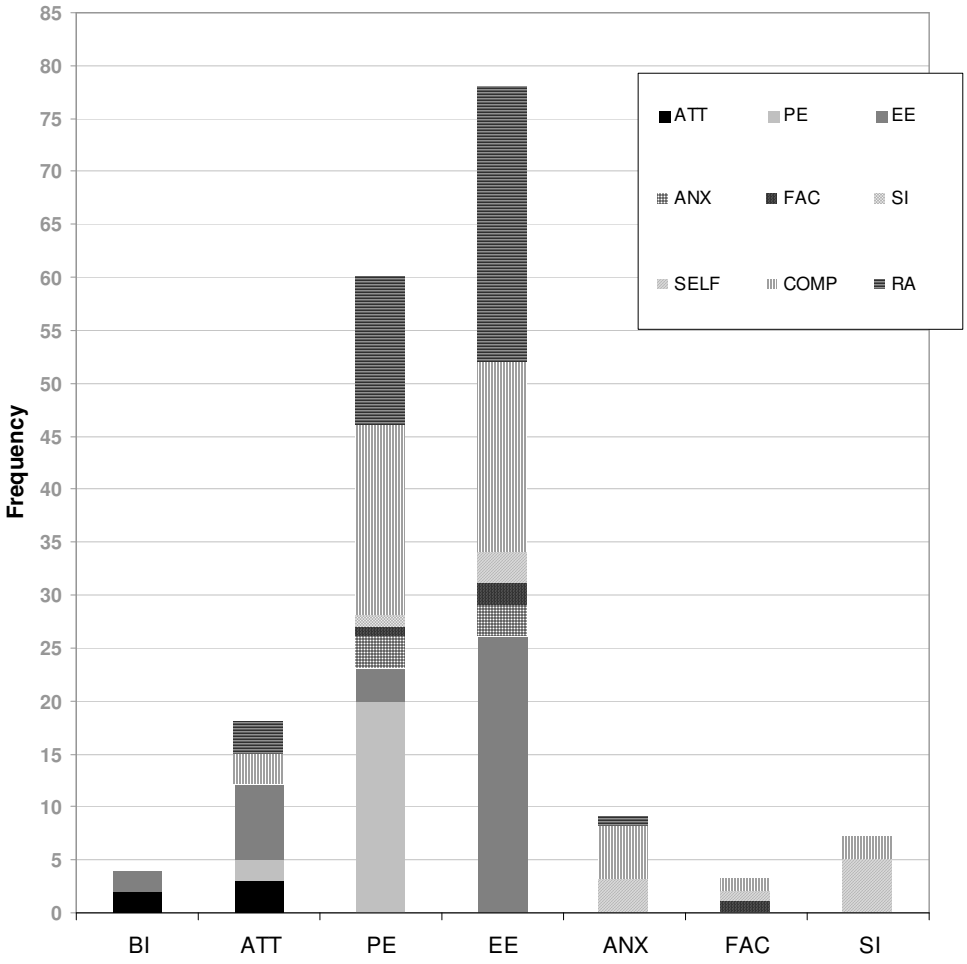


Figure 4. 2 Causal relationships between major constructs

As it can be seen in the Figure 4.2, the main constructs scaled in the quantitative study are clustered according to the causal relationships between the statements of the respondents. For example; however the frequency of behavioral intention is low, it is explained %38 by effort expectancy, %38 by performance expectancy and %25 by attitude. On the other hand, attitude is mainly explained by effort expectancy with 48 percent. Another significant result is the relationship between social influences and self efficacy. According to the results; SI is effective on users' expectations of their SE with the product with 83 percent.

Direct statements of the users regarding the effort and performance expectancy measures are also high in proportion; %22 for EE and %17 for PE. On the other hand, it is evident that many other measures are grouped under these two main constructs. Apart from compatibility and relative advantage which are mentioned before, it is seen that the 60 percent of reliability issues were related users' performance expectancy with 60 percent.

4.1.2. Results of the Quantitative Study

In the second session of the survey study, the items of an extended UTAUT model described in detail in the previous sections are measured.

There are some noteworthy findings from the results of the regression analysis which can be followed from the Table 4.1. In the table, the rows painted in dark indicate the meaningful effects of the independent variables on the dependent variables of the related model listed in the first column. R^2 values indicate the overall significance of the independent variables in explaining the change in the dependent variable.

Table 4.1 Regression Analysis results

Dependent Variables	Independent Variables + Moderator (EXP)	beta	R^2
Performance Exp.	Physical Characteristics of the Product/EXP	.498***	.249
	EXP	.054	
Effort Exp.	Physical Characteristics of the Product /EXP	.517***	.270
	EXP	.062	
Anxiety	Physical Characteristics of the Product /EXP	XX	.059
	EXP	XX	
Self Efficacy	Physical Characteristics of the Product /EXP	XX	.014
	EXP	XX	
Attitude	Performance Expectancy	.322*	.689
	Effort Expectancy	.442***	
	Anxiety (reversed)	(-).216*	
	Self Efficacy	.169	
	Social Influences	.265*	
	Facilitating Conditions	(-).054	
	EXP	.067	
Behavioral Intention	Performance Expectancy	.546***	.611
	Effort Expectancy	.109	
	Anxiety (reversed)	(-).038	
	Self Efficacy	(-).004	
	Social Influences	.153	
	Facilitating Conditions	.143	
	EXP	.064	
Behavioral Intention	Attitude	.582***	.356
	EXP	.092	
Behavioral Intention	Performance Expectancy	.531**	.607
	Effort Expectancy	.107	
	Social Influences	.160	
	Facilitating Conditions	.145	
Behavioral Intention	Performance Expectancy	.601***	.602
	Social Influences	.154	
	Facilitating Conditions	.165	

***Correlation is significant at the 0.01 level (2-tailed).
** Correlation is significant at the 0.05 level (2-tailed).
* Correlation is significant at the 0.10 level (2-tailed).

For example, in the first four rows, the effect of independent variable; *Physical Characteristics of the Product* (PCoP) on the dependent variables; performance expectancy, effort expectancy, anxiety and self efficiacy is evaluated seperately. It is found that there is a meaningful relationship between PCoP and

performance expectancy with 25 percent and between PCoP and effort expectancy with 27 percent. It means that the 25 percent of the change in performance expectancy and 27 percent of the change in effort expectancy can be explained with the change of PCoP. Whereas PCoP has no effect on anxiety and self efficacy, being contrary to the proposed initial model. Furthermore, the experience has no significant effect as a moderator on this relationships since its beta values are very low. Additionally, the results does not significantly change when experience is excluded from the models.

