EXPLORING THE SIGNIFICANCE OF COLLABORATION IN THE EARLY DESIGN STAGES OF INTERACTIVE KIOSKS

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To Oscar, Oki, Luna and Fuji…

ABSTRACT

In today's post-digital era, the role of design discipline has dramatically changed due to the major shifts in technological developments. Owing to adaptation of technology to human life in multiple ways, a new generation of needs and expectations emerged in the field of design. The interactive tools supported by these technological developments do not only provide access to information, but also determine people's behavior in the experience of products. As a kind of public display, the interactive kiosk is developed in order to provide access to information through the applications for different purposes. Beyond the purpose of transmitting the information, these public displays have a strong potential for creating an opportunity to people for exchanging the information in public realm by providing novel forms of interactivity due to their wide use. Recent literature reflects the fact that providing a sustainable communication through these products has not been maintained yet which needs to be investigated, not only through their interface but through an examination for its potential. The studies emphasize the importance of collaboration in the design process of interactive products. Therefore, establishing partnership in design, sharing ideas, experiences and information in the early stages of design is important in identifying existing design problems and producing innovative design solutions. However, since design problems are ill-defined in the early design process of products, application of design approaches in collaboration can differ in terms of the scope of the researches. For this reason, we believe that a collaborative process based on a particular context, user, environment and technology will be an important resource for similar future design research. The aim of this study, therefore, is to evaluate the early design process of interactive products supported by the collaborative process from a holistic point of view. Therefore, this research involves the analysis and discussion of the results in order to reflect the value of the collaboration in early design stages. Within this frame, a case study which is based on collaborative design method that addresses the process of designing effective user scenarios for interactive kiosks is conducted. Within the scope of this research, four information kiosks provided by Center of Energy Efficiency Environment at Ozyegin University campus are investigated to identify the problematic aspects of design and new user scenarios are developed and discussed. This design research which includes the engineers and specialists from CEEE,

design students and design researchers, was carried out in Department of Communication Design of Ozyegin University, under the Interaction Design Ergonomics course in 2015 and 2017 fall semesters. The results of the research emphasize the significance of collaboration in preventing future design problems and reveals a vision of how collaboration can guide the process. As a result, this thesis reveals the following conclusions: (1) Since each design problem may require different approaches, the key question might be centered to build a framework to be applied to identify the needs and to provide appropriate design solutions in order to communicate through varying media in public spaces. (2) The involvement of different voices in design processes enriches solutions in terms of producing creative ideas and plays an important role in communication between different disciplines. (3) It becomes evident to encourage organizations to invest in collaboration which accelerates the improvements in design field. The thesis ends with the discussions on possible future guidelines for the design development of interactive kiosks which will both be beneficial for early design and user experience evaluation stages.

Keywords: *collaboration in design, early design stages, user scenario, interactive kiosks*

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ÖZ

Bugünün post-dijital çağında, tasarım disiplinin rolü teknolojik gelişmelerdeki hızlı ilerlemeler sebebiyle büyük ölçüde değişmiştir. Teknolojinin insan yaşamına çeşitli şekillerde uyarlanması sayesinde, tasarım alanında yeni nesil ihtiyaçlar ve beklentiler ortaya çıkmıştır. Bu teknolojik gelişmelerle desteklenen etkileşimli araçlar artık sadece bilgiye erişim sağlamakla kalmamakta, aynı zamanda insanların ürün deneyimlerindeki davranışlarını da belirlemektedir. Kamusal ekranların bir çeşidi olan etkileşimli kiosklar farklı amaçlara yönelik uygulamalar aracılığı ile bilgiye erişim sağlamak için geliştirilmektedir. Kamusal alanda yaygın kullanımları nedeniyle bu etkileşimli ekranlar, bilgi iletimi amacının ötesinde, insanlara bilgi alışverişi yapabilmelerinde, özgün biçimlerde etkileşim olanakları sağlama açısından güçlü bir potansiyele sahiptir. Son araştırmalar, bu ürünler yoluyla sürdürülebilir bir iletişimin henüz sağlanamadığını, sadece ara yüzlerine odaklanmak yerine, bu potansiyellerinin de araştırılması gerektiğine değinmektedir. Araştırmalar, etkileşimli ürünlerin tasarım sürecinde iş birliğinin önemini vurgulamaktadır. Bu nedenle, tasarımın ilk aşamalarında tasarımda ortaklık kurmak, fikirlerin, deneyimlerin ve bilginin paylaşımı mevcut tasarım problemlerinin tespitinde ve yenilikçi tasarım çözümlerinin üretilmesinde önemlidir. Öte yandan, tasarım sürecinin erken aşamalarında tasarım problemleri henüz yeterince tanımlı değildir, bu nedenle iş birliği içinde tasarım yaklaşımlarının uygulanması, araştırmaların kapsamı açısından farklılık gösterebilir. Bu noktada, belirli bir bağlam, kullanıcı, çevre ve teknolojiye dayanan bir işbirlikçi sürecin, gelecekteki benzer tasarım araştırmaları için önemli bir kaynak olacağını düşünüyoruz. Bu nedenle, bu çalışmanın amacı, işbirlikçi süreç tarafından desteklenen etkileşimli ürünlerin erken tasarım sürecini bütüncül bir bakış açısıyla değerlendirmektir. Bu araştırma, erken tasarım aşamalarında iş birliğinin değerini yansıtmak için elde edilen sonuçların analizini ve tartışılmasını içermektedir. Bu çerçevede, interaktif kiosklar için etkin kullanıcı senaryoları tasarlama sürecini ele alan işbirlikçi tasarım yöntemine dayanan bir örnek olay çalışması yürütülmüştür. Araştırma kapsamında, Enerji, Çevre ve Ekonomi Merkezi tarafından Özyeğin Üniversitesi kampüsünde hizmete sunulan dört bilgi kiosku, mevcut tasarım problemlerini ortaya çıkarmak için incelenmiştir ve bu kiosklar için yeni kullanıcı senaryoları geliştirilmiş ve sonuçlar tartışılmıştır. EÇEM merkezinden mühendisler ve uzmanlar, tasarım öğrencileri ve tasarım araştırmacılarının katılımıyla gerçekleştirilen bu tasarım araştırması, 2015-

2016 ve 2016-2017 güz dönemlerinde, Etkileşim Tasarımı Ergonomi dersi kapsamında Özyeğin Üniversitesi İletişim Tasarımı Bölümü'nde gerçekleştirilmiştir. Araştırmaların sonuçları iş birliğinin gelecekte karşılaşılacak tasarım problemlerinin önüne geçmekte önemini vurgular ve iş birliğinin tasarım sürecine kattığı vizyonu ortaya koyar. Sonuç olarak bu tez ile şu çıkarımlara varılmıştır: (1) Her tasarım problemi farklı yaklaşımlar gerektirebileceğinden buradaki kilit soru, kamusal alanlarda farklı medyalar yoluyla iletişim kurmak için ihtiyaçları tanımlamak ve tasarım çözümleri geliştirmek için kavramsal bir çerçevenin ne olması gerektiğidir. (2) Farklı seslerin tasarım süreçlerine dahil olması, yaratıcı fikirler üretme konusunda çözümleri zenginleştirir ve farklı disiplinler arasındaki iletişimde önemli bir rol oynar. (3) Kurumları iş birliğine teşvik etmenin tasarım alanındaki ilerlemeleri hızlandıracağı belli olmuştur. Bu tez, etkileşimli kiosklar için gelecekte yapılacak olası tasarım geliştirme ve kullanıcı deneyimi değerlendirme süreçlerine kılavuzluk edecek tartışmalar ile son bulur.

Anahtar kelimeler: *tasarımda iş birliği, erken tasarım aşamaları, kullanıcı senaryosu, etkileşimli kiosklar*

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At the very beginning of my academic life as a design researcher candidate, I had the opportunity to present my study at national and international conferences and publish my papers in proceedings during my master education. I would like to thank all peer-reviewers for their valuable contributions to my research by their comments.

Lastly, I must express my biggest gratitude to my mother and father for their endless support and encouragement during my master education. They have always been with me in this difficult process and they have always reminded me that nothing is more valuable than the unconditional love in life.

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LIST OF ABBREVIATIONS

CEEE	Center of Energy Efficiency & Environment
CoD	Department of Communication Design
HCI	Human Computer Interaction
RFID	Radio-Frequency Identification
RQ	Research Question
UCD	User-Centered Design
VR	Virtual Reality

CHAPTER 1
INTRODUCTION

1.1 Motivation

We live in a world surrounded by information-rich technologies. Today, the information is accessible at anytime and anywhere, with the adaptation of pervasive computing approaches into the real life (Weiser, 1991; Weiser & Brown, 1997). The products providing the flow of information are now interconnected and communicate with each other through the networks (Oliver, 2017). Interactive displays, as a type of such products are placed in public, semi-public and private spaces. With the emerging display interaction technologies, traditional one-way communication has taken its place in two-way communication allowing public interaction by these products (Houben & Weichel, 2013). Beyond transmitting information, these public displays are becoming ubiquitous and have a strong potential for creating an opportunity to people for exchanging the information in public realm by providing the novel forms of interactivity (Vogel & Balakrishnan, 2004; Müller, Otero, Alissandrakis & Milrad, 2015).

Being one of the public displays, interactive kiosks are developed in order to provide access to information for different purposes like communication, commerce, entertainment, education, health (Zhao & Hou, 2011). Their strategic importance can be explained by the following reasons:

a. Interactive Kiosks are Often Used in Public Spaces: Rowley (1995) defined the early kiosks as typically "uninteresting boxes" produced to allow customers to complete a single task such as finding particular information or placing an order. However, the nature and role of kiosks have changed considerably over time, and since that time, kiosks seem to have been designed in countless variations depending on target users, services offered and the emerging technological developments (Rowley & Slack, 2001; Er & Çağıltay, 2011).

Previous academic research on the usage area of interactive kiosks includes studies in a variety of areas for public use such as interactive wayfinding guides that provide immediate on-site access (Johnston & Bangalore, 2004), information guides for museum visitors (Katre & Sarnaik, 2010), individual banking operations (Paradi & Ghazarian-

Rock, 1998), shopping guides (Hope et al., 2006), internet access (Guo et al., 2007), photo processing and printing services (Park, Lee, Kim & Ha, 2005). Several studies have been carried out in health care such as cancer diseases (Möller, Hult, Isacsson & Lindholm, 1997), nutrition, diet and weight control (Endres, Welch, & Perseli, 2001) and general health information (Nicholas, Huntington, Williams & Vickery, 2003) that are aimed to inform people about health issues and to increase their awareness. Besides these applications, it is also seen that these kiosks are used for measurement and analysis such as user tests (Scholtz, 1998), surveys (Blignaut, 2004), and voting simulations (Costlow, 2002).

b. Different Interaction Modalities can be Adapted to Interactive Kiosks: Interactive kiosks are usually set up in the public and semi-public spaces such as hospitals, schools, banks, shopping malls, museums, airports and so on (for e.g see Fig. 1). The applications designed for information kiosks are often for the purpose of exchanging information through their touch sensitive displays on a specific content. They are produced in different size and physical forms, usually horizontally or vertically that can be placed as stand-alone or wall-mounted.

The users can interact with the kiosks through the touch-sensitive displays where the system perceives each action as a particular task and delivers the user's actions to the terminal. When a user completes a task, the information that the user needs is displayed on the screen. Depending on the intended use, other input and output devices such as keyboards, RFID readers, microphones, cameras, printers and speakers can be combined with kiosks' touch screens.

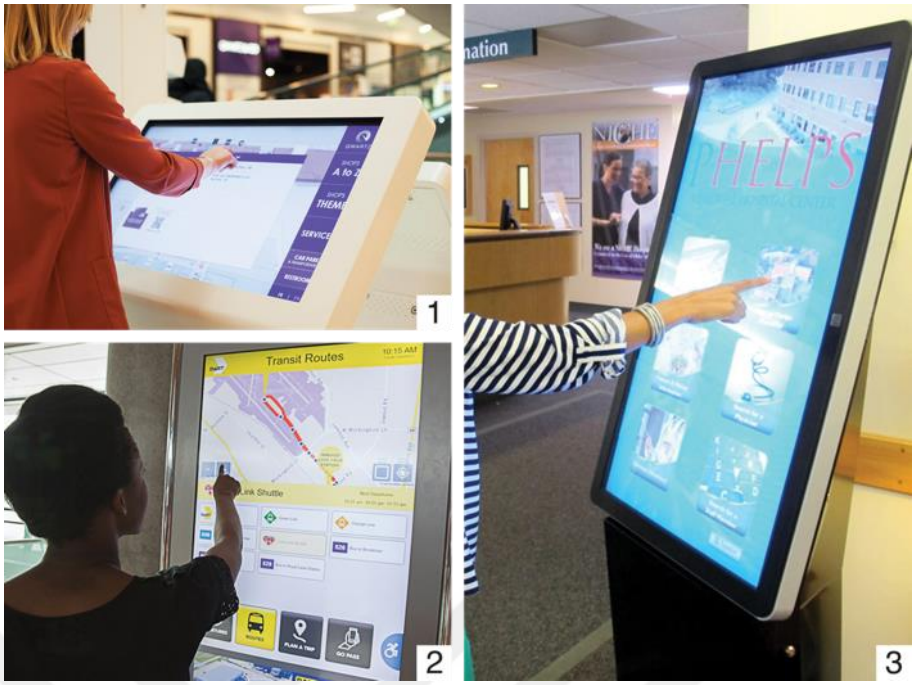


Figure 1 Interactive kiosks in public spaces (1) Qwartz Shopping Mall, (2) Love Field Airport (3) Phelps Hospital Kiosks and Digital Signs. (2015). ("The shopping mall "Qwartz" ", n.d ; "DART introduces interactive access information kiosk", n.d.; "Phelps Hospital Kiosks and Digital Signs", 2015).

Although the design of interactive kiosks seem to be focused on touch-screen based interaction in practice, some experimental prototypes were also developed by employing other types of interaction modalities in order to enhance the user experience of interactive displays. Hagen and Sandnes (2010) developed a prototype having a multimodal user interface that is adjustable based on the user's physical characteristics. The system measures the user's reading distance and adjusts the text size for providing a suitable reading. Speech recognition has also been studied in several kiosk prototypes which are usually focused on the evaluation of using speech input modality in user interfaces (Life et al., 1996; Ida, Mori, Nakamura & Shikano, 2004). Physical objects were also employed in order to investigate the role of motion and physicality in drawing passersby's attention (Ju & Sirkin, 2010). Moreover, mid-air gestures were investigated by particularly focusing on hand-gesture based interaction for public displays (Walter, Bailly, Valkanova & Müller, 2014). Khamis, Bulling and Alt (2015) discussed the challenges of employing eye gaze modality for public displays, and proposed technical solutions. Müller, Walter, Bailly, Nischt and Alt (2012) focused on the attractiveness of the displays. They designed an interactive installation that gave visual feedback to passersby's random movements. In

addition to literature studies, it is possible to find examples of multimodal kiosks that are adapted to real life. For instance; Gallery One at the Cleveland Museum of Art has placed interactive kiosks which can recognize user gestures and facial expressions in the museum in order to enrich the users' exhibition experience (Janet Dodrill, 2013), (see Fig. 2).

Figure 2 Interactive Kiosks usage with different modalities: (1) facial expression recognition (2) gesture recognition in a museum environment (Janet Dodrill, 2013).

Interactive kiosks with multimodalities have also been placed in public spaces for sales & marketing-oriented purposes. For example, Ford company provided an interactive kiosk with a augmented reality application which recognizes users' bodily gestures. Users can explore the features of an automobile (Golding, 2015) (See Fig. 3).

Figure 3 Ford company's interactive kiosk in which augmented reality application is implemented with gesture recognition technology (Golding, 2015).

Based on our background research we recognized that interactive kiosks have become very important in maintaining the communication and exchange of information in public

spaces due to their widespread use as well as their compitability with multimodal interaction. Because of this fact, alternative approaches for the design of these kiosks have to be investigated in order to increase their efficiency and the quality of the experience.

1.2 Subject of The Study and Background Information

The main subject of this thesis is to investigate the approaches in developing design solutions that will reveal the potentials of interactive kiosks by considering their widespread use in public spaces within technological possibilities. In this respect, the background information of this study includes theoretical approaches to the design of public interactive screens and user-centered design processes.

1.2.1 Studies Concerning Design of Interactive Kiosks

Rowley and Slack (2001) emphasized the importance of considering four critical factors in the design of successful public displays: user, environment, task and technology. Compared with the early kiosks, they reported that in the new kiosks -with their impression “Kiosk 21”- much more successful outcomes were obtained in relation to these factors (Rowley & Slack, 2001). However, they argued that service providers are not still sufficiently focused on context in the design of these kiosks. According to them, in order to provide a kiosk to be noticeable by users, it must be positioned at the appropriate point in the environment, and the physical forms of the kiosks also should be carefully designed. Also, they point out that the context should not be considered separately from the users' actions, goals, social and emotional situations regarding the provided experience. Hence, the context needs to be considered by investigating these factors in order to provide an effective user experience.

Maguire (1999) provided a set of design guidelines which are mainly focused on user interface design by reviewing the previous research concerning the design of kiosks in public realm. These guidelines are addressing user requirements, introduction and instructions, language selection, privacy, help, application of input and output devices, structure, navigation and customization as well as the graphical user interface elements. Similar to the Rowley and Slack’s (2001) arguments, Maguire (1999) highlighted the importance of noticeability of the kiosks. According to Maguire, most users will use the

system for the first time; therefore, the appearance of the kiosks must be designed simple and intuitive in order to be recognizable by passersby. In addition to that, the purpose of the system must be defined clearly. Moreover, Maguire (1999) emphasized the importance of user engagement and addressed some factors that are needed to be taken into account in the design of kiosks. The users of these systems are people who have very different levels of skill, experience and motivation. For this reason, kiosks should be designed considering people with different physical and cognitive abilities. Afterwards, in another study, a number of heuristics were also shared, including Maguire's design principles (Sandnes, Jian, Huang & Huang, 2010). In a detailed review, Sandnes et al. (2010) also enriched these guides by additional novel heuristics such as making pages multilingual, avoiding unnecessary action steps, using geographic layouts and so on. They also applied these heuristics for the evaluation of the Taiwan high-speed rail ticket vending kiosk (Sandnes et al., 2010).

Vogel & Balakrishan (2004) developed an interaction model for publicly located ambient displays, identified the design principles of the aesthetics, comprehension, notification, interaction duration, instant availability, shared usage and security. Unlike previous design guidelines in the literature, they claim that the interaction between user and product may vary according to different stages in the physical environment. In this context, they created interaction framework and highlighted how the product should interact with the user at different stages (See Fig. 3).

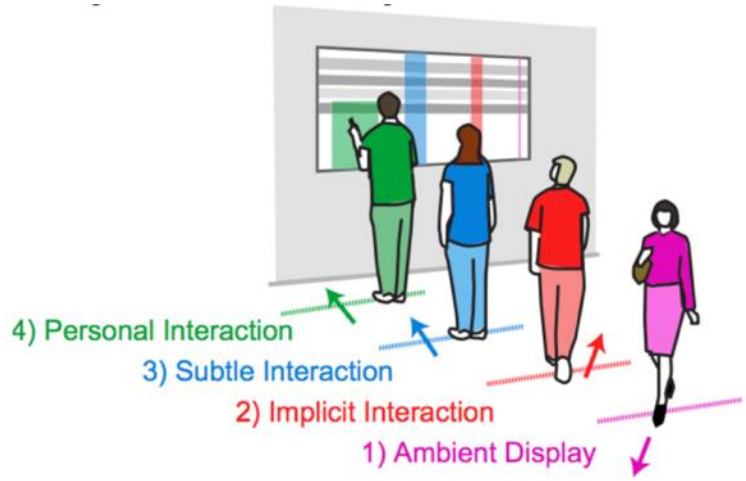


Figure 4 Interaction phases describe the product-user interaction at different levels in public spaces (Vogel & Balakrishan, 2004).

In this interaction framework, the ambient display phase is defined as where users can quickly notice the information provided by the product. In the implicit interaction phase,

the system can perceive the user's body position. Subtle interaction phase is defined as where and how the notifications can be activated, and more information can be reached by the user. Finally, the personal interaction phase, the user can interact with the system in a detailed way. This phase also can be designed for multi-user interaction. Buerger (2011), by supporting the idea of Vogel and Balakrishan (2004), drew attention to another problem of these devices, which is social embracement of users. Buerger (2011) suggested that these devices must be developed for overcoming users' fear of being watched. Therefore, in order to motivate users, these products must be easy to use and supported by natural gestures. In addition to this, a rewarding system can be provided for the user to interact with these products with a positive tendency. Müller, Alt, Michelis and Schmidt (2010) also explored user engagement for interactive displays in the physical environment and developed a model that describes different levels of the interaction (See Fig. 4).

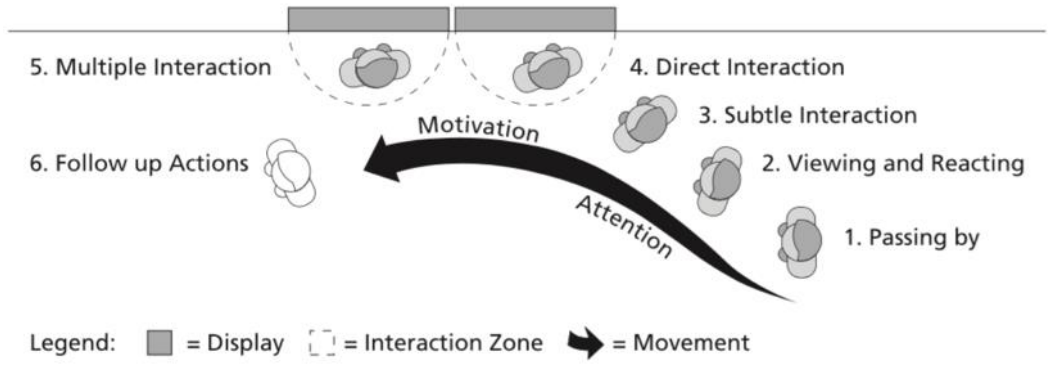


Figure 5 The Audiance Funnel defines the user's attention and motivation according to different stages of interaction (Müller et al., 2010).

Müller et al. (2010) claimed that, in the first phase, people usually pass by the devices without giving any attention. In the second phase, people can notice the screen. In the subtle interaction phase, the interaction begins with the actions of the users. In direct interaction phase, users interact with the system more deeply, and their body positions are adjusted according to the device's screen. Although there are many technological developments, the users still ignore these products because the intentions and motivations of users for interacting with public displays are not discovered yet. These products need to motivate people by attracting their curiosity, offering different choices, and even provide a space for multi-user interaction. According to Müller et al. (2010) these factors are still disregarded, and the design of these products is still not sufficient in terms of

providing an efficient interaction for intended information exchange in practice. Therefore, encouraging users to interact with these products and maintaining the interaction is still one of the most significant challenges in designing public displays.

As a result of the backgroud review, it is recognized that, interactive kiosks have a strong potential for creating an opportunity to people for exchanging the information in public realm by providing novel forms of interactivity. Although the design principles created for kiosks mostly focus on the user interface design, some researchers have argued that focusing on only interface design of interactive screens is a limited approach in terms of providing an efficient service. Design solutions which is limited with the user-screen interaction can cause some problems. For instance, passersby -who are the potential users of these products- may not find them attractive enough to use. Moreover, passersby may hesitate to use them by thinking they are difficult to use or they can simply ignore these kiosks because they have other goals. Hence, design of these kiosks need to be noticeable and attractive, encourage the users to engage. Moreover, the physical forms as well as the interfaces need to be designed by considering the users' cognitive and physical abilities. Furthermore, while designing these kiosks, its' context, the user and the technology in which the information kiosk is placed should be taken into consideration in order to provide an effective and sustainable user experience.

Within the scope of this thesis, by considering the context of the kiosks we planned to study (see section 1.3), we also searched the existing interactive kiosk examples which are placed on university campuses by aiming to provide information about energy efficiency. We recognized that some interactive dashboards are placed on university campuses (See Fig. 6).

Figure 6 Kiosk Applications about Energy Efficiency in University Campuses (1) University of Kentucky, (2), University of Western Carolina, (3) University of Miami ("University of Kentucky's Empowered program", 2012; "Harrill Hall rededicated," 2012; "Energy", n.d.).

We also searched the literature on for studies that explore role of the collaboration in designing user scenarios for information kiosks. However, we have not found a similar study yet.

1.2.2 Studies Concerning User-Centered Design Processes

"The User-Centered Design" was originated by Donald Norman in 1980s and has become widely used after the publication of his co-authored book, User-Centered System Design: New Perspectives on Human-Computer Interaction (Norman & Draper, 1986). Norman stressed the significancy of understanding the users (1986):

"…user-centred design emphasizes that the purpose of the system is to serve the user, not to use a specific technology, not to be an elegant piece of programming. The needs of the users should dominate the design of the interface, and the needs of the interface should dominate the design of the rest of the system."(p. 61).

Norman carried on his studies on UCD and he focused on users and usability of design in his prominent book titled "The Design of Everyday Things" (1988). In this book, Norman underlined the necessity of discovering users' needs and desires as well as the expected use of products (1988). By focusing on the usability of design, he suggested

some fundemental aspects on how a product need to be designed such as: specifying what actions take place at any time, providing alternative actions and their consequences as visible as possible, allowing to evaluate the current system by providing a natural mapping between intentions, required actions, and presented information products (Norman, 1988).

Various design principles developed since the user-centered design approach was introduced to the design field. Norman claimed that designers can not provide user-focused solutions only in an intuitive way. He emphasized the need for the guidelines and suggested some principles mainly adressing the “visibility”, “feedback”, “affordance”, “mapping”, “constraints” and “consistency” in design before implementing the end product. (Norman, 1988, p.189-201). In 1987, Shneiderman established "8 golden rules" which were similar to Norman's principles (Shneiderman, 1987). Nielsen (1995) adapted these principles into the field of usability engineering and transformed them into “ten usability heuristics”. In 2010 International Organization for Standardization (ISO) emphasized that UCD design should cover the entire user experience including the user, environment and tasks ,and proposed fundemental principles for design (2010).

