THE NEGATIVE EFFECTS OF TECHNOLOGY-DRIVEN PRODUCT DESIGN ON USER-PRODUCT INTERACTION AND PRODUCT USABILITY

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ABSTRACT

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In the last decades, the rapid change and prevalent use of technology are concerning, as they induced effects which mainly altered various encompassing contexts like consumer market dynamics and product development processes. Evidently, these transformations also affect the way users interact with products.

It is observed that, technological novelties are applied in the competitive market as a tool for product differentiation. In addition, the rapid development of these technologies is a dominating factor on shortening product lifecycles. Resulting from these two factors, implementing latest technologies in new products is interpreted by producers as an absolute way of achieving market success. Consequently, most of the products in everyday life are designed with a primary aim to implement latest technological advances, without appropriate consideration of user requirements and characteristics. The phenomenon has negative consequences on product usability.

This study basically examines the usability problems that are related with digital technology impelementations in consumer products. The evaluations are based on the contexts such as: changes in contemporary market conditions with the effects of the recent technological developments, technology-driven approaches in product development processes and the transformative consequences of digital technology applications on user-product interaction. Literature surveys are employed as method.

Finally, interaction characteristics of digital products and the contexts in which they are used are evaluated and it is argued that, the usability problems are due to the deficiency in evaluations of user characteristics and requirements during the product development processes, in general terms.

Keywords: Product design, user-product interaction, product usability, technology-driven design, user-centered design, digital technology.

ÖZ

TEKNOLOJİ MERKEZLİ TASARIMIN KULLANICI-ÜRÜN ETKİLEŞİMİ VE ÜRÜN KULLANILABİLİRLİĞİ ÜZERİNE ETKİLERİ

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Teknolojik gelişimlerin ürün tasarımı üzerinde belirleyici etkileri olduğu bilinmektedir. Bununla beraber, günümüzde teknolojinin hızlı değişimi ve yaygın kullanımı dikkat çekicidir. Özellikle sayısal teknoloji alanındaki ilerleme, yaşamın her alanında olduğu gibi, tüketici ürünleri pazar yapısında ve ürün geliştirme süreçlerinde de temel değişimlerle sonuçlanmıştır.

Teknolojik ilerlemeyle gelen yeniliklerin, rekabetin yoğun olduğu pazar koşullarında, ürün farklılaşmasını destekleyici bir araç olarak kullanıldığı gözlemlenmiştir. Öte yandan, teknolojinin hızlı gelişimi, ürün hayat döngüsünün giderek kısalmasında etkili olmaktadır. Bu iki genel değişimle birlikte, yeni ürünlerde son teknolojiyi kullanmak, üreticiler tarafından piyasa başarısı elde etmenin kesin yolu olarak yorumlanmaktadır. Bu olgunun sonucunda, günlük kullanımdaki birçok ürünün öncelikli olarak teknolojik yenilikleri uygulamak amacıyla, kullanıcı ihtiyaç ve özelliklerinin gözardı edilerek tasarlanması, kullanım zorluklarına sebep olan bir etken olarak karşımıza çıkmaktadır.

Bu çalışma, sayısal teknolojilerin tüketici ürünlerine uygulanmasının bir sonucu olarak ortaya çıkan kullanılabilirlik sorunlarını incelemeyi amaçlamaktadır. Konu, yakın dönemdeki teknolojik gelişmelerin piyasa koşullarına etkileri, ürün geliştirme sürecindeki teknoloji merkezli yaklaşımlar, sayısal teknolojinin tüketici ürünlerinde kullanılmasıyla gelen ürün-kullanıcı etkileşimindeki değişimler kapsamında, ürün kullanılabilirliği kriter alınarak tartışılmıştır. Yöntem olarak literatür araştırmalarına başvurulmuştur.

Sayısal teknoloji kullanan ürünlerin etkileşim özellikleri ve kullanım bağlamlarına dayandırılarak yapılan değerlendirmeler sonucunda, kullanılabilirlik sorunlarının, temelde, kullanıcı ihtiyaç ve yeteneklerinin ürün geliştirme sürecinde öncelikli olarak ele alınmamasından kaynaklandığı savunulmuştur.

Anahtar kelimeler: Ürün tasarımı, ürün-kullanıcı etkileşimi, ürün kullanılabilirliği, teknoloji merkezli tasarım, kullanıcı merkezli tasarım, sayısal teknoloji.

To my family,

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CHAPTER 1

INTRODUCTION

1.1 Problem Definition

Technology had always been a powerful tool of human being to rule over his environment and to meet his needs in the most effective way. Although the two-way relationship between the technological advances and social life had been existent for decades, it was with the mass production and consumption of industrial products that this transformation process had been accelerated. Industrial production techniques required the prevalent use of technological knowledge and enabled the integration of technological advances into various products that reach large amounts of people.

In the contemporary market conditions dominated by competition, product differentiation plays a vital role for the firms to attain product success. Also, different qualities and various functions are implemented in consumer products via technological advances. Therefore, technological novelty is utilized by the producers as an important tool to cerate product differentiation. In other words, technological novelties are imposed by producers in the market as a mark of high quality and superiority of products.

This phenomenon has it's reflections on the user-product interaction from several aspects. In the attempt to implement latest technologies in consumer products, integration of excessive features turns out to be right with the excuse of being novel. With the effects of the overall transformations in technology in the last decades, rate of technological obsolescence

shortens and new forms of interactions are integrated into products. Many products that are designed with a technology driven approach, surpass the needs and requirements of users and simple products began to accommodate added and often unnecessary functions. As a result, these rapid changes towards complexity in interfaces require users to involve in a continuous learning process to use everyday products, leading to the adaptation difficulties and deficiencies in product use.

1.2 The scope of the study

This study aims to elaborate the negative effects of technology driven product design approach on user-product interaction and quality in use in particular.

In this study, literature surveys on related domains will be utilized. In the later phase of the thesis, a case study will be presented for further exploration of the problem.

It should also be noted that, this study covers the main dynamics of the aforementioned transformations. The major problems resulting from the phenomenon will be evaluated; however, putting forward some exact design considerations as a solution to these problems is not within the scope of this study.

1.3 Structure of the thesis

From the next chapter onwards, the problem will be defined, by firstly stating the overall conditions that cause the problem and then by evaluating the effects of these factors on certain contexts. The study then will continue by the exploration of the problem with its main dynamics and consequences. So it can be said tat, the general structure of the study consists of two main parts, referring to the **definition of the problem** and **investigation of the problem**, respectively.

In the following chapter, the basic factors that affect the emergence of the problem will be stated. The evaluations will be based on the effects of developments in digital technology on the major alterations in the consumer market dynamics. Use of technological novelty as a tool to increase market success will be discussed within this context.

In the third chapter, the bases which define the problem will be evaluated. The factors that are stated in the second chapter will be related to certain contexts, through the discussions based on product usability. The definitions of 'quality in use', 'context of use', 'technology-driven design' and 'user-centered design' will be presented. As these concepts are in close relation with product usability, the effects of the aforementioned transformations on these contexts are found to be vital in order to explore the problem.

Fourth chapter will be about the effects of digital technology implementations on user-product interaction process, in consumer products. The discussions will be initiated by stating the dynamics of user-product interaction process from the findings of literature survey. Then the guidelines for an ideal user-product interaction will be broadly classified and the major usability problems will be presented. A further exploration is going to be done by evaluating negative consequences of these alterations on user-product interaction process and increasing function variety of products.

In the fifth chapter, the issues discussed throughout the study will be exemplified with a sample product and the findings will be discussed within the context defined in the previous parts of the study.

Finally, conclusions that are drawn throughout the study will be evaluated and potentials for the further studies will be investigated.

CHAPTER 2

TECHNOLOGY AS A COMPETITIVE TOOL IN CONTEMPORARY MARKET DYNAMICS

2.1 Changing market conditions

It is widely accepted that, contemporary developments in information and communication technologies, lead to fundamental changes in production processes and market conditions. These changes are stated as revolutionary, resulting in a transition from industrial to post-industrial stage (Miles, 1998; Nahm and Vonderembse, 2002). According to Manzini (1998), "we are witnessing the birth of an economy based on information" (p. 45). Tapscott (1995) adds that, there is a shift from industrial economy which was based on automotive industry, to a new economy, driven by computing, communications and networks. As Schmid (2001) also expresses, digitization of information and availability of new media such as Internet, personal computers and digital communication devices, lead to highly flexible technologies and fast flow of knowledge, thus altered production and design processes. Owing to these overall changes, market conditions are also transformed. The vital characteristics of the new environment are stated to be "expanding competition, rapidly changing markets and technology" (Nahm et al., 2002, p. 2067).

In this arduous environment, firms aim to utilize technology in novel ways to achieve competitive advantage.

Under contemporary market conditions, *being first* to enter the market is crucial to obtain greater market share and brings high profits. Evidently, firms compete with their rivals in a

time-based context, as competition mostly relies on fast development of novel products (Norman, 1988; 1999). Thackara (1997) claims the issue with the following:

> Innovative firms are known to collect and assimilate technological information enthusiastically –but the key to their success is in their capacity to exploit it immediately in new products. “Speed is the God; Time is the Devil,” goes Hitachi’s company slogan. (p. 19)

One of the preliminary outcomes of the increased competition and rapidly changing market structure is the shortening of product life cycles and development processes (Lorenz, 1990). Tapscott (1995) exemplifies the issue with following:

> In 1990, automobiles took six years from concept to production. Today they take two years… [T]hese days most of HP’s revenues come from products that didn’t exist a year ago. In the old economy, an invention (like the Polaroid camera, xerography) ensured a revenue stream for decades. Today, consumer electronics products have a typical lifespan of two months… Most medium- or large-sized companies in North America introduce more than one new product per day. Last year Sony introduced 5000 new products. Microsoft group vice president Nathan Myhrvold… says “No matter how good your product, you are only 18 months away from failure”… Even something as seemingly stable and low-tech as beer requires innovation; 90% of Miller’s revenues come from beers that didn’t exist 24 months ago. (pp. 60-63)

While speed of technological change and flow of information through digital networks enable firms to develop and market their products in a shorter time; changing customer demands and competitive strategies lead products to obsolete more rapidly (Nahm et al., 2002; Schmid, 2001). Similarly, Norman (1999) states that time is the main drive for competition, resulting in novel products to supersede old ones in shorter time:

> Nobody has time to think, nobody has time to plan. New products are due every six months. If you slow down, your competition will leap ahead of you. The computer industry thinks that the way to escape is to swim even harder, to bring out more and more products that push the technology envelope that are cheaper, faster, more powerful. (p. 241)

Another fundamental determinant of a company’s success in the contemporary market is innovativeness. The time pressure on production processes force companies to find new ways to increase their market share through introducing novel products and services.

Innovativeness is turned out to be a target for companies to increase their sales, for it is a "lucrative business" (Quiroga, 2001, p. 7). Also, according to Tapscott (1995):

> The new economy is all about competing for the future, the capacity to create new products and services, and the ability to transform businesses into new entities that yesterday couldn't be imagined and that the day after tomorrow may be obsolete. (p. 43)

As firms are urged to introduce novel products repetitively to stay in the market, they aim to direct consumer demands for their continuous innovativeness. Therefore, a product's obsolescence is mostly reliant on the introduction of goods with novel features, rather than its inadequacy to achieve a certain task. The speed of technological change is stated as a dominant factor on the length of product life-cycles, as newly introduced technologies fade current ones (Quiroga, 2001). Firms use this transformative effect as a provider to increase their innovative potential. For instance, "Obsolete your own products" is the motto applied by Microsoft like many other leader firms, to keep their market share, as cited by Tapscott (1995, p.59). He explains the idea with the following words:

> If you've just developed a great product, your goal is to develop a better one that will make the first one obsolete. If you don't make it obsolete, someone else will. (Tapscott, 1995, p.59)

The fore mentioned factors have their impacts on firms' innovative activities. Quiroga (2001) states that, the innovation models differ from that of the traditional one, especially in high-tech markets. In these industries, as competition is mostly reliant on the rapidity in product implementation, innovation may be realized as an act of "organizing" existent technologies in a different way, which is a more rapid and less costly process (p.10). Therefore, many products bring competitive success for they appear to be 'innovative', although their novelty is minimal. For instance, Personal Digital Assistant (PDA) is specified as a small and compact device, which executes similar features of a personal computer, phone, radio and MP3 player, as well as providing wireless communication.

Moreover, with shortening product life cycles and increasing competition, solely inventing technologies remain insufficient for success. Thus, producers choose to overcome

competition barriers by creating new markets simultaneously, for their continuous inventions (Jamison and Hard, 2003). Digital TV Broadcasting can be given as an example. This service promises a new way of interaction with long-familiar TV, by combining several features of a personal computer, with a broadcasting service that gives the opportunity to customize programs. The idea is promising in terms of competitiveness, not only for its being a fresh market but also for its being a flexible digital service that is easy to develop. Hence, it can be said that, diverse technologies are converged, to create various combinations of features, for a differentiated choice for customers.

2.2 Technology as a tool for product differentiation

Today, technology is utilized as a source for innovativeness in the consumer market. The overall technology shift from analog to digital increased flexibility of technologies and enabled its prevalent use (Tapscott, 1995). It can be said that, it is this peculiar characteristic that makes digital technology the basic element of innovative processes. In addition, the maturing of multimedia technologies created a demand; thus, provoked producers to use technological developments to introduce new types of services and products (Nicoll, 2000). Therefore, technological change is seen as a potential to increase competitiveness of product in the market. Norman (1999) argues that, “each successive new product boasts of improved technology: faster, more powerful, better this, better that. Technology rules the day, guided by feature-driven marketing” (p. ix).

The issue is also considered by Jamison and Hard:

> In our contemporary world, technology is primarily seen as the source of marketable commodities and new products… What is at issue here is not whether science and technology satisfy any particularly basic human needs or, for that matter, whether they help solve any particularly pressing social, environmental or human problem; the overriding, and more or less exclusive, concern is rather whether a market can be found for new innovations, and if so, how shares in that market can be increased for the purposes of corporate expansion and growth. In this perspective-what we might call the dominant technology discourse-scientific and technological change is seen as a key factor of economic competitiveness and successful business performance. The discourse is especially dominant in relation to firms that are

> actively promoting the so-called advanced, or 'high' technologies, but its influence is much more general and all-encompassing. …It is as commercial goods and services that technology and technological changes are most understandable and meaningful in the contemporary world. (p. 82-83)

The flexible use of digital technologies and increasing importance of communications are mostly utilized in saturated markets. As Lorenz (1990) states, the saturation of markets like radio and TV, is a factor that supports development of complex systems. It is observable that, such products are differentiated in the market by incorporating some other technologies. They either became a part of a system of converged features (like home-theatre systems) or they gathered some other technologies and designed as 'hybrid' products (like digital TV or cellular phone). Thus, new markets are created from the saturated ones by flexible implementation potential of digital technologies. On the other hand, Quiroga (2001) states that, hi-tech markets are "permanently immature markets" (p. 11) as they are dependent on technological change. Therefore, firms that compete in the matured markets may choose to 'shift' their products to these markets by adding high-tech features. By this way, systematic innovativeness can be achieved, utilizing high-tech market characteristics.

Therefore, computing and information technologies pervaded daily life. Developments in microchip technologies; in terms of their decreasing costs, reducing sizes and increasing availability; opened way to implementations of these systems in many fields (Thackara, 2001). Technological diffusion is not only observed through ordinary products having digital controls and displays rather than mechanical, but also through increasing number of novel products that utilize digital technologies in the consumer market (Bonner, 1999). Progressively, computing systems entered into everyday use, both by software companies that went into consumer market and by the existing firms, which integrated novel technologies into their products in widespread use (Hennemann, 1997; Mok, 1996; Norman, 1999).

On the other hand, the prospects of having competitive success through implementing novel technologies changed the way technology is utilized in generating product ideas. Firms search for ways to integrate novel technologies in their products long before there occurs enough demand from customers. Cockburn (1997) explains the issue with the following:

> In the West, the household is…served…by a "free market". Materials, processes and devices are developed for profit. Often they are brought into existence first in response to large and wealthy markets of military or industrial production. Subsequently their developers seek to maximise sales by adapting them to domestic and individual consumption. Microwave cooking for instance was a serendipitous product of radar. One of the engineers…described the thought-process in technological development. The technological potential comes first, applications second. The designers say to themselves, "we know we have this technology that can do *this*: now where's the market for it?" (p.366)

It can be said that, products are designed as "solutions in search of problems", "pushed" by companies onto the market and marketed through great commercialization to create demand (Jamison and Hard, 2003, p.83). Technological change is faster than consumer demand, so, market change operates as a 'supply-driven' process rather than 'demand-driven' as also explained by Bauman and May (2001):

> New technologies are not simply a response to a need: in no way has it's appearance been determined by popular demand. It is rather the demand that has been determined by the availability of new technology. Whether the need did or did not exist before, the demand for new product comes after their introduction. In this way the presumption that demand creates supply is reversed by the suppliers actively creating demand via their marketing strategies. (p. 150)

Also Norman (1999) states that, the competitive advantage brought by novel technologies result in integration of technologies into products beyond the speed of customer demand:

> The high-technology industry is driven by engineers, by technology itself. It has flourished through a period of phenomenal growth accompanied by high profits. As a result, the industry has succumbed to a technology fever, to *the disease of featuristis* [emphasis added], to pushing new technologies at the customer faster than even the most compliant customer can absorb. (p. x)

The phenomenon can be observed in the consumer market, by various products integrating novel communication technologies. Recent *smart product* concepts are examples to all-encompassing implementation of information and communication technologies into everyday activities.

> Smart houses: burglar and fire alarms, appliances, and lighting can be controlled from a handy keypad or by dialing up the system from an outside phone. You can check on the room temperature, get supper started in the oven, feed the dog, and monitor goings-on to ensure that your teenagers aren't breaking too much pieces of furniture at the party they're not supposed to be having while you're on vacation. Soon, the pantry will keep the track of items you're running out of and automatically issue food and beverage replenishment orders for food that is delivered to your door. (Tapscott, 1995, p. 45)

However, after five years of this definition, in 2000, a study on the market potential for smart home indicated that, in England, 65% of consumers were concerned about things going wrong in technical terms and 51% were concerned about the system complexity. The utmost demand (70%) was for safety and security aspects, which can be stated as features that are more familiar and applied in contemporary systems. (www.jrf.org.uk, accessed 06.01.2003)

In the supply-driven market conditions, product marketing and market research becomes increasingly important elements of the product development processes. Marketing phase is initialized as soon as a new product idea is generated and long before the product is on the market (Lorenz, 1990; Schmid 2001). According to Schmid (2001),

> In digital economy, the scarce resource shifts from production to communication, in a novel way: While the implementation of a given design in the manufacturing process…is mastered in less and less time by more and more suppliers in a state-of-the-art quality, its implementation in the customers' brains…remains as costly as ever, or becomes even more expensive. (p. 44)

By this way, demand is created and manipulated by companies. During the marketing process, users are aimed to be educated to 'be aware' of new needs and accept solutions that products offer (Solomon, 1999). Accordingly, new features are integrated in products for they promise:

> [I]ncreased choice,… greater access to information, active rather than passive use, more personal freedom, and (in the case of portable items of 'personal media' hardware like the Walkman, Gameboy and cell phone) enhanced mobility (Forgacs, 2001, p.134).

Consequently, the capability that producers have for directing their innovative actions, also direct the way technology is integrated in products, thus shape user-product interaction.

2.3 Conclusion

These factors have great impacts on the ways technology is integrated into everyday products and their impacts on users' interactions with products are prevalent. This part of the study can be concluded by suggesting that, three main issues may have vital effects on user-product interaction.

- Shortening product life cycles cause current technologies to fade out with the rapid development of novel ones. The ways to accomplish a certain task undergoes changes, thus, may force users to learn new forms of interactions continuously and harden the adaptation process.
- Convergence of various features into one system increases the number of functions that are accomplished through a single interface. This may lead to complex interactions, as well as diminishing efficiency during use.
- In addition, convergence of features results in 'hybrid' products that embody diverse functions at the same time. Consequently, product identity gets lost and standardization of interfaces becomes harder. Type-based experience shifts to a product-based experience, which may force users to learn a different interaction pattern for every product he uses.

The issues will be discussed in detail in the forthcoming parts of the study.

CHAPTER 3

AN EVALUATION OF MARKET TRANSFORMATIONS IN USABILITY CONTEXT

3.1 Product quality vs. quality in use

Within the increasing competition that dominates the aforementioned market conditions, companies aim to derive higher ranks in the market through adding value to their products. In this sense, it has been known for long that product quality is increasingly being expected in both professional and consumer markets and most of the firms achieved eminence in the market for they offered high quality products (Garvin, 1984a; 1984b; Day, 1986; Bevan, 1999). Therefore, it is an important issue to determine what 'product quality' is and how it is achieved in the product development process.

3.1.1 Diverse approaches to product quality

Although it appears that the term quality is clear in everyday usage, there are different approaches to quality in practice (Bevan, 1995a). The term conveys diverse definitions depending on its area of use. A comprehensive identification of five overall approaches to defining 'quality' is made by Garvin (1984a):

Table 3.1 Structure of chapter 3

- **3.1 Product quality vs. quality in use**
  - **3.1.1** Diverse approaches to product quality
  - **3.1.2** Quality in use as a determinant of product quality
  - **3.1.3** Approach to product quality in high-tech consumer market
- **3.2 Changing context of use**
  - **3.2.1** Definition of context of use
  - **3.2.2** Overall factors that affect context change
    - **3.2.2.1** Maturization of the high-tech market
    - **3.2.2.2** Prevalent use of digital technology
  - **3.2.3** The knowledge gap between users and designers
    - **3.2.3.1** Emergence of the knowledge gap
    - **3.2.3.2** The negative outcomes of user-designer difference on product usability
- **3.3 Technology-centred vs. User-centered design approach in the product development process**
  - **3.3.1** Main causes of technology-driven approach in development processes
    - **3.3.1.1** Technically oriented designers
    - **3.3.1.2** Blurred definitions for products' function content
      - **3.3.1.2.1** Time as a determinant of product
      - **3.3.1.2.2** Number of features as a determinant of product
    - **3.3.1.3** Low costs of added features
  - **3.3.2** The benefits of user-centered design

1. *The Transcendent Approach*: This traditional view defines quality as a simple, unanalyzable property, which is both absolute and universal, and can only be accepted through experience.
2. *The Product-based Approach:* According to this approach, quality is a precise and measurable variable, which represents quantity of some desired ingredient or attribute possessed by a product. This view approaches quality as "an inherent characteristic of goods, rather than as something ascribed to them".
3. *The User-based Approach:* Quality is precise combinations of product attributes that provide greatest satisfaction to the user, which "lies in the eyes of the beholder".
4. *The Manufacturing-based Approach:* Defines quality as conformance to specified requirements. The major issue is whether a product meets design and performance standards set for it (Garvin, 1984b).
5. *The Value-based Approach:* Quality is defined as the level of providing performance at an acceptable price or conformance at an acceptable cost. (Garvin, 1984a, pp. 25-28)

The definitions of product quality based on different approaches, which are considered by Garvin (1984a) are represented in detail in Table 3.2.

However, he also emphasizes that, each of these approaches remains inaccurate and vague in defining the basic elements of product quality. This results in the potential for conflict, which leads companies to employ different definitions of quality. To give an example, while marketing people approach to quality with a user-based view, manufacturing departments accept manufacturing-based definitions (Garvin, 1984a). Therefore, there occurs a language difference between professionals as a common source of problem in the market, which avoids the successful introduction of high-quality products. Another important issue that determines the appropriateness of the product quality definitions is how the interrelationships between product attributes and quality are set. Bevan (1995a) states that,

Table 3.2 Five Definitions of Quality (from Garvin, 1984a, p. 26).

Five Definitions of Quality

I. Transcendent Definition:

- "Quality is neither mind nor matter, but a third entity independent of the two...even though Quality cannot be defined, you know what it is." *(R. M. Pirsig. Zen and the Art of Motorcycle Maintenance, pp. 185,213)*

- "... a condition of excellence implying fine quality as distinct from poor quality.... Quality is achieving or reaching for the highest standard as against being satisfied with the sloppy or fraudulent." *(B.W.Tuchman. "The Decline of Quality." New York Times Magazine, 2 November 1980, p. 38)*

II. Product-based Definition:

- "Differences in quality amount to differences in the quantity of some desired ingredient or attribute." *(L. Abbolt. Quality and Competition, pp. 126-127)*

- "Quality refers to the amounts of the unpriced attributes contained in each unit of the priced attribute." *(K. B. Leffler, "Ambiguous Changes in Product Quality.". American Economic Review, December 1982, p. 956)*

III. User-based Definition:

- "Quality consists of the capacity to satisfy wants..." *(C. D. Edwards, "The Meaning of Quality." Quality Progress, October 1968, p. 37)*

- "Quality is the degree to wich a specific product satisfies the wants of a specific consumer." *(H. L. Gilmore. "Product Conformance Cost." Quality Progress, June 1974, p. 16)*

- "Quality is any aspect of a product, including the services included in the contract of sales, wich influences the demand curve." *(R. Dorfman and P. O. Steiner, "Optimal Advertising and Optimal Quality." American Economic Review, December 1954, p. 831)*

- "In the final analysis of the marketplace, the quality of a product depends on how well it fits patterns of consumer preferences." *(A. A. Kuehn and R. L. Day, "Strategy of Product Quality." Horward Business Review, Nowember-December 1962, p. 101)*

- "Quality consists of the extent to wich a specimen (a product-brand-model-seller combination) possesses the service characteristics you desire." *(E. S. Maynes, "The Concept and Measurement of Product Quality." in Household Production and Consumption, p. 542)*

- "Quality is fitness for use." *(J. M. Juran, ed., Quality Control Handbook, p. 2-2)*

IV. Manufacturing-based Definition:

- "Quality [means] conformance to requirements." *(P. B. Crosby, Quality is Free, p. 15)*

- "Quality is the degree to wich a specific product conforms to a design or specification." *(Gilmore, June 1974, p. 16)*

V. Value-based Definition:

- "Quality is the degree of excellence at an acceptable price and the control of variability at an acceptable cost." *(R. A. Broh. Managing Quality for Higher Profits, 1982, p. 3)*

- "Quality means best for certain customer conditions. These conditions are (a) the actual use and (b) the selling price of the product." *(A. V. Felgenbaum, Total Quality Control, p. 1)*

generally quality is approached as an intrinsic property of a product. For instance, ISO 9126 identifies the attributes that can be designed in a product by taking product-based approach, and categorizes these as functionality, efficiency, usability, reliability, maintainability and portability. ISO 9001 standards carry a manufacturing-based approach to set required steps in manufacturing to derive a specified quality of end product. ISO 8402 defines quality with *economic approach* [synonymous with *value-based approach* by Garvin (1984a)] as "the totality of characteristics of an entity that bear on its ability to satisfy stated and implied needs" (Bevan, 1999, p.90). Like other examples, this definition also determines quality with the *presence or absence of specific attributes*, which can be designed into the product (Bevan, 1999). However, the inherent characteristics of products can only be valid if the attributes of a product are "considered preferable by virtually all buyers" (Garvin, 1984a, p.26) and acceptable "to the extent that user needs are well-defined and common to the intended users" (Bevan, 1995a).

Therefore, it can be said that, there is no universal assessment for quality but it is evident that goals should be set by approaching product quality from different perspectives as well.

3.1.2 Quality in use as a determinant of product quality

The attempt to evaluate product quality through specifying inherent product attributes remain indeterminate, if it is examined that, user characteristics and conditions under which the product is used are highly variable. User-perceived quality has not been regarded as an indicator of product quality to a sufficient degree (Bevan, 1995a). This is mostly because user-based approach to quality is assessed as a highly subjective for evaluation, for it is "idiosyncratic and personal view of quality" (Garvin, 1984a, p. 27). In addition, it is conceived as a costly and time-taking process that negatively affects the competitive abilities in the short term (Bias, 1994; Norman, 1999).

However, there is a more fundamental issue, which affects the quality of a product: That is, the quality of a product cannot be thought independently of the product's use by users with different characteristics and in varying contexts. As stated by Bevan (1995a):

> "The conventional assumption that quality is an attribute of a product is misleading, as the attributes required for quality will depend on how the product is used. …if different groups of users have different needs, then they may require different characteristics for a product to have quality, so that the assessment of quality becomes dependent on the perception of the user. …Products can only have quality in relation to their intended purpose." (Pp.115-118)

In addition, competitive market environment leaves technical perfection insufficient for product success and forces companies to consider product's usability and compatibility with user characteristics, tasks and the usage environment as determinants of quality (Bevan, 1999). Products that have a closer fit with user requirements arrive at a higher quality; therefore, understanding user needs are closely interrelated with total quality management (Wiklund, 1994). Similarly, according to Cooper (1999), for a product to achieve market success, an objective of user satisfaction and specification of minimum level of quality for that objective is necessary, as well as the consideration of criteria such as performance, learnability, error rate and usability. Also, as Donoghue (2002) states, "As hardware becomes a commodity, it will be the software and services, and their associated user experiences, that add value for customers" (p.25).

Hence, usability and meeting user requirements are determinant factors on market success. Especially in software development processes, usability is closely related with product quality and serving for customer requirements have evident long-term benefits (Karat, 1994). A study on customer purchase decisions conducted in 1985 showed that, of the purchasers who search for alternative products, 40% stated the reason as; their being unsatisfied with their existing software package, for it does not meet their needs. 52% of the participants mentioned 'performance and ease of use' as the major factor affecting their purchase decision. In 1992, another study indicated that, the first time purchasers utilize an advice of a colleague as the most important information source. In the study, the first and

second key purchase decision criteria were stated as ‘meeting requirements’ and ‘being easy to use’, respectively (Harrison et al., 1994)

Therefore, product usability should be examined as a decisive element of product quality. Bevan (1995a) identifies “two complementary roles” of usability in design: “as an attribute which must be designed into a product, and as the highest quality objective which should be the overall objective of design”(p.116). He adds that, usability studies induced a broader approach to product quality, which emphasizes ‘user perceived quality’ through relating quality with the needs of the user.

In this sense, ISO/IEC 1459-1 distinguishes two approaches to quality: quality as an inherent attribute of a product and the quality as a result of the user-product interaction under stated contexts. The definition of ‘quality of use’ is given as “The extent to which a product can be used by specified users to meet their needs to achieve specified goals with effectiveness, task efficiency and satisfaction in a specified context of use” [ISO 13407:1999(E), p.15]. Another ISO definition is:

> …the user’s view of the quality of a system containing software, and is measured in terms of the result of using software, rather than the properties of the software itself. Quality in use is the combined effect of internal and external quality for the user (ISO/IEC 9126-1:2001, p.15).

These definitions accept the term quality as it is perceived and accepted by the user at the result of the interaction between the product and the user (Bevan, 1999). Bevan (1995b) also adds that:

> Quality of use should be the major design objective for an interactive product: does the product enable the intended users to achieve the intended tasks? This relates usability to business objectives and elevates usability from the optional extra to the prime design goal. (p.1)

Therefore, quality in use should be involved in the product quality objectives, as a measure of product quality from the user’s point of view.

3.1.3 Approach to product quality in the high-tech consumer market

A company's approach to quality is an importantly affective factor on the end product's quality as much as the extent that the quality standards are applied in the development process. In high-tech markets, firms mostly focus on shortening the product development process and differentiating their products in the market. In this sense, there is a general tendency to attain market success by adding new features to products. Norman (1999) remarks that, in saturated markets, a product's minor differences are marketed as the features that increase the quality of that product. This attempt of high-tech companies is stated as "the effort to improve their products" by "merely adding complicating and unwanted features to them" (Cooper, 1999, p.8). Similarly, according to Asatekin (1997) the

main reason for the increase in the number of functions in electronic products is that, the multi-functional characteristics of electronic devices are regarded as a criterion of superiority. Products using latest technology are valued as a 'sign for social aspiration' (translated). Therefore, technical qualities are differentiating factors for these devices. He exemplifies the phenomenon with music sets, emphasizing the innumerable buttons which are doubtable of performing any function, and states that such an approach can only be valid if there exists a direct relationship between the concepts of 'technical quality' and 'technical complexity'.

However, as there are not any widely accepted descriptions that identify the quality of products containing software yet [ISO/IEC 9126-1:2001(E)], generally customers truly evaluate quality of a product after its purchase or use (Day, 1986). Especially when the users are inexperienced with these features, usually they cannot judge these features' necessity for serving their needs before the purchase. Therefore, users would prefer products with more features 'in the case of any need', although they would not feel any requirements in the latter periods of usage (Norman, 1999). However, this may result in unsatisfying user experience (Donoghue, 2002).

According to Garvin (1984b), product quality is usually misinterpreted in the market. Customer requirements should be regarded to increase product quality, however generally undervalued:

> Many firms *think* they know what quality means in their industry; few have taken the time to survey customers to actually find out. If a company hopes to compete effectively on the quality of its products, a deeper understanding of the consumer's perspective is a necessary first step. (Garvin, 1984b, p.43)

Donoghue (2002) also states the issue by emphasizing that, superiority of product features may not always meet with user requirements and may conduct lower adoption rate, thus, business goals should be set by considering product's usability.

The approach to product quality that excludes quality in use, also conduct problems in user-product interaction. The consequences will be examined in detail in the next chapter of the study.

3.2 Changing context of use

Owing to the prevalent use of digital technology in consumer products, the context that these technologies are used altered mainly. The phenomenon has considerable effects on product usability.

3.2.1 Definition of context of use

The determinative role that the context of use has on product usability was emphasized broadly when defining quality in use. The definition of usability in ISO 9241-11 also implies that usability of a product or system is dependent upon the context of use: "The extent to which a product can be used by specified user to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" [ISO 9241-11:1998(E)]. Although prepared for software products, this standard applies to all consumer goods.

Therefore, usability of a product is evaluated by considering the context of the overall system, which "lies in the user's interaction with the product and assessed by the user" (Bevan et al., 1991, p.4; Bevan, 1995b; Thomas and Bevan, 1996). Similarly, according to Brooke (1996):

> Usability does not exist in absolute sense; it can only be defined with reference to particular contexts. This, in turn, means that there are no absolute measures of usability, since, if the usability of an artefact is defined by the context in which that artefact is used, measures of usability must of necessity be defined by that context too. (p.189)

Hence, a product cannot be stated as 'usable' without considering the context:

> It is not meaningful to talk simply about the usability of a product, as usability is a function of the context in which the product is used. The characteristics of the context (the users, tasks and environment) may be as important in determining usability as the characteristics of the product itself. Changing any relevant aspect of the context of use may change the usability of the product. (Bevan and McLeod, 1994, p.137)

The definition of the term 'context of use' is given in ISO 9241-11 as "the users, tasks, equipment (hardware, software and materials), and the physical and social environments in which a product is used" [ISO 9241-11:1998(E)]. Therefore, the characteristics of context of use may vitally influence usability. These are stated as:

a) *The characteristics of the intended users* like knowledge, skill, experience, education, training, physical attributes, habits, preferences, motor and sensory capabilities.
b) *The characteristics of the tasks the users are to perform* such as the frequency and the duration of performance
c) *The environment in which the users are to use the system* including hardware, software and the materials to be used and relevant characteristics of the physical (e.g., workplace, furniture, lighting, humidity) and social (e.g., work practices, attitudes) environment [ISO 13407:1999(E)].

Context of use have a vital role on the user's perception of the product quality and market success, as well as usability of that product. Bevan et al.(1991) state that, for a product to

be usable under real conditions, it should be acceptable by the user. They also emphasize the effects of the factors determined by context and user characteristics on acceptability; like cost, convenience, pre-requisite training and dislike. Similarly, Thomas and Bevan (1996) emphasize the importance of the product's compatibility with the context by giving the following example:

> ...adding extra features to a word processor may make it more usable for the professional secretary who has sophisticated requirements, (e.g. producing long documents with complex page layouts - multiple columns, headers, footers, etc.), who also has time to learn how to use the new features. However, the new features may reduce the usability of the product for executives who have very limited requirements, (e.g. production of short memos), who have no time to invest in relearning how to use the product after long periods without use. (p.83)

In addition, considerable research show that the effects of demographic variables such as income, education level and standard of living are "turned out to be particularly important" in determining market-introduction success of technology-related products (Sincovics et al., 2002, p. 478).

The assessment of the context of use in the product development process is important for product quality. As stated in ISO 13407:1999(E), details of the context of use should be identified in order to guide the early design decisions. These details are important for the specification of product requirements, thus, considering the context characteristics throughout the development process is decisive for a product to be appropriate and usable for its intended users (Thomas and Bevan, 1996). However, manufacturers' lack of concentration on intended user, intended tasks and usage, leads to usability problems.

3.2.2 Overall factors that affect context change

It can be said that, two main factors affected the user characteristics, tasks and the use environment. In the following part, these factors will be evaluated broadly under two headings.

3.2.2.1 Maturization of the high-tech market

The developments in the computer technology lead it to have an increasingly flexible nature, and therefore it progressively became applicable to many fields. Owing to its ability to serve for prevalent and diverse purposes, computer technology market is reached to a maturity, which bears new market characteristics (Norman, 1999). The issue is also valued in ISO/IEC 9126 : “The software industry is entering a period of maturity, while at the same time software is becoming a critical component of many of today’s products. This pervasive aspect of software makes it a major new factor in trade”. (2001, p.23)

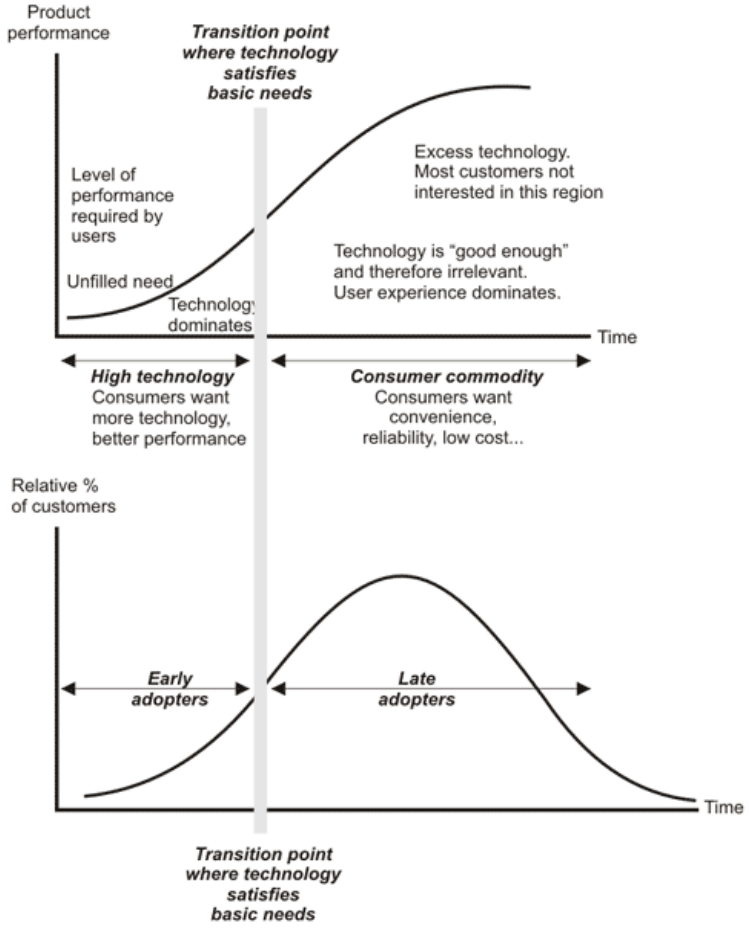


Figure 3.1 “The change from technology-driven products to customer driven, human centred ones” (from Norman, 1999, p.35)

Therefore, according to Norman (1999), a prevailing outcome of this development is the changing characteristics of the digital technology users. He differentiates the type of the customers in two different stages of technology lifecycles (Figure 3.1).