The main argument of the proposed model in the previous chapter was the effects of independent variables; performance expectancy, effort expectancy, self efficacy, anxiety, social influences and facilitating conditions on attitude. Regarding the fifth row of the Table 4.1, it is found that there is a meaningful relationship between attitude and the independent variables; performance expectancy, effort expectancy, anxiety and social influences. These four independent variables together can explain nearly 69 percent of the varience in attitude. However, their individual effects are not of equal strenght. The most effective variable is effort expectancy (in %1 error margin). Whereas; performance expectancy, social influences and anxiety has relatively lower effects on attitude respectively (in %10 error margin) and anxiety has a negative influence on attitude. Regarding the self efficacy and facilitating conditions on the other hand, their effects on attitude are found to be unimportant. In this model, the moderator experience again had no effect on attitude.

The most significant finding of the results is that the original UTAUT model was not validated as it can be followed from the eightieth row of Table 4.1. Effects of independent variables; effort ecpectancy, social influences and facilitating conditions on behavioral intention (BI) are very small except from performance expectancy. It is seen that performance expectancy explains %32 of the varience in BI. This situation is contradictory with UTAUT in which it is stated that the effort expectancy and social influences directly effect BI of the users (Venkatesh et al., 2003). Removing effort expectancy from the model that it may

be captured by performance expectancy measure did not change the loadings of other variables however it made performance expectancy slightly more significant.

The effects of the independent variables of this study on behavioral intention are also evaluated in the sixth row of the Table 4.1. The results are almost identical with the results of UTAUT model discussed above; only the effect of performance expectancy is found to be significant on BI.

Regarding the relationship between attitude and behavioral intention, it is seen that the attitude can explain 35,6 percent of the varience in BI. Correlation value of attitude and BI is also significant (.590, significant at 0.01 level). The correlation values can be followed from the Table D.2. in Appendix D.

It is remarkable that, in the analysis of all model alternatives, the effect of user eperience was insignificant however expected otherwise. Figure 4.3 shows the differences between the responses of experienced and inexperienced users evaluations. As the figure implies; there are slight differences on facilitating conditions and anxiety related responses where inexperienced users seem to have more anxiety towards the use of the products and less expectancies regarding facilitating coditions. However, the overall effect of facilitating conditions on product usage was low with respect to other variables. Additionally, inexperienced users gave less credit for the social influences when evaluating the usage of the product.

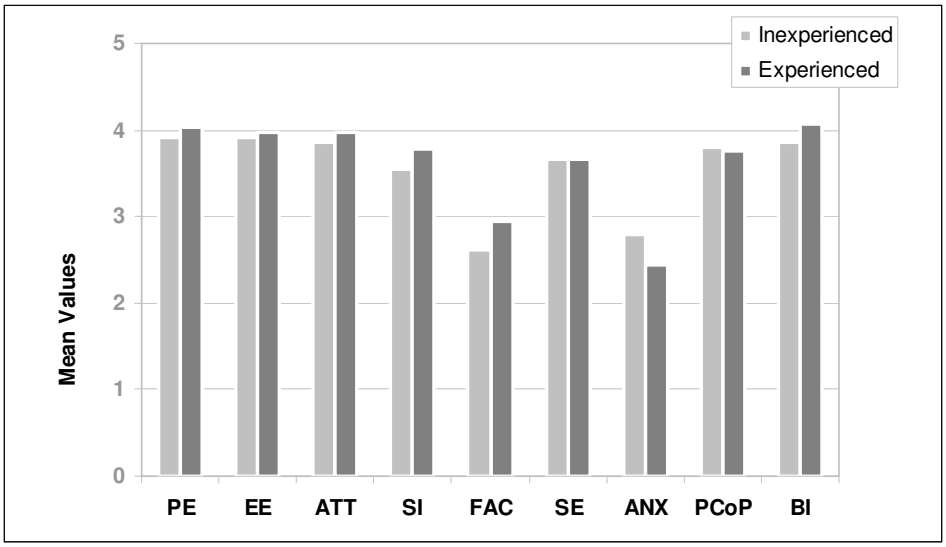


Figure 4.3 Mean values of the constructs for experienced and inexperienced user responses

4.2. Discussion of the Results

This study does not aim to propose a structural user acceptance model for military context, however; it aims to analyze the factors that affect user acceptance of new products with the help of pre-developed and validated models. The results of the survey study revealed some significant causal relationships between constructs and subconstructs. Following subsections will elaborate these results.

4.2.1. Discussion on Users' Subjective Evaluations

As it mentioned before, the qualitative session of the study aimed to reveal users' in-depth motivations about the future usage of a new military product without the limitation of any framework.

Regarding the distribution of the measures in Table 4.2, presented at the final stage of this section; the causal relationships between users' statements are somehow intricate that they are difficult to clarify. With an attempt to understand these relationships, following model in Figure 4.4 summarizes the findings of the qualitative study.

As it can be read from the framework, the most significant subjects of the discussion were the users' **effort** and **performance expectancies** regarding the use of the new product. The direct statements of the respondents eliciting an **attitude** towards the usage of PDA, MPC and their preceding products mainly revealed users' effort and performance expectancies. For example, the statements of the users; "*X* [preceding] *product is not good, it does not work properly…*" or "*It* [PDA] *is good if the embedded Bluetooth works rapidly*." indicated both negative and positive attitudes according to the satisfaction level of the users' performance expectancies. Similarly, the statement "[since they are complex and too much in number] *we do not fill in most of the reports* [of the software]…" indicates a negative intention to use regarding the unsatisfied effort expectancy of the user in terms of the complexity of the product.

