USER-PRODUCT INTERACTION IN NEW PRODUCT ENCOUNTERS:
PROMINENCE OF USER EXPERTISE AND PRODUCT PROPERTIES

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ABSTRACT

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PROMINENCE OF USER EXPERTISE AND PRODUCT PROPERTIES

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User-product interaction is a multi-dimensional, multi-faceted and multi-modal everyday encounter. This study concentrates on the two most prominent actors of this interaction, namely, the user and the product, whereby user expertise and product innovativeness are given special attention. Prominence of user expertise in new product encounters, especially those with innovative products, is established through the findings of two case studies.

Keywords: New product, user experience, user expertise, innovative product, product utilization

ÖZ

YENİ ÜRÜNLER İÇİN KULLANICI-ÜRÜN İLİŞKİSİ:
KULLANICI YETKİNLİĞİ VE ÜRÜN ÖZELLİKLERİNİN ÖNEMİ

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Kullanıcı-ürün ilişkisi günlük hayata dair çok yönlü ve çok kesitli bir deneyimdir. Bu çalışmada söz konusu ilişkinin en önemli iki aktörü olan kullanıcı ve ürün ele alınmış, kullanıcı yetkinliği ile ürün yenilikçiliği incelenmiştir. Kullanıcı yetkinliğinin yeni ve özellikle de yenilikçi ürünlerin kullanımındaki önemi iki vaka çalışmasının sonuçlarına dayandırılarak ortaya konulmuştur.

Anahtar Kelimeler: Yeni ürün, kullanıcı deneyimi, kullanıcı yetkinliği, yenilikçi ürün, ürün kullanımı

The dreams of technology have been inevitably frustrated.
As we fill life's every niche with high-tech gadgetry,
we gradually whittle away those restful places
where genuine satisfaction is nurtured.

Langdon Winner

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CHAPTER 1

INTRODUCTION

1.1 Problem Definition

Modern lifestyle brings with it a bundle of technological devices and this bundle brings with it diverse means of user-product interaction. The extent of this interaction is ever-growing due to rapid developments in digital technology and the common practices of the corporations that create, utilize and promote it. Manufacturers of end-user electronics strive to create a distinction in the competition, which results in the development and introduction of new technology for each and every new line of products. The slogan is simple and presumably most effective: "Technology betters your life." As accurate as that suggestion may be, it most probably has a hidden extension for the slightly more aware consumers: "Technology betters your life… And then it betters you!" If consumers do not want to fight a losing battle, they need to 'get their act together' in order to stay on top of all technological developments. Albeit, that requires hard work since there are innumerable functions and capabilities of every device they possess. Consequently, there lies one of the funnier contradictions in life: what was meant to make one's life easier now makes it harder.

Market competition requires products to come out frequently and loaded with numerous features. Producers are well aware of this requirement and spend large sums of money on research and development efforts. Coupled with effective marketing and affordable prices, advanced technological products create an immense center of appeal for consumerism. However, the abundance of features renders products only partially-utilized as users struggle to master these features, and somewhat need to be classified less as "haves and have-nots", and more as "cans and can-nots". The "can-nots" presumably fall prey to this large-scale case of product-user mismatch, which can be briefly described as product features failing to meet or exceeding user expectations, and give up on trying to utilize products to

their fullest extent. Products, in return, start to seem and be used like slightly improved versions –and only on the outside– of their forerunners.

Why, then, do users have to endure products that surpass their expectations? That may be a question to be answered by the producers but, in order to do so, user interaction with such products need to be examined. More specifically, usage patterns of these technologically advanced products should be studied in order to determine the extent of utilization of the improved technology integrated into these products. It may then be possible for the producers to decide how much technology to push into each line of product.

1.2 Scope of the Study

User-product interaction is a multi-dimensional, multi-faceted and multi-modal everyday encounter. Although it is governed by a large number of factors, this study concentrates on the two most prominent actors of this interaction, namely, the user and the product. In the following chapters, effects of user expertise and product properties on user-product interaction will be elaborated on with supporting arguments driven from related literature and data from two case studies in an attempt to uncover the underlying determinants of the interaction. However, it is not intended in this study to provide a set of guidelines for future product design processes.

1.3 Structure of the Thesis

The following chapter provides an elaboration of the subject matter in relevance with extant literature, and provides a direction for the subsequent bisection of the user-product interaction.

Chapters 3 and 4 share a common structure in which the two actors of user-product interaction mentioned above are taken into consideration separately, and arguments from relevant literature are conveyed. Chapters, then, proceed with a description and discussion of the corresponding case study, results of which are evaluated in light of the findings of preceding literature survey.

Fitting the above framework, chapter 3 examines the effects of user experience and expertise on product utilization in order to determine how these factors affect

product usage and to what extent prior product-related knowledge and habits play part during utilization. Relevant discussion is supported by succeeding presentation of a case study carried out with recent purchasers of television sets.

Chapter 4 is dedicated to the effects of product properties since the extent of product innovativeness is one of the most significant determinants of product utilization along with user expertise. The results of a usability study regarding consumer attitude and aptitude towards a hybrid mobile handheld combining several devices are conveyed in support of relevant literature.

The fifth and final chapter will summon the findings of the preceding chapters. Limitations of the study and suggestions for further research will be communicated in the closing sections of the chapter.

CHAPTER 2

ELABORATION

This chapter elaborates on the current state of new product development (NPD) processes, and investigates the role of industrial design (ID) in NPD in an attempt to portray the vitality of inclusion of interface design professionals in such processes. An account of the typical building blocks of user-product interaction concerning technologically advanced products is also provided. It should be noted that this is a widely studied subject area, and the following discussion provides key points from the literature. Problematic issues related to such advanced products are described, and previously suggested preventive measures for improving the user-product interaction are presented. Significance of user experience and satisfaction for an ideal interaction is also conveyed.

2.1 New Product Development Processes and the Role of Industrial Design in New Product Development

NPD processes typically involve collaboration among research, design, engineering, marketing, and various other departments of firms where each of these specialized departments concentrates on a different aspect of product development efforts. "Although each of these disciplines may contribute to the overall design effort, they have disparate approaches and focus on different (but often interrelated) product design issues" (Veryzer, 2005, p.24). Often, a mutual understanding and effective collaboration cannot be fostered among members of a design team and other people involved in the process (Bekker and Vermeeren, 1993) in which case the end product lacks a consistent design language and a well-built interface that would ensure successful product operation. Thus, a consumer's ability to make sense of a product –which incorporates complex technologies and numerous capabilities delivered through a poorly designed interface– often determines the marketplace success of that product (Veryzer and Borja de Mozota, 2005). Mullins and Sutherland (1998) note the marketers' difficulty in identifying "the best target market

for technologically driven innovations and to have confidence in the proper mix of the product's functionality, human interface, pricing, and market positioning" (p.228), and reason that the hardships are caused by the uncertainty created by potential customers' inability to articulate the necessary functionality and benefits of a new product. However, this statement fails to acknowledge the fact that it is *the designers'* responsibility to create products that are functional *and* usable regardless of the articulation or cognitive capabilities of users (Gelderblom, 2001).

As it stands, user-product interaction concerning modern consumer electronics is problematic owing to multiple and complex functionality of these products due to commercial concerns (Den Buurman, 1997). Den Buurman (1997) suggests reducing product functionality in accordance with actual user requirements, and developing user interfaces that foster "a coherent conceptual model that makes functionality apparent and comprehensible" (p.1159) in order to obtain more useful and usable products which would allow a "natural" interaction. Current state of the market requires high consumer creativity for successful product operation (Hirschman, 1980) since technological novelties, as well as addressing previously unnoticed needs, often require challenging product adaptations (Mick and Fournier, 1998). Subsequently, integration of numerous technological capabilities into a product that is "consistent with existing or evolving consumer usage patterns and needs" (Veryzer and Borja de Mozota, 2005, p.132) emerges as the design challenge. Triumphant undertaking of this challenge requires appreciation of both user needs and technological capabilities, but often than not, this is not the practice (Ulrich and Eppinger, 2004) in part due to conflicting interests involved in the NPD process (Veryzer and Borja de Mozota, 2005).

Traditional 'context in use' literature maintains that user practices and environment are the two key elements in defining user-product interaction (Petersen, Madsen and Kjaer, 2002; Maguire, 2001; Margolin, 1997; Venkatesh and Nicosia, 1997; Bevan and Macleod, 1994). It is also apparent that "users themselves do not carry out usability measures or use established heuristics for defining usability" (Keinonen, 1997, p.197). Thus, a thorough customer (or user) appreciation is required in order to create products that users "desire to interact with and from which they derive benefits" (Veryzer and Borja de Mozota, 2005, p.128); those that 'fit' users better. User-oriented design (UOD) processes, which will be discussed in

the upcoming sections, can aid towards achievement of such products. Better appropriateness of products developed through UOD also increases the adoption likelihood of these products (Veryzer and Borja de Mozota, 2005). Failure to facilitate product-related intentions shaped in the pre-purchase period may lead to dissatisfaction especially for durable goods (Ram and Jung, 1989), which may ultimately lead to the demise of the product due to long-lasting influence of initial product judgments on overall product satisfaction (Westbrook, 1987).

Despite the adversities stated earlier, the prominence of user-product interaction is gaining recognition in the design discourse (Margolin, 1997). The importance of well-designed products as means for brand positioning, differentiating, and equity building ensures that NPD processes of many leading companies pay more attention to ID (Veryzer and Borja de Mozota, 2005). However, ID is not yet an equal partner in NPD efforts (Borja de Mozota, 2002; Hollins and Pugh, 1990). Veryzer (2005) argues that research and development (R&D) managers responsible for NPD underestimate industrial designers' role in the design process, and states that "industrial design and the issues and concerns of the industrial design discipline simply do not seem to be of concern to these managers" (p.29). Veryzer (2005) also suggests that technical feasibility of new products and input of marketing departments responsible for shaping product specifications via target customer information are held upfront by R&D managers when compared to the contributions of ID. As such, the degree of involvement of ID in NPD processes is not as high as it should (and could) be. It should also be noted that industrial designers involved in the design of the products of concern in this thesis (i.e., technologically advanced consumer electronics featuring digital interfaces) are interface design specialists as well as those responsible for the appearance of the product. The determinations of the above discussion are likely to be worsened for interface designers since the profession of software design is inevitably largely populated by computer engineers (and the like) who also assume the role of interface designers when creating new software-based interfaces. Promoting NPD processes that incorporate UOD along with interface design specialists will without a doubt lead to creation of more user-friendly, usable, and pleasurable products.

2.2 *Product Integration and Electronification*

As new technologies penetrate our lives at an increasing rate, we no longer know what functionality to expect from our refrigerator, our

television, our car, our heating control system, etc. There is a trend toward product integration and we see an increased complexity of especially domestic technology. Thus our expectations become challenged in the meeting with new products and they are formed and modified as we gain experience with using the new technology. This exploration does not stop after the first hours or day of use. Our use continuously develops over time, new possibilities emerge, and others fade away. (Petersen, Madsen and Kjaer, 2002, pp.74-75)

Recent years have witnessed remarkable improvements in consumer electronics in terms of increased product capabilities at relatively stable prices owing largely to rapid development in digital technology. What is more striking is that this improvement is now moving on from 'hi-tech' products, such as personal computers and handheld devices, to domestic products such as refrigerators and washing machines. New lines of white goods offer previously uncharacteristic capabilities – a recently marketed refrigerator with an on-board television being one of the most appropriate exemplars of such products. As appealing as these technologically advanced products may be, things do not always work out as intended for the average user since "products that traditionally have been simple to operate (such as ovens and radios) are becoming more and more difficult to use as more and more functions are being integrated in them" (Honold, 2000, p.328). Widespread distribution of nearly every product brought about by the globalization phenomena ensures unprecedented access by a sizeable consumer body but what needs to be kept in mind, as Honold (2000) states, is that "more people without specific training can or must use relatively complex technical systems" (pp.327-328), be it personal computers, mobile phones, or finally, refrigerators and ovens.

The driving forces behind the increased pace of new product development efforts, and subsequent ever-shortening product life cycles, are technological innovation and market structure backed up by relentless advertising (Margolin, 1997). As such, "all of these activities are moving at such a pace that they outstrip our capacity to assess their social, psychological and spiritual value before the next wave of innovation occurs" (Margolin, 1997, p.234). Nonetheless, the lack of proper consideration for this rapid progression does not subdue consumers' desire to keep on consuming. In fact, it perhaps triggers greater craving towards acquisition of 'newer, faster, and better' products. Consumers, therefore, can be considered to be in a constant state of hunger for new products which integrate novel technology. In essence, "a consumer who expresses a willingness to adopt a new product is

necessarily also expressing a desire for novel information" (Hirschman, 1980, p.285), and this type of behavior is in fact quite contrary to human behavior since humans have been described as "cognitive misers" expending cognitive effort only when necessary (Garbarino and Edell, 1997, p.148). User demand from technology results in information overload caused in turn by multi-functional products, each of which requires a new episode of learning and adaptation period. This milestone in the user-product interaction is precisely where the significance of well-designed user interfaces surfaces.

2.3 Featuritis vs. Reduced Functionality

"Featuritis or creeping featurism is the tendency for the number of features in a product (usually software product) to rise with each release of the product" (Soegaard 2003). Given the electronic nature of current end-user products, it is only normal for the current generation of mobile phones, for instance, to integrate a digital camera along with a digital music player. Notwithstanding, the adversities of 'featuritis' have long been addressed by the likes of Donald Norman:

> Complexity probably increases as the square of the features: double the number of features, quadruple the complexity. Provide ten times as many features, multiply the complexity by one hundred. (Norman 1988, p.174)

For the average user, increased number of features makes user-product interaction potentially worrisome (Den Buurman, 1997) since most modern electronic products integrate "multiple and complex functions, with dozens of features, while lacking user interfaces that foster a coherent conceptual model that makes functionality apparent and comprehensible" (p.1159). What Den Buurman (1997) suggests instead is "adherence to an iterative, user-cent[e]red design process, instead of the common, technology and market driven one, [which] leads to more useful and usable products. These products have a reduced functionality that matches real user needs and preferences" (p.1159). As sound as this approach may be, it qualifies only as 'wishful thinking' since market structure does not allow for novel products that are stripped off the capabilities of their antecedents. Such products are not likely to be evaluated favorably by consumers either, since product evaluation is summative, and "a product will be evaluated less favorably when a feature is removed from it than if that feature had never been part of it. Similarly, a product will be evaluated more favorably when a feature is added to it than if that feature had

always been part of it" (Sen and Morwitz, 1996, p.226). In other words, makers of technology typically will not remove existing features from products, and will keep adding new ones as they become available to increase the favorability of a product. The battle between featuritis and reduced functionality, then, is likely to end in favor of the former. A candidate preventive measure to preserve user sanity appears to be user-oriented design.

2.4   User-Oriented Design

Consumer appreciation of a product is the number one prerequisite for that product to gain any kind of marketplace success, and in order to achieve appreciation, products embodying progressively complex technologies must be –at least partially– understood by users (Veryzer and Borja de Mozota, 2005). What is badly needed by users in order to cope with complex technological products is creativity which is required for "successful performance as a consumer" (Hirschman, 1980, p.286). Meanwhile, the designers need to foster a thorough understanding of their intended customers by acknowledging that "users are social actors who do not come to the product in a vacuum, but instead consider it in relation to their own plans and activities" (Margolin, 1997, p.232). User activities, defined by Kanis (1998) as "perceptions of users and their ways of reasoning, i.e. cognitive activities, together with use actions" (p.78), are continuously altered as new technology enters a user's life and requires adaptations that are not readily welcome (Mick and Fournier, 1998). Post-purchase period of novel technological products, therefore, are not always celebratory as "the same technology that creates radiant feelings of intelligence and efficacy can also precipitate feelings of stupidity and ineptitude [and] appliances purchased for saving time regularly end up wasting time" (Mick and Fournier, 1998, p.125).

Featuritis coupled with lack of consumer appreciation by the makers of technology presents a new design challenge of integrating technological novelties into products that are "consistent with existing or evolving consumer usage patterns and needs" (Veryzer and Borja de Mozota, 2005, p.132). This effort requires appreciation of technological capabilities as well as user needs, but as stated earlier, this is not the case particularly for technological products (Ulrich and Eppinger, 2004). Firms often opt to introduce as many features into products as possible – the only constraints

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are those related to technical capabilities. Consequently, Veryzer (2005) reasonably argues design process to be "equated with engineering" (p.23).

Despite the bleak picture painted so far, the prominence of user-product interaction is making ground in the design discourse. This means designers have to consider user concerns when developing a product, which ultimately converts product design into a much more difficult task (Margolin, 1997). "What contributes to this situation is the fact that users, for the most part, still remain little understood by designers, who make products for them and by manufacturers who try to win them as customers" (Margolin, 1997, p.227). To achieve a better understanding of consumers, firms need to engage in UOD activities.

> It is the focus on deep understanding of the customer or user—what may be termed user-oriented design (UOD)—that transforms a bundle of technology with the ability to provide functionality into a "product" that people desire to interact with and from which they derive benefits. (Veryzer and Borja de Mozota, 2005, p.128)

Another definition of UOD provided by Veryzer and Borja de Mozota (2005) is "sensitivity toward user/consumer design considerations in the context of extreme technology-based genesis and functional multiplicity/complexity of products" (p.129). UOD is likely to guide producers towards the solution of the apparent featuritis vs. product comprehension discordance by allowing them to push more technology into products while keeping the NPD process "grounded in the users' experience as a primary consideration" (Veryzer and Borja de Mozota, 2005, p.136).

2.5 User Experience

As underlined in the previous section, designers and producers of technology should strive to create satisfactory product experiences for their users through UOD, and the path to successful execution of such efforts crosses a thorough appreciation of the users and their experiences. It seems products that are "more readily adopted by users due to better product appropriateness" (Veryzer and Borja de Mozota, 2005, p.138) can only be realized in this fashion.

> "Experience" [means] all the aspects of how people use an interactive product: the way it feels in their hands, how well they understand how it works, how they feel about it while they're using it, how well it serves their purposes, and how well it fits into the entire context in which they

are using it. If these experiences are successful and engaging, then they are valuable to users. […] This [is] "quality of experience". (Alben, 1996, p.12)

Alben's (1996) 'quality of experience' definition also stems from product appropriateness, and addresses various evaluative dimensions such as haptic, cognitive, emotional, utilitarian and contextual. As diverse as this definition may be, it simply takes into consideration that any experience can be interpreted in many different ways, and individual experiences contribute to a set of larger experiences which are remembered later on (Forlizzi and Battarbee, 2004). Thus, it becomes crucial for a product to provide a pleasant user experience, which is the most important metric of product development efforts, and UOD processes that hold this metric foremost may influence "the range and type of new product solutions that are conceived, evolved, and produced" (Veryzer and Borja de Mozota, 2005, p.132).

2.6 User Satisfaction

Aware or not, consumers adjust user activities in a cyclical fashion demonstrated by Kanis (1998) as "constituting the sequence {… → use action → perception → cognition → use action → …}" (p.78). Here, each 'cognition' phase of the cycle contributes to the overall evaluation of a product. In addition, post-purchase consumption experience follows an evaluation → affect → satisfaction sequence (Mano and Oliver, 1993). When coupled, these two statements lead to a simple yet strategic corollary: *user satisfaction is a by-product of successful user experiences*. Successful achievement of user goals produces both cognitive and affective positive judgments which can only jointly lead to satisfaction (Mano and Oliver, 1993). It is also important for a product to elicit favorable user response early on in the post-purchase period since initial product judgments, as well as past affective responses, may have long-lasting influences on overall product satisfaction judgments (Westbrook, 1987). As such, the nature of user satisfaction is inevitably complex as described in the words of Fournier and Mick (1999):

> (1) consumer product satisfaction is *an active, dynamic process*; (2) the satisfaction process often has a strong *social* dimension; (3) *meaning and emotion* are integral components of satisfaction; (4) the satisfaction process is *context-dependent* and *contingent*, encompassing multiple paradigms, models and modes; and finally, (5) product satisfaction is invariably intertwined with *life satisfaction* and the quality of life itself. (p.15)

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Ultimately, a product has to have some sort of meaning to the user in order to evoke satisfaction (Fournier, and Mick 1999), and it should be designers' and marketers' goal to elicit positive product related affect in order to ensure successful performance of a product.

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As implied by the name 'user-product interaction', and however complex their nature may be, there are ultimately two players in the game, namely, the user and the product. Therefore, it seems the interaction can be defined and studied in terms of these 'players'. The effects of user profile and product properties will be discussed in detail in the following two chapters where the emphasis will be on user experience and expertise, and product innovativeness. Prominence of context-in-use, which influences both the user and the product, will be integrated into the respective discussions on user profile and product properties.