He states that, at the early stages of digital market development, the purchasers of these technologies were 'technology enthusiasts', who were mainly interested in the novelties that these products offer and naturally were not considering ease of use as a purchase criterion. At the later phases of the development, 'late adopters' were the customers, who waited for these products to get cheaper and prevalent in many fields. These purchasers show different characteristics from the earlier ones, not only for they have a lower level of knowledge and motivation to deal with novel technology, but also for they mainly look for reliability and the quality of the experience as the main criteria of purchase. On the other hand, as the market reaches to a state of maturization, number of competitors who can meet customers' technical requirements increases. In this respect, the criteria such as ease of use, style and cost are starting to be vitalities that add value to products, rather than technical features. Hence, it is crucial to consider the main factors that dominate the context of use within this new frame.

3.2.2.2 Prevalent use of digital technology

It has been stated in the previous part of the study that one primary outcome of the digital technology developments was the changing areas of implementations and prevalent use of digital technology. One reason for the pervasive use of digital technologies in domestic consumer products is that it is a potential market both for its being profitable and for its high level of specialization that enables product differentiation (Cockburn, 1997; Lorenz, 1990). Therefore, most of the products that are in daily use incorporated digital properties in the last decades:

> Computer technology and its various applications have become an integral part of everyday life. Not only is this evident by the large number of automatic teller machines…but also by the integration of computer chips and programmable features into domestic consumer products such as video cassette recorders, microwave ovens, and washing machines. (Hall et al., 1999, p.101)

Owing to this change, the circumstances related to the context in which these devices are used, altered considerably as well. As Buurman (1997) sates, casual users entered into interaction with these products in home environment. Thackara (2001) claims the issue with the following numbers:

> Today's computing is everywhere – but nowhere to be seen. The world is already filled with 30 computer chips for every man, woman, and child on the planet. In 1998 some 4.8 billion microprocessors were sold; only 2,5 percent of those were for personal computers. (p. 48)

These changes resulted in alterations in context of use, from a number of aspects.

Firstly, owing to the specific nature of the consumer market, characteristics of the users of these products highly varied. Sade (1999) states that, the groups of users of electronic devices became 'heterogeneous' for they highly alter in terms of level of experience, motivation, and skills. In this sense, these type of consumer products have users with different backgrounds and expectations, thus, they "will want to accomplish similar tasks in many different ways" (Smith, 1998, p. 298)

Secondly, everyday activities which are evidently different from the tasks in the work environment, started to include computing technology. As these activities are generally "done relatively quickly, often simultaneously with other activities" the level of difficulty is higher, so they require "conscious mental activity" to be kept at the minimum level (Norman, 1988 p. 125; Sade, 1999). Therefore, it can be said that, the nature of the tasks that digital devices are used for altered as well.

As a third factor, the nature of the tasks accomplished with these products changed in a way that increases the importance of the differences among users. As digital products incorporate electronic interfaces, the effort required to interact with these products became

“less physical and more mental” (Adler and Winograd, 1992, p. 4). The issue is also regarded by product standards as “[m]any machine requirements have now changed from biomechanical work to control work only, where psychological factors dominate… For the design of modern interfaces, average human thinking is very important” (ISO/CD 20282-2.1 draft, 2003, p.16-17). Therefore, rather than physiological and ‘lower-order’ cognitive usability, ‘higher-order’ cognitive usability gains importance during product use (Salvo, 2001).

However, owing to the changing nature of user-product interaction, differences in user characteristics affect the quality of interaction at a higher level. Although perceptive and cognitive processes proceed in the same way in all humans, the interpretation of received information may vary in detail, mainly depending on the individual’s background and training (ISO/CD 20282-2.1 draft, 2003). In addition, users combine their previous knowledge about that product and their process of learning and problem solving experiences, and further develop their intended way of use in order to adapt to the situations that the context presents (Teeravarunyou and Sato, 2001). Furthermore, commonly, mental capacities such as speed of recognition, reaction time, data memorization and short-term memory decrease with age. Therefore, “individuals may vary in their understanding of everyday objects both in terms of the functionality they offer and the ways in which they are operated” (ISO/CD 20282-2.1 draft, 2003, pp.7-8).

These alterations evidently show that, the context in which the digital products are used is mostly altered, as the characteristics of the users, the tasks that are accomplished with computing technology and the environment in which these products are used are changed. Buurman (1997) overviews the effects of the differences between the professional and domestic contexts on product use:

- Different from the professional users, users of consumer products do not have extensive training for the product use. Moreover, it is not realistic to expect the user to read the user manual and act according to that information.

- In opposition to work environment, there are no specified users, goals and contexts of use. These characteristics are highly variable.
- For the consumer products, effectiveness and efficiency are of secondary importance when compared to professional use. Therefore, pleasure and early success that motivate users are necessary for further exploration of functionality and interaction.

He also states that, these criteria are of vital importance when it is considered that the consumers have the choice of purchasing the product or not. Moreover, with the changing nature of the interaction, these differences convey great importance on the quality of use. Therefore, it can be said that, these alterations increased the importance of the knowledge derived from users, and accordingly, user's participation became a necessary component of the design process.

3.2.3 The knowledge gap between users and designers

In user product interaction, user's proper interpretation of the product's functioning has a vital affect on the quality in use. There is no doubt that, one primary responsibility of a designer is, to represent the necessary codes for the product's functioning in a way that requires minimum effort of the user. Kanis et al. (2000) state that, product characteristics can be viewed as mediators of a communication process between the user and designer:

> A combination of product characteristics, supposed by designers to have a particular meaning, are encoded in a design, subsequently to be decoded by users…communication primarily consists of the exchange of mental representations in a perceptive/cognitive process, which somehow thrives on experience and learning. (p. 366)

Therefore, the quality of the interaction between the product and the user is dependent upon the designer's understanding of the relationships between users, products and the environment in which they interact, to an extent (Asatekin, 1997).

However, representing the functioning of a product in the way that the user easily understands poses some difficulties. The issue may appear as a problem for the designer for mainly two reasons. Firstly, users highly vary with respect to their requirements and cognitive and perceptual capabilities, owing to their expectations and experiences in differing situations; therefore, it is hard to define 'the user' (Kanis et al., 2000). Secondly, Designer's cognitive capabilities may not be in accordance with the user's (Teeravarunyou and Sato, 2001), thus, requires the designer to consider an extraneous way of thinking for the design of the product.

As the issues related with user requirements are explained in the previous part of the study, the following part will mainly focus on the causes of emerging differences between the user and designer in terms of the capabilities required to operate a product. The results of the phenomenon will be evaluated in detail in the fourth chapter.

3.2.3.1 Emergence of knowledge gap

Due to the effects of technological advances, the perceptual and cognitive differences between designers and users of computing technologies became more evident. According to Kanis et al., "whatever the effort of designers, the intended communication frequently fails; that is, meanings in product characteristics preconceived by designers, are not properly recognised by users" (2000, p.365). Norman (1988) points out that, the communication problems lie in the difference between the designer's and the user's way of thinking. While designers become experts with the devices they design, users are experts on the tasks that they perform with that product:

> Designers have become so proficient with the product that they can no longer perceive or understand the areas that are apt to cause difficulties. Even when designers become users, their deep understanding and close contact with the device they are designing means that they operate it almost entirely from knowledge in the head. The user, especially the first-time or infrequent user, must rely almost entirely on knowledge in the world. That is a big difference, fundamental to the design. (p. 157)

This difference of expertise and motivation to use, which is emergent between the designer and user, became even more evident with the pervasive use of digital technology. As the development process of the products with computing technologies requires high level of technical knowledge, the designers of these systems were hired for their technical qualities. Nevertheless, owing to the specified use of these technologies for professional purposes, former users of these systems were like designers as well; who had sufficient level of computer knowledge, were interested in novel technologies, feeling enthusiastic about using technological devices and capable of coping with any technical problem (Rubin, 1994). Moreover, digital technology was limited to the use of these expert users (Norman, 1999). Therefore, the designers and users of these systems used to have the same characteristics, thus, were not having many problems in communicating (Rubin, 1994).

This equilibrium got lost with the implementation of digital technology in consumer products. As previously stated, many of the daily tasks required use of products with microprocessors, so, users with no expertise or familiarity with computers encountered these products in everyday life (Norman, 1999; Rubin, 1994; Sade, 1999). Therefore, users that confront with computing technologies today, have neither much knowledge on computing systems, nor enough motivation to learn to operate. They rather have different expectations from technology, as they want a “tool”, not a “hobby”, thus, “today’s user is no longer even remotely comparable to the designer in skill set, aptitude, expectation, or in almost any attribute that is relevant to the design process” (Rubin, 1994, p.6).

3.2.3.2 The negative outcomes of user-designer difference on product usability

Nevertheless, this factor became a cause of usability problems for it is not regarded by designers in the product development process. Cooper (1999) states that, programmers and engineers who develop software-based products have adequate knowledge to operate these products, however users do not. He adds that, although the experts claim that usability problems exist owing to the insufficient level of technological development to help

the user during the interaction process, the main reason is that technological artefacts have interactions, which are expressed in terms in which they are constructed. Hall (1997) points out to the same problem, by arguing that despite designers are entirely different from users, they believe that they think in the same way with the users and not have many different characteristics. As a result, they expect additional training and knowledge for using software-based products as a simple and natural requirement:

> We industry insiders toss around the term “computer literacy”, assuming that in order to use computers, people must acquire some fundamental level of training. We see this as a simple demand that isn’t hard and is only simple and proper. We imagine that it isn’t much to ask of users that they grasp the rudiments of how the machines work in order to enjoy their benefits. But it is too much to ask… Users should not have to acquire computer literacy to use for common rudimentary tasks in everyday life. Users should not have to possess a digital sensitivity to work their VCR, microwave oven, or to get email. (Cooper, 1999, p.37)

On the other hand, as stated by Rubin (1994), designers approach to usability requirements of a system with ‘common sense’ rather than with a scientific evaluation, therefore, let usability problems appear.

Therefore, it can be said that, aforementioned alterations in the context of use and user characteristics with the effects of digital technology implementations require new approaches to product design to be developed. Owing to this fact, designer’s role and his/her approach to the product development process also needs changing within these dynamics. As will be discussed in the fourth chapter of the study, electronic interfaces have ‘abstract’ form-function relationships; therefore, require representation of the functioning of the product into the surface forms by the designer, artificially. This affects the design process in two terms. On the one hand, designer is provided with unlimited alternatives to express any information and he picks the solution which serves the user best. However, on the other hand, with this situation, the designer has the responsibility to have sufficient knowledge on the artefact’s technology, human psychology and social interaction of the product with user groups. Similarly, Asatekin (1997) states that, the conditions that are brought by the developments in digital technology, provided *freedom* to the designer to decide on the form of the products as he envisions, free of limitations that are set by the

relationships between the form and the function. He adds that, this situation also brings responsibility to designers, as this flexibility on the product's appearance can be used for other purposes, like promoting and marketing the product. Moreover, if not considered attentively, the issue may negatively influence interaction process.

It can be concluded that, the evident difference between user and designer in terms of knowledge level and experience, results in usability problems unless not considered in product development processes. Jordan et al. (1996) assert the issue with following:

> As the products that we use at home and in our workplaces become even more complex in terms of features and functionality, it becomes vital that those involved in the design of these products consider the needs and limitations of those who will be using them. If these are not taken into account, products that are created with the intention of delivering some benefit can end up being more trouble than they are worth. (p. 1)

Therefore, a critical approach to design which involve users as essential components of the design process is required, to overcome the obstacles in designer-user communication.

3.3 Technology-centred approach in the product development process

The aforementioned developments in digital technology and the way it is utilised by companies in the consumer market to increase their sales, evidently altered content and use of everyday products. However, the issue may impose negative influence on the quality of interaction, depending on the approaches in product development.

The problem of complexity caused by the uncontrollable development of digital technology has been a matter of subject in recent years:

> We -all of us- are living through a media revolution as computing technology changes everything around us. It's chaotic, it's complicated, and many people find it uncomfortable. No one truly understands where computing is taking us; experts and trustworthy guides don't exist, and no one can find their way alone. (Mok, 1996, p.xii)

Also Norman (1999) states that, people feel frustration and estrangement towards technology, because technology is evolving by "pushing ever harder to newer, faster, and more powerful systems, with nary a moment to rest, contemplate, and reflect upon why, how and for whom all this energy has been expanded" (p. 229).

As discussed in the first chapter of the study, the main dynamics that rule consumer market has been shifted to a supply-driven character. In high-tech markets, the main drive that directs novelties is stated as 'technology-push'. Thus, the firm begins the product development process "with a new proprietary technology and looks for an appropriate market in which to apply this technology" (Ulrich and Eppinger, 2000, p.20). Nevertheless, the phenomenon has evident effects on the way technology is integrated in products, which may be an overriding cause to complexity of products.

The main reason for the problems that users experience with electronic products are stated to be the utilization of technological advances to develop superior products without considering users' requirements and limitations in use (Hennemann, 1999). According to Norman (1999), the prevailing complexity of high-tech products is a consequence of the developments with "technology for technology's sake" approach by which "the real needs of consumers are ignored" (p.4). The issue is also considered by Thackara (2001), remarking that it is rarely questioned if the computing technologies are developed for the real needs of people and if they result with better products. He adds that:

> When it comes to innovation, we are looking down the wrong end of the telescope: away from people, toward technology. Industry suffers from a kind of global autism. Autism, as you may know, is a psychological disorder that is characterised by "detachment from other human beings… The result is a divergence in technological complexity and perceived value. We're sitting uneasily between an infatuation with technology on the one hand and unease about its actual value to us on the other". (pp. 48-50)

Similarly, Sugar (2001) refers Norman, stating that "depending on how technology is designed, it can either be enabling (human centered) or disabling (machine centered)" (p.236). Therefore, it can be said that, technology-driven design approach has an important

affect on the emergence of usability problems. In the following part, the main context that assists technology-driven approach will be stated.

3.3.1 Main causes of technology-driven approach in development processes

The primary factor on the dominancy of technology in product development processes is stated as the system-centred view of the last decades, which also led to impressive developments. As demonstrated by Johnson (1998), modern technology has a 'system- or artifact- centered' nature. He explains the perspective of the term in product development as:

> The system-centered view is based upon models of technology that focus on the artefact or the system as primary, and on the notion that the inventors or developers of the technology know best its design, dissemination, and intended use… This system-centered approach to artefacts and systems has dominated technological development at least since the advent of the Industrial Age, and only recently have significant critiques of this view been offered. (p.25)

He also states that, according to this view, users are "inevitably ancillary, or, in some cases,… nonexistent", as the system or artefact is the hegemonic determiner of all (Figure 3.2).

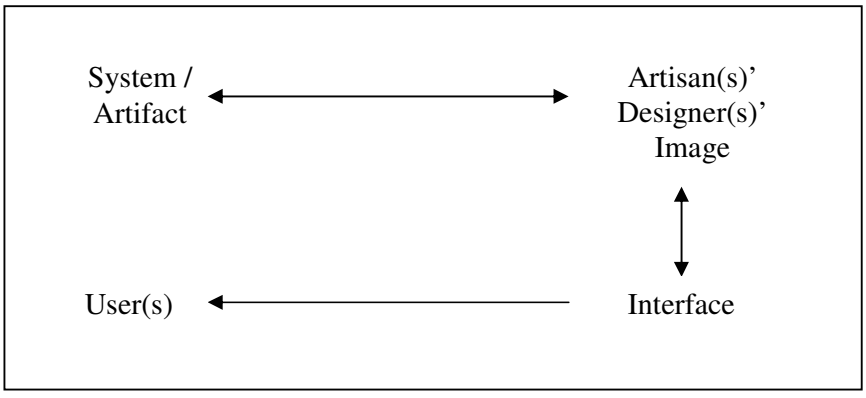


Figure 3.2 The System-Centered Model of Technology (from Johnson, 1998, p.27)

He continues explaining the model as:

> There is no need for the user to be involved with system or artifact development, this perspective suggests, because the system is too complex and therefore should be designed and developed by experts who know what is most appropriate in the system design. The system is created through a process of prototyping and iterative redesigning that is primarily controlled by the designers or artisans. From this process emerges a technological artifact that embodies the *designer's image* of the system… From this… follows the system *interface*- the "covering" of the internal system through which the user sees and operates. (Johnson, 1998, p.p. 26-27)

Similar arguments are put forward, which emphasize the dominancy of technology-driven approach in product development. For instance, Hennemann (1999) states that, in a typical product development process, technology-driven view is admitted, thus, users are not considered as components of the system. According to Sade (1999, p.65), "In spite of today's user-centered design philosophy, it is obvious that many products are designed in a machine-centered atmosphere". The reasons that assist the firms' favouring the technology-driven approach in development processes can be discussed under three main points.

3.3.1.1 Technically oriented designers

Designers and technical people who work in product development generally have a system-centred approach to technology. They are assigned for their ability to solve technical problems; rather than to deal with the human side of the process. Thus, they focus mainly on increasing the machine and task performance without considering user and context as components of the system (Rubin, 1994). The phenomenon also asserted by Sade (1996):

> The participants in the product development process are technically oriented, which leads to designs less suitable for non-technical users. The users are required to think in a way which is not natural for them. (p.65)

On the other hand, a common assumption is that, humans are adaptable and flexible by their nature, therefore, in the product development process, technology is used with a

primary aim to increase the machine performance and user is expected to adapt to the product features (Rubin, 1994; Norman, 1997; Sugar, 2001). Therefore, many people encounter problems in using products because they are forced to conform to an unfamiliar way of thinking.

3.3.1.2 Blurred definitions for products' function content

Owing to the flexible nature of digital technology, especially software-based products have indefinite content definitions. In other words, the 'limits' they conform to are very flexible. Therefore, as the definition of the 'finished product' is crucial for the communication between the marketing departments and programmers during the development process, firms choose to define the final product either in terms of 'deadline' of the development process, or 'with the number of features' that the product will include (Cooper, 1999). Hence, these two factors constitute firms' main drives for competition.

3.3.1.2.1 Time as a determinant of product

As also stated in the first chapter, time is an important factor on success in the digital product market. As Norman (1999) states, "it is better to be first than best" in the market, therefore, after a product idea is developed, "common sense disappears" and firms do not give extra time to decide on its appropriateness for users (p.p. 1-2). Easy to use, simple products are hard to develop and require research. Therefore, producers believe that usability tests and user researches postpone product's introduction to market (Martin, 2001). Rather, they prefer to develop products with more features in a shorter time, which is apparently a more profitable way (Lardner et al, 2000; Norman, 1999). In addition, programmers attempt to increase the 'perfection' of the product by adding more features, until the deadline for the product development is over (Cooper, 1999).

Consequently, the main determinants of interaction are shaped by time limitations, not by the user requirements and characteristics. Bauman and May (2001) emphasize the difficulties brought with fast technological developments, by stating that, while software products need to be updated within short periods of time, they also require new learning process. However, it is hard to adapt such a fast and continuous learning process. Moreover, when a product fails, a new version of it comes out and for most of the time, the newer one costs much less than to fix the old one. Therefore, this factor also forces users to adapt new ways of interaction continuously.

3.3.1.2.2 Number of features as a determinant of product

The number and variety of functions that a product contains are used as a differentiator factor in the market. Therefore, many firms use “shopping list of features” to define and differentiate their products (Cooper, 1999, p.42). This is a motivator of increased number of functions as product contents. Hennemann (1999) states that, in a typical product development process, the features that will be integrated in a product- in other words “functional requirements”- are decided on first (p. 135). Then, how these features will be integrated in a product is questioned and how successful the product performs these functions is tested before introducing the product in the market.

Another important factor that affects the product content is the overall approach of the firms towards the market research studies and the way that the results are evaluated in the product development processes to provide market success. Many different features that are stated by various consumers in market research studies are integrated into a single product to have a larger market share (Lardner et al., 2001). Cooper (1999) explains the phenomenon by stating that companies choose to cope with the unpredictable nature of the market by adding each function that customers state and expecting to gain success with one which might be the “magic feature” (p.224). According to Hall (1997), a problem in

specifying user requirements is that, it is difficult for users to define their needs truly. Moreover, when a novel technology is considered, users are unaware of their expectations, as they do not have any experiences with it yet. The issue is also pointed out by Norman (1999):

> If you ask, people usually focus on what they have and ask for it to be better: cheaper, faster, smaller. A good observer might discover that the task is unnecessary, that it is possible to restructure things or provide a new technology that eliminates the painstaking parts of their procedures. If you just follow what people ask for, you could end up making their lives even more complicated. That's one of the reasons our computer applications have so many confusing features: Every one was requested by a user. (p. 193)

He adds that, although marketing people ask customers what their expectations are, technologists decide on the content of the product and firms market their products by promoting their technological superiority. Therefore, the process develops with technology-driven approach.

Nevertheless, this result in complex products that no one expects to have, as Lardner et al. (2001) quote Cooper's following words:

> Still, people want the cool stuff. Call it the 'consumer-driven death spiral'…You interview a thousand people, and each one says, 'I want these 10 general features plus this specific feature,'… so you build a device with 1, 1010 features. But no one wants 1, 1010 features. (p. 36)

Similarly, according to Thomas and Bevan (1996), "contrary to many manufacturer's beliefs, adding extra features to a product does not necessarily make a product more usable" (p.81). Nevertheless, these added features cause to usability problems for most of the people:

> Even after 20 years on the market, VCRs remain too complicated for many ordinary folks program. So most people use them only to record shows in progress or play movies. The DVD is almost troublesome to set up. That's probably because ***design*** engineers focus on adding the next cool function rather than simplifying its use… When they finally do think about how these gadgets work, maybe we'll be able to relax in front of the TV without worrying about which button to push—or not. (Aston and Keenan, 2001, p.93)

Also Bauman and May (2001) points out that, although many versions of products have an assertion that they provide advantage by including various features which broaden the tasks handled with that product, most of these features remain useless.

3.3.1.3 Low costs of added features

Another dominant factor on the product content is that, the cost of adding microprocessors into products is increasingly getting cheaper, especially when compared to older, mechanical systems; therefore, it is advantageous for manufacturers to use computing systems in wide range of products and services:

> Because functions and features are added in intangible code and not in tangible steel, copper or plastic, it appears to traditional manufacturing executives that additional features are nearly cost-free. It seems to them that software is easy to add, change, and "improve"… It is cheaper to put an entire microprocessor in your car key, microwave, or cell phone than it is to put in discrete chips and electronic components. Thus a new technical economy drives the design of the product... so any proposed feature is *assumed* to be a good investment until proven otherwise. (Cooper, 1999, p.28)

On the other hand, the firms aim to integrate various features in products, for it is a less costly way to differentiate their product in the market. Sade (1999) suggests that, "the designers implement more and more functionality, making the product too complex for users to access and enjoy the functions, because increasing the number of features by programming is less expensive than it used to be by hardware design" (p. 65). Wiklund (1994) exemplifies the phenomenon:

> In the past, adding functions to a product required a great deal of mechanical and electrical engineering. For example, if designers wanted to add a clock to an oven's control panel, they had to buy clock parts and bolt them into the faceplate of the oven. Today, the clock feature is a veritable freebie on more advanced ovens that employ a microprocessor and associated display to set the oven temperature, set the timer, and perform myriad other functions. The intoxicating effect of cheap-to-produce features has led some clever (if frustrating for consumers) merchandising approaches. (p.10)

For this reason, increasing the number of features in a product is used as a tool in the consumer market "for often questionable commercial reasons" (Buurman, 1997, p.1159).

It can be concluded that, in the digital product market, the interpretation that equates market success with increased number of features of a product is supported by a technology-centred approach to product design. However, as Johnson (1998) states, "even in less complex technologies interfaces can be problematic if they represent an image of the system that fails to meet user's expectations" (p.27). The following words of Buurman (1997) also emphasize the importance of taking into account of user characteristics in product development, rather than the technology, for usable products:

> What is badly needed are better designed products where functionality has been substantially reduced in accordance with the user needs, and where user interfaces are clear, coherent and consistent. This would allow users to interact more naturally again, and focus on their goals and tasks instead of on the underlying technology and the interaction it requires. (p.1161)

Therefore, as will be discussed in the following part, technology-driven design needs to be replaced by user-centered design aprroach in development processes, as to meet real customer requirements is what adds value to consumer products in the contemporary market.

3.3.2 The benefits of user-centered design

The increasing value of usability is emphasized especially in the last decades, with the pervasive use of digital technology in everyday life. Nevertheless, in the overall market, user-centered design approach contradicts with technology-driven approach and generally, it is hard for firms to get a balance between the two:

> Technological innovation is important, but it tends to dazzle people with what's possible instead of lighting the way toward products that people can understand and use. Making things understandable and usable isn't particularly glamorous, but it's good business. For every silicon valley company, numerous others met quick deaths because they ignored that principle. Businesses recently have begun to recognize

> the importance of usability in their products, but now there's a catch: products have to be developed at a breakneck pace. (Mok, 1996, p.xiii)

However, it is also stated that, firms should shift their technology-driven design pocesses into user-centered ones, to attain success within the maturing market conditions. To be innovative and fast in the market is important but not sufficient as to specify the consumer needs is started to be vital for success (Leonard and Jeffrey, 1997; Norman, 1999) Also, D'souza et al. (1998) states the importance of the issue with a similar perspective:

> In a competitive marketplace, it is not sufficient that organizations focus mainly on the innovative technology aspects when developing a product, because this technology is available to other organizations, too. There is very little separating the products of these organizations if they are only technology-driven. They need to focus on combining these technology-related features with user-centered design, giving the products a more "human" look and making them more appealing. (p.992)

Therefore, the importance of user-centered design for continuous competitive success in the long term is started to be valued by firms, as Lardner et al (2001) suggest: "...an industry that has historically equated complicated with cool is starting to change. A few companies tuned into the waves of consumers tuning out, are beginning to rethink things. Simple, they believe, may now be the ticket that sells" (p. 30).

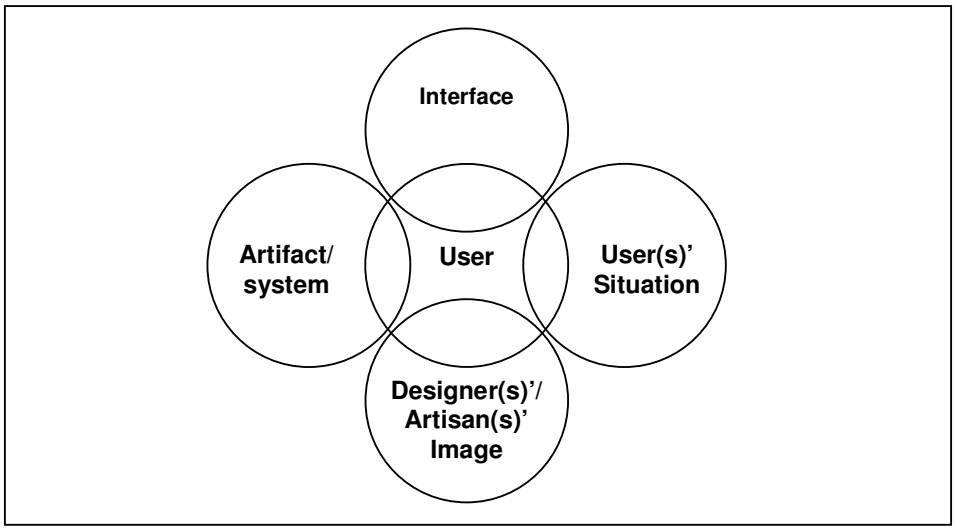


Figure 3.3 Johnson's user centered model (from Johnson, 1998, p. 30).

As stated by Johnson (1998), user centered view is just the opposite of system-centered view, as “user-centered theory argues for the user as an integral, participatory force in the process” (p.30). The model has *the user* at the central point and includes *user’s situation* as an important dimension to the system (Figure 3.3).

The user’s situation also takes into account the *tasks* and *actions* he or she will be performing as a result of a particular situation or activity. This focus on tasks and actions within the user’s context is clearly counter to the system-centered approach. Because in user-centred approach, the use of technology is seen from the user’s view of interaction with technology, as opposed to a system-centered view that would describe these activities in terms of system features and functions (Johnson 1998).

He also adds that, the problems that emerge between the system and users do not owe to the faults of the users, but results from the development process which does not include users as components. The view states that, user needs should be assessed before the initiation of the development process and system should be designed according to those needs. Therefore, “the early assessment of user needs turns much of the designing planning toward a collaborative effort of designers and users” (Johnson, 1998, p. 73)

A definition of user-centered design, adapted from ISO 13407, is given by Bevan (1996), through emphasizing its benefits:

> User-centered design is an approach to interactive system development which focuses specifically on making systems usable and safe for their users. User-centered systems empower users and motivate users to learn and explore new system solutions. The benefits include increased productivity, enhanced quality of work, reductions in support and training costs and improved user health and safety. (p.11)

Another definition by Norman (1999) is: “It is a process of product development that starts with the users and their needs rather than with technology. The goal is the technology that serves user, where the technology fits the task and the complexity is that of the task, not of the tool” (p.185). He also adds that, it requires “developers who understand users and tasks they wish to achieve”, hence, it is necessary to start with observing and working with users

and evaluating whether the product meets user requirements. Therefore, this process "means completely reversing today's technology-centered process" (Norman, 1999, p. 185)

The basic principles of user-centered design is suggested by Rubin (1994):

1. Early assessment of users and tasks
2. To derive evaluated knowledge about the product usage through the observation of real users when using prototypes
3. Development of product concepts and ideas through iterative design methods.

Rubin (1994, p.10) states that, as importantly as stating the techniques, processes, methods and procedures, user-centered design has "the philosophy which places user at the center of the development process". Similarly, according to Wood (1996), the main focus of user-centered design is on users in terms of their characteristics, tasks and environment and therefore, functional requirements of the system are developed from the user's perspective, and referred as "*user requirements*" (p. 2).

The benefits of user-centered design are also suggested in the literature. D'souza et al. (1998) state that, user-centered design process aims an optimization of product according to the benefits of both user and manufacturer and add that, depending on its central role in the development process, user-centered design provides firms important knowledge about users, which also posivitely affects consumer evaluation of the product. Similarly, according to Salvo (2001), user-participatory approaches "rely upon the user to provide information that the designer may not have even considered" (p.275).

However, although it has long been stated in the literature that user-centered design approaches provide benefits both for companies and for users, there are barriers which avoid the overall application of the process in the market. For instance, one of the most common problems is that, the investments required for user-centered design activities are considered as additional cost to product development (Bevan, 1999). Another problem is, user-centered design activities are not properly applied. Generally, a set of product versions

are offered for the user to select, rather than making the necesssary changes that the user pointed out in the product development process. This is assumed as a less time-consuming way (Hall, 1997).

Nevertheless, the benefits of the user-centered design approach can only be evaluated by considering the whole product lifecycle. According to Bevan (1996), user-centered design avoid the penalties and expensive reworking caused by problems of unmet usability objectives of the later phase of product development. Therefore, cost of user-centered design balance the costs of unsuccessful product, as well as providing a better company image. According to Bevan (1996), user centered design avoids the penalties and expensive reworking caused by the problems of unmet usability objectives at the later phase of the product development. Therefore, costs of user-centered design balance the costs of unsuccessful product as well as providing a better company image.

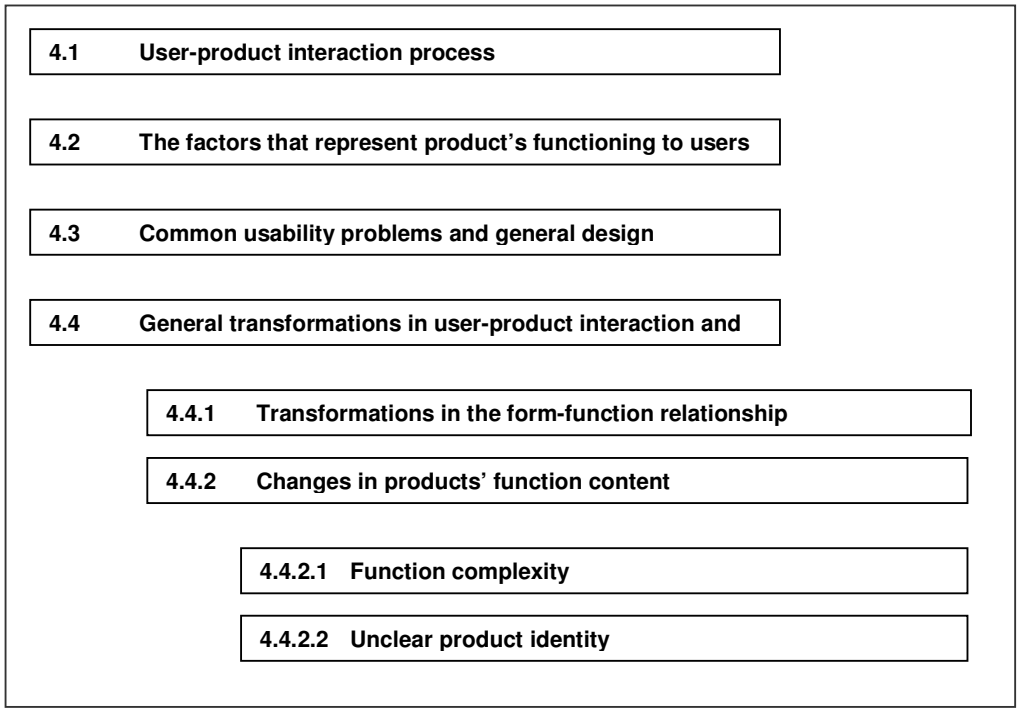
Therefore, it can be concluded that, although it appears that implementing newest technological developments in products in the shortest time creates competitive advantage, it is the user-centered design approach which brings long-term success, by adding value to the product from the user's perspective.

CHAPTER 4

TRANSFORMATION OF USER-PRODUCT INTERACTION WITH DIGITAL TECHNOLOGY IMPLEMENTATIONS

The role of technology in consumer market as a provider for competitive success has its effects, not only on product development processes but also on user-product interaction patterns. In this section, how digital technology implementations in consumer products altered user-product interaction processes will be examined, with an aim to inquire about the major usability problems during interaction with digital products.

Table 4.1 The structure of Chapter 4.



It is widely argued that, overall transformations that have been discussed in the previous parts of this study resulted in usability problems comprehensively for consumer products. According to Cooper (1999), high-tech products that utilize latest computer technology are extensively powerful and sophisticated to perform various tasks, however, most of them are also hard to use and complicated. A similar statement is put forward by Hall et al. (1999) that, generally users are unable to operate many of the functions in these devices owing to their complexity. The issue is also considered in ISO standard related to ease of operation of everyday products:

> The ongoing technological revolution computerizes ever more products, thereby complicating their use. People often do not understand how to operate a product, and as a result, they often cannot profit from the functionality that a product offers. (ISO/CD 20282-1.2 draft, 2003, p. v)

Therefore, it can be said that, the emergence of usability problems are related with certain transformations in user-product interaction processes, to an extent. The following part of the study will consider the effects of these transformations on user-product interaction processes and their negative influences on product usability.

4.1 User-product interaction process

Evaluation of how people encounter difficulties in product use inevitably requires investigating the nature of people activities in the *world*. Norman (1988) explains the process with *seven stages of action*. He states that, there needs to be a goal as a notion of what is to be wanted, preliminary of people taking an action. The 'action' comprises two main aspects, that are, *execution* (doing something) and *evaluation* (checking the appropriateness of the situation to the intended goal) (Figure 4.1). The *execution stage* starts with the goal. The goal is translated into an intention to achieve that goal. This follows action sequence in terms of internal commands, which is still a mental event until the action sequence is executed in the world. *Evaluation stage* initializes with the perception of the

world and this follows the interpretation of these perceptions according to the expectations. Then these interpretations are evaluated with respect to intentions and goal (Figure 4.2). These seven stages form an approximate model, not a complete psychological theory.