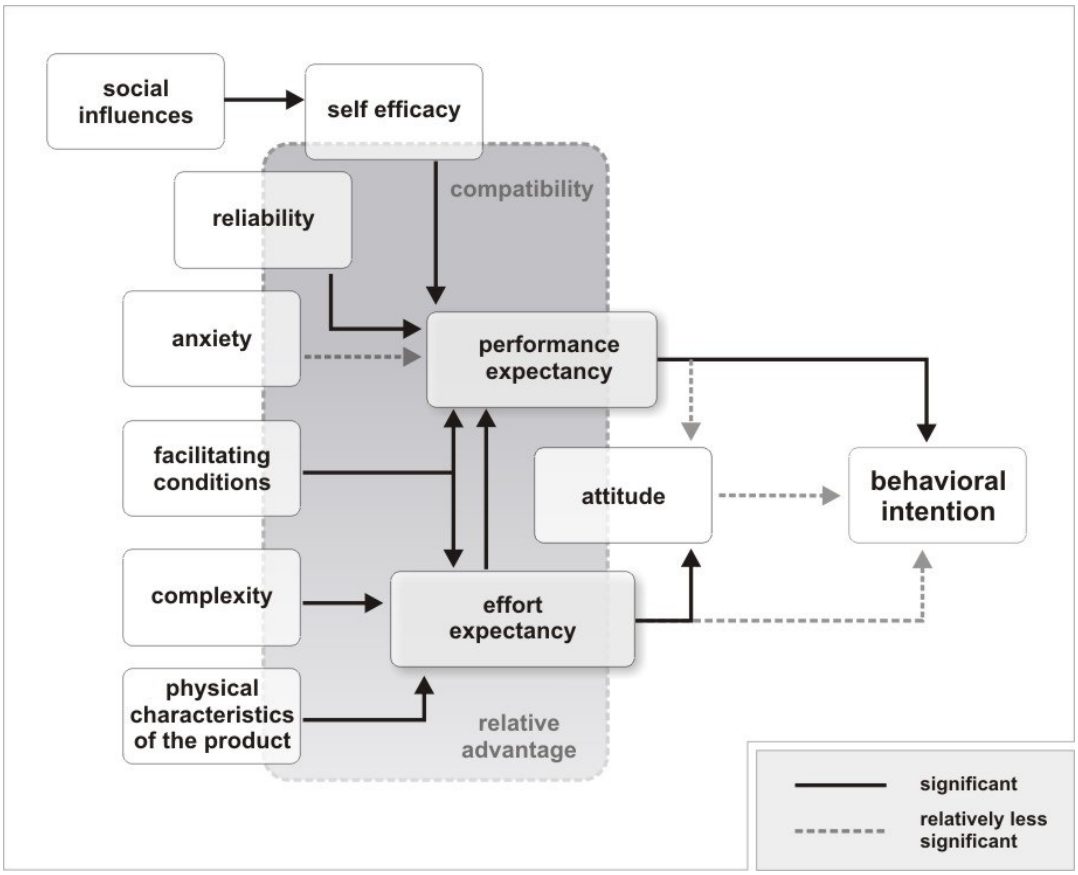


Figure 4. 4 Framework of the relationships between qualitative study variables

However in most cases the ease of the product usage is related with the consequent user performance. This is consistent with Davis' (1989) TAM, in which he stated that perceived ease of use partially explains attitude by means of perceived usefulness. It is also consistent with the findings of UTAUT and modified versions of it; that in most cases, the effect of performance expectancy on attitude or intention to use was found to be stronger especially through time and gained experience. The one-way relationship from effort expectancy to performance expectancy in the figure 4.4 indicates this situation.

Correspondingly, some of the users' statements about the trade-off between effort expectancy and performance expectancy were by the side of **performance expectancy**. That is, as long as the product fulfills its intended purpose successfully, users are ready to face some usage difficulties.

For example in one discussion group, the size of the screen was given more importance even it was explained that the larger screen will probably cause product to be heavier than it is now; they believe that the larger screen will help them complete their tasks more accurately.

On the other hand, the significance of performance and effort expectancies on direct attitude and direct behavioral intention responses has different strengths. When expressing their attitudes, users mostly stressed their effort expectancies (with %48 of attitude responses) whereas performance expectancy was conveyed with 18 percent.

Regarding the underlying effects of **compatibility** and **relative advantage** as it is denoted in Figure 4.4, these two variables are found to be effective on nearly all variables of the study. The users' expectations about the products are moderated by their compatibility with the usage context and its relative advantage regarding the products they use.

The users' evaluation of PDA and MPC were usually moderated by means of the products' **relative advantage** with regard to the preceding products in use. **Effort expectancy** is the most significant factor evaluated through relative advantage. The favorite criteria for comparison were that to what extend the new product was easier to use. For instance, the mobility of the PDA and MPC was responded with great pleasure since HT and FDC are fixed devices and therefore they limit the task flexibility. Wireless communication that frees users from the bundles of data cables was also granted. Furthermore, some of the respondents specifically gave examples from the movies and civilian products such as head-mounted binoculars and some high-tech cellular phones in order to express their expectations.

On the other hand, the **compatibility** of the PDA and MPC with the current system and usage context is questioned by a great portion of the population. Users visualized themselves using the products in battle conditions, severe environment and regular procedural training practices in relation with other equipments in the system.

Users' performance expectancies had significance in these compatibility evaluations. For example, the participants asked questions about the **reliability** of the products under rainy, cold and hot weathers. Many of them complained about the poor performance of preceding products under extreme temperatures therefore they stated these products to be unreliable. Similarly, the vulnerability of the touch-screen is stated many times that they offered a protective lid like the one in HT for PDA and MPC against mechanical pressure which is highly probable in battle conditions. Since the break down of the devices would cause a dramatic decrease in task performance, the users' **anxiety** increased about their performance with the product. The relative performance of PDA and MPC under these conditions was evaluated since the tool performance is regarded as the synonym of mission success. Therefore, reliability is found to be influential on user attitude via performance expectancy with the moderating affects of compatibility and relative advantage.

Similarly, users were **anxious** about their **performance** with the product usage regarding its **compatibility** with the usage context. The negative attitudes of the respondents were mainly related to the characteristics of the usage environment. Two participants agreed that the soldiers “are” and “have to be” in a “rough” manner. They state that the influence of harsh environment make soldiers behave likely. Therefore the products to be used in such an environment should also be rough in order to be reliable and durable. In these cases, the **visibility** of the product became significant that the participants visualize others using the system (Venkatesh et al., 2003).

Users’ expectations and beliefs about the facilitating conditions and social influences were relatively less frequent during the discussion. **Facilitating conditions** were mainly regarded as the supplier support including spare accessories provided and post-purchase training. Many respondents state that they can not make salutary comments before training.