CHAPTER 3

PROMINENCE OF USER EXPERTISE

This chapter concentrates on effects of user expertise, determinants of which are presented, on various dimensions of user-product interaction. Special consideration is given to new product encounters in which case the role of expertise becomes highly pronounced in enabling product comprehension and utilization.

3.1 Experience vs. Expertise

3.1.1 Product Usage, Consumer Knowledge, and Building Blocks of Expertise

Formation of any type of first hand product-related knowledge inevitably crosses through product usage, which has two dimensions: usage frequency and usage variety (Ram and Jung, 1989). "Usage frequency refers to how often the product is used, regardless of what it is used for. Usage variety refers to the different ways in which the product is used, and to the different types of situations in which it is used" (Ram and Jung, 1989, p.160). Usage frequency (or product involvement) and user experience (or familiarity[1]) are directly proportional since experience is accumulated as the number of user-product interactions increase. Usage variety, on the other hand, aids toward expansion of expertise by enabling the user to carry out –what may be termed 'challenging'– product-related tasks as well as common ones. Alba and Hutchinson (1987) identify familiarity and expertise as the two major components of consumer knowledge where "familiarity is defined as *the number of product-related experiences that have been accumulated by the consumer* [and] expertise is defined as *the ability to perform product-related tasks successfully*" (p.411).

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[1] The terms 'usage frequency' and 'product involvement', 'experience' and 'familiarity', as well as 'consumer innovativeness' and 'consumer creativity' are used interchangeably in the text since this is the common practice in extant literature.

There are conflicting views on the relation of experience and expertise in literature. While Alba and Hutchinson (1987) argue that "in general, increased product familiarity results in increased consumer expertise" (p.411), Ram and Jung (1989), and Keinonen (1997) state that this is not necessarily the case.

> Involvement does not necessarily require expertise: an involved individual may use the product for the same purpose over and over, thus having a high frequency but relatively low variety. Use innovativeness, on the other hand, relates to the different, new ways in which a customer wants to use a product. This is more likely to create the need for building operational knowledge about the product. Further, the use innovative person is more likely to be independent and creative and seek information from sources as user manuals, which tend to be more technical in case of multi-functional products. (Ram and Jung, 1989, p.161)

In fact, user innovativeness has been long linked with personal variables such as educational attainment, occupational status, and urbanization (Rogers and Shoemaker, 1971). Ram and Jung (1989) also maintain that involvement is product specific and use innovativeness is a personality trait, and argue product specific involvement to be "the dominant consumer characteristic in explaining product usage, especially usage frequency and usage-related behavior" (p.165). It should also be noted that "involvement is consumer defined, not product-defined" (Richins and Bloch, 1986, p.283). Even though these two statements seem to conflict at first glance, the opposite is quite accurate: the consumer –perhaps inadvertently– defines the level of product involvement which, in turn, governs the nature of product usage in terms of frequency and variety. What goes undisputed, as Alba and Hutchinson (1987) note, is that users benefit from increased product familiarity in the shape of decreased cognitive effort expended during product usage. The reduction in cognitive effort due to simple repetition, and the development of cognitive structure enabled by building operational knowledge, in turn, improve users ability to analyze, elaborate on, and remember product-related information (Alba and Hutchinson, 1987), all of which contribute towards achieving a higher expertise level.

3.1.2 Advantages of User Expertise in New Product Encounters

While it should be designers' responsibility to come up with products that would be readily accepted by consumers as discussed in the previous chapter, this is often not the case in today's consumer electronics market. Hence, users are obliged with

adapting themselves to products instead of simply *adopting* them. Inevitably, this process is dependent upon user expertise, which encompasses an array of consumer characteristics ranging from demographic variables to personality traits. Garbarino and Edell (1997) state that "humans have limited cognitive resources and allocate them judiciously" (p.148). On the other hand, experts possess enhanced cognitive resources when compared to novices (Mattila, 1998), and allocate them more efficiently (Wood and Lynch, 2002). The last two statements, coupled with the fact that creative users have to expend less cognitive effort to comprehend novel product concepts (Hirschman, 1980), serve as a clear indication of expert consumers' edge over novices in new product encounters. A concise summary of the above argument provided by de Bont and Schoormans (1995) is as follows:

> The more adequate reaction of consumers with product expertise to new-product concepts is caused by their superior information processing capabilities with respect to the particular product or product class. (p.601)

Expert consumers also enjoy improved decision-making skills in case of product acquisitions (Wood and Lynch, 2002; Keinonen, 1997). Consumers, experts or not, are subjected to the same amount of product attribute information through advertisement in the pre-purchase period. However, "expert consumers may seek a greater amount of information about particular product attributes simply because they are aware of the existence of those attributes or because they are more capable of formulating specific questions about them" (Alba and Hutchinson, 1987, p.418). In the absence of additional information, "when experts and novices base their decisions on the same set of product attributes, novices are more likely to weight highly those attributes that are easily understood or have been made salient through promotion" (Alba and Hutchinson, 1987, p.423). Thus, the likelihood of experts acquiring the "right" product for themselves is higher than that of novices. The better user-product fit attained in this manner reflects on both usage frequency and usage variety since it prevents under-utilization of product functions (compared to that intended by the consumer) which may result in dissatisfaction (Ram and Jung, 1989).

Another advantage of higher expertise becomes apparent when users attempt to classify new products in terms of existing ones in an attempt to achieve product

comprehension, which is the typical consumer behavior in new product encounters (Gregan-Paxton and Roedder John, 1997).

> When a consumer has little experience with a product, […] being able to categorize it with products that are familiar may permit a set of important inferences to be made. How such categorization will be accomplished may depend importantly on the degree of product complexity and the consumer's background knowledge. (Cohen and Basu, 1987, p.470)

Considering the fact that users have little or no product-related experience in the pre-purchase period, it becomes crucial to develop product comprehension in order to shape purchase intentions and potential product utilization pattern. Consumers attempt to apply existing product categories, or schemas, to novel products, and check for congruence. If a successful fit can be attained, the novel product is hence classified, which aids toward building product comprehension. Peracchio and Tybout (1996) refer to this as 'schema congruity', where congruity is defined as "encountering a stimulus that conforms to expectations" (p.177). They also note that the schema-congruity effect is higher for individuals with limited knowledge about product category, and that non-experts will try to fit products in schemas whereas experts will make inferences based on schemas and not seek a perfect fit of the product into the schema since "an elaborate knowledge structure may allow new information that is incongruent with the basic schema to be accommodated with relatively little effort" (p.178). Experts intrinsically develop an understanding of product concepts since their enhanced cognitive capabilities enable flexibility in applying categories and acknowledging variations in schemas, and are less affected by the presence of possible irrelevant product-related cues which may handicap novices during schema application to the novel product (Peracchio and Tybout, 1996).

In the post-purchase period, users try to maintain their habitual way of use as much as possible as "existing use habits seem to limit the ability to be flexible when confronted by the unfamiliar" (Kanis, 1998, p.80). The flexibility in applying product schemas associated with higher expertise may also be of help in such situations if a user can demonstrate creativity in product usage. In fact, "a consumer whose purchase and usage rate is much lower but whose behavior is less habitual may exhibit considerable expertise" (Alba and Hutchinson, 1987, p.438). It is apparent that not experience, but expertise is the key user asset when it comes to early

stages of utilization of novel products since "lack of specific experience means less constraints in coming to grips with the designed functionality [of the unfamiliar product]" (Kanis, 1998, p.80).

As for the influence of expertise on early post-purchase evaluations of novel products, it should be mentioned that the frustration generated by potential failures during initial stages of utilization of such products are better tolerated by expert users. Mattila (1998) states:

> People with a relatively high capability for processing information partial out the impact of mood when making their on-line [i.e., instant] judgments, whereas people with a low capability for processing information use their mood states as input to evaluations. (p.483)

Thus, experts, equipped with adequate cognitive resources, are able make product judgments independent from mood effects, and may evaluate products favorably even if they suffer shortcomings in product usage. Conversely, novices' evaluations depend heavily on their mood and their evaluations will tend to be negative when in a bad mood (Mattila, 1998). Ultimately, higher expertise may avert elicitation of negative product-related affect, which may have long lasting effects on overall product satisfaction judgments (Westbrook, 1987).

3.1.3 Pitfalls of User Expertise in New Product Encounters

As demonstrated in the previous section, expert users possess enhanced cognitive capabilities that aid in comprehension of novel product concepts. Nonetheless, there are adversities related to higher expertise as well.

> Cognitive science supports the superiority of experts in a myriad of decision processes. In contrast, behavioral decision research paints a bleak picture of experts' performance, demonstrating poor judgments, inaccurate decisions, and overconfidence. (Wood and Lynch, 2002, p.416)

Even though experts are better able to grasp novel product concepts, they may suffer unwanted consequences if their overly strong beliefs on their true level of knowledge inhibit proper product-related information search and interpretation (Alba and Hutchinson, 1987). Higher expertise and prior knowledge are useful in new product encounters only as long as the inferences made by the user are not rendered obsolete by the new product. If prior knowledge is indeed rendered

obsolete, overconfidence in one's knowledge and expertise may result in learning less than those with lower prior knowledge (Wood and Lynch, 2002) where, in fact, the opposite is more likely due to better allocation of cognitive resources by experts. Indeed, "if more knowledgeable consumers have undue confidence that new product information will be redundant with what they know already, they may process less extensively than their capabilities and learn less than those who think they know less" (Wood and Lynch, 2002, p.417). However, experts will benefit from their enriched cognitive resources if they recognize the possible substantial changes within the product category in which case they will devote sufficient attention to product properties (Wood and Lynch, 2002). Drawing on prior research, Wood and Lynch (2002) identify three reasons experts may be more willing to try a new product:

> First, the combination of elaborate knowledge structures and analytic tendencies should allow experts to recognize potential benefits or improvements in the new product. Second, experts are also likely to be confident in their ability to correctly use new products or make decisions about new products based on [prior knowledge], self-efficacy, optimistic knowledge assessment, or [feeling-of-knowing]. Experts may be confident in trying novel products even when their confidence is not well calibrated. Third, Shanteau (1992) has noted the need for experts to engage in expert-like behaviors in order to maintain their self-image. Trying new, cutting-edge products and sharing opinions are just such behaviors. (p.425)

Wood and Lynch (2002) also maintain that expert consumers may be prone to making inferential errors due to overconfidence, thereby using the product incorrectly, and attributing poor product performance to the product rather than to themselves. In turn, "mistaken attributions should exert a negative influence on product satisfaction evaluations and, subsequently, on product adoption and word of mouth" (Wood and Lynch, 2002, p.425). This type of behavior by expert consumers "may lead to a cycle of self-delusion" in the absence of apparent disconfirming evidence (Alba and Hutchinson, 1987, p.439).

3.1.4 Relevance of Product Satisfaction

Increased experience helps in the formation of elaborate satisfaction judgments since "high familiarity customers are better able to discriminate between poor and good performance to a larger extent than low familiarity customers are" (Söderlund, 2002, p.872). Consumers with limited familiarity tend to produce moderate product

or service-related affect simply due to the fact that their knowledge structures contain little issue-related thought (Söderlund, 2002; Peracchio and Tybout, 1996). Consequently, "evaluations tend to polarize, or become more extreme as experience accumulates" (Söderlund, 2002, p.864).

As noted previously, under-utilization of product functions and incorrect product usage have been reported to induce negative product evaluations, which may result in dissatisfaction (Wood and Lynch, 2002; Ram and Jung, 1989).

> If consumers invest a large sum in a product which has sophisticated auxiliary features, but find that they use only a few of these features, the low usage may lead to dissatisfaction. Also, if a consumer bought such a product expecting to use it frequently, but never did, the resulting usage disconfirmation may result in dissatisfaction. This type of phenomenon can be expected more often in the case of durable or "important" products (Bloch and Richins, 1983), which offer usage variety. (Ram and Jung, 1989, p.166)

In order to avoid generation of negative product-related affect and product abandonment due to frustration, users need to attain fluency with the product in early stages of the post-purchase period, which means that "minimal time can be invested in learning the basic controls, and that use should be rewarding from the start" (Forlizzi and Battarbee, 2004, p.265).

Attaining ongoing consumer satisfaction is not an easy task:

> Even satisfied consumers will complain if often enough angered, disgusted, or contemptuous in connection with consumption of a particular product/service. […] Affects of different valences are not "netted out" against each other in a compensatory way. (Westbrook, 1987, p.267)

It should also be mentioned as an end note that consumer satisfaction alone does not guarantee product loyalty. Variety-seeking, age and income are important moderators of the satisfaction-loyalty link, whereas effects of gender and involvement are not as pronounced (Homburg and Giering, 2001).

3.2 Mental Models and Consumer Learning

This section describes the underlying processes related to consumer knowledge and learning. As discussed previously, users attempt to apply existing product

categories, or schemas, to novel products in order to attain product comprehension (Peracchio and Tybout, 1996). What determines the extent of existing product representations in consumers' psyche is a set of internal information referred commonly as 'mental models' in cognitive science (Freudenthal, 1999; Norman, 1983).

> A mental model is built up of internal information, most of which has the form of a representation in the user's mind, which consciously or unconsciously describes, explains and predicts the whole product, or parts of it. This internal information: can concern the structure of the product; can include the main functions and subfunctions of the product; generally includes information about procedures required to activate the functions; […] can be detailed or vague; can be (partly) correct or incorrect (when compared to the actual properties of the product). (Freudenthal, 1999, p. 52)

"Mental models are naturally evolving models" (Norman, 1983, p.7). Through interaction with a product, users continually modify and update their mental models which are constrained by such variables as "the user's technical background, previous experiences with similar systems, and the structure of the human information processing system" (Norman, 1983, p.8). Thus, mental models are incomplete, unstable, and lack firm boundaries since "people forget the details of the system they are using, especially when those details (or the whole system) have not been used for some period [and] similar devices and operations get confused with one another" (Norman, 1983, p.8). Nevertheless, possessing a mental model, as inaccurate and incomplete as it may be, saves users considerable cognitive effort in coming to grips with novel product concepts, and facilitates learning.

Consumer learning has two dimensions: initial post-purchase learning, and ongoing, passive learning that occurs during later stages of product utilization, and these two dimensions of learning should be distinguished. "During the initial, post-purchase experience, consumers may engage in a variety of activities such as reading manuals, taking tutorials, or engaging in self-guided exploration" (Mittal and Sawhney, 2001, p.4), and, as stated earlier, use innovative consumers are more likely to engage in such activities (Ram and Jung, 1989). On the other hand, "ongoing post-purchase learning is interactive in nature, evolves over time, and impacts consumption as usage" (Mittal and Sawhney, 2001, p.4). Therefore, it is

likely that this second phase of post-purchase consumer learning is the underlying mechanism for the evolution of mental models.

In addition to the above dimensions of learning, users may "seek information pertaining to presently adopted products and consumption situations in an effort to improve [their] performance" (Hirschman, 1980, p.284), where higher expertise and creativity will be important assets in evaluating novel products in relation to previously adopted ones (Hirschman, 1980). Gregan-Paxton and Roedder John (1997) identify external information sources, such as advertising and product experience, as primary sources of consumer learning. However, they also acknowledge the existence of learning by means of internal knowledge transfer which they term 'consumer learning by analogy' (CLA).

> When faced with something unfamiliar, we often attempt to understand it by relating it to something familiar. When we do this, we are learning by analogy. More formally, analogical learning is concerned with the use of a familiar domain (the base) to understand a novel domain (the target). (Gregan-Paxton and Roedder John, 1997, p.267)

In developing an extension of the CLA model, Moreau, Lehmann and Markman (2001) maintain that multiple knowledge bases may be required to form a mental model of a novel product, i.e., additional knowledge from secondary domains may be required to "fill in the gaps left after transferring knowledge from the primary base domain" (p.27) in order to achieve full comprehension of a new product. Expert users are expected to blend knowledge from different domains with relative ease since their knowledge structures are not only more extensive, but also more interconnected when compared to novice users (Gregan-Paxton *et al.*, 2002). Gregan-Paxton *et al.* (2002) point out the cognitive and affective advantages of CLA in new product encounters:

> Analogy provides the consumer with a means to assimilate the [really new product] within existing knowledge structures and, consequently, greatly reduces the degree of cognitive change required to create the initial representation of the novel product in memory. To the extent that analogy increases the probability that the consumer will be able to represent the [really new product] as an extension of a familiar domain, rather than as an entirely new and distinct knowledge structure, analogical processing should lead to the generation of positive affect. (Gregan-Paxton *et al.*, 2002, p.539)

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Peracchio and Tybout (1996) also note that positive affect is generated by resolution of moderate incongruities with existing product schemas. It therefore becomes important for the user to demonstrate sufficient expertise in order to attain product comprehension without generation of negative product-related affect, which may result in dissatisfaction and, ultimately, product abandonment.

Stages of CLA have been identified as "(a) accessing the base domain, (b) mapping the elements of the target onto the base, (c) transferring knowledge from the base to the target, and (d) inducing a schema" (Gregan-Paxton and Roedder John, 1997, p.267). Only after completion of these stages, can users check for schema congruity where experts have been demonstrated to have an edge over novices.

Product mappings required for the second stage of CLA are of two types: relational mappings concerning product concept and operation (e.g., product rules, operating system, etc.), and attribute mappings related to product attributes and mere appearance similarities (e.g., physical properties, number and type of buttons, etc.) based on exemplar products (Gregan-Paxton and Roedder John, 1997). "A key proposition of the CLA model is that relational mappings are associated with schema-based knowledge transfer whereas attribute mappings are associated with exemplar-based knowledge transfer" (Gregan-Paxton, 2001, p.142). Since constructing an overall understanding of the product functioning is more helpful than attempting to relate its attributes to an exemplar product, "comparisons based on relational mappings have greater explanatory power than comparisons based on attribute mappings" (Gregan-Paxton and Roedder John, 1997, p.271). Thus, owing to their enhanced cognitive capabilities, experts tend to employ relational mappings during CLA[2], whereas novices are limited to attribute mappings (Gregan-Paxton and Roedder John, 1997). This situation also extends to product judgment formations:

> […] novices, who are limited to the construction of attribute mappings, are more likely than experts to rely on specific knowledge when constructing product judgments. Similarly, [...] experts, who are able to construct relational mappings, are more likely than novices to rely on abstract knowledge when forming product judgments. (Gregan-Paxton, 2001, p.143)

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[2] Gregan-Paxton and Roedder John (1997) also note that experts recognize the cases where relational mappings are inappropriate, and abandon the process to conserve cognitive effort if only attribute mappings are possible between two products.

Success of analogical learning depends upon the conceptual distance between the new product and previously encountered categories (Gregan-Paxton *et al.*, 2002), or what may be termed 'the transfer distance' defined by De Corte (2003) as "the degree of difference between the original learning task and the transfer task" (p.145). If the transfer distance is more than appropriate, or users apply faulty inferences, CLA may not aid in developing product comprehension, or even worse, lead to incorrect product inferences. This drawback is due to 'transfer errors' that may surface during CLA (Gregan-Paxton and Roedder John, 1997).

> Transfer errors are a particularly worrisome problem for mere appearance comparisons because such comparisons are based entirely on attribute overlap. With attributes as the sole basis of the comparison, the subset of knowledge associated with the base that can be appropriately transferred to the target is relatively small. This suggests that the potential for exceeding the limits of the comparison (i.e., for transferring information beyond the appropriate subset) is higher for mere appearance comparisons than for [relational] comparisons. (Gregan-Paxton and Roedder John, 1997, p.269)

Accordingly, novices limited with mere appearance comparisons face a greater risk of experiencing transfer errors when attempting analogical learning. Hence, the benefits of consumer expertise are twofold: experts can apply both CLA *and* subsequent schema-congruity assessment with less cognitive effort (and a higher success rate) compared to non-experts, and devote additional cognitive resources to secondary product-related issues.