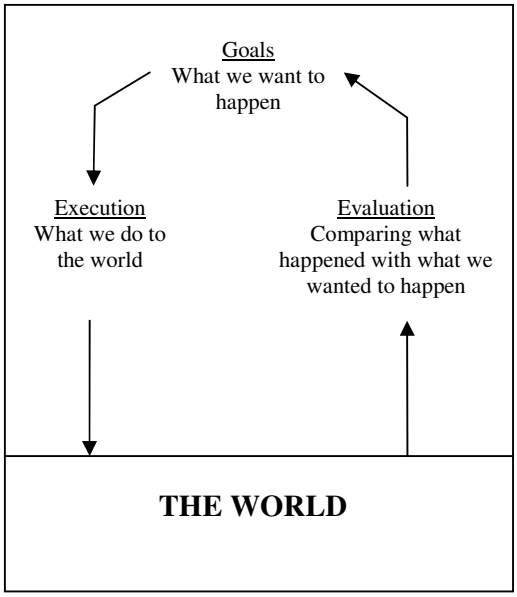


Figure 4.1 The action cycle

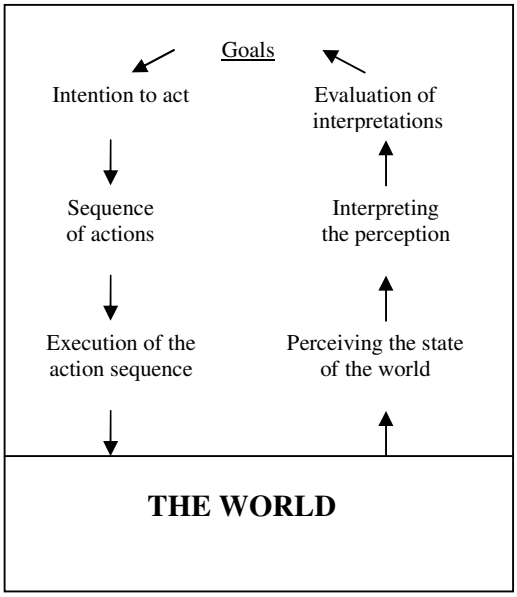


Figure 4.2 Seven stages of action
(from Norman, 1988, p.47)

He adds that the same goal can be satisfied with alternative action sequences. In addition, the preliminary intentions can be decided to be changed depending on the perceptions and interpretations of the world throughout the process. “The stages are almost certainly not discrete entities…There are activities in which goals are forgotten, discarded, or reformulated” (Norman, 1988, p.48). Especially everyday tasks include not well-specified intentions and goals, and are less precise, hence require less mental effort. These processes are also applicable to user-product interaction processes, as interacting with a product embodies the execution of these stages in a similar pattern.

For instance, Stanton and Baber (1998), assume that The user and product interacts with an *input-conversion-output cycle* (Figure 4.3):

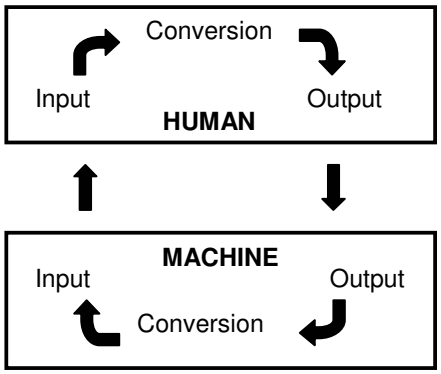


Figure 4.3 Input-conversion-output cycle of human/machine interaction
(from Stanton and Barber, 1998, p.77)

The human and the device are subcomponents of a system consisting of structures and functions, which have hierarchical and interdependent relations. They explain the interaction process similar to Norman. Humans perceive the state of the machine through sensual and perceptual processes and with this information take a physical action in the form of input to the machine. The machine's internal state is modified with this input and the machine gives feedback to the user in the form of output.

Taking account of previous traditions, Stanton and Baber (1998) propose a blended approach to explain this system as a *problem-solving process*:

> General goals and expectations enable plans to be developed in advance of interaction. These plans may be modified as interaction progresses, as performance is influenced by feedback. However, there may be situations in which an entirely new course of action is taken, where the original plans are hijacked and new courses of action take over…We offer this account …as a unified problem-solving approach, where the planning process is modified by the context in which it operates. (p.78)

Accepting Newell and Simon's assertions on problem-solving behaviour, they add that, a person interacting with a product acts as a problem solver with an attempt of reducing the difference between the initial state and goal state. For doing this, he 'breaks the problem down' into subgoals (intermediary states) and selects "state-transforming operations

(operators)" to achieve these subgoals and the usage of different operators result in different states (Figure 4.4). Throughout the process, user involves in a *production of knowledge states* and user's knowledge changes while moving towards the end goal, from one intermediary state to another.

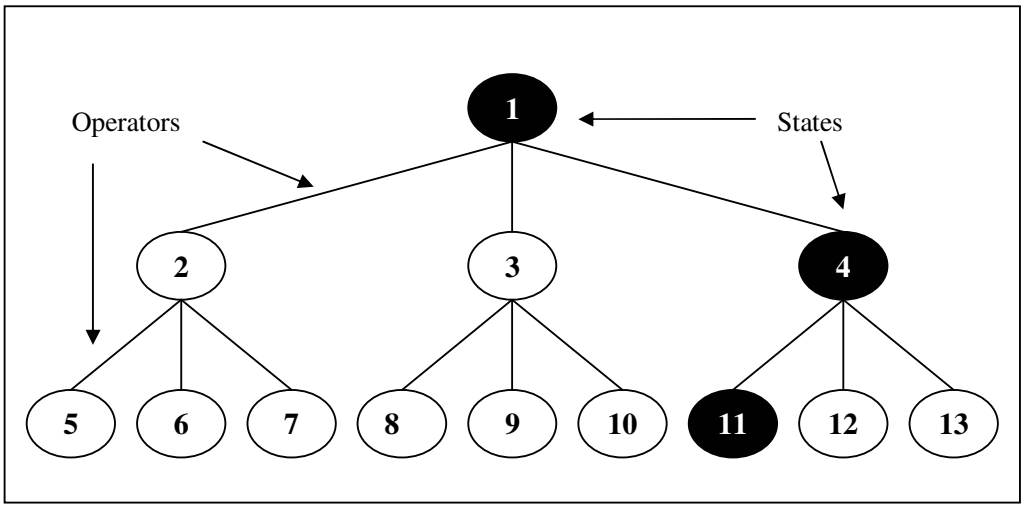


Figure 4.4 States and operators (from Stanton and Baber, 1998, p.79)

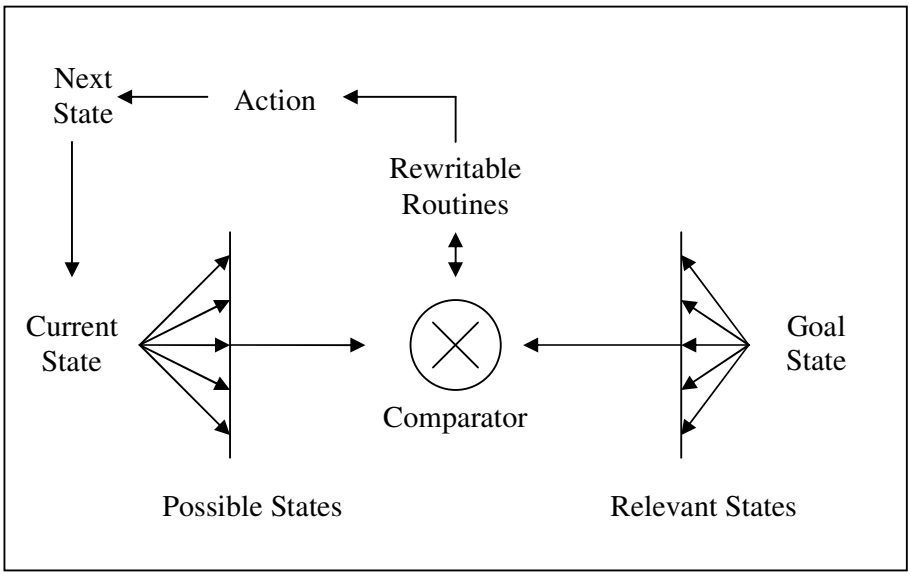


Figure 4.5 Simple schematic of rewritable routines.
"The possible states (interpreted by the user from the product) are compared against states which could lead to goal. The comparator has a two-way connection to the rewritable routines (with the routines both influencing the comparator, i.e. by definig relevance, and taking the output to define action)" (from Stanton and Baber, 1998, p.80).

Stanton and Baber also emphasize that, exploration of the device as well as user perceptions is important in the development of this knowledge throughout the interaction. Users “hold knowledge states in working memory and operators in long-term memory” (1998, p.78). By breaking the goals into subgoals, users substantially reduce the cognitive demand of the task. Therefore, users move from current state to a relevant one by eliminating other possible states. Thus, they need to “to retain some record of the interaction to make some elimination”. At each state, the user needs to modify the record of the interaction.

An explanation of distinct relationships among the elements of user-product interaction is given by Bonner (1998), as illustrated in Figure 4.6. In this representation, user-product interaction is defined as “the dialogue between the user and product” and it constitutes a ‘system’ taking place in the context of a task being performed in certain environmental conditions. In this process, user interface “refers to the control, display and feedback mechanism that exist on a product but not necessarily physically located together on the product” (1998, p.241).

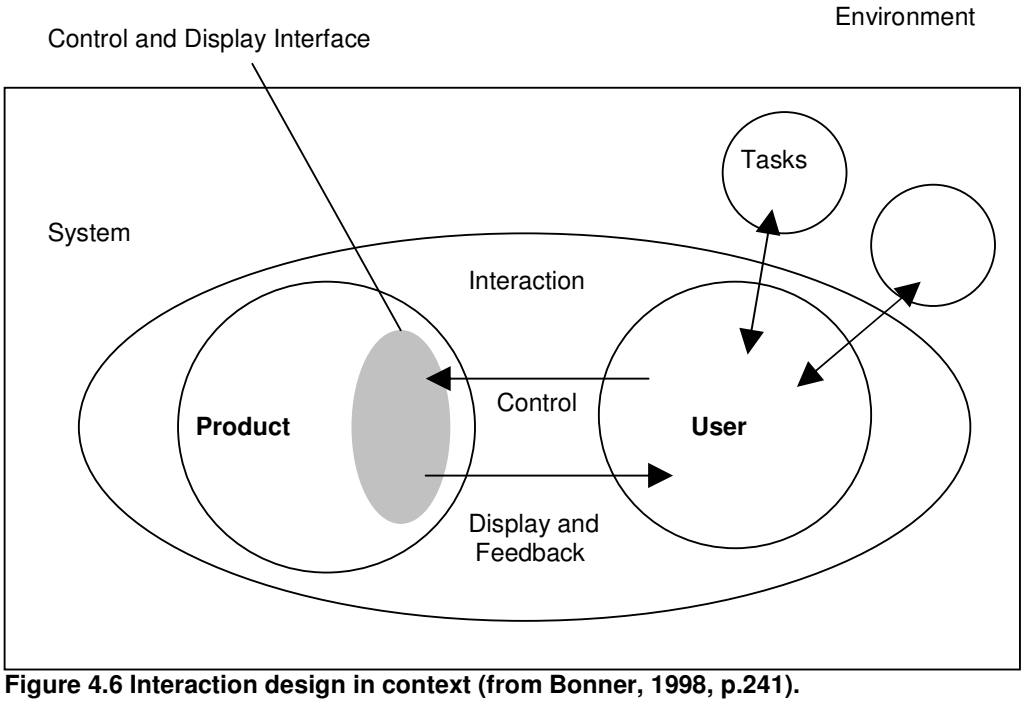


Figure 4.6 Interaction design in context (from Bonner, 1998, p.241).

Another representation, which is derived from observational studies into the usage of different products, brings an insight to the 'user activities' during the functioning of a product operated by a user (Kanis, 1998) (Figure 4.7).

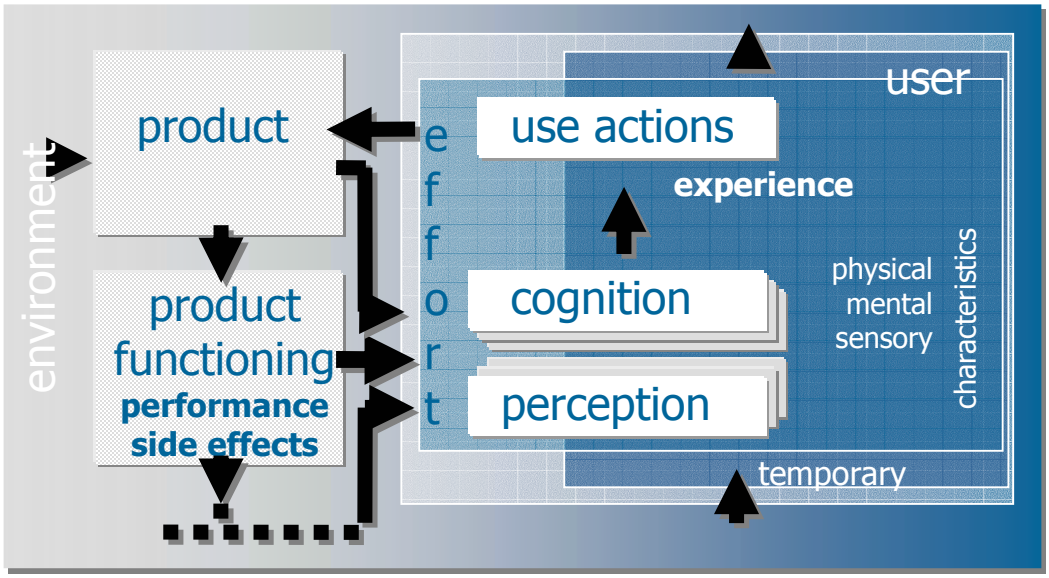


Figure 4.7: The functioning of a product operated by a user in order to achieve some goal (from Kanis, 1999, p.37)

As explained within the representation, perception and cognition precede use-actions. These use-actions result in the functioning of the product with user's effort. The functioning of the product provides feedback to the user to initiate the cognitive process. The environment, through temporary conditions, can affect this interaction process.

In the figure, the 'layered' representation of perception/cognition puts an emphasis on the various levels of involvement (i.e. distinction between skill-based, rule based and knowledge based product operation by Rasmussen's study in 1986). Kanis (1999) notes that, particularly usage of everyday products becomes automated with the continuous update of experience. Hence, the interaction occurs at a skill-based level and the cognitive involvement tends to be low, as far as the user does not attend to these activities.

4.2 The factors that represent product's functioning to users

In the user-product interaction process, an important factor that supplies guidance to the user to achieve goal tasks, through the intended usage is the output supplied by the machine (Norman, 1988; Stanton and Baber, 1998). Therefore, Kanis et al. (2000) states that, two major aspects of product functioning, which should be expressed by the designers are the *functionalities* of a product and *how these functionalities can be activated*. For a product to be usable, these should be provided in a way that accords with user's way of thinking in an intuitive and natural way (Wood, 1996).

A widely accepted approach to describe the elements that provide cues about products' functioning is made by Norman. He accepts that, there are three dimensions of representing knowledge about how to operate a product. These are, *conceptual models, constraints and affordances*, and have a mixed interpretation (Norman, 1988; 1999b).

A significant concept that is vital for users' interpretation of product usage as well as other things in the world is *mental model*. Norman (1988) describes the concept as:

> The models people have of themselves, others, the environment, and the things with which they interact. People form mental models through experience, training and instruction. The mental model of a device is formed largely by interpreting its perceived actions and its visible structure. (p. 17)

A similar definition of the term is given by Freudenthal (2000):

> 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 a product; can include the main functions and subfunctions of the product; generally includes information about procedures required to activate functions; generally includes the (meaning of the) feed forward and feedback provided; can be detailed or vague; can be (partly) correct or incorrect (when compared to the actual properties of the product). (pp. 6-909)

Mental models are closely related with the *conceptual models* of products. The term is defined by Norman (1988) as *the ability to derive the knowledge necessary to operate a*

product through simulating its functioning. A 'good conceptual model' of a product is necessary for the user to learn using a product successfully and to be able to overcome the problems during use. Therefore, the designer should build principles of operation that are observable, and consistent with the conceptual model in user's mind. Norman (1988) explains the issue by differentiating three aspects of mental models, which are, the *design model*, the *user's model* and the *system image* (Figure 4.8):

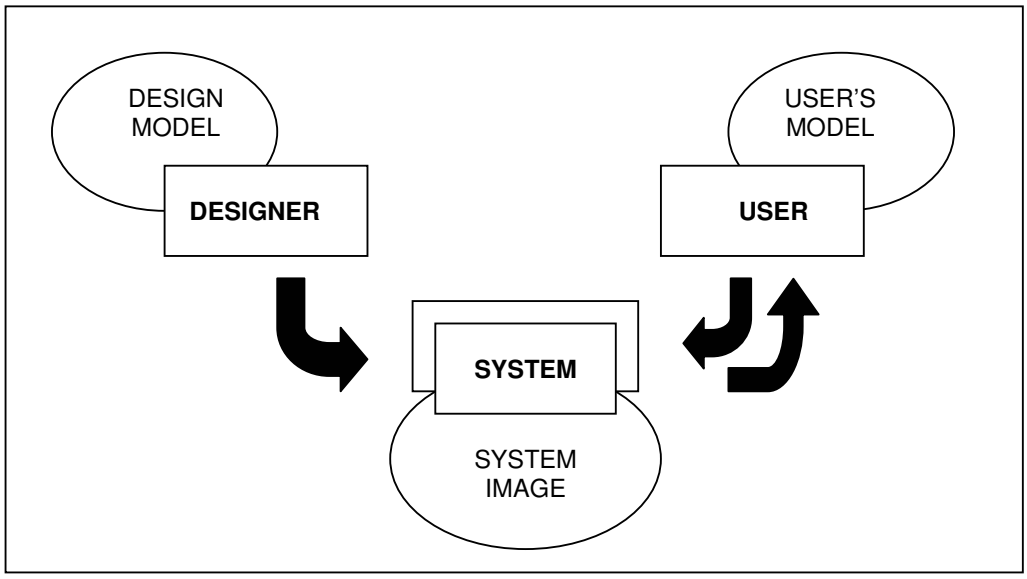


Figure 4.8 Conceptual models (from Norman, 1988, p.16)

The design model is the conceptualization that the designer has in mind. The user's model is what the user develops to explain the operation of the system. Ideally, the user's model and the design model are equivalent. The user and the designer communicate only through the system itself: its physical appearance, its operation, the way it responds, and the manuals and instructions that accompany it. Thus, the *system image* is critical: the designer must ensure that everything about the product is consistent with user's conceptual model; in such a way that user can clearly get the proper information about the product's state and its operation, from the visible parts of it (Norman, 1988). Referring to Norman's explorations, Bonner (1998) adds that, another definition of the process is given by Van der Veer et al. in 1985 as 'metacommunication', "which refers to all activities which communicate the

underlying conceptual model of the product" (Bonner, 1998, p.245). The description of this communication process is also agreed by Mok (1996), by further stating that it should be tested whether these three images for a product overlaps and these areas of overlap can guide the designer in creating a natural and intuitive system for the user.

Similarly, Asatekin (1997) defines a *conceptual communication criterion,* which is related with the products image in the users mind, in terms of the form-function relationship. Product's communicating its functions to the user is vital for a reliable user-product interaction. Any product, which is produced to perform a certain function, reaches to a formal unity with time and this concept of form is captured by the user to comprehend the relationships of that product with its function. Therefore, a product should conform to an appearance that conceptualizes itself in the user's mind, by having similar formal characteristics that of the product's performing the same function and within predetermined formal relationships.

Mental models play a vital role on the user's understanding of and control over the product. According to Bonner (1998), the development of correct mental model is vital in the learning process and further in the retention of the product's functions, adding that, users can understand the functioning of the device easier when the device matches with users' prior knowledge and experience. He also states that, one common failure is to assume that most people have similar experiences. Thus, the incompatibility between the designer's and users' mental models is chiefly a cause to usability problems. The determinative effect of the appropriateness of mental models on product usability, also debated in ISO standards:

> Ease of operation is a result of the complete chain of mental and psychomotoric processing stages necessary for the operation of a product and every element of the chain may be a weak point in the overall interaction. While the problems of user interface design normally relate to inadequate matches with the users' mental models, in some cases inappropriate biomechanical design may be the cause… Careful consideration should be given to user expectations and existing mental models. (ISO TC 159/SC 1N, p.4-8)

The second element, *affordances*, is closely related with mental models. Norman explains the concept introduced by the perceptual psychologist Gibson, as “the actionable properties between the world and an actor (a person or animal)” (Norman, 1999b, p. 39). These are naturally existing relationships deriving from the “perceived and actual properties that determine just how the thing could possibly used” (Norman, 1999b, p. 39). He further states that, these provide strong clues about how a product can be operated, if used properly by the designer. Examples can be given as, the holes of scissors afford placing fingers in them or the blinking cursor that emerge on a text document affords typing.

Stanton and Baber (1998) utilize Norman’s definition of affordances in explaining user-product interaction process. They assert that interaction takes place with “step by step processing of the states and planning at each state” as the interaction with technology needs prediction (p. 80). The user defines available actions and compares these with end user goals, therefore, the options presented to the user via affordances. They accept Gaver’s suggestions, which assume that affordances have sequential relationships.

The third element, *constraints*, can be defined as the limitations that guide the user to prevent taking wrong actions or limit the usage to provide fit between the actual and intended usage (Norman, 1988). Three types of constraints can be identified: *Physical constraints* limit the actions with physical relations; like the frame of the screen limits the movement of the cursor. *Logical constraints* use reasoning; like users expect to use left arrow on the keyboard to move the cursor left and right to move it right. *Cultural constraints*, which can also be termed as conventions, are shared among a cultural group, developed over time and learned by individuals. For instance, using a scroll bar by clicking on it and dragging is a learned action (Norman, 1999b).

Another approach to classify the knowledge of product use is asserted by Shneiderman. The differentiation is made at two levels, as explained by Bonner (1998). *Syntactic knowledge* is dependent on the particular properties of a product such as, which button conducts which specific function. *Semantic knowledge* refers to the ‘concepts’ that provide

the information to the user to build up necessary mental representation of a product's functioning and can also be referred as user's 'mental model' of a system. A similar statement is also given by Asatekin (1997), stating that, for a reliable user-product interaction, a product should communicate itself to the user *with its shape as a whole and with its smaller parts*. He adds that, the form of the product should carry necessary codes related with its functioning and a product should be clear so that the user could understand how it will perform its function by looking at it.

Therefore, it is evident that, the compatibility between the means of users' understanding of a device with the product's form and functioning deserves particular emphasis in product design process. The content of this study under the following heading will bring a general inquiry about the overall usability problems in user-product interaction, which are mainly related to the difficulties that users have in understanding and controlling product's functioning as a result of this incompatibility.

4.3 Common usability problems and general design guidelines

According to Norman (1988), the three main causes of people feeling uncomfortable are *being out of control*, *not knowing how to respond* and *experiencing unexpected results of actions* (Norman, 1999). He states that general problems that users encounter in product usage can be due to the following:

- Invisible relations of operation and lack of feedback
- Arbitrary or unnatural mappings between the user's intention and the action required to accomplish a task, unclear names for operations.
- Inconsistency of the way operations are accomplished
- Incomprehensible of uninformative message about the operations or errors
- Unintelligible verbiage making the user feels responsible of the errors
- Dangerous operations that cannot be fixed if not wanted

Referring to Norman's classifications, Hall (1997) states that these design defects may cause users to

- have difficulties in understanding the product's functioning
- be unaware of the possible actions at a certain point of interaction
- be unable to comprehend the situation or mode of the device
- be unable to figure out the results of the actions taken or face with unexpected task outcomes

Human errors are closely related with the defects in user-product interaction. Hence, they may also provide clues to explain user thinking during the interaction process. For instance, according to Stanton and Baber (1998) "errors can occur when there is an incompatibility between operators suggested by a device and its actual properties". They differentiate two types of incompatibility as "when the device does not actually allow an action that it appears to afford" or "when a device allows an action but results in an unexpected outcome" (Stanton and Baber, 1998, p.79). In this respect, machine output should provide sufficient guidance to user in selecting the right actions and decrease the mental workload.

Another differentiation is presented by Bonner, referring to Verhoef's study on ticket vending machines. In the study, human errors during product usage are classified as; "Information presented by the system may not be noticed by the user; users may not have all the information to hand to complete a transaction; the system may not clearly explain the tasks; or the user perform the tasks in the correct order" (Bonner, 1998, p. 249).

Due to these general problems, various design guidelines are emphasized to maintain user's clear understanding of the functioning process. The following headings are stated to make a broad categorization of these guidelines, which are mostly related with the discussions undertaken throughout this study, hence, do not cover all principles of product usability.

Consistency: A way of accomplishing a task should be consistent with those of similar tasks (Jordan, 1998). Therefore, when a user learns to accomplish a particular task, this knowledge should provide him the ability to accomplish similar tasks, not only with the same product, but also with the products belonging to the same product group. Bonner(1998) approaches the concept with a more broad term as *the consistency with user expectations*. He further classifies the necessary considerations that should be taken into account:

- Ensure compatibility with other products that users may have experience of or would expect to function in a similar way.
- Ensure that the product does not counteract other tasks that may be associated with the product.
- Consistency with the user's mental model of the product, task or relevant experiences.
- Consistency with user stereotypes. (Bonner, 1998, p. 244)

An example related to the appropriate use of the concept can be given as; when a person learns to drive a car, he gains the ability to drive cars in general. This is due to the necessary qualities that are added into car interface, providing consistency among various car models although their designs may be of utmost variability (Jordan, 1998).

Compatibility: The functioning of a product should be compatible with the user's experiences of the world in general, and also should accommodate user's expectations from the results of the actions taken throughout the interaction (Jordan, 1998). Bonner (1998) names this criterion as *a product's fit to normal behavioural patterns.* He states that, it is of vital importance that user interface is "comprehensible, with the user knowing what to do, when to do it and how to do it" by having accordance with users' prior knowledge and experience (Bonner, 1998, p.244). In addition, Norman (1988) states that, the actions and results, controls and their effects, represented and actual system state should embody appropriate mappings that are natural for users. Therefore, as stated by Jordan (1998), a product's operation should be made explicit. This can be made by making use of affordances and constraints to guide the user throughout the interaction (Norman, 1988; Jordan, 1998)

Visibility: A product should be visible so that, by looking at the device, user can be able to tell the state of the device and be aware of the alternatives of action (Norman, 1988). As Jordan (1998) states, the information provided by the device should be easily and clearly understandable by the user, thus it would not cause any misinterpretation. Therefore, the necessary points of consideration includes visual clarity of both information feedback provided by the product and the labelling of interface elements like switches, buttons or commands.

Another point related to the criterion is pointed out by Mok (1996) as; the necessary elements of the interface should be visible and known by the user. He emphasizes that; this would not mean exhibiting any available feature that can be operated, but means, to make the user find the necessary feature when needed. This requires differentiating the mostly used functionalities and information from the ones that are rarely used, and considering this difference when designing an interface (Jordan, 1998). Evidently, this should be supported by appropriate relationships between the features: by building an appropriate conceptual model and simplifying the structure of the tasks (Norman, 1988).

Feedback: For an appropriate understanding of the operation of a product, it is important for the user to know the result of each action, by receiving immediate, continuous and meaningful feedback (Jordan, 1998; Mok, 1996; Norman, 1988). Bonner (1998) refers Norman and Shneiderman, stating that user can be informed by giving confirmations on the act itself, intermediate results and the outcome. Therefore, knowledge should be provided to the users about how an action can be started, if the product is processing the information and how the action is resulted, at each step of the interaction. Norman(1988) points out to the importance of this criterion, stating that the main reason of problems with VCR's are due to lack of visual feedback, as users:

> (1) have trouble remembering their place in the lengthy sequence of required steps; (2) have trouble remembering what next needs to be done; (3) cannot easily check the information just entered to see if it is what was intended, and then cannot easily change it, if they decide it is wrong (p.101).

User control: For a satisfactory and easy usage, user control on product operation is vital. According to Jordan (1998), user control on the actions taken by product should be set at maximum level, by providing adjustability for customization, default settings for easy and fast usage and appropriate flexibility for user's interaction speed. Issues related to the user control are stated in ISO/CD 20282 (2003, draft) as, "speed of interaction should be determined by the user rather than by the machine" and "if there are no technical constraints on the sequence, user should be free to begin with any step" (p. 7). Similarly, Mok (1996) states that, designer should not decide on what users can do or cannot do. User should be able to customize the product according to his needs and characteristics.

Error prevention and recovery: It is inevitable for users to make errors during product usage; however, products can be designed to minimize the probability of users making errors (Jordan, 1998). According to Norman (1988), products should be *designed for errors.* This means that, the device should contain necessary properties to prevent the user to take wrong actions which could lead errors and further notify him, together with making it possible to correct probable errors (Mok, 1996; Jordan, 1998).

These criteria are also important for satisfactory usage. Shneiderman (1997), states that, "mastery of the interface", "competence in performing tasks", "ease in learning the system", "confidence in the capacity to retain mastery over time" are the positive feelings stated by the users which related to interfaces.

4.4 General transformations in user-product interaction and their consequences

The principles of the user-product interaction inevitably transform with the effects of the aforementioned factors. These factors can be differentiated in two main contexts, which both have vital influences on the way users interact with products and on the emergence of common difficulties in use.

The first alteration is due to the *products' inner functioning mechanisms.* In general terms, as previously stated, there existed a shift from mechanical to electronic and computational product mechanisms. Owing to these changes, *form-function relationships* within products are also mainly altered, therefore, the supplements of representing products' functioning to users changed.

The second alteration relies on the *function content* of products. The two outcomes of this change, can be evaluated as, the *increase in the number of features* and the *increase in the variety of features* that a product contains. These sub-alterations mainly influence the development of users' conceptual models of a product, which is highly related with the learning and control processes in user-product interaction. As the first overall transformation is more related to the products' general functioning principles, it can be accepted that, the second group of change is due to the previous one.

The following part of the study presents an evaluation of how the aforementioned technological and market changes altered the interrelationships within the user-product interaction processes and the main outcomes of these changes, in terms of product usability will be discussed.

4.4.1 Transformations in the form-function relationship

It is evident that, as a consequence of the technological developments, the elements that define the products' formal and functional characteristics, gradually alter, disappear or replaced by novel ones (Asatekin, 1997). Therefore, in general terms, interrelations between form and function of products also undergo changes, which as a result affect the dynamics of user-product interaction.

The phenomenon can also be observed with the overall transition from mechanical to electronic operating systems in products. The rule *Form Follows Function* was the all-encompassing idea of the modern design, which assumed that the formal harmony that is

derived through an effective functional analysis was necessary both to increase the system performance and to inform the user about the system structure. Therefore, functional interrelations within the product components reflected on the case and guided the design decisions (Asatekin, 1997). In other words, the mechanical characteristics of a system could be used as the determinative component of the products appearance and as a communicative element of the products functioning to the user.

Nevertheless today, technological developments resulted in the replacement of the products' mechanical structures by single sheets of microprocessors and electronic operating systems (Norman, 1993). As a consequence of these changes, products' operating systems became miniaturized, the spatial characteristic of the functioning process disappeared (Asatekin, 1997; Sade, 1999), and the formal characteristics of products became no more guidable by the mechanical interrelations of the operating system (Norman, 1993). Thus, it is no longer possible to apply a direct form-function relationship that the Modern design proposes to many of the devices in everyday use (Asatekin, 1997; Thackara, 1997). Owing to these transformations, the way that the internal functioning processes reflected to the form of the product also mainly altered.

Norman (1988) exemplifies how the differences between mechanical and electronic interfaces affect user-product interaction with an illustration of 'strange bicycle' (Figure 4.9).

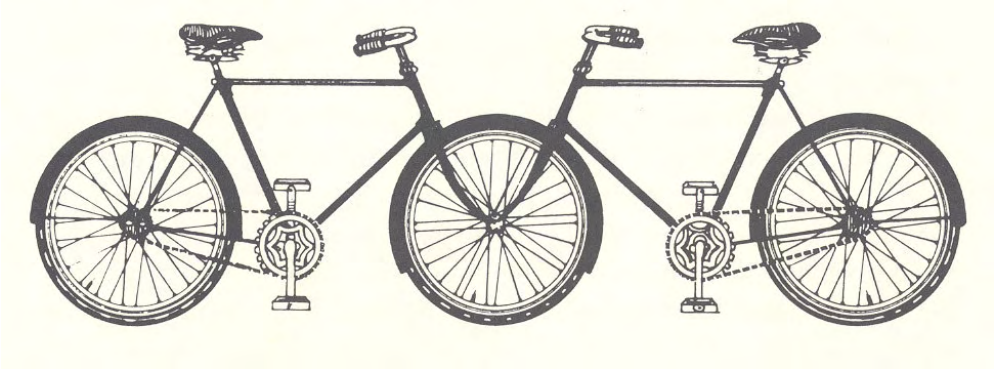


Figure 4.9 Jacque Carelman's Tandem "Convergent Bicycle (Model for Fianés)." (from Norman, 1988, p. 13).

He states that, what makes people to know that this bicycle will not work is the appropriate conceptual model and visibility of the parts, making it possible to mentally simulate its functioning.

On the contrary, electronic devices are *internal artefacts* that require *transforming* the information related to the products' inner functioning into surface forms. Therefore, as the condition of the system cannot be readable through the operating mechanism (Norman, 1993), the functional interrelations within the product became "invisible" to the user (Sade, 1999, p. 65). Similarly, according to Buurman (1997), many of the daily products already equipped with interfaces in which "processors and memory chips do their works invisibly, obscuring functionality" and "causing the great axiom of more traditional design 'form follows function' to lose much of its significance" (p. 1160). Therefore, as the relationship between the form and the functioning of the product is not direct and "natural", electronic interfaces require designer to build *arbitrary relationships* between the appearance of a product and its internal state (Norman, 1993, p. 79).

One common view is, the problems in user's understanding of the device are due to the invisibility of product's functioning processes to the user, in general terms. According to Cooper (1999), as the functioning of mechanical devices is based on physical principles and their interactions consist relatively limited functionality, even if they would be hard to use, they rarely cause misinterpretations (or as he names, *cognitive friction*). However, for instance, when using a microwave oven, user may wrongly cook one hour instead of one minute, or activate the wrong feature, and still may not recognize (Cooper, 1999). Similarly, Buurman (1997) states that, these products cause users to face difficulties in use, as they may include interfaces that do not "foster a coherent conceptual model" and do not make "the functionality apparent and comprehensible" (p.1159).

Norman (1999) brings an explanation to the issue, by making a differentiation between *real* and *perceived* affordances. He states that, in physical products, there can be both real and perceived affordances that provide clues about the functioning of the product. However, in

the interaction between digital products, physical affordances only represent how user can interact with the hardware of the product, like its keyboard, pointing device or display screen. He continues by exemplifying the process:

> Now consider the traditional computer screen where the user can move the cursor to any location on the screen and click the mouse button at anytime. In this circumstance,…the affordance exists independently of what is visible on the screen. Those displays are not affordances; they are visual feedback that advertise the affordances: they are the perceived affordances. The difference is important because they are independent design concepts: the affordances, the feedback, and the perceived affordances can all be manipulated independently of one another. (p. 39-40)

The problem also exists for providing feedback. Buurman (1997) asserts that, "these products have a low *a priori* 'guessability' as they lack most of the intrinsic feedback (movements, noise) and the characteristic form elements of conventional products" (p. 1159). Therefore, for casual users of these products, "the interaction is potentially difficult as intuitive use and further exploration is limited" (Buurman, 1997, p. 1159). Similarly, Bonner (1998) states that, in products with electronically based control and display mechanisms, as user interactions are more abstract and independent of the physical actions, feedback is required to be *designed into* the interaction process. However, he also points out to a problem, referring to Thimbleby and Norman:

> At a low level, designer may recognise that providing meaningful and appropriate prompt messages is important but, on the other hand, not recognise that feedback is important when mistakes are made, for example some VCRs do not even beep when a mistake is made… At a high level, the designer's understanding of how the product may be used can often be different from users' or, put another way, the designer's conceptual model of a product may be at variance with the users'. (ibid., p.240)

Bauman and May (2001) approach to the issue with another but similar perspective, stating that, understanding the inner workings of these devices requires expert knowledge. Therefore, regular users mostly do not understand product's mode of operations fully and thus remain impotent if anything goes wrong.

Consequently, it can be said that, at the result of digital technology implementations, the dynamics of the way products communicate its functioning to the user also altered so that, it makes harder for a user to understand the internal state of a regular product. The level of user's interaction with digital products is not sufficient for him to interpret this process without any arranged feedback. The issue may pose negative influences on user-product interaction, as there may be some cases that designers are not fully aware of the users' mental models.

4.4.2 Transformations in the product's function content

Implementation of electronic operation systems into consumer products altered user-product interaction patterns also through its impacts on product's function content. As previously stated, digital technology provided system flexibility which opened way to the integration of more features into a single product. However, this is stated as inducing problems in use, as it increases complexity of the interaction. The two dominant outcomes of the increasing extent of the number and variety of functions, which are included in the scope of this study, are *function complexity* and *undefined product identity*.

4.4.2.1 Function complexity

Integration of unnecessarily increased number of features in a single product, result in usability problems and users feel frustration towards technology. Norman (1988) terms the tendency in the market to increase the number of features in a device as *creeping featurism*. Bonner(1999) claims that the pervasive use of microprocessors resulted conventional products like microwaves and video cassette recorders to have additional features and become more complex and difficult for users to learn. Cooper (1999) agrees the issue by making a general comparison between the mechanical and digital devices, stating that although each computerized device "has more features and options than its

manual counterpart…we often wield the manual devices with more flexibility, subtlety, and awareness than we do the modern versions" (p.7).

It is also stated that, in general, the enriched content of these products does not merit the difficult usage. According to Norman (1999), although these products integrate multipurpose functionality, most of these features do not meet with user requirements. Therefore, as Sinkovics et al. (2002) states, they mostly do not provide additional satisfaction and utility to users, but rather result in frustration:

> Many consumers feel overwhelmed by the technological complexity of new products. This renders consumers less open to innovative technology-related products and may even lead to negative attitude toward these products. Indeed, most consumers are unaware of all features and applications that a given technology-related product offers. (p.477)

A market-research study conducted in America indicates that, "43 percent of the time Americans spend with electronic appliances when they first get them is devoted to fiddling or figuring out how they work; even then, hardly anyone figures out all the functions". Moreover, according to the same study, these people only utilize the 35 % of the technology integrated in these appliances (Lardner et al., 2001, p. 31). Johnson (1998) also exemplifies the issue with a study. A manufacturer of fax-machines conducted a survey about the three novel features that had been added into a device, to state if these features were satisfactory to the users. The result was that, the newly added features had never been used by 95 % of the purchasers.

On the other hand, limited usage of these extra features is also due to the overall complexity of these devices, as it obstructs users' full control of the features. Cooper (1999) claims how users respond to complicated products that include multiple features as, "They take the minimum they need from it and ignore the rest. Each user learns the smallest set of features that needs to get his work done, and he abandons the rest" (p.33). He further represents his personal experience related to the issue. He mentions that, when bought his new TV, he had found 'picture in picture – PIP' feature (which enables the user to view a channel in a smaller frame while watching another channel in the main frame) very useful.