Many different techniques and methods are applied in user-centered design processes. Stakeholder meetings can be defined as the first step of UCD process. At these meeting, actors from different disciplince such as designers, users, managers, technologist, usability experts may come together to create a total user experince. (Vredenburg, Mao, Smith & Carey, 2002). Task analysis is also very important in the early stages of system design. It is an observation technique that provides information about how users perform tasks and how they achieve their goals (Nielsen, 1993). Surveys and interviews are qualitative research methods for exploring users' views and attitudes. With the questionnaires, it is possible to get detailed opinions and information about a product from the users. These techniques are very useful both in the early designing interactions as well as to get information about user’s experience on an established product (Nielsen, 1993). The focus group is a discussion session which is usually conducted with 5-10 participants. At these sessions, expectations and reactions of the people on a particular product can be deeply understood (Goodman, Kuniavsky & Moed, 2012). In usability testings, users complete series of standardized tasks to evaluate a product. The aim of these techniques is to identify the usability problems of the products by collecting

quantitive and qualitative data. Usability testing also helps to determine the user satisfaction with the product (Nielsen, 1993). As an usability testing method, heuristic evaluation is applied for examining the interface of computer systems for identifiying the usability problems based on predetermined sets of criteria (Abras et al, 2004). Ethnographic observations are also defined as type of usability testing which is based on observing user behaviors in a real environment to determine the usability needs of a product. It is recommended to apply this method to receive feedbacks after the product is released. (Hom, 1998). Brainstormings sessions are common used methods where a group of people come together for discussing a design problems and generate ideas about possible solutions. This sessions are usually directed by a facilitator (Wilson, 2013). Role-playing can be defined as acting in the role of a specific character. It is an usefull exercise for understanding the possible actions of a product not yet created and developing ideas (Simsarian, 2003). Another commonly used technique, card sorting, allows to organize and evaluate the information architecture of an interactive product . In this technique, the participants categorize the subjects, and label them under different categories (Martin & Hanington, 2012). Participatory design (has been referred as co-design or co-creation afterwards) is an approach that actively engages all stakeholders in the design process. Unlike other techniques, it has become a research field which has its own techniques and principles (Buur & Bødker, 2000; Sanders & Stappers, 2008). Personas are used to identify the charactheristics of the potential users via developing fictional characters (Martin & Hanington, 2012). Through the scenarios, context, action steps and the user of a product are defined in the design process (Carroll, 2000; Nardi, 1992). Prototypes are used for creation of a design product as a draft at low costs. In this way, the properties of a potential product can be better explored and possible problems can be tested in the early design stages (Nielsen, 1993).

In UCD processes, It is also important to determine at what stage these techniques will be used. Preece et al. (Preece, Rogers, & Sharp, 2002), stated that user participation is essential especially in early in the user-centered design stages. They underlined the teqhniques which needed to be applied in these stages, (Figure 7):

Technique	Purpose	Stage of Design Cycle
Background Interviews and questionnaries	Collecting data related to the needs and expectations of users; evaluation of design alternatives, prototypes and the final artifact	At the beginning of design project
Sequence of work interviews and questionnaries	Collecting data related to the sequence of work to be performed with the artifact	Early in the design cycle
Focus groups	Include a wide range of stakeholders to discuss issues and requirements	Early in the design cycle
On-site observation	Collecting information concerning the environment in which the artifact will be used	Early in the design cycle
Role Playing, walkthroughs, and simulations	Evaluation of alternative designs and gaining additional information about user needs and expectations; prototype evaluation	Early and mid-point in the design cycle
Usability testing	Collection quantitites data related to measurable usability criteria	Final stage of the design cycle
Interviews and questionnaries	Collecting qualitative data related to user satisfaction with the artifact	Final stage of the design cycle

Figure 7 Involving users in the design process (Preece, Rogers, & Sharp, 2002).

One of the most evolutionary shift that distinguished user-centered design from traditional design concepts is to involve users as a central part in the design development process. It is claimed that this approach led to more effective, productive and safe product designs and contributed to the acceptance of products by the user (Preece, Rogers, & Sharp, 2002). However user-centered design do not always include people involved in the design process as an active participant (Marti and Bannon, 2009). Designers and researchers can observe users in real (Beyer and Holtzblatt, 1998) or simulated environments, for example in usability laboratories (Nielsen, 1993) where users only play an informational role in the process (Hackos and Redish, 1998) which may cause the lack of determination about the users, their needs and their ideas about future products (Norman, 2005; Webb, 1996; Ives & Olson, 1984; Marti & Bannon, 2009; Lettl, 2007). Moreover, the other actors such as engineers, usability experts, designers in the design team are usually work alone. Therefore, there may be communication problems between these actors (Abras, Krichmar, & Preece, 2004). Researchers emphasized importance of establishing collaboration in design process to overcome these fundamental problems by

providing an open communication between the actors from different disciplines where people can involve several design activities (Steen, Manschot, & De Koning, 2011). It is claimed that maintaining collaboration is important for developing sustainable and successful products (Maciver, 2012; Derkzen, Franklin, & Bock, 2008). Also, the evaluation of design problems of products in a collaboratively is also important in terms of introducing innovative design solutions (Lawson and Dorst, 2009) Apart from this, collaboration in design also leads to changes in the roles of actors involved. Beyond their own expertise, actors can act as designers, users, or experts for creating and evaluating design ideas which transforms the design process from product-oriented to more experience-driven design solutions. (Sanders & Stappers, 2008).

To sum up, user-centered approach is essential for producing effective, productive and safe product design. Various design principles have been introduced in order to maintain the effectiveness of products in terms of user acceptance of interactive products. Applying several user-centered techniques are important in order to understand the users needs, expectations and reactions about a product especially in early stages of design process. On the other hand, there are some fundamental problems may occur while applying user centered design. In UCD processes, users are not always involved in design activities which may couse the lack of understanding of their needs as well as their ideas about future products. Moreover, since many different people from different disciplince can involve design process, there may be communication problems between these actors. Researchers emphasized importance of establishing collaboration in design process to overcome these problems by involving stakeholders more actively in design processes and providing an open communication between the actors from different disciplines. In this context, we decided investigate whether the the collaboration has a significance in early design of interactive products and we continue our literature review by focusing on collaboration in design. We would like to emphasize that, this thesis do not focus on UCD. However we considered user-centered design principles and techniques which can be beneficial in our study. Therefore, we extended our literature review by including “concepts of affordance” and “user scenarios”.

1.3 The Aim and The Scope of The Study

The aim of this study is to explore the effects of collaboration in the early design stages of interactive kiosks which will enhance their public use and enable their sustainability. The limitations imposed for the scope of the research are as follows:

1. This study focused on the early design stages of these kiosks, in order to create an example for other publicly used interactive products.

2. Because the early design stages are aimed to be explored, the study focused on the development of user scenarios rather than the designs of kiosks' end-use systems.

3. New design scenarios which are developed for information kiosks are classified in terms of the experiences they provide in parallel with their interaction modalities.

4. In order to observe the effects of early stage and collaboration and to obtain realistic results, a case study which is addressed the process of designing effective user scenarios for information kiosks was conducted. In the scope of the research, four information kiosks provided by CEEE (Energy Efficiency & Environment Center) at Özyeğin University were investigated in terms of their problems and new user scenarios were developed and discussed in collaboration with service providers from CEEE, design researchers and design students.

1.4 Research Questions

We believe that establishing a collaboration in the early design stages of interactive kiosks in a holistic framework is an effective way in identifying the need of collaborators both its' service providers and the users. In parallel with the outcomes, this study intends to reveal the potential of the information kiosks which will strengthen their essentiality in public places as well as to carry on with their strategic responsibilities in the future.

On a general level, the results of this research can provide a vision for future researchers, institutions and other organizations who are researching similar domain by,

- Demonstrating how collaboration leads the design and the implementation of more efficient design solutions in the early design stages of an interactive product,

- Implying how the collaborators shape the process, what their contribution are and how they benefit from this knowledge exchange.

Based on our purpose which are outlined above, we identified two key research questions and aimed to discuss how far the results we planned to obtain from the research would address them as follows:

RQ1: Does collaboration in early design stages of interactive kiosks support the ideation of interactions?

RQ2: What is the contribution of collaboration to the people from different disciplines in terms of information exchange that is obtained during the design process?

1.6 Structure of the Thesis

This thesis consists of five chapters: Chapter 1 presents the motivation, subject of the study and background information, the aim and the scope of the study, hypothesis and contribution of the study to the design field, research questions and the structure of the thesis. Chapter 2 presents the findings of literature review which includes collaboration in design, concepts of affordance in HCI and user scenario building in early design stages. Chapter 3 describes the overall methodology of the study. Later, it describes the tools and technics which are used in the study in parallel with the stages of the research. Chapter 4 presents results which are obtained from the study and Chapter 5 presents the discussions on outcomes obtained from the study, and recommendations for further research.

CHAPTER 2
LITERATURE REVIEW

2.1 Collaboration in Design

The origins of collaboration in design can be traced back to the 1970s, when the academic practitioners have started to take into account of design-oriented approaches (Sanders & Stappers, 2008). Due to the arising need to bring valuable knowledge to design process from different perspectives, companies, organizations and scientific institutions have taken on the approach to collaborate with other disciplines from diverse scientific backgrounds in order to solve complex design problems (Kleinsmann & Valkenburg, 2008; Sanders & Stappers, 2008; Peralta, 2013; Markopoulos, Martens, Malins, Coninx, & Liapis, 2016).

Sanders and Stappers (2008) conceptualized collaboration in design with separate definitions as co-creation and co-design. According to them, co-creation refers to, " any act of collective creativity, i.e. creativity that is shared by two or more people", and co-design refers to the "collective creativity as it is applied across the whole span of a design process"(Sanders & Stappers 2008, p. 2). Kleinsmann (2008) defines co-design by emphasizing its' interdisciplinary nature: "Co-design is the process in which actors from different disciplines share their knowledge about both the design process and the design content. They do that in order to create shared understanding on both aspects, to be able to integrate and explore their knowledge and to achieve the larger common objective: the new product to be designed" (p. 370). It is also defined as a learning system based on the existing features of the social world that enables groups or individuals to reach all phases of the design process, including idea generation and evaluation (Wenger, 2010; O'Sullivan, 2012).

Collaboration in design is favored because of many advantages it brings to the design process. First of all, it provides an open communication between the actors from different disciplines. As it enhances communication between the actors that are involved in design activities, collaboration in design supports mutual learning and understanding (Steen, Manschot, & De Koning, 2011). Second, maintaining collaboration is beneficial in order to create long-lasting, sustainable and successful products (Maciver, 2012; (Derkzen,

Franklin, & Bock, 2008). Furthermore, the evaluation of design problems in existing systems in a collaborative manner is important in terms of introducing innovative design solutions (Lawson and Dorst, 2009).

2.1.1 Roles of Actors in Collaborative Design

According to Sanders and Stappers (2008) there has been a shift from user-centered design to co-design in terms of implementing different methods and practices which have also caused the differences in the roles of actors in the design process. In the traditional user-centered design process, the researcher was involved as a facilitator between the user and the designer. In collaborative design process, all the collaborators become actors which can take on the roles of designer, researcher, user and expert (Sander & Stappers, 2008).

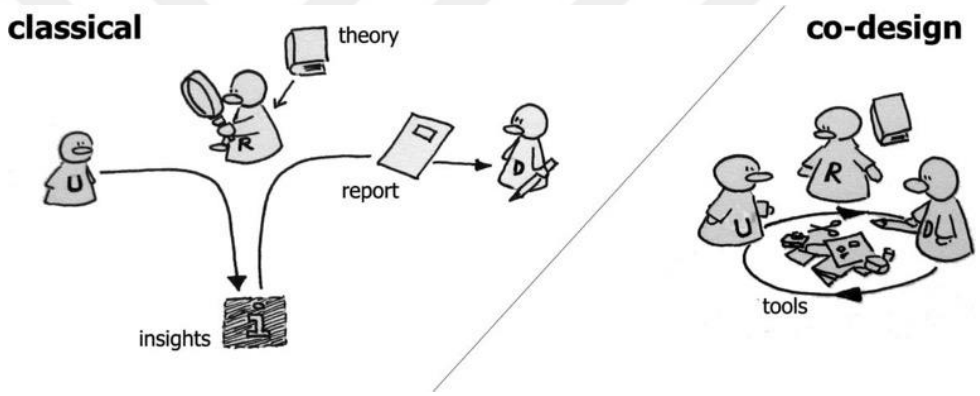


Figure 8 Changing roles of actors from the traditional design to collaborative design processes (Sanders & Stappers, 2008)

Visser, Stappers, Lugt & Sanders (2005) noted that users can become part of the design team as expert if they have the appropriate tools for expressing themselves. Fischer (2002) also stated that it depends on different situations in which the participant wants to be in a consumer role or a designer role. For example, users can sometimes play a role as a co-designer in the design process, but this depends on their expertise, intentions and creativity, so the user does not always contribute as a designer in every collaborative design process. Similar role changes exist among researchers and designers in co-design processes. Researchers can also use their background knowledge and experience to design, inspire, and guide other actors (Postma & Stappers, 2006). The designers' role can also vary regarding to context, and designers can become users in order to explore the dynamics of social settings with processes of communication and collaboration in

terms of their experiences and opinions. (Wenger, 2010). To conclude, the actors' involvement can be shaped by the implementation of the design process, depending on their experience, background and motivation as well as the context of design research.

2.1.2 Tools and Techniques for Collaboration in Early Design

Collaborative design solutions have different flavors according to the implementation of technology and methodology as it provides access to people, groups or individuals, to all stages of the design process from idea formulation to evaluation (David, Rega, Vannini & Cantoni, 2003).

Since the early design focuses on the envisioning, ideation and evaluation of the possible user experiences rather than focusing on the end use of products and services, structuring collaboration in this stage is identified as specially important (Markopoulos et al., 2016). However, design problems are mostly ill-defined (Buchanan,1992; Cross, 2006) and in the early design stage, the solution of each design problem requires different methods in terms of context and organization, and goals of stakeholders (Markopoulos et al., 2016). Therefore, structuring the early design process by considering these factors is essential instead of applying a prespecified stepwise method (Stumpf & Mcdonnell; 2002; Markopoulos et al., 2016). It is an iterative process which needs to be flexible due to the possible changes that may arise during the process. Actors can reconsider the design problems with different perspectives, and their design decisions can be revised. Moreover, the nature of the early design stage is challanging in terms of establishing a proper communication between actors who are having different backgrounds and experiences (Gomes, Tzortzopoulos & Kagioglou, 2016; Kleinsmann & Valkenburg, 2008).

Collaborative design sessions which may the form of workshops are identified as very useful technique to provide a space for face to face communication for developing ideas about future designs in early design stage. (Jungh & Müllert, 1996). They are usually conducted in three sessions: First, participants share their ideas in terms of creating a common understanding about a specific design problem, usually for a real context. Later on, participants come together to create ideas in order to deal with the problems identified in the previous session. After that, the proposed ideas are discussed in order to conceptualize them. In collaborative design workshops, peoples' ideas are represented in

order to describe design concepts. In this session, some useful tools are used for illustrating the design concept in order to describe how the design product will work. There are several representation tools used in collaborative design sessions such as sketches, mappings, mock ups, collages, cards, stories, storyboards and so on (Sanders, Brandt & Binder, 2010; Visser, 2010; Martin & Hanington, 2012; Marcapolous et al., 2016).

Kensing and Madsen (1991) stated that, in order to create a successful collaboration in these workshops, participants need to become the actors of a shared problem and have a common goal to revise the present condition in the designs of the systems. Buur and Bødker (2000) highlighted the importance of conducting workshops in real context where different actors collaborate together in the setting. They proposed "the design collaboratorium" to overcome the physical limits of usability testing environments (Buur & Bødker, 2000). Similarly, Iacucci and Kuutti (2002) emphasized the role of the participation of actors in a real environment in a real context for obtaining efficient design solutions. According to their study, the actors can discover the present condition as well as the possible future design opportunities in a real context. Ivey and Sanders (2006) particularly focused on the physical environment of co-creation, and conducted a collaborative design study by involving participants who have common expertise in order to provide an inspiration for the design of future co-design environments.

Paulus and Brown (2003) stated that brainstorming in design workshop environments has increased creativity and supported the communication among actors in these sessions. Also, it is mentioned as a successful technique in supporting the discovery of an existing design problem in early design stage and is beneficial to allow people from different backgrounds to generate a large number of ideas by discussing in a short time (Börekçi, 2015).

The literature survey on collaboration in design shows that, each design process has differences in terms of content, context, targeted knowledge and settings. And these factors play an important role in determining the progress. Therefore, demonstrating how these factors shape a study can lead to planning and implementing more efficient design solutions. Existing features of the social world enables groups or individuals to reach all phases of the design process, including idea formulation and evaluation. Each design

process has actors from different disciplines who are affected by the system and affect the system. In addition to this, the role of collaborators may vary in accordance with context, their own ideas and experiences. Thus, it is necessary to investigate how these collaborators shape the process, what their contribution are and how they benefit from this knowledge exchange.

2.2 Design of Interactive Products

Emerging technologies have the potential to make everyday life easier and more enjoyable, with an increasing number of benefits. However, it is argued that interactive products are developed from a techno-centric perspective rather that being human-centered. The systems of these interactive products are invisible, yet increasingly complex. With the complicated structures they have, they may also increase user dissatisfaction with difficulty of their use. (Norman, 2002).

Interaction design is a creation of dialogue between a user and a product, service or system. On that sense, it is also related with cognition, memory and perception. Structuring dialogue is important but difficult which requires a reactionary and visionary understanding to create a natural and fluid communication between user and products. A design which is not understood by the user cannot be considered as usable. (Kolko, 2007). For this reason, these products need to be designed to assist the users in order for the user to understand the product. Moreover, the required information need to be visible to show how the interaction occurs. In this respect, the importance of affordances arises in establishing the preminarily features that determine how these technologies are perceived (Norman, 2002). When these affordancers are provided correctly, the users easily understand the possible actions and functions of the products. With the diversity of possibilities they provide, affordances also allow users to determine the appropriate mode of action even in new situations (Norman, 2002).

2.2.1 Concepts of Affordance for Interactive Products

“Affordance” was first introduced by James J. Gibson in his book "The Ecological Approach to Visual Perception"(1979). With Donald Norman's book, “The Psychology of Everyday Things”, this concept was introduced in 1988 in the field of HCI (1988). Gibson (1979) discussed this concept from an ecological perspective, through the

relations between a person or animal and their environment. According to Gibson, affordance is the possibility of action that is independent from the actor's ability to perceive. From Norman's perspective (1988) affordance is a design aspect related to both real and perceived conditions which give cues to users about the function of the products and how to use them:

"Affordances provide strong clues to the operations of things. Plates are for pushing. Knobs are for turning. Slots are for inserting things into. Balls are for throwing or bouncing. When affordances are taken advantage of, the user knows what to do just by looking: no picture, label, or instruction needed" (p.9).

Affordance has become one of the most fundamental concepts of HCI design ever since it was introduced by Donald Norman to the field of HCI. Many researchers have developed various approaches about this concept. Norman always indicated the relationship between visibility of affordance and highlighted the importance of them in the usability of an interactive product (1988, 2002).

Gaver (1991) addressed the concept of affordance through criticising the strengths and weaknesses of the technological possibilities that are offered to users. He examined how an object was perceived and how this perception affects people by establishing a bond between the characteristics of the environments and people's behaviour. He included visibility as an aspect under affordances and emphasized the necessity of visibility in order for designers to better understand the affordance concept. He distinguieshed this concept as the use that an object has and the visibility that is perceived by an actor at an information level. Accordingly, he developed a concept and classified the affordances as correct rejection, perceived, hidden and false affordances by exploring the relationship between affordances and perceptual information (see Fig 8.). Gaver (1991) claimed that if the affordances and perceptual information are not given together, users cannot complete any action. Gaver also examined the hierarchical and temporal relationships between the affordances, and he proposed the sequential affordance concept. According to this concept, sequential affordances are revealed as overlapped in a particular environment. When an affordance emerges, another affordance reveals.

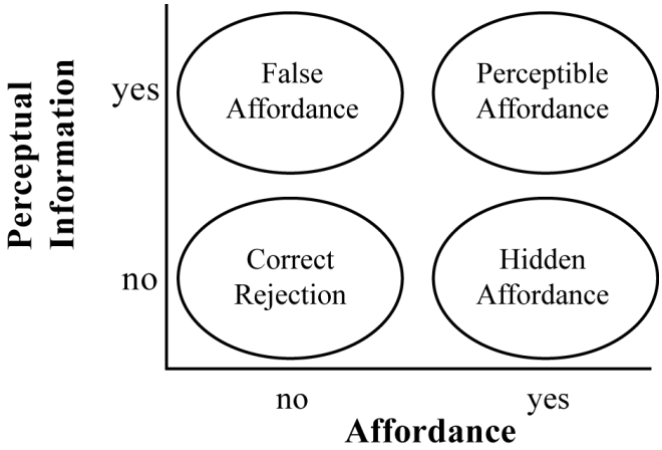


Figure 9 Types of affordances through perceptual information by Gaver (1991)

Rex Hartson (2003) defined affordance as "an instrument for focusing on links in design among the user, the actions, and the artifacts" (p. 322). He classified the affordances as cognitive affordance, sensory affordance, physical affordance, and functional affordance (Hartson, 2003, 2012). According to Hartson, in the context of interaction design, these four type of affordances are connected each other in products environment (see Figure 9).

Affordance Type	Description	Example
Cognitive affordance	Design feature that helps users in knowing something	A button label that helps users know what will happen if they click on it
Physical affordance	Design feature that helps users in doing a physical action in the interface	A button that is large enough so that users can click on it accurately
Sensory affordance	Design feature that helps users sense something (especially cognitive affordances and physical affordances)	A label font size large enough to read easily
Functional affordance	Design feature that helps users accomplish work (i.e., the usefulness of a system function)	The internal system ability to sort a series of numbers (invoked by users clicking on the Sort button)

Figure 10 Classification of Affordances by Hartson (2003)

Hartson claimed that affordance theory can guide design of HCI artefacts (2012). Each kind of affordance plays a different role in the design of different attributes of the same artefact, including design of appearance, content, and manipulation characteristics to

match users' needs. Due to its relation with our research, the types are examined as below (Hartson, 2003, 2012):

1. **Cognitive Affordance** plays an essential role in interaction design as a design feature which facilitates thinking, understanding and learning a design product. This feature especially helps less experienced users to learn how to use a product. Due to this critical role, cognitive affordance has been recognised as a user-centric design feature nowadays for interactive products which provide information via their screen-based or other interaction modalities. In this context, preliminary information about how to use an object is provided before the object is used. Another feature of cognitive affordance is feedback. When the user selects an object, -for example, when a button is pressed-, it gives information about what happens after this action. This feedback also tells whether the user's interaction with the product has been successful so far in terms of performing the functionality of the system. Cognitive affordance is often associated with the semantics and meaning of user interface elements. Sometimes the meanings of these elements may not overlap with their representations, but cognitive affordance can convey meaning to the object through a common convention.

2. **Physical Affordance** is a design feature that allows users to perform an action physically. This feature is related to the ability of a design product to provide sufficient physical properties and to be easily accessible. Physical affordance enables users to complete a task with less need of cognitive affordance and to be able to perform physical actions quickly while doing so. In this context, with an effective physical affordance, products can be experienced by users easily if the appropriate physical actions are provided as compatible with product's physical environment.

3. **Sensory Affordance** is associated with features such as the noticeability, visibility, legibility and audibility of the products which allows users to perceive products through visual, auditory, haptic, or other sensations. In interaction design, sensory affordance has a complementary role regarding the quality of the user experience. For example, the visibility of a screen element is related to its position, and its physical relationship with that position, as well as it's size, colour

or symbol of that element. From this point of view, sensory affordance can be accepted as a property that supports the cognitive and physical affordances.

4. **Functional Affordance** promotes the intentional actions which are purposed in design and is described as an extension of physical affordance. It provides a connection between the user's physical actions between the product to invoke it's system. It is related to the user enablement which helps the users in doing actions to experience the products.

Mcgrenere and Ho (2000) addressed to the concept of affordance as the usefulness of the design. They emphasized the duality of a system's affordance regarding the distinction between usability and usefulness. According to them, usefulness is the possibilities for action which are afforded by a design corresponding to user's goals and allow them to accomplish their tasks. They pointed out that, designers should consider creating useful actions which include functions that enable users to achieve their goals and allow users to efficiently perform their actions (see Fig.10).

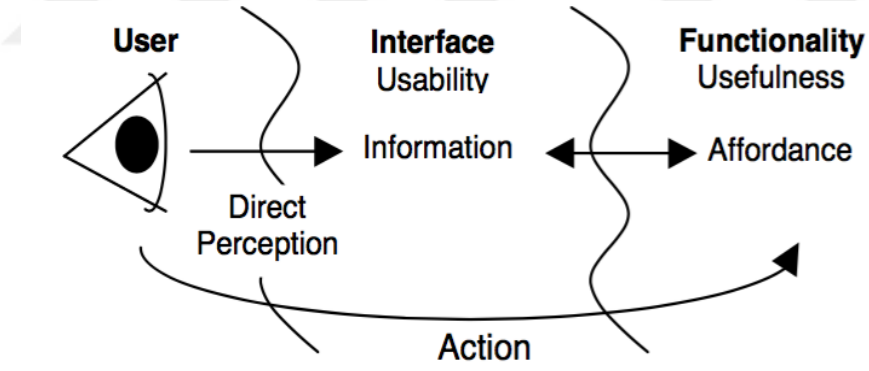


Figure 11 Duality of Usability and Usefulness (Mcgrenere & Ho, 2000)

Researches on affordance concepts also include approaches emphasizing the environment. According to Schmidt (2005) "Communication and interaction between humans happen always in a specific situation, a certain context, and in a particular environment" (p. 163). People's perceptions vary according to this contextual arrangement and, inherently, the physical environment affects the users' behaviours where the interaction and communication take place (Schmidt, 2005). Chen, Qian and Lei (2016) considered the environment as "a mediator of affordance"(p. 4). They emphasized

that a displayed information is presented in a particular environment and this environment has its own characteristics in parallel with its social context. This environment provides people a space within a number of different choises based on variety of interaction methods. They underlined the importance of constructing an environmental design that improves affordances while designing interactions (Chen et al., 2016).