3.3 Case Study 1

Neither use, nor products can be understood in isolation. The setting in which any technological product is used has to be taken into consideration in order to understand its adoption and use (Petersen, Madsen and Kjaer, 2002; Maguire, 2001; Margolin, 1997; Venkatesh and Nicosia, 1997; Bevan and Macleod, 1994). Users of a product are the key elements of the setting due to the simple fact that they *govern* the setting. Hence, the need for understanding the effects of user profile on user expertise as well as the need for examination of use specific situations arises in order to understand how development in use occurs. Furthermore, Fournier and Mick (1999) maintain that "(1) satisfaction is not an evaluative state but a process extending across the entire consumption horizon and (2) the study of

consumer-product interactions following purchase is fundamental to advancing knowledge along these lines" (p.6). These statements call for an investigation of consumer-product interaction in the latter stages of product ownership in order to develop an understanding of the expertise-satisfaction link. In addition, evaluating products in their respective environments appears to be the only feasible method to understand context in use. Fournier and Mick (1999) stress the need for data collection and analysis to concentrate on "sociocultural and personal lifeworlds, thus allowing for representation of context and meaning in consumers' satisfaction experiences" (p.6), and this approach was adopted for the following case study.

3.3.1 The Research Framework

As has been previously discussed, current consumer electronics market structure requires consumers to endure products that surpass their expectations. Therefore, consumer reactions to such products need to be examined. More specifically, usage patterns of these technologically advanced products should be studied in order to determine the extent of utilization of the improved technology integrated into these products. It may then be possible for the producers to decide how much technology to push into each line of product.

There are many underlying motives governing users' approach to novel electronic products but, in an attempt to address the above query, this study concentrates on the effects of expertise on utilization of a replacement product. Four main questions addressed in this study are:

- Do users perceive/utilize new products simply as substitutes for old ones?
- Are users willing or reluctant to make use of new product capabilities?
- How do users' habits related to the previous product play part while using the new product?
- Assuming the new product has a menu-driven interface, does computer literacy affect product usage?

The television (TV) was selected for the study to determine user motives and perceptions due to the fact that this device has evolved significantly in the past few decades: first the color TV, then the remote control (remote), and finally, TVs with on-screen menu controls (menu) surfaced the market. Even though the first step of this evolution did not lay much burden on users, the departure of the user interface from the TV itself and onto, first the remote, and then the screen, meant that every

new generation of the product demanded a new episode of learning and adaptation by the users. Relocation of some functions onto the remote could be considered a smooth transition since the user was allowed to stay partly in the physical realm but, the on-screen menu structure has rendered it impossible for the user to carry on TV usage in the accustomed fashion.

3.3.2 Methodology

In the first phase of the study, users were asked to complete a questionnaire regarding demographic information, computer usage characteristics, purchasing criteria, viewing statistics, menu usage and product satisfaction (see Appendix A.1). In the second phase, which was conducted in users' dwellings, users were asked to complete three tasks using the remote and the menu. The tasks were (a) automatic channel presetting, (b) picture setting (color, contrast, etc.) adjustment, and (c) sound setting (bass, treble, etc.) adjustment. Users were encouraged to think aloud while performing the tasks, and were sound-recorded for subsequent task deconstruction. Upon task completion, users were asked, in a semi-structured interview, to evaluate menu usage and offer alternative methods, if any, for completing the tasks (the interview guide is presented in Appendix A.2). The results of the questionnaire, task analysis and the interview were finally brought together to form a database and perform relevant analysis.

3.3.3 Sampling

Twenty-two users who have purchased a new TV within the past three years were contacted. The three-year limit was employed to ensure that users' recollection of their previous TVs in terms of usage and habits would still be considerably vivid. The sample consisted of 13 females and 9 males with an overall mean of 36.7 years of age. Of the twenty-two users, 59% hold a university degree or higher, and 82% are at least bilingual, which is significant since the study was conducted with an entirely Turkish population using TV sets with menu structures in English.

3.3.4 Results, Analysis and Discussion

In compliance with the proposition that user profile, preferences, and practices are interrelated with users' ability to perform required tasks, *user expertise level* was defined. According to the number of tasks completed, users were assigned levels of 1, 2, and 3 for completing one, two, and three tasks, respectively. Users who failed to complete all three tasks were assigned a level of zero. Following the expertise

level assignment, its relation with user characteristics and preferences were examined.

3.3.4.1 Analysis

Task duration and failure rate for each task is presented in Figure 3.1. The term failure, here, is used for incomplete tasks only, since users were allowed to work toward task completion for as long as they required, and were given the chance to start over or navigate the menu until the task was completed. Notably, the duration for task (a) is significantly higher than that of the remaining tasks but this is mostly due to the layout of the menu structures of users' TV sets. For all but two cases, the function for completing task (a) was at least one level deeper in the menu structure and this presumably led to longer completion times for this particular task. The proximity of completion times for tasks (b) and (c) are also due to a similar reason: the functions for completing these two tasks were on the same menu level for all but three cases. Moreover, the users had to explore the picture menu in order to complete task (b), and this led to a slight decrease in the completion time for task (c), which is a very similar task.
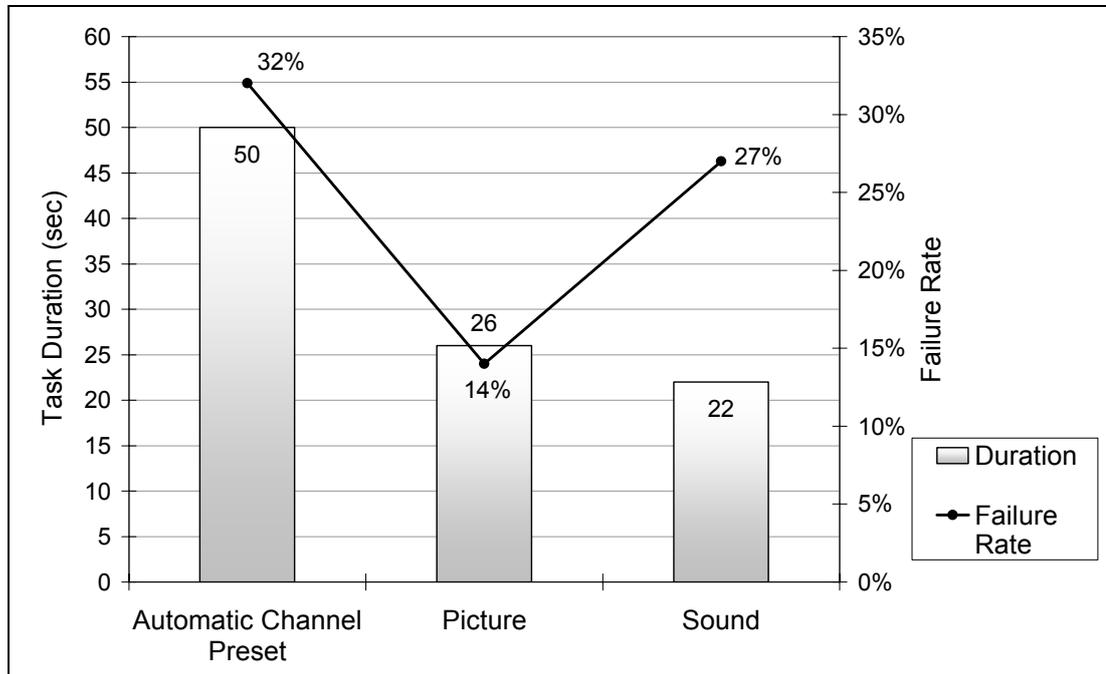
Figure 3.1 Task duration and failure rate

Failure rates in Figure 3.1 indicate expected trends for tasks (a) and (b) since the former requires more number of steps for completion than the latter. However, failure rate for task (c) is unexpectedly higher than that of task (b). Further examination of the data, on the other hand, reveals that the difference in the failure rates is due to the three special cases where users failed to find the function for task (c) on the same menu level as task (b), and did not carry on with the task with the assumption that their TVs did not have the required function. These special cases can be considered an indication that users expect to find similar functions of the TV on similar menu levels, which is also in keeping with the suggestion that product rules should be applied consistently in the entire product (Molich and Nielsen, 1990, Freudenthal, 2000).

3.3.4.2 Effects of User Profile on User Expertise

This section describes correlation of key user characteristics and expertise level. The distribution of expertise levels zero, 1, 2, and 3 within the population are 13.5%, 4.5%, 23%, and 59%, respectively. It should be noted at this point that all users with zero expertise level did not attempt using the menu at all as they claimed they would not be able to complete the tasks anyway. Another interesting point about these users is that all are males above the age break point of 40. Only one male participant above the age break point attained an expertise level other than zero. Females above the break point (5 users making up 23% of the population), however, did attempt task completion regardless of experience in using the menu prior to this study, and attained expertise levels other than zero.

User's educational level and ability to speak foreign languages are among key driving factors of expertise level. All users with expertise levels of zero and 1 have high school degrees, whereas 72% of the users with level 2 and 3 expertise have university or higher degrees, and 11% are currently enrolled to university. Additionally, correlation coefficients (ρ) for educational level and language skills with respect to expertise level are 0.59 and 0.68, respectively, which imply that these two qualities of the user are fairly strong indicators of a user's ability to utilize the TV menu. It can be argued that one's familiarity with technical terms increases with higher education, and it is therefore not surprising that two users with zero and 1 expertise levels who both have high school degrees argued that the TV should have a more "understandable" language.

Another key driving factor for user expertise is computer usage characteristics. Data suggests that a strong correlation (ρ = 0.63) exists between the two and, most fittingly, all users with zero expertise level do not use computers, whereas 92% of users with level 3 expertise use computers at home, office or both, of which 69% average more than 10 hours per week. Moreover, 73% of the population considers computer and menu usage familiar subjects even though their opinions vary: 50% considers computer literacy helpful for understanding and using the menu, whereas the remaining 23% thinks the notion they carried over from computer usage misled them while using the menu, or they would be more comfortable using the TV menu if it resembled a computer menu. It is therefore likely that the aforementioned 73% of the population transferred their knowledge from the computer domain to the TV domain by way of CLA, where approximately one third of them experienced transfer errors (as argued by Gregan-Paxton and Roedder John, 1997) that led to slip-ups while using the menu.

Users' prior experience with menu usage affects their expertise level: 68% of the population had experience using the menu prior to this study and, as can be expected, this subgroup posted expertise levels of 2 and 3, whereas only 43% of the remaining users managed to do so. Moreover, all users with zero and 1 expertise levels were among those who had not explored the menu before. Data analysis also indicates that experience with menu usage and expertise levels are highly correlated (ρ = 0.73). In essence, direct proportionality between experience and expertise suggested by Alba and Hutchinson (1987) holds for the population.

Questionnaire correspondence reveals that only a portion of the population took the time to read through the TV manual (23%), but this group, once again, posted expertise levels of 2 and 3 (20% and 80% among themselves, respectively). However, it is hard to argue that reading the manual is a prerequisite to achieve higher expertise levels (ρ = 0.27) since 41% of the population posted level 3 expertise without reading the manual. If a large user segment is unwilling to receive product information through the product manual, as is the case with this population, it becomes more important for those users to have an intuitive understanding of product rules and operation. Previous discussion suggests that effective utilization can be achieved when a product fits the user's mental model. Hence, it is

reasonable that some users, those who possess appropriate mental models for their TVs, are able to use the menu without receiving relevant information or training.

Examination of users' average daily TV viewing hours versus their expertise levels yielded a rather unexpected outcome. Users with level 2 and 3 expertise average 2-3 hours of TV watching per day, whereas users of lower expertise levels reported 3-4 hours per day. Yet, these average values do not provide valuable insight since average TV viewing hours is very weakly correlated to expertise level ($\rho = -0.18$). It can only be inferred from the data that one does not have to spend extended hours in front of the TV in order to master its functions, and that spending many hours does not guarantee effective utilization of the product. This statement is also in keeping with Ram and Jung's (1989) argument that increased product involvement does not guarantee increased expertise.

Participation in purchase decision, likewise, does not necessarily contribute to user expertise as suggested by Alba and Hutchinson (1987). Analysis indicates that 46% of level 3 expertise users did not participate in purchase decision at all, while the percentage for lower expertise level participants is at a much lower rate (22%.) Moreover, data yields a very weak correlation ($\rho = -0.12$) between participation in purchase decision and expertise level.

Lastly, duration of product ownership is among determining factors for expertise level. Level 3 users reported an average ownership period of one to two years while other users have purchased their TVs within the past year, and failure rate among users who have purchased their TVs within the past six months is 67%. Even so, it should be noted that these two parameters convey a mild correlation ($\rho = 0.48$). Also noteworthy, results of a study by Ram and Jung (1989) maintain no differences in usage patterns based on length of ownership of the product which suggests that "usage patterns [stabilize] at fairly early stages of the ownership" (p.163).

3.3.4.3 *Effects of User Expertise on Product Utilization and Satisfaction*

Users were requested (in the questionnaire) to evaluate how much they agree with several statements on a continuum as a 7-point scale (0 = disagree, 6 = agree) in order to determine their product utilization patterns and satisfaction ratings. Some of the key statements are given in Table 3.1. Also provided in the table are average

ratings of the entire population, expertise level 3 users, expertise level zero-to-2 users, and correlation coefficients of the ratings with users' expertise level. It should be noted that the average ratings are provided only as a reference for the following discussion, and do not hold any statistical value. However, these values provide insight into how users of different expertise levels evaluate their TVs and their own product utilization.

Table 3.1 Average evaluation scores for user practices and satisfaction, and their correlation with expertise level

	Average Rating of Entire Sample	Average Rating of Expertise Level 3 Users	Average Rating of Expertise Levels Zero, 1 and 2 Users	Correlation Coefficient with Expertise Level (ρ)
User Utilizes New Functions of the TV	2.9	3.5	1.9	0.44
User Changed TV Usage Habits with New TV	2.2	2.5	1.8	0.23
User Changed TV Viewing Habits with New TV	1.0	1.3	0.7	0.18
Menu Meets User Expectations	2.5	3.2	1.4	0.41
New TV Meets User Expectations	4.2	5.2	2.9	0.78

It is evident by examining Table 3.1, that utilization of new functions of the TV is much more commonplace with users of expertise level 3. This could be attributed to the assumption that users will be willing to explore more functions of the TV as their expertise increases, and data reveals, with a mild correlation, that this assumption is safe to make. As for changes in TV usage and viewing habits, all users post similar ratings, which remain in the lower half of the scale, which implies that the new TV does not influence usage and viewing habits to a large extent. Answers to open-ended product expectations query also indicate that users' expectations from the TV are limited: 82% of the population expects good picture and sound, whereas only 14% expects compatibility with peripheral devices, and 23% expects durability. This statement, however, does not take into consideration that new lines of TVs meet most user expectations by default, and many users take their latter expectations, and those not listed here, for granted. Nevertheless, the answers to the expectations

query provide a clear suggestion that most users' primary expectations from a new TV are quality picture and sound, while other offerings of the TV, which include various technical capabilities and issues such as menu usability, do not affect their usage and viewing habits in particular. Analysis also depicts that changes in TV usage and viewing habits are weakly correlated to user expertise (ρ = 0.23 and ρ = 0.18, respectively).

Users of expertise level 3 report higher menu satisfaction ratings than other users but data suggests that menu satisfaction and expertise level are only mildly correlated (ρ = 0.41). Non-experts' dissatisfaction may be attributed to their inability to use the menu, but the reason for level 3 users' meager satisfaction rating lies elsewhere: 46% of these users consider the menu to be complex and argue that it should be easier to use regardless of the fact that they experienced little or no trouble completing all three tasks. In keeping with Westbrook's (1987) previously conveyed proposition that even satisfied consumers will complain if they are displeased with consumption of a product, it is only normal that expertise level 3 users will be critical of the menu regardless of the fact that they are able to use it.

Users' overall satisfaction with their TVs is strongly correlated with their ability to utilize the products to a desired extent (ρ = 0.78). The difference between satisfaction ratings of level 3 users and the remainder of the population is remarkable. This situation clearly suggests that a user first has to discover functions and capabilities of the TV in order to state a high satisfaction level for it. It is to be expected that once users of lower expertise levels start employing more functions of their TVs, their satisfaction levels will also increase.

3.3.4.4 User Opinions and Suggestions

A list of user opinions other than the ones presented in the previous section surfaced during the interviews. Some of these opinions, along with their occurrence rates and brief discussions, are presented below.

A substantial portion of the users expressed opinions on direct function buttons on the remote: 50% stated they would prefer function buttons instead of the menu for sake of easier usage of TV functions, and 23% thought buttons were unnecessary and crowding the remote control. Of the users, 27% stated that they liked the remote

control of their previous TV better, and 18% expressed having trouble using the remote because they sometimes looked for buttons that were on the previous remote, in which case existing use habits seemed to limit the ability to be flexible as suggested by Kanis (1998).

Users also expressed dissatisfaction with menu and button icons and labels: 55% stated that menu and/or button icons or labels were unclear, misleading or misrepresenting. 50% of the users suggested on-screen directions or usage tips would be helpful to achieve higher efficiency as if to echo the argument that the ultimate responsibility of the designer with respect to multimedia products is "to create a navigable environment with interfaces that help to orient the user" (Trumbo, 1997, p.20). The orientation process is particularly important since "the designer should not expect the user to remember anything more than his final user goal" (Freudenthal, 2000, p.912).

In many instances, capabilities of the TV exceeded users' expectations: 41% of the population stated that they found many menu functions or remote control buttons unnecessary or useless, and added that they would like to remove them. These statements indicate that product capabilities exceed user expectations, and those functions which are beyond expectations are bound to stay non-utilized. 18% of the subjects expressed that they would prefer customizable menus instead of the current ones so that frequently used functions could be accessed with less navigation in the menu.

As a final note, answers to the questionnaire revealed that none of the users hold menu and remote control appearance or usage as purchasing criteria, and none examined the menu or the remote control prior to purchasing their TVs. 36% claim they will not use the menu to make any adjustments unless the current settings are somehow altered.

3.3.5 Conclusion

User expectations and involvement are the ultimate driving forces behind product utilization, and when expectations are limited, as is the case with television, new products end up being treated as mere improvements which can perform the same functions as the old one; only better. Users seem to be interested in only the functions that will get them by as they are accustomed (Kanis, 1998), and do not

attempt to learn additional functions. The results of the case study indicate a lack of interest in advanced product functions (i.e., low usage variety) rather than overall user incompetence in using them. Once again, this could be attributed to the low level of product expectations, in which case, product-user mismatch becomes evident. At a low level of intended product function utilization, user experience, and not expertise, governs usage of the new product. For most cases, it is only a matter of time until new product designations are learned, and then the user can carry on using the product in the familiar fashion. Morris, Venkatesh and Ackerman (2005) identify consumer intention as "the sole predictor of short-term use", and short-term use as "the key determinant of long-term use" (p.72). In accordance with this proposition, case study results reveal a low level of consumer interest in product functions, which also carry over to latter stages of ownership. When product expectations are low, investing minimal amount of time in learning basic controls seems to provide a satisfactory experience as suggested by Forlizzi and Battarbee (2004). However, relocation of the user-product interface calls for effort on user's account, and personal variables such as educational attainment, language skills, and computer literacy, which serve as building blocks of user expertise, have an effect on determining the extent the user will be able to utilize the product.

A number of studies reported in relevant literature also convey similar results. In a study reported by Margolin (1997), when the capabilities of a telephone exceeded a user's experience, he became reluctant to make an effort to learn the additional capabilities and preferred to ignore them even though he possessed the intellectual capacity to learn more functions. In this case, the user opted to utilize the device by relying solely on his 'experience as knowledge', and forego the chance to attain 'experience as satisfaction' when the effort to learn new functions of the device outweighed the benefits to be achieved by using those functions. As a consequence, the user utilized the phone in a self-limited fashion, which, in return, suggests that he would do just as well with a device with fewer functions. Additionally, two studies by Vuick (1993), and Loopik, Kanis and Marinissen (1994) found some operating problems to be of permanent nature; the former relating to unused products or product functions (as was observed in the case study), and the latter to operating difficulties with vacuum cleaners. Both studies maintain that "the majority of these difficulties are of cognitive origin, in the sense that subjects

misunderstand product information or falsely apply pre-learned operating procedures" (Gelderblom, 2001, p.4).

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The literature presented in this chapter, also supported with the results and discussion of the case study, clearly indicate that experience and expertise are key determinants of product utilization, and that expertise aids consumers to grasp novel product concepts with relative ease when compared to novices. The benefits of expertise in new product encounters become even more emphasized if products are not only unfamiliar but also innovative. A discussion on innovation, product innovativeness, and relevance of consumer expertise is presented in the following chapter.