This is partially related to the **results demonstrability** of the products that the users could not comprehend the outcome of the usage and they could not visualize whether the product will be **compatible** with the usage context in **long term usages**.

Training related expectations were significant on users’ effort expectancies whereas product related facilities influenced users’ performance expectancies. For instance, many of the respondents questioned whether there will be a spare battery package since the military missions require long lasting power supplies in battle environment regarding electronic equipments. Additionally, three of the respondents uttered the necessity of templates in the software in order to save time and fasten the mission complement. Hence, **facilitating conditions** was found to be effective on both **performance** and **effort expectancies**.

Regarding the effect of **social influences**, it is seen that the users are interested in their **self efficacy** with the product since self efficacy influence individual performance. Since war conditions are rare in frequency, many of the soldiers do not have a real battle experience in their professional careers. Therefore, superiors' evaluations of soldiers depend on the mission success and task compliance in especially procedural trainings. However, the frequency of these effects of others was not high in proportion during the discussions, the statements of the respondents were explanatory for their significance: "*We do not deserve our salary if we can not use these devices properly, this is the doctrine here. Our superiors want us to use them well.*" Here, the well usage rather indicated the successful tasks competence and speed rather than the ease of use or usage free of effort. Therefore it is meaningful to say that **self efficacy** of the user creates a positive attitude on one's superiors towards himself. From that perspective, **self efficacy** seems to be influential on users' **performance expectancy** rather than effort expectancy. This finding is contradictory with Venkatesh et al.'s (2003) hypothesis that they stated the effect of self efficacy is captured by the effect of effort expectancy of the users.

Complexity measure seems to be effective on users' **effort expectancies** regarding their statements. This is consistent with Venkatesh et al. (2003) who said that complexity has similar effects of perceived ease of use and ease of use constructs, therefore it can be clustered in effort expectancy measure.

Lastly, the effects of **physical characteristics of the products** on users' evaluation criteria can be derived from the discussion results. It is clear that there is a high correlation between PCoP and **effort expectancy** variables. Many of the users evaluated product form with an attempt to criticize it in terms of its ease of use. Its fit in hand, holding position, the placement of the connector detail, usage of touch-screen and graphic pen, size of the screen, the navigation between the menus etc. are all evaluated by the users regarding how these qualities affect the use effort relatively. Therefore it is evident that PCoP has an influence on users' effort expectancies.

Table 4. 2 Frequency of clustered measures

VARIABLES	BI	ATT	PE	EE	ANX	FAC	SI	SELF	REL	CMX	RD	LTC	VIS	SAFE	IM	PCoP	COMP	RA
Behavioral Intention (BI)		**2**	**3**	**3**														
Attitude (ATT)		**3**	**3**	**10**												**1**	**3**	
Performance Expectancy (PE)			**12**	**8**	**3**	**3**	**1**		**12**	**1**		**1**			**1**		**16**	**9**
Effort Expectancy (EE)			**1**	**19**		**2**				**6**						**7**	**17**	**20**
Self Efficacy (SE)						**1**			**1**						**1**		**3**	**2**
Social Influences (SI)								**5**	**1**									
Facilitating Conditions (FAC)						**1**				**1**							**3**	
Anxiety (ANX)					**1**				**2**	**2**	**1**		**2**	**1**				**1**
Reliability (REL)												**1**					**9**	**5**
Complexity (CMX)																	**2**	
Results Demonstrability (RD)																	**3**	
Long Term Consequences (LTC)																		
Visibility (VIS)													**1**					
Safety (SAFE)																		
Image (IM)																		
PCoP																		**3**
Compatibility (COMP)																	**3**	
Relative Advantage (RA)																		**2**

4.2.2. UTAUT and Military User Acceptance

Quantitative session of this study shows that the original UTAUT model is somehow deficient to explain user acceptance in military context. However, the correlations between the model constructs are validated to some extend, the UTAUT model should be extended further in order to cover all amenities of this specific context.

Independent variables of this survey study namely; performance expectancy, effort expectancy, social influences, anxiety, self efficacy and facilitating conditions by means of their effects on both attitude towards usage and behavioral intention to use were examined. The results indicate that addition of attitude in the model resulted in a more comprehensive structure that the effects of social influence and effort expectancy became legible. With the regression analysis the following model in Figure 4.5 is formulated with an attempt to see the relationships between study costructs.

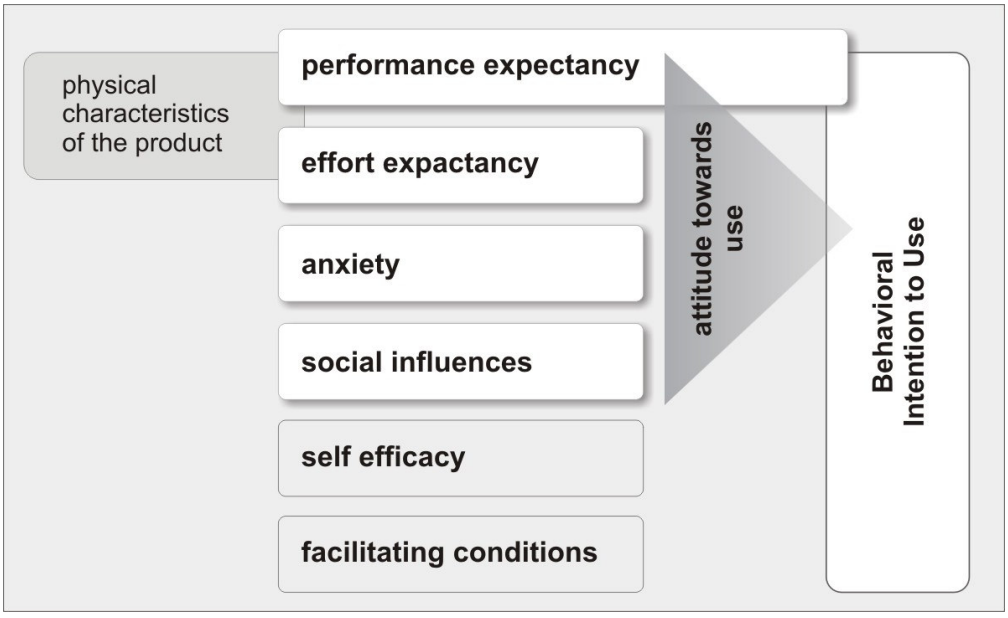


Figure 4.5 Regression analysis results of the research model

In order to better understand the results, the study measures will be analyzed separately in detail.