However, owing to the complexity of the device, he later dropped using the feature. A study conducted in United States verifies the example. According to the study, 1/3 of the people who own VCRs had never used the one of the basic features of the device, 'recording films while the consumer is not at home', because they find it hard to use (Sinkovics et al.).

Moreover, studies show that, these extra features are not considered by users as a utility. A research on usability of a digital TV broadcasting demonstrates that, extra features of the service affect positive user evaluation to a small degree. Rather, users are generally uninterested in these features or do not find them useful (Maguire, 2003). As Cooper (1999) sates, users only care about achieving their goals, not about features. He adds, "Sometimes features are needed to reach goals, but more often than not, they merely confuse users and get in the way of allowing them to get their work done. Ineffective features make users feel stupid" (p. 47-48).

The form of device and its interface elements are evidently affected by the extended functionality as well. The extra features beyond needed, results in efficiency problems in use and decreased quality in interaction, as each added feature requires a new control, display, button or a new instruction on the device, thus complicating its use. (Norman, 1999). Buurman (1997) agrees the issue and emphasizes that these devices become harder to use, especially when used in home environment, simultaneously with other devices (Figure 4.10):

> Even with the manual at hand, only a minority of the owners can set their video-recorders for delayed recording. Users experience major problems when they have to re-set the channels on their TV sets and for remote control devices only a few basic functions are used regularly and with difficulty. It is no great surprise as these small devices, usually different ones for TV, video-recorder and audio system, often feature more then 30 tiny push buttons each. These buttons have to be located and operated in dimly lit environments where people can't identify the minuscule, low-contrast pictograms and inscriptions, even if they wear their reading glasses. What are your own experiences with your new office telephone with extended functionality? Do you profit from it fully yourself? (p.1160)

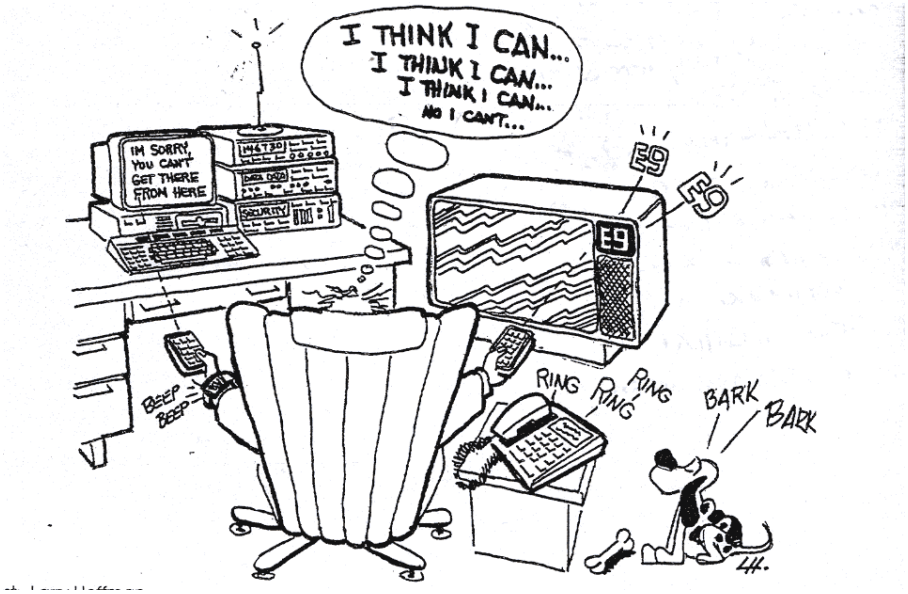


Figure 4.10 The complexity of interaction with products integrating increased functionality is even higher, when it is considered that these devices are used simultaneously in the same environment.
"A stalwart consumer faces-off with consumer electronics (courtesy of American Institutes for Research)" (from Wiklund, 1994, p.10**)**

Therefore, an important point of consideration becomes the visual clarity of the product (Figure 4.11). According to Norman (1988):

> When the number of controls equal to the number of functions, each control can be specialized, each can be labelled. The possible functions are visible, for each corresponds to a control. If the user forgets the functions… the controls serve as reminders. When… there are more functions than controls, labelling becomes more difficult or impossible. There is nothing to remind the user. Functions are invisible, hidden from sight. (p. 22)

It is also stated by Johnson (1998) that, "to hide innumerable features behind simple interfaces like digital wristwatches" can cause to usability problems, as the user will be unable to see how to access these features (p.70). However, it can also be a problem of complexity for the user, if the number of buttons or icons exceeds the perceptible degree, therefore, some rarely used features should be identified and hided (Lardner et al., 2001). It can be said that, with increasing number of features, providing visual clarity becomes not only critical , but also harder.

Figure 4.11 "Example of an office telephone set with an extended functionality; courtesy of Tiptel b.v., Almere, The Netherlands." (from Buurman, 1997, p.1160)

On the other hand, as the number of functions embodied in a device increases, the conceptual model of the device becomes more complicated, too. As the number of steps to achieve an end goal in the interaction process increases, the amount of information required to be remembered by the user increases as well, which hinders easy interpretation of the conceptual model of the product (Figure 4.10). As discussed by Bonner (1998), providing the right type and level of functionality is crucial to reduce cognitive loading. He continues by referring studies of Lee and Thimbleby, stating that, although "many products offer a wide range of functions which are perceived as being useful by buyers…very few of these functions are used because they are difficult to use or remember" (p. 245).

In addition, increase in the number of features requires careful allocation of function between the user and the device. Recent technological developments are stated as 'bringing a solution' to interaction complexity, with the introduction of intelligent systems.

However, this may also bring another problem of usability, as “the issues of how, when, who or what activates or controls a function become increasingly difficult to specify” (Bonner, 1998, p.242). If the task functions are not matched correctly between the user and the product, the smartness integrated in daily-used products like microwaves or video-recorders lead ambiguous conceptual model of a product, as it becomes unclear for the user to know which function to be accomplished by the device and which by the user (Buurman, 1997). An example related to the issue is given by Bonner (1998):

> For example, the advanced photocopiers take some of the copying decisions away from the user by preventing copying if the original overlaps the designated format size. In this example the system function has been increased by the machine to make copying decisions. This function can be overridden by keeping the ‘copy’ button depressed. Many users, however, are unaware of this because the communication concerning the transfer of function between the machine and the user has been poorly considered by the designer. (pp. 242-243)

It can be summed up by saying that, although novel features are integrated in products to utilise the latest technology for improved user experience, most of these functionalities not only remain unnecessary for the user, but also result in usability problems even when using simplest functions. The main reason of complexity is that, extended functionality increases the overall system complexity. However, the problem can be mastered by considering real user requirements and providing optimum task hierarchy that is consistent with user’s mental models.

4.4.2.2 Unclear product identity

The determinative importance of the user’s understanding of the product’s identity for the quality of the use process was previously stated in this chapter. With digital technology implementations, a trend towards combining several products in a single novel product emerged in the market. The phenomenon claimed by Smith (1998) as, “new products will often integrate or replace the features supported by several older products. Tasks in the past which might have been accomplished using a diverse array of products might be done

with a single new product" (p. 284). According to Mok (1996), "multipurpose hybrid objects and tools… such as combination scanner/faxes, phone/message machines" are becoming familiar products of everyday life, and also define new contexts for human activities, like watching television on computer or shopping on-line from TV (p. 50-51).

Consequently, users encounter with products that are not clear about the diversity of functions they perform and this results in indefinite product concepts in the users' mind. Tapscott (1995) emphasizes that, the integration of information technologies into consumer products is a dominant factor for the emergence products with mixed identity:

> Set-top boxes for the TV will initially provide intelligence and enable initial interactivity. Eventually, microprocessor technology will transform television into something unrecognizable, a multimedia information work-learn-play station. Ditto for the telephone. (p. 105)

Similarly, according to Mok (1996), "In the consumer market, the shift to the computing medium is resulting in products and services that are "neither fish nor fowl." Consumers are being offered more choices all the time, but not all of them are meaningful ones" (p. 40).

However, this may cause to usability problems, as interaction process may combine few interaction schemes belonging to different product concepts. As stated previously, users mostly utilize their previous experiences with similar products to understand a device. Hence, combinative product identities require users' the mental representation of a product's functioning to be "completely rebuilt" (Stanton and Baber, 1998, p.80). Further, the previously built conceptual models of the well-known devices may negatively affect the adoption process. Users generally prefer to use the new product combination in a limited but familiar range, rather than changing their predictions of available actions, therefore, it will be difficult to plan the use process. The issue is also debated in ISO standards for ease of operation of everyday products. It is stated that, especially when designing new products, it should be of particular importance to develop interactions that are compatible with widely known interaction concepts because the users may have got used to an interaction style that have a negative transfer effect (ISO/CD 20282 draft, 2003).

The increasing diversity in the product types in terms of various functions that they combine also necessitates different types of interaction modes to be integrated in products. Bonner (1999), states that the phenomenon is an influential factor on increasing complexity of user-product interaction, as the product combinations integrate not only the features, but also the interface characteristics of these products. As an example, developments in the interactive television technologies generated new types of remote control devices that combine analog and digital features, LCD screens, alternatives to pushbutton controls like joysticks and novel software interaction modes, which may also provide a game interface (Wichansky, 2000).

However, the trend in the market towards integrating different features into a single device may result in difficulties in use as they require an adaptation process. Donoghue (2002) discusses the phenomenon by exemplifying with two devices that combine cell phone and PDA features: "…many of these features are hard to use because they force users to relearn familiar things. Some wireless devices, for instance, require users to adapt to an unfamiliar user interface when dialling a phone number or listening to a call" (p. 24)

On the other hand, as the diversity resulting from the combinations of different products increases, the standardization of interfaces for these products also becomes difficult. According to Norman (1993), these devices are hard to learn because "each one uses its own arbitrary choice of operations and methods" (p. 79) Bonner (1998) states that, the retention of the knowledge about "device dependent information" such as which button controls which feature is becoming increasingly difficult:

> Users may experience confusion when, for example, the remote control of a VCR is different in terms of key layout and symbols from a functionally similar product such as music centre control. Many products lack explicitness in conveying the purpose and consequence of control and display devices. (p.247)

In other words, products that have diverse combinations of features require different modes of interactions and diverse interface elements. However, this is an obstacle for the user to

adapt the interaction modes and further learn and use efficiently, as each product would have different ways of operation.

Therefore, it can be concluded that, with integration of various functions into a single device, users encounter difficulties in use, not only for the product's identity would be unclear in user's mind, but also for users would have trouble in adapting the use process.

However, these problems can be mastered by indepth exploration of user characteristics and use experiences (Bonner, 1998). The products that are designed until last decades, were mechanical and had an interaction based on physical principles, therefore, there is appropriate knowledge on physical limitations of people (Raskin, 2000). However, many products in everyday life today, have totally different functioning rules, requiring mental effort. They also integrate much more complex interactions, which makes it hard for the designer to predict the use process.

Most of the usability problems related with the interfaces are not due to the complexity of the tasks that these products are used (Raskin, 2000), but because they are designed without appropriate knowledge and consideration of users' mental processes. Therefore, knowledge related to the users' interaction processes with these devices are required to be produced and integrated into designs. This can only be possible by conducting human-factors activities process and user involvement in the design process.

CHAPTER 5

FIELD STUDY

In order to exemplify the previously discussed subjects throughout the research, a field study was conducted.

5.1. Aim of the study and Hypotheses

The aim of the study was to demonstrate that some of the novel features that are integrated into the products in everyday use are excessive as they are not required and utilized by users. Another aim was to inquire whether these additional features raise some issues of usability as they increase the complexity of systems and tasks that users interact in the home context. The evaluations were made within the previously presented arguments of this research to discuss the research problem on a clearer basis. It should be noted that, to make specific statements related with the design of the product investigated in this research was not within the scope of the study. The findings of the study were discussed to derive general conclusions related with the thesis subject, not specifically related with the product.

Within this context, the hypotheses of the field study were set as the following:

H1 Some of the functionalities integrated into the products in everyday use do not conform to requirements and expectations of the real users.

H2 If the 1st hypothesis is true, then these excessive features remain unused by the users.

H3 The excessive and unused features increase the complexity level of the interaction, thus lead to usability problems and decreased level of user satisfaction.

Regarding the hypotheses, the following research questions were set:

H 1 : **1.** What are the features of the product?

2. Are the users satisfied with the existent features of the product?

3. What are the user expectations from the product?

H 2: **4.** To what extent are the users aware of the product features?

5. To what extent do the users utilize the product's features?

6. Which product features remain unused? Why? (Not known / not needed / could not be used)

H 3: **7.** What problems do the users experience with the product?

8. What are the users' opinions about the additional features of the product?

9. Do these additional features affect the use process? How?

5.2 Material and method:

The research was conducted with a sample product that exemplifies the products which are subject to the discussions within this thesis. The product chosen was a digital television broadcasting service which is widely used in Turkey. The system connection is made with a cable connection and a decoder which is connected to the TV set. Users receive the broadcast via the AV channel of the TV. The system has another remote control. If it is compatible, it is possible to control the TV set with that remote control. It also contains a number of buttons to control VCR if compatible.

The digital TV broadcast provides some interactive services and film purchasing as well as standard and specialized TV channels. 5 different pocket memberships are provided by the broadcasting service, varying on their content. A more detailed data related with the broadcasting service can be found in Appendix A.

The following criteria were considered when choosing the sample product:

1. The context in which the product is used: Television has long been a widely used product in daily life. Depending on its context of use, different user groups with highly varied characteristics (age, education, economic level…etc.) are consecutively interact with the product. Also, as it is used in the home environment, the factors that determine the nature of interaction diverge highly, depending on the physical conditions (like lighting, distance from the screen, noise…etc.) as well as on the product's inherent characteristics (like screen dimensions and picture-sound quality).

2. The characteristics of the interaction with the product: Television is a device which embodies various technologies and different kinds of interfaces like remote control, menu-driven and on-screen interfaces, as well as various functionalities provided by digital broadcasting offered in the last decades. Therefore, it can be said that, it is a device which has diverse kinds of interactions.

3. The variety of features added into television with the digital broadcasting service: With the digital broadcasting services offered around the world in recent decades, televisions started to integrate a different kind of technology, which has a second level of interaction with the user. Digital TV broadcasting services usually contain diverged functionalities that are made available by the digital technology, like mail services, access to local information and on-line shopping. As previously discussed in the study, these functionalities also require different types of interfaces to be adapted into existing TV systems. Thus, user's familiarity with these type of interaction may be a factor that affects the quality of interaction.

Questionnaire and observation with think aloud sessions applied as the method. Therefore the study composed of two main parts aiming to collect data about issues as explained below:

The first part of the study was designed as a questionnaire composed of 19 questions. The questionnaire was mainly focused on deriving data about the following:

1. Data about user characteristics like age, gender, experience with computer and cellular phone usage were collected with multiple choice questions. Data related with the attitudes toward technology and confidence in using these types of products were collected with 7-point Likert scale. To collect data related with users' experiences with the product, time of use and approximate daily time of watching TV were collected with multiple choice questions. The criteria considered in purchase and general problems encountered during use were asked with open-ended questions.
2. To gather the data about the utilization of product features, first respondents were asked to fill out a questionnaire which asks the functions of the buttons they know on the remote and mark the ones they use. The opinions related with the features of the service were collected with a 7-point Likert scale. The reasons for not using features were also asked.
3. Users' expectations from this kind of service were asked with a 7-point Likert scale.

In the second part of the study, usage of the broadcasting service was observed and they were asked to think loudly. The aim was to derive data about:

4. Common problems that users encounter during product use and if these are related with the excessive functions integrated into the product. It was asked from each participant to accomplish six tasks that are provided by the broadcasting service. Following each task, open-ended questions were asked to get users' opinions about the features and the interaction process. The sessions were recorded using a digital video camera. Analysis was based on the translations of video cassettes (available in Appendix C). The observed problems were grouped according to their type, the tasks and participants. The conclusions were drawn out considering the groupings of usability criteria made in the 4th chapter of the study.

5.3 Results and findings

The findings of the study can be presented under the sections below:

5.3.1 Participant characteristics

The following table represents the data collected through the first 7 questions of the questionnaire conducted with the test participants.

Table 5.1 Characteristics and interest in technology of the participants attended in the field study

Participant	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**
Age	59	31	53	55	58	60	37	38
Gender	F	M	F	M	F	M	F	M
Computer experience *(Multiple choice)*								
Internet	0	1	1	0	1	1	1	1
Office Programs	0	1	1	0	1	1	1	1
Specialized Programs	0	1	0	0	1	1	0	0
Total	**0**	**3**	**2**	**0**	**3**	**3**	**2**	**2**
Cellular phone usage *(Multiple choice)*								
Talk	1	1	1	1	1	1	1	1
Message	0	1	1	1	1	1	1	1
Additional features	0	1	0	1	1	1	1	1
Wap services	0	0	0	0	0	0	0	0
Total	**1**	**3**	**2**	**3**	**3**	**3**	**3**	**3**
Personal interest in technology *(7 point Likert scale)*								
Interest in electronic products	2	3	4	3	6	6	3	4
Utilization of features in a product	2	3	3	5	4	5	1	5
Number and variety of features imp.	3	0	2	2	4	4	3	6
Way of learning product usage*	0	6	2	0	4	5	1	0
Self confidence in product usage*	1	6	2	4	2	1	1	4
Internet usage	0	0	5	1	4	5	4	3
Interest to technological novelties	0	3	4	5	6	5	3	4
Office programs usage	0	6	4	2	6	4	3	4
Specialized program usage	0	3	4	3	6	4	6	4
Electronic device usage	5	6	4	3	5	4	3	4
Total	**13**	**36**	**34**	**28**	**47**	**43**	**28**	**38**
Average	**33,4 / 70**							

** The values are reversed depending on the negative meaning of the question*

Age and gender: The participants attended the study were chosen above 30 and below 61 years of age. The numbers of participants from different genders were equal.

Computer and cellular phone usage: Out of 8 participants, 2 of them stated that they have very limited/no computer experience, 3 stated they use PC's to use internet and office programs, and 3 stated that they utilize specialized programs as well as internet and office programs. None of the participants was using WAP services, while 6 of them stated that they utilize additional features in their cellular phones. 1 participant stated that she utilizes messaging feature in her cellular phone, and 1 participant stated that she uses cellular phone just to make and get calls.

Personal interest in technology: The results of the Likert scale questionnaire represented that the participants of the study had an average interest in technology at a rate close to %50 (33,4 / 70). 3 participants were significantly above and 4 of the participants were significantly below the average value, while 1 of the participants was very close to the average.

It was seen that, the 2 participants who have limited/no computer experience also had low interest rates with the technology. It is also observed that, these two participants had high error rates and significant difficulties during product use.

Product experience: Of the 8 participants, 6 can be expected to have sufficient level of experience with product use, as they stated that they have been using the product for more than 6 months. 2 of the participants had experience close to 6 months. 1 of these two participants mentioned that she doesn't have much knowledge about product's different features because she had not been informed when the system installed.

5 participants mentioned that they watch TV 2 to 5 hours everyday, while 3 mentioned that they watch TV less that 2 hours a day. Nearly all (7/8) participants stated that they preferred to purchase the service mainly for the films shown in the special movie channels of the broadcasting service. Sports channels and picture-sound quality were given as other reasons as purchase criteria.

Table 5.2 Raw data representing participants' experiences with the product

Participant	P	P2	P3	P4	P5	P6	P7	P8
Kind of service	süper	süper	sinema	sinema	süper	süper		
Service usage time	> 6 months	>6 months	2-6 months	2-6 months	> 6 months	> 6 months	> 6 months	> 6 months
Approximate daily TV watching(hours)	2 - 5	<2	2 - 5	2 - 5	2 - 5	2 - 5	< 2	< 2
Issues considered when purchasing service	films	films	lig TV and films	films and original language	films	sports and film channels	started with 6 m. payless service. Continued for films and picture-sound quality	started with 6 m. Payless service
If initial infornation has taken and how he learned to use	explanation + manual. Customer service for problems with the box	explanation	no info, learned by herself	info given, learned new functions by reading the manual	no info, learned by herself	no info, learned by himself	info and manual. Had read before using	Gave info and manual
Help during use	-	-	during 1st month called customer service when problems occured	if it requires calls customer service	-	-	at first she were reading manual while using.	-
Problems in system use	-	connection fails in rainy days	problems in channel use. Does not use services because not given any info.	remote control device and TV set are unadaptable, thus encounter problems during use	-	-	problems when connection failed	-
Problems in decoder box use	cable unplugged. Called customer service.	-	occured problems in TV-box connection a time ago but not exists any more	cable gets unplugged from the device when moved	-	-	sometimes the service locks and connection cuts off	-
Repeating problems during use	-	-	connection fails in windy days	gets mixed up between TV and Service remotes, closes programs accidentally	-	browsing some channels are slow	service locks off because of the double remote controls	signal level decreases from time to time

Common problems related with the service use were stated as the service breakdown because of the weather conditions or cable unplugged from the decoder box. Another problem mentioned by 2 participants was related with service breakdown caused by the incompatibility of the remote control of the service with the TV set. It observed that 7 participants were using 2 remote controls to interact with the TV set and the service separately because of the incompatibility problem.

5.3.2 The level of utilization from the product features

The features of the buttons of the remote control device are shown in Appendix A. The table below represents the data related with participants' level of usage of the buttons.

Table 5.3 Participants knowledge and level of usage of remote control buttons

Button		P1		P2		P3		P4		P5		P6		P7		P8		TOTAL	
#	function	know	use	know	use	know	use	know	use	know	use	know	use	know	use	know	use	know	use
1	standby	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	8	8
2	sat	0	0	1	1	1	1	0	0	0	0	1	1	0	0	1	1	4	4
3	*tv**	0	0	1	1	0	0	0	0	0	0	1	0	0	0	1	0	*3*	*1*
4	*vcr**	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	*2*	*0*
5	*aux**	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	*1*	*0*
6	*favourites*	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	*1*	*1*
7	info	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	6	6
8	*themes*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*0*	*0*
9	guide	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	6	6
10	*options*	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0	0	*2*	*2*
11	ok	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	6	6
12	ch	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	8	8
13	page	0	0	1	1	0	0	0	0	1	1	1	1	1	1	1	1	5	5
14	back	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	8	7
15	PP	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	5	4
16	volume*	1	0	1	1	1	0	1	0	1	0	1	0	1	0	1	0	8	1
17	mute*	1	0	1	1	0	0	0	0	1	0	1	0	1	0	1	0	6	1
18	*tv/av*	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	*1*	*1*
19	*txt**	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	*2*	*0*
20	language	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	7	7
21	*video k.**	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	*3*	*0*
	total	11	6	15	14	6	5	5	4	11	9	18	11	11	9	15	10	92	68

0	wrongly knows the function	0 0	Buttons not known and used
1	partially knows the function	1 0	Buttons known but not used

buttons used less than half of the participants

* the buttons incompatible with the TV

It was seen that, out of the 21 buttons/groups of buttons on the remote control device, 7 were not active when the remote control is not compatible with the TV set. Of these 21, the functions of 9 buttons were not known by users. Also, the users were not using 3 of the active buttons as they did not know the feature related with that buttons. The functions of these buttons were specific to the broadcasting service and did not exist in other common TV remote control device panels.

Table 5.4 represents the data regarding to the utilization of the services. The participants were asked about their level of satisfaction and utilization of 11 interactive services and 6 functionalities related with program access. If the service/functionality is used by the participant, the level of satisfaction was asked. If it is not used, the participant was asked to state the reason for not using the service/functionality.

As can be seen from Table 5.4, 8 out of 11 interactive services were not utilized by most of the participants. The mostly utilized services were relevantly more basic services like film purchasing, on-line news and weather forecast. 4 services were not used by the participants mostly for they were not needed. 2 services were used by 2 participants and 2 were used by 3 participants. 'Being unpractical or hard to use' was stated as the reason for not using the service by 2 participants for two distinct interactive services. On the other hand, the feature that enables users to see program information in another channel while watching a program was not utilized by the users mostly for it was not known. On the other hand, one participant (having 6 months experience with the product), did not experienced the interactive services as she did know they were provided by the broadcasting. She mentioned that, it was because she was not informed during the installation. However, she also mentioned that she once noticed a warning on the screen related to promotions given by the service and tried to explore the feature, but could not managed to understand how it was used and did not try again later.

Table 5.4 Level of satisfaction and reason for not using the services

Participant	P1	P2	P3	P4	P5	P6	P7	P8	total	
Film purchasing	6	-n	-n	-n	6	6	6	5	29	
Digital radio	6	6	2	3	6	6	3	5	37	
Weather forecast (TV Hava)	3	6	-k	-k	6	2	3	5	25	
TV games (Oyun Parkı)	6	-n	-k	-n	3	-n	-u	-u	9	used by 2 users
Customer service (Müşteri hizmetleri)	-n	-n	-k	3	-n	-n	3	-n	6	
Telephone directory (Altın rehber)	-k	-n	-k	-n	-n	-n	-k	2	2	used by 1 user
News (TV Haber)	-n	-n	-k	-k	-n	2	-n	-k	2	
Cellular phone billing (Kanal 532)	-n	-n	-k	-n	-k	-n	-k	-k	0	used by none
Online Banking (TV Banka / Pamukbank)	-n	-n	-k	-n	-n	-n	-n	-n	0	
Hipodrom iTV	-k	-n	-k	-k	-n	-n	-n	-k	0	
Mail/message (Digiposta)	-n	-u	-k	-n	-n	-n	-n	-u	0	
Getting information about program content	6	6	-k	5	6	5	6	1	35	
Watching programs with original language	6	6	6	6	6	6	6	3	45	
E-Guide	6	6	-k	-k	6	6	6	1	31	
Program remembering	-n	6	-k	-k	6	6	6	4	28	
Easy access to a chosen channel	-k	6	-k	-k	6	6	5	-k	23	
Getting program info while watching another channel	-k	-n	-k	-k	-k	-k	5	-k	5	used by 1 user
average satisfaction of participants	6	6	4	4	6	5	5	3		

Level of satisfaction
6: satisfied - 1: not satisfied

Reason for not using the service
-k does not know the feature
-n does not need the feature
-u the feature is not practical and usable

5.3.3 User expectations from a digital broadcasting service

When the participants were asked about their expectations from a digital broadcasting service, it was seen that the most expected services were the basic features of the service (Table 5.5). It was also observed that 4 of the 5 least expected services are the services that are mostly accessed via internet.

Table 5.5 User expectations from a digital broadcasting service

Participant	P1		P2		P3		P4		P5		P6		P7		P8				
Expectation level/use	exp	use	exp	use	exp	use	exp	use	exp	use	exp	use	exp	use	exp	use	total	total use	
Online tv news and weather forecast	5	1	6	1	4	1	6	1	6	1	6	1	6	1	5	1	**44**	**8**	most expected 5
TV listing and program info	4	1	6	1	4	1	5	1	6	1	6	1	6	1	4	1	**41**	**8**	
Picture and sound quality	0	0	6	1	6	1	6	1	6	1	6	1	6	1	5	1	**41**	**7**	
Digital radio	5	1	6	1	3	1	4	1	6	1	6	1	6	1	4	1	**40**	**8**	
Buying films	5	1	0	0	2	1	6	1	6	1	6	1	6	1	5	1	**36**	**8**	
Access to local service information	6	1	0	0	5	1	6	0	6	1	*	1	6	1	5	1	**34**	**6**	
Sending and getting pictures	4	1	0	0	4	1	6	0	6	0	0	0	3	1	6	1	**29**	**4**	
TV games	6	1	0	0	4	1	0	0	6	1	2	1	5	1	4	1	**27**	**6**	
Order food via tv	0	0	0	0	3	1	6	1	6	1	*	0	6	1	6	1	**27**	**5**	
Sending/getting mail-message	0	0	0	0	3	1	6	0	6	0	2	1	4	1	4	1	**25**	**4**	
Access to city traffic info	0	0	6	1	4	1	6	1	6	1	*	1	0	0	2	0	**24**	**5**	
Access to real estate billboards	0	0	0	0	3	1	6	1	6	1	*	0	3	1	3	1	**21**	**5**	
Online finance	0	0	0	0	3	1	6	0	6	1	*	1	0	0	5	1	**20**	**4**	
Online information about product costs	2	0	0	0	4	1	6	1	3	0	*	1	4	1	0	0	**19**	**4**	least expected 5
Online banking	0	0	0	0	0	0	6	1	6	1	1	1	3	0	2	0	**18**	**3**	
Online shopping	0	0	0	0	2	1	6	1	6	1	*	1	0	0	3	1	**17**	**5**	
Spacialized commercials	*	*	0	0	2	1	6	1	3	0	*	1	4	1	1	1	**16**	**5**	
Access to discussion groups	6	1	0	0	0	0	6	0	0	0	*	0	3	1	0	0	**15**	**2**	
total	**43**	**8**	**30**	**5**	**56**	**16**	**99**	**12**	**96**	**13**	**35**	**14**	**71**	**14**	**64**	**14**			

*** Not stated by the participant**

5.3.4 General usability problems during product use

In the second part of the study, the participants were observed while using six of the services provided by the digital broadcasting. The tasks were defined as given in table 5.6:

Table 5.6 Tasks for the think aloud session

Task	Explanation
1	Open the television and go to the channel CNBC-e. While watching the program on this channel, access to the information related with this program.
2	Make the necessary settings for Digitürk to remind you the time of the program that you want to watch this evening.
3	Learn what program is shown in TRT 1 at this moment, while watching this program.
4	Send an e-mail through your TV to the address peling@mail.com, having a title as “deneme”.
5	Get the necessary information about the weather forecast of Ankara tomorrow.
6	You want to rent a car. Find a useful address from Digitürk.

Table 5.7 shows participants’ successes (**S**) and failures (**F**) at the end of each task.

Some of the participants did not want to try some tasks because they stated that they did not know the service or that they would not use the service, and just stated some opinions related with the feature. Thus, success or failure evaluations of these participants are not stated in the table. Some other users completed the tasks with the help given by the observer, when the participant dropped trying to take the next step, or when he stated that he would not come through at a certain step. Nevertheless, help was given by the observer to derive data on the use process at the remaining steps of the tasks.

The first two tasks did not pose a dominant usability problem; however, the users who are unfamiliar with the feature could not succeed because they could not access it. Task 3 was not tried by 4 participants because they could not guess how to access the feature and just

told their opinions related to it. 4 participants said that they reach the same goal (getting program information on another channel while watching a program) by alternative ways (going to that channel and seeing the program), thus found the task useless.

Table 5.7 success and failures according to participants and tasks

TASKS	1	2	3	4	5	6
P1	**S**	Does not know feature **F**	Does not know feature **F**	Does not know feature **F**	Does not know feature **S**	Does not know feature **S** with help
P2	**S**	**S**	Knows but Doesn't use **S**	used once (hard to use) **S** with help	**S**	Does not know feature **S**
P3	Does not know feature **F**	Does not know feature **F**	Does not know feature did not try	Used once (hard to use) **S** with help	Does not know feature **S**	Does not know feature **S**
P4	Does not know feature did not try	Does not know feature did not try	Does not know feature did not try	Does not know feature **F**	Does not know feature **S**	Does not know feature **F**
P5	**S**	**S**	Does not know feature **F**	Does not know feature-no need **S**	**S**	Does not know feature **S**
P6	**S**	**S**	**S**	Tried once Did not want to complete the task	**S**	Does not know feature **S**
P7	**S**	**S**	Does not know feature Did not try	Tried once-Doesn't use-hard to use **F**	knows feature but not use **S**	Does not know feature **S**
P8	**S**	**S**	Does not know feature Did not try	Used once. Slow and hard. **S**	**S**	Does not know feature **S**

It was observed that participants significantly encountered problems in using the messaging service provided by the broadcasting service. None of the participants succeeded to send e-mail with the service. Apart from several problems commonly observed through all the participants, the system failure at the last step prevented the accomplishment of the task, thus, the participants who approved to send mail were accepted as successful. However, it was also observed that none but one of the participants wrote their real user names, because they got bored to use the keyboard at that step and typed accidental letters on the screen. 5 users stated that they tried the service once, but did not use it because they found it hard to use. These participants also did not remember how use the service and 2 of them

needed help to accomplish the task. 1 participant who had tried the service before did not succeed to finish the task even she was helped by the observer. 1 of the 2 users who tried the service before stated that he did not want to try the task because ‘it is like dying’ and other refused to try the task because of being ‘superfluously slow and unpractical’.

The fifth task was accomplished by all participants. However, two users stated that they reach the weather forecast from the news programs in regular channels, thus thought that the feature was not that much necessary. 1 participant stated that he does not trust the information given at the channel as he believes that it is not updated regularly.

The sixth task accomplished by 6 participants with minor problems. It was observed that, the two participants who encountered difficulties during the task had problems related with low computer literacy.

On the other hand, a general observation during the sessions was that, computer literacy and product familiarity were two dominant factors that affected the level of success among the participants. Table 5.8 represents information that is more detailed relative to the problems in product use.

Table 5.8 Observed problems during think aloud sessions

This problem was encountered by user number	1	2	3	4	5	6	7	8
Error prevention and recovery								
Presses 2 buttons at a time	x			x	x		x	
Presses a button 2 consequent times	x			x	x		x	x
Decided to press wrong button	x				x			x
Mixed up between two remotes - accidentally pressed button on the TV remote to change the program and locked or left the broadcast	x		x	x		x	x	
Visibility / clarity								
Could not identify a specific button on the remote			x	x				
Wasn't sure how to type letters on the screen			x	x	x		x	x
Was unable to understand the icon on the screen-stands up and have a closer look			x	x	x	x	x	
Could not understand that the icons on the screen were representing the buttons on the remote			x	x		x	x	
Mixed up with the commands on different screens				x			x	
Could not clearly understand the abbreviated words on the screen	x							
Lack of / Slow feedback								
Was unsure about the system status and could not decide which action to take because of the slow transfer rate - made error	x		x	x	x	x	x	x
Could not intervene in the system during the channel download process	x			x	x		x	x
Had doubt on which command was active on the command screen		x		x	x			x
Could not understand wording in the warning screen					x			
Was unable to understand the system status so could not take any action	x			x	x			
Compatibility (experience)								
Wanted to select the icon on the screen by moving on it		x	x		x		x	
Was unable to guess how to type letters - wants to write message as it is in cellular phone		x	x		x		x	x
Consistency								
Was unsure which button to press to leave the channel (OK/Back-changes from task to task)	x	x	x	x	x		x	
User control								
Was unable to take an action during the interactive channel download	x			x	x			x
System proceeded faster than the user while entering channel numbers - could not understand where he was				x				x
Lost data/got afraid of losing the data that was typed on the screen		x					x	
(-) opinion								
Incompatibility between TV and broadcast remote controls								
Not comfortable to carry two remotes	x	x	x	x	x	x	x	x
Two remotes are not similar to each other so problems in adapting to both				x			x	
Unreliability								
Did not trust the information given about program hours		x	x			x	x	
Found program information not detailed enough		x					x	x
Did not trust that the online information given in the channels were updated regularly						x	x	x
Miscellaneous								
Found the feature long /complex to use (mail sending feature)		x	x	x	x	x	x	x
Found the feature long compared to computer/conventional ways (telephone/address directory)	x	x		x				
Increased function number				x	x			
Difficulty in finding channels			x	x		x	x	
Complained about waiting time	x		x	x	x		x	x

5.4 Discussion

Regarding the hypotheses defined and the research questions set at the beginning of this chapter, the following evaluations can be made:

The participants generally stated that they were satisfied with the services they use in the broadcasting service. It was also seen that participants do not use most of the interactive services for they did not feel any need.

When the ratings made for the expectations from a digital broadcasting service were evaluated, it was seen that the services that can be accessed via internet got lower ratings. This may indicate that, users are inclined to approach TV within the limits of its conventional concept (getting information), rather than as a device, that has a two-way interaction like computer and/or Internet. However, it was also a noteworthy result that, although some participants stated that they did not utilize some of the interactive services provided because they did not feel the need, they stated that they expect these features to be integrated in a digital broadcasting service and use if exists; but gave lower ratings. 1 of the 4 services which were not used by any of the participants was investigated with think-aloud observations. It was seen that, most of the participants encountered difficulties in using the service and stated they would not prefer to use the service for mail and message purposes for it was unpractical and hard to use.

Generally, the services related with easy and customizable access to TV programs were highly utilized by the participants. However, when the data related with remote control device was considered, it was seen that, users did not know and use some specialized buttons related with program and service customization. Although some optional features were presented to the users to enrich the interaction, it was seen that users interact with the product within the habitual limits, like a conventional TV broadcast

As a matter of fact, most of the problems observed were originated from the design of the sample product; however, it is found meaningful to analyze these by considering their relationships with the issues stated at the earlier phases of this research. Although it is hard to evaluate the problems in the use process independently of other factors, the discussions related with the product use can be made considering the usability criteria presented in the fourth chapter of the study.

It was seen that users had problems with the increased number of buttons on the remote control, as everything is located on a single device to combine several features, e.g. some buttons were for additional features, and some of them were for compatible TV and VCRs. It was observed that, all but one TV sets were not compatible with the remote control of the service. Furthermore, none of the users owned a VCR. Therefore, nearly half of the buttons could not be utilized by the users because of technical incompatibility. On the other hand there were also a number of buttons which were not used because the feature was not known. Those unused buttons seem to increase the complexity of the interface and pose problems for *visibility and clarity*. Especially while dealing with an unfamiliar feature, it was observed that users tried the buttons which they were not sure of their functions. This was confusing for most of the users. Another cause was that some novel buttons which were specialized for the type of interaction (like navigation buttons, and OK – Back buttons which have dominant functionalities to control the product) were new for the users and caused hesitation.

On the other hand, increased number of buttons decreased the space requirements and buttons had a smaller size than those on a standard TV remote. This was observed as a problem in remote control usage as users made errors because they pressed two buttons at a time.

However, it can be said that these issues were mainly related with the design of the remote control. Although increased number of buttons caused some problems of visibility, the hardware design could be enhanced by making right groupings on the remote control

display, or some design solutions could be developed to minimize usability problems derived from visual complexity or small button dimensions.

Users also complained about two remote control device usage. They stated that they usually make errors as they got confused between two remote controls. As *error prevention and recovery* of the system was low, such cases usually result in system failure or leaving the broadcast. Obviously, this results with low user satisfaction.