CHAPTER 4

PROMINENCE OF PRODUCT PROPERTIES

The current structure of consumer electronics market requires firms to promote technological novelties as soon as they become available in order to maintain an edge over the competition. Veryzer and Borja de Mozota (2005) mention "the tensions between such things as the need for innovation, the rapid rate of technological change, the need for deep customer understanding, product complexity and multiple functionality, maximizing customer experience, and value proposition" (p.133) as a number of conflicting interests that developers of technology have to endure. As a consequence of harsh marketplace conditions, firms often opt to overlook user-related concerns when developing technology-driven products (Ulrich and Eppinger, 2004), and aim to integrate all available technology into new lines of products. Considering the limitations for altering the long-accustomed physical attributes of products, it is often the digital interface (or the "soft side") of a product that incorporates improved and innovative technologies. "Creative" designs coupled with advanced capabilities, present endless possibilities for providing users innovative interface solutions for carrying on their product-related practices. However, there is a limit for the innovativeness a product can offer since consumers can opt to reject a product if they feel they will be overwhelmed by it. It therefore becomes important for an innovative product to maintain a certain level of usability before it is perceived as 'too-complex-to-use'.

In accordance with the above discussion, this chapter elaborates on the effects of the degree of product innovativeness on product comprehension, adoption, and utilization. A discussion of innovation and product innovativeness is followed by presentation of a usability study involving an innovative handheld device where special attention is paid to the relationship between product innovativeness and user expertise.

4.1 Innovation and Product Innovativeness

An appreciation for product innovativeness should be developed in order to understand its influence on user-product interaction. This section communicates innovation typology and innovativeness terminology as a first measure.

The online version of the Compact Oxford English Dictionary defines 'innovation' as "a new method, idea, product, etc." (www.askoxford.com). NPD efforts are likely to embody all aspects of this definition. Linking innovation to NPD, Garcia and Calantone (2002) base their definition of innovation on a 1991 OECD study:

> 'Innovation' is an iterative process initiated by the perception of a new market and/or new service opportunity for a technology-based invention which leads to development, production, and marketing tasks striving for the commercial success of the invention. (p.112)

Naturally, commercial success of an innovative product depends on users' ability to understand and appreciate the product, which, from the designers' viewpoint, often requires anticipating the future in order to create products that are consistent with users' evolving needs (Veryzer and Borja de Mozota, 2005).

> An innovation's design is more easily integrated into people's minds and lives when constructed so as to evoke a shared experiential vocabulary and preexisting understandings (Hargadon and Douglas, 2001; Veryzer, 2000). Prospective innovators need to carefully cultivate designs that assimilate some elements of the familiar, along with novel features, into new product embodiments that can be readily interpreted and are willingly embraced. (Veryzer and Borja de Mozota, 2005, p.138)

Be that as it may, the hardships of linking user needs and offerings of new technology are also recognized (Mullins and Sutherland, 1998). Unless such setbacks encountered during NPD are overcome by the designers, relative advantages of new product capabilities may be undermined by increased product complexity, which in turn may create resistance to products (Veryzer, 1998a). Ultimately, as Veryzer (2003) states, "fundamental to the change brought by product innovation is how the new offering will interact with the actual needs and desires of consumers" (p.851). The success of this interaction is imminent upon the marketplace success and diffusion of an innovative product since "innovation is essentially about change, and diffusion is essentially consumer willingness for change" (Veryzer, 2003, p.851).

Garcia and Calantone (2002) define product innovativeness as "a measure of the potential discontinuity a product (process or service) can generate in the marketing and/or technological process" (p.113). The discontinuity (or the innovativeness) of products vary depending on the target user profile. Veryzer (1998b) suggests that innovations fall on a continuum from evolutionary or (continuous) to revolutionary (or discontinuous). Hence, alternative definitions of product innovativeness for radical, incremental, really new, discontinuous, and imitative innovations[3] exist in numerous resources[4] (Garcia and Calantone, 2002). However, in an attempt to simplify the profuse terminology, Garcia and Calantone (2002) classify products as 'incremental', 'really new', and 'radical' innovations upon inspection of extant literature, and maintain that 37.5%, 50%, and 12.5% of all new products, respectively, belong to these three classes.

"Earlier products are often used as design templates for innovations because the existing product is a viable solution to several potential functional and aesthetic goals" (Moreau, Lehmann and Markman, 2001, p.15). Influences of earlier products are most evident for incremental innovations since these products are defined as "products that provide new features, benefits, or improvements to the *existing* technology in the *existing* market" (Garcia and Calantone, 2002, p.123). Another definition of incremental innovations provided by Song and Montoya-Weiss (1997) states that "an incremental new product involves the adaptation, refinement, and enhancement of existing products and/or production and delivery systems" (p.126). Really new innovations comprise majority of innovations and are characterized by newness in the market *or* technology but *not both* (Garcia and Calantone, 2002, p.123). At the far end of the spectrum lie radical innovations that incorporate technological novelties *and* generate entirely new markets by not addressing recognized consumer demands but by creating "demand previously unrecognized by the consumer" (Garcia and Calantone, 2002, p.121). Despite employing a very similar definition, Veryzer (1998b) terms radical innovations as 'discontinuous' innovations, and in relating this product class to user experience and product

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[3] The terms 'innovation' and 'innovative product' are used interchangeably in the text. For example, as is customary in extant literature, a product is often referred to as 'a radical innovation' instead of 'a radically innovative product'.

[4] Readers can refer to Garcia and Calantone (2002) for an exceptionally detailed account of innovation typology and innovativeness terminology.

utilization, states that "discontinuous innovation refers to radically new products that involve dramatic leaps in terms of customer familiarity and use" (p.305). As such, radical innovations are the most demanding product class since this type of products may displace users' existing utilization patterns by requiring new problem solving strategies, adaptations and commitments.

4.2 Risks Associated with Innovative Products

Radical innovations, along with incremental innovations, have a better shot at commercial success than really new innovations: a U-shaped relationship exists between product innovativeness and commercial success (Lee and O'Connor, 2003) since incremental innovations present minor schema incongruity which can be resolved with little cognitive effort, and radical innovations offer major schema incongruity which prompts "arousal and cognitive elaboration directed toward making sense of the incongruity" (Peracchio and Tybout, 1996, p.177). In either case, the resolution of incongruity achieved by discovery or insight produces satisfaction (Peracchio and Tybout, 1996). Albeit, in cases of extreme incongruity where users cannot accurately forecast the amount of cognitive effort required to resolve incongruence, which occur often than not (Garbarino and Edell, 1997), failure to reach a satisfactory resolution may elicit "feelings of frustration and helplessness" (Peracchio and Tybout, 1996, p.177) which will generate negative product-related affect.

Veryzer (1998a) provides a concise list of key factors affecting customer evaluations of radical innovations:

- Lack of familiarity: Products not fitting users' knowledge structure, product schema, or current consumption patterns.
- Customer 'irrationality': Users focusing on 'irrelevant' details (for the design team) or not acting 'logically' (or as expected by the developers).
- User-product interaction problems: The lack of understanding of product operation and benefits by the users.
- Uncertainty and risk: Customer uncertainty about the need for or benefits of the product and the associated risks.
- Accordance: The degree of compatibility of a new product with a customer's life and the amount of accommodation or adjustment required by the product.

- Aesthetics: The visual, haptic, etc. appeal of a product. Has the same kind of influence for both continuous and discontinuous products.

Addressing additional risks associated with innovative products, Kanis (1998) notes that designed functionalities may be not exploited, undermined or by-passed, and that there may be imagined functionalities.

> The design relevance of noticing and understanding featural and functional cues, as a prerequisite for their effectiveness, is self-evident. […] The emergence of imagined functionalities can be seen as an indication of the perceptual/cognitive inadequateness of designed featural and functional cues. (Kanis, 1998, p.79)

Such design deficiencies are likely to aggravate product-related uncertainty, which may hinder efficient product utilization. Ziamou (2002) associates the uncertainty related to new product performance with the novelties presented by innovative product interfaces. This uncertainty is expected to be greater with radical innovations since these products embody novel interfaces and functionalities. Ziamou and Ratneshwar (2002) stress the importance of communicating product offerings to consumers where they suggest that when a new interface is combined with a new functionality, more (vs. less) information about the interface increases consumer uncertainty about the performance of the new interface and decreases intentions to adopt the new product. For incremental innovations combining novel interfaces with preexisting technology, however, providing consumers with adequate levels of interface-related information serves toward lowering product-related uncertainty (Ziamou and Ratneshwar, 2002). Nowlis and Simonson (1996) note that the contribution of a new feature or an innovation to a product, and the uncertainty associated with the performance of these novelties need to be taken into consideration when evaluating the effect of product innovativeness. In essence, product-related performance uncertainty should be minimized in order to maximize consumers' adoption intentions since "the functionality of a new product is a critical determinant of consumers' reaction to it" (Ziamou, 2002, p.372).

Rogers (1995) states that "when an adequate level of how-to knowledge is not obtained prior to the trial and adoption of an innovation, rejection and discontinuance are likely to result" (p.166). This is mostly due to the atypical user-product interaction associated with advanced technological products since these

products have low "*a priori* 'guessability' as they lack most of the intrinsic feedback (movements, noise) and the characteristic form elements of conventional products" (Den Buurman, 1997, pp.1159-60). Gelderblom (2001) defines low guessability as "the information provided by the product on its use [being] either absent or misleading" (p.150), and states that product guessability should be as high as possible for products involving potentially unfamiliar operations which is often the case with innovative products. Another issue conveyed by Gelderblom (2001) is user 'fixation' defined as "the tendency of users to restrict operating possibilities on the basis of strong but wrong expectations" (p.150). Fixation causes faulty application of familiar operating procedures to novel products when such procedures are in fact not applicable. If fixation effects are strong enough, product information indicating inapplicability of former operating procedures is "not understood, overlooked or even ignored" (Gelderblom, 2001, p.80). Gelderblom (2001) relates design model of products to users' mental models as follows:

> The design model is the conceptual model of the designer. This is [materialized] into the product or system. On the basis of the interaction with the product the user builds a mental model, the user model. The system image results from the physical product and the product graphics, including the accompanying instructions and documentation. The designer expects the user model to correspond with the design model, but the connection between these two is intermediated by the system image. If the system image does not communicate the design model correctly then the user ends up with a user model which deviates from the design model, giving way to confusion around the product and its use. (p.9)

If, in fact, product guessability is low and user fixation is evident, as is likely to be with innovative products, the system image will fail to deliver an appropriate representation of the design model, and product-related uncertainty and confusion will be aggravated. In turn, negative product-related affect will be elicited, and rejection and discontinuance will possibly result as suggested by Rogers (1995). It therefore becomes especially crucial to foster a coherent appreciation of user requirements during NPD processes for innovative products[5] so as to trigger "the correct knowledge in the head" (Gelderblom, 2001, p.80) that would guide users toward successful product operation.

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[5] Discussions of how such processes may be attained have been presented by Song and Montoya-Weiss (1997), Veryzer (1998b, 2003), and Kumar (2004).

4.3 Innovative Products and User Expertise

Importance of user expertise is highlighted when products are not only new, but also innovative, since utilization of such products demands more of the user in terms of use variety and use innovativeness. Therefore, this section revisits expertise, examining its effects in innovative product encounters.

"The frenetic pace of incremental product innovation in today's marketplace is testimony to marketers' implicit belief that consumers will react favorably to such product reformulations" (Sen and Morwitz, 1996, p.225). Many of these incremental innovations surface in the form of multi-functional products integrating a number of different devices, and in most cases "post-purchase usage of multi-functional products may involve more than merely using the product" (Ram and Jung, 1989, p.160). As discussed in the previous chapter, expertise plays an important part in utilization of novel products, and use innovativeness acts as a key determinant of user-product interaction especially in cases of innovative products. As Hirschman (1980) states, "the more creative the consumer, the less cognitive effort must be expended to comprehend any novel product as a concept" (p.289), and reduced effort facilitates easier adoption of products. Enhanced information processing capabilities of expert users enables them to react favorably to novel product concepts (de Bont and Schoormans, 1995) since their organized knowledge structures allow classification of novel items independent of surface-level cues, thereby enabling these users to draw conclusions about product features and interaction patterns, and also to make product judgments (Cohen and Basu, 1987). Further, aptly structured mental models of experts aid in evaluation of unknown products belonging to known product categories (Keinonen, 1997) which would serve as a valuable asset for evaluating incremental and really new innovations, but not for radical innovations since these products generally create entirely new product categories.

Even though evaluations of radical innovations are not readily achievable in early phases of the post-purchase period, prior knowledge related to existing product categories may aid in shortening product judgment formation since it can be used to facilitate analogical learning even when "the target entity defies classification in terms of existing product concepts" (Gregan-Paxton and Roedder John, 1997,

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p.275). In other words, analogical learning (or CLA) can be exercised even for radical innovations which, by definition, do not fit into any existing product schema.

Possession of an elaborate knowledge structure becomes further pronounced in interaction with innovative products since such knowledge encourages "conceptually driven processing, whereby new information is related to prior knowledge and evaluative inferences regarding important product features are likely" (Peracchio and Tybout, 1996, p.179). Hence, after grasping the product concept, expert users can act accordingly and concentrate on the underlying concept rather than the apparent processes in order to accomplish user goals. This, in turn, enables experts to formulate more specific questions about product attributes in seeking more product-related information (Alba and Hutchinson, 1987). Then again, problems regarding overconfidence in one's true level of knowledge and expertise may surface during product information search as discussed earlier in chapter 3. Overestimated expertise may shorten the information search process even when external information is available, since users may assume they already know the content of the information and that additional search will yield few new facts, thereby basing their decision on previously acquired information or an ad-hoc choice rule (Alba and Hutchinson, 1987), but "if the ignored or poorly processed information contains truly new and important facts, suboptimal decisions may obtain" (p.439). However, in general, "the combination of elaborate knowledge structures and analytic tendencies should allow experts to recognize potential benefits or improvements in the new product" (Wood and Lynch, 2002, p.425) as long as the inferences made by the user are not rendered obsolete by the product.

Shanteau (1992) notes that experts need to engage in expert-like behavior in order to maintain their self-image, and trial and adoption of innovative products have been identified as exemplars of such behaviors (Wood and Lynch, 2002). On the contrary, Moreau, Lehmann and Markman (2001) maintain that extensive prior knowledge may lead to hesitation for adopting radically innovative products by expert users since net benefits/risks related to these products may not be readily perceived: "there are strong cognitive switching costs for experts because their knowledge structures are entrenched and difficult to change" (p.27). Only for relatively continuous new products (i.e., incremental and really new innovations) do information processing benefits provided by user expertise aid in product adoption

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by increasing both comprehension and perceived net benefits of the new product (Moreau *et al.* 2001). "When the new product [is] discontinuous, however, expertise entrenched in the primary base domain [creates] resistance by reducing both comprehension and perceived net benefits" (Moreau *et al.* 2001, p.27). Thus, Moreau *et al.* (2001) conclude that experts are not more prone than novices to adopt radically innovative products.

4.4 Case Study 2

4.4.1 The Research Framework

As mentioned earlier, incremental innovations account for 37.5% of all new products in the consumer electronics market (Garcia and Calantone, 2002). Usage-related problems concerning incremental innovations are likely to be less when compared to really new and radical innovations. Thus, consumption nature of incremental innovations needs to be investigated and appreciated before moving on to products with higher degrees of innovativeness. Accordingly, a study on consumers' approach to an incrementally innovative product was conducted in the METU-BILTIR/UTEST Product Usability Unit in order to determine various problems users may face during usage of an unfamiliar device, and their reactions to these problems.

4.4.2 Methodology

4.4.2.1 The Test Product

The study was performed using mobile phones as these devices have become an integral part of a majority of urban dwellers' daily lives. A recently released model of a major mobile phone manufacturer, which is marketed as 'the real definition of a smart phone', was preferred as the test product since it emerges as a genuinely different device when compared to other mobile phones. The device offers users many possibilities by combining a mobile phone, a personal digital assistant, a digital camera, a game console, and a digital music player into a single device. It has to be mentioned that, the distinction of the test product lies mainly behind the fact that it's a combo-device; there isn't a great deal of innovativeness involved in the ways common practices are handled with the product. However, the device does present users with different methods for making calls, sending text messages and managing their organizers (some of which will be described in the following

sections), thus qualifies as an incremental innovation since it provides improvements in existing technologies, and is targeted for an existing market.

4.4.2.2 Participants

It was stated by de Bont and Schoormans (1995) that "even in the case of major innovations, in which most consumers by definition can be considered non-experts, it is likely that those consumers who at least have some expertise concerning related products or services will be the most appropriate respondents in a [product] concept test" (p.612). It therefore is likely that such consumers are better equipped for a usability test involving an innovative product as well. Accordingly, eight participants, four males and four females, belonging to the middle-high income range were selected among mobile phone users of ages 25 to 40. The age spectrum was limited in an attempt to ensure that participants would have similar experience levels with mobile phones in terms of duration of ownership.

Of the eight participants, five had full-time jobs whereas three were pursuing graduate degrees at the time of the study. All participants speak one or more foreign languages, and own or have access to personal computers at home or the office. Moreover, all participants have switched mobile phones at least once.

4.4.2.3 Context of Product Use

Participants were required to complete two main tasks, namely, sending a text message (SMS) and creating a calendar entry. The context of product use in the test is largely reminiscent of daily usage of mobile phones as the tasks do not require any specific settings to achieve completion.

4.4.2.4 Questionnaire

A questionnaire regarding participant attitude towards new products, extent of mobile phone usage, and evaluation of previous and current mobile phones through several statements was handed out at the beginning of the test (see Appendix B.1). The questionnaire correspondence was utilized to determine each participant's characteristics in terms of behavioral intentions and practices when using a new mobile phone, and the extent to which the participant utilizes functions of his or her current phone. This piece of information, along with participants' performance in completing the tasks described in the next section, formed the basis for classification of the eight participants into three skill levels (high, medium and low), which will be elaborated on in the Results section.

4.4.2.5 Tasks

4.4.2.5.1 Sending an SMS

Each test participant was required to send four text messages: one message using participant's own phone and three using the new device which offers three different methods for text entry by using, (i) the number pad, (ii) the virtual keyboard, and (iii) hand-writing with the jotter of the phone. Participants were allowed to use the above methods in the order of their choice given that the order was not repeating for all eight participants. The message text and the number to send the SMS were provided on a note card along with the task description (see Appendix B.2).

4.4.2.5.2 Creating a Calendar Entry

Test participants were required to create two calendar entries: one with their phones, and one with the organizer application of the new device. Details of the entry, such as the date, time and location, were once again provided along with the task description (see Appendix B.2).

Participants were allowed to refer to the user's manual of the new device and the brief explanations for using the three text entry methods provided on note cards any time during the test.

4.4.2.6 Interviews

Short interviews were held by test personnel present in the room upon completion of each task using the test product to obtain participant opinions on that particular application. Participants were asked to reflect opinions on the methods they used during the tasks, evaluate phone usage for different text entry methods, compare the messaging and organizer applications of the test product to their phones, and compare and evaluate it and their own phones in general. The interview guide is presented in Appendix B.3.

4.4.2.7 Test and Technical Environment

As mentioned previously, all tests were conducted at the METU-BILTIR/UTEST Product Usability Unit in the Industrial Design Department of METU. Participants were hosted in a room equipped with cameras and a microphone, and the tests were video recorded in their entirety for subsequent deconstruction of transactions and analysis. The video recordings of the participants were made using two cameras; one for following facial gestures, and one for following hand gestures while

working toward task completion. A screen shot of the typical recording scene is presented in Figure 4.1. Test personnel present in the room also monitored participant behavior and provided task-related clarifications if required by participants.
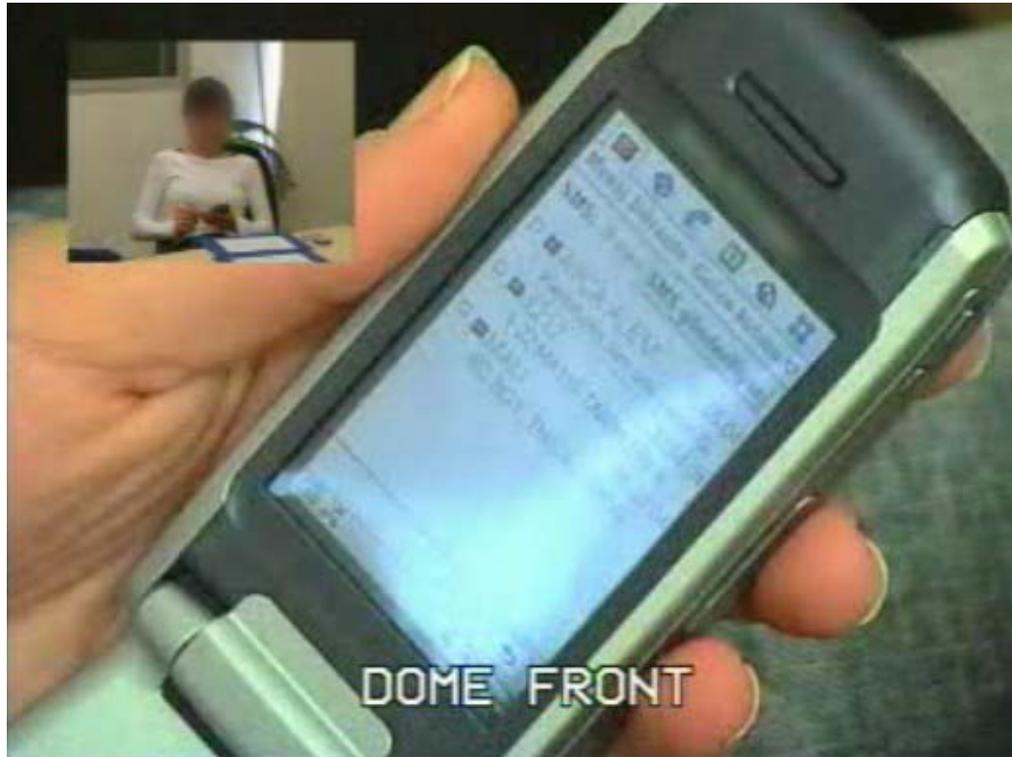
Figure 4.1 A screen shot of the typical test video recording

4.4.3 Experimental Design

4.4.3.1 Procedure

Participants were handed four note cards: one card with specifications for the two main tasks (sending and SMS and creating a calendar entry), and three cards with brief descriptions of the number pad, virtual keyboard and hand-writing methods for text entry using the new device (see Appendix B.2). The tasks were initially verbally conveyed to the participants in brief by the test personnel, after which the participants were requested to read the directions on the provided note cards.