Physical Characteristics of the Product: Characteristics of innovation plays an important role on the acceptance of an IT product by individuals. As mentioned before, physical characteristics of military products was proposed to be effective on users performance expectancy, effort expectancy, self efficacy and anxiety. Correspondingly, the regression modeling proved that the PCoP is effective on users performance expectancy (%25) and effort expectancy (%27), whereas it is not effective on self efficacy and anxiety. Users are not anxious about making mistakes related with the product form and they do not relate their self efficacy with product form.

Therefore it can be said that the form, color, material and overall form of the products can explain the 25 percent of the varience in performance expectancy and 27 percent of the varience in effort expectancy. The compatibility of the product form with the usage context creates a general attitude on the users regarding its use effort and use performance.

However, the effect of PCoP is not strong enough to make a general explanation for the varience in effort expectancy and performance expectancy. From that perspective, it is clear that other characteristics of the products such as complexity and results demonstrability can be added to the model, since these characteristics are related with the perceived product form.

Effort Expectancy: The most significant measure of the qualitative study was effort expectancy. EE is significant in explaining 44 percent variance in attitude. Users first criteria is how it is easy to use a product. Similarly, the results of quantitative study indicated the same. The most discussed subject was the ease of use of PDA and MPC. However, in qualitative study, the direct effect of EE on behavioral intention was significant, quantitative study does not reveal such a relationship.

Performance Expectancy: The results proved PE as the other most significant measure for acceptance. The study revealed that the attitude of the users can be explained with 32 percent in variance by PE. Therefore it can be said that the users' PE has a positive effect on attitude towards the use of the product. On the other hand, PE is also effective on self-reported behavioral intention to use the product with 54 percent in variance. This is consistent with the qualitative study and also the only consistent result with UTAUT model.

Social Influence: SI seems to have an effect on attitude whereas this effect is deficient relatively. The influence of superiors on product usage was expected to have a significant effect on users attitude however this is partially validated in the model with %26 varience in attitude.

Anxiety: As it was expected, there is a negative meaningful relationship between anxiety and attitude towards using technology. That is ANX regarding the usage of the product causes a negative effect on attitude. ANX explains 22 percent variance in user attitude however this is the weakest influence of independent varibles on attitude.

Self Efficacy: However proposed otherwise, users' SE with the products does not play an important role on the acceptance with refer to the analysis of the research model. According to the qualitative study, SE was found to be significant to some extend regarding the superiors' conceptions about the usage adequacy of the users with the product, however this influence could not be figured out through the quantitative study. The situation can be explained in correspondence with UTAUT, in which it is said that the effect of SE is captured by the effect of effort expectancy. Similarly, it is consistent with Davis' (1989) TAM that he defined self efficacy by quoting Bandura (1982; in Davis, 1989) as "judgements of how one can execute courses of action required to deal with prospective situations" (p.321) and stated that SE is similar to ease of use. Thus, it can be said that the ease of use of a product make users think that their interaction with the product will be effective.

Facilitating Conditions: Being one of the independent variables of UTAUT and of this study's research model, FAC is insignificant in terms of its effect on user attitude or intention to use. This is a critical finding because the literature review of the study also showed that the opportunities such as training, supplier support, maintanance and other factors which contributes to the effective usage of the military products would expected to have a positive effect on attitude. The possible reason for this conflict may be explained with the generalized meanings of the original items used in the scale of the construct. The matters should be narrowed down to the specific aspects of military usage.

Experience as Moderator: As staded in the section 4.1.2, the results of the quantitative study does not display any significant difference between experiences and inexperienced user responses. The effect of experience factor in the model is not validated. The main reason for this may be that the experience scale of this study which consists of work experience, domain knowledge and IT familiarty in general does not include PDA and MPC usages, since they are new comers even for civilian context. That is, both experienced and inexperienced users are not familiar with this product category yet.

In the Last Chapter, the overall thesis study and the significance of the findings will be reminded in contribution to further research and practice.

CHAPTER 5

CONCLUSION

Benefiting from the psychology, sociology, information technology, management and marketing literatures, in the second chapter of the this thesis study, relevant subjects are elaborated with comparison of civilian and military contexts respectively; the significance of information technologies, innovation and levels of innovativeness in term of its effects on new product encounters, user attitude towards information technology, individual and organizational factors on user attitude, user behavior and the prior research studies on the factors that affect user acceptance, leading theories and models that explain the measures of product acceptance, military context in general with special focus on user, task and environment and product evaluation criteria herein with regard to both organizational and individual levels.

Comparing military and civilian products and their usage contexts, it is seen that there are both similarities and differences between them. Growing dependency on Information Technology (IT) products are evident for civilian and military usages. Organizational adoption of IT products has similar measures such as cost and effectiveness. Functionality is seen as the most important criteria for IT products in both contexts. However, the differences between the contexts of use; user role, task and environmental factors shape the way of users' product evaluation.

The main difference between two contexts stems from the points of views regarding the individual product acceptance. User acceptance of new products has different levels of importance for these two different perspectives. End user expectations are the key motivations for industrial product acceptance research whereas the military literature focuses on rather organizational behavior towards new products. User acceptance phenomenon is understood as the convenience of new products with the usage context. In the light of the scanned literature, the

need for an exploratory study in military context is evident since the user acceptance issue was intact among the research studies regarding military products. It is realized that the dominancy of organizational factors such as task performance, cost and efficiency had dominated the product acquisition process that individual factors are mostly overestimated.

5.1. Conclusion of the Results

With an attempt to understand *the factors that affect user acceptance of military products*, an exploratory research study which is explained in detail in the third Chapter is conducted. There are significant findings of this thesis; especially the qualitative discussion has produced a ground base for further research.

From the users' perspective, the major utility of a new product is the mission success gained through its usage. On the other hand, so called 'mission success' is directly related to user performance which is gained through the performance of the tool itself. This is evident because of the participants' expectations from a new product regarding its technical capabilities before all else. It is critical for users whether the product will function for its intended purpose. This is also correspondent with civilian context in which many researches are in favor of "form follows function" idea.