Some features that were integrated into the system required different kinds of interactions and caused problems of consistency and feedback. For instance, mail sending feature required the users to type letters on the TV screen by using the remote control device. This kind of interaction was unfamiliar for nearly all participants. It was observed that at first all participants had difficulty to figure out how to type letters on the screen. Then they expected to see a computer keyboard on the screen, or a clue about writing the letters with the number buttons on the remote control similar to an interaction with a cellular phone.

None of the participants noticed that icons on the screen represented the buttons on the remote, although it was written on the screen that they could use the number buttons on the remote control to type letters. Only one user -by trial-error- discovered that she could write letters with the number buttons, because the letters were not written on the number buttons like the way in the cellular phones. The other users first tried to understand the meanings of the icons on the screen. 5 of the users stood up to see the icons clearly. Then the next common action was to try to move on the icons and select them, similar with the object-cursor relationship available in computer interfaces. However, as the system interface did not support that kind of interaction, icons were used only to help the users. It can be said that the cause of the problem was *inconsistency* because the users are not familiar with interaction style that requires matching the icons on the screen with the buttons on the remote.

After trying a number of buttons, users realized that one icon was representing the TXT button on the remote which opens an on-screen keyboard and continued with writing the mail address. However, a problem of *clarity* observed when the users tried to delete the letters on the address bar. As the icon on the screen and the button were not similar to each other, they could not find the delete button. Again, it was observed that some users stood up to see the icon clearly.

These problems indicate that, *the novel mailing feature forced users to adapt to a new way of interaction* which requires the usage of TV screen and remote control together. Although some characteristics similar to cellular phone and computer interaction were integrated into the interface, these were not *visible and clear* for most of the participants, mainly because the nature of the task was complicated when compared to a conventional use of the TV with a remote control. This emerged as a problem because the interface of a standard TV set was not providing necessary elements to interact with the system at an acceptable level of ease. H*ybridization* of multiple products required new types of interaction to be presented to the users. Nevertheless, as there was an inconsistency between the interaction style of the task (sending e-mail) and the interface elements (remote control), the interaction was not natural for many of the users.

Another problem of *clarity* was observed in the program listing feature. **Some users had difficulties to understand the abbreviated expressions on the screen.** The feature was integrated into the service for providing easy access to increased number of channels. Although nearly all users found the program guide service useful, the complexity caused by high amount of information on the screen was a problem for some of the users. Some conditions related with the use context, like screen dimensions and distance from the screen, could be the factors that cause the problem to emerge.

Slow data transfer rate of the system was another problem. The participants complained about waiting during interactive channel download. Apart from being a vital cause of *decreased user satisfaction*, the issue also resulted in problems of *user control*.

It was observed that, the lack of *feed back* during the slow transfer rate caused most of the users to be unsure about the system status. In program guide feature, when the users wanted to scroll down through the channel numbers, the yellow cursor and program names disappeared on the screen since the system was slow. At this point, some users waited a response from the system without taking an action. However, after a while -thinking that the system did not receive the feed forward-, they repeated the action several times. Nevertheless, meanwhile the actions also processed and the system jumped to another status *out of the user's control*, or continued to proceed slowly without any user action. Consequently, most users interpreted the result of their action as a system breakdown or as an error, and continued with a wrong step. In some other cases, users kept waiting for a meaningful feedback, trying to figure out the system status. At the result of those series of actions, users either told that 'they do not know how to use the system' or they dropped struggling with the system saying that 'the system is very slow to use, especially when compared to conventional TV broadcast'.

A similar problem occurred during the channel download process because **the system did not give any feedback about its status and the name of the channel downloaded.** During this period, it was observed that users got bored of waiting without being informed. Some participants also complained about seeing the same advertisement every time they log on to a channel.

The main origin of the problem may be that, the possible penalties depending on real use conditions, like low connection speed at peak usage hours or bad weather conditions, was not considered in the design process. The interaction under ideal conditions might not require feedback. However, when the system works slower, *feed back* about system status is required for the user to understand the product and be sure about the steps of the interaction.

Another problem of *user control* was observed when entering channel numbers. Especially when the user was writing a three digit number, the system received only the first/first two

digits because it responded faster than the user. Users could not figure out what happened at the result of their action as they were focused on number buttons on the remote control at that time. This was a main cause for *decreased level of perceived control*.

In addition, when the users entered a wrong channel number, they were unable to correct it because the system gave no response during channel download. Users had to wait the wrong channel to appear on the screen, and then they had to leave that channel by selecting the 'exit' option and then giving approval. Only then, they could enter the number of the channel they wanted. Naturally, the problem of *error recovery* caused by system inflexibility was a disturbing experience for most of the users as they were *unable to control* the system.

One other case was that, **some users lost/were afraid of losing the data they typed on the screen thus doubted to take an action.** This also indicates that users' experience with the system was not clear enough to build a good conceptual model of the system and as a result, caused a feeling of frustration by *low level of control*.

The system also had *inconsistency* problems. Although these problems were mainly specific to the product's design, the variety of functions increased the probability of inconsistency among different features. Complex system with various functions required some buttons to be multifunctional- like OK and Back buttons. It was seen that buttons functioned differently for TV watching features and for interactive tasks, so, users were confused about which button to press when leaving a channel.

In some other cases, **users were confused with the commands on different screens.** It was observed that, especially the users with low computer literacy have difficulties in understanding the 'window' metaphor, thus could not decided if it could be possible to take an action with the command on the backward window. Another problem was that, **users could not understand which command was active (yes/no) in the approval screen** for leaving the channel and made error because of the coding in the *feedback.* However, it was observed that, while users who had experiences with computer programs figured out the cause of the problem after one failure, users with low computer literacy got frustrated and

was not sure if they made a mistake. These examples indicate that, the level of computer literacy became a discriminating factor in the interaction with daily used products.

It is seen that, the results of the field study are in accordance with the arguments presented throughout the research. The points discussed above will be put in the framework of the study in Chapter 6, which presents the conclusions made at the end of the study.

CHAPTER 6

CONCLUSION

In this chapter, a brief overview of the subjects discussed throughout the research will be made, by evaluating the findings of the field study in the context of the arguments put forward. The main conclusions arrived at will be presented.

The research can be reviewed in three main parts, that are, the general conditions that effect the emergence of the problem, the context on which the problem is defined and the evaluation of the problem.

6.1 The general conditions that effect the emergence of the problem

In the first part of the study, the main conditions which affected the emergence of the problem were stated through a general review of the competition-based market dynamics. It was pointed out that, the main drives of contemporary market are product differentiation, innovativeness, rapid rate of change and supply-driven characteristic. With the effects of these dominant factors, technological novelties are utilized by firms to increase their competitive potential in the consumer market. This first part of the study was concluded by putting forward that, the product development processes that are mainly driven by technological novelties rather than user requirements may cause difficulties in use (see part 2.3 of chapter 2). Therefore, the research problem of this study was mainly defined on this general basis, and was formulated as *the negative effects of technology-driven design on user-product interaction and product usability*.

6.2 The contexts that define the problem

In the second phase of the study, the problem was stated through a number of discussions held on the contexts which determine the basis of the issue. It was concluded that, the transformations in the market had a number of outcomes, which as a result caused to the emergence of the problem, when the effects are considered on the related contexts. These can be reviewed as:

Divergent approaches to product quality: Technological novelty and complexity of a product are approached as means of higher product quality in the market. Also the field study indicated that, sample product was embodying a number of excess functionalities which the users were not felt the need to use. While some buttons and functions remain unused because they were not known by the users, some others were considered as unpractical or useless. However, these features affected the use process, by making the interface more complicated.

Changing context of use: With the full development of high-tech product market and prevalent use of computing technology, digital technologies are integrated into the products in everyday use. Hence, the users, tasks and environment; in other words, the *context of use* related to these technologies also mainly altered. On the other hand, depending to the different characteristics of home and work contexts, the knowledge gap between the users and the designers of these technologies increased. Therefore, for instance, while the level of computer literacy required to use a simple product was not a concern for the designers, this may create problems for a regular user during interaction. As also observed in the study, users tried to use the TV set with their past computer experience. However, users with low computer literacy had difficulties in understanding the system status and deciding on which action to take, and rather unmotivated for struggling with the system.

Technology driven design approach in the market: These transformations, in particular, necessitate careful consideration of user characteristics and requirements from the product

usability perspective. However, under the effects of aforementioned factors related to market conditions, generally, these issues are not valued in design process and the design decisions are taken with a *technology-driven* approach.

However, as also stated at the final of this part, the way of interaction with digital products and the contexts in which they are used necessitates *user-centered design* as a counter-perspective of technology-driven design.

6.3 Evaluation of the problem

The fourth chapter of the research mainly considered the influences of the problem on user-product interaction and product usability. Based on the general analysis of user-product interaction process, the research problem was evaluated with a usability perspective. As previously stated, an appropriate user-product interaction mostly depends on how well the user understands the product's functioning. The main usability problems that users encounter with digital products were overviewed and it was concluded that, the qualities, *consistency, compatibility, visibility, feedback, user control* and *error prevention and recovery* are crucial for a product to be usable. The effects of the aforementioned transformations on user-product interaction were analyzed with respect to these qualities, under two main headings:

Transformations in the form-function relationships: The computing-based operating systems have arbitrary relationships with their inner functioning, in contrast with the direct relations in mechanical systems. Therefore, the mechanism structure, function relationships and the condition of the device are *invisible* to the user, if the necessary cues are not provided by the designer. The issue may pose usability problems related with *visibility* and *feedback* criteria. It is also indirectly related with *user control*, as information related to the functioning of the device is of vital importance for the user to have the feeling of control. The results of the problems related with these criteria were also observed in the field study. The

lack of consideration of real use conditions was a cause for the system to proceed slower than it was planned in the design process. This resulted in lack of/slow feedback during interaction. It was seen that most of the users could not understand the system status and were unsure if they took a wrong action. In addition, users occasionally tried other actions or repeated the last action several times, thus the system proceed in an unwanted way. It was a noteworthy result that, especially the users with low computer experience thought the problem emerged because they did not know how to use the system.

Transformations in the product's function:

The issue was discussed under two sub-headings:

Function complexity: An increase in the number of features in a product brings difficulty in use, as the *conceptual model* of a product gets complex. The user can not differentiate the necessary function and interpret the appropriate way of using it. It was observed in the field study that, the increased number of functions and complicated interaction required some additional buttons on a standard remote control. This created both physical and cognitive problems: difficulty in choosing the right control (cognitive) and errors by mistakenly pressing two buttons at a time (physical).

Unclear product identity: Products that integrate different features which were previously a part of various other products may harden user's full understanding of a product's function, owing to product's unclear conceptual model. On the other hand, different combinations of features makes it harder to standardize product interaction, thus requires a continuous learning process for users. For instance, the novel mailing feature integrated in the sample product, required a different type of product interaction. The act of writing letters was a totally novel task for the users in their interaction with a TV set and, as the TV interface did not provide the necessary tools to interact at a higher level of task complexity, there needed another type of interaction to accomplish the task. The process required the users to learn a new way of interaction.

Unclear product identity and function complexity mainly result in inefficiency and difficulty in use. Therefore, although there is an observable trend in the market to achieve product differentiation by integrating increased number and diversity of features into single devices, most of these functionalities remain unutilized, either for their being unnecessary for the user, or due to the increased complexity of the product. However, as it is presented in this thesis, product quality is dependent on the *quality in use*, which is, the quality of a product from the users' perspective. Thus, *user centered design* is required as a vital approach to product design process, for the utilization of novel technologies in the most effective way, by everyone.

REFERENCES

Adler, P. S. and Winograd, T. A. (1992). The usability challenge. In Adler, P. S. and Winograd, T. A. (Eds.), Usability: Turning technologies into tools (pp. 3-14). New York: Oxford University Press.

Aston, A. And Keenan, F. (2001, March, 12). Building 'easy' into technology. Business Week, 3760, 92-93.

Asatekin, M. (1997). Endüstri tasarımında ürün-kullanıcı ilişkileri. Ankara: Publications Committee of METU Faculty of Architecture.

Bauman, Z. and May, T. (2001). The business in everyday life: consumption, technology and lifestyles. In Bauman, Z. and May, T. (Eds.), Thinking Sociologically (pp. 147-162). Oxford: Blackwell.

Berkman. A. E. (2002). The influence of ergonomics on marketing and product styling. Unpublished MSc. Dissertation, METU, Ankara. *(not cited)*

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

Bevan, N. (1995b). Usability is quality of use. In Proceedings of the 6th international conference on human computer interaction, Yokohama, July 1995. Anzai and Ogawa (Eds.), Elsevier.

Bevan, N. (1999). Quality in use: Meeting user needs for quality. Journal of System and Software. 49 (1), 89-96.

Bevan N. and Macleod, M. (1994). Usability measurement in context. Behaviour and Information Technology, 13, 132-145.

Bevan, N. Kirakowski, J. And Maissel, J. (1991). What is usability? In: Proceedings of the 4th International Conference on HCI, Stuttgart, September 1991.

Bias, R.G. (1994). Wherefore cost-justification of usability: Pay me now or pay me later-But how much? In. Bias, R.G. and Mayhew D.J. (eds.), Cost-justifying usability. (pp. 3-8). California: Morgan Kaufmann.

Bonner, J. V. H. (1998). Towards consumer product interface design guidelines. In Stanton N. (Ed.), Human factors in consumer products. (p.p. 239-258) London: Taylor and Francis.

Bonner, J. V. H. (1999). Implications for using intelligence in consumer products. In Green W.S. and Jordan P.W. (Eds.), Human factors in product design: Current practice and future trends (p.p. 64-72). London: Taylor and Francis.

Brooke, J. (1994). SUS: A 'Quick and dirty' usability scale. In Jordan, P.W., Thomas, B. And McClelland, I.L. (Eds.), Usability evaluation in industry, (p.p. 189-194). London: Taylor and Francis.

Buurman, R.D. (1997). User-centred design of smart products. Ergonomics, 40 (10), 1159-1169.

Cockburn, C. (1997). Domestic technologies: Cindrealla and the engineers. Women's Studies International Forum. 20 (3), 361-371.

Cooper, A. (1999). The inmates are running the asylum: Why high-tech products drive us crazy and how to restore the sanity. Indiana: Macmillan.

Day, E. (1986). Defining and evaluating quality: the consumer's view. Advances In Consumer Research. 13 (1), 94-98.

Donoghue, K. (2002). An equilibrium of value: Linking business decisions and user benefits. Interactions. 9 (6), 23-27.

Draper, S.W. and Norman, D.A. (1984). Software engineering for user interfaces. In Proceedings of the 7th international conference on Software engineering. Orlando, Florida, United States. (p.p. 214 – 220). Piscataway: EEE Press

D'Souza, M. E., Dykstra, D. and Poole, A. (1998). Integrating user-centered design within a virtual product development organization: Observations from the field. In Proceedings of the Human Factors and Ergonomics Society. Annual Meeting. Santa Monica.

Forgacs, D. (2001). Scenarios for the digital age: Convergence, personalization, exclusion. Modern Italy 6(2), 129–139.

Freudenthal, A. (2000). Improving home appliances to support the learning phase. In Proceedings of the IEA 2000/ HFES 2000 Congress. (p.p. 6.909–6.912)

Garvin, D.A. (1984a). What does “product quality” really mean? Sloan Management Review. 26 (1), 25-43.

Garvin, D.A. (1984b). Product quality: An important strategic weapon. Business Horizons. 27 (3), 40-43.

Hall, R.R. (1997). Ergonomics, design and new technology. Papers presented at the productivity ergonomics and safety. [On-line]. Available: www.dtir.gld.gov.au/hs/ergo97/hall2.pdf

Hall, R.R., Zinser, S., Keller, P. (1999). The Usability of Time-Setting Functions on Small Electronic Consumer Products: A Test. International Journal of Cognitive Ergonomics, 3 (2), 101-114.

Harrison, M.C., Henneman, R.L. and Blatt, L.A.(1994). Design of a human factors cost-justification tool.. In. Bias, R.G. and Mayhew D.J. (eds.), Cost-justifying usability. (pp. 203-241). California: Morgan Kaufmann.

Hennemann, R.L. (1999). Design for usability: Process, skills and tools. Information, Knowledge and Systems Management, 1 (2), 133-144.

ISO 9241-11:1998 Ergonomic Requirements for Office Work With Visual Display Terminals (VDTs) – Part 11: Guidance on usability

ISO/IEC 9126-1:2001 Software Engineering – Product Quality – Part 1: Quality Model

ISO/CD 20282-1.2:2003. Ease of operation of everyday products – Part 1: Context of use and user chateristics.

ISO 13407:1999(E). Human-centred Design Processes for Interactive Systems

Jamison, A. & Hard, M. (2003). The story-lines of technological change: Innovation, construction and appropriation. Technology Analysis & Strategic Management, 15 (1), 81-92.

Jordan, Thomas, Weeredmeester and McClelland. (1996). Usability Evaluation in industry. London: Taylor & Francis.

Kanis, H. (1998). Usage centered research for everyday product design. Applied Ergonomics, 29 (1), pp. 75-82.

Kanis, H. (1999). Design centered research into user activities. In Green W.S. and Jordan P.W. (Eds.), Human factors in product design: Current practice and future trends (pp. 64-72). London: Taylor and Francis.

Kanis, H., Rooden, M. J. and Green, W. S. (2000). Usecues in the Delft design course. In McCabe, P.T., Hanson, M.A. and Robertson, S.A. (Eds.), Contemporary Ergonomics 2000. London: Taylor and Francis.

Karat, C.M. (1994). A Business case approach to usability cost justification. In. Bias, R.G. and Mayhew D.J. (eds.), Cost-justifying usability. (pp. 45-70). California: Morgan Kaufmann.

Lardner, J., LaGesse, D., Rae-Dupree, J. and Roane, K.R. (2001) Overwhelmed by tech. U.S. News and World Report, 130 (2), 30-35.

Leonard, D. and Rayport, J.F. (1997). Spark innovation through empathic design. Harvard Business Review, 75 (6), 102-114.

Lorenz, C. (1990). The design dimension: The new competitive weapon for product strategy and global marketing. Oxford: Basil Blackwell.

Macleod, M. (1994). Usability in context: Improving quality of use. In Bradley, G. And Hendricks, H.W. (Eds.) Proceedings of the International Ergonamics Association 4th International Symposium on Human Factors in Organizational Design and Management, Stockholm, May 29-June 1. Amsterdam:Elsevier.

Manzini, E. (1998). Products in a period of transition: Products, services and interactions for a sustainable society. In T. Balcıoğlu (Ed.) The role of product design in post-industrial society. Ankara: METU Press.

Martin, M. (2001). What's wrong with high tech?. Intercom, 48 (6), 3.

Mok, C. (1996). Designing business: Multiple media, multiple disciplines. California: Adobe Press.

Norman, D. A. (1999). The invisible computer: Why good products can fail, the personal computer is so complex, and information appliances are the solution., Cambridge: MIT Press.

Nahm, A. Y. And. Vonderembse, M. A. (2002) Theory development: An industrial/post-industrial perspective on manufacturing. International Journal of Product Research 40 (9), 2067-2095.

Nicoll, D. W. (2000). Users as currency: Technology and marketing trials as naturalistic environments, The Information Society, 16, 303–310.

Norman, D.A. (1988). The psychology of everyday things. New York: Basic Books.

Norman, D. A., (1993). Things that make us smart: Defending human attributes in the age of the machine. Massachusetts: Perseus Books.

Norman, D.A. (1997). Toward human-centered design. Technology Review, 96 (5), 47-53.

Norman, D.A. (1999). Affordances, constraints and design. Interactions, 6(3), 38-42.

Norman, D. A. (1999). The invisible computer: Why good products can fail, the personal computer is so complex, and information appliances are the solution., Cambridge: MIT Press.

Quiroga, C. A. (2001) Predatory innovation: A step beyond? (Understanding competition in High-technology markets). International Review Of Law Computers &Technology, 15 (1), 7–33.

Raskin, J. (2000). The humane interface: New directions for designing interactive systems. Boston, Addison Wesley.

Rubin, J. (1994). Handbook of usability testing: How to plan, design and conduct effective tests. New York: John Wiley and Sons.

Sade, S. (1999). Representations of smart product concepts in user interface design. In Green W.S. and Jordan P.W. (Eds.), Human factors in product design: Current practice and future trends (pp. 64-72). London: Taylor and Francis.

Salvo, M.J. (2001). Ethics of engagement: user-centered design and rhetorical methodology. Technical Communication Quarterly, 10 (3), 273-290.

Schmid, B. F. (2001). What is new about the digital economy? Electronic Markets, 11 (1), 44–51.

Shneiderman, B. (1997) Direct manipulation for comprehensible, predictable and controllable user interfaces. In Proceedings of the 2nd international conference on Intelligent user interfaces. Orlando, Florida, United States. (p.p. 33-39) New York: ACM Press

Sinkovics, R.R., Stöttinger, B., Schlegelmich, B.B., and Ram, S. (2002). Reluctance to use technology – related products: Development of a technophobia scale. Thunderbird International Business Review, 44 (4), 477-494.

Smith, C. (1998, February). Usability and user requirements. European Journal of Engineering for Information Society Applications [On-line], 1. Available: www.ejeisa.com/nectar/journal/00/002.htm

Smith, C.D. (1998). Tansforming user-centered analysis into user interface: The design of new generation products. In : Wood, L.E. (Ed.), User Interface Design: Bridging the gap from user requirements to design. Boca Radon: CRC.

Solomon, M. R. (1999). Consumer behavior. New Jersey, Prentice Hall.

Stanton, N. and Baber, C. (1998). A Systems analysis of consumer products. In Stanton N. (Ed.), Human factors in consumer products. (p.p. 75-90) London: Taylor and Francis.

Steven, M. (1998). Consumerism: As a way of life. London: Sage Publications.

Sugar, W.A. (2001) What is so good about user centered design? Documenting the effects of usability sessions on novice software designers. Journal of Research on Computing in Education, 33 (3), p. 235- 250.

Tapscott, D. (1995). The digital economy: Promise and peril in the age of networked intelligence. New York: Mcgraw Hill.

Teeravarunyou, S. and Sato, K. (2001). User process based product architecture. In The Proceedings of World Congress on Mass Customization and Personalization, October 1-2. pp. 1-10. Hong Kong

Thackara, J. (2001). The design challenge of prevasive computing. Interactions, 8 (3) 46-52.

Thomas, C. And Bevan, N. (1996). Usability context analysis: A Practical guide. Version 4.04. Middlesex: National Physical Laboratory.

Ulrich and Eppinger, (2000). Product design and development. Boston: Irwin and McGraw Hill.

Wichansky, A.M. (2000). Usability testing in 2000 and beyond. Ergonomics, 43 (7), p. 998-1006.

Wiklund, M.E. (1994). Introduction. In Wiklund, M.E. (ed.), Usability in practice (pp. 1-20). London: Academic Press.

APPENDIX A

MAIN INTERFACE ELEMENTS OF THE SAMPLE PRODUCT

Figure 1 The receiver box of the digital broadcasting service

Table 1 Functions of the buttons on the receiver box

Button	Function
OPTIONS	Main menu appears on the screen
INFO	Info page appears on the screen
BACK	System returns to the previous menu
OK	Accepts the active option
●	Red light) Shows Digibox is in standby pozition
◀	Enables navigation in options to left
▶	Enables navigation in options to right
▲	Enables navigation in options upwards
▼	Enables navigation in options downwards
⏻	Digibox shifts to standby position

Table 2 Functions of the buttons on the remote control device

no	Button	Function
1	**standby**	Brings Digibox to standby position
2	**sat**	Takes the remote contol to Digbox position
3	**tv***	Takes the remote contol to TV position in compatible TV's
4	**vcr***	Takes the remote contol to VCR position in compatible VCR's
5	**aux***	Takes the remote contol to stereo system position in compatible stereos
6	**favourites**	Enables easy access to favourite channels set by the user
7	**info**	Brings the information page
8	**themes**	Arranges program guide according to program type
9	**guide**	Brings program guide on the screen
10	**options**	Opens the main menu
11	**ok**	Activates the seleted options
12	**direction-CH**	Enables transition between the channels and options
13	**page**	Opens info screen of a program on another channel
14	**back**	Returns to the previous menu
15	**PP**	Returns to the last program
16	**volume***	Controls volume in compatible TV's
17	**mute***	In compatible TV's turns off the voice, when pressed again, turns on
18	**tv/av**	Enables the transition between TV and AV positions
19	**txt***	Opens teletext in compatible TV's
20	**language**	Shifts the program language to original
21	**VCR controls***	Controls compatible VCR's
** Active only in compatible systems*		

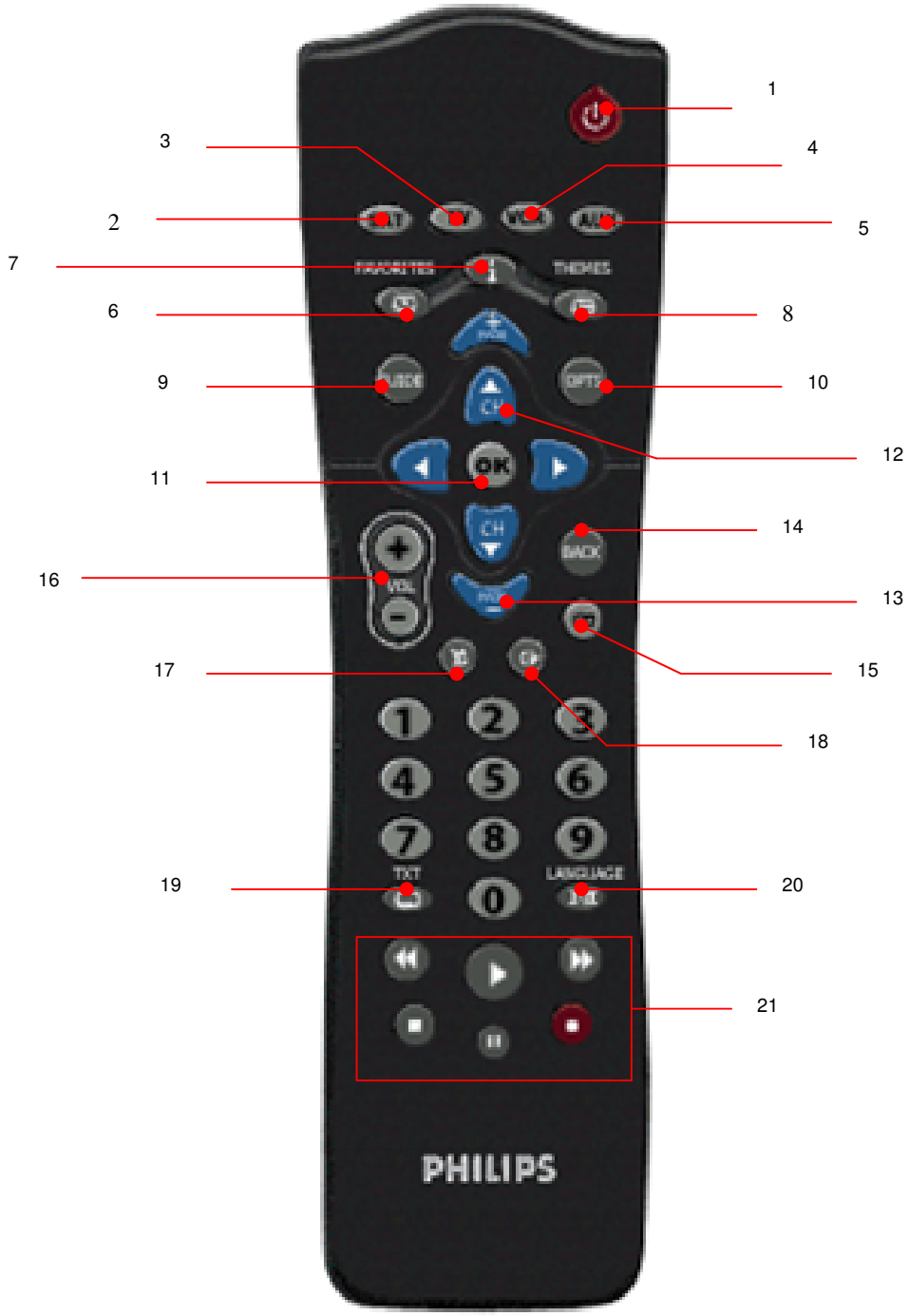


Figure 2 The remote control of the digital broadcasting service (One-to-one proportion)

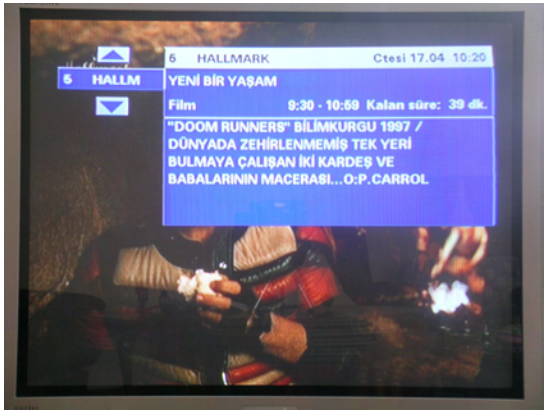


Figure 3 Program info (Task 1)

Figure 4 Program Guide (Task 2)

Figure 5 Program info of another channel

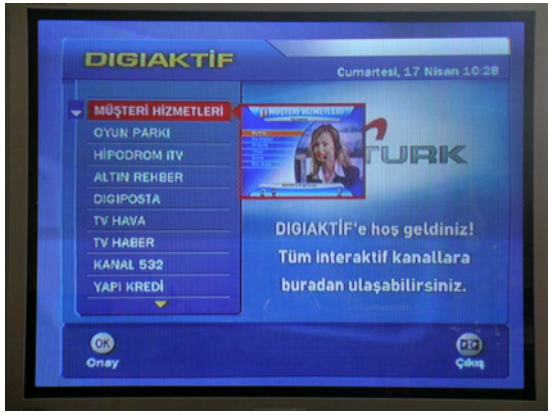


Figure 6 Main page for interactivechannels (Tasks 4,5 and 6)

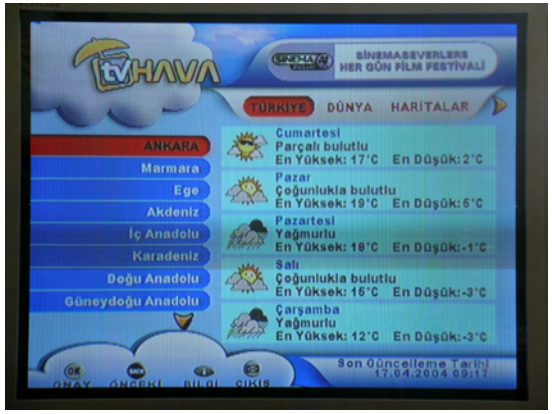


Figure 6 Main page for interactivechannels (Tasks 4,5 and 6)

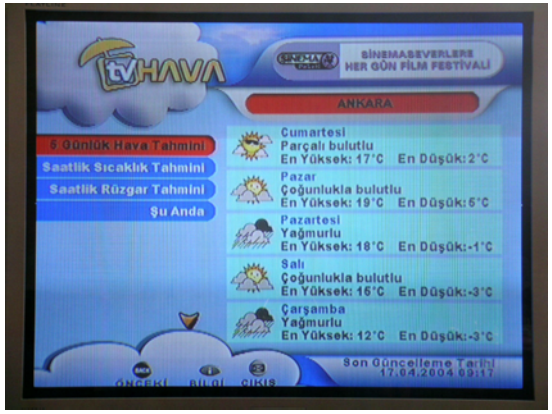


Figure 8 Weather forecast information page for Ankara (Task 5)

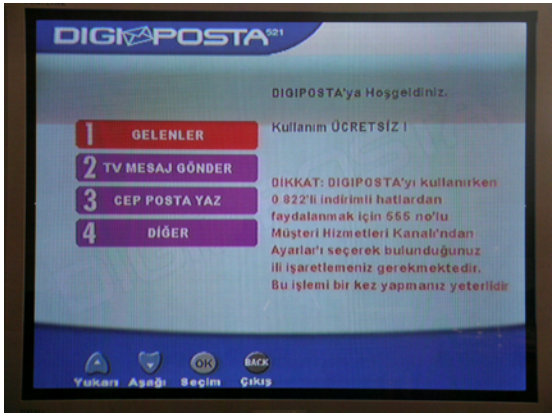


Figure 9 Main page of the mailing service - Digiposta (Task 4)

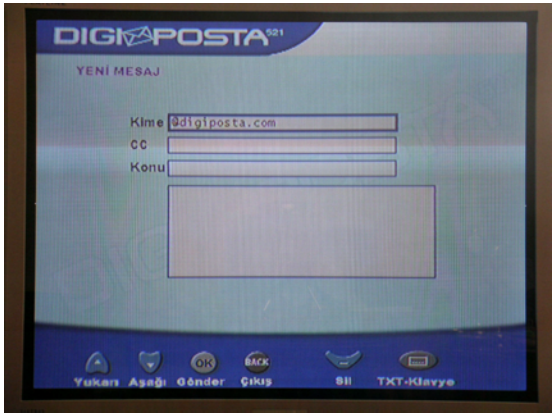


Figure 10 Mail writing screen - Digiposta (Task 4)

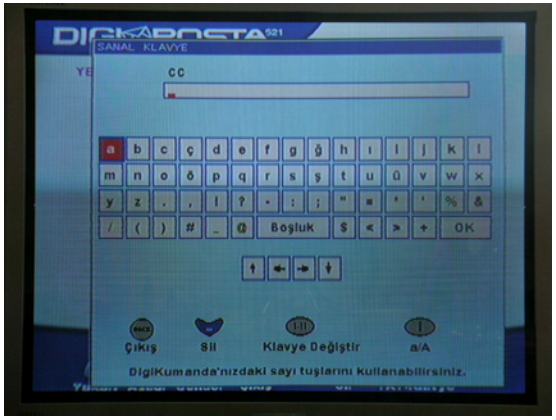


Figure 11 1st on-screen keyboard -Digiposta

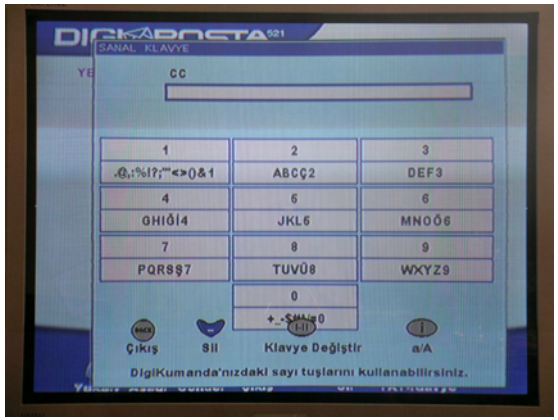


Figure 12 2nd on-screen keyboard of the mailing service (Task 4)

Figure 13 User name and password window - Digiposta (Task 4)

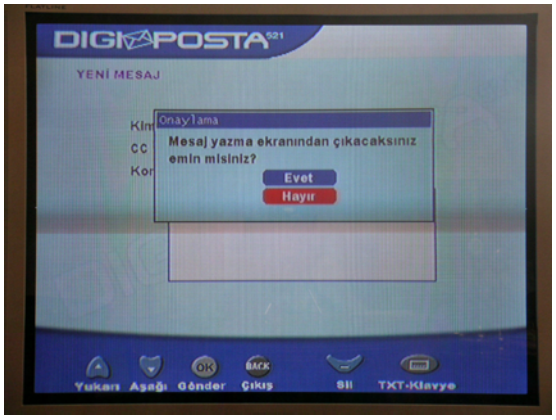


Figure 14 Approval window for leaving the mailing service - Digiposta (Task 4)

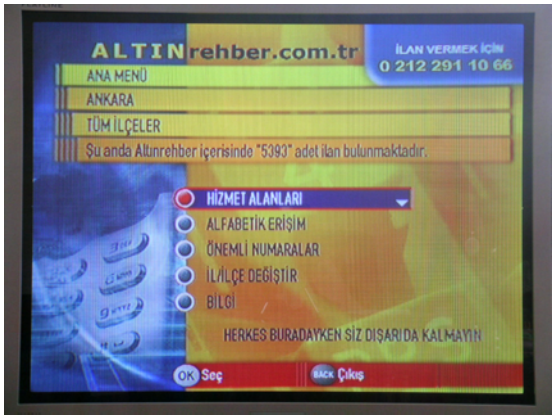


Figure 15 Main page for the telephone - address directory service – Altınrehber (Task 6)

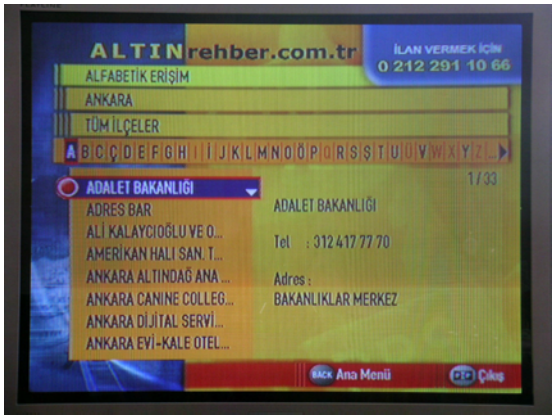


Figure 16 Alphabetical search page of Altınrehber (Task 6

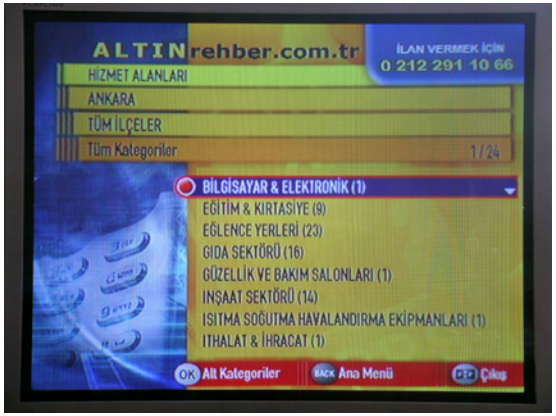


Figure 17 category search page of Altınrehber (Task 6)

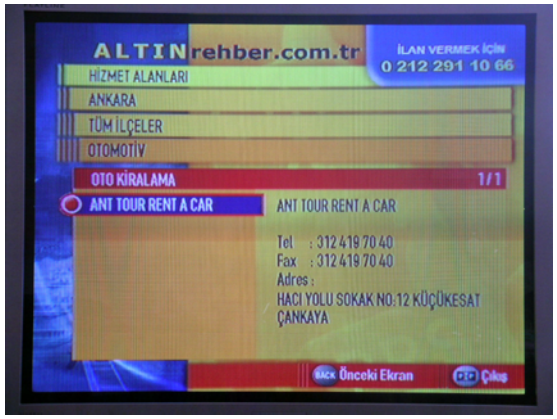


Figure 18 Address page of Altınrehber (Task 6)

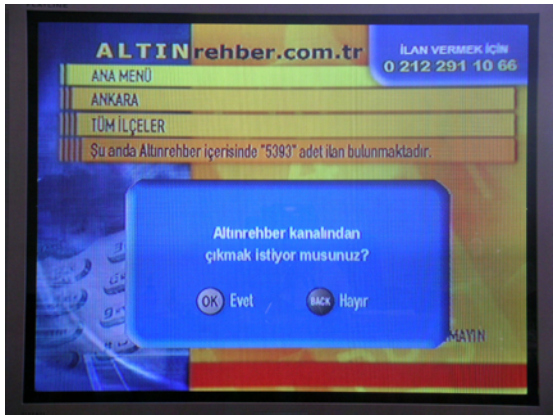


Figure 19 Approval window for leaving Altınrehber

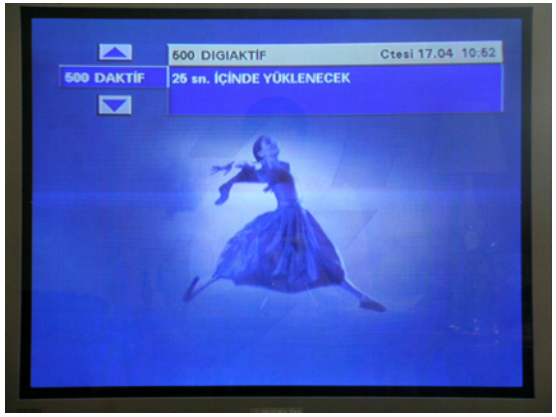


Figure 20 Screen during channel download (appears for a few seconds)

Figure 21 Empty screen during channel download

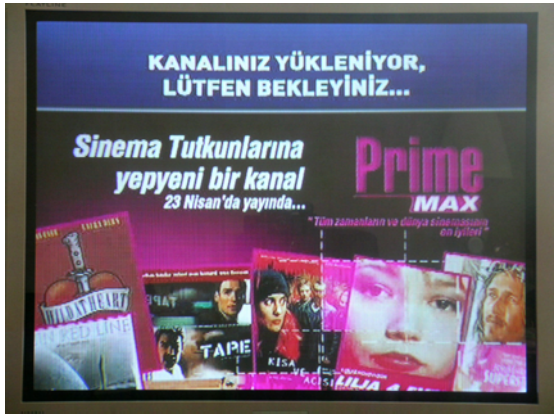


Figure A1.21 Advertisement screen during channel download

Table 3 List of Channels integrated in the sample product

Kind/name of the channel	Channel number
Digitürk advertising channel about novel programs and services	1
Conventional TV channels	2 - 108
Film purchasing channels	201, 202, 203
Digiturk channels	301-306, 333
Digital radio channels	400 - 445
Interactive service channels	
Digiactive (Main axcess channel)	500
Altın Rehber (Telephone / address directory)	505
Pamukbank (TV banking)	510
TV Banka (TV banking)	515
Digiposta (Mailing and messaging)	521
Turkcell 532 (Cellular phone service information and billing)	532
TV Haber (News)	540
TV Hava (Weather forecast)	545
Customer services	555
Oyun Parkı (TV games)	565
Hipodrom iTV (virtual horce race)	575

APPENDIX B

FIELD STUDY QUESTIONNAIRE AND THINK ALOUD TASKS

Bu anket, ODTÜ Endüstri Ürünleri Tasarımı Bölümü'nde yürütülmekte olan bir tez çalışması kapsamnda hazırlanmıştır. Ankette amaçlanan, ***kullanıcıların dijital televizyon yayını hizmetleri hakkındaki düşünceleri, bu hizmetlerden beklentileri ve kullanım sırasında karşılaştıkları zorluklar*** *konusunda bilgi toplamaktır. Verdiğiniz cevaplar, sadece akademik amaçlı yürütülecek çalışmalarda kullanıcak, hakkınızda herhangi bir kişisel bilgi bu çalışmalarda yer almayacak, ilgili eğitmen dışındaki şahıslarla paylaşılmayacaktır. Verdiğiniz bilgiler doğru veya yanlış olarak değerlendirilmeyeceğinden düşüncelerinize en yakın cevapları vermeniz, çalışmanın başarısı açısından önemlidir.*

Zaman ayırdığınız ve çalışmaya katkıda bulunduğunuz için teşekkür ederim.