4.4.3.2 Metrics for Evaluation

4.4.3.2.1 Effectiveness of Operation

Participants were allowed to work toward task completion for as long as they required, and were also allowed to start over in case of failure. Hints were provided by test personnel for those participants failing to complete a task to ensure that participants would form an opinion on each method they used, and that those opinions would be communicated during the subsequent post-task interview. However, such tasks where hints were awarded were deemed incomplete, i.e. ineffective, for analysis purposes.

4.4.3.2.2 Efficiency of Operation

Duration until task completion was recorded for each participant and task in order to measure efficiency of operation. It should be noted that the task duration includes the entire time period spent by a participant, including consecutive tries, until a task was completed as described in the instructions. Therefore, task durations might exhibit variations among the participants depending on the number of tries until task achievement.

4.4.3.2.3 Satisfaction with Operation

Participants were asked a number of questions in a semi-structured short interview regarding the text entry methods used for the SMS sending task and the calendar entry task in order to discover participant satisfaction for each task and the relevant method. They were also encouraged to describe the methods in their own words in order to obtain keywords associated with each method.

4.4.4 Results

Presented below are participant skill level classification data and an analysis of the test data along with participant opinions. Possible implications and interpretations of participant comments are also provided.

4.4.4.1 Participant Classification with Respect to Their Own Phones

Participants were required to complete the two main tasks using their own phones prior to using the test product in order to assess each participant's ability to utilize his or her own device, which in turn served towards user classification. Participants, who completed both tasks without any hesitation or problems using their own phones, were classified as high-skill users. Participants, who experienced minor problems during the tasks yet managed to complete, were classified as medium-skill

users. Lastly, participants who experienced major problems or failed to complete either or both tasks were classified as low-skill users. Once again, questionnaire correspondences –especially those related to device utilization– were integrated into the classification process. Consequently, four, three, and one participants were classified as high-, medium-, and low-skill users, respectively.

Figures 4.2 and 4.3 indicate task durations for sending an SMS and creating a calendar entry using participants' own phones along with effectiveness rates, and median and mean task durations. Zero task duration indicates an incomplete task.

Upon examination of the following figures and relevant questionnaire correspondence, participants (P) 2, 3, 4 and 5 were classified as high-skill users, participants 1, 6 and 8 as medium-skill users, and participant 7 as a low-skill user.
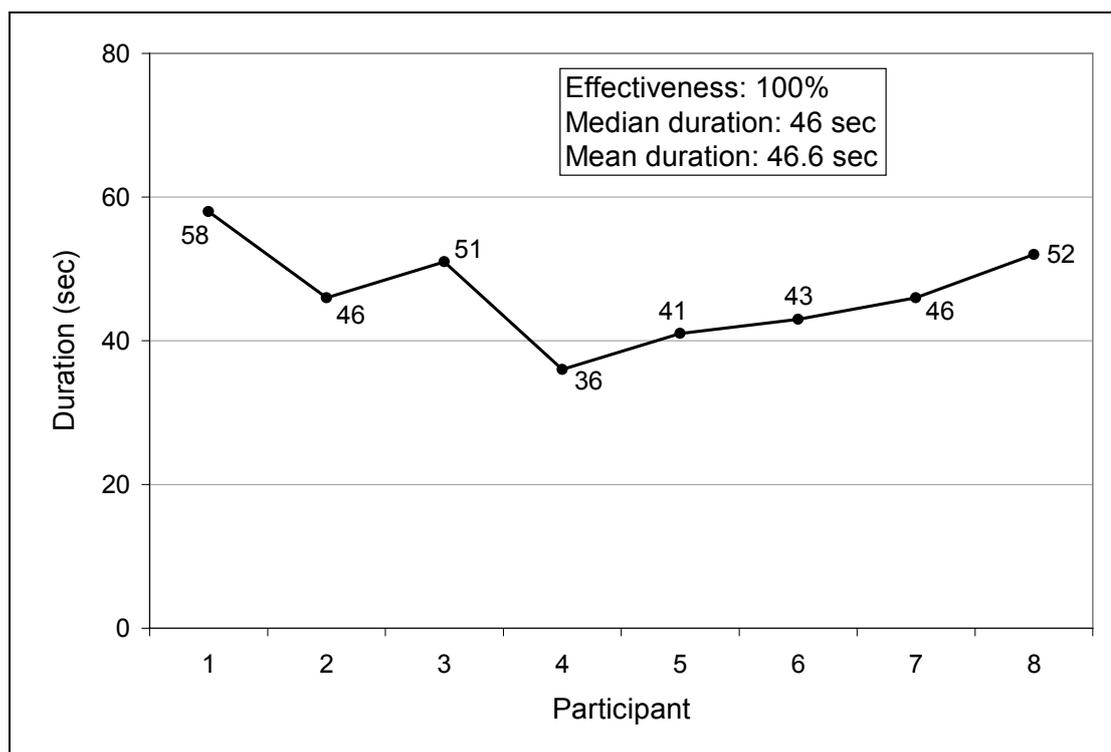
Figure 4.2 Task durations for sending an SMS using participants' own phones
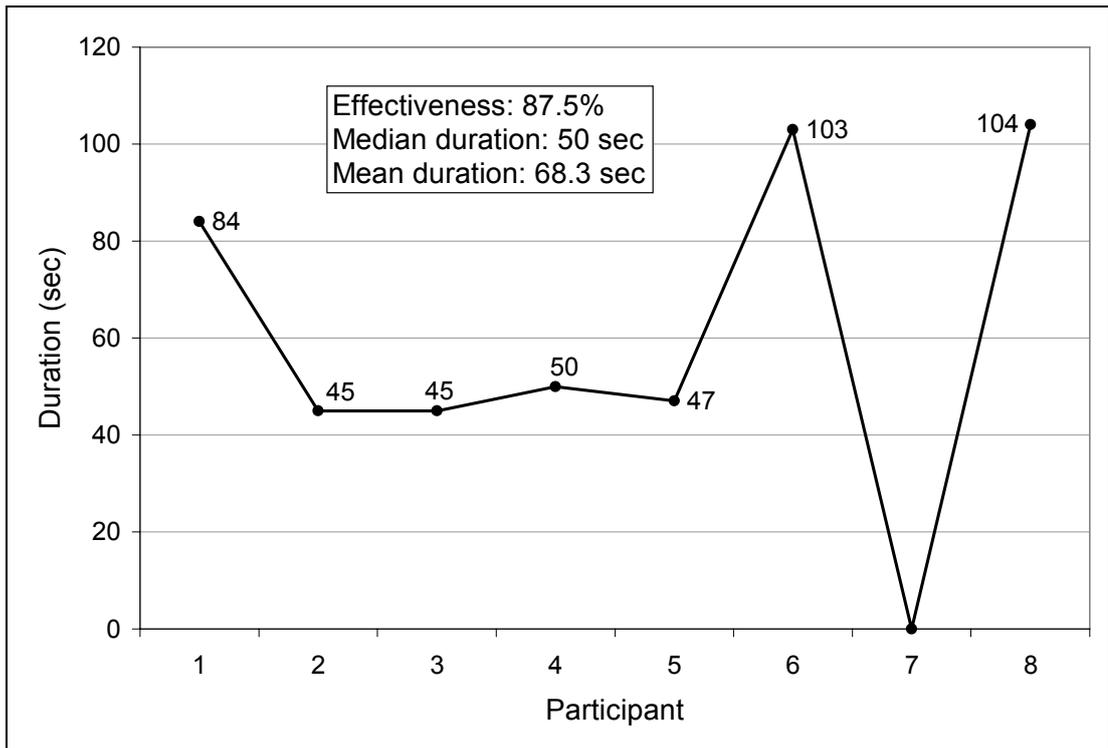
Figure 4.3 Task durations for creating a calendar entry using participants' own phones

4.4.4.2 Task-based Analysis

4.4.4.2.1 SMS Sending: Text Entry with Number Pad

Using the number pad of the test product for text entry is the method most likely to be regarded as familiar by test participants since it involves the use of a number pad as is customary with other mobile phones (see Figure 4.4). However, the introduction of the jog dial for switching between number and text entry areas as a secondary control for the SMS operation complicated the process for almost all users despite the fact that four participants duly stated that the dial assumed the functions of the 2-way or 4-way navigation arrows on their phones, whereas three users stated hesitation with jog dial usage since it was unfamiliar, and considered it to be more upfront than the arrows during the operation. In addition, the difference between number pad layouts of participants' phones and that of the test product resulted in numerous typing errors for all users during text entry, but all participants considered it to be a minor problem (i.e., a moderate incongruity with the existing schema), and went on to say that it would only be 'a matter of getting-used-to' before they could type comfortably.

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Figure 4.4 Number pad and jog dial usage for text entry

Figure 4.5, presented below, illustrates task durations for sending an SMS using the number pad of the test product. This figure, when compared to Figure 4.2, indicates a drastic increase in task duration for all users when using the number pad for text entry: even the shortest duration for the task is approximately twice as long as the longest duration recorded when participants used their own phones for sending the SMS. Moreover, two high-skill users (P3 and P5) experienced as much trouble with the method as the low skill user (P7), whereas the only incomplete task was recorded by another high-skill user (P4), in which case the user failed to switch to the text area using the jog dial after entering the SMS recipient number.
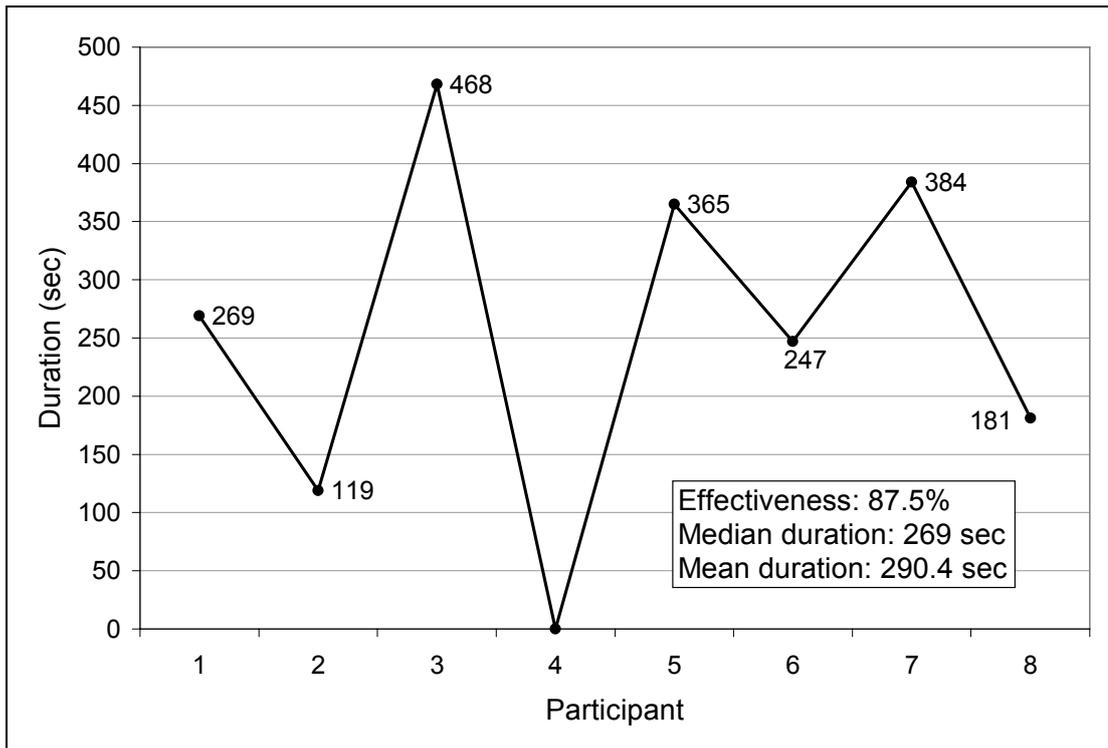
Figure 4.5 Task durations for sending an SMS using the number pad of the test product

4.4.4.2.2 SMS Sending: Text Entry with Virtual Keyboard

The virtual keyboard method for text entry yielded the most homogeneous set of participant opinions in terms of usage: six participants used the phrase "it's like using a computer keyboard". Regardless of considering the method easy-to-use, four users stated being indifferent to having the feature on their phone whereas only two users claimed they would like to have this feature. Four participants considered the "keys" on the virtual keyboard to be too small and the keyboard complicated, and stated that this could lead to problems when aiming for letters. Four participants expressed opinions on the keyboard layout being different than that of the computer keyboard where two of these users thought the layout difference would not cause any problems while the other two looked for characters in their accustomed locations. Figure 4.6 shows virtual keyboard usage for text entry with the test product.

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Figure 4.6 Virtual keyboard usage for text entry
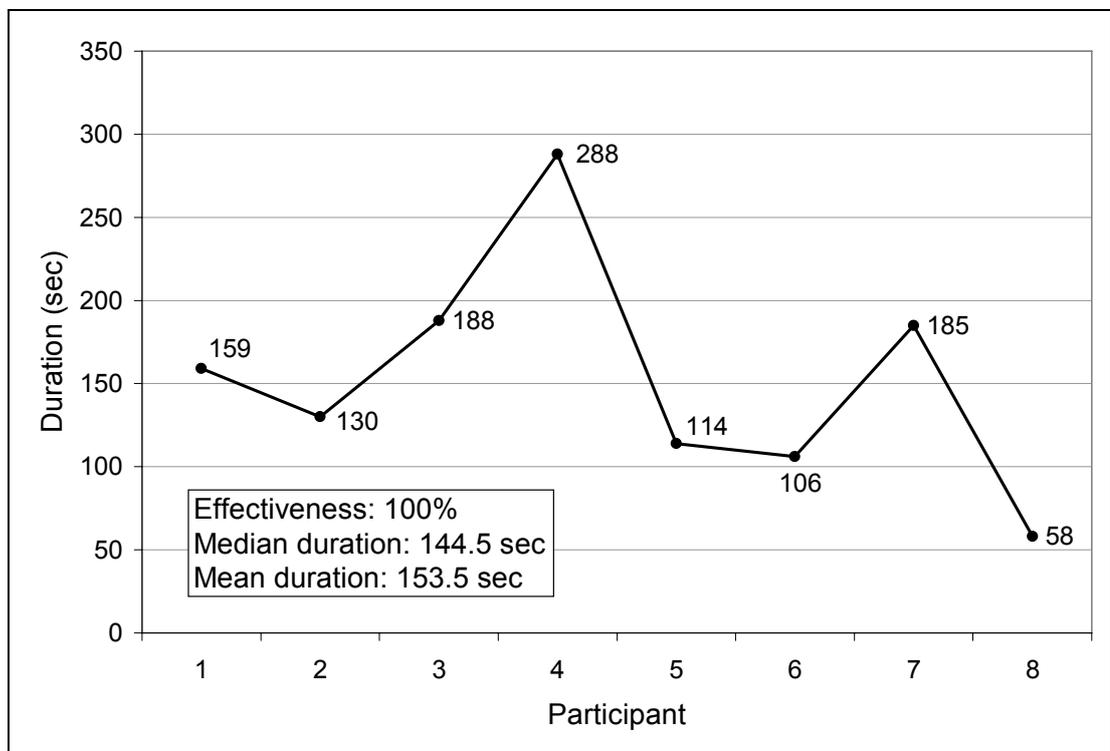
Figure 4.7 Task durations for sending an SMS using the virtual keyboard of the test product

As can be seen in Figure 4.7, the effectiveness rate for the virtual keyboard is higher than that of the number pad for the test product. Similarly, the median and mean task durations are noticeably shorter (typically about half as long) for this method. It can be inferred from the data and participant comments that text entry with the virtual keyboard allows little room for errors and is more straightforward when compared to the number pad. This can possibly be attributed, as duly stated by most participants, to the computer keyboard analogy users were able to make while using this method. It should also be noted that typing errors were reduced to a great extent with this method, which suggests that difference between the virtual keyboard and computer keyboard layouts causes little trouble when compared to the number pad layout difference between the test product and the participants' phones. This bit of information suggests that the virtual keyboard involves less habitual operation than the number pad (or the transfer distance between computer and virtual keyboards is higher than that of two different phone number pads), and that users can perform better when using a novel method (for a phone) once they are stripped off of their usual practices. Apparent as well is the fact that familiarity with the method used does not award improved performance, but in fact, can be a hindering factor since it makes more room for employing user habits which can lead to transfer errors (related to CLA) when using unfamiliar devices. In the instance of number pad and virtual keyboard tasks, the case was that the less user practices were allowed to play part, the less were their adverse effects on user performance. It seems, as suggested by Kanis (1998), existing use habits probably limited users' ability to be flexible in applying an existing product schema (i.e., computer keyboard) when confronted by an unfamiliar exemplar (i.e., virtual keyboard).

4.4.4.2.3 SMS Sending: Text Entry with Jotter

All eight participants of the test were selected among those users who had not previously owned or used personal digital assistants, and therefore, had little or no experience with hand writing on a device screen using a jotter and character recognition software. The test product employs certain customary styles for typing letters, numbers and punctuation as well as motions for leaving spaces, erasing faulty characters or returning lines when using a jotter. Knowledge on these styles have a direct effect on user performance and since test participants lacked the necessary knowledge, they all experienced considerable amount of difficulties with this task. Consequently, the effectiveness rate for the task was a meager 37.5%

(3/8). However, the median and mean task durations for those users who managed to complete the task did not vary significantly from those of the number pad method. Relevant data can be found in Figure 4.8.
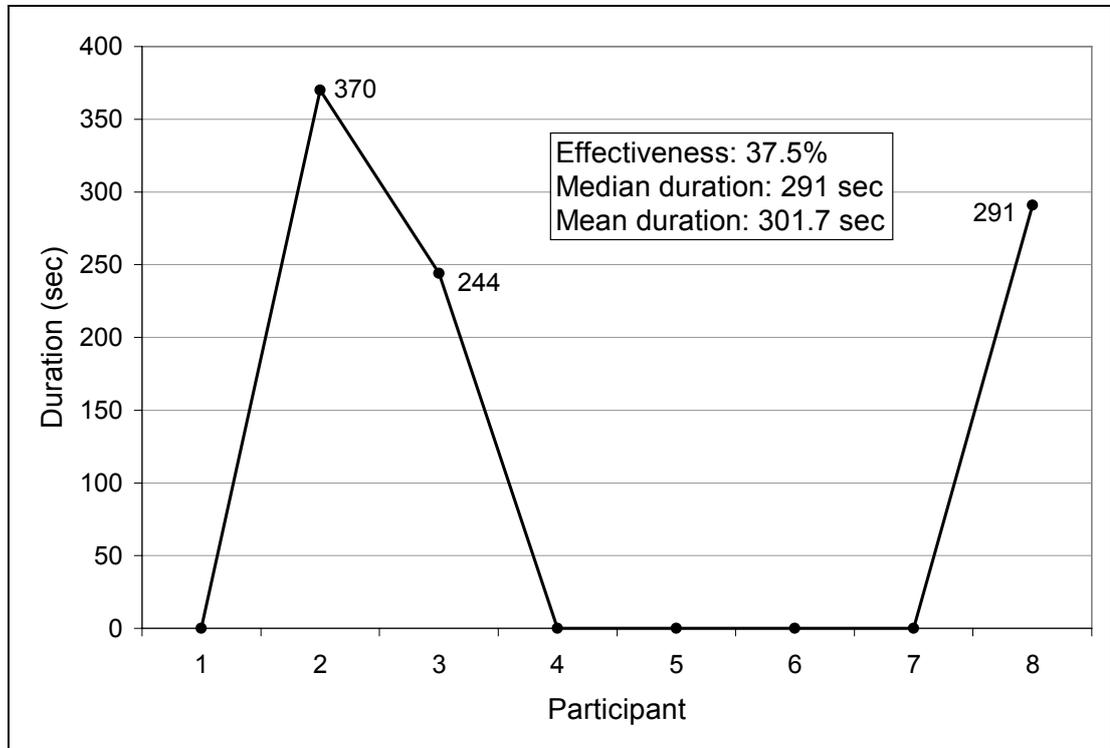
Figure 4.8 Task durations for sending an SMS using the test product jotter

Since participants lacked knowledge on character styles and relevant motions, they were allowed to refer to the user's manual during the task. However, this offer did not help two of the three participants who did refer to the manual as they either failed to find what they were looking for or forgot what they had to do to type certain characters, and opted for hints from the test personnel at the cost of an incomplete task. Only one participant (P8) utilized the manual effectively and managed to move on beyond the point where the task came to a halt. It is noteworthy that the other two participants (P2 and P3) who completed the task were among the high-skill users and did not refer to the manual for completion of the task. Figure 4.9 shows jotter usage for text entry with the test product.