However, the relationship between performance of a product and required effort to use it properly was unclear that users mostly failed to differentiate them. It is meaningful to state that the outcome of the combination of these two measures may provide a positive attitude towards using the new product, whereas, these two measures solely are not enough to make a product acceptable.

Many of the other measures encountered in literature seem to be secondary measures when evaluating a new military product. Namely, social influences, reliability, facilitating conditions, complexity, anxiety, physical characteristics of the product and self efficacy have no direct effect on user attitude but via performance and effort expectancies. These measures influence users'

perception of the utility out of the usage of the product and result in positive attitudes.

During discussions, users stated many concerns regarding the effect of superiors on their behavior; especially the superiors' expectations of operational success. It was significant that operational success was bound to user performance. Therefore the users were sensitive about their self efficacy with the product regarding their performance. Users' performance expectations are formed by social influences. Soldiers see themselves from their superiors' point of view.

The research study of this thesis indicates that the function of the product is the first criteria for its users and it is partially related to the capabilities of the technology involved. However it is also clear that this functionality is not meaningful unless it is used.

5.2. Limitations of the Study

This study has some limitations especially with regarding its context. Since the survey conducted in a military settlement and these settlements are protected against both physical and informational threats, the survey could not use visual or audio-visual sources. Moreover, some specific features of the pruducts used in the survey, the identity of the settlement and its location had to be obscured due to the military and commercial regulations. Instead, generic names are used when describing survey products. Additionally, because of both academical ethics and the military regulations, the identities and work positions of the participants are not avowed.

This study also has some technical limitations. Firstly, the results of the survey study are limited to the number of participants which may not be enough to make generalizations for the whole population. Secondly, because of the military restrictions, the participants' voluntariness of attending the study is not cogent since the study was conducted as an obligatory vocational procedure; however

the users were informed about their ethical rights with a voluntary attendance form they have signed and they were free to leave the study room without completing the questionnaire.

On the other hand, the existence of senior manager as an observer in the test room may have caused a psychological pressure on the participants, whereas the observer was requested not to interfere the process.

Additionally the questions that the UTAUT model includes may not be well understood by the participants, since the item loadings are relatively poor, although, the participants were also allowed to ask questions about any ambiguity in the items during the test process.

Lastly, however the thought provocative environment of a group discussion has been beneficial in terms of enriching the quality of the meeting by reducing the stressors on the individuals; it also limited the participation of some respondents while others dominated the discussion.

5.3. Implications for Further Research

The aim of this thesis study is to define the factors that influence user acceptance of new military products. Through the study, existing acceptance models are analyzed in terms of their extent and applicability in military context since there is no specific model for military users. The results are valuable in terms of a theoretical scope contributing further research rather than specific design implications for practice.

This thesis study is a descriptive approach more than representative with its relatively small survey sample. However, to create a valid, context specific acceptance model, there is a need for further investigation. With larger survey samples and varying product groups, the research domain should be extended in order to make some generalizations. The nature of user acceptance research influenced this study to concentrate on IT products; user acceptance

phenomenon might be worth to study on also for other product groups used in military context such as wearable products and consumables since individual preferences are more significant in such products.

It is also realized that qualitative studies are more relevant and valuable in order to understand user perspective in military context. Without comprehending the key relationships between the triggers of users' expectations, prior models such as Unified Theory of Acceptance and Use of Technology seem to be relevant but also inadequate to enclose all aspects of this specific context.

The results of this research study did not focused on a particular measure of acceptance and tried to reveal all possible factors that may have influence. Further studies may focus on some spesific factors such as social influences and facilitating conditions and apply different methods to reveal their prominance.

On the other hand, as it mentioned before, this study did not deal with the real usage. Instead, it accounted users' self-reported behavioral intention to use as the determinant of actual use. However to validate the findings of the study, further research may concentrate on measuring actual usage since self reported usage is a surrogate. Although theoretically the product usage is mandatory in military context, it is also found that the soldiers may take up the option of using conventional methods in which they find themselves more efficient in order to fulfill the given tasks. Therefore, the further research may cover actual usage,-so that the effect of familiarity with the product would also be significant.

5.4. Implications for Practice

The differentiation of purchase and end-use positions in an organization such as military may cause ill-defined acquisition decisions which are in favor of the high level organizational benefits but in the opposite of the actual requirements of the

user. Hence, there needs to be a strong communication between both user-purchaser and user-designer.

With the growing importance of human factors in military context, there seems to be an increasing interest in users' expectations regarding the introduction of new information technologies. But still, the nations' willingness to create power upon their adversaries may cause an imbalance between the acquired equipment and their target user groups in military. Instead trying to catch up with the speed of technology growth, defense sector should be aware of the users' attitudes towards technology products and their compatibility with the usage context in order not to alienate the users with the technology. Therefore; the design and development teams should include user perspective as of the very beginning of the process. It is important to realize that when users have a negative attitude towards a designed system, whether because of its complexity, incompatibility with the context, breakable or unreliable impression; they will refuse to use it and therefore the product will fail no matter what an advanced technology it involves and how expensive it is.

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APPENDIX A

PRELIMINARY STUDY

The participants of the preliminary study held in 2007 were the users of a rugged hand terminal (rugged computer) which is the ancestor of the tested material. The users' past experiences were assumed to be the major determinants of product resistance. Therefore, the domain experience was a dependent variable for the study. It was aimed to gather data about the experience levels of the participants by conducting an initial screening questionnaire. Referring to the results of the screening questionnaire, six experienced (Group A) and eight inexperienced (Group B) participants were interviewed. During the interview, participants were asked to compare new HT with the old one in terms of its usability. The results showed no major resistance towards the usage of new product regarding the user groups A and B. However, the 75 percent of the Group A's attitude towards wireless technology was significant. The experienced participants got difficulty in comprehending the occurrence of data transmission via wireless network. Although the author explained several advantages of wireless communication, the users had a negative attitude toward the technology in terms of its reliability.

The study also showed that the physical features of the product also effective in determining perceived usability. Half of the participants stated that the new product should be more rugged. Considering the rugged products, the appearance of the military products is accustomed to be rude. When users see rather a neat product, they automatically think that it is fragile. This originates from the structure and the physical appearances of the materials in nature. Although the growing technology let engineers produce durable materials in smaller dimensions with the help of chemicals, it is hard to convince users about the maintainability and durability of such products before trying them in real environment.