2.2.2 Design Studies Examining the Affordances in Different Areas Under HCI

Many HCI researchers conducted design studies regarding the concepts of affordance for different mediums through different interaction approaches such as tangible interaction, screen-based interaction, natural user interfaces, gesture-based interaction and spatial communication (Vidal, Geerts & Feki, 2013; Chen et al., 2016; Yantaç, 2013; Ünlüer et al., 2017; Orhun, 2017) :

Vidal et al., (2013) argued that users can not adequately control their smart environments because these systems are not user-friendly although people can shape their environments in accordance with their own need. And they conducted a study that aimed to improve people's daily life by designing a smart application that could be easily created and configured by users. For this purpose, they developed three different scenarios regarding the affordances of tangible controllers (see Fig. 11). In their prototypes, these tangible controllers are adapted to screen based interface. Based on the results of the research they have conducted, they suggested that the real-time connection of the interaction with the system and the smart environment suggests that more feedback should be provided in the interaction between the user and the tangible user interface, and that affordances should stimulate more frequent and consistent learning (Vidal et al., 2013).

Figure 12 A Graphical user interface for the teaching basic programming with tangible interaction (Vidal et al., 2013)

Chen et al., (2016) conducted an affordance-based design development study for interactive displays. They created a research framework in which they adapted the affordance concepts to design an interactive data visualization and evaluation tool for analysts. This large display is context-aware and allow for multi-user interaction (see Figure 12). The interactive display they designed later was heuristic evaluated by domain-specific experts. The evaluation results are discussed through cognitive, sensory, functional and physical affordance concepts.

Figure 13 A sequence describing physical movement and interaction of SolarWheel Project Interface (Chen et al., 2016).

Asım E. Yantaç (2013) focused on the affordances of natural user interfaces from the perspectives of interactive media design education and has developed a method which aimed design students to discover user experience design solutions. In this study, they have discovered ways to generate alternative interaction solutions for physical boundaries caused by disabled environment factors, with exercises applied to design students to transform natural objects into interactive products.The process involved the identification of the physical properties of a selected natural object, and the production of their sensory attributes. The interaction stories associated with the reactions of these objects to the actions of the users were created. Later, the students reconstructed their stories in order for these objects to function for a spesific purpose (see Figure 13). According to Yantaç (2013) these exercises constitute the basis of design thinking in design of experiences and therefore, they can be better functional if they are applied to preliminary stages of the curriculum.

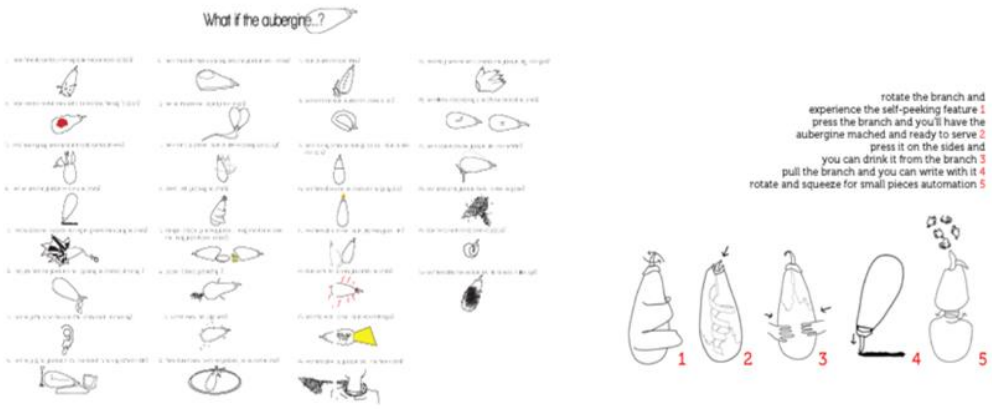


Figure 14 A student project describing the ideas about an interactive eggplant by Bruno Santoz (Yantaç, 2013)

Adviye Ayça Ünlüer et al. (2017) addressed role of the natural gestures on user interfaces which have become increasenly widespread in computing applications. They argued that, designers need to have a deep understanding about the nature and usage of natural gestures in user interfaces in order to create innovative interactions by utilising the technological affordances. In this context, they developed and applied an "awareness course" for design students based on the mime art and creative drama. Three groups of students involved to the process and several exercises were applied such as bodystorming, role playing, mime based gestural communication and shadow mapping. Following all these exercises, design students were asked to design the final projects. These projects were evaluated by incorporating the perspectives of design educators, experts from industry as well as the students. At the end of the study it is seen that this study encourages the students to use the non-verbal, bodily communication at a high level by using natural gestures for expressing the abstract concepts and abstract thinking, which is relevant for contributing the awareness in terms of design education as well as industrial requirements.

Figure 15 Pictures from a gesture-based interaction exercise called "unusal interactions" (Ünlüer et al., 2017)

Simge E. Orhun underlined (2017) the lack of case studies to guide the development of scenario solutions that refers to physical conditions in communication design education. By addressing the concept of affordance through the spatial communication, Orhun developed an educational model that uses the physical data to enhance the design students' competencies on affordance design. In this research, design students explored the possible interaction solutions for interactive exhibiting in the context of spesified themes and developed narrations with visual storytelling by considering the spatial conditions of selected physical spaces. During this process, they discovered how to integrate user actions and interaction with navigational and organizational aspects of the physical space on the basis of spatial communication. Interactive projects which were designed based on spatial communication by considering the physical data and constraints imposed by physical space, were found to satisfy the specified affordance components and provided appropriate strategies for spatial communication design solutions. The results of the study also become an important indicator for awareness of spatial affordances for future design developments of digital media and virtual environment (Orhun, 2017) (see Fig.14).

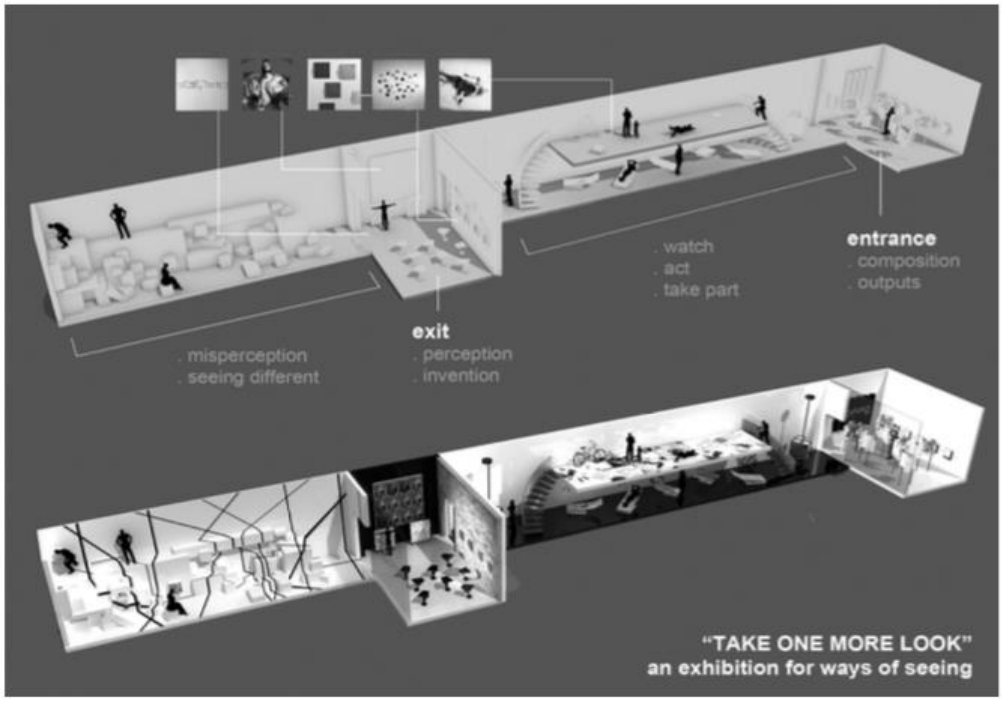


Figure 16 An interactive exhibiting project focuses on creating sequence of experiences by Cansın Bozoğlu (Orhun, 2017).

Examples from the literature survey show that considering the concepts of cognitive, perceptual, physical and spatial affordances has the potential to reveal the existing design problems as well as develop effective design solutions for future design solution. Based on the conceptial design examples on literature, we realized that this concepts can be supportive for early design studies, and we found it appropriate to make use of the concepts of affordances in our study.

2.2.3 The Significance of User Scenarios in Designing Interactions

As users of information, people are interacting with products through specific actions, in order to exchange information in different environments. User scenarios designed for systems for different purposes directly influence how people interact with information-rich digital environments. Nevertheless, these scenarios can also prevent users from acquiring knowledge by managing and limiting their actions. At this point, the importance of designing user scenarios has emerged in order to be able to make effective decisions about how interactive tools can direct human behaviors and experiences (Carroll, 2000). "Scenarios are stories" (Carroll, 2000, p. 46). Carrol defined the user scenario as a series of integrated action steps of a system in human machine interaction. Each scenario has a

setting that describes the events, actions, actors and objects which are involved to overall experience. The actor is defined as the user of the system. The event-sequence determines the specific action steps of the actors, the flow of events how the system respond to actors, and under which conditions all these stages change or evolve during the experience. Conditions have crucial role in determining the characteristics of the provided information. They specify which action steps will occur in the experience process, determine the rules of the system, and define certain permissions and constraints in the user-product interaction according to these rules (2000).

An increasing number of studies suggested the scenarios as effective tools in design of systems of services and products (Nardi,1992 ; Suri & Marsh, 2000; Carroll, 2000; Alexander & Maiden, 2004; Anggreeni & van der Voort, 2007). Nardi (1992) stated that the user, the context, a series of actions and how technology can support this experience can be expressed creatively and futuristically through scenarios. Similar to the Nardi's description, Suri and Marsh (2000) defined scenario building as generating a series of alternative fictional stories that include specific characters, events, products, and environments that enable to discover alternative design solutions.

Suri and Marsh (2000) claimed that developing user scenarios also support the human-factors methods in product design by it's possibility to represent user experiences in early design process. They stated that one of the important benefits of user scenarios is that it can also adresses how the design solutions can be integrated into different physical and social context (Suri & Marsh, 2000). Hartson (2003) mentioned the scenarios in terms of it's relationship with affordances. According to Hartson (2003), scenarios can guide the design process while developing the workflow of applications in terms of their psychological effects on users.

Anggreeni and van der Voort (2007) stated that the interactions can be expressed more freely in terms of behaviors of the potential users and the products in the conceptual design phase. At this stage, the scenarios are recognized to be beneficial in developing ideas for the context of use, the users and their emotions and how the product behaves to these aspects (see Fig. 15). The ideas developed in conceptual design stage are elaborated in more detail at later stages of the design where the scenarios can be expressed more deeply in terms of how the product guide the user behaviours in interaction. Anggreeni

and van der Voort (2007) also emphasized the importance of "flexibility" of interaction scenarios. If the designer decides that product's behavior is not appropriate, the interaction scenario which is created in the conceptual stage can be reviewed in order to find suitable solutions.

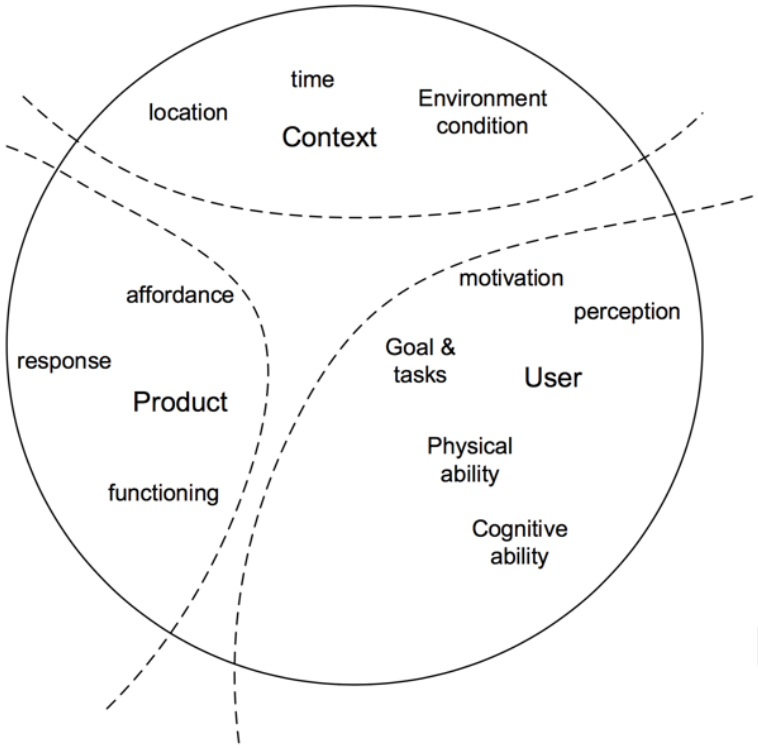


Figure 17 Scope of interaction scenarios in conceptual design by Anggreeni & van der Voort (2007)

Creating a user scenario is a fast and inexpensive way to visualize early design ideas and evaluate them in the context of product user interaction. Visualized scenarios provide a concrete reference for discussing existing problems with the stakeholders. (Suri & Marsh, 2000). User scenarios can be represented by different techniques such as scripts, storyboards, animations an so on (Carroll, 2000; Marcapolous et al., 2016; Greenberg, Carpendale, Marquardt & Buxton, 2012 ; Suri & Marsh, 2000; Anggreeni & van der Voort, 2007). One of these techniques, storyboards are found to be effective visualisation tools for designing interactions in early design phases (Greenberg et al., 2012).

Greenberg et al. (2012) pointed out the lack of context in the visualisation of interfaces and claimed that the storyboards can provide the context in designing interactions (e.g

see Fig. 16). By representing the sequence of a particular action, they give extensive information about where the interaction occurs, who are the users and what are the possible actions in user-product interaction. The advantage of the storyboards is that the scenarios can be easily revised, they can be created partially without overall details of the interaction.

Figure 18 An example action sequence of a user scenario visualied with srtoryboard (Greenberg et al.,2012)

Scenarios are also tools that support interdisciplinary communication in the design process by providing a common language among different disciplines (Erickson, 1995; Carroll, 2000; Suri & Marsh, 2000 ; Pang, Johanson, Cao, Liu, Zhang, 2007). Many stakeholders can be involved who have different backgrounds such as project manager, interaction designers, engineers, potential users, usability experts. Hence, scenarios provides a concrete source for revising and elaborating the ideas and solutions in design development stage.

Based on the literature survey we recognized that scenarios are useful in producing effective solutions in the early phases of design process. In addition, we see that scenarios supports multidisciplinary communication. Therefore, we decided to use user scenarios as a design development tool in our study.

CHAPTER 3
METHODOLOGY

3.1 Research Approach

This research aims to explore the importance of collaboration in the early design stage of an interactive product. For this purpose, a case study conducted and in the scope of the research, four interactive kiosks provided by CEEE at Özyegin University were investigated in terms of their design problems and new user scenarios were developed and discussed. The selected interactive kiosks were found suitable to be the subject of this case study, due to their established mission by the CEEE, their stationary situation and placement in physical spaces as well as their potential for multimodality and widespread use. These kiosks were installed in different buildings of the campus of Özyeğin University, with the mission to draw attention to environmental problems and increase awareness for energy consumption. This design research including engineers and specialists from CEEE, design students and design researchers was carried out in CoD (Department of Communication Design) at Özyeğin University, under the Interaction Design Ergonomics Course in 2015 fall and 2017 fall semesters. The research outcomes included the provided experiences through kiosks as well as the opinions of all contributors were evaluated from a qualitative perspective (Walliman, 2006).

3.2 Research Phases

A 4-phased research process was carried out which was planned to be a resource for an early stage design. The phases of the research were as follows:

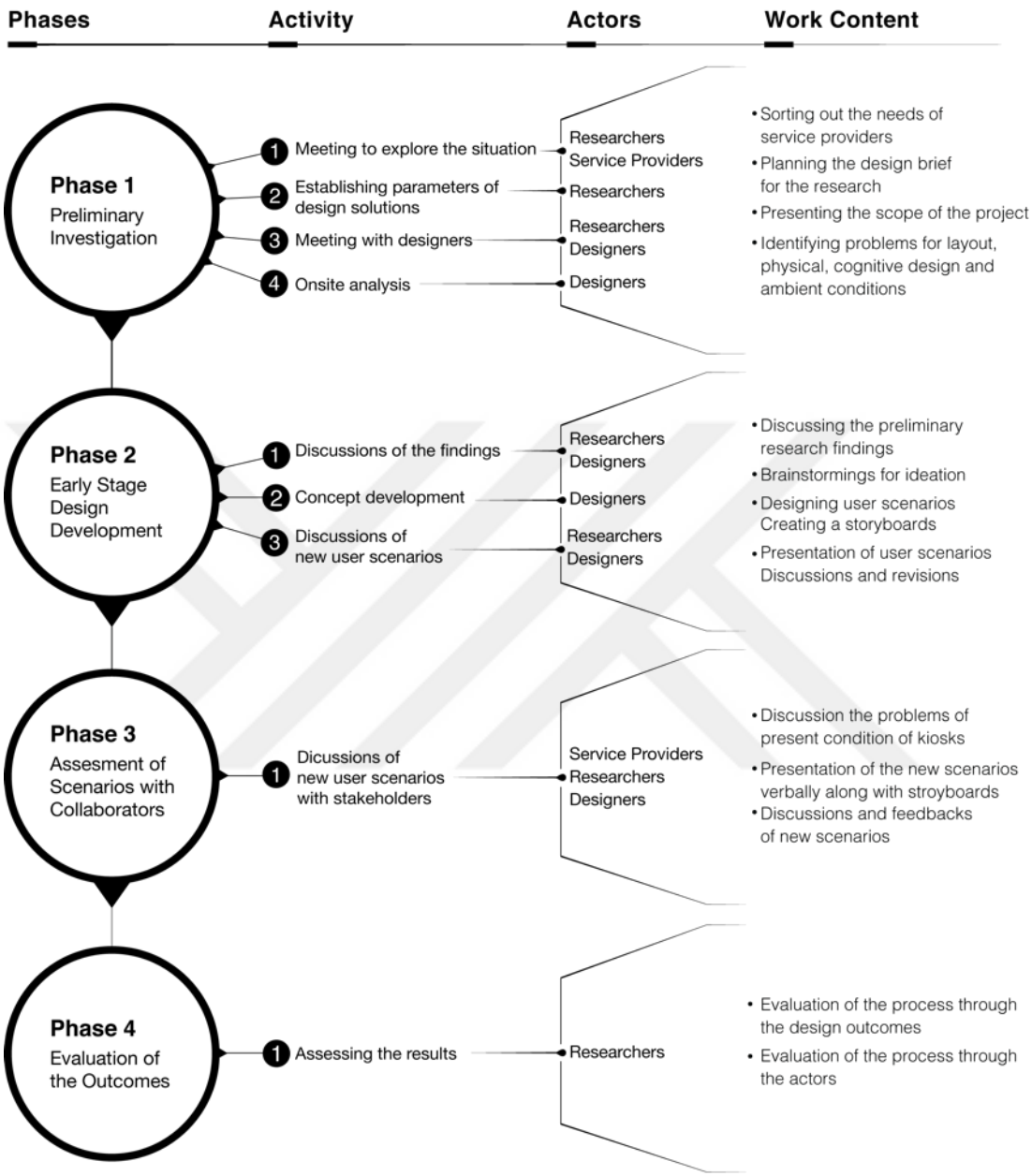


Figure 19 Research Phases

3.2.1 Phase 1: Preminarily Investigation

CEEE research center has been found in 2009 and working on “sustainable energy” and “energy efficiency” in Ozyegin University. The center owns and makes use of interactive kiosks which have been located in the buildings of Business Administration, Science, Law, and Student Center (See Fig. 18).

Figure 20 Placements of the kiosks in the campus buildings: (1) Building of Faculty of Engineering, (2) Building of Faculty of Business Administration, (3) Building of Faculty of Law, (4) Building of Student Center.

All kiosks have the same graphical user interface that allows users to access information, statistical data and quizzes about energy efficiency and energy consumption in the Campus of Ozyegin University (e.g see Fig. 19).

Figure 21 Some interface details of Kiosks

1. Meeting to Explore the Situation: Upon the first meeting with design researchers and experts from the CEEE, general information about CEEE's purpose of placing kiosks in the university campus buildings will be aimed to obtain. In order to clarify the scope of the research and to establish a general framework, the researchers would try to agree with

the institution to provide a brief explaining upon what kind of expectations they have in terms of the kiosks.

2. Establishing Parameters of Design Solutions: In parallel with the background research (see Section 1.2) we recognized that, while designing these kiosks, its' context, and the technology in which the interactive kiosk is placed should be taken into consideration in order to provide an effective and sustainable experience (Rowley & Slack, 2001; Maguire, 1999; Vogel & Balakrishan, 2004; Müller et al., 2010). In addition, the concepts of cognitive, perceptual, physical affordances as well as the spatial affordances has the potential to reveal the existing design problems as well as develop enriched and more experience-driven design solutions (Norman, 1988; Hartson, 2003; Shimdt et al, 2005). For this reason, based on these concepts, we found it appropriate to adapt the following parameters to our on-site preliminary research phase:

- **Ambient conditions:** refer to physical environment conditions for improving the efficiency of user-product interaction.

- **Physical Design:** Refers to the ability of a product that provide sufficient physical properties which are easly accessible and allows users perform their actions**.**

- **Cognitive Design:** refers to the appropriateness of the design of human behaviour to match the perceptual and behavioral tendencies of users as well as the matching of system design with the users' mental models.

- **Layout design:** refers to design of solid user interface elements and organization of the information that guide for the depiction of the relationship between the user and a set of data. This parameter is related to cognitive affordance, however we found it appropriate to add as an additional parameter in order to investigate the user interfaces problems in terms of their compatibility with content.

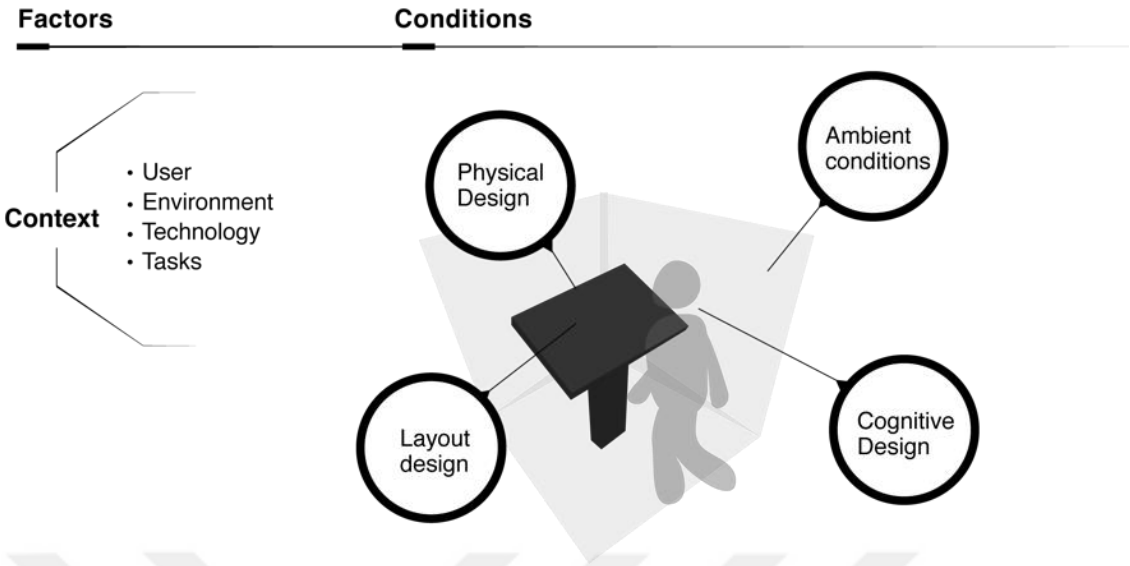


Figure 22 Research Parameters for On-site Investigation

3. Meeting with Designers: A workshop session will be planned in which the researchers will share a brief with the design students which is expressing the expectation of the service provider. Then a roadmap will be determined regarding the research process. After the announcement of the research plan, the students will be primarily informed about the interactive kiosks and ergonomics in the field of interaction design. After these theoretical lectures, students will be guided to observe the kiosks in the campus. Then they will analyze the kiosks on-site and report their finding through questionnarie worksheet which is formulated by concerning the research parameters which are described below (For the details of worksheet, see Appendix A).

4. On-site Analysis: Students are expected to analayze kiosks on-site. Rather than focusing entirely on the graphical user interfaces of the kiosks, this process is planned to evolve through a holistic viewpoint that involving spatial, physical, cognitive aspects in the user scenario testing as well as organization of information. Observations will be made at different times during one week to find out usage patterns and usage rate of the kiosks in different locations of the university campus.

3.2.2 Phase 2: Early Stage Design Development

1. Discussions of the Findings: Findings obtained from the on-site investigation will be reported and discussed in workshops. This phase is planned to be carried out on the basis of questionnaires to be answered by the designers. The answers will be evaluated in order

to determine the common problems of the kiosks on the basis of qualitative data collection techniques.

2. Concept Development: After the preliminary research process, designers will focus on developing new user scenarios. In this stage, the possibility to achieve innovative design solutions will be searched through the design of new user scenarios. This process is planned to run together with workshop sessions and on-site observation. Designers are expected opened up their implicit knowledge along with discussions and brainstromings in workshop sessions. New user scenario designs are expected to be visualized with storyboard technique (Greenberg et al, 2012).

3. Discussions of the New User Scenarios: The new scenarios will be evaluated by designers and researchers in the workshop sessions and necessary revisions will be made until the final design decisions are made. All workshop discussions will be recorded by voice recording technique (Lichtman, 2003).