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Figure 4.9 Jotter usage for text entry

The common reasons for the high failure rate were lack of knowledge on leaving spaces between words and erasing faulty characters. All eight participants made numerous typing errors as, for certain varying characters, their hand-writing styles did not match those which the software recognizes[6]. When prompted to erase faulty characters, all participants recalled a type of pen-and-paper analogy where they instinctively scratched over the characters they wished to erase, and when this action failed, were hesitant to try other actions of which the results were unforeseen. Participants applied the 'scratching method' numerous times even after discovering (or being instructed on) how to backspace.

Five participants expressed concern about character recognition capability of the device software and three of these participants stated they wouldn't want to write in a pre-dictated style since the hand-writing they have to perform would not be theirs anymore. Three users claimed that the error rate involved with character recognition

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[6] The character recognition software of the test device is non-adaptive, i.e., regardless of the number of trials, the device does not recognize characters typed otherwise than as prescribed in the software.

would not decrease with usage after inquiring about the software and discovering that it is non-adaptive. However, text entry with the jotter was by far regarded as the most fun method (6/8) among the three methods used during the test. The virtual keyboard method fared slightly superior (3/8) to the other two methods (2/8 each) in terms of practicality.

4.4.4.2.4 Calendar Entry

The organizer application of the test product differs largely from other mobile phones in the sense that all details of an entry are entered and displayed on a single screen. In addition, the jotter is used as a pointing device, as is the case with text entry using the virtual keyboard, for selecting the event date and time. These factors combined, resulted in a remarkable participant satisfaction and six participants affirmed that they preferred the novel organizer application to the one on their phone whereas one participant rated his phone better and one did not make a distinction between two phones. Regardless of user preferences, the effectiveness rate for creating a calendar entry was a 100% whereas the rate was 87.5% when participants used their own phones. The user who failed to complete the task using her own phone (P7) related her success with the new device to "doing everything at once and being able to view it all [being] much more logical". Three users stated that the entry screen resembled that of a paper or computer software organizer since it contained all the relevant information. Task durations for creating a calendar entry with the test product can be seen in Figure 4.10.

Date and time adjustments of the calendar entry of the test product also differ from similar applications on other mobile phones. Screen shots in Figure 4.11 show these two controls. Date adjustment shows resemblance with other organizer applications; the difference is that the monthly calendar view appears when the date is tapped with the jotter and the desired date is once again selected with the jotter instead of navigating with 2-way or 4-way navigation arrows as with other phones. Likewise, time adjustment appears when tapped, and adjustment is made by increasing or decreasing the value of the displayed hour and minutes by tapping the upper or lower halves of the relevant boxes.
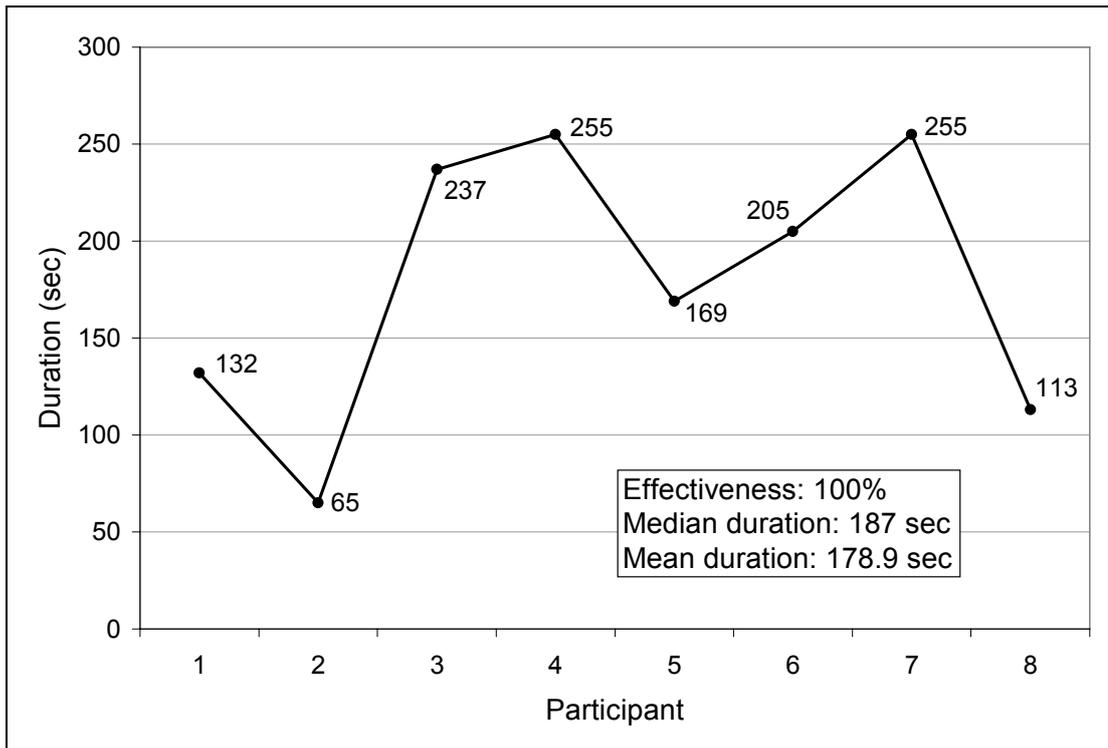
Figure 4.10 Task durations for creating a calendar entry with the test product
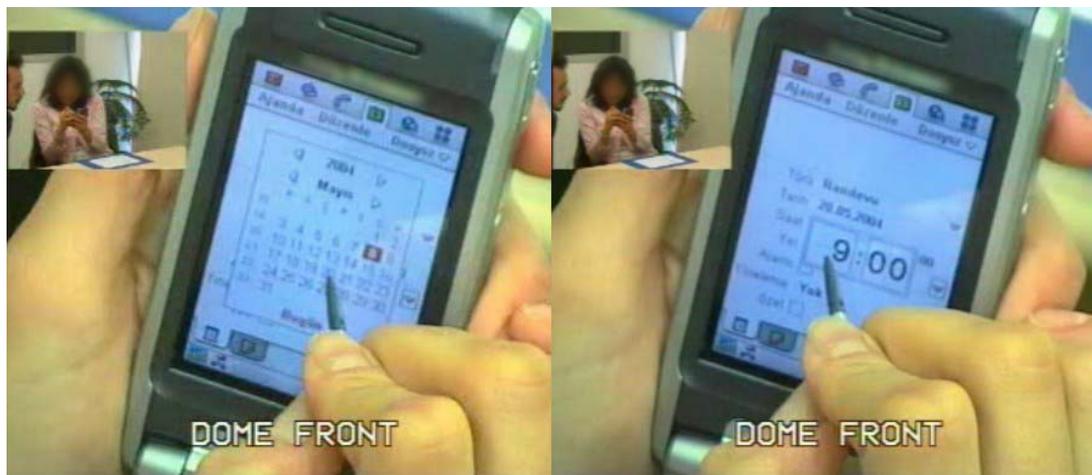
Figure 4.11 Date and time adjustment of the calendar entry

When queried about these controls, test participants expressed only positive opinions. Especially, the time adjustment method was praised with descriptors such as practical (3/8), easy (2/8), nice (2/8), fun (1/8), and intuitive (2/8). There were also mixed opinions on the appearance of the control: One participant stated that she liked the hour-adjustment boxes "just because they're new" (P5), whereas another

found them reminiscent of folding display clocks and described the control as "a retro design" (P8). It is likely that the resolution of moderate incongruity with similar applications prompted positive affect for all participants, and the act of discovery produced satisfaction with the operation as expected by Peracchio and Tybout (1996).

Despite the general positive evaluation of the organizer application, one important problem surfaced during the task for all participants: the button for saving the calendar entry (Figure 4.12) was mistaken for a return or undo button following computer logic by six participants where four of these participants tried the save button when all else failed, and two participants referred to the manual after failing to discover the button function. Despite being the only button on the calendar entry screen, the symbol on the button was not considered to be representative of the 'save' function and two participants suggested a check mark would be more suitable and one suggested the use of the word "save" on the button instead of a symbol. This case can be considered an indication of "the perceptual/cognitive inadequateness of designed featural and functional cues" (Kanis, 1998, p.79) which hinder successful product operation.

Figure 4.12 The return button for saving a calendar entry
(Thumbnail image edited for visual clarity)

4.4.4.3 Participant Classification with Respect to the Test Product

Participant performances using personal phones presented in Figures 4.2 and 4.3, and the test product presented in Figures 4.5, 4.7, 4.8, and 4.10, exhibit considerable variations in task durations and success rates. These variations call for an additional participant skill level assignment with respect to the test product. In light of new data, two, three, and three participants were classified as high-, medium-, and low-skill users, respectively. Participants 2 and 8 were classified as high-skill users, participants 3, 5 and 6 as medium-skill users, and participants 1, 4 and 7 as low-skill users. Table 4.1 shows how each participant fares with respect to both phones, and the direction of the shift in participant's skill level classification.

Table 4.1 Participant skill level assignment with respect to own phone and the test product

	Participant	1	2	3	4	5	6	7	8
Skill Level	Own Phone	Medium	High	High	High	High	Medium	Low	Medium
	Test Product	Low	High	Medium	Low	Medium	Medium	Low	High
	Shift	↓	–	↓	↓	↓	–	–	↑

It is evident by examination of the table that skilled utilization of participants' own phones by no means warrants the same ability with the new device. In fact only one participant (P2) managed to sustain a high skill level with both products whereas four high- or medium-skill users experienced significant operating difficulties and subsequent down-shift in skill level assignment with the test product. Of all participants, only one (P8) managed an up-shift in skill level assignment using the new device.

4.4.5 Discussion

Test results indicate that prior knowledge, experience and expertise are determining factors during users' initial encounters with an innovative product. However, these factors have both favorable and adverse effects in varying situations. For example, text entry with the number pad is significantly more efficient if the pad layout on the new device is similar to that of a familiar device. However, in another case, text entry with a virtual keyboard becomes more efficient as users' familiarity with

computer keyboards decreases, in which case users' experience with the latter is less likely to affect the usage of the former since a more experienced computer user tends to look for certain characters as accustomed on the computer keyboard.

Repeated problems regarding device utilization concentrated in areas such as lack of intuitive usage, misleading/non-representative interface elements (indications of lack of UOD, and proper user orientation towards successful product operation, respectively), and users' discomfort in adjusting to the device in first use. However, Alba and Hutchinson (1987) expect reduction in cognitive effort after a limited number of experiences with the same product-related task, and stress that the effects of cognitive effort are most evident in early stages of the post-purchase period of an innovative product. Thus, the earlier users familiarize themselves with a newly acquired innovative product, the quicker they will experience reduced cognitive effort and be able devote unused cognitive resources to additional product-related issues. This statement is also in keeping with Forlizzi and Battarbee's (2004) suggestion that "users need to attain fluency with the product early on, to ensure that they will continue to use the product and not abandon it in frustration" (p.265). Attainment of such fluency requires building operational knowledge, which can be acquired by consulting the product manual, from family members or friends, or by observation (Ram and Jung, 1989).

Another key finding of the test is that attitude toward technological improvements determines users' approach to an innovative device. As one's approval for technological improvements increases, the person becomes more likely to justify the added functions and capabilities of a device independent of adoption intentions. Positive attitude towards innovative technology can be considered an indication of higher expertise since experts are better able to grasp novel product concepts (Peracchio and Tybout, 1996; Cohen and Basu, 1987). Quite fittingly, the only expert participant (P2) in the study demonstrated high skill in using both his own phone and the test product as well as stating positive assessment of the innovative new product and high purchase intentions. Questionnaire correspondence of this participant indicates low product involvement and that he was using only his second mobile phone at the time of the study. On the contrary, another participant (P4) using his fifth mobile phone and reporting high product involvement demonstrated high skill using his own phone whereas he classified as a low-skill user with the new

device by failing to complete two of the four tasks and posting the longest completion times for the remaining two. These two users' performances reveal a clear indication of the conceptual difference between experience and expertise, and stand as unique exemplars of the argument that "if the experimental task requires differentiation or analysis, performance may be inversely related to purchase, usage, and subjective familiarity" (Alba and Hutchinson, 1987, p.438).

The results of the case study also provide previously not-encountered empirical support for several well-established theoretical arguments in related literature. These arguments will be made relevant in conjunction with the results as the last constituents of the discussion.

Alba and Hutchinson (1987) identify time pressure, information complexity, and low motivation as inhibitors of analytic processing, and maintain that influence of these factors are greater for novices due to insufficient cognitive resources. Even though participants were not limited in time during the test, it is likely that they experienced anxiety during the test simply because they were hosted in a test utility, and were being video recorded. The related pressure along with encountering an unfamiliar product may have aggravated some of the product-related problems, and such effects may have been elevated for novices. As a consequence, these participants may have formed negative initial product judgments for the test product which are likely to last (Westbrook, 1987), and will have a direct influence purchase intentions. It is therefore not surprising that only three participants who demonstrated high- or medium-skill with the new device (P2, P6 and P8) stated high adoption intentions for it. It should be noted that the mentioned medium-skill participant (P6) was especially fond of the organizer application of the test product, and stated she could purchase the device "for the organizer alone". It is also noteworthy that all four participants who were "demoted" in the skill rankings (P1, P3, P4, and P5), and the low-skill user for both phones (P7) deemed the test product tasks "difficult" or "quite difficult", which implies miscalculated necessary (cognitive) effort as expected by Garbarino and Edell (1997). The additional cognitive effort expended which did not secure successful task completion is likely to have elicited negative product-related affect resulting in low adoption intentions. These users, who ultimately qualify as novices, are also likely to have used their mood states, which declined during the test due to

numerous failures, as input to their negative product evaluations as suggested by Mattila (1998).

CHAPTER 5

CONCLUSION

This chapter briefly revisits the issues made relevant in the second chapter in conjunction with the discussions and results of the case studies presented in the third and fourth chapters on user expertise and product properties, respectively. The chapter concludes with an account of limitations of the study, and provides suggestions for further research.

5.1 Concluding Remarks

User-product interaction is a multi-dimensional, multi-faceted and multi-modal everyday encounter. Although additional factors may and do exist, this interaction is governed largely by the user and the product as implied by the name. The literature presented in the third chapter portrays user experience and expertise to be of utmost importance in determining the nature of user product interaction. Nonetheless, as both discussed in literature, and also supported by the results of case study 1, expertise is far more instrumental in enabling consumers to efficiently employ novel technological products which often involve multiple and complex features that demand enriched cognitive capabilities from their users. Building adequate expertise is dependent upon an array of user characteristics ranging from demographic variables to personality traits and personal attainments. In turn, expertise ensures higher success in learning about novel products (through CLA or not), and utilizing them. Although beneficial in attaining expertise, experience encourages continuation of former practices developed through prior knowledge related to similar products, and this practice does not aid in developing an appropriate appreciation of novel products. Moreover, higher product involvement and familiarity do not ensure higher use innovativeness and expertise. The end result, as depicted by the findings of the case study, is that expert users are better able to utilize features of multi-functional devices with relative ease, which in turn leads to higher satisfaction, thereby increasing the likelihood of higher marketplace success of the product through word-of-mouth recommendations. It therefore

becomes important for firms to turn novices into experts by increasing consumer knowledge in the post-purchase period in order to ensure both higher product satisfaction, and product (and perhaps brand) loyalty.

As conveyed in the fourth chapter, the immense rate of technological improvements makes ample room for innovations and innovative products which exhibit varying levels of discontinuities in relation to existing product classes. Innovative products are typically classified as incremental, really new and radical innovations where relatively continuous products (i.e., incremental and really new innovations) account for a sizeable percentage of all new products. As much as innovative products offer unique methods of user-product interaction, they also present many usability problems, as portrayed by the findings of case study 2, due to poorly designed interfaces that fail to foster a coherent user appreciation. Apparent as well is the fact that these products are less likely to concur with users' mental models which aid in explaining product functionality and operation. Users' inability to properly apply mental models to innovative products results in operational failures, dissatisfaction with product operation, and subsequent low adoption intensions as displayed in the case study. The results also indicate that these effects are higher for novices than experts, which underlines the importance of user expertise especially in innovative product encounters. However, interface and usability-related problems may be overlooked by users for products acquired in order to fulfill expressive needs (i.e., hedonic goods) in which case product involvement and attachment increases drastically, and product satisfaction needs to be evaluated along the satisfaction-as-pleasure pattern which does not involve utilitarian measures.

The findings of this study, briefly summarized above, should be considered in relation to the plea that *products and all means of user-product interactions should be designed to deliver 'experiences' to users*. Alben's (1996) definition of experience best describes the intention of the last statement, and deserves to be included (once again) in this section as a final remark.

> "Experience" [means] all the aspects of how people use an interactive product: the way it feels in their hands, how well they understand how it works, how they feel about it while they're using it, how well it serves their purposes, and how well it fits into the entire context in which they are using it. If these experiences are successful and engaging, then they are valuable to users (Alben, 1996, p.12).

5.2 Limitations of the Study

Product consumption experience clearly is not limited with user-product interaction and other issues investigated in this study. However, time and scale constraints involved in the research allowed for only certain aspects of the consumption experience to be included herein. Nonetheless, the results of the empirical studies presented in chapters 3 and 4 highlight the importance of user expertise in new (and especially innovative) product encounters.

There also are certain limitations regarding the two case studies presented in earlier chapters. Participant selection for both studies was based on case-specific criteria, and all 30 participants involved in the studies were selected among users that were deemed appropriate by the researcher and the thesis supervisor. However, the sample sizes of the studies should have been higher in order to make generalizable inferences. Lastly, hosting participants of case study 2 in the laboratory environment may have caused certain performance anxieties reflecting directly upon test performance. However, the need for video recording the participants inevitably required the tests to take place in UTEST as the test setup was both readily available in the facility, and also would be troublesome to set up elsewhere.

5.3 Further Research

There are several suggestions for further studies related to the issues mentioned in this thesis:

1. Case study 2 investigates usability problems regarding the digital interface of an incrementally innovative product as mentioned in the research framework of the study. Similar studies can be undertaken for really new and radical innovations in an attempt to determine whether interface and interaction-related problems are aggravated for such products.

2. As much as user expertise and product innovativeness influence product adoption and utilization patterns, there are certain products that defy any external influences. Even though consumer reaction to products have been associated with functionality (Ziamou, 2002), instrumentality (Morris, Venkatesh and Ackerman, 2005), and contentment with the consumption

experience (Hunt, 1977), some products are consumed just for expressive goals rather than utilitarian purposes. These products are termed 'hedonic' products, goods, items, or possessions (Okada, 2005; Dhar and Wertenbroch, 2000; Mittal, 1989), and product evaluation and satisfaction occurs on different patterns for these products (to the extent that interface and usability-related problems may be overlooked by users). The subject matter is immense, and can provide worthy of an additional study in which investigation of consumer involvement in utilitarian and hedonic products, product evaluation and satisfaction, and other related issues can be undertaken with one or more case studies.