Pelin Gültekin
ODTÜ Endüstri Ürünleri Tasarımı Bölümü
Yüksek Lisans Öğrencisi

KULLANICIYA AİT BİLGİLER

1. Yaşınız:

2. Cinsiyetiniz: ☐ K ☐ E

3. Bilgisayar kullanıyor musunuz?

☐ Evet ☐ Hayır (cevabınız hayır ise 5. soruya geçiniz)

4. Hangi amaçlarla bilgisayar kullanıyorsunuz?

☐ İnternet erişimi ☐ Office programları (Word, Excel...vb.) ☐ Özelleşmiş programlar

5. Cep telefonu kullanıyor musunuz?

☐ Evet ☐ Hayır (cevabınız hayır ise 7. soruya geçiniz)

6. Cep telefonunuzun sesli iletişim dışındaki fonksiyonlarını kullanıyor musunuz? Hangi fonksiyonlar?

☐ Mesaj göndermek ☐ Hatırlatmalar, oyun, fotoğraf çekme...vb. yan fonksiyonlar ☐ Wap ☐ Kullanmıyorum

7. Lütfen aşağıdaki cümlelere ne kadar katıldığınızı işaretleyin.

	Katılıyorum ← → **Katılmıyorum**						
	6	**5**	**4**	**3**	**2**	**1**	**0**
Elektronik ve teknolojik ürünlere karşı ilgiliyim.							
Kullandığım elektronik ürünlerdeki fonksiyonların hepsini keşfetmeye ve kullanmaya çalışırım.							
Elektronik ürünleri seçerken fonksiyonlarının çok ve çeşitli olması benim için en önemli bir kriterdir.							
Elektronik ürünleri kullanmadan önce mutlaka kullanım kılavuzunu okurum.							
Özellikle fazla hakim olmadığım elektronik aletleri kullanırken bozmaktan çekiniyorum.							
İnternet kullanımı konusunda tecrübeliyim, sorun yaşamıyorum.							
Teknolojik yenilikleri takip ederim.							
Office programlarını sorunlarla karşılaşmadan ve yardım istemeden kullanabiliyorum.							
Kullandığım, belli bir amaca özelleşmiş programları sorunlarla karşılaşmadan ve yardım istemeden kullanabiliyorum.							
Elektronik ürünleri genellikle zorlanmadan kullanabiliyorum.							

DİJİTAL YAYIN KULLANIMIYLA İLGİLİ BİLGİLER

8. Kullandığınız Digitürk paketi:

9. Digitürk'ü ne kadar zamandır kullanıyorsunuz?

- ☐ 2 aydan az
- ☐ 2-6 ay
- ☐ 6 aydan fazla

10. Günde ortalama ne kadar süre Digitürk seyrediyorsunuz?

- ☐ 2 saatten az
- ☐ 2-5 saat
- ☐ 5 saatten fazla

11. Digitürk'e abone olurken öncelikli olarak hangi hizmetlerini dikkate aldınız?

12. Digitürk'ü kurarken, sistemi ve kumandayı nasıl kullanacağınız konusunda bilgi veren bir açıklama/doküman verdiler mi? Kullanmayı nasıl öğrendiniz?

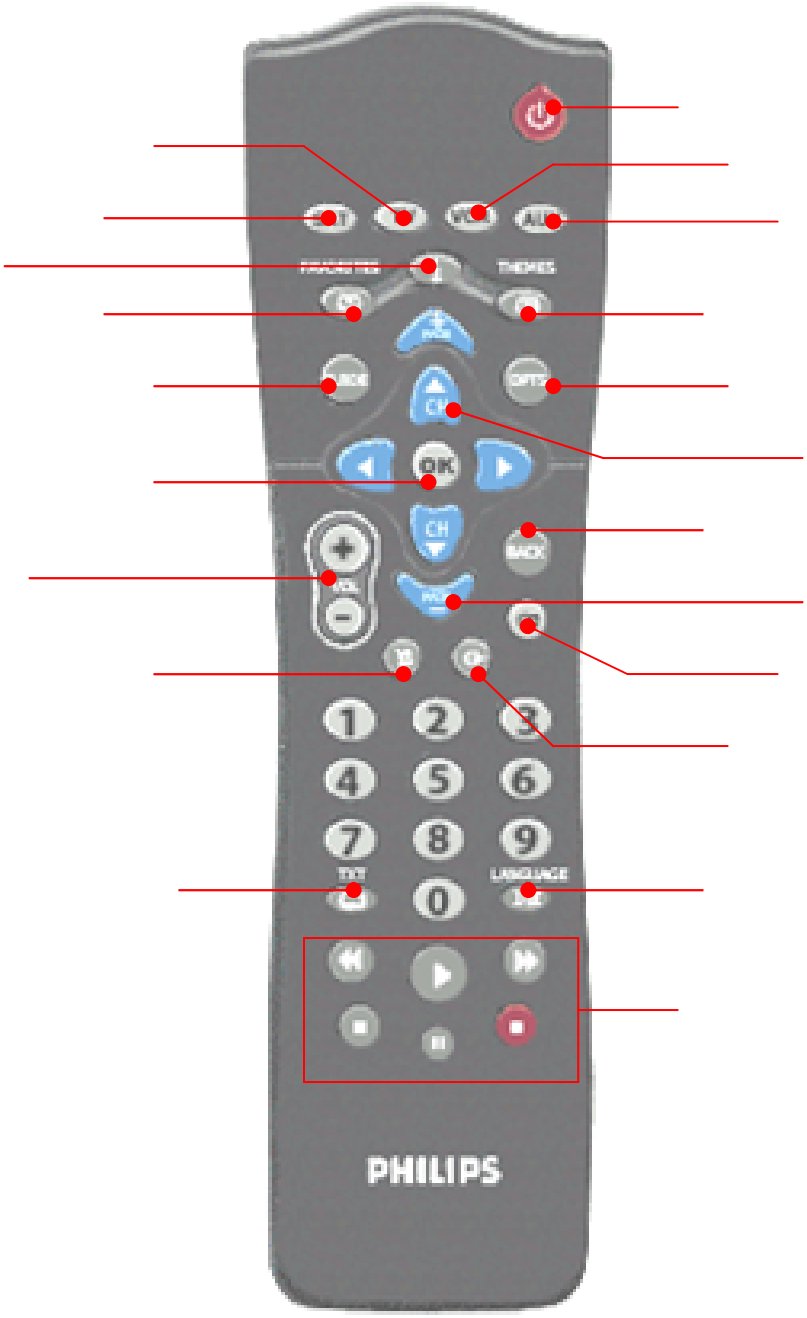
13. Digitürk'ü kullanırken bir başkasından yardım alıyor musunuz? Ne konuda?

14. Digitürk'ü kullanırken servis ya da kanallara bağlanmakta sorun yaşadınız mı? Nasıl sorunlar?

15. Digikutu kullanımıyla ilgili sorunlarla karşılaştınız mı? Nasıl sorunlar?

16. Digitürk kullanımında, genelde tekrarlanan bir şekilde karşılaştığınız herhangi bir problem var mı? Nedir?

17. Digitürk ile beraber kullandığınız uzaktan kumandada bulunan düğmelerin fonksiyonlarını biliyorsanız, düğmelerle ilişkili olan yerlere fonksiyonunu yazınız. Bilmiyorsanız boş bırakınız. Kullandığınız düğmeleri X koyarak işaretleyiniz.



18. Aşağıda listelenmiş Digitürk hizmetlerini kullanıp kullanmadığınızı, en yakın cevaba ait bölümü işaretleyerek belirtiniz.

	Kullanıyorum							Kullanmıyorum			
	Memnunum ← 6	5	4	3	2	1	Memnun değilim → 0	Hizmetten haberim yok	İhtiyaç duymuyorum	Pratik ve kolay değil	Diğer (belirtiniz)
Film satın alma											
Radyo kanalları											
Müşteri hizmetleri											
Oyun Parkı											
Altın rehber											
Digiposta											
TV Hava											
TV Haber											
Kanal 532											
TV Banka / Pamukbank											
Hipodrom iTV											
Program içerikleri hakkında bilgi											
İzlenen programın dilini değiştirme											
E-rehber (Guide)											
Program hatırlatma											
Seçtiğiniz programlara kolay ulaşma											
Bir kanaldayken diğer kanaldaki program bilgisine ulaşma											

19. Aşağıda dijital televizyon yayını ile verilebilecek servislerin bir kısmı bulunmaktadır. Bu servislerin kullandığınız dijital televizyon yayını kapsamında bulunması sizce gerekli mi? Bulunursa kullanır mısınız?

Dijital Televizyon Yayını Hizmetleri	Gerekli ← 6	5	4	3	2	1	0 → Gereksiz	Kullanırım	Kullanmam
Film satın alma									
Güncellenmiş televizyon programı bilgilerine ulaşma									
Yüksek kalitede ses ve görüntü									
Dijital radyo kanallarına ulaşma									
Televizyon oyunları									
Televizyondan e-posta ve mesaj alma-gönderme									
Televizyondan yakınlarınızın fotoğraflarını alabilme									
Televizyondan bankacılık / ödeme hizmetlerine erişme									
Şehirde trafik akışı hakkındaki son durumu kontrol edebilme									
Haber-hava durumu bilgilerine ulaşma									
Sizin ilgi ve ihtiyaçlarınıza özelleşmiş reklamlar									
Marketteki ürünlerin fiyatlarına ulaşma									
Yerel hizmet bilgilerine (yakın restoranlar, önemli telefonlar, otobüs, tren, uçak saatleri...vb.) ulaşma									
Online alışveriş									
Televizyondan borsa ve yatırım bilgilerine ulaşma									
Emlak ve vasıta ilanları verme / ilanlara ulaşma									
Yakın bir restorandan yemek siparişi verme									
On-line tartışma forumlarına ulaşma									

SENARYOLAR

1. Televizyonu açın ve CNBC-E kanalına ulaşın. Bu kanalı seyrederken şu an gösterilmekte olan programın içeriğine ulaşın.

SORU: 2. kumanda kullanmak konusunda ne düşünüyorsunuz?

Digitürk'te istediğiniz kanala ulaşma konusunda problem yaşıyor musunuz?

Program içeriklerine ait bilgilerden yararlanıyor musunuz?

2. Bu akşam seyretmeyi düşündüğünüz bir program başladığı zaman Digitürk'ün hatırlatması için gerekli ayarlamaları yapın.

SORU: Bu özellikten haberiniz var mıydı?

Daha önce kullandınız mı? Kullanışlı mı?

3. Şu anda seyretmekte olduğunuz programı seyretmeye devam ederken TRT1'de gösterilen programın ne olduğunu öğrenin.

SORU: Bu özellikten haberiniz var mıydı?

Daha önce kullandınız mı?

Genel Soru: Digitürk'ün televizyon programları ile ilgili bilgilere ulaşmak için sunduğu servisleri kullanmakta zorluklarla karşılaşıyor musunuz?

4. Televizyonunuzdan peling@mail.com adresine "deneme" başlığında bir e-posta atın.

SORU: Televizyonunuzdan başka bir televizyona, cep telefonuna veya bilgisayara mesaj göndermeyi faydalı buluyor musunuz?

Sizce pratik ve kolay bir yöntem mi?

Daha önce kullandınız mı?

Kullanırken yardım istediniz mi?

5. Havanın yarın Ankara'da kaç derece olduğunu öğrenin.

SORU: Bu servisi daha önce kullandınız mı?

6. Bir araba kiralamak istiyorsunuz. Digitürk'ten işinize yarayacak bir telefon bulun.

SORU: Daha önce bu servisten yararlandınız mı?

Pratik ve kolay buluyor musunuz?

This page that was prepared to give to the participant during think aloud sessions.

SENARYOLAR

1. Televizyonu açın ve CNBC-E kanalına ulaşın. Bu kanalı seyrederken şu an gösterilmekte olan programın içeriğine ulaşın.

2. Bu akşam seyretmeyi düşündüğünüz bir program başladığı zaman Digitürk'ün hatırlatması için gerekli ayarlamaları yapın.

3. Şu anda seyretmekte olduğunuz programı seyretmeye devam ederken TRT1'de gösterilen programın ne olduğunu öğrenin.

4. Televizyonunuzdan peling@mail.com adresine "deneme" başlığında bir e-posta atın.

5. Havanın yarın Ankara'da kaç derece olduğunu öğrenin.

6. Bir araba kiralamak istiyorsunuz. Digitürk'ten işinize yarayacak bir telefon bulun.

Çalışma sona ermiştir. Katıldığınız için teşekkür ederim.

APPENDIX C

THE DATA RELATIVE TO THINK ALOUD SESSIONS IN THE FIELD STUDY

P1: Pınar A.	
T1: 0:31:36>0:33:30	Önce televizyonu televizyon kumandasıyla açıyorum. Oradan AV kanalıyla, arkadan Digitürk'te bir kanala basarak Digitürk'e geçiyorum. Ondan sonra istediğim bir programı belirleyerek ya sırayla devam ederek... Ya da bildiğim bazı kanallar var, örneğin 15 TRT1, (yazarken hata yapıyor, tekrar 15 yazarak teker teker artırıyor.) CNBC-e kanalına bu yolla geliyorum. CNBC-e kanalını çok fazla seyretmediğim için kanal numarasını bilmiyorum ama günlük seyrettiğim kanalların program numaralarını biliyorum. Diğerlerini kanallarda yukarı-aşağı kullanarak ulaşıyorum. Program içeriğine ulaşmak için üzerinde 'i' yazılı tuşu kullanarak konu hakkında bilgi ediniyorum.
2 kumanda	2 kumanda birden kullanmak sevimsiz. Çünkü zaman zaman bunu kullanırken bir anda ses için yanılıp basıyorsun, o zaman kaybediyorsun veya program değişiyor. Çünkü devamlı ya ses için biri elinde olacak öbüründe de kanalları ayarlamak için olacak Kullanışlı değil. Ama alıştım. Böyle kullanıldığı için kullanıyoruz.
>İstediğiniz kanala ulaşmada sorun yaşıyor musunuz?	Çok yaşamıyorum.Çok da fazla iyi bir Digitürk izleyicisi değilim belki, çok iyi bir TV izleyicisi de değilim. İzlediğim belli programlar var, onları da ezberlemiş durumdayım biliyorum.
T2: 0:35:13 > X *>Nereden yapılıyor olabilir?*	Ben onu bilmiyorum. Guide'dan öğrenebilirim belki (Guide'ı açıyor. Yanlışlıkla 2 kere bastığı için tekrar çıkıyor.) Yine bu çıktı... (tekrar giriyor.) Mesela Starda ana haber... (aşağı-yukarı oklara basarak ilerlemeye çalışıyor. Page – tuşunu da deniyor. Yukarıdaki pencerede program ismi değişiyor ama bunu anlayamıyor. Sarı işaretleyici gözükmediği için nerede olduğunu anlayamıyor.) Yani kullanmasını bilmiyorum. Yan taraftan o iniş hangisinden.. Hiç kullanmadığım için... Aşağı doğru gitmek istiyorum, Star'ı bulup, Star ana haber'i bulup... onun için de ne diyor... (kumandayı inceliyor) Hiç ilgi alanımda olmadığı için de bilmiyorum. Bunlardan birinden kullanacağım, devam edeceğim öyle mi... tema... (themes tuşundan bahsediyor. Teker teker düğmelerin ne işe yarayabileceğini düşünüyor. Oklarla işlemi yapamayınca ayrı bir tuş arıyor) Şu mu oluyor: language... yok değil (aslında bu düğmenin dil değiştirme için olduğunu biliyor ama bir kez daha deniyor. Page – tuşuna 4 kere daha basıyor. Ekranda bazı değişiklikler olsa da anlam veremiyor.) Hayır... Ben bu kullanımı bulamadım (guide'dan çıkıyor).

>Bu özellikten haberiniz var mıydı? Kolay mı?	Bunu biliyorum. Ama hiç kullanmadım. İhtiyaç duymadım daha doğrusu. Eğer kullanımını biliyorsanız ve ilgi duyuyorsanız tabi kolay.
T3: 0:37:58> X !HATA! fonksiyon gösterilmedi	Yani bunu seyrederken ben TRT'de ne olduğunu görmek istiyorsam TRT1'in program sayısını bildiğim için basıyor ve TRT1'e geçiyorum. Bu şekilde.
GS:	Kullanmadığım için net cevap veremeyeceğim. Ben bunların hiçbirini kullanmıyorum. Kullanmadığım için de öyle bir zorluk yaşar mıyım yaşamaz mıyım... İlgi duyduğum zaman, demin yaptığımız şeyi öğrenmek istiyorsam okurum ve öğrenerek yaparım. Ama şu anda böyle bir şeye ihtiyaç duymadığım için... Ama ihtiyaç duyduğumu hissettiğimde kitapçığı kullanarak istediğim şeye ulaşabilirim.
T4: 0:39:41 > X	Böyle bir şeyi yapma şansım yok. Çünkü bilmiyorum.
>Nereden yapılıyor olabilir? Hiç rastladınız mı?	Hiç rastlamadım, hem de hiç ilgi alanıma girmediği için hiç ilgilenmiyorum. Dolayısıyla şimdi buradan nereden yaparım diye (kumandayı inceliyor) bilmeden bunun üzerinde uğraşmak yanlış olur. Ama yine yapmak istiyorsam böyle birşeyi kitapçığı alıp öğrenirim. Çok zorlanıyorsam da servisine telefon ederim, onlar çok güzel anlatıyorlar adım adım yapıyorsunuz. Çok ihtiyaç duyarsam bu yolları denerim.
Açıklama:500	(500 kanalını tuşluyor) Yalnız bu bilmiyorum nedir, biraz geç ulaşıyor. Bu sıkıntılı oluyor. (biraz bekledikten sonra ekran yükleniyor) *>Görüyor musunuz şimdi buradan nereden ulaşabileceğinizi*? (teker teker başlıkları geçiyor. Ama bulamıyor. Digiposta olduğu söyleniyor. Gidip seçiyor. Beklemeden sonra sayfa geliyor. Fonksiyon hakkında genel bir açıklama yapılıyor. Kullanıcı 'diğer' seçeneğine giriyor.)
Genel görüş	Tebrik kartı... Ne alaka? Gönderiyor mu? (gülüyor) Şimdi tabi ben tebrik kartını da kendi elimle yazıp göndermeyi tercih ederim. Ben mektubu da kalemle kağıtla yazıp göndermeyi tercih edenlerdenim. Ben kendi adıma faydalı bulmuyorum ama bu teknikle 21. yy.da yaşayan insanların da bunu bilmesi ve kullanması gerekli olduğuna da inanıyorum. Ama ben kullanmıyorum. Buradan çıkıyorum şimdi.

	(çıkmak için back'e basıyor. 'Çıkmak istiyor musunuz? Evet-Hayır' penceresi geliyor. Seçenek için ayrım belirgin olmadığı için hayır'dayken OK'e basıyor. Geri dönüyor.) Çıkış... Evet değil mi? (tekrar aynı şey oluyor. Seçilen seçeneğin kırmızı olduğu açıklanıyor. Çıkıyor.)
T5: 0:44:18>0:46:00	Hava durumuna gideceğiz o zaman öyle mi? Ben onun da numarasını bilmiyorum. (Guide'ı açıyor) TV Hava... Değil mi? 545. Şimdi ben böyle gitmektense 545'ten bularak gitsem daha kolay olmaz mı? Çünkü demin öbür türlü demin kullanamadım. (Guide'da iken 545 yazıyor. OK'e basmadığı için Guide'da sarı işaretleyicinin 545 kanalında olduğu ekran geliyor.) 545 değil mi?
Yardım: feedback	(Tekrar 545 yazıyor ve bekliyor. Guide'dan çıkmazsa kanalın gelmeyeceği söyleniyor. Guide'dan çıkıyor, kanal numarası olarak 545 yazıyor.) Ne kadar ilgisiz olduğumu görüyorsun. Hiç hazzetmediğim birşey. Ama zaten yaşımı verdiğin zaman anlaşılır. (Sayfa geliyor. Ankara sayfası açık, task tamamlanıyor.)
>Sizce kullanışlı bir fonksiyon mu?	Haftalık bir meteoroloji bilgisine ben ne derece ihitiyaç duyuyorum o soru işareti. Günlük hava raporunu zaten haberlerde alıyoruz, gazetelerde alıyoruz. Doayısıyla çok ekstra, ancak bir yurtdışına ya da seyahate gideceksem, bir üç günlük hava raporunu almak istersem o zaman gerekli. Onun dışında gerek duyduğum bir kanal değil.
T6: 0:47:20>0:55:33 (Yardım ile)	Digitürk'ün böyle bir hizmeti var mı? *> bu bilgiye ulaşabiliyorsunuz.* Hmm.. Bu vesileyle ilk defa duymuş oldum. Şimdi devamlı araba kiralayacağım o zaman. (gülüyor) Şimdi o zaman nereden kiralayacağız... Yine Guide'a gideceğiz o zaman. Oradan bilgi alacağız. Başka yolla ulaşmasını bilmiyorum. (Guide tuşuna basıyor. Ekran gelmekte gecikince bulunduğu ekrandan çıkmadığı için olduğunu düşünerek back'e basıyor. Tekrar Guide basıyor. Feedback geç olduğu için guide ekranı gelip-gidip tekrar geliyor. Sırayla kanalları okuyor) M.Hizmet... Bu olabilir mi acaba? (Yukarı çıkmak için CH+ ya basıyor. Ama feedback yavaş olduğu için sarı işaretleyici gözükmüyor.) Niye gitmiyor bu? Şununla gidiyorum değil mi? (Page+ tuşunu denemesi söyleniyor. Ona basıyor. Ekran değişmeyince birçok defa basıyor ve ilk sayfalara geliyor.) *>Geçtiniz...* (arka arkaya page- tuşuna basıyor. Çok iniyor. Her seferinde 1 sayfa geçtiği ve 2 sayfa geride kaldığı söyleniyor. Sayfaya geliyor.) *>Bu sayfada bununla ilgili bir bilgi var görebiliyor musunuz?*

Hayır.
>505 AltınR. Yazıyor. Altınrehber'in kısaltılmışı.
Guide'dan çıkıp 505'ten (Çıkıp 505 yazıyor. Kanal yüklemeye başlıyor.) Çok bekliyorsun. Özellikle oyun kanalına girmek istediğim zaman, oyun kanalına giriyorsun bir miktar bekliyorsun. Kanalınız yükleniyor 26sn. diyor. Ondan sonra OK veriyorsun oynayacağın oyunla ilgili. Bu sefer de ondan sonra bekliyorsun. O oyundan çıktım başka oyuna geçeceğim, 1 şeye basıp aktarmalıyım ben onu. Hayır. Yine aynı yolla geri dönüyor, kanalınız yükleniyor diyor 26 sn., tekrar oyunu seçiyorsun, tekrar bekliyorsun. Zaman kaybı tabi. Ama bunları yapan insanlar da boş insanlar tabi bekleyebilirler. Onun karşısına oturup oyun oynuyorsan öyle bir boş vaktin var demektir. Çok sorun değil ama hoş birşey de değil.

(Sayfa geliyor) Herhalde aşağıya ilerliyorum değil mi... (başlıkları geçiyor) 'Bilgi'den girebilirim herhalde. (bakıyor, olmadığını görüyor.) çıkalım. (aşağıda açıklamalarda çıkış için gerekli olan tuşu görüyor. Back yerine çıkış tuşuna basıyor. Kanaldan çıkıyor. Kanal gözükmezken OK'e basıyor ancak belli bir amacı yok. Yanlışlıkla da olabilir.)
Hadi bakalım buraya geldi... Programdan çıktım. Geri dönüş-back yapmadım.
(Haber kanalı yüklenmeye başladı. Kanala geri dönmek istiyor ama yüklendiği için dönemiyor.)
Dönemiyorum bu yükleniyor. Niye yükleniyor bilmiyorum. Belki aynı kanalı yüklüyordur...(sayfa geliyor)
Peki biz burayı istemiyoruz. Şimdi burada çıkış dediği zaman başka şansımız yok.
>Kanaldan çıkıyorsunuz.
Ama o zaman tümünden çıkacağım yine. (çıkıyor. 505 altın rehberi buluyor, OK'e basıyor.)

(Sayfa geliyor. Tekrar bilgi ekranına geliyor. Back ile ana menüye dönüyor.) Hizmet alanlarında olabilir mi acaba (giriyor, araba kiralama başlığı arıyor) Öyle birşey yok galiba (devam ediyor) otomotiv... Bunun alt kategorilerine geçmek için OK diyeceğiz galiba (buluyor).

>Bu servis hakkında ne düşünüyorsunuz

Ben yine demin söylediğimi savunacağım. Bilfiil kendim giderek, veya telefonla bildiğim yoldan ulaşmayı tercih ederim. Ben işin aslında benimle konuşmayan, açıklama yapmayan makinalara muhatap olmaktan hiç hoşlanmıyorum. Bu dünyada yaşıyorsam insanlarla muhatap olmak istiyorum. Bunlar benim hiç hoşuma gitmiyor. Sevmiyorum, sevmediğim için de kullanmamayı tercih ediyorum, belki doğru değil ama sevmiyorum.

P2:Demokan A. T10:56:56>0:57:18	TV kumandası ile açıp kenara koyuyor. Digikumanda ile yayını açıyor. Kanalı açıp info'ya ulaşıyor.
2. kumanda:	Keşke uyumlu olsa da...hiç kullanmıyorum diğerinin yerini bilmiyorum. Kumandanın kullanımı kolay, sorun yaşamıyorum.
Program bilgileri:	Bir tek film kanallarında işe yarıyor. Öbürlerinde zaten ya geç kalıyor. Çoğunlukla yanılıyor. Bir de bir tek kendi kanalında doğru dürüst bilgi veriyor. Dğerlerinde simpsons her c.tesi CNBCe'de gibi lüzumsuz şeyler yazıyor. İşlevsiz kalıyor.
T2: 0:59:08>0:59:22	Kullanıyor, kullanışlı.
T3: 0:59:39>0:59:45	Yapıyor. Lüzumsuz. Kullanmıyorum. Burada ne olduğuna bakıp oraya gitmek yerine orada bakıp buraya geri dönmek daha mantıklı.
GS:	İçeriğinin lüzumsuz olması dışında karşılaşmıyorum. Bu da gereksiz birşey. Tvde 1sn. kaçırılmayacak hiçbirşey yok.
T:41:01:01>1:07:10	Bu kabus bunu yapmak bile istemiyorum. (Kumandayı inceliyor. Opts'dan menüye giriyor.) Mesaj di mi... yok unutmuşum bunu (menüden çıkıyor. Guide'a giriyor. Düğme arıyor kumandada.) Hiçbir fikrim yok ya.. ben çünkü bir kere kullandım iğrençti. Hiçbirşey yapamıyorsun, böyle saatlerce oklarla harflere gelip basmaya çalışıyorsun. (Guide'dan çıkıyor) favourites...themes... bir daha optionsa dönelim... yok ben bulamadım (gidiyor) Hiç kullanmadığım için hiç bilmiyorum.
500 kanalına gitsen..(yardım)	(Ekran geliyor) Digiposta... Başka bakalım birşey var mıymış... Yok. (kanal yükleniyor, TV mesaj at'ı seçip giriyor) (Adres satırını silmek istiyor. Sol ok ile sola gidiyor. Kumandada tuş arıyor.) *>Silmek mi istiyorsun?* Sileceğim tabi. Ama hiçbir fikrim yok. (Aşağıdaki ikonlara gelmek için aşağı okuna basıyor. Olmayınca geri çıkıyor. Kumandaya tekrar bakıyor. Page- düğmesi olduğunu anlıyor.) Sil şuymuş hah! Değil miymiş?! (kumanda bir an için almıyor. siliyor) (alttaki ikonların kumandadaki düğmeleri gösterdiği mantığını aldıktan sonra TXT klavye tuşunu buluyor.)Klavyeyi çıkardım
İnternet kullanımı alışkanlığından herşeyi tek tuşla yapma beklentisi var.	ama şu an keşfederek aşağıya bakarak buluyorum. Ama yanlış yere yazdım(adres satırına değil CC:ye yazıyor. Yukarı ok ile adres satırına geçmeye çalışıyor ancak klavyenin satırları arasında geçiyor.) Niye o sonda? (geri yazısına gelmeye çalışıyor. Back tuşu ile bağlantısını çözünce back'e basıyor)

	hasta ettin adamı haaa! Yani illa...
	(Klavyeyi kapatıp geri dönüp bir üst satıra çıkıp klavyeyi açıyor.)illa sileceğiz hepsini üfff..(siliyor) tam bir burdan yani lüzumsuz. (adresi yazıyor) Çok sıkılıyorum! (geri dönüp metin kısmına rastgele harfler yazıyor.) *>Tamam konu yazmana gerek yok.* (Göndermek için OK'e gelip ok düğmesine basıyor. Ancak birşey olmuyor çünkü OK karesi kumandadaki OK düğmesi ile aynı fonksiyona sahip) OK demiyor muyduk göndermek için... (bekliyor. Basıyor. Tekrar basıyor. Çaresizlik gösteren bir şekilde elini sallıyor) *>O OK aslında kumandadaki ile aynı fonksiyonda.* (gülüyor) *>Nereden çıkabilirsin?* Back ile çıkabilirim ama yazdıklarımın silinmesinden korkuyorum. (gülüyor. Back ile klavyeden çıkıyor. OK'e basıyor. Kullanıcı adı penceresi geliyor. Sıkılmış olduğu için rastgele harflere basıyor. Pin kodunu yazıyor. İşlem tamamlanıyor.)
>Faydalı buluyor musun?	Tamamen işlevsiz. Çok gereksiz. İnternet gibi, bilgisayar gibi birşey var. Bu kadar saatlerce sürmüyor, böyle harflerle boğuşmuyorsun. Ve de kim alır da bakar böyle bir şeye. Çok lüzumsuz. Ne yazabilirsin? Merhaba yazmak için bile ne kadar uğraşıyorsun. Abijikzs yazdım o bile ne kadar sürdü. (Çıkmak istiyor. Back'e basınca 'çıkmak istediğinizden emin misiniz?' penceresi geliyor) evet kesinlikle eminim! (evet-hayır arasından doğrusunu seçemiyor. Tekrar deniyor) çıkmak istediğinizden emin misiniz?! Hah. Evet yanlış basmışım.
T5:1:08:29>1:09:07	Öğreneceğiz açılırsa. (Ankara sayfası açık çabuk bir şekilde işlemi tamamlıyor.) Kullandım İşe yarıyor. Hem yola çıkarken hem de dışarıda çalıştığımda çok işe yarıyor.(dışarıda film çekiminde çalıştığı için 5 günlük rapor işine yarıyor.)
T6: 1:09:23>1:11:18	Bulurum ama nasıl bulurum demin öğrendim. 500'ü öğrettin bana yoksa bulamazdım. 500'den Altınrehber'i gördüm. (500 kanalından girip altınrehber'i seçiyor.)
>Biliyor muydun, yararlandın mı?	Servisten haberim var ama hiç kullanmadım. Tamamen bireysel sebeplerden (tanıdığı içeriğini hazırlamış)

(ekran geliyor.) Hizmet alanları herhalde.(aşağı iniyor.) Otomotiv olabilir mi acaba?...taşımacılık.. iki tane zorlu seçenek. Biz otomotiveden başlayalım da yine..(buluyor. İşlem bitiyor)

>Pratik mi? Kullanır mısın?

Olabilir ama Bilgisayar varken kimse yüzüne bakmaz herhalde. Yani şunla kimse uğraşmaz. Yani 500'e git... www.altinrehber.com dersin;mousunla tık yaparsın. Burada da mousumla tık yapsam kullanırım. Ama bu haliyle değil.

Ben digitürkten sadece müzik dinliyorum film seyrediyorum, tek faydası o bence.