3.2.3 Phase 3: Assessment of New User Scenarios with Collaborators

1. Discussions of User Scenarios with Stakeholders: After scenario building stage is completed, design students, researchers from CoD and experts and engineers from CEEE will come together. Firstly, the problems related to the kiosks will be discussed. Afterwards, the discussions will be held upon each scenario which will be explained verbally along with the storyboards. The evaluations of the newly designed user scenarios will be made together. These meetings will be recorded with note-taking technique (Webb, 1991).

3.2.4 Phase 4: Evaluation of the Results

1. Assessing the Results: The results obtained from the whole process will be evaluated by the researchers from two different viewpoints:

- All scenarios will be classified in terms of the experiences they provide and their interaction modalities. The results will be discussed through the effects of collaboration in design evaluation and design development in the early stages.

- The design process will be evaluated through the actors and the benefits of establishing collaboration in the early design stages for different disciplines will be discussed.

CHAPTER 4
RESULTS

This chapter includes the results obtained from the research. This study was repeated twice and the findings and outcomes obtained from both studies including premilinary investigation, design development, assesments of the scenarios with stakeholders, and general insights obtained from the study are presented in following sections.

4.1 Preliminary Investigation Results

Within the first meeting with the service providers, the experts from CEEE stated that the kiosks they served were not used as much as they expected by the campus students, based on the results they obtained from the system of the product. They emphasized that they need more innovative and creative design ideas to be implemented in kiosks that trigger a positive change in the behavioral patterns of the users in the context of “sustainable energy and energy efficiency”.

In the preliminary investigation stage, the design students examined the kiosks in terms of their location, physical characteristics, users, and the embedded application. The present conditions of the kiosks were experienced onsite and the findings were reported. The observations were made at different times during one week to find out usage patterns and usage of the kiosks in different locations of the university campus. The findings of the on-site investigation were discussed by researchers and designers in the workshop sessions.

Since the CEEE experts already indicated that the kiosks were not used frequently, we did not apply a statistical data collection phase in our study. However, by applying an onsite investigation, we aimed to gain information to be reported about the usage rate, the behaviors of passersby and their relationships with the products in terms of spatial and physical aspects where the kiosks are located. During this phase, design students faced with some challenges which were as follows:

- The most challenging part of the analyzing was that kiosks were located on four different buildings and it took long time to observe each place at the specified time shifts. In order to overcome this difficulty, designers made observations in collaboration with each other to obtain up-to-date information concerning the frequency of occurrence in relationship with its placement in the buildings.

- After one week of on-site investigation, design students observed that no passersby used the kiosks. Therefore, it was not possible to observe user behavior in their natural environment.

As the onsite investigations were complete, design students and researchers discussed the findings in the workshop sessions. (See Fig. 12)

Figure 23 Images from workshop discussions

Based on the discussions, the following problems concerning the kiosks were identified:

1. Problems due to Ambient Conditions: After a week of on-site investigation, design students observed that no passersby used the kiosks. This result supports the lack of use frequency of kiosks that service provider has informed us in advance. Therefore, it was not possible to observe user behavior in their natural environment. The common view from all design students was that the kiosks were not noticeable because they were not positioned strategically in the space they were placed. They were installed alongside the walls and inner corners of the buildings which decreased their visibility. Design students also stated that these kiosks should be placed on the circulation route of passersby. In addition, they emphasized that the kiosks need be recognizable from both directions of this circulation route.

2. Problems due to Physical Conditions: When the physical forms of the kiosks were examined, designers' shared opinion was that the width and height of the screen of the kiosks could not provide a comfortable reading for the user. In addition to that, there was always a reflection on the screen, due to the angle of the kiosks which made it difficult for the user to perceive the information appears on the screens. Further to that, it has been found that kiosks did not have a physical indicator that would give the user a clue about the provided information. Moreover, it was mentioned that the kiosks looked less attractive because their color was black. At this point it was stated that the shell's of the kiosks could be designed more colorfully. Apart from this, it was also mentioned that these kiosks could be designed and installed in a way that was more integrated with the environment, like by considering elements of space such as walls and floors.

3. Problems due to Cognitive Design: A common view expressed by many students was that they were challenged to experience the system of the kiosks. A number of particular problems were emphasized in this regard. First, design students stated that kiosks could not deliver a proper message that would enable users to understand the relationship between content and context. Second, they identified that feedbacks of the system were weak which caused perception problems while using the kiosks. Third, they indicated that they experienced difficulties while using the kiosks because the system did not functioning appropriately, for instance, they could not understand that the area they clicked on the screen was a link or a static element. Many design students claimed that an interactive product which was served for awareness-raising might not go far beyond a poor user experience and knowledge acquisition with the present strategy implemented.

4. Problems due to Layout Design: When the applications in the kiosks were examined in terms of the layouts, it was recognized that primary information that the service provides wanted to present to the people, was not strategically constructed. The main screen always looped a video, which did not enhance the predictability of the kiosk for the user to interact with the product. Since the information organization of the interface was not strategically designed, they need to find their way in order to reach the information they seek while navigating on the screen. In this case, the designers indicated that it took time to discover which information was where. It was observed that the size and format of the interface elements also made it difficult to read. Moreover, although important information was found in the static information screens, these screens seemed

to be of secondary importance. The most interesting common opinion expressed in the discussions was that, once they have used these kiosks, they would not need to visit them again because they could access the information through any device which provide internet access.

4.2 Early Design Development Results

In the early stages of the idea development process, ideas about the reconstruction of the content presented in the kiosks were revisited, and design students restated that the current interaction scenario which was limited with screen-based interaction was not sustainable and did not address the target user's motivations and expectations since the information was not well structured in terms of contextual aspects. Moreover, the physical and spatial aspects should have been reconsidered in order to attract users and keep them motivated for using the kiosks frequently. Another shared opinion of the designers was that the kiosks were more than multitouch screens, they were able to perceive sound and motion, could communicate with each other at the same time, and were developed in accordance with the interaction modalities that could enhance the user experience with other tools to be combined with the system. Based on these identifications, the main tendency among students for developing new user scenarios was shaped as;

- to guide the user in an effective way within the place they were located in,
- to increase awareness by enriched experiences with different types of interaction models,
- to provide sustainable information exchange.

In this process, the designers revisited kiosks on site many times, looked for any possible relationships between the buildings and searched for ways to transform the spatial and physical disadvantages of the situation to positive outcomes. In parallel with the discussion of findings, brainstormings were carried out and mind maps were created for determining possible design solutions (Fig. 22).

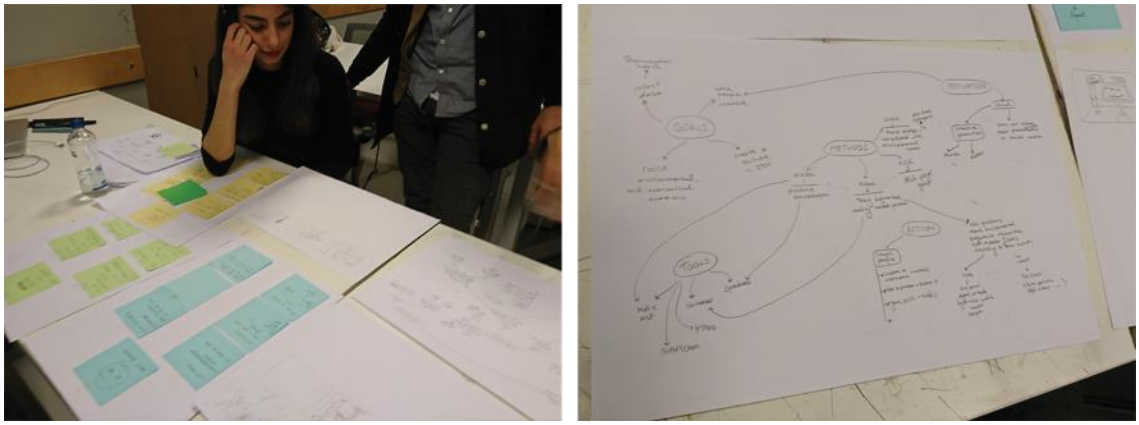


Figure 24 Images from the idea development process

In this respect, designers had the opportunity to discuss the potentials of the ideas rather than focusing on a single idea or project. All the scenarios were repeatedly visualized with the storyboarding technique and discussed in the workshop sessions until final decisions were made. This iterative process, which lasted for about 8 weeks was quite beneficial in terms of growing ideas. With the participation of educator researchers as an equal stakeholder rather than having a teacher role, students were able to express their opinions more freely and exchange the diversity of knowledge between people from different perspectives.

In accordance with their provided experience and interaction modalities, new scenarios are classified in three categories as "interaction based on dialogue", "interaction based on activity" and "interaction based on dialoge and physical activity". Details of these classifications through interaction scenario examples are described below:

4.2.1 Interactions Based on Dialogue

These interaction scenarios were based on the dialogue between the user and the tool through a specific language for communication during the user-product interaction and 7 different scenarios were obtained (see Appendix B for all storyboards in this category). As an example, one concept was developed on the basis of personalization of kiosks. The interaction scenario which was described in the storyboard in Figure 23 intented the user to empathize the kiosk's current emotional situation. For this purpose, different emotional states were used together with their opposite states in the scenario. Each emotional state was represented by a color.

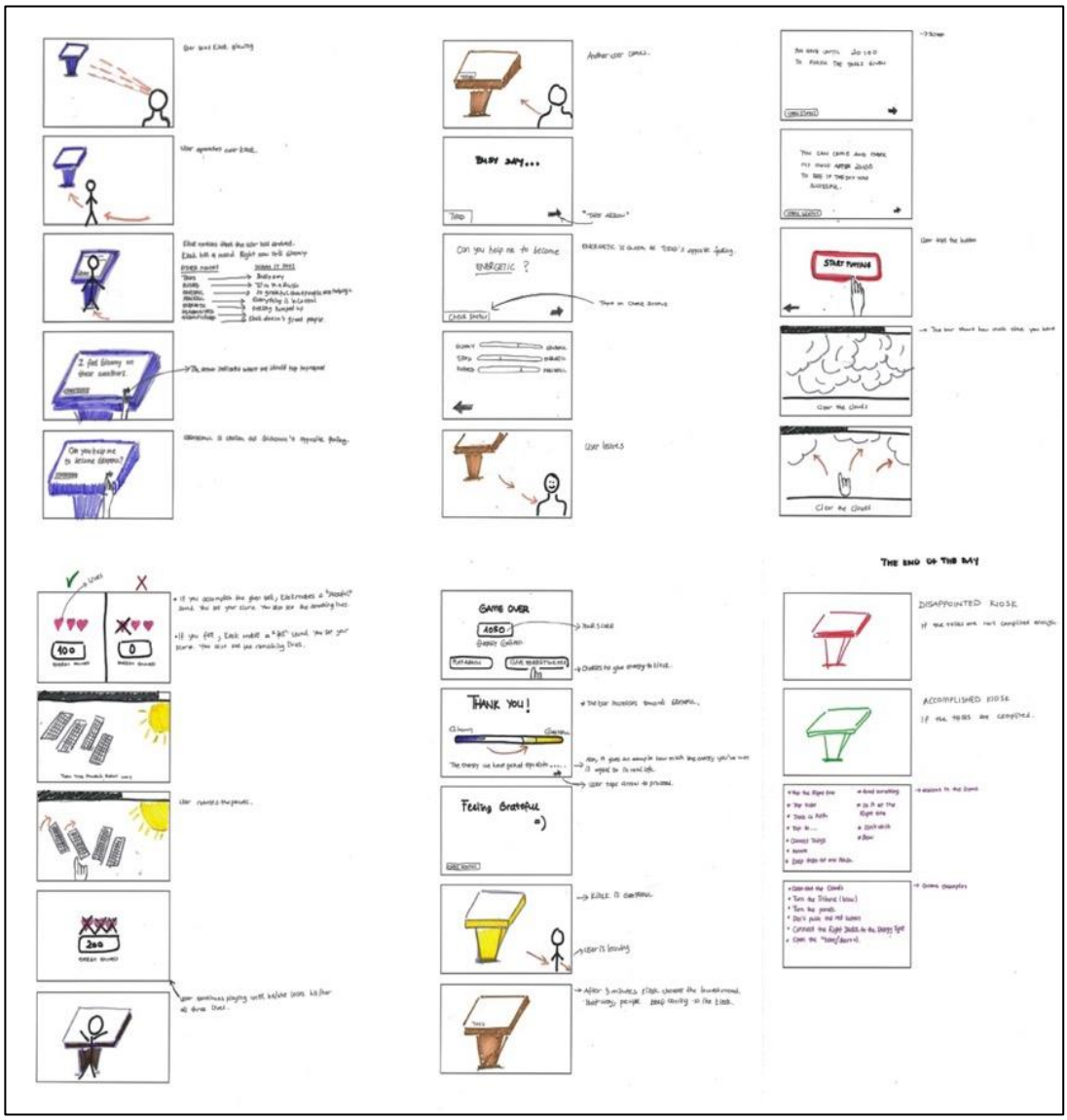


Figure 25 Design Scenario by Sinem Çoban (for the larger version, see Appendix B)

In this scenario, it was aimed to increase the awareness of kiosks turning into different colors. For example, if the kiosk's color was blue, it showed that kiosk was sad due to unnecessary energy consumption. When the user stopped in front of the kiosk, the kiosk detected the user and explained why he was sad. For example, solar panels did not work because the weather was overcast, so no energy could be generated. For this reason, the kiosk was feeling sad. At this point, the user was asked to complete a series of game-based tasks to turn the kiosk emotional state into positive. The user gained points as they completed these tasks. Every point which were earned represented the energy generated by the user. Once tasks were completed, the games could be replayed or the accumulated energy could be transferred to the kiosk to generate more energy. When the kiosk's

energy boost took place, the kiosks changed color depending on its emotional states. For example, if the kiosk was sad, once the user has successfully completed the task, the kiosk's emotional state rose to a joyful state and the color turned into yellow.

4.2.2 Interaction Based on Activity

These scenarios were focused on interaction through physical activities provided by additional tools that were integrated to the kiosk. 4 different scenarios were found to involve the interactions where users can experience kiosks through physical actions based on specific activities offered. The flow of information occured simultaneously through experience with the tools in communication with each other in different locations (see Appendix B for all storyboards in this category).

As an example, in the proposed interaction scenario below, the users were able to wander among the other buildings where the kiosks were located by driving bicycles deployed next to the kiosks. A dynamo placed in bicycles which stored energy during driving. At the same time, the user found out how far he or she has traveled with a GPS device placed on the bicycle (see Fig. 24).

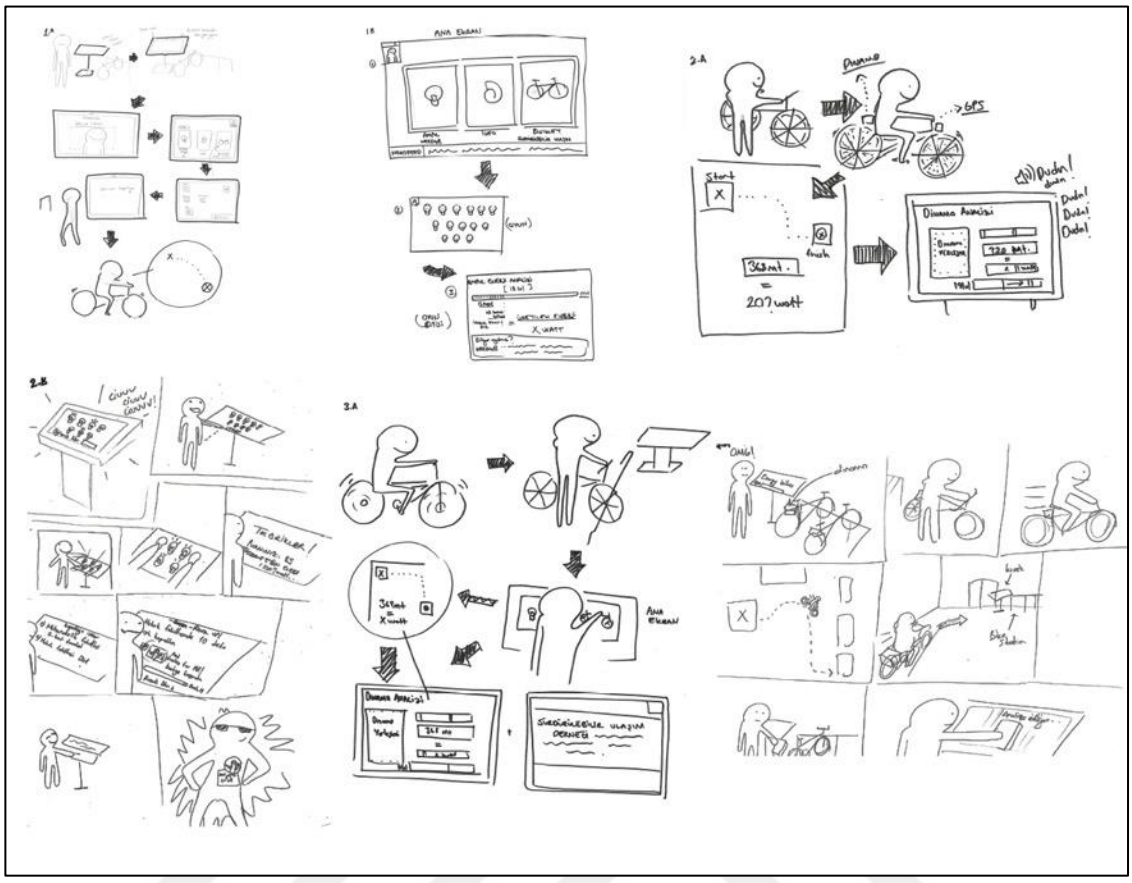


Figure 26 Design Scenario by Ekmel Ayar (for larger version, see Appendix B)

Once the user completed the turn, the user could leave the bicycle at the desired station. These stations were planned to function as energy stations where users were able to transfer energy that was accumulated in dynamo to kiosks. The aim was here not to make the user save energy by performing this action but rather to enable the user to generate energy. In addition, there was a multi-level game designed for raising awareness of users about sustainable energy which multiplayer game where users could compete with other users.

4.2.3 Interactions Based on Dialogue & Physical activity

User Scenarios that communicate with the users and lead them to interact with the kiosks on campus constantly through various activities are classified under this category. In the following example scenario, the students basically tried to produce solutions for three problems: the touchscreen of kiosks were not sensitive enough, the system was difficult to navigate and the users did not spend enough time with the kiosks in the campus.

Students created a mobile application which provided users an intelligent personal assistant called “grassman”. When students visited the kiosks, they could connect their grassman with a QR code and their grassman turned into an assistant. Users could communicate with their grassmen via voice instead of touching the screen.

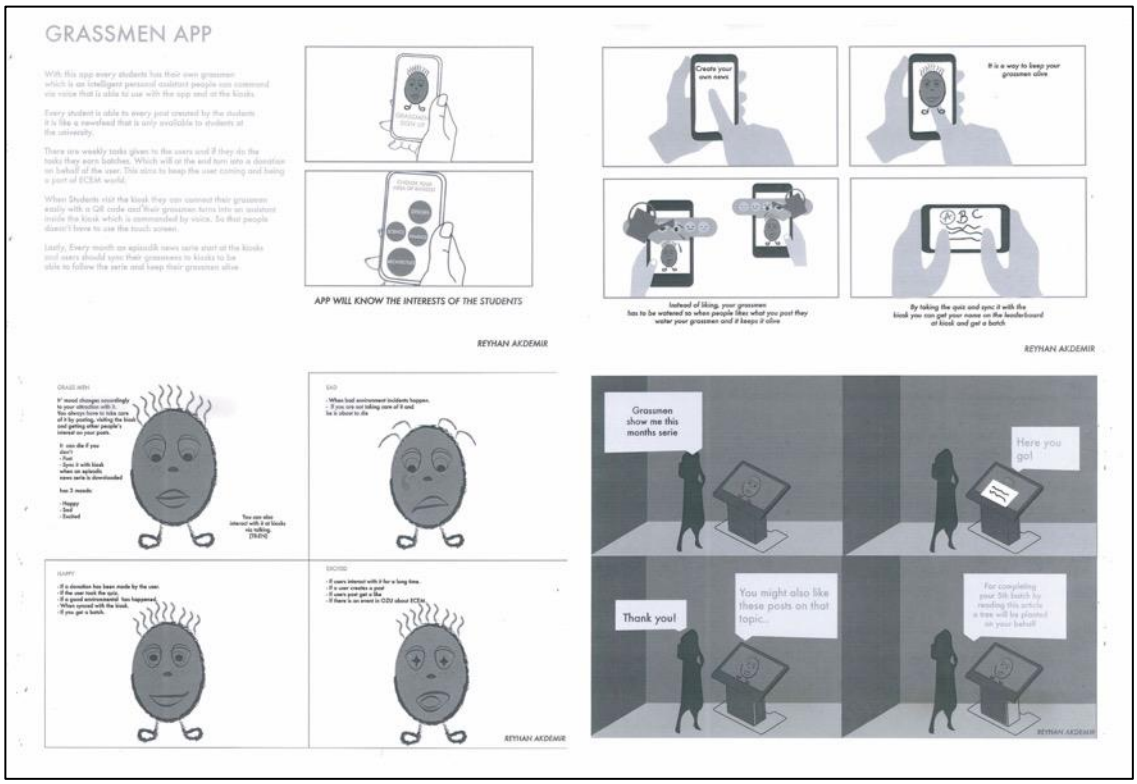


Figure 27 Some Sequences of User Scenario by Reyhan Akdemir & Zeynep Marmaralı (for larger version, see Appendix B).

In order to keep the their grassmen alive, the users had to perform a number of actions. For example, there were weekly tasks were given to the users. If users completed the tasks they earned batches, this batches turned into a donation which was planting a tree by EÇEM on behalf of the users. User also could create post which was appeared on the kiosks as a newsfeed. The episodic news series were run every month in kiosks and users could follow this series when they synced their app with kiosks. It was also a necessity to keep their own grassman alive because grassman's emotional state was related to the usage frequency. Users needed to visited kiosks on site, and continued to produce posts that will attract other users in order to keep their grassmen happy. Another reason for these given tasks was to keep user visiting kiosks regularly on campus.

4.3 Results of the Assessment of New Scenarios with Collaborators

This design study has been carried out twice, and at the end of both design development processes, design students, researchers from CoD and experts and engineers from CEEE came together in order to evaluate the new user scenarios. Each meetings lasted about 1.5 hours. In this phase, the problems related to the kiosks in use were discussed and, new scenarios explained verbally along with storyboards to the CEEE experts,. During the discussion, stakeholders shared their opinions about new scenarios in terms of their compatibility with subject, applicability and their possibility to impact on behavioral change on users positively. Ideas were shared about how scenarios could be realized. The results obtained from the two meetings are as follows:

Results of the First Meeting:

1. Services providers agreed that all scenarios could match with their expectation which was to promote their studies and create awareness about energy efficiency. They also identified each user scenario as a bridge, which could convey the information transformed into experience.

2. Services providers indicated that the newly designed scenarios had solutions that complement the missing aspects of the other projects they were working on.

3. Service providers also evaluated the technologies proposed in the interaction of the scenarios and stated that these technologies should be reassessed in terms of energy efficiency. In this respect, they informed the design students about possible alternative technologies in order to overcome the unnecessary energy consumption which could be caused by the proposed technologies.

4. Service providers indicated that the user scenarios developed by students were not only refer to the user group in campus, but also had the potential to communicate with different user profiles and public areas. They found the proposed design approaches valuable and, they expressed their intention to work with the designers together for their future projects.

5. Based on the feedbacks taken during the evaluation of the user scenarios, the possibility to adapt new scenarios to the kiosks and continue to collaborate within this process were agreed by all stakeholders.

Results of the Second Meeting:

1. The simplicity in the designs were found to be attractive by service providers. They stated that transferring the basic information directly instead of putting unnecessary information over was important for them.

2. Service providers indicated that reflex-focused scenarios that encourage the user to physical movement might be more effective in providing a sustainable service. In this respect, they found the activity based scenarios were more powerful.

3. Service providers warned the designers that ordinary metaphors and common actions which were adapted to scenarios might not effectively communicate the content. They specifically underlined that the ideational background of such scenarios needed to be restructured and a deeper research should be done.

4. The idea of collecting user data found to be important by all parties for understanding the user profiles, measuring the effect of application as well as providing new approaches.

5. The scenarios which were supporting the multiple user interaction were found succesful in terms of their potential for increasing the amount of user participation.

6. Service providers also indicated that reliable and filtered information was important for them. Therefore, the only user scenario proposal which were developed based on this approach were found to be efficient, because this scenario were supporting the active participation in the process. They also defined this scenario as an organic and alive communication tool.

7. Service providers also offered to publish the scenarios on CEEE's official website in order to set an example and increase motivation of students.

8. At the end of the meeting, service providers offered us to give one of their kiosks and suggested us to develop a prototype for testing the one of the user scenarios. In addition, they also indicated that they would support us to develop more projects that would meet the social and cultural needs for similar issues within the university campus.

4.4 Results of the Evaluation of the Research Outcomes

The results obtained from the whole process were interpreted by the researchers in two sections. In the first section, achievements were discussed through the effects of collaboration in design evaluation and design development in the early stages. In the second section, the design process is discussed through the actors and the benefits obtained from this study by establishing collaboration were discussed in terms of involving different disciplines to the design study. The results of the entire process are as follows:

4.4.1 The Effect of Collaboration on Enhancing Product Experience in Early Design Development

In this research, participants observed the problems with a holistic understanding by considering the affordance concepts which are adapted to the study for defining research parameters, then tried to develop user scenarios in accordance with these problems they identified. 12 different user scenarios were designed to address common design problems of the kiosks by integrating different interaction modalities.

In all the studies presented, it was observed that participants tried to develop user scenarios which aimed to guide the users effectively in the physical space, to increase their awareness by simulated activities based on real events. It is seen that collaboration is effective for developing various design alternatives instead of concentrating on a single design concept. Results of the study show that people with different backgrounds can bring very different perspectives to design. Differences between new and existing scenarios are found as a result of the structuring research parameters for early design stage by considering user, environment and technology and tasks together. At this point, the importance of structuring research parameters by considering the contextual factors emerges for collaboration in the early stages of design, especially in the preliminary research and idea development processes.