3. NPD processes and a detailed discussion on means of proper integration of ID in these processes are highly relevant to the Department of Industrial Design. If undertaken, such a discussion should include a comparative study of two separate NPD processes where one process is directed in accordance with current practices, and the other involves UOD. The study may also include a comparative usability study of the end products created through these two processes differing in nature.

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APPENDIX A.1

PARTICIPANT QUESTIONNAIRE FOR CASE STUDY 1

Turkish Version

Aşağıdaki anket sorularına vereceğiniz cevaplar ODTÜ Endüstri Ürünleri Tasarımı Bölümü'ndeki yüksek lisans çalışmalarım kapsamında yürütülen bir araştırma için kullanılacaktır. Kişisel bilgileriniz ve ankete vereceğiniz cevaplar gizli tutulacak, ilgili eğitmen dışındaki üçüncü şahıslarla paylaşılmayacaktır. Dilerseniz araştırma sonuçlarına dair yazılacak olan makale tarafınıza iletilecektir.

Zaman ayırdığınız için teşekkür ederim.

1) Adınız, Soyadınız:_____

2) Yaşınız:_____

3) En son sahip olduğunuz eğitim derecesi nedir?

İlkokul	☐	Üniversite	☐
Ortaokul	☐	Yüksek lisans	☐
Lise	☐	Doktora	☐
Yüksek okul	☐		

4) Yabancı dil biliyor musunuz?

Evet ☐ Hayır ☐

Cevabınız evet ise bildiğiniz yabancı dilleri belirtiniz.

_____

5) Bilgisayar kullanıyor musunuz?

Evet ☐ Hayır ☐

Cevabınız evet ise devam ediniz, hayır ise 8. soruya geçiniz.

6) Bilgisayarı hangi ortamda kullanıyorsunuz?

Evde	☐
İşyerinde	☐
Evde ve işyerinde	☐
Diğer	☐ Belirtiniz: _____

7) Haftalık ortalama bilgisayar kullanım süreniz hangi aralıkta yer almaktadır?

0 – 1 saat ☐   5 – 10 saat ☐
1 – 2 saat ☐   10 – 15 saat ☐
2 – 5 saat ☐   15 saat üstü ☐

8) Kullanmakta olduğunuz televizyonun markası nedir?

Arçelik ☐   Telefunken ☐
Beko ☐   Toshiba ☐
Loewe ☐   Vestel ☐
Philips ☐   Diğer ☐
Sony ☐   Belirtiniz:_____

9) Televizyonunuzu ne kadar zamandır kullanıyorsunuz?

0 – 6 ay ☐   1 – 2 yıl ☐
6 ay – 1 yıl ☐   2 yıldan fazla ☐

10) Kullanmakta olduğunuz televizyonu kendiniz mi seçtiniz?

Evet ☐
Hayır ☐
Başka biri ile birlikte ☐

11) Lütfen televizyonunuzu seçerken/satın alırken göz önünde bulundurduğunuz veya bulunduracağınız özellikleri önem sırasına göre değerlendiriniz.

	Önemli değil						Çok önemli
	0	1	2	3	4	5	6
Fiyatı	☐	☐	☐	☐	☐	☐	☐
Markası	☐	☐	☐	☐	☐	☐	☐
Ekran boyutu	☐	☐	☐	☐	☐	☐	☐
Tasarımı/rengi	☐	☐	☐	☐	☐	☐	☐
Teknik özellikleri (teletext, PIP, vb.)	☐	☐	☐	☐	☐	☐	☐
Görüntü kalitesi	☐	☐	☐	☐	☐	☐	☐
Ses kalitesi	☐	☐	☐	☐	☐	☐	☐
Garanti koşulları	☐	☐	☐	☐	☐	☐	☐
Teknik destek (servis ve onarım ağı)	☐	☐	☐	☐	☐	☐	☐
Diğer(Belirtiniz):_____	☐	☐	☐	☐	☐	☐	☐
Diğer(Belirtiniz):_____	☐	☐	☐	☐	☐	☐	☐

12) Günde ortalama kaç saat televizyon izliyorsunuz?

0-1 saat	☐	3-4 saat	☐
1-2 saat	☐	4-5 saat	☐
2-3 saat	☐	5 saat ve üstü	☐

13) Evinizdeki televizyonu sürekli olarak kullanan kişi sayısını belirtiniz

1	☐	4	☐
2	☐	5	☐
3	☐	6 ve üstü	☐

14) Televizyonunuzun menü sistemini kullanıyor musunuz?

Evet	☐	Hayır	☐

Cevabınız evet ise devam ediniz, hayır ise 16. soruya geçiniz.

15) Televizyonunuzun menü sistemini kullanmayı hangi yöntemle öğrendiniz?
(Birden fazla seçenek işaretleyebilirsiniz.)

Deneme-yanılma yöntemiyle ☐
Kullanım kılavuzunu okuyarak ☐
Bir başkasından yardım alarak ☐
Diğer ☐
        Belirtiniz:_____

16) Lütfen aşağıdaki cümlelere hangi derecede katıldığınızı belirtiniz.

	Katılmıyorum						Katılıyorum
	0	1	2	3	4	5	6
Menü sisteminin kullanımını basit buluyorum.	☐	☐	☐	☐	☐	☐	☐
Menü sistemini rahatlıkla kullanabiliyorum.	☐	☐	☐	☐	☐	☐	☐
Menü sisteminin tüm özelliklerini kullanabiliyorum.	☐	☐	☐	☐	☐	☐	☐
Menü sistemini sıklıkla kullanıyorum.	☐	☐	☐	☐	☐	☐	☐
Menüde ayarları yapmak fazla zaman almıyor.	☐	☐	☐	☐	☐	☐	☐
Menüdeki ikonları/başlıkları anlaşılır buluyorum.	☐	☐	☐	☐	☐	☐	☐
Menü sisteminin yapısını beğeniyorum.	☐	☐	☐	☐	☐	☐	☐
Menü sistemi beklentilerimi karşılıyor.	☐	☐	☐	☐	☐	☐	☐
Televizyonu satın alırken teknik özelliklerini inceledim.	☐	☐	☐	☐	☐	☐	☐
Televizyonu satın alırken eskisine benzemesine özen gösterdim.	☐	☐	☐	☐	☐	☐	☐
Televizyonu satın alırken eskisiyle aynı marka olmasına özen gösterdim.	☐	☐	☐	☐	☐	☐	☐
Televizyonun yeni özelliklerini kullanıyorum.	☐	☐	☐	☐	☐	☐	☐
Televizyonu eskisine oranla farklı kullanıyorum.	☐	☐	☐	☐	☐	☐	☐
Bu televizyon beklentilerimi karşılıyor.	☐	☐	☐	☐	☐	☐	☐
Bu televizyon, TV izleme alışkanlıklarımı değiştirdi.	☐	☐	☐	☐	☐	☐	☐
Bu televizyonu izlemekten keyif alıyorum.	☐	☐	☐	☐	☐	☐	☐

17) Bir önceki televizyonunuzun markası nedir?

Arçelik ☐   Telefunken ☐
Beko ☐   Toshiba ☐
Loewe ☐   Vestel ☐
Philips ☐   Diğer ☐
Sony ☐   Belirtiniz:_____

18) Bir önceki televizyonunuzu ne kadar süreyle kullandınız?

1 – 2 yıl ☐   5 – 10 yıl ☐
2 – 5 yıl ☐   10 yıldan fazla ☐

19) Televizyonunuzu neden değiştirdiniz?

_____

_____

20)	Kullanmakta olduğunuz televizyondan beklentileriniz nelerdir?

_____

_____

21)	Lütfen eski televizyonunuzun değişmesini istemediğiniz yanlarını belirtiniz.

_____

_____

22)	Lütfen yeni televizyonunuzun değişmesini istemediğiniz yanlarını belirtiniz.

_____

_____

23)	Lütfen yeni televizyonunuzun değişmesini istediğiniz yanlarını belirtiniz.

_____

_____

24)	Lütfen bir sonraki televizyonunuzda mutlaka olması gerektiğini düşündüğünüz özellikleri belirtiniz.

_____

_____

Lütfen ankete ara veriniz.

25)	Lütfen aşağıdaki televizyon ayarlarını kullanım kolaylığı açısından değerlendiriniz.

	Çok zor						Çok kolay
	0	1	2	3	4	5	6
Görüntü	☐	☐	☐	☐	☐	☐	☐
Ses	☐	☐	☐	☐	☐	☐	☐
Kanal	☐	☐	☐	☐	☐	☐	☐
Ek cihaz (Video, VCD/DVD oynatıcı, ses sistemi, vb.) kullanımı	☐	☐	☐	☐	☐	☐	☐
Diğer (Belirtiniz):_____	☐	☐	☐	☐	☐	☐	☐
Diğer (Belirtiniz):_____	☐	☐	☐	☐	☐	☐	☐

English Version

The answers you provide to the questionnaire below will be evaluated within a research undertaken for my graduate study in METU Industrial Design Department. Your personal information and questionnaire correspondence will be kept confidential, and will not be shared with third persons other than the course instructor. Should you require it; the article related to the study results will be delivered to you.

Thank you for taking the time.

1) Name, Last Name: _____

2) Age: _____

3) What is the last degree you hold?

Primary school	☐	Undergraduate	☐
Middle school	☐	Graduate	☐
High school	☐	Ph. D	☐
Vocational school	☐		

4) Do you speak any foreign languages?

Yes ☐ No ☐

If you answered yes, please indicate the foreign languages you can speak.

_____

5) Do you use computers?

Yes ☐ No ☐

Please continue if you answered yes. Skip to question 8 otherwise.

6) Where do you use computers?

Home	☐	
Office	☐	
Home and office	☐	
Other	☐	Pls. specify: _____

7) What is your average weekly computer usage?

0 – 1 hour	☐	5 – 10 hours	☐
1 – 2 hours	☐	10 – 15 hours	☐
2 – 5 hours	☐	15 hours or more	☐

8) What is the brand of your current television?

Arçelik ☐   Telefunken ☐
Beko ☐   Toshiba ☐
Loewe ☐   Vestel ☐
Philips ☐   Other ☐
Sony ☐   Pls. specify: _____

9) How long have you owned this television?

0 – 6 months ☐   1 – 2 years ☐
6 months – 1 year ☐   2 years or more ☐

10) Did you select your current television?

Yes ☐
No ☐
Joint decision ☐

11) Please indicate the order of importance of product properties you considered when choosing/purchasing your television.

	Not important						Very important
	0	1	2	3	4	5	6
Price	☐	☐	☐	☐	☐	☐	☐
Brand	☐	☐	☐	☐	☐	☐	☐
Screen size	☐	☐	☐	☐	☐	☐	☐
Design/color	☐	☐	☐	☐	☐	☐	☐
Technical specs (teletext, PIP, etc.)	☐	☐	☐	☐	☐	☐	☐
Picture quality	☐	☐	☐	☐	☐	☐	☐
Sound quality	☐	☐	☐	☐	☐	☐	☐
Warranty terms	☐	☐	☐	☐	☐	☐	☐
Technical support (service & repair network)	☐	☐	☐	☐	☐	☐	☐
Other (Pls. specify):_____	☐	☐	☐	☐	☐	☐	☐
Other (Pls. specify):_____	☐	☐	☐	☐	☐	☐	☐

12) In what range is your average daily television viewing hours?

0-1 hour ☐   3-4 hours ☐
1-2 hours ☐   4-5 hours ☐
2-3 hours ☐   5 hours or more ☐

13) How many people in your household regularly watch television?

1 ☐   4 ☐
2 ☐   5 ☐
3 ☐   6 or more ☐

14) Do you use the menu system of your television?

Yes ☐   No ☐

Please continue if you answered yes. Skip to question 16 otherwise.

15) Which method did you prefer in order to learn the menu system of your television? (You can check multiple boxes.)

Trial-and-error ☐
User's manual ☐
Help from someone else ☐
Other ☐
      Pls. specify: _____

16) Please indicate how much you agree with the statements below.

	Do not agree						Agree
	0	1	2	3	4	5	6
I consider menu usage simple.	☐	☐	☐	☐	☐	☐	☐
I can use the menu comfortably.	☐	☐	☐	☐	☐	☐	☐
I can use all functions of the menu.	☐	☐	☐	☐	☐	☐	☐
I regularly use the menu.	☐	☐	☐	☐	☐	☐	☐
Adjustments using the menu do not take much time.	☐	☐	☐	☐	☐	☐	☐
I consider menu icons/headings comprehensible.	☐	☐	☐	☐	☐	☐	☐
I like the menu structure.	☐	☐	☐	☐	☐	☐	☐
The menu satisfies my expectations.	☐	☐	☐	☐	☐	☐	☐
I examined tech specs when making the purchase.	☐	☐	☐	☐	☐	☐	☐
I paid attention to resemblance with my previous television when making the purchase.	☐	☐	☐	☐	☐	☐	☐
I paid attention to purchasing the same brand.	☐	☐	☐	☐	☐	☐	☐
I use the new functions of the television.	☐	☐	☐	☐	☐	☐	☐
My utilization pattern has changed with the new television.	☐	☐	☐	☐	☐	☐	☐
This television satisfies my expectations.	☐	☐	☐	☐	☐	☐	☐
This television has changed my TV viewing habits.	☐	☐	☐	☐	☐	☐	☐
I enjoy watching this television.	☐	☐	☐	☐	☐	☐	☐

17) What was the brand of your previous television?

Arçelik	☐	Telefunken	☐
Beko	☐	Toshiba	☐
Loewe	☐	Vestel	☐
Philips	☐	Other	☐
Sony	☐	Pls. specify: _____	

18) How long have you owned your previous television?

1 – 2 years	☐	5 – 10 years	☐
2 – 5 years	☐	10 years or more	☐

19) Why did you change your television?

_____

_____

20) What are your expectations from your television?

_____

_____

21) Please indicate the qualities of your previous television that you wouldn't like to change.

_____

_____

22) Please indicate the qualities of your current television that you wouldn't like to change.

_____

_____

23) Please indicate the qualities of your current television that you would like to change.

_____

_____

24) Please list the functions that your next television must contain.

_____

_____

Please pause.

25)   Please evaluate the television adjustments below in terms of ease-of-use.

	Very hard						Very easy
	0	1	2	3	4	5	6
Picture	☐	☐	☐	☐	☐	☐	☐
Sound	☐	☐	☐	☐	☐	☐	☐
Channel	☐	☐	☐	☐	☐	☐	☐
Peripheral device (VCR, VCD/DVD player, audio system, etc.) usage	☐	☐	☐	☐	☐	☐	☐
Other (Pls. specify):_____	☐	☐	☐	☐	☐	☐	☐
Other (Pls. specify):_____	☐	☐	☐	☐	☐	☐	☐

APPENDIX A.2

INTERVIEW GUIDE FOR CASE STUDY 1

Turkish Version

Anketteki 24. sorudan sonra katılımcıya üç görev verilecek ve sorularla verilen görev için menü kullanımını değerlendirmeleri istenecek.

<u>Görevler</u>

- Otomatik kanal sıralama
- Görüntü ayarı (renk/kontrast)
- Ses ayarı (bas/tiz)

Aşağıdaki sorular tüm görevler için tekrarlanacak.

- Menü sisteminin kullanımını uygun buluyor musunuz?
- Kumandada fonksiyon tuşu olmasını tercih eder miydiniz?
- Menüyü kullanırken zorlandınız mı?
- Menüde yer almasını tercih edeceğiniz alternatif bir yol var mı?
- Menü kullanımı beklentilerinize uyuyor mu?
- Menü kullanımının daha basit olmasını tercih eder miydiniz?
- Tekrar kullanım için hatırlamanız gereken şeyler var mı?
- Önereceğiniz başka bir konu var mı?

Aşağıdaki sorular tüm görevler bittikten sonra sorulacak.

- TV'nin yeni özelliklerini biliyor musunuz?
- Bu özellikleri kullanıyor musunuz?
- Kullandıklarınızı neden kullanıyorsunuz? (Kendi isteğiyle, zorunluluktan, vb.)
- Kullanmadıklarınızı neden kullanmıyorsunuz?
- Bilgisayar kullanma alışkanlığınızın menüyü kullanmakta yardımcı olduğunu düşünüyor musunuz? Neden? (Katılımcı bilgisayar kullanıyorsa sorulacak)
- TV izleme alışkanlığınızın menüyü kullanmakta yardımcı olduğunu düşünüyor musunuz? Neden?
- TV'yi alırken kalıcı olmasını düşündünüz mü? (Dijital, 100 Hz, vb.)

- "Yenisini aldım ama hala eskisi gibi kullanıyorum" dediğiniz ürünler var mı? Varsa bunu neye bağlıyorsunuz?

English Version

Participants will be assigned three tasks after the 24th question of the questionnaire, and will be requested to evaluate menu usage for completion of the tasks.

Tasks
- Automatic channel presetting
- Picture setting (color/contrast)
- Sound setting (bass/treble)

Following questions will be repeated for all tasks.
- Do you consider menu usage appropriate for this setting?
- Would you rather have a function button on the remote?
- Did you have any trouble using the menu?
- Is there an alternative route you would like to suggest for menu usage?
- Is menu usage in parallel with your expectations?
- Would you prefer easier operation with the menu?
- Is there anything you have to memorize in order to use this function later on?
- Is there anything else you would like to suggest?

Following questions will be asked after all tasks are completed.
- Are you knowledgeable on the new functions of your TV?
- Do you use these functions?
- Why do you use the ones you do? (Out of want, out of need, etc.)
- Why don't you use the ones you don't?
- Do you consider your computer literacy helpful in using the menu? Why? (Ask only if the participant is a computer user)
- Do you consider your TV viewing habits helpful in using the menu? Why?
- Did you consider the long-lasting of the TV when making the purchase? (Digital, 100 Hz, etc.)
- Do you own any products for which you think "I purchased a new one but I'm still using it in the old fashion"? If you do, why do you think that is the case?

APPENDIX B.1

PARTICIPANT QUESTIONNAIRE FOR CASE STUDY 2

Turkish Version

Aşağıdaki anket sorularına vereceğiniz cevaplar ODTÜ Endüstri Ürünleri Tasarımı Bölümü'ndeki yüksek lisans çalışmalarım kapsamında yürütülen bir araştırma için kullanılacaktır. Kişisel bilgileriniz ve ankete vereceğiniz cevaplar gizli tutulacak, ilgili eğitmen dışındaki üçüncü şahıslarla paylaşılmayacaktır. Dilerseniz araştırma sonuçlarına dair yazılacak olan makale tarafınıza iletilecektir.

Zaman ayırdığınız için teşekkür ederim.

1)   Adınız, Soyadınız:_____

2)   Yaşınız:_____

3)   En son sahip olduğunuz eğitim derecesi nedir?

İlkokul	☐	Üniversite	☐
Ortaokul	☐	Yüksek lisans	☐
Lise	☐	Doktora	☐
Yüksek okul	☐		

4)   Yabancı dil biliyor musunuz?

Evet	☐	Hayır	☐

Cevabınız evet ise bildiğiniz yabancı dilleri belirtiniz.

_____

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5) Lütfen aşağıdaki cümlelere hangi derecede katıldığınızı belirtiniz. Lütfen her cümle için değerlendirme yapınız.

	Katılmıyorum						Katılıyorum
	0	1	2	3	4	5	6
Yeni bir cep telefonu aldığımda tüm özelliklerini kullanmak isterim.	☐	☐	☐	☐	☐	☐	☐
Yeni bir cep telefonu aldığımda kullanım kılavuzunun tamamını okurum.	☐	☐	☐	☐	☐	☐	☐
Ürün kullanımında zorluk çekersem kendi başıma çözmeye/anlamaya çalışırım.	☐	☐	☐	☐	☐	☐	☐
Ürünle ilgili tekrarlanan sorunlar (teknik/kullanım) olduğunda cep telefonumu değiştiririm.	☐	☐	☐	☐	☐	☐	☐

6) Yeni bir cep telefonu aldığınızda ürün özelliklerini öğrenmek için aşağıdaki yöntemleri hangi sırayla kullanmayı tercih edersiniz? Lütfen yöntemleri tercih sıranıza göre 1'den başlayarak numaralandırınız.

Deneme-yanılma yöntemi ☐
Kullanım kılavuzunu okumak ☐
Bilen birinden yardım almak ☐
Diğer ☐
      Belirtiniz:_____

7) Ürünle ilgili bir sorunla (teknik/kullanım) karşılaşırsanız aşağıdaki yöntemleri hangi sırayla denersiniz? Lütfen yöntemleri deneyeceğiniz sıraya göre 1'den 4'e kadar numaralandırınız.