U3: Hülya D. **T1:** **0:00:15>Bitiremedi**	Benim Sony, ayrı bir kumanda olduğu için 1'e basıp TV yi açıyorum, sonra Digitürk kumandasında 1'e basarak Digiturk'e ulaşıyorum. *> CNBC-E kanalına ulaşırmısınız.* Hepsini bilmiyorum , şöyle bir gideyim... (8' e basıyor) Bundan önce olmadığını biliyorum en azından. 18. bundan sonra olmalı (+ tuşu ile iki kere ilerliyor ve ulaşıyor. (Diğer kumanda sol elinde sesi kısıyor.)
Tahmin etmesi sorulmadı	*> Bu kanalda şimdi veya biraz sonra yayınlanacak program bilgisine ulaşırmısınız.* O bilgiye ulaşamıyorum... bu kanalla mı ilgili? Onu bilmiyorum – (ve bırakıyor.) *> i tuşu var , fonksiyununu biliyormusunuz? ona bir basarmısınız?* Ne tuşu? *>i* Göremiyorum. (Uzaktan bakıyor, kumandada ki tuşlar için yakın gözlüğünü kullanıyor)(Ben gösteriyorum. 1 kere basıyor... bir süre ekrana bakıyor ...) önemli bir tuş mu? Hiç kullanmadım daha. *> Bakın kalan süre , programın ismi...* Hımm... o ilk açıldığında gelen. *> Bir daha basarsanız (basıyor) filmlerle ilgili bilgiler de yazıyor burada.* Ama birşey söyleyeyim, hani şu ilk açtığımda geliyor ya, bu genelde çok doğru olmuyor. Yani mesela, orada bilmemne dizisi başlamış oluyor. Yani televizyonla birebir gitmiyor. Bu dikkatimi çekti geçişlerde. *> Tamam* Tekrar i ile mi çıkıyorum?
0:02:44 **2 kumanda kullanımı**	*> Evet* Zor tabii, ben arada alıştım da mesela Mekan (eşi)alışamadı. Arada direkt buna (TV kumandası kapama düğmesi) basarak kapatıyor. Bir terslik olurmu diye düşünüyorum, 1-2 kere de oldu. Halbuki bana öğretilen önce bunun (digiturk kumandası kapama düğmesi) sonra bunun (TV kapama düğmesi) kapatılmasıydı ama Philips televizyonu olanlar bunu kullanıyor. Ama bizimki Sony olduğu için , farklı bir marka olduğu için çift kullanmak zorunda kalıyorum, ama tek olsa tercih ederim, Yani çift kumanda taşımak zor geliyor. *> Peki bu yüzden yanlışlıkla kumandadaki tuşa basıp hata yaptığınız oldu mu?* Mekan yaptığında karşılaştık, Yani bunla...(TV kumandası) kapattı, açmakta zorlandık, bağlantısında bir bozukluk oldu , arkasındaki aparatları çıkardım, taktım, tekrar yaptım, tekrar, tv'yi bir dinlendirdim, çektim fişten, 10 dakika,öyle birşey öğrenmiştim Müşteri Temsilcisi (Hizmetleri) nden, tekrar koyup en büyük

	ihtimalle tekrar set yapıyorsun bir daha o hafızayı tekrar kurabilmek için , uğraştım oldu.
> İstediğiniz kanala ulaşırken sorun yaşıyor musunuz?	Kanala ulaşırken yok, yani bir süre sonra seyrettiğin kanalların numarasını iyi kötü öğreniyorsun, Yani bir süre sonra çok kullanmaktan öğreniyorum. Mesela 22 Star. Rahatlıkla öğrenebiliyorum. Ama kendi isteğinle dizemiyorsun. Baştan eski tv ye göre gittiğin için zorluk yaşıyorsun. *> Ona özel bir özen gösteriyordunuz yani.* Tabii! Ben belli bir kullanım dizisine onları ayarlamıştım, ilk bir ay bir buçuk ay kullanım zorluğum oldu. Hep eski rakam şurdadır diye aklımda , fakat 1 ay sonra buna alıştım, şimdi çok rahat, bilmediğimi de arayarak buluyorum, çok az seyrettiğim kanalıda. *> Bu program içeriklerine ait bilgilere güvenmediğiniz söylüyorsunuz. Kullanmıyor musunuz?* Açılışta onu görüyorum tabii, sık sık kontrol ediyorum. Bir şey izleyeceğim diyelim, kaçırmak da istemiyorum. Açıyorum başlamış görünüyor. Örneğin bir 90 dakikalık kurtlar vadisi. Kalan süre 80 dak diyor, esasında kurtlar vadisinden bir önceki program hala devam ediyor. Yani reklam başlamış orada 10 dak. Bazen orada 60 dak. kaldı dediğinde benim istediğim dizi başlamış oluyor. O çok bire bir tutmuyor. O önemli mesela. Ben açtığımda onu gerçekten şu kadar süre kaldı dediğinde benim için önemli. O yüzden şimdi ona hiç dikkat etmiyorum. Normal TV kullanımı gibi , açıyorum , o başlamış mı başlamamış mı... yani bana doğru bilgi vermiyor.
T2 . 0:07:17	Bundan haberim yok. İşte bu çok önemli esasında. Önemsediğim bir fonksiyon ama bunu bana verirken hiçbir şekilde açıklama yapmadıkları için bundan benim haberim olmadı. *> Nereden olabilir?* Teletex'ten olabilir mi? (TXT tuşunu kastediyor) Guide'dan olabilir. Olsa olsa GUİDE'dan olur. *> Guide'ı daha önce kullandınız mı?* Hiç kullanmadım. (Basıyor ve giriyor. Oklarla navigate ediyor.) Saatleriyle mi veriyorlar burada bunları? Ama aşağı yukarı alamadım... hah indi... (feedback geç olduğu için sorun oldu) Peki bu sadece programın saati yönünden öyle değil mi? *> Evet peki burdan hatırlatma işlemini nasıl yapabilirsiniz sizce?* Herhalde tahmin yürütüyorum yani, istediğim kanala gitmem lazım önce. Ama biraz zorladı bu. (söyleniyor, alçak sesle) Yani şu üst tuşla gidebilmem lazım değil mi? Şimdi "En Son Babalar Duyar" var mesela (o programın üzerine gitmeye çalışıyor ama sarı işaret kayboluyor) Değişiyor, kendi kendine değişiyor. (Yavaş feedback'ten dolayı önceki bastıkları process ediyor.)

0:09:44 - Bitiş	> *O galiba biraz gecikmeden.* Ondan mı oluyor? Şimdi mesela ATV'nin üzerine gelip , sanıyorum yani, benim o kanalın üstüne gelip, istediğim programın üstünde bu sarı ışığı görünce , muhtemelen, fikir yürütüyorum, ortada bir OK tuşu var, orada bir Ok'lemem lazım gibi birşey düşünüyorum. (Bu arada istediği programa gelmeye çalışıyor ancak, sarı ışığı ve program isimlerini göremiyor.) Sarıyla bir göstermesi lazım, onu alt-üstten. (okları kastederek) ...gelemedim. (bu arada daha sert basıyor) mesela 10 numara SHOW diyor... (sarının durduğu yeri seçti) (sarı seçisi yer değiştiriyor) (basmayı bırakıp kumandaya bakıyor) kendi kendine geçti sanki?! Şimdi şu an durduğu yerde OK'liyim. Hah! Evet! Tik attı! Doğru! ☺ Yani OK yazısını görünce onu tahmin ettim zaten. > *Şimdi siz anladınız mı oraya tik attığı zaman "Yani şimdi bunu hafızaya mı almış oluyor?" Şimdi size ne düşündürdü? Ne yapmış olabilir?* Yani ben bunu istiyorum işte tik ile onaylamış oluyorum. > *Sizce kullanışlı mı ne düşünüyorsunuz?* Peki şimdi ben bu tiki attıktan sonra bana gerçekten başladığı saatte mi yoksa gene o gösterdiği saatte mi ikaz ediyor beni? Bu önemli. Öyle bir gecikme oluyor çünkü o çıkan ekranda. O durumda bir de nasıl ikaz ediyor beni? Otomatik mi dönüyor? Onu bilmiyorum? Herhalde bir ikaz yazısı bir şey çıkması lazım. > *Bu fonksiyonu öğrendiniz , bundan sonra kullanır mısınız?* Bunu kullanırım çünkü takip ettiğim programlar var. Çevirip, çevirip bakmaktansa seyrettiğim ekranda başladı diye ikaz edecekse bu güzel birşey... Yani benim için önemli(program) ama buradakini de o zamana kadar seyretmek istiyorum. İkide bir gelip gitmektense bana bu ikazın çıkması güzel. > *Tamam teşekkürler. Çıkabiliriz.* Bunu da BACK'le çıkacağım değil mi? Yani herşeyden BACK'le çıkıyordum ama? Evet... Yani bu biraz ingilizce bilgisinden kaynaklanıyor tabii tahmin yürüterek.
T3 **0:12:49>13:39** **Tahmin sorulmadı.** *>Bu Fonksiyon Hakkında ne düşünüyorsunuz?*	Bunu bilmiyorum, direkt orayı açıp öğreniyorum. Hemen basıyorum, TRT1 in kaçta olduğunu biliyorum, dönüp bakıyorum. Ama onun nasıl öğrenileceğini bilmiyorum. > *Burada açıkken page +,- tuşlarıyla.* Hiç kullanmadığım birşey...Hımmm, seyrederken şu bilgiyi alabiliyorum. Gene o sıkıntı ...onun (saat-program uyuşmazlığı) düzelmesi lazım... Artık program akışına göre otomatik mi ayarlanır bilmiyorum. Öyle bir sistem olmalı ki ben doğru bilgi alabileyim. Şimdi açsam ben ona da güvenemem. Hiç doğru yakalayamadığım için muhakkak kanalı açar bakarım.

	Hiç rastlamadım bire bir doğru eşleştiğini. Bir Lig TV... maçlar tabi saatinde başladığı için , kesinlikle bir olay yoksa başlıyor maç. Movie max bu anlamda daha düzgün diğer kanallardan. *> MovieMax'ta film bilgisine ulaşıyor muydunuz?* Kitapçığı geliyor, oradan bir film seçip o günün saatini ayarlayıp açıp seyrediyorum.
GS: *>Bilgilere ulaşmak için zorlanır mısınız, aklınıza gelir mi*?	Gelir tekrarlarsam yani, 2-3 kere tekrarlarsam, çok kolay yaparım, ama gerek vakitsizlikten, biraz da ondan oluyor yani. Bütün gün , çalışıyorsun, eve geliyorsun. Ben bütün gün evde olsam çok rahat bir günde çözerim hepsini, daha çok ilgilenirim. Şimdi işten geldin iki günde hemen haberi açıyorsun. Haberlerden sonra belirlediğin birkaç program var saatini beklediğin, programlar var izlemek istediğim, onların da yaklaşık saatlerini bildikten sonra şu an çok ihtiyaç hissetmiyorum. Ama daha uzun süreli evde olsam, TV seyretsem hissederim onu.
T4.0:16:36 >	İşte onu hiç bilmiyorum!☺ *> Acaba nasıl bir sistem olabilir bu?* Bir kere ben birşey seyrederken ekranda bir yazı çıktı. "Hediye puanınızı öğrenmek istiyorsanız 555'e girin gibi birşey...yanlış hatırlamıyorsam öyle birşeydi... Girdim işte uğraştım biraz, yapamadım, dönüp tekrar okuyum dedim, okumadan hızlı gittim yaptım söylenenleri, o sırada başka bir program başladı, vazgeçtim yapamayınca da döndüm. Başka birşey yapmadım.
	Ama şu programlar var shwroom'da veriliyor ya (alışveriş kanalı) bütün gün çıkıyor alışveriş şeyleri, program arasında bazen bakıyorum o satılan şeyler nedir diye.
Hata! Burada Tahmin sorulacaktı. **T5 giriyor:0:19:10**	*> Peki o zaman. 500 numaralı kanala gider misiniz?* (Sayfa açılıyor) 500 numaralı kanaldan gidiyorum hep öyle mi? Tv hava Tv haber hep buradaymış... TV hava mesela (seçiyor) *>İlginizi mi çekti?* Çekti tabi merak ediyorum. *>Normalde başka kanallardan, teletextten takip ediyor musunuz?* Teletextten değil de normal kanallarda hemen haberlerden önce hava durumu olduğu için onlara bakıyorum. Bu çok iyiymiş mesela. Bunu çok sık kullanacağıma eminim.
Visibility snapshot! 0:20:22	(kanaldan nasıl çıkılacağına bakıyor) Önceki yine back'le mi olacak? Ya da çıkış... (ekrana yaklaşıp bakıyor. Hangi düğme olduğunu anlayamıyor.) tabi gözlük olmayınca... *>Normalde kumanda kullanırken gözlük takıyor musunuz?* Yok yazıları okuyamadığımda bir tek. Yoksa kanal kullanımında

	falan kullanmıyorum. Rakamlar büyük olduğunda okuyorum rahatlıkla da, şuradaki çıkışın ne olduğunu, ona benzer düğmeyi arıyorum. Şu herhalde, değil... hah şuymuş, backin altındaki. *>ama back'le mi çıkmayı düşündünüz?* Herşeyden backle çıkıp veya ekrandaki birşeyi backle sildiğim için esasında yanıldım çünkü o teletext olacaktı.
>Sizce kolay mı hava durumunu öğrenmek?	Kolaymış. Yani 500'e girince bir sürü şeye ulaşabileceğim esasında.
T4 (devam) 0:21:53>33:11	Tüm interaktif kanallara buradan ulaşabiliyormuşuz. (ekrandaki yazıyı okudu. Sırayla seçenekleri okuyor). Digiposta gireceğim herhalde (seçiyor).
>Ne düşünüyorsunuz bunun hakkında? İlginizi çekti mi?	Kullanırım esasında. Peki bu mailim ille digitürk bağlı birisine mi gidebilir? Yani bilgisayardan mail atar gibi atacağım. *>evet.* Maili olan da nereden alabiliyorsa alacak herhalde. Tamam o zaman. (sayfa geliyor. Bir süre inceliyor.) Gelenleri de görebiliyorum. Bana da gelebilir.
Kayıt olma süreci kullanıcının fikir değiştirmesinde etkili olmuş olabilir.	Yani buna önce bir kayıt olacağız herhalde... Yani şimdi mesaj da, bütün gün bilgisayar kullandığım için buna çok ihtiyaç duymam, akşamları, ama diyelim ki ileride tam gün evdeyim, bilgisayarım yok, buradan göndermek isteyebilirim. Ama şu anda bunlara çok ihtiyaç hissetmeyebilirim. (TV mesaj at bölümüne giriyor) Kime diye zaten üstte var. Şuraya adres yazacağım herhalde. Şuraya (cc: satırı) kendimi mi yazacağım? *> Bu ekranı ve elinizdeki kumandayı kullanarak bütün bilgilere ulaşabilirsiniz. Öyle düşünün.* O zaman... harflerden mi peki... yazmak için birşey... (ekranın altındaki ikonları ve yazıları okuyor). Menü, geri, çıkış, gönder, OK, sil... Allah allah... (kumandaya bakıyor) enteresan. Buradan ne yapıyormuş bakayım (sayı tuşlarını kastediyor. 1'e basıyor. '.' İşareti çıkıyor.) Hmmm.. Şuradan... Üzerinde yazmıyor ama cepteki gibi... sanki... (sayı tuşlarına basmaya devam ediyor) 1 tane basınca G iki tane basınca H... Şunun mesela M olması lazım. Cep telefonu hafızamdan tabi gidiyorum. *>Cep telefonunda çok kullanıyor musunuz mesaj atma özelliğini?* Çok değil ama kullanıyorum. Oradan mantık yürüterek böyle olması gerekli diye düşündüm ama harflere ihtiyaç duyan biri için

zor. Ben cep telefonunu gözlük kullanmadan ezbere yazdığım için harflerin yerini hafızama işletip böyle ezbere yazıyorum hiç görmeden. Biraz da ondan kaynaklandı burada harf yazmamasına rağmen. Ama harfe ihtiyaç duyan biri zorlanır.
>*Peki üstteki adres satırına benim mailimi yazsaniz... O satırı düzeltmeniz gerekiyor.*
Onu sil yapacağız o zaman (tekrar yakın gözlüğünü takıyor) şuradan şu sil işaretiyle sanıyorum... (televizyona yaklaşıyor görmek için) Page değil mi o? Üzerinde page yazmıyor... Ha buymuş canım(düğmeye basınca silmeye başlıyor). Üzerinde page yazmayınca işaretinden anladım. (yazmaya başlıyor)

@'i nasıl yapacağız burada? Bilgisayar mantığıyla düşünsem ama onda çift tuşa basıp F'ye basıyorum tabi ben (gülüyor). Onu burada tespit etmem zor. @ işaretini koymam lazım neyle koyacağım?

>*Normalde bunu yapıyorsunuz mesela bir arkadaşınıza mail atmak için. Bu noktada ne yaparsınız mesela devam eder misiniz bir şekilde dener misiniz?*
Birşeyleri denerim.
>*Deneyin o zaman...*

1 olabilir mi burada harf olmadığına göre (cep tel tuşlarını kastediyor) burada olabilir mi? Yok... (basınca '.' Çıktı tekrar basmadı.)
Şu yapabilir. (başka tuşu denedi) yok... Language? @ işareti... öyle birşey yok. (sırayla kumandadaki üzerinde farklı işaretler olan, fonksiyonunu bilmediği düğmelere basarak deniyor.) Bulamadım...

Visibility snapshot! 0:30:59

>*Size yardım edeyim. Ekranda sağ altta bir düğme var bakın...*
Hıı.. teletext klavye diyor...
>*Bu ne olabilir sizce?*
Basıp bakalım... Hmmm.. (gülüyor) Klavye çıktı. @ işareti ayrı bir yerde mi var? Basmadan ben bunu nasıl yapayım? Birtakım tuşlara basıp yapıyorum ben. (oklarla hareket edebileceğini keşfediyor. @'i buluyor, OK'e basıyor) koydum.

>*mail.com diye devam edin. Bu klavyeyi de kullanabilirsiniz.*
Buradan bir çıkacağım tabi @ koyduktan sonra. (çıkış tuşu ile çıkıyor) Şimdi 'mail' yazıyorum.
>*Niye klavyeyi kullanmadınız?*
E öbürü daha kolay tek tek harflerin üzerine gelmektense. (yazıyor, aşağı iniyor. Göndermek için OK'e basıyor) Şimdi kullanıcı adı. En az 6 karakter. (yine sayıları kullanarak yazıyor. Göndermek için tekrar onay'a basıp bekliyor)

	Geç oluyor ama değil mi? Bunun da böyle maildaki gibi hatların doluluğuyla ilgisi var mı? *>Olabilir. Çok mu yavaş?* E tabi yavaş. Biz tabi dairede çok hızlı bir bağlantıya alıştığımız için biraz ondan da olabilir. Yoksa evde internete bağlanınca daha yavaş oluyor.
>Fikriniz?	Güzel birşey. Benim hoşuma gidiyor teknolojik şeyler. Birisiyle de beraber yaparsam öğreniyorum hoşuma gidiyor.
>Sizce kolay mı?	Kolay. Ama bekletme fazla. *>Bu sebepten dolayı vazgeçer misiniz?* Vazgeçerim. (Mesajı uzun bir süre gönderemedi. Çıkmak için back'e bastı, feedback biraz daha geç geldi.) Çıkmıyor. Back değil mi çıkış işte? (o sırada 'bağlantı kurulamıyor tekrar denemek ister misiniz?' ekranı çıktı.) Hayır. Hayırda kırmızı değil mi? Yoksa ben mi alacağım aşağıya? (yukarı-aşağı oklara basarak değiştiğini görüyor) Hayır dedik, Back (backe basıyor, birşey olmuyor.) *>Back'e mi basıyorsunuz?* Hayır dedikten sonra OK o zaman... mı? (basıyor ve mesaj ekranına geri dönüyor) Çıkış şimdi de (PP tuşuna basıyor) emin misiniz... OK (Evet'i ok'e basarak seçiyor ve çıkıyor.)
T6: 0:37:28	Yine Digiaktif'ten olduğunu sanıyorum. (ekran açılıyor) Altınrehber'dir. Eskiden adı öyleydi yani. PTT'nin vardı Altınrehber orada bulurduk böyle şeyleri. (sayfa açılıyor, başlıkları sırayla okuyor) Önce hizmet alanı mı kendi ili mi? (il/ilçe değiştir'e gelip Ankara'yı seçiyor.)kaydetmek için 1 tuşuna basınız (yazıyı okuyor, basıyor). Şimdi hizmet alanlarına gideceğim muhtemelen (Girip sırayla sektörleri aşağı doğru geçiyor.) Otomotiv'e mi geleceğiz (giriyor ve buluyor. Task bitiyor.)
>Ne düşünüyorsunuz?	Bu önemliymiş. Bir yeri, bir şeyi arayıp öğrenmek için iyi. Bence iyi oldu.
>Kolay mı kullanır mısınız?	Kolay, bir zorluğu yok. Kullanırım bunu.

P4: Mekan D. **T1: 0:40:51> X**	1'e basacağız. (televizyonu açıyor, AV'ye gidiyor, Digitürk kumandasında 1'e basıyor.) tahmini olarak 20'lerde falandı. (açıyor) *> Programın bilgisine ulaşır mısınız? Biliyor musunuz bu fonksiyonu?* Hayır. Bir alta sonra bir üste geçerim, üzerinde yazıyor işte. Ben bulmuyorum kendi kendine veriyor.
Yardım	*> Bu şekilde buluyorsunuz. Peki o zaman size fonksiyonu tanıtayım. Kumandanın üzerinde İ harfi olan tuş* (bulamıyor, gösteriliyor ve açıklama veriliyor.) O zaman bunu aynı programdayken yapabiliyorsun bunu. Bir ileri bir geri gitmeyle olmuyor. Fonksiyonu bu mu? *>Evet*
2 kumanda kullanımı	Tam bir rezalet tabi. Bu hakikaten çok şaşırtıyor. Bu ikisinin düğmeleri de farklı yapıları da farklı, konuşlandırmaları da farklı... TV kumandasını zaten sadece ses için kullanıyorum ama arada bir şaşırıyorum. Herhalde kumandayla televizyon arasında bir teknik uyumsuzluk var. Sony'e göre yapmamış. Sanırım bu başka. Zaten çok da kullanışlı değil. Ortopedik bir hava vermişler ama. Kullanımı da iyi değil. Düğmeler birbirine çok sokulmuş mesela. Üzerindeki işaretler de yetersiz. Bit gibi şeyler filan da koymuş yani şu grinin üzerinde şu siyahtan ne anlaşılıyor? Hiç bir şey anlaşılmıyor yani. Bunu ancak kitabına filan bakacaksında oradan göreceksin. Kırmızının üzerinde niye beyaz mesela? (Rec tuşu için söylüyor) Böyle bir işaret mi var? Şu(açma-kapama düğmesi) hadi kapatma işareti, anlıyorum. Diğer işaretler... mesela bir language var. Tamam İngilizcesi ama Türkçe de yazılabilirdi. Page, veya guide... yani yaygınlaşmasını istiyorsan. Şurada TV'yi biliyorum. Noluyor TV'de... herhalde TVye geçiyor...
! Kumanda düğmelerinin çok küçük ve yakın olması **0:45:55 snapshot çift kumanda**	
>Peki karıştırıyor musunuz ikisini?	Uuuuu... hem de kaç defa. Kapatıyorum... Heyecanlanıyorum mesela aman dur şunun sesini açayım diyorum... Uzanmışım mesela... Zaten ikisi de yanyana durmak zorunda. Ne yer var, ne kucağımda tutabiliyorum ve cebime sokabiliyorum... Karıştırıyorum yani. Karıştıyorum da o zaman yani. Ya da başka bir yere geçiyor, program geçiyor o arada heyecanlı yerinde. En güzel yaptığım şey kapatmak! Çünkü masanın üzerinde durduğu için elimi uzatıyorum, burada artırayım derken öbür tarafta kapatıyorum. Zaten tuşlar da belirgin değil. Bunu da birbirine karıştırıyorum. Uyumlu da olsa sıkıntı var. Karanlıkta mesela iyi bir film seyrederken bunları (navigasyon tuşları) da karıştırıyorum. Bunları

Çok fonksiyonluluk-düğme	el yordamıyla bulmaya çalışıyorum. Bir belirginlik yok yani. OK'e basabiliyorum bilmem page'e basabiliyorum falan... çok araya koymuşlar yani başka birşey de yapabilirlerdi. Bir düğmeyi bulmak için diğer üçünü yokluyorum falan. Herhalde fazla yer kaplamasın mantığında yaptılar... Çok fonksiyonu varmış gibi yapıyorlar ama düğmelere değişik bir fonksiyon yapılabilir diye.
>İstediğiniz kanala nasıl ulaşıyorsunuz?	Sırasıyla takip ediyorum. Tahmini birşey var kafamda, bir sırası var kabaca, yakinen buluyorum. Bazı kanalları ezberledim. Şurada bir program varmış bakayım derken buluyorum. Başka bir kanala geçtikten sonra aramaya çalışıyorum ama üzerine bakarak buluyorum.
>Bu size zor geliyor mu?	Arada vakit kaybediyorum. Mesela national geography'i buldum ama bunun 81'de kayıtlı olduğunu bilmiyorum.
>Peki bu program açıklamalarına dikkat ediyor musunuz?	Bakıyorum tabi bence digitürkün güzel bir özelliği. Gerçi onun reklamın arasında şimdiki program mı yoksa bundan sonraki program mı belli değil. O da ayrılırsa iyi olur. Bir işaret koyabilir. Bundan sonraki program diyebilir, devam eden diyebilir...
T2: 0:51:25> X	Fonksiyonunu bilmiyorum.
>Nereden yapılıyor olabilir?	Heralde bu kumanda aletiyle yapacağız. Bir memory'si filan mı olması lazım? Programı gireceğiz sonra orayı fiksleyeceğiz... saatini koyacağız... öyle olabilir... Memory gibi o tür programı sabitleme bir yeri olması lazım saati ayarlama gibi yani. Kanalı sabitleyecek en sonunda da OK diyeceksin. (kumandanın üzerinde gösteriyor. Orada bir tuş vasıtasıyla yapılacağını düşünüyor.)Ama bilmiyorum şimdiye kadar kullanmadım. *>Bilseniz kullanır mısınız?* Yo, bir programı öyle bana hatırlatsın diye beklemem. Eğer bir programı kafama koyduysam gelir oturur o saatte o programı seyrederim. Başka bir program seyrediyorsam da o program o kadar mühim değilmiş demekki... *>Guide tuşundan...* Evet rehber yani. Ne program varsa gösteriyor. Dönüşte de bir sürü problem yaşıyoruz (Guide'ı açıyor) Burada açıklamalar biraz karışık... haaa.. (kısaltmaların yukarıda açık şekilde verildiğini farketti.) daha doğrusu biraz daha bakmak lazım. Burası kullanıma yönelik birşey de. şimdi bakıyorum... daha önce biliyordum baktım da hiç kullanmadım. evet iyiymiş. O sarısı şeyi (?) gösteriyor mesela aşağıda tuşlar falan var... (inceliyor ancak ilgili değil) Şimdi buradan çıkmak istiyorum mesela çıkamıyorum. Back'e basıyorum yok (basıyor ve oluyor) Şimdi buldum mesela... ama benim teknik zekamla oluyor. Gerçi kitabı var ama kalın oluyor. Okudum gerçi ama... (kitapçıktan okuduğu halde hatırlayamadı)

T3: 0:54:43> X	Yani program devam ederken... bu fonksiyonu bilmiyorum... onu duydum, hakikaten o hep aklımdan geçiyor ama uzun zamandan beri de kullanıyoruz ama onu hiç yapmadım. Bozarım diye mi yapmadım acaba veya da şimdi bilemiyorum. Programın bir köşesinde filan çıkıyor zannediyorum, yani aynı anda 2 tane program aynı ekranda görünüyor diye düşünüyorum. *>Öyle değil* O zaman bilmiyorum.
Yardım: açıklama	Hmm. Evet tamam doğru. Ama bu sırayla gidiyor değil mi? Ben soruyu yanlış anlamışım o zaman. Yani bu programı seyrederken acaba hangi program var... evet, konsantrasyonu bozmadan... Öğrenmiş olduk tabi bu arada...
>Kullanışlı bir fonksiyon mu?	Tabi canım evet.
GS: **Aesthetic expectation**	Herşeyi birarada vermeye çalışmaları sıkıntı yaratıyor. Her fonksiyonu yükleyince ağırlık da kalkıyor. Bütün fonksiyonları zayıf oluyor. Mesela elli tane kanal yapacağına, radyo kanalı mesela, seçimi de güçleştiriyor. Üzerindeki görüntü de yok... 532 mesela (tuşluyor ve kanallar arasında dolaşmaya başlıyor.) Radyo kanallarında bir sıkıntımız var. Bütün kanalları geçmen gerekiyor orada böyle bekliyorsun. Ya kapasitesinden dolayı ya yüklenmesinden dolayı beklemek sıkıntı yaratıyor. Buraya uçan bir kız koymuşlar.. yani digitürk deyince böyle digi lafıyla teknolojiyle pek uyuşmuyor. Burası da reklamdan geçilmiyor yani sözde jazz kanalı... Bütün kanallarda önce uçan bir kadın sonra arkasından aynı reklam... hiç değişmiyor. En azından kırk tane şeye aynı reklamı koymasınlar. (o sırada TV hava kanalı yükleniyor) Şükür kavuşturana! Yoksa hizmetleri güzel yani. Mesela şu aşağıdakileri de bilmiyorum: onay, önceki, bilgi, çıkış... mesela çıkış için şuraya mı basacağım? Zaten o işaretle bu işareti(kumandanın üzerindeki) bilinceye kadar bakıyorsun. (çıkış tuşuna basıyor) Çıkmak için OK'e mi basıyoruz? Evet... (Çıkıyor.)
T4: 1:01:42 > X	Mümkün değil atamam çünkü bilmiyorum. Böyle bir fonksiyon olduğunu da bilmiyorum, posta atmayı da bilmiyorum.
>Bilseniz kullanmak ister misiniz?	Bilgisayar e mail adresi filan yaparsam atarım tabi. (?)
Yardım: 521 **Hata: 500**	(521 kodladıktan sonra 500'e gitmesi söyleniyor. Ancak kanal yüklenirken sistem feedback vermediği için kanala girip çıkmak zorunda kalıyor. 500 yazıyor. Feedback gelmeyince:) Gidemeyiz

	çıkacağız herhalde... işte sıkıntı burada, hiçbirşey yapamıyorsun! Bekleyeceksin, o oradan çıkacak, reklamı güzel seyredeceğiz... (Kanal geliyor) Hah şimdi buradan bakacağım. Çıkış... Hepsi de farklı. Back'e mi basacağım (basıyor. Çıkmak istiyor musunuz penceresi çıkıyor) Evet Hayır... OK'e mi basacağım burada? (mavi-kırmızı ayrımını anlayamıyor. Seçenek hayır'da iken OK'e basıyor. Geri dönüyor.)Evet diyeceğim hangi düğmeyle demem gerekiyor? OK dedim o da olmadı yani. *>Birini seçmeniz gerekiyor.* İşte seçtim yine aynı yere geldim. *>Hayır'ı seçtiğiniz için oldu.* Şimdi bakın çıkış back diyor. Seçim OK... (basıyor ve tekrar çıkış penceresi açılıyor.) *>Yukarı tuşuyla Evet'i seçmeniz gerekiyor.* Hayır oradaki seçme... seçim için... cep posta gönder, TV mesaj gönder onun için... Ben bu şeyden çıkacağım çıkamıyorum. *>tamam ben sizi çıkarayım.* Lütfen iyi olur. (Biraz sinirleniyor. Gösterdikten sonra:) Ha o kırmızı mı oluyor, haaa.... Ben maviye evet deyince oradan çıkıyorsun zannettim. (Söylenen üzerine 500 tuşlamak istiyor ancak hata yaparak TV Banka kanalına gidiyor.) 500 kanalı mı bu? *>Yok... Burası Yapı Kredi...* 500 diye geldim... Burayı ben istemedim ki... *>buradan da çıkar mısınız?...* Tamam. Nereden çıkıyoruz... backle çıkıyoruz. (basıyor, çıkmak istediğinize emin misiniz penceresinde her iki seçenek de mavi ile gösterilmiş, etrafında beyaz çerçeve var) Evet hayır ikisi de mavi şimdi ne yapıyoruz? Şöyle mi? Hayır yok ikisi de beyazmış. Şöyle mi? (sağ-sol okla deniyor ve çıkıyor.)
T4 yeniden başlıyor	Onu atamayacağım. Onun için kendime mahsus bir bilgisayarım yok ya da kanalım yok yani... (kanal yükleniyor) Müşteri hizmetlerinden mi gidiyoruz buraya? *>Nereden yapabilirsiniz sizce?* (Sırayla başlıkları geçiyor) Digiposta olabilir. (o kanalı seçiyor)
>Siz kullanır mısınız böyle bir fonksiyonu?	Yoo bilgisayarda yaparım. Ancak bilgisayarımda yapamam, bir sıkıntı olur, bu da önemli birşey. Bilgisayarımı işte bıraksam gerekli olabilir. (ekran geliyor) *>Şimdi işleme devam etmek için ne yaparsınız?*

	Orada seçenekler yazıyor zaten. Orada örneğin bana geldiyse gelenlere bakacağız. (Gelenler seçeneğini seçiyor) Yeni kullanıcı adı... Herhalde isim misim... Ama burada isimleri yazarken harf fonksiyonlarını bilmiyorum. Orada soyadı diyor mesela... Nasıl yazacağım soyadını? Sorun var yani... şimdi çıkmak istiyorum, back diyorum... Birşey olmuyor (üstüste açılan pencerelerdeki komutların hangi pencere için geçerli olduğunu anlayamadığı için sorun çıkıyor. Bu noktada yardım alarak seçenekten çıkıyor. Fonksiyondan çıkıyor.)
>Sizce kullanışlı mı?	Basitçe anlaşılabilecek, kullanılabilecek bir yöntem değil tabi... O siteler farklı kullanılıyor, düğmeler farklı kullanılıyor, birisinde OK kullanıyorsun birisinde başka birşey kullanıyorsun... Karışık yani. Opsiyonlar arasında bir bağlantı yok. Birinde yazı kullanıyorsun evet hayır, birisinde renk farklı... Bu takip hikayesinde bir mantık olması lazım. Bunu kullanmak istiyorsanız buna basın, şunu kullanmak istiyorsanız şuna basın şeklinde. Evet hayır değil de... Ne yapmak istiyorsan şuna basın diyecek. Kanal mı değiştirmek istiyorsun şuna basın, şuraya mı gitmek istiyorsun şu tuşa basın... Çıkmak mı istiyorsunuz.... Hayır...diye bir cevap olmaz. Çıkmak isteyen var, çıkmak istiyen olursa şuna basın. Girmek istiyorsanız şuna basın demeli. Neyse, pek kullanışlı değil.
Genel interface sorunları...	
T5:1:13:48 >1:18:33	Bunun bir guide kısmı var herhalde. Hava durumu nerede diye bakacak mıyız... (guide'a giriyor) Tv hava diyor... 545mi (tuşluyor, ama OK'e basmıyor, bekliyor.) şimdi ne yapıyoruz buna mesela... OK diyoruz (OK'e basıyor. Kanal bekleme ekranı gelince:) gördün mü, başka yere geçti... (oysa doğru kanalda ama feedback gelmediği için anlamıyor.) yani buldum ben, hava durumunu da buldum, tamam OK demem lazımdı. Ya da onu mu bekleyecek onu da bilmiyorum... sarı duruyor, onu bekleyip hava durumunu mu getiriyor onu da bilmiyorum. Bir daha deneyelim (tekrar guide'a giriyor, yukarı 545 yazıyor, yine OK'e basmıyor. Bekliyor, program bilgisi mevcut değil yazısı geliyor. Guide'dan çıkıyor. Guide'a girdiğinde kanal TV hava'da olduğu için tekrar kanal yükleniyor. İstanbul sayfası açılıyor. Ankara'ya ulaşmak için Bilgi seçeneğine giriyor.) O makinanın kullanımı ile ilgili bilgi. bilgiye ulaşmak için bilgi değil... (back ile pencereden çıkıyor.) Şimdi Ankara'ya bir türlü ulaşamıyorum. Şimdi şöyle iç anadolu bölgesine gelip onay verelim... Evet (işlemi tamamlıyor).
Bu fonksiyonu beğendiniz mi?	Öbüründen daha iyi. Ona giremedik ama bu güzel.

T6: 1:19:07> X **Yardım**	(Kanal numaralarını tek tek geçerek benzer isimli bir kanal arıyor. Altınrehber'i atlıyor ve bulamıyor. 500 kanalına gidip bakması için yönlendiriliyor.) Müşteri hizmetleri olabilir mesela. (araba kiralama işlemi olarak arıyor. Başlıkları teker teker geçiyor.) burada öyle birşey yok alım satım gibi... (Müşteri hizmetleri'ne giriyor.) Yani her düğmeye bastığımda bu pikap çıkıyor. Yani bir takip yok. Baştan gösterdin tamam yani. Hiç olmazsa aynı sistem içinde ver mesela. Bekleme süresini bu şekilde değerlendiriyor yani. Bunu koyduğu için mi bu gecikiyor yoksa o geciktiği için mi bunu koyuyor onu bilmiyorum. (Ekran geliyor) Oo demek ki bununla hiçbir alakası yok müşteri hizmetlerinin. Bu sefer çıkış yine ayrı bir şeyden, sanırım şuradan (çıkış dğmesi ve OK ile çıkıyor. Radyo kanalı açılıyor.)
Kontrol problemi	Jazza geçti gördün mü şimdi hopladı oraya. Ne alakası var şimdi 444'le 500'ün.. Böyle yapıyor işte sürprizler oluyor bazen. Tekrar 500'e girelim. (Bir şekilde digitürk'ün ana sayfasını açıyor-1 numaralı kanal) Allah allaah.. Digitürk'e geçti. 500... (500 yazarken sıfırları geç tuşladığı için 5'te Hallmark kanalına geçiyor.) Sen birşeyle mi oynuyorsun!(Dışarıdan müdahale olduğunu düşünüyor!! Durum hakkında açıklama yapılınca tekrar 500 yazıyor) Müşteri hizmetleri değilmiş. O zaman araba kiralayamıyoruz kusura bakma... Bu kadar süre içinde ben giderdim şuradan rent a car'dan hallederdim... *>tamam o zaman fikrinizi sormak için kanalı göstereyim size... Altınrehber'e gider misiniz...* (kanal açılıyor) Ana menü... Neymiş bakalım... (Hizmet alanları seçili iken OK'e basıyor ve buraya giriyor.) >siz şimdi nereyi seçmek istemiştiniz? Ana menüye (back ile çıkıyor) Hizmet alanları... ana menü bu mu olmuş oluyor?.. seçelim bakalım (OK'e basarken yanlışlıkla alt ok'a da basıyor, o yüzden Bilgi sayfasına giriyor) *>şu anda bilgi sayfasındasınız...* O zaman bu bilgi yaramaz bana, bu altınrehber hakkında bilgi. (Back ile geri dönüyor. Teker teker başlıkları inerek bilgi başlığına giriyor. Aynı sayfayla karşılaşınca bir an duraksıyor. Back ile geri dönmek istiyor ama 2 kere bastığı için kanaldan da çıkarak 1 no'lu kanala geliyor. İşlem tamamlanmıyor.)