In this study, the collaboration, which includes different voices has opened up new problems which have not been recognized by service providers and tried to enrich the user experience with new perspectives. At this point, the collaboration is found to be an effective way in solving design problems as well as discovering the new possibilities in design research.

Apart from that, it can be concluded that the design process for such technological investments should not be proceeded with only the service providers or engineer's perspectives and involving the new-generation-users growing within these technologies to early design processes of interactive products are expecially important for understanding their motivations and expectations.

4.4.2 Benefits of Collaboration in Early Design for Different Disciplines

This early design development study was shaped by the contribution of service providers and participants from different disciplines by putting their knowledge and experience together. This information exchange revealed the importance of collaboration in the planning of the later stages of the design process in order to determine a road map for the identification of the methods and tools to be used. The evaluation of these achievements through the actors are as follows:

For Service Providers: The CEEE group became aware of the complexities of the dynamics of design and realized how the users' needs and goals had been changing rapidly. By witnessing how design students –who were also their target users- perceive their products and offer diversity of design solutions through their multidisciplinary perspectives, they understood the significance of collaborations in early design of their products and they have established a "Communication Design Group" within the CEEE. With this new approach, they began to rapidly modify their products, taking into account the expectations and needs of different groups in ensuring the sustainability of the products they served. They first searched for ways to link daily newspaper to kiosk interfaces. They also added short animations giving information about energy and the environment in order to help users to recognize more quickly about the purpose of serving these kiosks. Moreover, they also tried to increase the attractiveness of the kiosks by covering their outer shells with light sensitive color-changing tapes.

For Design Students: Designers from different disciplines dealt with more realistic and up-to-date design problems compared to their previous design experience. Moreover, instead of working alone, they had a chance to work collaboratively with other design students, researchers as well as the service providers. At this point, design students learned different approaches to solutions for product design problems by working collaboratively. The process of creating design solutions for real-life problems was an exciting process for design students. Design students also had the opportunity to communicate with the service providers who had engineering background and learned how their design ideas could be adapted to real life. In terms of sharing information on how new design solutions could be implemented in practice, it was a sign that communicative problems between designer engineers could also be solved through collaboration. It was also observed that, students' confidence increased in terms of sharing their design ideas with other people especially after the meetings with service provides.

For Researchers: Establishing collaborative early design study was an effective method for obtaining useful outcomes for both academic and design areas for researchers. During these processes they were active actors with design students and service provides from different disciplines. They had the opportunity to witness the different contributions of these actors to the process. Thus, researchers recognized the importance of working together with actors from different disciplines in bringing about innovative design solutions for an interactive product in terms of both design development and evaluation. Moreover, by combining the problem-based learning approach with the collaborative design method, they noticed the possibility to develop creative design solutions for application-based problems.

CHAPTER 5
CONCLUSION

Today there is a demand to reach information through experiencing technological products. And the solutions call for collaboration between designers, researchers and clients in order to be supported by multiple point of views. This study examined whether collaboration among multiple actors in the early stages of design process have an impact on the ideation of the products. For this purpose, a case study was conducted in which four interactive kiosks provided by CEEE research group at Özyeğin University were examined. Possible interaction solutions explored through the creation of new user scenarios based on the brief of service providers and the expectations of the students who were the end users of kiosks. This research including engineers and specialist from CEEE, design students and design researchers have been carried out in Department of Communication Design of Özyeğin University, under Interaction Design Ergonomics course in 2015 and 2017 fall semesters.

The phases of the study progressed in the following order: At the beginning, a literature survey covering background and recent studies for interactive kiosks, collaborative design, concepts of affordance and user scenarios have been done. The case study started after receiving the brief from the CEEE. Once the service provider's expectations were identified, the on-site investigation was carried for revealing the problems of the kiosks through the concepts of affordance in relation with their users and environment. Afterwards, findings obtained from the on-site examination were discussed in the workshops. The research continued with the exploration of design solutions through the creation of new user scenarios. Specialists from CEEE, design students and researchers came together in order to discuss the new user scenarios face-to-face. In those meetings, the overlapping features of the newly designed scenarios with CEEE’s expectations and purposes were revealed. Possible limitations for the implementation of new scenarios were discussed. As the case study ended, the results obtained from the collaboration were evaluated and discussed on the basis of the research questions of the study.

In this chapter, firstly, research questions which are identified at the beginning our research are revisited and the deductions from the research process are discussed through

both the created designs and actors involved in the process by addressing research questions identified at the beginning of the study. Afterwards, this discussion concludes with our insights about emerging aspects which can guide similar studies. This chapter ends with the recommendations for further research.

5.1 Discussions

At the beginning of our research, we aimed to conduct a study based on a collaboration in the early design stages of interactive kiosks in a holistic framework by identifying the need of collaborators in order to develop effective design solutions. With this aim in mind, the research questions and the answers that we obtained through this study are the following:

RQ1: Does collaboration in early design stages of interactive kiosks support the ideation of interactions?

What we gained from our background research was that screen-based applications designed for interactive kiosks were not able to provide the intended effective and sustainable user experience. In this study, we believed that we might be able to produce experience-driven design scenarios by establishing a collaboration with different actors. Based on the outcomes, it is revealed that in new scenarios, screens are not completely eliminated, however they are integrated in an experience-driven process when compared to present condition. The diversity of the designed scenarios that invite the user to physically activity, allow them to communicate with the system, and works with dynamic content proved that collaboration is effective in generating more experience-driven design scenarios.

RQ2: What is the contribution of collaboration in terms of information exchange that is obtained during the design process to the people from different disciplines?

In professional life, design usually starts with marketing department (Ulrich & Eppinger, 2016). Marketing provides the design expectations to designers, and when designers turns them into physical, human factors come into play. Marketing workers are able to formulate user needs because they are close to the costumer, however, they may not be able to formulate the design's itself alone. Because, the responsibility of the marketer

tends to the needs of the user with a focus on achieving the fastest and highest number of sales at the lowest cost. However, the end-product may not always be efficient and long-lasting without a deep understanding of the user product relationship. Hence, it is needed to deal with design issues with more holistic point of view.

Moreover, in terms of design strategies to be developed, differences between sales-oriented and awareness-raising services must be considered. In this study, we particularly focused on design for interactive kiosks which had the purpose of increasing energy awareness. We established a collaboration with service providers as well as designers. In this process, we intended to incorporate design students- who are the actual user groups of the kiosks- directly into the research process to reveal user needs and expectations. Based on the positive outcomes we obtained from the study we can say that collaboration in design act as a communicative bridge among different actors. Collaborative processes create a space where designers can reveal their own perspective and needs, and provide alternative design solutions to a real life problem. Collaboration in design allows service providers to communicate with other actors, not only to inform designers about technical and financial criteria but also to better understand their own expectations. Collaboration allows different actors come together to understand more deeply by discovering, observing, experiencing and discussing how the goal-oriented product should be.

In the following sections, we discuss the insights that we gained from the research in detail:

a. Inferences About How Digital Natives Want to Use Kiosks: As researchers, what mattered for us was the designers to consider these kiosks as media for developing alternative experience solutions. With the examination of the outputs many benefits and versatile outcomes are achieved in comparison with existing condition. The new user scenarios reflected different perspective for how to create awareness through sustainable interaction solutions fulfilled the objectives of the service providers as well as researchers. In most user scenarios it is clearly seen that, new generation designers are interested in applications that establish social dialogue with the users rather than numeric/ technical data, work with real-time data and enable multi-user interaction. In addition, they tend to design in which the content of the products are associated with their physical

environment. The classification of user scenarios with respect to their interaction and their association with place can be seen in Table 1.

	Spatial Data-Based	*On-site / Predefined Data-Based*
Dialog-Based Interaction	Scenario by Abdimajid H.Aden	Scenario by Tuğrul V. Şalcı & Dila Atay Scenario by Doğa İlter Scenario by Tugay Çetinkaya Scenario by Sinem Çoban Scenario by Sümeyra C. Traş Scenario by Ranim H. Eddin
Activity-Based Interaction	Scenario by Ekmel Ayar	Scenario by Hazal D. Kılıçkap Scenario by Bortay Gökkaya Scenario by Pelin Oymacı & Derin Bayraktar
Activity & Dialogue Based Interaction	Scenario by Reyhan Akdemir & Zeynep Marmaralı	

Table 1 Classification of user scenarios based on interactions

It is possible to say that developing experience-driven design solutions based on collaboration for early design development process brings creative options for idealization of the concepts and make sense of the objective of the need to use technology. This young user population which can also be defined as digital natives have been excited to become a part of such design projects which aim to create social awareness. However, it becomes clear that using kiosks is no longer meaningful for creating awareness for this generation who already access information anytime and anywhere, thanks to the mobile technologies. In addition to this, although they do not prefer playing games with an on-site public product regularly, they seek more playful experiences which are encouraging them to action. Service providers also support this view from the experience they received from their previous projects. In accordance with all these outcomes, we propose the following aspects that can contribute to designing experiences that will appeal to the new generation of users for those who develop design in similar subjects:

- Supporting “physical activiy”
- Incorporating “spatial and temporal facilities”
- Increasing “social” and “playful” conditions
- Offering “meaningful” experiences

b. The Importance of Coming to an Understanding to Define a Goal-oriented Product: In collaborative design environments, it is difficult to talk about possible design solutions without outputs. As new design concepts come to exist, it becomes easy to discuss them with the actors, and it is possible to produce new context-specific information. Moreover, when researchers, service providers and designers perform a project alone, unfamiliarity in communication among actors are emerging. For this reason, a balance needs to be established in the communication between these actors. In this study, designers transformed the design concepts into user scenarios and presented them to other stakeholders via storyboards. service providers were able to grasp the designs quickly during the discussions and all the actors were able to communicate through the designs. This result supported the idea that user scenarios are not important just for the designing experiences for end-users, it is also a significant communication tool for information exchange among stakeholders in the early stages of design process.

Within the context of this study, researchers guided designers in both problem analysis and concept development processes by including affordance concepts in the framework of this research. This approach enabled the designers to become aware of the importance of human factors in design. Designers, as the users of the related interactive products, better understand these concepts by experiencing the products on-site with a more concentrated viewpoint in the early stages of the design. This result becomes a sign that during the design development processes, building a specific research framework contributes positively to the flow of the process.

In discussion sessions, after the presentation of each user scenario, service providers also determined new aspects about creating awareness on their subject that they have not considered before. These ideations which triggerred the sharing become an indication that service providers are able to generate new contextual information in collaborative environments where the ideas are shared more openly and freely. The aspects that service

providers care about -which were not delivered in brief at the beginning but revealed during the discussions on new design concepts- as follows:

- Consistency in system design
- Originality in the user scenarios
- Concerning the ideational background about energy culture
- Encouraging the users to act
- Expanding the participation boundries (Collaborating with different institutions, e.g TEMA)

As a result of these discussions with service providers, we have also recognized the emerging aspects needed in communicating information through an interactive product for a spesific context in this mutual information exchange process. Reserchers as well as the institutions who are working on design development can benefit from the following aspects, which have potential for further examination in future design research:

- Providing reliable information
- Cyclic-sequential production
- Basic knowledge sharing by users
- Avoiding cliches which are overshadowing the opportunity spaces.

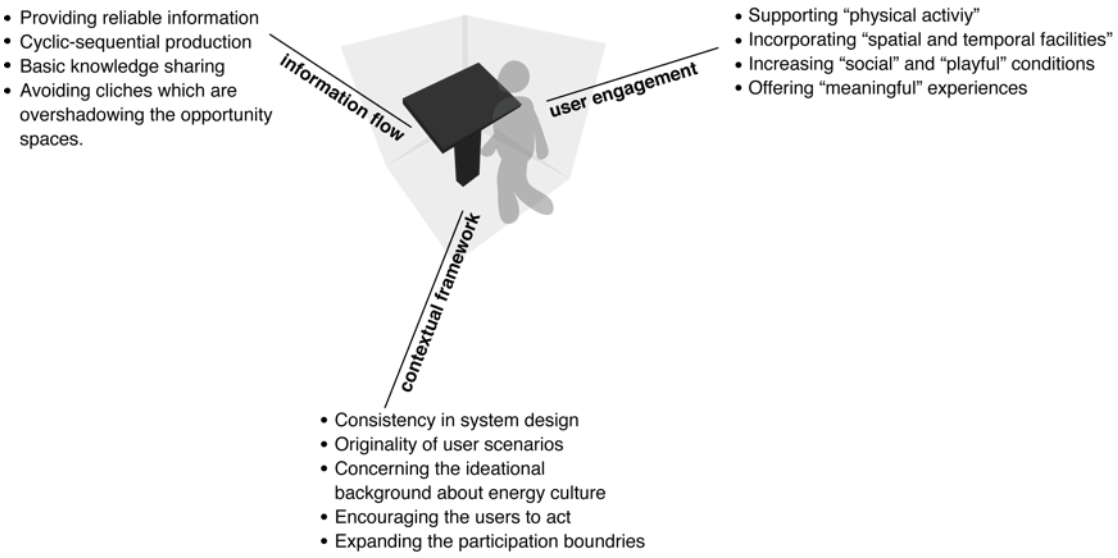


Figure 28 Emergent aspects offered to be considered for similar future design studies

5.2 Recommendations for Further Research

a. Studies to be Improved for Changing User Behaviour: In this study, we focused on exploring the potential of collaboration to yield new design concepts in the early design process for interactive kiosks, and in this process we particularly addressed it through user scenarios. Based on the positive outputs obtained from the study, these scenarios should now be implemented and tested as the next step. In this way, it will be possible to examine how these scenarios can change user behavior positively and increase their awareness. At this stage, the research questions that need to be adressed as follows:

- How can we influence user behaviors in a positive way through interactions with information communication tools?
- How can the social-behavioral state of energy efficiency awareness be in practice with adaptation of IOT technologies?
- How will the implementation of the user scenarios work in different public spaces?

b. Platform-based Studies for Improving the Collaborative Process: Our research process was implemented based on providing real-time and space communication to actors. We think that moving such collaborative process into VR (virtual reality) environment can provide the following contributions in overcoming the limitations in real-time and real-space based processes:

- Accelerating the temporal flow by reducing the boundaries and obstacles that arise when the actors can not be found in the same place on every meeting.
- Producing alternative solutions for third-group actors (e.g clients) to follow the process online and offline in the processes carried out by dual groups (e.g designers & researchers).
- Making clients or designers more active in terms of communication in the process which are driven mainly by researchers.

Based on the purposes mentioned above, the research topics for a platform-based collaborative process can be as follows:

- Structuring spatial characteristics of new virtual environments
- Examining of possible effects of these areas on each other
- Contribution of interaction modalities (keyboard, speech to text, audial, etc.) to the process
- Determination of permissions and restrictions for interactions in VR environments

Measuring the efficiency of the results and comparing them with real time / real space will yield important results in terms of the quality of the collaboration and its reflection on the outputs.

REFERENCES

Abras, C., Maloney-Krichmar, D. & Preece, J. (2004). User-Centered Design. In *Bainbridge, W. Encyclopedia of Human-Computer Interaction*. Thousand Oaks: Sage Publications.

Alexander, I., & Maiden, N. (2004). Scenarios, stories, use cases: Through the systems development life-cycle. Chichester: John Willey & Sons.

Anggreeni, I., & van der Voort, M. C. (2007). *Tracing the Scenarios in Scenario-Based Product Design: a study to support scenario generation*. Enschede: Centre for Telematics and Information Technology.

Blignaut, P. (2004). Computerized self-administered questionnaires on touchscreen kiosks. *Extended Abstracts of the 2004 Conference on Human Factors and Computing Systems - CHI 04*. doi:10.1145/985921.986019

Börekçi, N. A. (2015). Usage Of Design Thinking Tactics And Idea Generation Strategies In A Brainstorming Session. *METU Journal Of The Faculty Of Architecture*,32(2), 1-17. doi:10.4305/metu.jfa.2015.2.1

Buchanan, R. (1992). Wicked Problems in Design Thinking. *Design Issues*, 8(2), 5-21. doi:10.2307/1511637

Buerger, N. (2011). Types of Public Interactive Display Technologies and How to Motivate Users to Interact. *Media Informatics Advanced Seminar on Ubiquitous Computing*. Retrieved from http://nealbuerger.com/wp-content/uploads/2011/07/Neal_Buerger_Types-of-Public-Interactive-Display-Technology.pdf

Buur, J., & Bødker, S. (2000). From usability lab to "design collaboratorium". Proceedings of the Conference on Designing Interactive Systems Processes, Practices, Methods, and Techniques - DIS 00, 297-307. doi:10.1145/347642.347768

Carroll, J. M. (2000). *Making Use: Scenario-Based Design of Human-Computer Interactions*. London:The MIT Press.

Carroll, J. (2000). Five reasons for scenario-based design. *Interacting with Computers*,13(1), 43-60. doi:10.1016/s0953-5438(00)00023-0

Chen, Y., Qian, Z., & Lei, W. (2016). Designing a Situational Awareness Information Display: Adopting an Affordance-Based Framework to Amplify User Experience in Environmental Interaction Design. *Informatics*, 3(2), 6. doi:10.3390/informatics3020006
Costlow, T. (2002). Computer kiosk expedites voter registration. *IEEE Spectrum*,39(10), 26-26. doi:10.1109/mspec.2002.1038593

Cross, N. (2006). *Designerly ways of knowing*. London: Springer.

DART introduces interactive access information kiosk at Love Field Airport. (n.d.). Retrieved April 06, 2017, from https://www.globalairrail.com/news/entry/dart-introduces-interactive-access-information-kiosk-at-love-field-airport

David, S., Rega, I., Vannini, S., & Cantoni, L. (2013). Co-designed improvement actions in Mozambican Community Multimedia Centres. *Proceedings of IFIP WG 9.4: Social Implications of Computers in Developing Countries, Ocho Ríos Jamaica*, 19-22 May, 2013. Short Paper, pp. 1004-1017.

Derkzen, P., Franklin, A., & Bock, B. (2008). Examining power struggles as a signifier of successful partnership working: A case study of partnership dynamics. *Journal of Rural Studies*,24(4), 458-466. doi:10.1016/j.jrurstud.2008.03.010

Dodrill J. (2013). Gallery One Offers Art & Technology Interactivity at Cleveland Museum of Art [Blog post]. Retrieved April 07, 2017, from https://janetdodrill.wordpress.com/tag/kiosk/

Endres, J., Welch, T., & Perseli, T. (2001). Use of a Computerized Kiosk in an Assessment of Food Safety Knowledge of High School Students and Science Teachers. *Journal of Nutrition Education*,33(1), 37-42. doi:10.1016/s1499-4046(06)60008-0

Energy (n.d), *Greenu*.Retrieved August 1, 2016 from http://www.miami.edu/finance/index.php/green_u/energy/

Er, E., & Çağıltay, K. (2011). User Evaluation of Internet Kiosks in University Setting. Lecture Notes in Computer Science Design, User Experience, and Usability. *Theory, Methods, Tools and Practice,* 394-403. doi:10.1007/978-3-642-21708-1_45

Erickson, T. (1995). Notes on design practice: Stories and prototypes as catalysts for communication. In Carroll, J.M. (Ed.), *Scenario-based design: Envisioning work and technology in system development.* New York: John Wiley.

Fischer, G. (2002). Beyond "Couch Potatoes": From Consumers to Designers and Active Contributors. *First Monday*,7(12). doi:10.5210/fm.v7i12.1010

Gaver, W.W. (1991). Technology affordances. *Proceedings of CHI'91 Conference*. 79-84.
Gibson, J.J. (1979). *The ecological approach to visual perception*. Michigan: Houghton Mifflin.

Golding, J. (2015). JCDecaux's first campaign involved gesture recognition technology that enabled users to virtually explore the features of the car in collaboration with Ford CMa. Retrieved April 15, 2017, from http://www.signlink.co.uk/Features/Business-Opportunities/3632/augmented-reality-signage

Gomes, D., Tzortzopoulos, P., & Kagioglou, M. (2016). Collaboration through shared understanding in early design stage. *Paper presented at the IGLC 2016 - 24th Annual Conference of the International Group for Lean Construction*, 63-72.

Goodman, E., Kuniavsky, M., & Moed, A. (2012). *Observing the user experience: A practitioners guide to user research*. Amsterdam: Morgan Kaufmann.

Greenberg, S., Carpendale, S., Marquardt, N., & Buxton, B. (2012). The narrative storyboard: telling a story about use and context over time. *Interactions*, 19(1), 64–69. doi:10.1145/2065327.2065340

Guo, S., Falaki, M. H., Oliver, E. A., Rahman, S. U., Seth, A., Zaharia, M. A., & Keshav, S. (2007). Very low-cost internet access using KioskNet. *ACM SIGCOMM Computer Communication Review*,37(5), 95. doi:10.1145/1290168.129018

Hagen, S., & Sandnes, F. E. (2010). Toward accessible self-service kiosks through intelligent user interfaces. *Personal and Ubiquitous Computing*,14(8), 715-721. doi:10.1007/s00779-010-0286-8

Harrill Hall rededicated after $15.5 million renovation (2012), *The Reporter*. Retrieved August 1, 2016 from http://thereporter.wcu.edu/2012/09/harrill-hall-rededicated-after-15-5-million-renovation/

Hartson, H. R. (2003). Cognitive, physical, sensory, and functional affordances in interaction design. *Behaviour & Information Technology*, 22(5), 315-338.

Hartson, R., & Pyla, P. S. (2012). The UX book: Process and guidelines for ensuring a quality user experience. Amsterdam: Morgan Kaufmann.

Hom. (1998). The Usability Methods Toolbox. Retrieved May 16, 2017, from http://usability.jameshom.com/

Hope, T., Hamasaki, M., Matsuo, Y., Nakamura, Y., Fujimura, N., & Nishimura, T. (2006). Doing Community: Co-construction of Meaning and Use with Interactive Information Kiosks. *Lecture Notes in Computer Science UbiComp 2006: Ubiquitous Computing*,387-403. doi:10.1007/11853565_23

Houben, S., & Weichel, C. (2013). Overcoming interaction blindness through curiosity objects. *CHI 13 Extended Abstracts on Human Factors in Computing Systems on - CHI EA 13*, 1539-1544. doi:10.1145/2468356.2468631

Iacucci, G., & Kuutti, K. (2002). Everyday Life as a Stage in Creating and Performing Scenarios for Wireless Devices. *Personal and Ubiquitous Computing*,6(4), 299-306. doi:10.1007/s007790200031

Ida, M., Mori, H., Nakamura, S., & Shikano, K. (2004). A noise-robust speech input interface for information kiosk terminals. *Electronics and Communications in Japan (Part II: Electronics)*,87(12), 51-61. doi:10.1002/ecjb.20135

ISO - International Organization for Standardization. (2015, June 18). Retrieved from https://www.iso.org/standard/52075.html

Ives, B., & Olson, M. H. (1984). User Involvement and MIS Success: A Review of Research. *Management Science*,*30*(5), 586-603. doi:10.1287/mnsc.30.5.586

Ivey, M., & Sanders, E. (2006). Designing a Physical Environment for Co-experience and Assessing Participant Use. *Proceedings of Wonderground Design Research International Conference* (pp. 1-17). Portugal: Centro Editorial de IADE.

Johnston, M., & Bangalore, S. (2004). MATCHKiosk. *Proceedings of the ACL 2004 on Interactive Poster and Demonstration Sessions* -. doi:10.3115/1219044.1219077

Ju, W., & Sirkin, D. (2010). Animate Objects: How Physical Motion Encourages Public Interaction. *Persuasive Technology Lecture Notes in Computer Science*,40-51. doi:10.1007/978-3-642-13226-1_6

Jungk, R., & Müllert, N. R. (1996). *Future workshops: How to create desirable futures*. London: Institute for Social Inventions.

Katre, D., & Sarnaik, M. (2010). Identifying the Cognitive Needs of Visitors and Content Selection Parameters for Designing the Interactive Kiosk Software for Museums. *Human Work Interaction Design: Usability in Social, Cultural and Organizational Contexts IFIP Advances in Information and Communication Technology*,168-179. doi:10.1007/978-3-642-11762-6_14

Kensing, F., & Madsen, K. H. (1991). *Generating visions: Future workshops and metaphorical design*. Roskilde: Roskilde University, Computer Science.

Khamis, M., Bulling, A., & Alt, F. (2015). Tackling challenges of interactive public displays using gaze. Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing and Proceedings of the 2015 ACM International Symposium on Wearable Computers - UbiComp 15,763-766. doi:10.1145/2800835.2807951

Kleinsmann, M., & Valkenburg, R. (2008). Barriers and enablers for creating shared understanding in co-design projects. *Design Studies*,29(4), 369-386. doi:10.1016/j.destud.2008.03.003

Kolko, J. (2007). *Thoughts on interaction design*. Georgia: Brown Bear
Lawson, B., & Dorst, K. (2009). *Design Expertise*. Oxford, UK: Architectural Press.
Lichtman M. (2013).*Qualitative research in education: a users guide*. Los Angeles: SAGE Publications.

Lettl, C. (2007). User involvement competence for radical innovation. *Journal of Engineering and Technology Management*,*24*(1-2), 53-75. doi:10.1016/j.jengtecman.2007.01.004

Life, A., Salter, I., Temem, J., Bernard, F., Rosset, S., Bennacef, S., & Lamel, L. (1996). Data collection for the MASK kiosk: WOz vs. prototype system. *Proceeding of Fourth International Conference on Spoken Language Processing*. ICSLP 96,1672-1675. doi:10.1109/icslp.1996.607947

Maciver F., Malins J. (2016) Two Heads Are Better Than One: Principles for Collaborative Design Practice. In Markopoulos P., Martens JB., Malins J., Coninx K., Liapis A. (eds) *Collaboration in Creative Design* (13-31). Cham:Springer.

Maguire, M. (1999). A review of user-interface design guidelines for public information kiosk systems. *International Journal of Human-Computer Studies*,50(3), 263-286. doi:10.1006/ijhc.1998.0243

Markopoulos, P., Martens, J., Malins, J., Coninx, K., & Liapis, A. (Eds). (2016). *Collaboration in Creative Design: methods and tools*. Cham: Springer International Publishing.