APPENDIX B

QUESTIONNAIRE SHEET

1. Turkish Version

ÜRÜN KABUL EDİLİRLİK ANKETİ

Bu anket, "yeni askeri ürün-kullanıcı tepkisi" ilişkisini etkileyen faktörleri belirlemek üzere yalnızca görüşlerinizi almak amacıyla hazırlanmıştır. Vereceğiniz cevapların doğru ya da yanlış olması söz konusu değildir. Görüşleriniz gizli tutulacak ve sadece araştırma amacıyla kullanılacaktır. Eğer bir sorunuz olursa lütfen çekinmeyiniz. Katılımınız için teşekkür ederiz.

A) Anketin ilk kısmında, size ve kullandığınız teknolojik ürünlere ilişkin sorular bulunmaktadır.

1- Yaşınız :

2- Kurum içerisindeki görevinizin tanımı :

3- SKMÜ / AİB kullanma sıklığınız nedir? (**gün**, **hafta** ya da **ay** bazında belirtiniz)

Günde / haftada / ayda.....kere

4- Aşağıdaki teknolojik ürünlerden kişisel olarak sahip olduklarınızı işaretleyerek kullanma sıklığınızı belirtiniz.

Kişisel masa üstü bilgisayar	☐	günde / haftada / ayda.....kere
Kişisel diz üstü bilgisayar	☐	günde / haftada / ayda.....kere
Kişisel el bilgisayarı	☐	günde / haftada / ayda.....kere
Diğer.....		günde / haftada / ayda.....kere

B) <u>Anketin ikinci kısmında, incelemiş olduğunuz Taşınabilir MPC / PDA ile ilgili ifadeler bulunmaktadır. Her ifade için, görüşünüzü en iyi yansıttığını düşündüğünüz kutuyu "X" ile işaretleyiniz.</u>

	Kesinlikle katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle katılıyorum
Ürünü, teknoloji ve kullanım açısından yenilikçi buldum.					
İşim için faydalı bir ürün olur.					
Ürünü kullanmak, işlemleri daha çabuk yapmamı sağlar.					
Ürünü kullanmak üretkenliğimi artırır.					
Ürün ile etkileşimim açık ve anlaşılır olur.					
Ürünü ustaca kullanmak benim için kolay olur.					
Ürün, kolay kullanılabilir.					
Ürünü kullanmayı öğrenmek kolay olur.					
Ürünü kullanmak iyi bir fikir.					
Ürün, işimi ilgi çekici kılar.					
Ürünle çalışmak eğlenceli olur.					
Ürünle çalışmayı sevdim.					

Davranışlarıma etkisi olan kişiler, ürünü kullanmam gerektiğini düşünür.					
Benim için önemli olan kişiler, ürünü kullanmam gerektiğini düşünür.					
Üslerim ürünün kullanımında yardımcı olurlar.					
Genel olarak içinde bulunduğum kurum ürünün kullanımını destekler.					
Ürünü kullanmak için gerekli kaynak var.					
Ürünü kullanmak için yeterli bilgim var.					
Ürün, kullandığım diğer sistemlerle uyumlu değil.					
Ürünle ilgili sorunlarda başvurabileceğim bir kişi ya da grup mevcut.					

Ürünü kullanarak bir işi ya da görevi tamamlayabilirim, eğer...

çalışırken ne yapacağımı söyleyen biri olmazsa.					
zorlandığımda yardım için birini çağırabilirsem.					
yazılım işi için çok vaktim varsa.					
ürün içinde yardım menüsü varsa.					
Ürünü kullanmak konusunda tereddütlüyüm.					

Ürünü kullanırken yanlış bir yere basarak bilgi kaybedebileceğim düşüncesi beni korkutuyor.					
Ürün bir şekilde beni tedirgin ediyor.					

Kullanım amacı ve kullanıldığı ortam düşünüldüğünde;

ürünün formu (genel şekli) uygun.					
ürünün rengi uygun.					
ürünün malzeme seçimi uygun.					
Ürünün genel görünümü çekici.					
Gelecek bir kaç ay içinde bu ürünü kullanmayı isterim.					
Gelecek bir kaç ay içinde bu ürünün temin edilmesi beni memnun eder.					

Anketi tamamladınız. Anket kâğıdını uygulayıcıya teslim edebilirsiniz.
Katılımınız için tekrar teşekkür ederiz.

2. English Version

PRODUCT ACCEPTANCE QUESTIONNAIRE

This questionnaire is prepared in order to understand your opinion about the factors that affect the relationship between “new military products - user response”. There is no right or wrong answers. Your answers will be used only for research purposes and will not be shared with third participants. If you have any questions, please do not hesitate to ask. Thank you for your participation.

A) In this first section of the questionnaire, there are questions about you and the technological products you use.

1- Age:

2- Your work description in the organization:

3- Frequency of your HT / FDC usage (**day**, **week** or **month** format)

.....times per day / week / month

4- Please point out the following products you own and state the frequency of your usage. (**day**, **week** or **month** format)

Personal Desk-top Computer	☐	.....times per day / week / month
Personal Lap-top Computer	☐	.....times per day / week / month
Personal Hand-held Computer	☐	.....times per day / week / month
Other :		.....times per day / week / month

B) <u>In this second section of the questionnaire, there are statements regarding the MPC and PDA you have tried. For each statement, please put an ”x” for the one that best represents your opinion.</u>

	Completely Disagree	Disagree	Neutral	Agree	Completely Agree
I found product innovative in terms of its technology and usage.					
It becomes a usefull product for my job.					
Using the product enables me to accomplish my tasks more quickly.					
Using the product increases my productivity.					
My interaction with the product would be clear and understandable.					
It would be easy for me to become skillful at using the product.					
The product is easy to use.					
Learning to operate the product is easy.					
Using the product is a good idea.					
Using the product makes work more interesting.					
Working with the product is fun.					
I liked working with the product.					

People who influence my behavior, think that I should use the product.
.

People who are important to me, think that I should use the product.

My superiors would be helpful in using the product.

In general, the organization supports the use of the product.

There are resources necessary to use the product.

I have the knowledge necessary to use the product.

The product is <u>not</u> compatible with other systems I use.