Ürünü kurcalayarak sorunu gidermeye çalışırım. ☐
Kullanma kılavuzuna bakarım. ☐
Bilen birine danışırım. ☐
Teknik servisi ararım. ☐

8) Daha önce kaç adet farklı cep telefonu kullandınız?

1 ☐   3 ☐
2 ☐   4 ve üstü ☐

9) Lütfen bir önceki cep telefonunuzun markasını ve modelini belirtiniz.

_____

10) Bir önceki cep telefonunuzu ne kadar süre ile kullandınız?

0 – 6 ay ☐   1 – 2 yıl ☐
6 ay – 1 yıl ☐   2 yıldan fazla ☐

11) Yeni cep telefonunuzu ne kadar zamandır kullanıyorsunuz?

0 – 6 ay	☐	1 – 2 yıl	☐
6 ay – 1 yıl	☐	2 yıldan fazla	☐

12) Cep telefonunuzu günde kaç kez kullanıyorsunuz?

0-5 kez	☐	10-15 kez	☐
5-10 kez	☐	15 kez ve üstü	☐

13) Lütfen **eski cep telefonunuzu değerlendirerek** aşağıdaki cümlelere hangi derecede katıldığınızı belirtiniz. Lütfen her cümle için değerlendirme yapınız.

	Katılmıyorum 0	1	2	3	4	5	Katılıyorum 6
Telefonu satın alırken özelliklerini inceledim.	☐	☐	☐	☐	☐	☐	☐
Telefonun...							
tüm özellikleri hakkında bilgim vardı.	☐	☐	☐	☐	☐	☐	☐
tüm özelliklerini kullanıyordum.	☐	☐	☐	☐	☐	☐	☐
genelde rahatlıkla kullanabildiğini düşünüyordum.	☐	☐	☐	☐	☐	☐	☐
gündelik olmayan (ikincil) işlevlerini de zorlanmadan kullanabiliyordum.	☐	☐	☐	☐	☐	☐	☐
sunduğu tüm özelliklerin gerekli olduğunu düşünüyordum.	☐	☐	☐	☐	☐	☐	☐
Telefon, ilk aldığımda beklentilerimi karşılıyordu.	☐	☐	☐	☐	☐	☐	☐
Telefon, tüm kullandığım süre boyunca (atana/satana/verene kadar) beklentilerimi karşılıyordu.	☐	☐	☐	☐	☐	☐	☐
Telefonu kullanmaktan keyif alıyordum.	☐	☐	☐	☐	☐	☐	☐
Telefonun benim için uygun olduğunu düşünüyordum.	☐	☐	☐	☐	☐	☐	☐

14) Lütfen **yeni cep telefonunuzu değerlendirerek** aşağıdaki cümlelere hangi derecede katıldığınızı belirtiniz. Lütfen her cümle için değerlendirme yapınız.

	Katılmıyorum						Katılıyorum
	0	1	2	3	4	5	6
Telefonu satın alırken özelliklerini inceledim.	☐	☐	☐	☐	☐	☐	☐
Telefonun...							
tüm özellikleri hakkında bilgim var.	☐	☐	☐	☐	☐	☐	☐
tüm özelliklerini kullanıyorum.	☐	☐	☐	☐	☐	☐	☐
genelde rahatlıkla kullanabildiğini düşünüyorum.	☐	☐	☐	☐	☐	☐	☐
gündelik olmayan (ikincil) işlevlerini de zorlanmadan kullanabiliyorum.	☐	☐	☐	☐	☐	☐	☐
sunduğu tüm özelliklerin gerekli olduğunu düşünüyorum.	☐	☐	☐	☐	☐	☐	☐
Telefonu satın alırken eskisine benzemesine özen gösterdim.	☐	☐	☐	☐	☐	☐	☐
Telefonun eskisiyle aynı marka olmasına özen gösterdim.	☐	☐	☐	☐	☐	☐	☐
Telefonun eskisinden farklı olan özelliklerini de kullanıyorum.	☐	☐	☐	☐	☐	☐	☐
Bu telefon, cep telefonu kullanma alışkanlıklarımı değiştirdi.	☐	☐	☐	☐	☐	☐	☐
Telefon, ilk aldığımda beklentilerimi karşılıyordu.	☐	☐	☐	☐	☐	☐	☐
Telefon, halen beklentilerimi karşılıyor.	☐	☐	☐	☐	☐	☐	☐
Telefonu kullanmaktan keyif alıyorum.	☐	☐	☐	☐	☐	☐	☐
Telefonun benim için uygun olduğunu düşünüyorum.	☐	☐	☐	☐	☐	☐	☐

English Version

The answers you provide to the questionnaire below will be evaluated within a research undertaken for my graduate study in METU Industrial Design Department. Your personal information and questionnaire correspondence will be kept confidential, and will not be shared with third persons other than the course instructor. Should you require it; the article related to the study results will be delivered to you.

Thank you for taking the time.

1) Name, Last Name: _____

2) Age: _____

3)   What is the last degree you hold?

Primary school	☐	Undergraduate	☐
Middle school	☐	Graduate	☐
High school	☐	Ph. D	☐
Vocational school	☐		

4)   Do you speak any foreign languages?

Yes   ☐   No   ☐

If you answered yes, please indicate the foreign languages you can speak.

_____

5)   Please indicate how much you agree with the statements below. Please evaluate every statement.

	Do not agree						Agree
	0	1	2	3	4	5	6
I would like to be able to use all functions of a new mobile phone.	☐	☐	☐	☐	☐	☐	☐
I read the user's manual in its entirety when I purchase a new mobile phone.	☐	☐	☐	☐	☐	☐	☐
I would try to resolve/understand any usage-related problems by myself.	☐	☐	☐	☐	☐	☐	☐
I would change my mobile phone in case of repeating product-related problems (technical/usage).	☐	☐	☐	☐	☐	☐	☐

6)   In which order would you try the methods below in order to learn product properties of a new mobile phone? Please rank the methods in your choice of order starting from 1.

Trial-and error	☐
User's manual	☐
Help from someone knowledgeable	☐
Other	☐

         Pls. specify: _____

7)   In which order would you try the methods below in order to resolve product-related problems (technical/usage)? Please rank the methods in your choice of order from 1 to 4.

I would fiddle with the device.	☐
I would consult the user's manual.	☐
I would consult someone knowledgeable.	☐
I would contact the technical service.	☐

8) How many different mobile phones have you used before?

| 1 | ☐ | 3 | ☐ |
| 2 | ☐ | 4 or more | ☐ |

9) Please indicate the brand and model of your previous mobile phone.

_____

10) How long have you used your previous mobile phone?

| 0 – 6 months | ☐ | 1 – 2 years | ☐ |
| 6 months – 1 year | ☐ | 2 years or more | ☐ |

11) How long have you been using your current mobile phone?

| 0 – 6 months | ☐ | 1 – 2 years | ☐ |
| 6 months – 1 year | ☐ | 2 years or more | ☐ |

12) How many times a day do you use your mobile phone?

| 0-5 times | ☐ | 10-15 times | ☐ |
| 5-10 times | ☐ | 15 times or more | ☐ |

13) Please indicate how much you agree with the statements below **with respect to your previous mobile phone**. Please evaluate every statement.

	Do not agree						Agree
	0	1	2	3	4	5	6
I examined phone properties when making the purchase.	☐	☐	☐	☐	☐	☐	☐
I...							
was knowledgeable about all phone properties.	☐	☐	☐	☐	☐	☐	☐
used all of the phone properties.	☐	☐	☐	☐	☐	☐	☐
considered the phone to be easy-to-use in general.	☐	☐	☐	☐	☐	☐	☐
could use extra (secondary) phone functions with ease.	☐	☐	☐	☐	☐	☐	☐
considered all product properties necessary.	☐	☐	☐	☐	☐	☐	☐
The phone initially satisfied my expectations.	☐	☐	☐	☐	☐	☐	☐
The phone satisfied my expectations throughout the ownership period.	☐	☐	☐	☐	☐	☐	☐
I enjoyed using the phone.	☐	☐	☐	☐	☐	☐	☐
I considered the phone suitable for myself.	☐	☐	☐	☐	☐	☐	☐

14) Please indicate how much you agree with the statements below **with respect to your current mobile phone**. Please evaluate every statement.

	Do not agree						Agree
	0	1	2	3	4	5	6
I examined phone properties when making the purchase.	☐	☐	☐	☐	☐	☐	☐
I...							
am knowledgeable about all phone properties.	☐	☐	☐	☐	☐	☐	☐
use all of the phone properties	☐	☐	☐	☐	☐	☐	☐
consider the phone to be easy-to-use in general.	☐	☐	☐	☐	☐	☐	☐
can use extra (secondary) phone functions with ease.	☐	☐	☐	☐	☐	☐	☐
consider all product properties necessary.	☐	☐	☐	☐	☐	☐	☐
I paid attention to resemblance with my previous mobile phone when making the purchase.	☐	☐	☐	☐	☐	☐	☐
I paid attention to purchasing the same brand.	☐	☐	☐	☐	☐	☐	☐
I use the functions of the phone that are different from my previous phone.	☐	☐	☐	☐	☐	☐	☐
This phone has changed my mobile phone usage habits.	☐	☐	☐	☐	☐	☐	☐
The phone initially satisfied my expectations.	☐	☐	☐	☐	☐	☐	☐
The phone still satisfies my expectations.	☐	☐	☐	☐	☐	☐	☐
I enjoy using the phone.	☐	☐	☐	☐	☐	☐	☐
I consider the phone suitable for myself.	☐	☐	☐	☐	☐	☐	☐

APPENDIX B.2

PARTICIPANT INSTRUCTIONS FOR CASE STUDY 2

Turkish Version

<u>Görev Tanımları</u>

I: Kısa Mesaj (SMS) Gönderimi

[Test ürünü] ile mesaj yazarken metin girişi yapabilmek için üç farklı yöntem mevcuttur. Size verilmiş olan kartlarda bu üç yöntem hakkında kısa açıklamalar bulabilirsiniz.

Önce kendi telefonunuzu, ardından [test ürününde] *tercih ettiğiniz metin girişi yöntemini kullanarak* kendi numaranıza mesaj metni **"Merhaba. Ne var ne yok?"** olan bir kısa mesaj gönderiniz.

II: Ajanda Girişi

Önce kendi telefonunuzu, ardından [test ürününü] kullanarak **20.05.2004 tarihinde saat 10:00'da yapılacak bir toplantıyı yarım saat önce hatırlatacak** bir ajanda girişi yaratınız.

[Test ürününde] ana ekranın üstünde yer alan çubuktaki takvim simgesini veya ana menüdeki "Ajanda" girişini seçerek ajanda uygulamasına ulaşabilirsiniz. Gerekli alanlarda metin girişi için size verilen kartlardaki *"El Yazısı ile Metin Girişi"* ve *"Ekran Klavyesi ile Metin Girişi"* açıklamalarını gözden geçirebilir, telefonun kullanıcı kılavuzuna başvurabilirsiniz (s.35-37).

<u>Metin Girişi için Yönergeler</u>

Tuş Takımını Kullanarak Metin Girişi

Tuş takımını kullanarak metin girişi yalnızca telefonun kapağı kapalıyken mümkündür. Kapak kapalı iken telefonun kalemi çalışmayacağından kısa mesaj göndermek için gerekli durumlarda telefonun sol yan tarafındaki döndürülebilir *jog dial* düğmesini ve tuş takımını birlikte kullanmak gerekir. Örneğin kapak kapalıyken

mesaj uygulamasına ulaşmak için *jog dial* döndürülerek ekranın solundaki zarf ikonu seçilmeli ve *jog dial* düğmesi içeri doğru bastırılarak veya **OK** tuşuna basılarak uygulama başlatılmalıdır.

İhtiyaç duymanız halinde, bu iki kontrol öğesinin kullanımı hakkında bilgi almak için telefonun kullanıcı kılavuzuna başvurabilirsiniz (s.19-20).

El Yazısı ile Metin Girişi

El yazısı ile metin girişi telefon kapağı açıkken telefonun kalemi kullanılarak yapılır. Ana ekranın sol üst köşesindeki zarf simgesini veya ana menüdeki "Mesajlar" girişini seçerek mesaj uygulamasında "SMS Oluştur" seçeneğiyle boş bir mesaj ekranı açabilirsiniz. Bu ekranda mesajın alıcısını ve mesaj metnini istediğiniz sırayla ilgili alanlara girebilirsiniz. Metin modu ekranı, sağ kenarın ortasından bir okla iki bölüme ayrılmıştır. Okun alt kısmına küçük harfler, ok ile aynı hizaya ise büyük harfler girilir. Okun üst kısmına rakamlar girilir. Çoğu harfler farklı şekillerde yazılabilir. Stil, harfin büyük veya küçük olmasını belirlemez. Harfin büyük veya küçük olması ekrandaki konuma bağlıdır.

İhtiyaç duymanız halinde, bu kontrol öğesinin kullanımı hakkında bilgi almak için telefonun kullanıcı kılavuzuna başvurabilirsiniz (s.36-37).

Ekran Klavyesi ile Metin Girişi

Ekran klavyesini kullanarak metin girişi telefon kapağı açıkken telefonun kalemi kullanılarak yapılır. Ana ekranın sol üst köşesindeki zarf simgesini veya ana menüdeki "Mesajlar" girişini seçerek mesaj uygulamasında "SMS Oluştur" seçeneğiyle boş bir mesaj ekranı açabilirsiniz. Bu ekranda mesajın alıcısını ve mesaj metnini istediğiniz sırayla ilgili alanlara girebilirsiniz. Ekran klavyesini etkinleştirmek için ekranın altındaki çubukta yer alan klavye simgesini seçmeniz gerekir.

İhtiyaç duymanız halinde, bu kontrol öğesinin kullanımı hakkında bilgi almak için telefonun kullanıcı kılavuzuna başvurabilirsiniz (s.35).

English Version

<u>Task Descriptions</u>

I: Sending a Short Message (SMS)

There are three different methods for text entry with the [test product] when writing a message. You can find short descriptions of these three methods on the provided note cards.

Send a short message with the text ***"Merhaba. Ne var ne yok?"*** to your mobile phone number using first your phone, and then *the text entry method of your choice* of the [test product].

II: Calendar Entry

Create a calendar entry for ***a meeting taking place on 05.20.2004 with a half-hour advance reminder*** using first your phone, and then the [test product].

You can start the organizer application by tapping the calendar icon on top of the screen or by selecting the ["Organizer"] entry on the main menu of the [test product]. You can review the provided note cards titled "Text Entry by Hand-writing" and "Text Entry with the Virtual Keyboard", or consult the user's manual (pp.35-37) when entering text in the required fields.

<u>Directions for Text Entry</u>

Text Entry with the Number Pad

Text entry with the number pad is possible only when the phone lid is closed. It is necessary to use the rotating *jog dial* on the left side of the phone and the number pad together in certain situations when sending a short message since the jotter of the phone will not work with the lid closed. For example, the envelope icon on the left side of the screen should be highlighted by rotating the *jog dial*, and selected by pressing the *jog dial* inwards or by pressing the **OK** button in order to start the messaging application when the lid is closed.

Should you need it, you can consult the user's manual for more information on usage of these two controls (pp.19-20).

Text Entry by Hand-writing

Text entry by hand-writing is available using the phone jotter when the phone lid is open. After tapping the envelope icon on top left corner of the main menu or selecting the ["Messages"] entry on the main menu, you can open a blank message screen by tapping ["Create an SMS"] with the jotter. You can enter the recipient number and the message text in relevant fields in your order of choice. The text screen is divided in two halves by an arrow on the right side of the screen. Small letters and capital letters are recognized below and in line with the arrow, respectively. Numbers should be entered above the arrow. Many letters can be inscribed in multiple styles. The style does not determine the letter case. The case is dependent upon the location of the inscription on the screen.

Should you need it, you can consult the user's manual for more information on this method (pp.36-37).

Text Entry with the Virtual Keyboard

Text entry with the virtual keyboard is available using the phone jotter when the phone lid is open. After tapping the envelope icon on top left corner of the main menu or selecting the ["Messages"] entry on the main menu, you can open a blank message screen by tapping ["Create an SMS"] with the jotter. You can enter the recipient number and the message text in relevant fields in your order of choice. You can activate the screen keyboard by tapping the keyboard icon on the bottom tab of the message text screen.

Should you need it, you can consult the user's manual for more information on this method (p.35).

APPENDIX B.3

INTERVIEW GUIDE FOR CASE STUDY 2

Turkish Version

Test sırasında aşağıdaki sorular sorulacak.

- Her mesaj gönderiminden sonra...
    - o Bu yöntemle mesaj göndermenin iyi ve kötü yönlerini anlatır mısınız?
    - o Bu yöntem sizin telefonunuzda olsun ister misiniz? Olsa kullanır mısınız?
    - o Mesajı yazarken/gönderirken sıkıntı yaşadınız mı? Tarif eder misiniz?
    - o Bu yöntemle mesaj göndermek keyifli mi?
- Tüm mesajlar gönderildikten sonra...
    - o Üç metin girme yönteminden en kullanışlı olan hangisi?
    - o Üç metin girme yönteminden en keyifli olan hangisi?
    - o Farklı durumlarda farklı yöntem kullanmayı tercih eder misiniz?
    - o Aynı telefonda üç ayrı yöntem olması iyi mi?
    - o Kendi telefonunuzdaki yöntemle karşılaştırınca hangi telefonu tercih edersiniz?
- Ajanda girişinden sonra...
    - o Ajanda girişi yaratırken kullandığınız tarih ve saat ayarlama yöntemleri hakkında ne düşünüyorsunuz?
    - o Bu yöntemler sizin telefonunuzda olsun ister misiniz? Olsa kullanır mısınız?
    - o Kendi telefonunuz mu, bu telefon mu daha kullanışlı? Hangisini tercih edersiniz?
    - o Kendi telefonunuz mu, bu telefon mu daha keyifli? Hangisini tercih edersiniz?
    - o Ajanda girişini yaratırken sıkıntı yaşadınız mı? Tarif eder misiniz?
- Cep telefonunuzu neden değiştirdiniz?
- Eski telefonunuzdan farklı olan fonksiyonlardan hangilerini kullanıyorsunuz? (Anketten kullanıp kullanmadığı kontrol edilecek.)
- Bu fonksiyonları daha önce kendi telefonunuzda kullandınız mı?

- Bu fonksiyonları telefonu satın almadan/seçerken incelediniz mi?

- Bu telefonun sizin telefonunuza göre iyi ve kötü yönleri nelerdir?

- Böyle bir cihazı kendiniz için uygun buluyor musunuz? Neden? [Görevler tamamlandıktan sonra telefon özellikleri (kamera, internet, GPRS, Bluetooth, mp3 çalar, ses kayıt, word, excel, powerpoint, pdf görüntüleyici, vs.) kısa bir metinle (konuşma şeklinde) katılımcıya anlatılacak.

- Eklemek istediğiniz bir şey var mı?

English Version

The following questions will be asked during the test.

- After every message sent...
  - Could you describe the positive and negative aspects of sending a message with this method?
  - Would you like to have this method on your phone? Would you use it if you had it?
  - Did you have any trouble when writing/sending the message? Could you describe it/them?
  - Is it enjoyable to send messages using this method?

- After all messages are sent...
  - Which one of the three text entry methods is most practical?
  - Which one of the three text entry methods is most enjoyable?
  - Would you use different methods under different circumstances?
  - Is it good to have three different methods on one phone?
  - Which phone would you prefer when comparing the method on your phone to the ones on the test product?

- After the calendar entry...
  - What do you think of the date and time adjustments you used when creating the calendar entry?
  - Would you like to have these adjustment methods on your phone? Would you use them if you had them?
  - Is your phone or this one more practical? Which one would you prefer?
  - Is your phone or this one more enjoyable? Which one would you prefer?
  - Did you have any trouble when creating the entry? Could you describe it/them?

- Why did you choose to change your previous phone?
- Which ones of the new functions do you use? (Check from the questionnaire correspondence if new functions are used.)
- Did you previously use these applications (messaging and calendar) of your phone?
- Did you examine these functions when choosing/purchasing your phone?
- Could you describe the positive and negative aspects of this phone in comparison with your phone?
- Do you find this device suitable for yourself? Why? [Phone capabilities (camera, internet, GPRS, Bluetooth, mp3 player, voice recorder, word, excel, powerpoint, pdf viewer, etc.) will be verbally conveyed to the participant in brief after completion of all tasks]
- Is there anything else you would like to add?