Markopoulos, P., Martens, J., Malins, J., Coninx, K., & Liapis, A. (2016). Creativity and collaboration in early design, in *Collaboration in Creative Design: methods and tools*. Cham: Springer International Publishing. pp. 1–9.

Marti, P., & Bannon, L. J. (2009). Exploring User-Centred Design in Practice: Some Caveats. *Knowledge, Technology & Policy*,*22*(1), 7-15. doi:10.1007/s12130-009-9062-3

Martin, B., & Hanington, B. M. (2012). Universal methods of design 100 ways to research complex problems, develop innovative ideas, and design effective solutions. Beverly, MA: Rockport.

McGrenere, J., & Ho, W. (2000). Affordances: Clarifying and evolving a concept. In *Proceedings of Graphic Interface 2000*, Montreal, 179-186.

Möller, T. R., Hult, C., Isacsson, Å, & Lindholm, L. H. (1997). Multimedia Techniques in the Primary and Secondary Prevention of Malignant Melanoma. *Skin Cancer and UV Radiation*,930-941. doi:10.1007/978-3-642-60771-4_112

Müller, J., Alt, F., Michelis, D., & Schmidt, A. (2010). Requirements and design space for interactive public displays. In *Proceedings of the International Conference on Multimedia - MM 10*,1285-1294. doi:10.1145/1873951.1874203

Müller, J., Walter, R., Bailly, G., Nischt, M., & Alt, F. (2012). Looking glass: A field study on noticing interactivity of a shop window. In *Proceedings of the 2012 ACM Annual Conference on Human Factors in Computing Systems* - CHI 12,297-306. doi:10.1145/2207676.2207718

Müller, M., Otero, N., Alissandrakis, A., & Milrad, M. (2015). Increasing user engagement with distributed public displays through the awareness of peer interactions. *Proceedings of the 4th International Symposium on Pervasive Displays - PerDis 15*,23-29. doi:10.1145/2757710.2757740

Nardi, B. A. (1992). The use of scenarios in design. *SIGCHI Bulletin*,24(4), 13-14.
Nicholas, D., Huntington, P., Williams, P., & Vickery, P. (2003). Health information: An evaluation of the use of touch screen kiosks in two hospitals. *Health Information & Libraries Journal*,18(4), 213-219. doi:10.1046/j.1471-1842.2001.00345.x

Nielsen, J. (1993). *Usability engineering*. San Diego: Academic Press.

Nielsen, J. (1994). Heuristic evaluation (J. Nielsen & R. L. Mack, Eds.). In *Usability inspection methods*(pp. 25-62). New York, NY: John Wiley & Sons.

Norman, D. A., & Draper, S. W. (1986). *User centered system design: New perspectives on human-computer interaction*. Hillsdale, NJ: Lawrence Erlbaum.

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

Norman, D. A. (2002). *The design of everyday things.* New York: Basic Books.
Oliver. C. (2017). *Fundamentals of data communication networks.* Hoboken, NJ, USA: John Wiley & Sons, Inc.

Norman, D. A. (2005). Human-centered design considered harmful. *Interactions,12*(4), 14. doi:10.1145/1070960.1070976

Orhun, S. E. (2017). Integrating Architectural Approaches in Communication Design Education to Improve Awareness in Affordance Design. *Journal of Systemics, Cybernetics and Informatic*s,15(7), 66-71.

O'sullivan, R. G. (2012). Collaborative Evaluation within a framework of stakeholder-oriented evaluation approaches. *Evaluation and Program Planning*,35(4), 518-522. doi:10.1016/j.evalprogplan.2011.12.005

Pang N., Johanson G., Cao S., Liu J., Zhang X. (2007) Collaborative Scenario Building: The Case of an 'Advertainment' Portal. In: Smith M.J., Salvendy G. (eds) *Human Interface and the Management of Information. Methods, Techniques and Tools in Information Design*. Human Interface 2007. Lecture Notes in Computer Science, vol 4557. Berlin: Springer.

Paradi, J., & Ghazarian-Rock, A. (1998). A framework to evaluate video banking kiosks. *Omega*,26(4), 523-539. doi:10.1016/s0305-0483(97)00080-7

Park, T. Y., Lee, M. Y., Kim, J. M., & Ha, Y. H. (2005). Design and implementation of digital photo kiosk system with auto color-correction module. *IEEE Transactions on Consumer Electronics*,51(4), 1067-1073. doi:10.1109/tce.2005.1561826

Paulus, P. B., & Brown, V. R. (2003). Enhancing ideational creativity in groups: Lessons from research on brainstorming. In P. B. Paulus & B. A. Nijstad (Eds.), *Group creativity: Innovation through collaboration* (pp. 110-136). New York, NY: Oxford University Press.

Peralta, C. (2013). Collaboration between designers and scientists in the context of scientific research (doctoral thesis). https://doi.org/10.17863/CAM.14060
Phelps Hospital Kiosks and Digital Signs. (2015). Retrieved April 05, 2017, from https://kioskindustry.org/phelps-hospital-kiosks-and-digital-signs-help-visitors-find-their-way/

Postma, C. E., & Stappers, P. J. (2006). A vision on social interactions as the basis for design. *CoDesign*,2(3), 139-155. doi:10.1080/15710880600888527

Rowley, J. (1995). Multimedia kiosks in retailing. *International Journal of Retail & Distribution Management,*23(5), 32-40. doi:10.1108/09590559510089212

Preece, J., Rogers, Y., & Sharp, H. (2002). *Interaction design: Beyond human-computer interaction*. New York, NY: Wiley.

Sandnes, F.E., Jian, H., Huang, Y., & Huang, Y. (2010). User Interface Design for Public Kiosks: An Evaluation of the Taiwan High Speed Rail Ticket Vending Machine. *J. Inf. Sci. Eng*., 26, 307-321.

Sanders, E. B., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *CoDesign,*4(1), 5-18. doi:10.1080/15710880701875068

Sanders, E. B., Brandt, E., & Binder, T. (2010). A framework for organizing the tools and techniques of participatory design. *Proceedings of the 11th Biennial Participatory Design Conference on - PDC 10*. doi:10.1145/1900441.1900476

Schmidt, A. (2005). Interactive context-aware systems interacting with ambient intelligence. In G. Riva & G. Riva (Eds.), *Ambient intelligence: The evolution of technology, communication and cognition towards the future of human-computer interaction* (pp. 159-178). Amsterdam: IOS Press.

Scholtz, J. (1998). Kiosk-based user testing of online books. Proceedings of the 16th Annual International Conference on Computer Documentation - SIGDOC 98. doi:10.1145/296336.296356

Shneiderman. B. (1987). *Designing the User Interface: Strategies for Effective Human-Computer Interaction*. Reading, MA, Addison-Wesley Publishing Company.

Simsarian, K. T. (2003). *Take it to the next stage: the roles of role playing in the design process*. In CHI '03 extended abstracts on Human Factors in Computing Systems, Ft. Lauderdale, Florida, USA.

Slack, F., & Rowley, J. (2002). Kiosks 21: A new role for information kiosks? *International Journal of Information Management,* 22(1), 67-83. doi:10.1016/s0268-4012(01)00041-x

Steen, M., Manschot, M., & De Koning, N. (2011). Benefits of co-design in service design projects.*International Journal of Design,* 5(2), 53-60.

Stumpf, S., & Mcdonnell, J. (2002). Talking about team framing: using argumentation to analyse and support experiential learning in early design episodes. *Design Studies,* 23(1), 5-23. doi:10.1016/s0142-694x(01)00020-5

Suri, J. F., & Marsh, M. (2000). Scenario building as an ergonomics method in consumer product design. *Applied Ergonomics*,31(2), 151-157. doi:10.1016/s0003-6870(99)00035-6

The shopping mall "Qwartz" (Altarea) equipped with 12 wayfinding, information and loyalty multitouch kiosks. *Viadirect.*(n.d.). Retrieved April 09, 2017, from https://www.viadirect.com/en/news/shopping-mall-qwartz-altarea-equipped-12-wayfinding-information-and-loyalty-multitouch-kiosks

Ulrich, K. T., & Eppinger, S. D. (2016). *Product design and development*. New York, NY: McGraw-Hill Education.

University of Kentucky's Empowered program allows community to discern energy use (2012), *Lanereport*. Retrieved August 1, 2016 from http://www.lanereport.com/903/2012/01/university-of-kentuckys-empowered-program-allows-community-to-di scern-energy-use/

Ünlüer, A. A., Baytaş, M. A., Buruk, O. T., Cemalcilar, Z., Yemez, Y., & Özcan, O. (2017). The Effectiveness of Mime-Based Creative Drama Education for Exploring Gesture-Based User Interfaces. *International Journal of Art & Design Education*. doi:10.1111/jade.12136

Vidal, G. M., Geerts, M., & Feki, M. A. (2013). The Role of Affordances and Interaction Bits in the Design of a New Tangible Programming Interface: A Preliminary Result. *Bell Labs Technical Journal*,17(4), 157-174. doi:10.1002/bltj.21581

Visser, F. S., Stappers, P. J., Lugt, R. V., & Sanders, E. B. (2005). Contextmapping: Experiences from practice. *CoDesign*,1(2), 119-149. doi:10.1080/15710880500135987

Visser, W. (2010). Designing as Construction of Representations: A Dynamic Viewpoint in Cognitive Design Research. *Human–Computer Interaction*,21(1), 103-152. doi:10.1207/s15327051hci2101_4

Vogel, D., & Balakrishnan, R. (2004). Interactive public ambient displays: transitioning from implicit to explicit, public to personal, interaction with multiple users. *Proceedings of the 17th Annual ACM Symposium on User Interface Software and Technology - UIST 04*,137-146. doi:10.1145/1029632.1029656

Vredenburg, K., Mao, J., Smith, P. W., & Carey, T. (2002). A survey of user-centered design practice. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems Changing Our World, Changing Ourselves - CHI 02*. doi:10.1145/503376.503460

Walliman, N. S. (2006). *Social research methods*. London: SAGE.

Walter, R., Bailly, G., Valkanova, N., & Müller, J. (2014). Cuenesics. Proceedings of the 16th International Conference on Human-computer Interaction with Mobile Devices & Services - MobileHCI 14,299-308. doi:10.1145/2628363.2628368

Webb, B. R. (1996). The role of users in interactive systems design: When computers are theatre, do we want the audience to write the script? *Behaviour & Information Technology,15*(2), 76-83. doi:10.1080/014492996120283

Weiser, M. (1991). The computer for the 21st century. *Scientific American*, 265(3), 66-75.

Weiser, M., & Brown, J. S. (1997). The coming age of calm technolgy (P. J. Denning & R. M. Metcalfe, Eds.). *In Beyond calculation*(pp. 75-85). New York, NY: Copernicus.

Wenger, E. (2010). Communities of Practice and Social Learning Systems: The Career of a Concept. *Social Learning Systems and Communities of Practice*,179-198. doi:10.1007/978-1-84996-133-2_11

Wilson, C. (2013). *Brainstorming and beyond: A user-centered design method*. Amsterdam: Elsevier.

Yantaç, A. E. (2013). A Method for Teaching Affordance for User Experience Design in Interactive Media Design Education. Design, User Experience, and Usability. *Design Philosophy, Methods, and Tools Lecture Notes in Computer Science*,630-638. doi:10.1007/978-3-642-39229-0_67

Zhao, S., & Hou, X. (2011). The Information Ecological Analyze of Application Plight of Urban Public Information Kiosk in China. *2011 International Conference on Computer and Management (CAMAN*),1-4. doi:10.1109/caman.2011.5778807

APPENDICES

APPENDIX A - Questionnaire Worksheet for Preliminary Investigation

CoD 315- Interaction Design Ergonomics Course
Özyeğin University / Department of Communication Design

QUESTIONNAIRE WORKSHEET
Preminarily On-site Investigation for CEEE Kiosks at Ozu Campus

Duration: One week
Locations: Faculty of Engineering, Faculty of Business Administration, Faculty of Law (Scola Part), Building of Student Center

Physical Design

Who are the users?

How does the technology fit different user dimentions?

How does the technology fit user anatomy?

How does the technology fit user strength?

How does the technology accommodate different abilities?

How safe is technology? (Health, comfort, performance)

How do users interact with technology?

Cognitive Design

How do users expect the technology to work?

How is the information displayed?

How complex is the interface?

How much training is required?

What user knowledge assumtions are made?

How complex is the interface?

Layout

Are the work items optimally positioned in terms of comfort, convenience, layout, frequency of use?

How well does the layout support work flow?

Who can be accommodated by the layout?

How flexible is the layout when work content changes?

What are the work patterns?

What are the work tasks?

What are the required skills? (Physical, Cognitive, Social)

What are the training needs?

What can be simulated?

Ambient Conditions

How the product is positioned in its physical environment?

How well is the product compatible with its environment?

Is the product noticeable enough in its environment?

What is the behavior pattern of users in the technology's environment?

How the physical environment effect the user- product experience?

APPENDIX B - Storyboards of User Scenarios

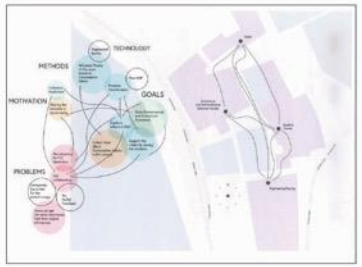
Interactions Based on Dialogue

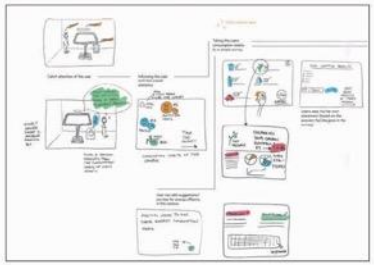
Storyboard 1

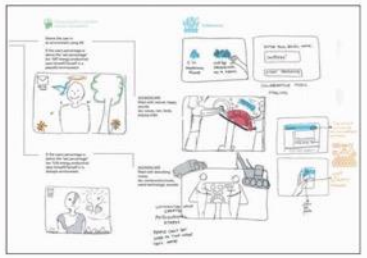
Designers: T. Veli Şalcı & Dila Atay / Communication Design

Description:

In this scenario it was aimed to solve some particular problems: according to designers, kiosks were not attractive for their own generation, their screens were too large, there was not a audial feedback and kiosks did not provide a collaborative usage. In this scenario, when a passerby was around, kiosk recognised this person and yelled at him/her. If the user came close to kiosks, it gave the users some audial information about the energy consumption habits of the OzU Community. In parallel with this audial data, statistical data obtained from surveys appeared on the screen. The system asked user for filling survey about his/her habits of energy consumption. After user filled the survey, he/she also gave additional suggestions about energy consumption. After these steps, an AR application ran on the screen depending on the user's survey results. On this screen, the user saw himself / herself in a specific environment according to the information of how much user used energy efficiently. For example, If the user's energy efficiency ratio is 87%, the user saw himself/ herself in a peaceful environment with natural sounds (rain, birds, playing children's sounds etc), if this ratio is 37%, the user saw himself/ herself in a distoptic environment with disturbing noises, such as construction, truck sounds, strange industrial sounds. Users were able to make music according to these environments where two options were available, user made music either alone or in collaboration. After they created a composition, they posted it on social media for creating awareness about energy consumption.



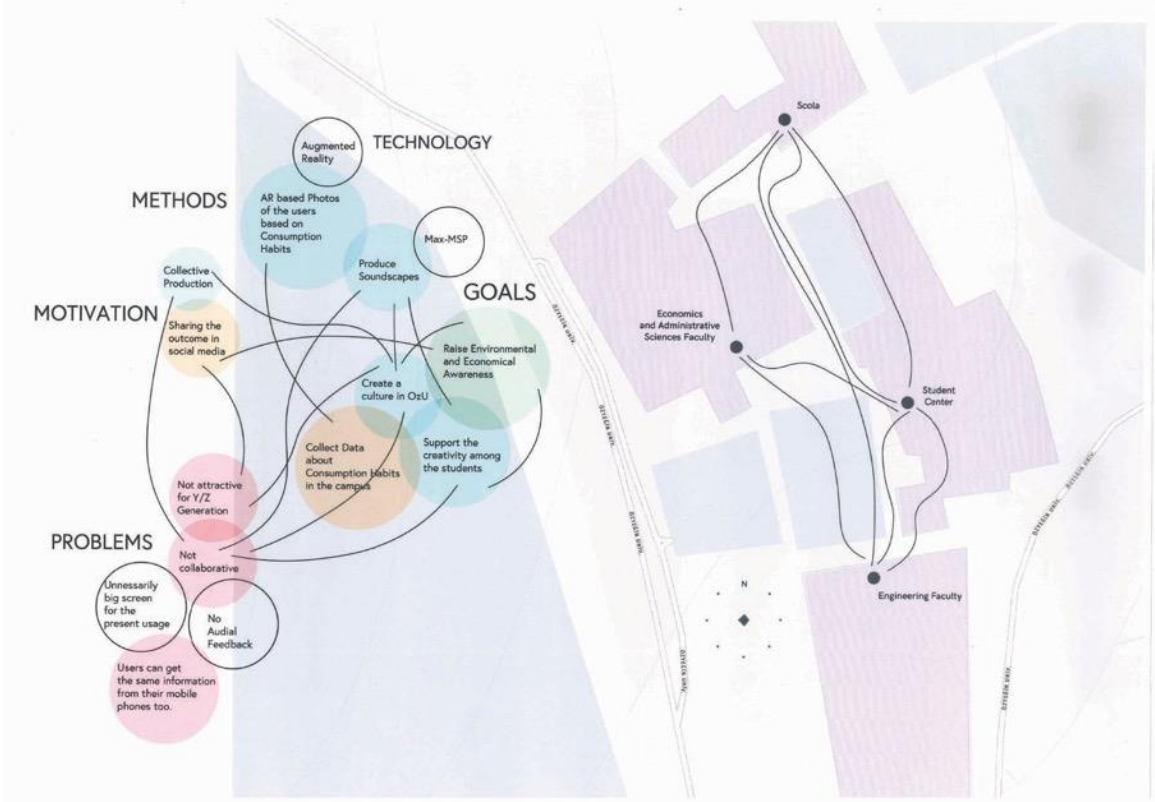




Interactions Based on Dialogue

Storyboard 1

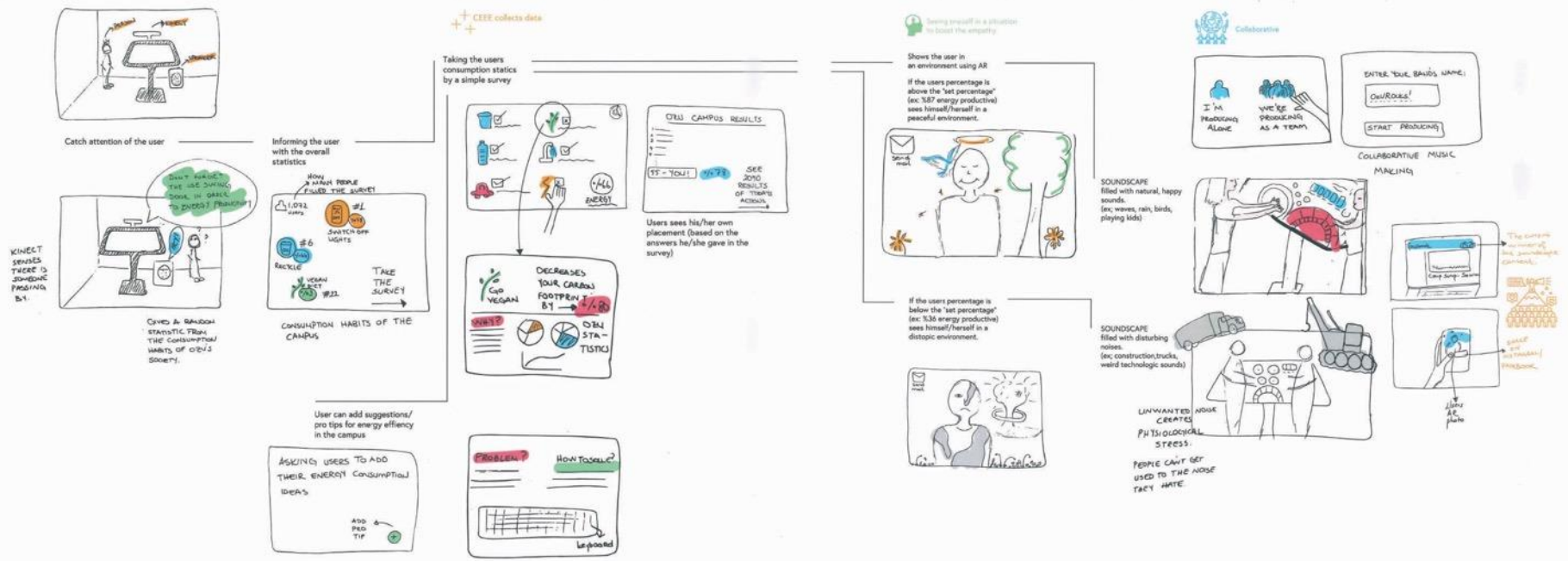
Designers: T. Veli Şalcı & Dila Atay / Communication Design



Interactions Based on Dialogue

Storyboard 1

Designers: T. Veli Şalcı & Dila Atay / Communication Design



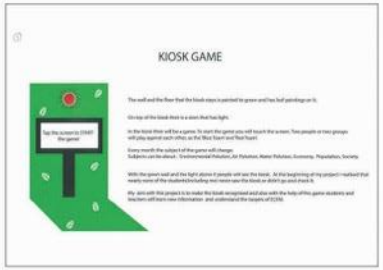
Interactions Based on Dialogue

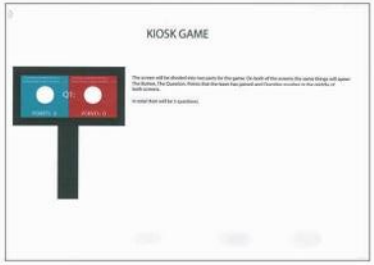
Storyboard 2

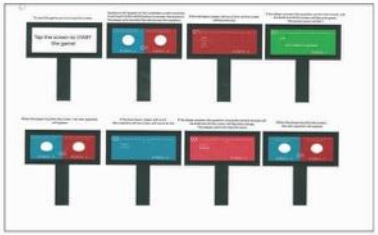
Designer: Doğa İlter / Communication Design

Description:

In this scenario it was aimed to solve some particular problems: according to designers, kiosks were not attractive for their own generation, their screens were too large, there was not a audial feedback and kiosks did not provide a collaborative usage. In this scenario, when a passerby was around, kiosk recognised this person and yelled at him/her. If the user came close to kiosks, it gave the users some audial information about the energy consumption habits of the OzU Community. In parallel with this audial data, statistical data obtained from surveys appeared on the screen. The system asked user for filling survey about his/her habits of energy consumption. After user filled the survey, he/she also gave additional suggestions about energy consumption. After these steps, an AR application ran on the screen depending on the user's survey results. On this screen, the user saw himself / herself in a specific environment according to the information of how much user used energy efficiently. For example, If the user's energy efficiency ratio is 87%, the user saw himself/ herself in a peaceful environment with natural sounds (rain, birds, playing children's sounds etc), if this ratio is 37%, the user saw himself/ herself in a distoptic environment with disturbing noises, such as construction, truck sounds, strange industrial sounds. Users were able to make music according to these environments where two options were available, user made music either alone or in collaboration. After they created a composition, they posted it on social media for creating awareness about energy consumption.







Interactions Based on Dialogue

Storyboard 2

Designer: Doğa İlter / Communication Design

①

KIOSK GAME

The wall and the floor that the kiosk stays is painted to green and has leaf paintings on it.

On top of the kiosk their is a siren that has light.

In the kiosk their will be a game. To start the game you will touch the screen. Two people or two groups will play against each other, as the 'Blue Team' and 'Red Team'.

Every month the subject of the game will change.
Subjects can be about : Environmental Polution, Air Polution, Water Polution, Economy, Population, Society.

With the green wall and the light above it people will see the kiosk. At the beginning of my project I realised that nearly none of the students(including me) never saw the kiosk or didn't go and check it.

My aim with this project is to make the kiosk recognized and also with the help of this game students and teachers will learn new information and understand the targets of EÇEM.

Interactions Based on Dialogue

Storyboard 2

Designer: Doğa İlter / Communication Design

KIOSK GAME

The screen will be divided into two parts for the game. On both of the screens the same things will apear: The Button, The Question, Points that the team has gained and Question number in the middle of both screens.

In total their will be 5 questions.