P5: Gülden B. **T1: 0:00:15> 0:00:50**	Şimdi bunu böyle 56ya getiriyoruz gölge çıkmasın diye. (yayını net almak için o evde uygulanan özel bir ayarlama) 20de cnbc-e. Ne oynuyor ona bakacağım, 'i'ye basıyorum *information*'a.
2. kumanda *>yanlış tuşa bastığınız oluyor mu?*	Önce yadırgamıştım, şimdi alıştım 2 kumanda olmasına. Yok hayır. Tuşların karıştığı oluyor da iki kumandayı birbirine karıştırmıyorum.
>İstediğiniz kanala ulaşmak zor oluyor mu? *>Nasıl ulaşıyorsunuz?* **0:02:55snapshot** Kumandanın geç feedbacki kullanıcı tarafından tv setinin sinyali almaması olarak yorumlanıyor. Kumanda tutuşu. **0:03:44 snapshot** ikonu göremediği için ayağa kalkıyor.	Olmadı. Ezbere biliyorum zaten. İşte film kanalları 301, 302... peşpeşe, 200de bilgi veriyor satın alınan kanalların bilgilerini (1. işleme örnek olarak film kanallarındaki filmler hakkında bilgi almayı gösteriyor, yanlış tuşa basarak bir geri kanala giderek yayından çıkıyor. Tekrar giriyor. Uğraşıyor ama geç feedbackten dolayı amacına ulaşamıyor. Vazgeçiyor.) Neyse sen söyle ben başka birşey yapayım. (Bu arada çıkmaya çalışıyor. Ancak çıkmak için back tuşuna basıyor çıkış için ayrı bir tuş var. Bunun ne olduğunu göremediği için yerinden kalkıyor.)
T2: 0:04:04>0:04:26	Mesela 301de bir film var. Guide'a basıyorum, yüksek ökçeleregeliyorum böyle (sağ ok), ok diyorum çek atıyorum.
>Kullanıyor musunuz bu fonksiyonu? *>Kullanışlı mı?* **T3:0:05:22> X** *>Nereden ulaşabilirsiniz sizce?* (Fonksiyon anlatılıyor) *Sizce kullanışlı mı?* **GS:**	Yok, kullandık ama Necip(Eşi) daha çok seviyor unuturuz diye birşeyi. Ben bazen kullanıyorum mutfakta bir işim falan varsa. Tabii ki. Onu bilmiyorum... Yani bunu seyrederken. Teletexti falan herhalde ama (TXT tuşu) hiç kullanmadım. (Basıyor, hiçbirşey olmuyor. Kumandaya bakıyor...) Bilemeyeceğim. (back'in altındaki çıkış tuşunu deniyor, olmuyor) İki kanal arasında gidip gelmeyi biliyorum ama... Evet, kullanırım... (Bu arada kumandaki inceliyor) Kolay....
T4: 0:07:34>0:20:36	Eyvaaah... (Gülüyor) Onu hiç bilmiyorum. Hiç kullanmıyorum. (Yan taraftan Digitürk rehberini alıyor) Hangi kanaldı bakayım...

Bu fonksiyondan haberiniz var mıydı? Daha önce bildiğiniz halde kullanmadınız?

Var da... digiposta! (rehberden buldu) 521

Bilgisayar ya da cep telefonu olduğu için ihtiyaç duymadım. (ekran geldi)
TV mesaj gönder... OK... (ekran geldi) (adres satırı dolu olduğu için CC satırına indi) Nasıl yazacağım şimdi bunu? (kumanda tuşlarına bakıyor) Cepteki gibi olsa yazardı abc diye... öyle mi? (denemiyor, sorusuna cevap gelmeyince kumandanın arkasını çevirip kısa bir süre bakıyor, önünü çevirip tekrar bakıyor, TXT tuşunu görüp basıyor, klavye çıkıyor. Oklarla harflere gelerek yazıyor) Daha kolay bir yolu var mı bunun?

> *Bir klavyesi daha var aslında.*
Var mı? (bu klavyeyi kullanmaya devam ediyor) (yazma işlemi bitince göndermek için ekranın altındaki tuşlara bakıyor, isimlerini mırıldanıyor.)

> *Şimdi neyi arıyorsunuz mesela?*
E çıkış değil sil değil klavye değiştir değil... (alt oka basıyor, o sırada page – tuşuna bastığı için 1 harf siliyor) Ay sildim... Aşağıdakilere(ikonları kastediyor) gelmek istiyorum ama... (gelemeyince kumandayı inceliyor) Bilseydim çalışırdım... zormuş... informationa basıyorum yok... (back'e basıyor ekrana geri dönüyor. Alt satıra iniyor) tabi tekrar texte gireceğiz değil mi? (deneme yazıyor, tekrar ekrana geliyor) Gönder (OK'e basıyor, kullanıcı kayıt sayfası çıkıyor)

Yeni kullanıcı adı... hıı... (txt'den klavyeyi açıp geri dönerek satırları yazıyor. Yazması bitince göndermek için OK'e basıyor, ancak kullanıcı adında türkçe harf geçtiği için kabul etmiyor. Yalnız uyarı açık olmadığı için –harfler ve rakamlar dışındaki işaretleri kullanmayınız gibi bir uyarı- kullanıcı sebebini anlamıyor.)

E işte abcçde yazdım? Niye uyarı verdiğini anlamadım. (klavyeyi açıyor ve bakıyor çünkü harfleri silemiyor) Var orada sil ama oraya gidemiyorum... (kumandayı inceliyor, page – tuşunu buluyor ve siliyor, yeni kullanıcı adı yazıyor, geri dönüp onay veriyor ama sistem kabul etmiyor çünkü 6 karakterden az)

(İsyan ederek bağırıyor) AAA en az diyor (gülüyor) Bu da olmadı (tekrar yazıyor, onaylayınca bağlantı kuruluyor yazısı çıkıyor, ancak bağlantı kurulmuyor.) Kurulmayacak herhalde... Benim adıma olmadığı için... neyse... (rahatlayıp hemen sigara yakıyor!)

>Sizce kullanışlı mı bu fonksiyon? Kolay mı?	Yani işte cep telefonu kullanılmıyorsa, bozuksa, bilgisayarın yoksa olabilir. Pratik, kolay değil. Mesaj çıktı: bu kullanıcı adını almak istediğinizden emin misiniz? Hayır diyelim de... (kanaldan çıkıyor)
T5: 0:22:28>0:23:33	545'ti.
>Bu özelliği sık sık kullanıyor musunuz?	Kullanıyorum. (kanal yüklemesi sırasında çıkan reklamı kastederek) a hep bu mu çıkıyor beklerken?
>Bekleme konusunda ne düşünüyorsunuz?	Eskiden bu kadar değildi. (sayfa geliyor) a şimdi kolaylaştırmışlar... Önce başka şeyler çıkıyordu, birkaç tuştan sonra geliyordu hava durumu...
T6: 0:24:22>0:31:15	Eyvaah... Hmm...altınrehber mi... (digitürk rehberini açıyor altınrehber'i arıyor, içeriğini okuyor) Digiaktif olabilir... Biz de kullanıyoruz zannediyorduk ama... bir 505e bakalım... (kanalı yanlış kodluyor, başka bir interaktif kanala giriyor. Kanal yüklenmeden çıkmak istiyor ama başaramıyor. Ekranın gelmesini bekliyor.)
	> Böyle yanlış kodladığınız oluyor mu Oluyor tabi böylede oturmadığım için, bazen almıyor. Tabi o herhalde televizyonun konumuyla ilgili. (ekran geliyor)
! kumanda düğmelerinin çok küçük ve yakın olması	(Sırayla seçenekleri okuyor, alfabetik erişime giriyor) Telefon istiyordun değil mi? (buradan vazgeçiyor. Geri dönmek için back'e basıyor ama yanlışlıkla 2 kere basıp kanaldan çıkıyor) AA tamamen çıktı! (tekrar giriyor. Ancak girerken yanlış kanala giriş yapıyor. Ekranın üzerinde kısa bir an için kanal numarası gözükse de kullanıcı bunu farketmiyor. Tekrar deneyerek Altınrehber'e giriyor. Beklerken:) Fonksiyonu arttıkça bekleme süreleri de artıyor. (Ekran tekrar geliyor) hizmet alanlarına bakacağız. (seçiyor ve başlıkları aşağı doğru okuyarak geçiyor. Taşımacılık sektörünü seçerek taskı tamamlıyor.)
>Bu servisten haberiniz var mıydı? Ne düşünüyorsunuz?	Tabi görüyordum dergiden birşeyler. Bu Altınrehber güzelmiş fena değil ama mesaj güzel değil.

P6: Necmi B. **T1:0:33:43>0:34:00**	Önce TVu açıyoruz.Bizim tv kabloya da bağlı olduğu için digitürke geçince görüntü kayması yapıyor . onun için boş bir kanal ayarladık oraya getiriyoruz. CNBC-e 20ydi galiba.(taskı bitiriyor)
2 kumanda: *>Yanlışlıkla bu kumandada bir tuşa bastığınız oluyor mu* *>Digitürkte istediğiniz bir kanala gelirken bu kolay ya da zor oluyor mu?* *>Program içeriklerine ait bilgiden yararlanıyor musunuz?* **T2: 0:35:40>0:36:56** *>Bu özelliği daha önce kullandınız mı? Kullanışlı mı?* **T3:0:38:39>0:38:52** *>Bu özelliği kullandınız mı? Kullanışlı mı?* **GS:**	Televizyon maalesef bu kumandanın yayınına uygun değil. Dolayısıyla bunun volume ve bazı kontrolleri televizyonun kontrolleıyle yapılabiliyor o pratik değil tabi. Şimdi 2 kumandayla birlikte çalışıyoruz. Oluyor. Şöyle oluyor en fazla: bunun kumandasıyla yayını değiştireceğime televizyonunkiyle değiştiriyorum, o zaman alakasız bir kanala atlıyor. Kanalın numarasını biliyorsam kolay geliyor. Ama tabi bilmiyorsam biraz daha zor oluyor. O zaman bu arayıcıdan veya guide'a gidip oradan arayıp buluyorum. Tabi. Mesela TRT3te bir program (Guide'ı açıp o kanalı arıyor. Sarı gösterici kayboluyor) Bazen bir de bunları yapıyor. *>bu neden kaynaklanıyor sizce?* Son 1 haftadır kontrollerinden kaynaklanan birşey var. Mesela Anadolu Üniversitesini seyretmek istiyorum, Anadolu Üniversitesine sarıyı getirip sağ-sol tuşları ile oraya gelip OK tuşuna basıp orada çek işaretinin çıkmasını sağlıyorum. Evet. Şöyle kullanışsız: Guide'a bastığınız zaman program çok geç geliyor. Bir de son 5 gündür bir karışıklık var. Sarı seçme bandı sayfanın içinde kayboluyor. Ama bu bizim kumandadan mı kaynaklanıyor yayından mı kaynaklanıyor onu bilemiyorum. (Task'ı yapıyor) Beğenirsem Ok'e basıyorum TRT1e gidiyor beğenmezsem back yapıyorum hallmarka geri dönüyor. Evet. Tabi kullanışlı. Tabi öyle köşede resim olsa daha iyi. Sadece isim ve içerik gösteriyor. Kendi kanalları dışındakiler hiçbir zaman isim ve program tutmuyor. Saatleri tutmadığı için o açıdan problem var.

T4:0:40:42> X	(Kumandaya bakıyor.) e-posta hangi kanaldaydı onu bilemiyorum ama şöyle bir arayalım bakalım. (page + ile kanalları tek tek geçmaya başlıyor.) 500lü kanallarda olması lazım. 500den aramaya başlarsak... (500den sonra page + ile devam ediyor. Digipostayı bulunca OK'e basıyor.)
Kullandınız mı?	Kullanmadım çünkü hiç pratik değil. Tuş takımı olmadığından dolayı oklarla harflerin üzerinden dolaşıp OK diyerek falan... Bir de tabi şu ekran çıktıktan sonra... mesaj mı demiştiniz... (seçiyor ve mail sayfasına geliyor. İlk satırdaki adresi silmeden sol okla ilerliyor. Nasıl sileceğini düşünürken ekrana yaklaşıp alttaki açıklamaları görmeye çalışıyor. Klavyeyi nasıl açacağını bulamıyor. OK'e basıyor.) Kullanıcı adımı bilmiyorum. Bir yerde yazıyor da... Necip Kemal Berkman'dı galiba. Söylemişlerdi ama... Burada zaten yeni şeyi soruyor.Yani pratik birşey değil.
>Sonuna kadar bu işlemleri yapmış mıydınız?	Yaptım ama kalvyede 1-2 kelime yazdıktan sonra sıkıldım. *>Tamam teşekkürler o zaman sıkmayalım sizi.* Ama o son kullandığımdan beri ekranı değiştirmiş.
T5:0:44:01>0:44:40	545 miydi... (açıyor)
>Bundan yararlanıyor musunuz?Kolay mı	Evet bizim hanım havaya meraklı olduğu için... Evet.
T6: 0:45:16>0:47:33	Onu denemedim hiç. *>Bir dener misiniz nereden olabilir?* 500lü kanallarda olabilir bir dolaşalım bakalım... Digiaktif... Altınrehber'de olabilir. (giriyor.)
Bu fonksiyondan haberiniz var mıydı?	Altınrehber yeni çıktığında Digitürk'te okumuştum. Hiç kullanmadım. Yani o da herhalde şey diye tahmin ediyorum Sarı Sayfalar var ya Amerika'da var Cdde veriyorlar. (sayfa geliyor. Başlıkları okuyor.) Bizim Ankara'da olduğumuzu biliyor... (Hizmet alanları'na giriyor. Otomotiv başlığında bir süre durup devam ediyor. Araba kiralama, ulaşım gibi bir başlık arıyor. Bulamayınca hizmet alanlarından çıkıp alfabetik erşim'e giriyor. Teker teker firmaların verdikleri servislerin açılımlarına bakarak tarıyor ve buluyor.)
>Bu fonksiyon hakkında ne düşünüyorsunuz?	Böyle birşey pratik değil ve çoğu zaman doğru da değil. Çünkü güncellemiyorlar gibi geliyor. En basitinden hava raporu bile kendi içinde tutarlı değil. Şu anda Ankara'daki hava durumu ile bir ekran evvelki Ankara'daki hava durumu bile birbirini tutmuyor. Böyle bir lakayt davranıyorlar.

P7: Ayşe D. **T1:** **0:48:37>0:48:41**	Önce televizyonumuzu açıyorum.(Digitürk'ü de açıyor) Ben kanalların numralarını bilmediğim için önce Guide'a basıp bakıyorum. Burada şunu söyleyebilirim: bazen çok yavaş ilerliyor.o zaman da sıkılıyorum. (feedback çok yavaş ve sarı gösterge yok oluyor. O yüzden peşpeşe basıyor) Ne oluyor buna ya... CNBC-e'ye geçiremiyorum. Çünkü bak işte böyle gördün mü... anlatabildi mi derdimi çok bekletiyor... (bu arada kanal numarasını görüp guidedan çıkıyor. Taskı tamamlıyor.)
2 kumanda:	Beni aslında sıkıyor. Özellikle televizyonu bir kumandayla açıp AV tuşuna basıp digitürke geçmek... Ondan sonra diğer kumandayı kaldırabiliyorum ama genelde kaldırmadığım için unutuyorum digitürkte olduğumu ve bununla gidiyorum o zaman da kilitleniyor program. O beni etkiliyor. Aslında tek kumandadan olsa daha rahat Digitürk kullanabileceğim ve daha fazla seyredebileceğim. Sırf bunun yüzünden ben çoğunlukla digitürkü açmıyorum.
>İstediğiniz kanala ulaşma konusunda ne düşünüyorsunuz?	Ha o kolay Guide'a girdiğim zaman bana dökümü vermesi kolay. Tek onda sıkıntı telefon hatlarından veya teknik bir arızadan bazen çok ağır işliyor o zaman da sıkılıyorum. Gitmiyor saatlerce. Çünkü ezberlemeyi fazla sevmeyen bir insanım kanalların kaçta olduğunu, bilmediğim için numaralarını o yüzden guide'a girmek zorundayım. Ha sürekli kullandığım kanallarda sorun olmuyor ama mesela CNBC-e'yi seyrederken ben genelde kablo Tvden seyrettiğim için buradaki numarasını bilmiyorum.
Programlar için verilen bilgiden yararlanıyor musunuz?	Yararlanıyorum, özellikle filmlerde yararlanıyorum ve filmlerin içerikleri iyi oluyor fakat diyelim ki normal Atv, Show TV gibi kanallardaki filmlerin içerikleri çok baştan savma. Bazen yok bile, orada yayımlanan bir filmin içeriğini ben bilemiyorum. Ama mesela Moviemax'te veya satın alacağım kanallardakinde bir sorun yok.
T2: **0:53:22>0:53:49**	Tabi ki, onu biliyorum. Diyelim ki CNBC seyrediyorum ve ben Star'da... ama şey gelmiyor (sarı işaret) Monaco- Real Madrid maçını seyretmek istiyorum, OK diyip back'le de dönersem CNBC-e'ye dönerim herhalde... evet...
>Bu özelliği kullanıyor musunuz?	Evet özellikle izlemek istediğim filmi seçip başka programa dönebiliyorum, o kolaylık oluyor benim için. Kumandayla uğraşmadan bir anda gelmesi...

T3: 0:54:34	Ulaşamam çünkü hiç yapmadım. *>Nereden oluyor olabilir bir tahmin yürütseniz?* Öyle bir bilgiye ulaşmak istersem kullanım kılavuzundan bakmam lazım. Ama yani nereden bulurum, açıkçası bilmiyorum. Mesela bu kanalda birşey izerken başka bir kanala bakmak istiyorsam o kanala gidiyorum, orada eğer başlamamışsa acele geri dönüyorum. Yani sürekli back'le harekete devam ediyorum. Yani bunu izlerken bakmayı bilmiyorum hiç yapmadım, o yüzden fikir de yürütemiyorum.
Yardım: açıklama yapılıyor.	Ben bunu biliyordum biliyor musun... yani bir ara böyle gittiğini şimdi hatırladım sen page deyince. Ama hiç kullanmadım. Daha çok şey yapıyordum, şimdi TRT1de ne var diye değil de, Show'a gitmek istiyorum Show'un numarasını unuttum. O zaman + - ile gidip Show'u gördüğüm zaman OK'e basıyordum. Ama yani başka kanalda ne var diye hiç kullanmadım ama sen söyleyince şimdi hatırladım. Bu da çok fazla kullanmadığımın bir kanıtıdır.
Peki şimdi nasıl değerlendiriyor-sunuz kullanır mısınız?	Kullanışlı ama ille de gerekmiyor. Ben bir kanalda birşey seyretmek istiyorsam onu bekliyorsam o işaretlemeyi yaparım zaten bana gelir, zapping yapacaksam da bütün kanalları gezerim zaten. Eğer bu program beni ilgilendiriyorsa başka kanalları da izlemem. Ama ben böyle bir izleyiciyim. Benden kaynaklanıyor.
GS:	Guide'da verdikleri düzenli gidiyor ama bazen takılıyor. Yani mesela bir film oynuyor infosuna bakıyorum, 10'daki filmin infosu hala kalmış oluyor. Yani böyle takılmalar oluyor. Teknik arıza olabilir. Genelde dergilerinden şikayetçiyim bazen geliyor bazen gelmiyor. Daha doğrusu önceden geliyordu, sonradan satın alın dediler... Yani yazılı yayın organları doğru dürüst çalışmıyor. Eksikliği oluyor. Ben sürekli Digitürk seyreden takip eden bir izleyici değllim. Benim zamanım kısıtlı, elimde bir dergim olursa seyretmek isteyeceğim filmin en azından yayınlanacağı tarihleri aklımda tutar o günümü o anımı boş bırakmaya çalışırım. Çocuğum da olduğu için yapacağım şeyleri ona göre ayarlarım. Yüzüklerin Efendisi'ni bir türlü denk getirip seyredemedim mesela. Eğer bir dergi olursa çünkü o dergide tarih, saat falan veriyor. Ona bakarak program yapabilirim bence eksiklik. Buradaki infolardan memnunum takılmadığı zamanlarda.
T4: 0:59:22> X	Hıı... Şimdi onu ben 1 kere yapmıştım ilk başta. Daha doğrusu mail atarak değil de başka televizyona mesaj yolladım... ama şu anda net hatırladığımı söyleyemeyeceğim. Önce digiposta'yı bulalım da.. Bakmam lazım yani, öyle bir kanal var mı yok mu onu bile hatırlamıyorum... Bu tür bir işlemi ben çok fazla yapmam.

Bilgisayardan yapmayı tercih ediyorum, televizyondan çok mühim değil. Kullanımı çok zor, buradan harflere okla gitmek bana sıkıcı geliyor. Ben bir de çok hızlı yazı yazmaya alışmış bir insan olarak hakikaten yavaş geliyor ve sıkılıveriyorum. Mesela oyun parkında bu kumandayla oynanan oyunlar da sıkıyor. Yeterince hıza ulaşamıyorsun. Senin hızına ulaşamıyor kumanda doğal olarak. Bunu beklemiyorum hızlı olmasını ama o zaman da içinden gelmiyor. Yapacağım şey ya bilgisayardan, bilgisyarım yoksa cep telefonumdan geçmeyi tercih ediyorum... mesela bunu bulamıyorum kullanıcısı olmadığım için... bir aşağıya gidersek digitürk dimi... ama gidemiyorum. Gördün mü ne kadar ağır çalıştığını! İşte bu da beni öldürüyor. Biraz da şeyden kaynaklanıyor. Normal televizyonda çok rahat geçiş yaptığımız için, o alışkanlığın var çocukluğundan beri. E üzerine böyle bekleyince... Biraz da benim gibi sabırsız bir insansan sıkılıveriyorsun. O oyun parkına üyelikte de, 3 kere denedim, 3ünde de o kadar bekletti ki lanet olsun dedim oynamam, çıktım... E hadi artık hadi (çıkmak için daha önce bastığını algılamadığı için o şekilde bekliyordu. Digitürk kanalındayken OK'e tekrar bastı, Guidedan çıkarak digitürk'e girdi.)

1:02:02

>Bu fonksiyonu denemenizin sebebi neydi?

Meraktan. O zaman tabi mail atma yoktu televizyondan televizyona kart atabiliyordun. Haber yazabiliyordun ilk başta. İşte böyle tv mesajdan. E peki mail nerede?
> O da aynı şekilde oradan atılıyor. (bunun üzerine oraya giriyor.)

(sol okla adres satırında başa geliyor. Silinmediğini farkediyor) Peki şey nerede(klavye arıyor. Kumandaya yakından bakıyor. Themes tuşuna basıyor. Bir feedback gelmeyince:) ...bir dakika şeyi bulmam lazım... (TXT tuşuna basıyor, klavye çıkıyor) (kalvyede ilerlerken:) Yani şu hareketler... bir daha söyler misin?(adresi soruyor, yazmaya başlıyor, yazdığı zaman adres satırındaki kelimenin üzerinden düzelteceğini bekliyor ama düzeltmeden yazıyor...) Ama silmedi bir dakika... nasıl siliyoruz?.. (sol okla tekrar geri gidiyor) Bir dakika ... ha sil yazıyor (gördüğü işareti tuşlarda arıyor. Alt oka basıyor. Kumandaya yakından bakıyor) Onu bulursam eğer... (page – olduğunu anlıyor ve siliyor. Harflere gelerek yazmaya devam ediyor.) @... görmem lazım önce... (kısa sürede buluyor)
Ay hep yazacakmışım gibi gidiyor elim kumandaya! Rakamların olduğu yerden çıkacakmış gibi de... tamam bu kadar değil mi... eee? (nasıl geri dönüleceğini bulamıyor) Gönder'i yok burada. Çıkışa mı basacaktım yoksa? Ay burada bilmiyorum. OK'e mi basacaktım yoksa? (Klavyede OK karesine gidiyor) Bilmiyorum... (seçiyor) OK'e bastığım zaman birşey olmuyor. (alt satırdaki

	yazılanları okuyor) ‘Kumandanızdaki sayı tuşlarını kullanabilirsiniz’... (birine basıyor sonra siliyor) Sen biliyor musun?
	> ben biliyorum ama...
	E söyle o zaman! (Gülüyor ama biraz sabrı tükenmiş...)
Yardım	*> Peki. Back’le çıkıyorsunuz* (yapıyor) Konu satırına birşey yazacak olsanız, örneğin ‘de’ yazsanız...
	tekrar klavyeye girmem gerekecek... İşte bunların hepsi ...
	>Tamam çok uzatmayalım isterseniz... Gönderin şimdi (OK’e basıyor. Kullanıcı adı ve ismiyle ilgili ekran geliyor.)
	Benim kullanıcı adım yok ki... Klavyeyi bulursam yeniden...(TXT basıyor. Rastgele harflere basıyor. Geri dönüyor. Alt satırı yazmak için aşağı iniyor.) tekrar klavyeye gidiyorum... İşte bak bu benim için ölüm! Birşey yazacağım varsa da vazgeçiyorum. (tek harfe basarak satırları dolduruyor. Onay için OK’e basıyor ama aynı sayfa boş olarak tekrar geliyor) eee? Sil’e mi bastım ne yaptım? Tekrar mı yapıcam yani!
	> Tamam mühim değil bitirebiliriz.
	Yani iyi bilmiyorum belki ama sonuçta tahmin yürüterek yapılabilir.
	>İlk denediğinizde yardım almış mıydınız?
	Yok yardım almadım ama Hakan’la beraber işte nereden çıkılır ne olur... diye öyle mesaj yolladık.
>Peki sizce bu daha kolay olsa faydalı bir fonksiyon olarak kullanır mısınız?	Kesinlikle! Yani hakikaten daha fonksiyonlu olsa... Yani daha kolay yapabileceğim... Bu çok bayıyor beni! O zaman kullanabilirim belki. Yani bilgisayar kadar kolay yapabilirsem televizyonda da o zaman evet...
	(guide’a giriyor, kanal numarasına bakıyor, seçip OKliyor)
T5: 1:09:24>1:10:14	Arada sırada. Yani bir havaya bakayım diye açmıyorum ama arada guidedayken gözüme çarparsa, yarın hava nasıl olacak diye bakıyorum ama hergün aman hava durumuna bakayım değil. Onu zaten haberleri izlerken görüyorum. Yani çok fazla kullanmıyorum. (ekran açılıyor ve kolaylıkla bilgiye ulaşıyor. Çıkmak için gerekli tuşun hangisi olduğunu anlayamıyor. Kumandaya yakından bakıyor. Buluyor)
>Bunu daha önceden biliyor ve kullanıyor muydunuz?	
T6: 1:10:40> 1:13:20	İlk defa gireceğim. Yani Altınrehber’e mi gireceğim neye gireceğimi net olarak onu da bilmiyorum ama... (guide’ı açıp bakıyor) 700lü numaralar mı? Biliyorsan yazayım... (aramaya devam ediyor. Son sayfalara gelmek için sayıları kullanıyor. Hata ile Back’e basınca ilk sayfaya gidiyor.) AA!

>Kanal numaralarına basarken hata yapıyor musunuz?

Yapıyorum tabi! (kanalı bulup giriyor.)

Bu fonksiyondan haberdar mıydınız?

Evet bir kere Hakan girdiğinde gördüm ama özellikle açıp bakmadım. Birşeye ihtiyacım olmadı ama ulaşabileceğim yakın hastane telefonu falan olması lazım, onu anketinde işaretledim. Hiç başıma gelmedi ama öyle bir acil durumda ihtiyaç duyabilirim.

(Sayfa geliyor ve hemen hizmet alanları'na giriyor. Sırayla aşağı iniyor. Otomotivde bir an durup düşünüyor, sonra hepsine bakmak için devam ediyor. Sona gelince tekrar geri dönüp otomotiv'i seçiyor, taskı tamamlıyor.

>Ne düşünüyorsunuz?

Kullanışlı tabi yani gerçekten full bir şekilde girerlerse, yani araba kiralama çok gerekli olmayabilir ama diyelim ki evimin yakınındaki restoranları, acil bir durumda ulaşabileceğim hastane, veya açık, nöbetçi eczane gibi hayatı kolaylaştırabilecek bu tür bilgiler girerlerse kullanırım, ama araba kiralamaya çok acil ihtiyacım olabileceğini zannetmiyorum, zaten araba kiralama yerinden gider kiralarım. Bunun için kullanmam. Yani gündüz değil de gece saatlerinde ulaşabileceğim yerlerin bilgisini verirse kullanırım.

P8: Hakan D. **T1: 0:00:04>0:01:11**	(Televizyonu açıyor ve digitürke giriyor. İnteraktif bir kanal yüklenmeye başlıyor. Kanaldan çıkmak istiyor ama yükleme sırasında sistem feedback vermiyor.) Back yaparak kanaldan çıkmaya çalışıyorum ama olmuyor. (TV Hava kanalı açılıyor. Buradan back ile çıkıyor. 20ye yakın bir kanala gelip ileri doğru birkaç kanal geçiyor) 20ymiş. Kanalın içeriğine ulaşıyorum (Tamamlıyor.)
2 kumanda	Zor. Daha önce ikisini birden kullanıyordum. Ama son zamanlarda ayarı bozuldu herhalde ya da bir şekilde yanlış bir şeye bastık. Dolayısıyla önce bu kumandayla açıyoruz televizyonu sonra yine tv kumandasıyla Avye geliyoruz ve daha sonra digitürke geçiyoruz. Muhtemelen bu kumandanın içinde var ama biz o kadar konuya hakim değiliz.
>*Yanlışlıkla bir düğmeye basıp yayından çıkmak gibi durumlarla karşılaştınız mı?*	İnteraktif kanallarda oluyordu tabi. OK'di, Back'ti, şu, bu... ve o kanallarda çok bekliyor tabi. O çok bunaltıyor. Yani klasik televizyonun bir teletext hızına bile ulaşamadı daha. O tür bilgiler bu kadar görsel, detaylı değil ama normal televizyonun teletext şeyleri de var. Özellikle son zamanlarda çok daha süratlendi. Özellikle TRT1'inki çok içerikli, kapsamlı, birçok şeye ulaşabiliyorsunuz. Ama tabi bir görsel estetik yok onda renkler falan. Amaç orada bilgiye süratli ulaşmak. > *Birtakım şeyler için Teletext'i tercih ettiğiniz oluyor mu?* E tabi daha süratli. Özellikle Borsa'daki kağıt fiyatlarını kesinkes televizyondan. Ama mesela bilgisayar varsa internetten bakmıyorum, teletextten bakıyorum.
>*Peki bu kanalın numarasını biliyor muydunuz?*	Hayır tahmini olarak. Bildiklerim işte Eurosport, 11 Show tv ile başlıyor ondan sonra tıktıktık yukarı-aşağı giderken tahmini ortalarda birşey seçtim. 20'deymiş CNBC.
>*Bu size zor geliyor mu?*	Klasik televizyondaki zapping hastalığına yakalanmış biri olarak, onunla bunun arasında çok büyük fark var. Bu çok yavaş. Öbürüyle tıktıktıktık kanal geçtiğinde, çok daha fazla.
>*Kanallardaki bilgiden yararanıyor musunuz?*	Evet özellikle filmlerde. Düzenli seyrettiğimiz ve hakim olduğumuz kanalların dışındaki kanallarda kullanıyoruz.
T2: 0:05:00> 0:05:25	Guidea basıyorum. Önce istediğim programa bakıyorum. Mesela Akademi Türkiye'yi geçtim, geldim ve Monaco-Real M. Maçına... (aynı program seçildiği için uyarı çıkıyor. Back ile çıkıp başka

	programa geliyor. Onu onaylamak için OK demek isterken Back'e yanlışlıkla basıp yayından çıkıyor. Tekrar dönmek için tekrar back yapıyor... bekliyor..) İşte bu öldürüyor beni. Belki kumandanın pilinden bilmiyorum. Yani bütün televizyonların kumandalarını sağa tut,sola tut, bir yansıtma yoluyla alıyor. Bunda o sıkıntı var yalnız. Hala çıkmaya çalışıyor. (guide'a tekrar dönüp işaret koyuyor.)
>Bu özelliği kullandınız mı? Kullanışlı mı?	Evet bu özelliğini seviyorum. Daldık birşey kaçırdık olgusunu ortadan kaldırıyor. Burada tek sıkıntı guide'ın yavaş işlemesi. Özellikle bu page down'a falan bastın mı... Yani insan bunu şıkşıkşıkşık gitmek istiyor ve bu kumandanın daha efektif olmasını istiyoruz yani. Normal televizyon kumandasında teletexti şusu busu kısa sürede değişiyor. Bunda öyle değil. Bak mesela bastım, hala geçemedi. En az 4 kanal bastım.
T3: 0:08:26> X *Nereden olabilir*	Hiç bilmiyorum. Themes'deno labilir (basıyor feedback gelmiyor) Favourites'den olabilir mi?... (basıyor) yok... options'dan olabilir mi (basıyor, pencere açılıyor, vazgeçip kapatıyor.) şurada ne olduğunu bilmediğim birşeye bastım... (görüntü bir saniyeliğine gidip tekrar geliyor) Şu anda bulamadım.
Yardım (açıklama) *>Sizce nasıl bir fonksiyon?*	Ooo... çok güzel E bu güzel birşey, hatta normal tvlerde de olsa evdeki zapping kavgalarını azaltır. Programa bakmakta fayda var öbür türlü böyle tıktıktıktık geziyoruz habire. Bu tamamen zapping hastalığıyla ilgili birşey, yoksa... Benim işime şöyle yarayabilir, ben 4 tane kanal takip ediyorum, ama çok hakim de değilim, düzenli seyredemiyorum. Ama burada çok cazip title'lar oluyor. Onları yakalamak adına evet.
GS:	Birçok şeyde yeterli bilgi yok. Detaylı bilgi de değil, bazılarında hiç bilgi yok.
T4: 0:12:36> X	Arayarak bulabilirim ancak. Şöyle yaparım:711 futbol kanalı. Bunların akabinde şeyler var (Guide'a giriyor. Digitürk 1 numaralı kanaldan çıkıyor) Doğru yerde miyim? Burası mı? *>Siz şimdi genel bir bilgi mi almak istiyorsunuz?* Yoyoyo hayır... (1 numaralı kanal tekrar geliyor, digiaktif-test kanalına giriyor, sonra oradan çıkıp guide'a tekrar giriyor. Kanalları page- ile arıyor.) Şimdiye normal televizyon kanallarından 20 tane geçmiştik. (521 numaralı kanal olduğunu öğreniyor. Kanal sayısını yazarken yalnızca 5 sayısı algılanıyor. Sistem o kanala geçiyor.) Yani saçmasapan yerlere atlıyor. Yani ben 5 falan yazmadım şimdi. Yani bunlar ister istemez soğutuyor.

	(521 yazarak kanalın yüklenmesini bekliyor.)
>Bu fonksiyonu daha önce denediniz mi?	Bir kere kullandım merakımdan ama bu yavaş hızıyla yani... daha bak şimdi kanal yüklenecek... O şifremi falan da bilmiyorum yani... nereden yüklenir ne yapılır... (Sayfa açılıyor ve mesaj gönder seçeneğine giriyor)
	Kime... (adres satırındaki harfleri siliyor.) *> Oraya yeni birşey yazmak için ne yapıyorsunuz?* Text'e basıp klavyeyi kullanıyoruz. Burada mesela bir cep telefonu mantığını buraya ekleyebilir. *>Aslında böyle bir şey var ama farketmemiştiniz herhalde...* (Deniyor.) Ama burada tuşların üzerinde harf olmadığı için... (bazı harfleri sırayla sayarak hangi tuşa basacağına karar vererek kullanıyor.) İyi bir cep telefonu kullanıcısı olarak... (Geri çıkmak istiyor. Back'e basıyor. Karar ekranı geliyor.) Burada çok fazla anlaşılmıyor. Yani bizde yetki verdiğin şey kırmızıdır... Hah öyleymiş zaten... (kanalın ana sayfasına geliyor.)
>Pratik ve kolay buluyor musunuz?	Çok fazla değil... (gülüyor) Ama acil bir durumda birine mesaj atmak istiyorsunuz... bizim evde bilgisayar yok mesela. Veya işte, fantazi de, birinin cep telefonuna mesaj atacaksın, cebin de arızalı, elektrik... elektrik kesilse bu da çalışmaz tabi (gülüyor), kontürün yok birşeyin yok, telefonun arabada kalmış, telefon da etmek istemiyorsun mesaj atmak istiyorsun, onun için kullanılabilir. Ben buradan kendi kullanıcı adımı öğrenebiliyor muyum peki ? (açıklama yapılıyor) Ben kendiminkini öğrenemiyorum buradan öyle mi? Yani hotmail'a ulaşıp okuyamıyorum... *>Hayır.* Bak işte öyle olsaydı çok sevinirim. Kullanmaya başlardım yani.
T5: 0:20:46 > 0:22:11 *>Daha önce kullandınız mı?*	555... Bu değilmiş.. (Guide'a girip numarasına bakıyor, kanala giriyor.) Tabi. Mesela İstanbul'da faciada kaldığımızda 1gün kaldım, 2 gün kaldım, yola çıkıp Ankara'ya gelmem gerekiyor. Ve de bana tavsiye de etmişlerdi tahminleri çok doğru gidiyor diye, dolayısıyla buradan yararlandım. Yani meraklısı değilim yani hergün kalkıp acaba diye. Ama böyle çok ekstrem durumlarda özellikle kış aylarında yola çıkacakken...
Kolay, kullanışlı buluyor musunuz?	Diğer kanallarla kıyasladığım zaman, bu altınrehber falan çok daha süratli. İşte birşeye bastım, bitti. Ama kendi kanallarında sıkıntı var. Ama bunların ikisi süratlı.

T6: 0:22:46 >0:25:23 *>Bu özelliği daha önce kullandınız mı?*	(Guide'dan kanala bakıp giriyor.) Kullanmadım ama çok faydalı birşey olduğunu biliyorum. Destekliyorum. Çünkü bu posta kutusuna atılan el ilanlarından nefret ederim ben. Evde bunları bulundurmaktan da nefret ederim, ama ihtiyaç da duyduğum oluyor. A tüh niye attım diyorum. Ki ben bunu cep telefonunda bile kullanıyorum... İşte Ankara, gece hayatı, ... işte GPRS'ten buluyorum. Cafeler barlar falan. Çünkü şey bana artık çok bes geliyor. Açıp 'şuranın numarası', kapat, tekrar ara falan... bunların hepsinin nakavt olduğu bir koşul mevcut. Hizmet alanları- a pardon... İl/ilçe değiştir... Ankara, tüm ilçeler, OK. (Hizmet alanları'na giriyor) Buna Otomotivden de ulaşabiliriz, taşımacılıktan da ulaşabiliriz, ama en sağlıklısı turizmden ulaşmak. (Taskı tamamlıyor.)
>Peki bunu kolay buluyor musunuz?	Tabi. Bazen sektörlerde çakışma olabiliyor ama normalde bulunuyor. Diğer kanallarla kıyasladığımda çok daha süratli.