A person or a group is available for assistance with product related difficulties.

<u>I could complete a job or a mission using the product if...</u>

there is <u>no one</u> around to tell me what to do as I go.

I can call someone for help when I got stuck.

I have a lot of time for the job for which the software was provided.

there is an embedded help-menu in the product.					
I feel apprehensive about using the product.					
It scares me to think that I could lose information using the product by hitting a wrong key.					
The product is somewhat intimidating to me.					
<u>Thinking of it usage purpose and use context;</u>					
the product form (general looking) is appropriate.					
the color of the product is appropriate.					
the material selection is appropriate.					
The general looking of the product is appealing.					
I would like to use the product in the next few months.					
The procurement of the product in the next few months would make me pleased.					

You have completed the questionnaire. You can deliver the questionnaire sheet to the conductor. Thank you for your time.

APPENDIX C

QUALITATIVE STUDY CONSTRUCTS

Table C.1 Qualitative Study Constructs (Venkatesh et al., 2003)

Source	Construct	Definition
TRA	Attitude towards behavior	"an individual's positive or negative feelings (evaluative affect) about performing the target behavior" (Fishbein and Ajzen 1975, p. 216).
UTAUT	Social influences	The degree to which an individual perceives that important others believe he or she should use the new system.
	Performance expectancy	The degree to which an individual believes that using the system will help him or her to attain gains in job performance.
	Effort expectancy	The degree of ease associated with the use of the system.
MPCU	Complexity	"the degree to which an innovation is perceived as relatively difficult to understand and use" (Thompson et al. 1991, p. 128).
	Long term consequences	"Outcomes that have a pay-off in the future" (Thompson et al. 1991, p. 129).
	Facilitating conditions	Objective factors in the environment that observers agree make an act easy to accomplish.
IDT	Relative advantage	"the degree to which an innovation is perceived as being better than its precursor" (Moore and Benbasat 1991, p.195).
	Image	"The degree to which use of an innovation is perceived to enhance one's image or status in one's social system" (Moore and Benbasat 1991, p. 195).
	Visibility	The degree to which one can see others using the system in the organization (adapted from Moore and Benbasat 1991).
	Compatibility	"The degree to which an innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters" (Moore and Benbasat 1991, p. 195).
	Results demonstrability	"The tangibility of the results of using the innovation, including their observability and communicability" (Moore and Benbasat 1991, p. 203).
SCT	Self efficacy	Judgment of one's ability to use a technology (e.g.,computer) to accomplish a particular job or task.
	Anxiety	Evoking anxious or emotional reactions when it comes to performing a behavior (e.g., using a computer).

APPENDIX D

STATISTICAL ANALYSIS RESULTS

Table D. 1 Item Loadings for Model Constructs (Factor Analysis with SPSS v.13)

Constructs	Component								
	1	2	3	4	5	6	7	8	9
PE 1	,659	,459							
PE 2	,808								
PE 3	,667								
EE 1	,426	,501						,360	
EE 2		,829							
EE 3	,594	,475					,374		
EE4	,467	,679							
ATT 1	,414	,527		,375					,333
ATT 2		,377			,350		,539		
ATT3		,668							
ATT4	,650								-,303
SI1				,759			,302		
SI2	,317			,665					
SI3	,379			,630		,395			
SI4				,330		,650			
FAC1	,439			-,367			,318		,527
FAC 2							,875		
FAC 3								,489	,556
FAC 4						,769			
SE 1					,859				
SE 2				,481	,690				
SE 3					,854				
SE 4									,746
ANX 1	,600						,466	,496	
ANX 2								,864	
ANX 3						,620		,449	
PcoP 1	,623		,602						
PcoP 2			,848			,366			
PcoP 3			,815						
PcoP 4			,839						
BI 1	,692								,391
BI 2	,604								,358

Rotated Component Matrix(a)

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Table D. 2 Correlations between Regression Analysis variables

Correlations										
		PCoP	PE	EE	SI	FAC	SE	ANX	ATT	BI
PCoP	Cor.	1	0,496(***)	0,516(***)	0,339(**)	0,312(*)	0,118	0,118	0,296(*)	0,504(***)
	p		0,002	0,001	0,040	0,060	0,486	0,487	0,075	0,001
PE	Cor.	0,496(***)	1	0,714(***)	0,445(***)	0,421(***)	0,029	0,406(**)	0,653(***)	0,739(***)
	p	0,002		0,000	0,006	0,009	0,864	0,013	0,000	0,000
EE	Cor.	0,516(***)	0,714(***)	1	0,323(*)	0,443(***)	0,120	0,335(**)	0,685(***)	0,602(***)
	p	0,001	0,000		0,051	0,006	0,480	0,043	0,000	0,000
SI	Cor.	0,339(**)	0,445(***)	0,323(*)	1	0,449(***)	0,447(***)	0,212	0,568(***)	0,496(***)
	p	0,040	0,006	0,051		0,005	0,006	0,208	0,000	0,002
FAC	Cor.	0,312(*)	0,421(***)	0,443(***)	0,449(***)	1	0,342(**)	0,434(***)	0,377(**)	0,488(***)
	p	0,060	0,009	0,006	0,005		0,038	0,007	0,022	0,002
SE	Cor.	0,118	0,029	0,120	0,447(***)	0,342(**)	1	-0,113	0,356(**)	0,147
	p	0,486	0,864	0,480	0,006	0,038		0,507	0,030	0,385
ANX	Cor.	0,118	0,406(**)	0,335(**)	0,212	0,434(***)	-0,113	1	0,091	0,329(**)
	p	0,487	0,013	0,043	0,208	0,007	0,507		0,594	0,047
ATT	Cor.	0,296(*)	0,653(***)	0,685(***)	0,568(***)	0,377(**)	0,356(**)	0,091	1	0,590(***)
	p	0,075	0,000	0,000	0,000	0,022	0,030	0,594		0,000
BI	Cor.	0,504(***)	0,739(***)	0,602(***)	0,496(***)	0,488(***)	0,147	0,329(**)	0,590(***)	1
	p	0,001	0,000	0,000	0,002	0,002	0,385	0,047	0,000	
*** Correlation is significant at the 0.01 level (2-tailed).										
** Correlation is significant at the 0.05 level (2-tailed).										
* Correlation is significant at the 0.10 level (2-tailed).										