Interactions Based on Dialogue

Storyboard 3

Designers: Tugay Çetinkaya / Communication Design

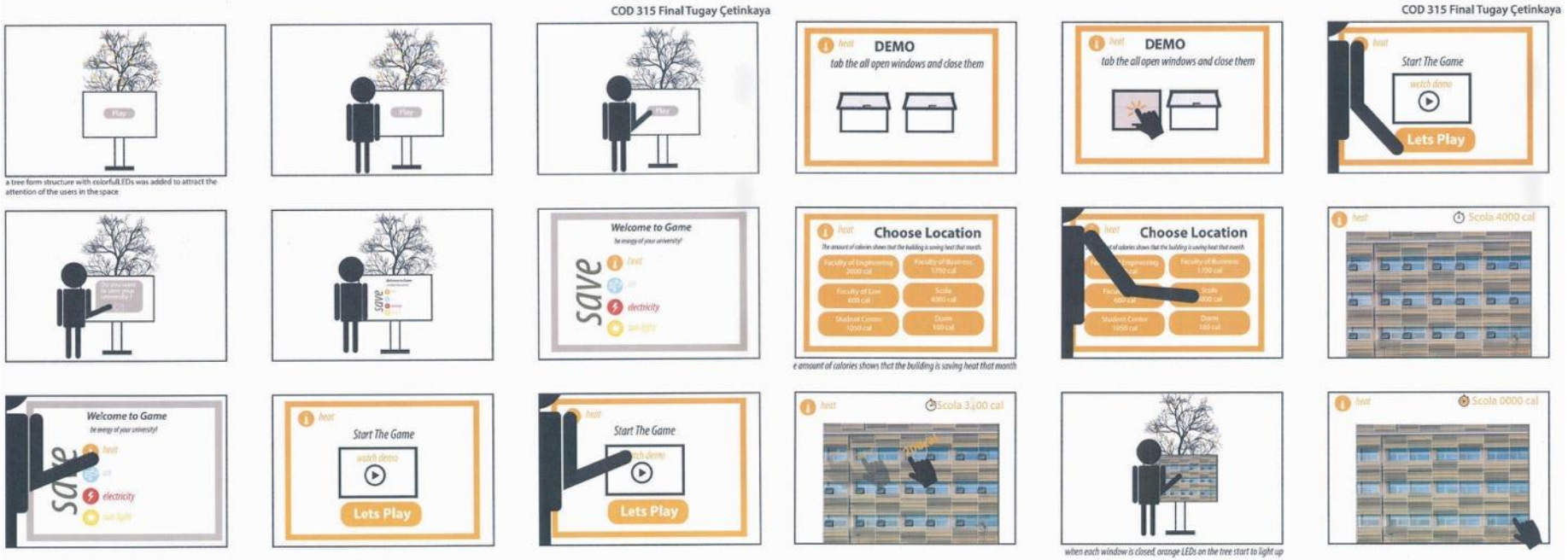
Description:

In this scenario it was aimed to solve some particular problems: according to designers, kiosks were not attractive for their own generation, their screens were too large, there was not a audial feedback and kiosks did not provide a collaborative usage. In this scenario, when a passerby was around, kiosk recognised this person and yelled at him/her. If the user came close to kiosks, it gave the users some audial information about the energy consumption habits of the OzU Community. In parallel with this audial data, statistical data obtained from surveys appeared on the screen. The system asked user for filling survey about his/her habits of energy consumption. After user filled the survey, he/she also gave additional suggestions about energy consumption. After these steps, an AR application ran on the screen depending on the user's survey results. On this screen, the user saw himself / herself in a specific environment according to the information of how much user used energy efficiently. For example, If the user's energy efficiency ratio is 87%, the user saw himself/ herself in a peaceful environment with natural sounds (rain, birds, playing children's sounds etc), if this ratio is 37%, the user saw himself/ herself in a distoptic environment with disturbing noises, such as construction, truck sounds, strange industrial sounds. Users were able to make music according to these environments where two options were available, user made music either alone or in collaboration. After they created a composition, they posted it on social media for creating awareness about energy consumption.

Interactions Based on Dialogue

Storyboard 3

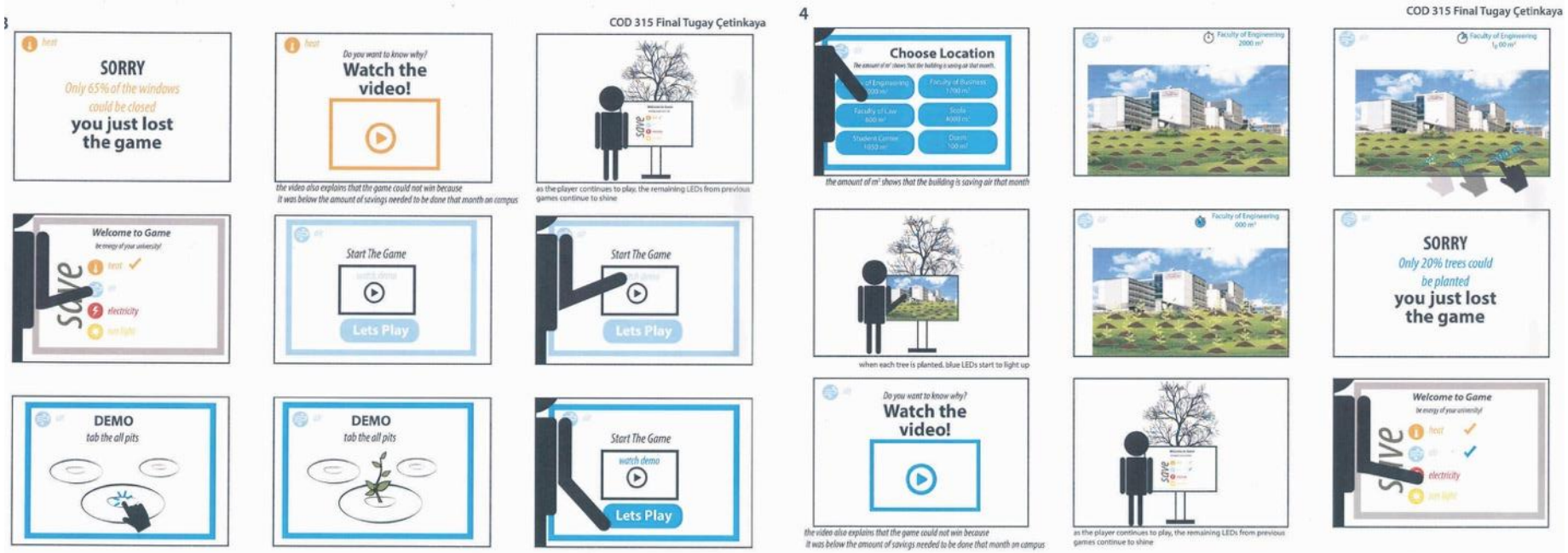
Designer: Tugay Çetinkaya / Communication Design



Interactions Based on Dialogue

Storyboard 3

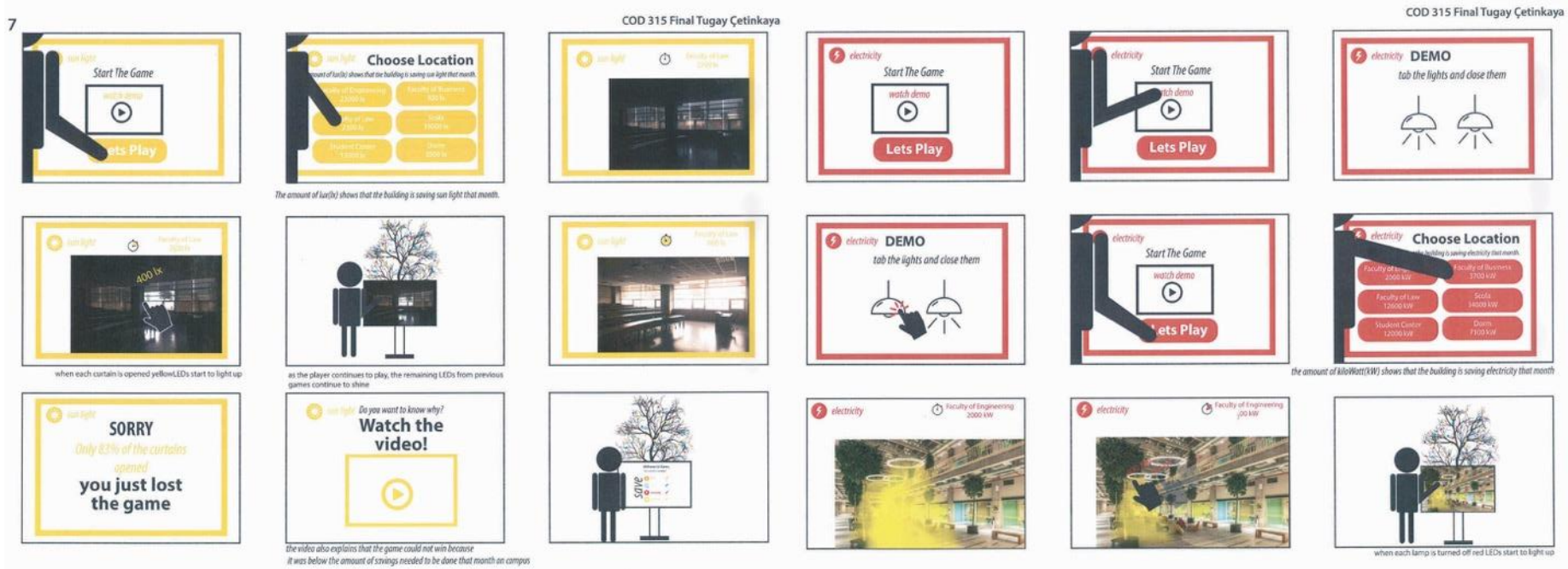
Designer: Tugay Çetinkaya / Communication Design



Interactions Based on Dialogue

Storyboard 3

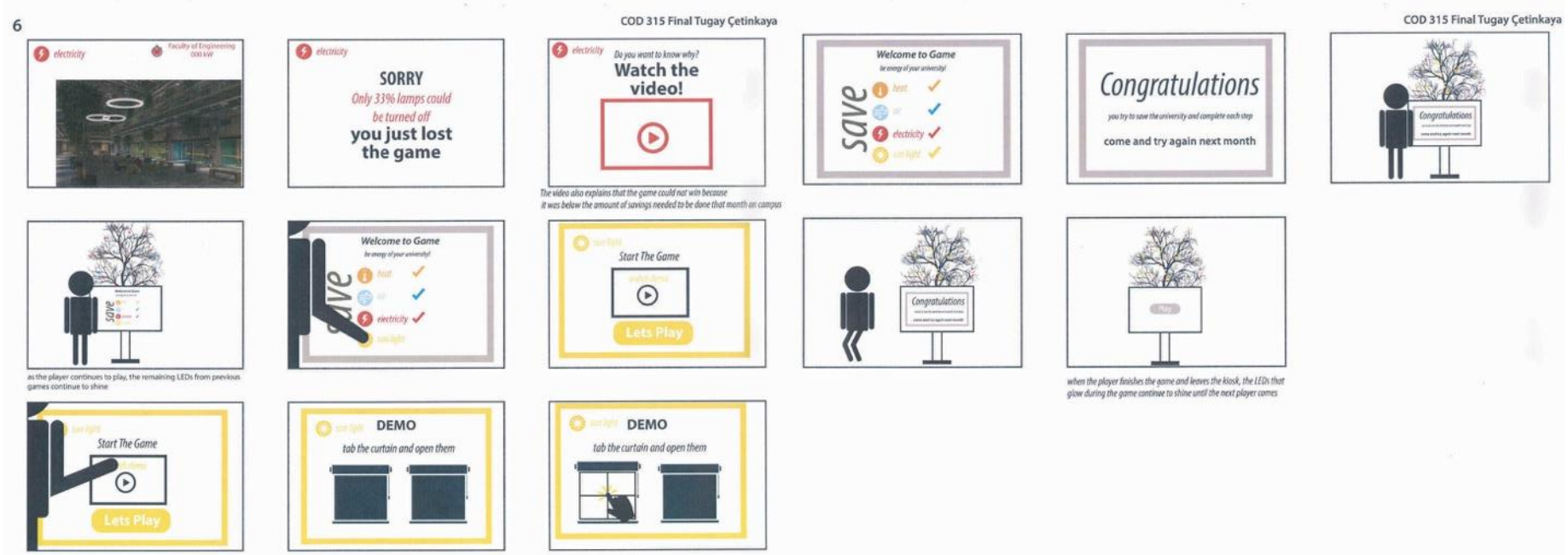
Designer: Tugay Çetinkaya / Communication Design



Interactions Based on Dialogue

Storyboard 3

Designer: Tugay Çetinkaya / Communication Design



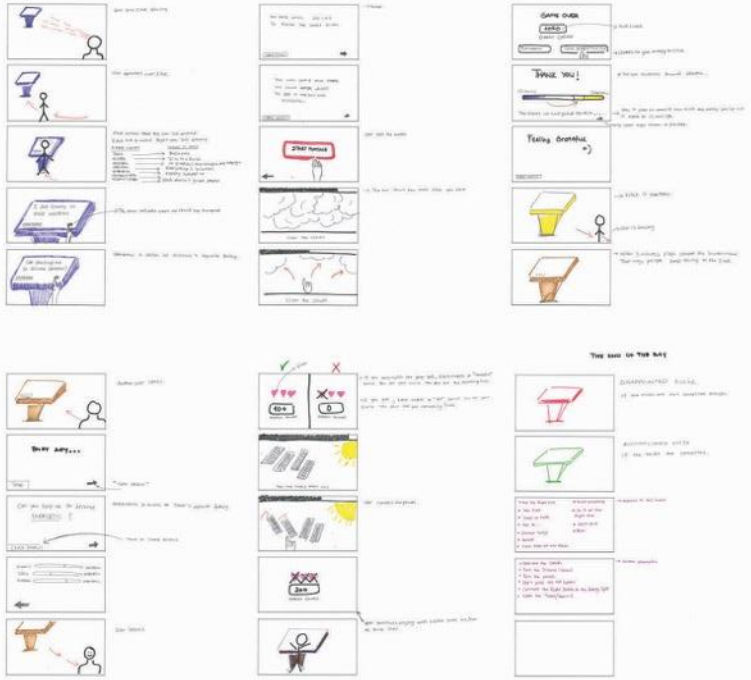
Interactions Based on Dialogue

Storyboard 4

Designer: Sinem Çoban / Communication Design

Description:

In this scenario it was intended the user to empathize the kiosk's current emotional situation. For this purpose, different emotional states were used together with their opposite states in the scenario. Each emotional state was represented by a color. It was aimed to increase the awareness of kiosks turning into different colors. For example, if the kiosk's color was blue, it showed that kiosk was sad due to unnecessary energy consumption. When the user stopped in front of the kiosk, the kiosk detected the user and explained why he was sad. For example, solar panels did not work because the weather was overcast, so no energy could be generated. For this reason, the kiosk was feeling sad. At this point, the user was asked to complete a series of game-based tasks to turn the kiosk emotional state into positive. The user gained points as they completed these tasks. Every point which were earned represented the energy generated by the user. Once tasks were completed, the games could be replayed or the accumulated energy could be transferred to the kiosk to generate more energy. When the kiosk's energy boost took place, the kiosks changed color depending on its emotional states. For example, if the kiosk was sad, once the user has successfully completed the task, the kiosk's emotional state rose to a joyful state and the color turned into yellow.



Interactions Based on Dialogue

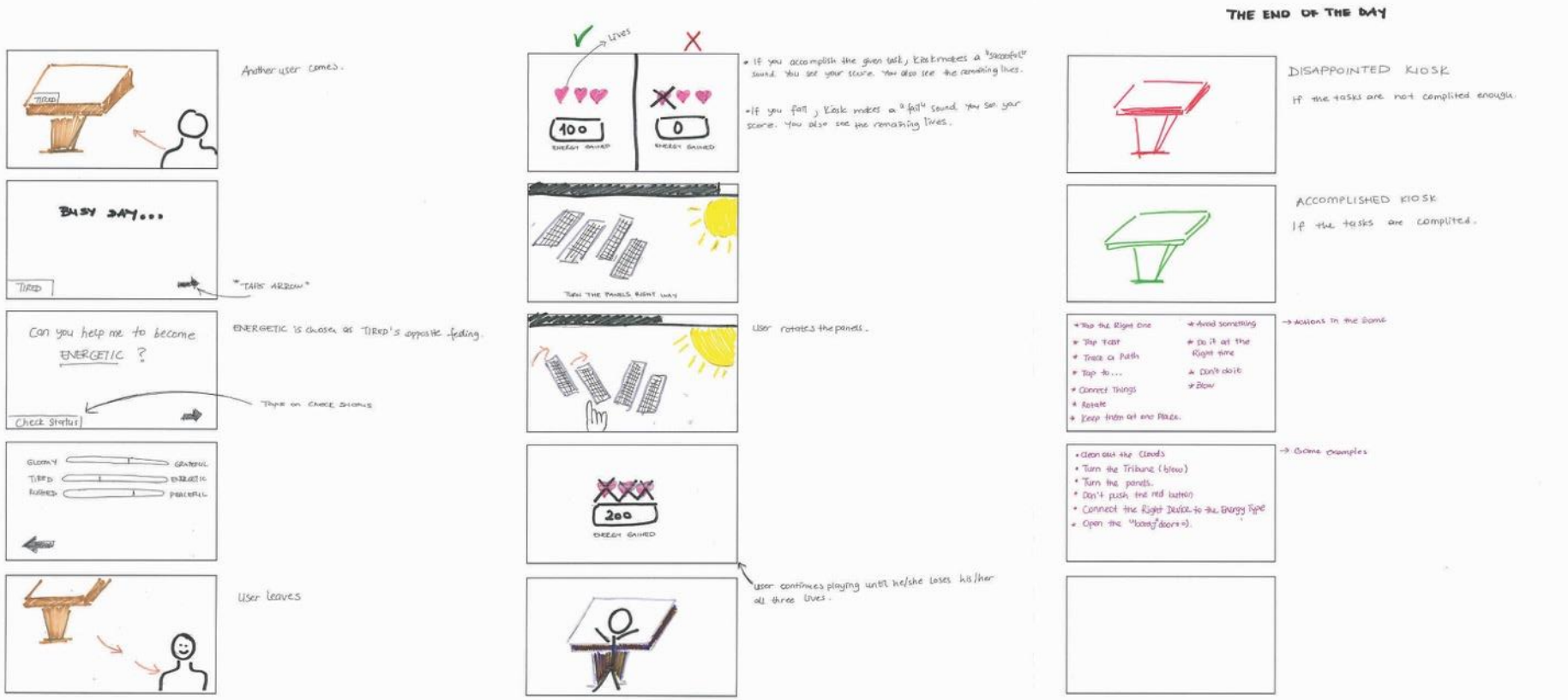
Storyboard 4

Designer: Sinem Çoban / Communication Design

Interactions Based on Dialogue

Storyboard 4

Designer: Sinem Çoban / Communication Design



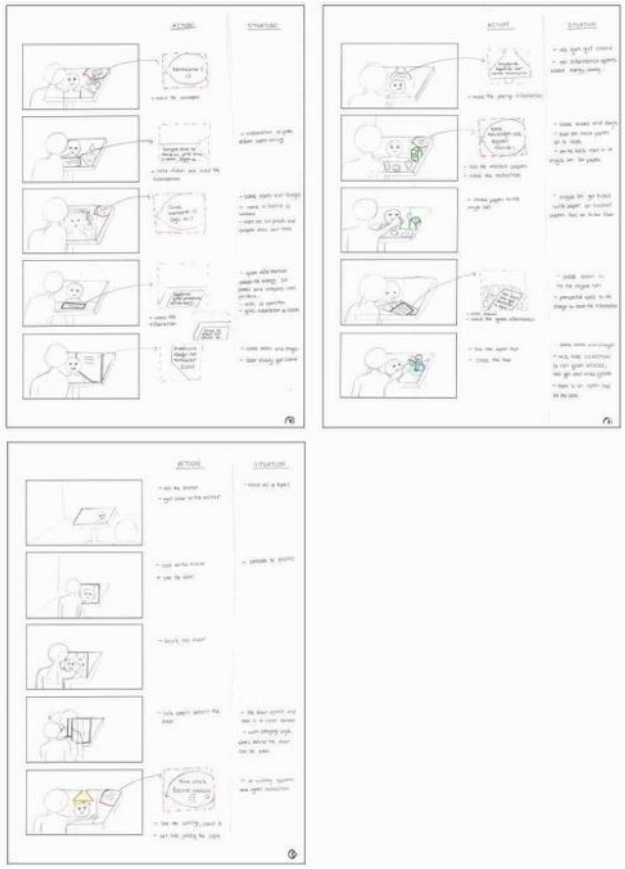
Interactions Based on Dialogue

Storyboard 5

Designer: Sümeyra C. Tıraş / Industrial Design

Description:

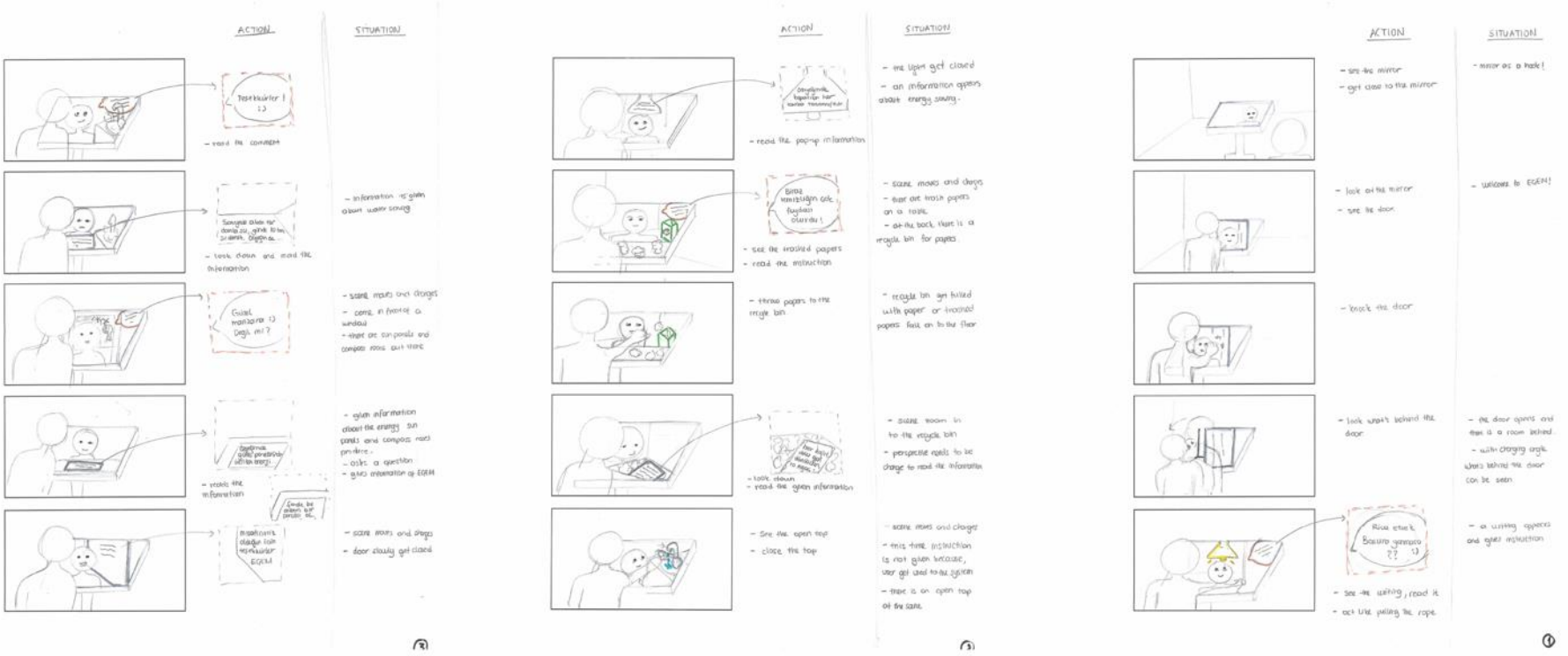
In this scenario, it was aimed to provide information to people through entertaintment. For this purpose the kiosk screen was used as a mirror. When the user passed near the kiosk, user saw himself / herself inside of the kiosks screen in a fictional environment called “CEEE House”. The system directed the user to complete a number of actions for energy saving. For example, he asked the user to close a lamp that was left in one of the buildings. And afterwards, a statistical information appeared on the screen which was about the amount of the energy saved by each lamp that was shut down at Özyeğin University buildings. In this scenario it was anticipated that the user would be able to create a sense of satisfaction after each action he/she completed and by this way, it was forseen that the user were encouraged to use the kiosk again.



Interactions Based on Dialogue

Storyboard 5

Designers: Sümeyra C. Tıraş / Industrial Design



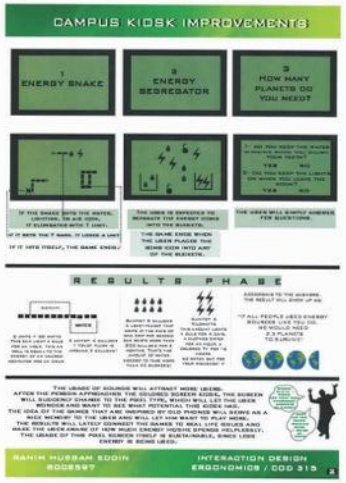
Interactions Based on Dialogue

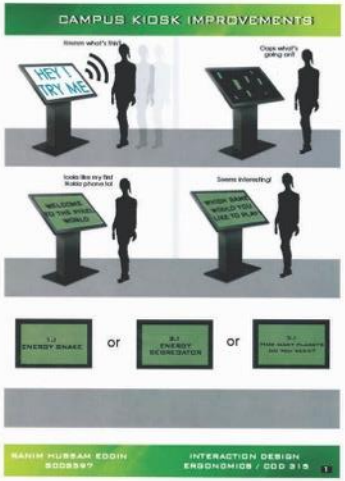
Storyboard 6

Designers: Ranim H. Eddin / Architecture

Description:

In this scenario, an 8 bit game called “snake” adapted to CEEE’s topics. Main reason to use the snake game was to attract people. Also, by using a 8 bit graphical interface, the energy saving of the kiosks were decreased. In the scenario, when the passerby were walking inside the building, kiosk noticed the person and called it with an audial feedback in parallel with the same information appeared on screen. When the person came in front of the kiosks, the screen turned into a game interface. The system offered user three game options: “Energy snake”, “energy generator” ve “how many planets do you need?”. In the “energy snake” game, user collected particular icons and gains units of elements such as water, lightning and air. At the end of the game, units collected during the game were calculated and transformed to energy ratio and a message delivered via screen. For example, each winned unit from the electricity had 10 watts of energy and this corresponded to the amount of energy needed to keep an bulb open for an hour. In the “energy generator” game, user’s mission was to put the elements into related buckets.. At the end of the game, if the user gained 4 units water, this was equivalent to the amount of water consumed in a shot. In “how many planets do you need?” game, user answered questions about energy and environment and gained units according to his/her answers. At the end of the game, the user received a message like: "If all the people were using the energy sources as much as you would, we would need 3.5 more planets to survive".

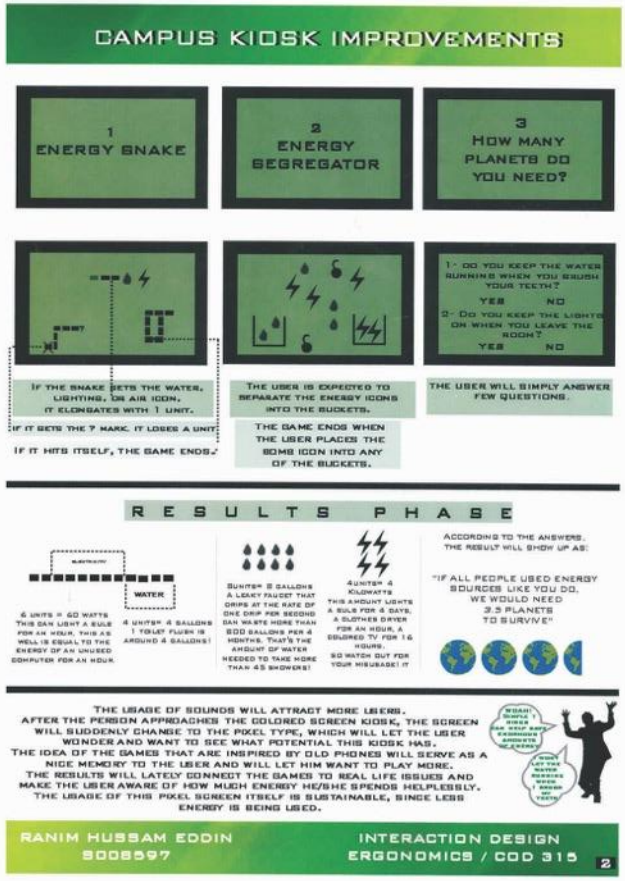


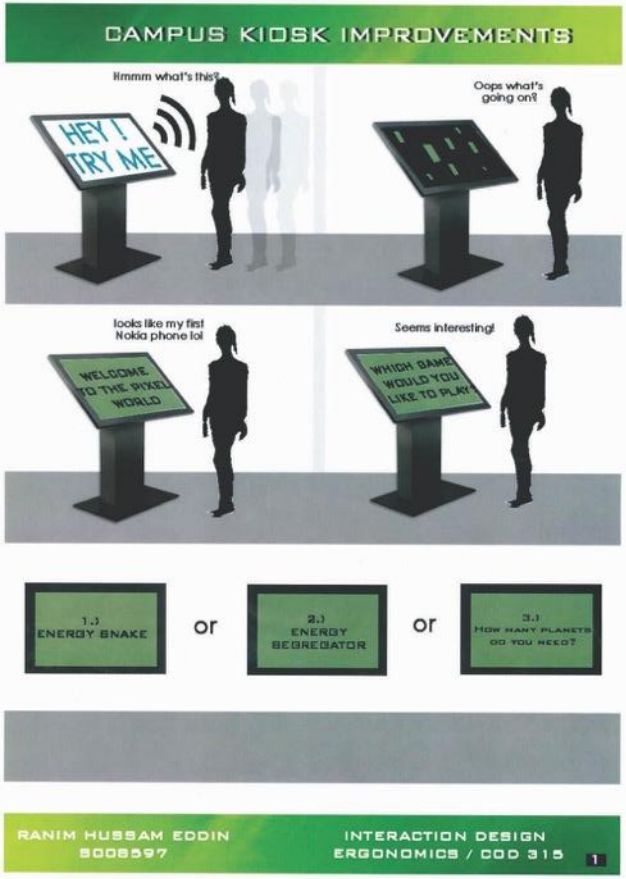


Interactions Based on Dialogue

Storyboard 6

Designers: Ranim H. Eddin / Architecture





Interactions Based on Dialogue

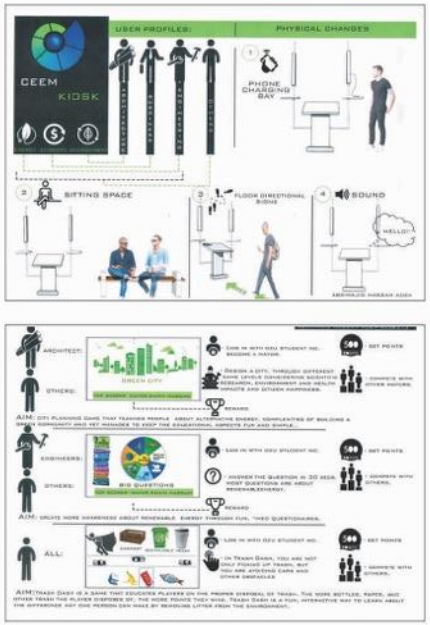
Storyboard 7

Designers: Abdimajid H. Adden / Architecture

Description:

With the assumption that the kiosks were not recognizable due to their location in campus buildings, changes in the physical environment were suggested in this scenario.

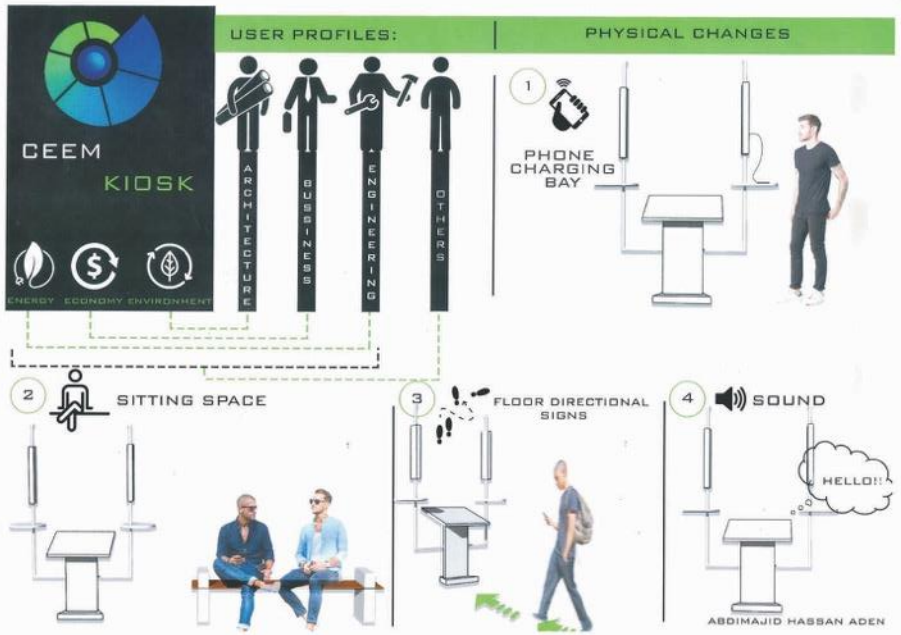
A phone-charging station were added to kiosks to allow people to sit in rush hours and recharge their phones in campus. This charging station was also set up to increase the attractiveness of the kiosks. With the additional guide signs on the ground, it was aimed to make it easier for students to reach the kiosks. When the student came near the kiosk, kiosk perceived the student through the sensors and gave him/her an audible notification: "hello, how can I help you". The system suggested 3 different games to the user. In the Green City game, students built various buildings in four different categories as housing, commercial, recreation and facilities by taking into account scientific research, environment and health issues. Through this game, users could learn tips about energy saving and of eco-life. The second game was called Big Questionnary which was sort of a quiz that user answered questions about renewable energy. The name of the third game was "Trash Dash". In this game, students had to throw the garbage into the basket they belonged to. But in order to be able to do this, it was necessary to throw it in the basket without hitting the obstacles like a car. In all three games, users gained point and competed with other users. The student who received the greatest score was rewarded by CEEE. Users could replayed the games to increase their points.

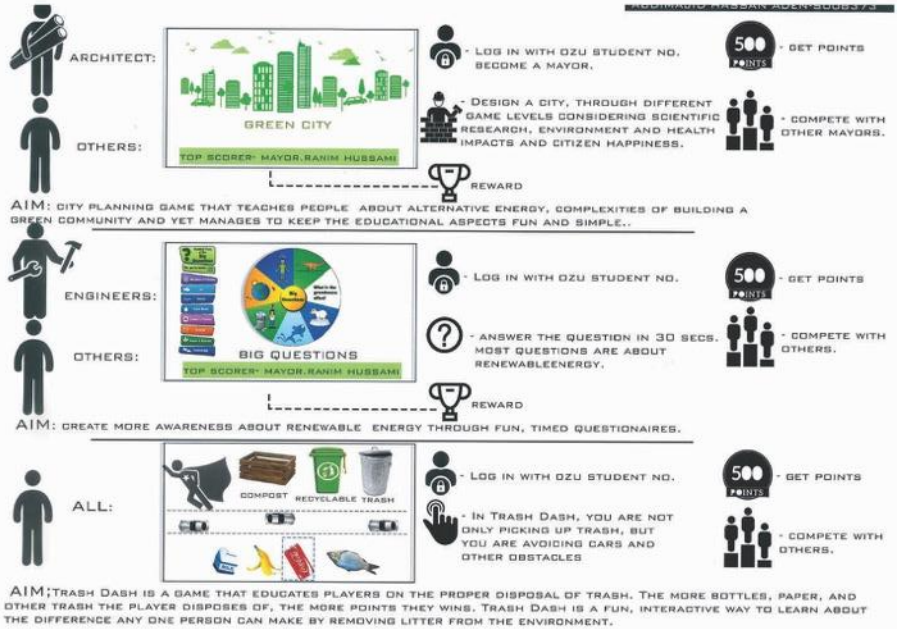


Interactions Based on Dialogue

Storyboard 7

Designers: Abdimajid H. Adden / Architecture





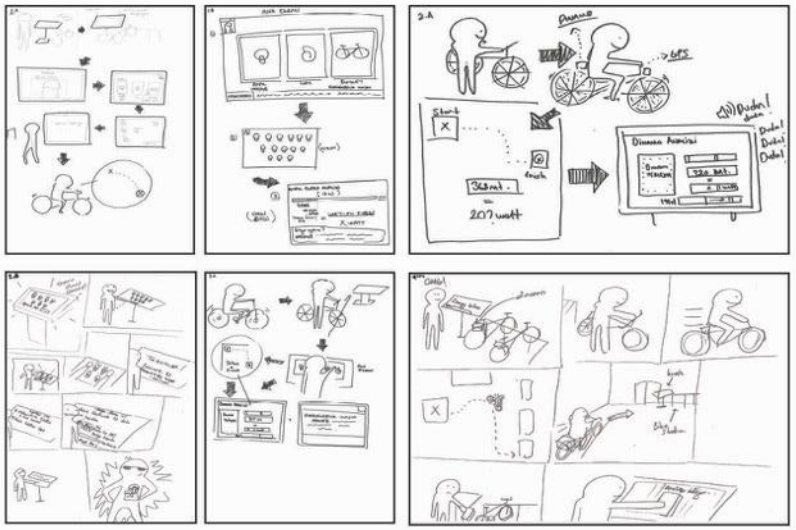
Interactions Based on Activity

Storyboard 1

Designer: Ekmel Ayar / Industrial Design

Description:

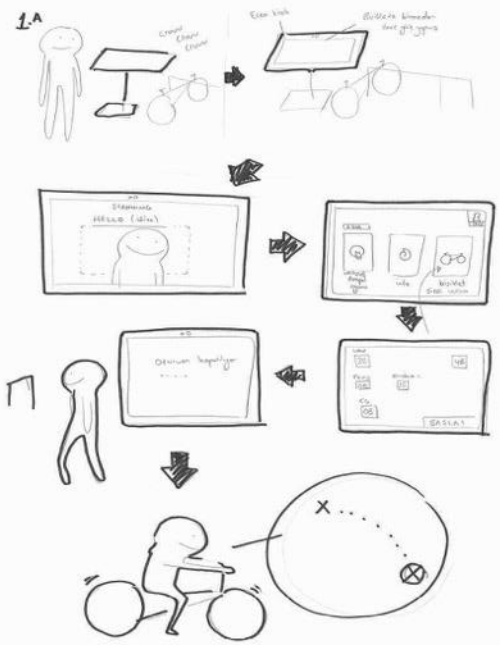
In this scenario, users were able to wander among the other buildings where the kiosks were located by driving bicycles deployed next to the kiosks. A dynamo placed in bicycles which stored energy during driving. At the same time, the user found out how far he or she has traveled with a GPS device placed on the bicycle. Once the user completed the turn, the user could leave the bicycle at the desired station. These stations were planned to function as energy stations where users were able to transfer energy that was accumulated in dynamo to kiosks. The aim was here not to make the user save energy by performing this action but rather to enable the user to generate energy. In addition, there was a multi-level game designed for raising awareness of users about sustainable energy which multiplayer game where users could compete with other users.

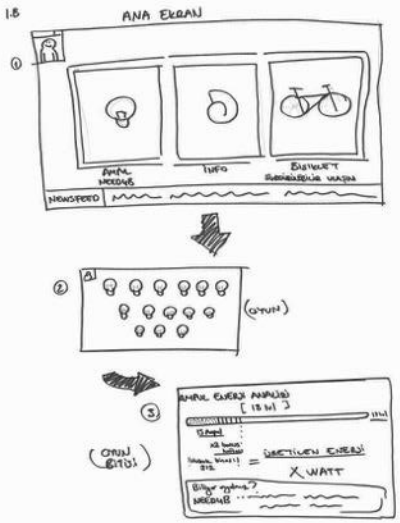


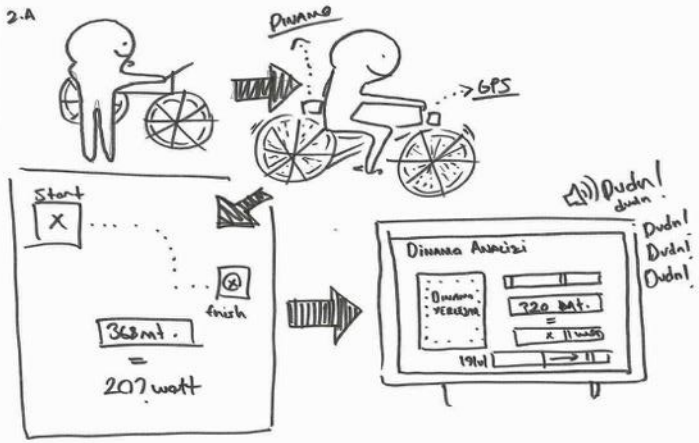
Interactions Based on Activity

Storyboard 1

Designer: Ekmel Ayar / Industrial Design



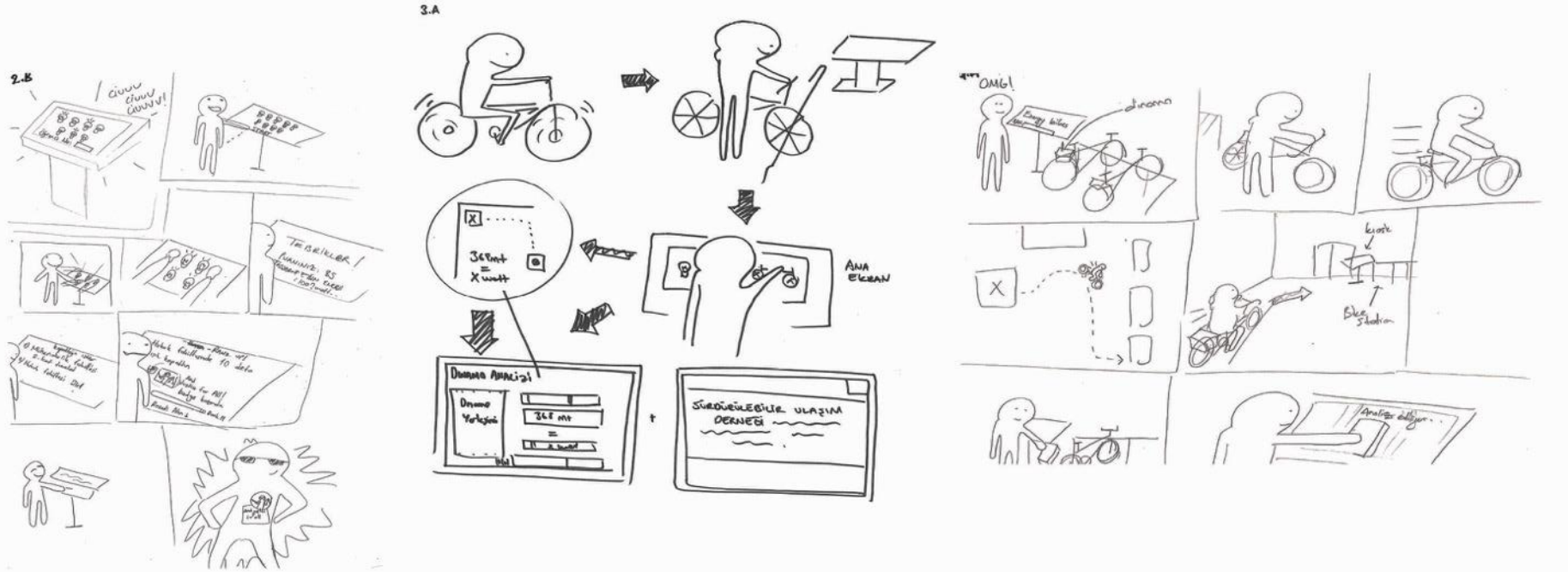




Interactions Based on Activity

Storyboard 1

Designer: Ekmel Ayar / Industrial Design



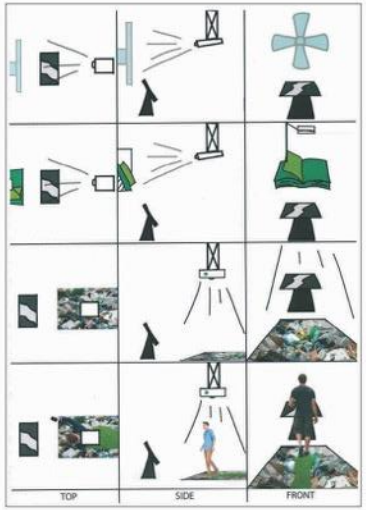
Interactions Based on Activity

Storyboard 2

Designer: Bortay Gökkaya / Communication Design

Description:

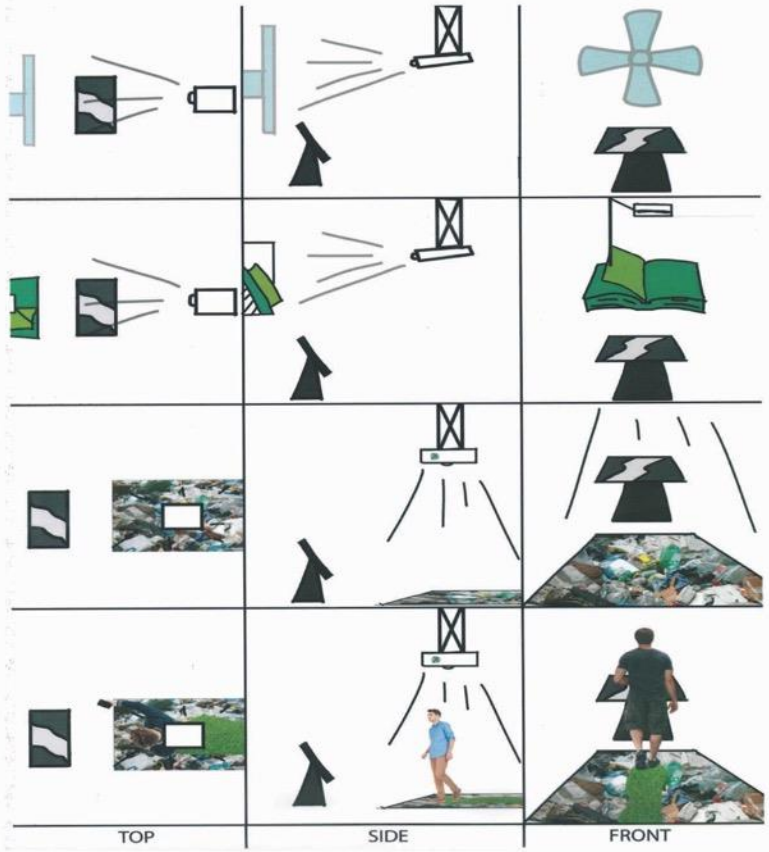
In this scenario, with user interaction, the current garbage floor turned into grass as users walked on it. Electricity was produced when users walked on the surface supported by kinect technology and pressure sensors. The system was idle until the user contacted the floor. The amount of electricity obtained by walking affected the intensity of the reflected colors. For example, if a small amount of electricity was produced, the color of the reflection became green and the leaves appeared, which made the book and engine fan brighter on the wall.



Interactions Based on Activity

Storyboard 2

Designer: Bortay Gökkaya / Communication Design



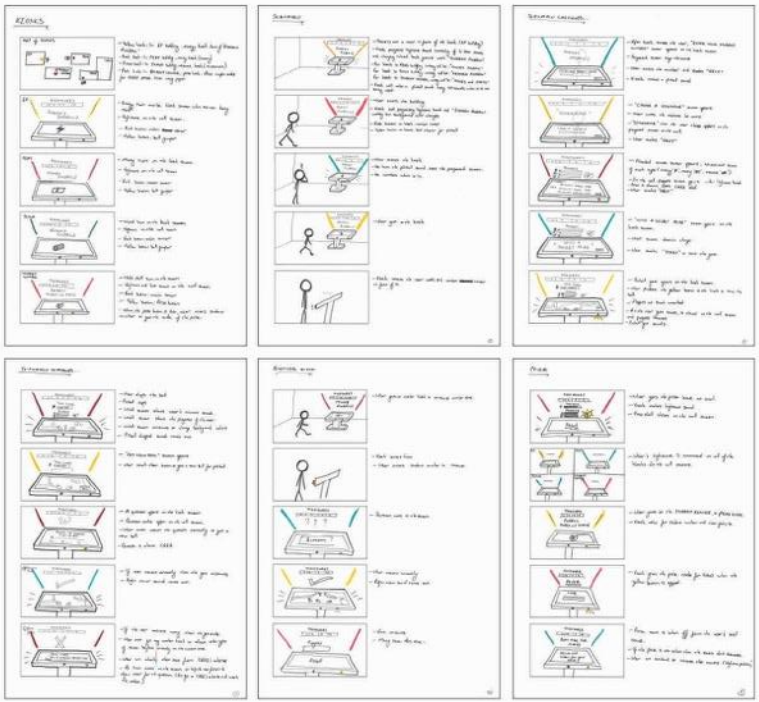
Interactions Based on Activity

Storyboard 3

Designer: Hazal D. Kılıçkap / Industrial Design

Description:

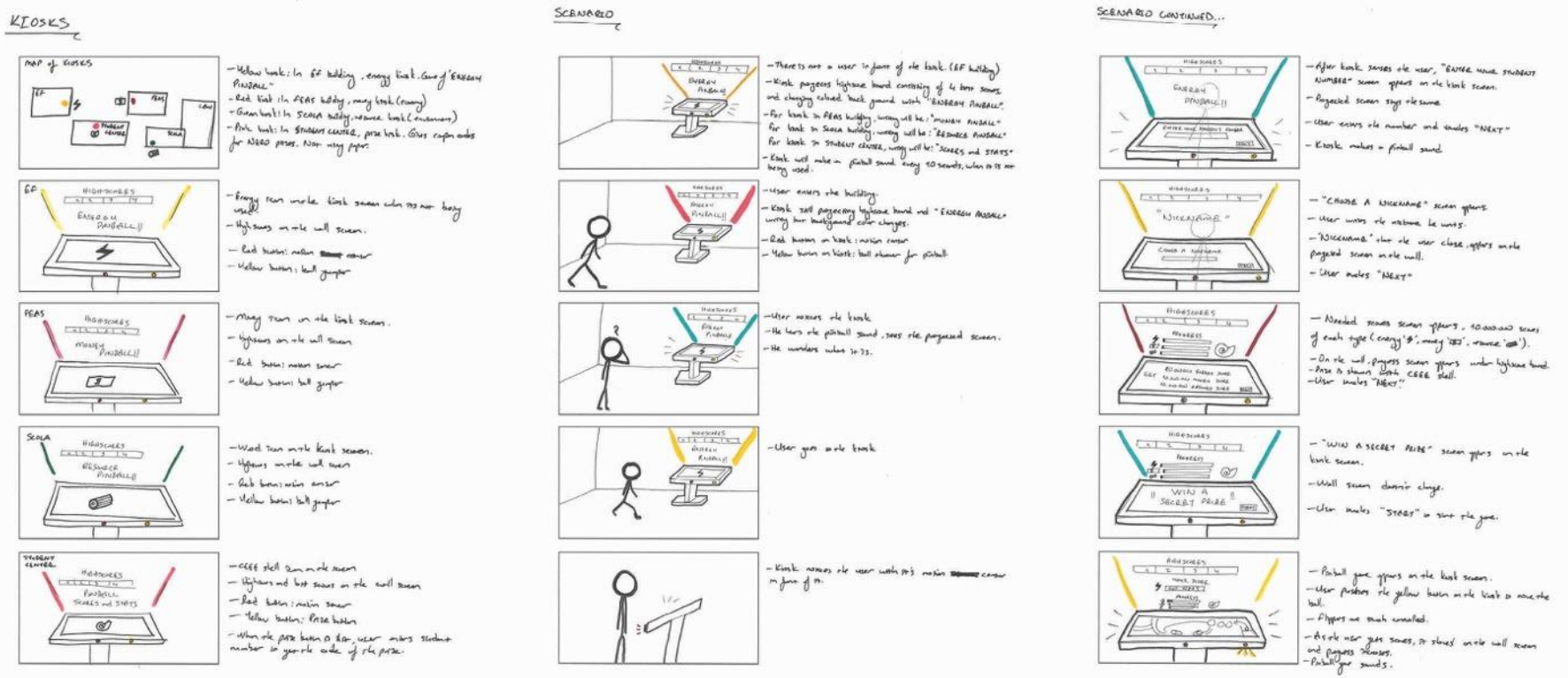
By aiming to provide sustainable exchange of information, designer created a user scenario that the subject of the disciplines that kiosks were placed in their buildings determined the intented information to be transmitted. In this direction, kiosks were aimed to give awareness to the users about "energy" in the Faculty of Engineering, "economy" in the Faculty of Business Administration, "resources" in the Faculty of Law, and "general information" in the Student Center. Pinball wich was a traditional game were adapted to the kiosks. In the scenario, kiosk sensed the user through the motion sensor. Kiosks asked questions in relation with the subject determined which were related with kiosks where user played the game. Every correct answer gave the user the right to throw a new ball. In addition to this, the wall behind the kiosks were also included the system. This space used for presenting the scoreboard which was also aimed to attract users with sound and light.



Interactions Based on Activity

Storyboard 3

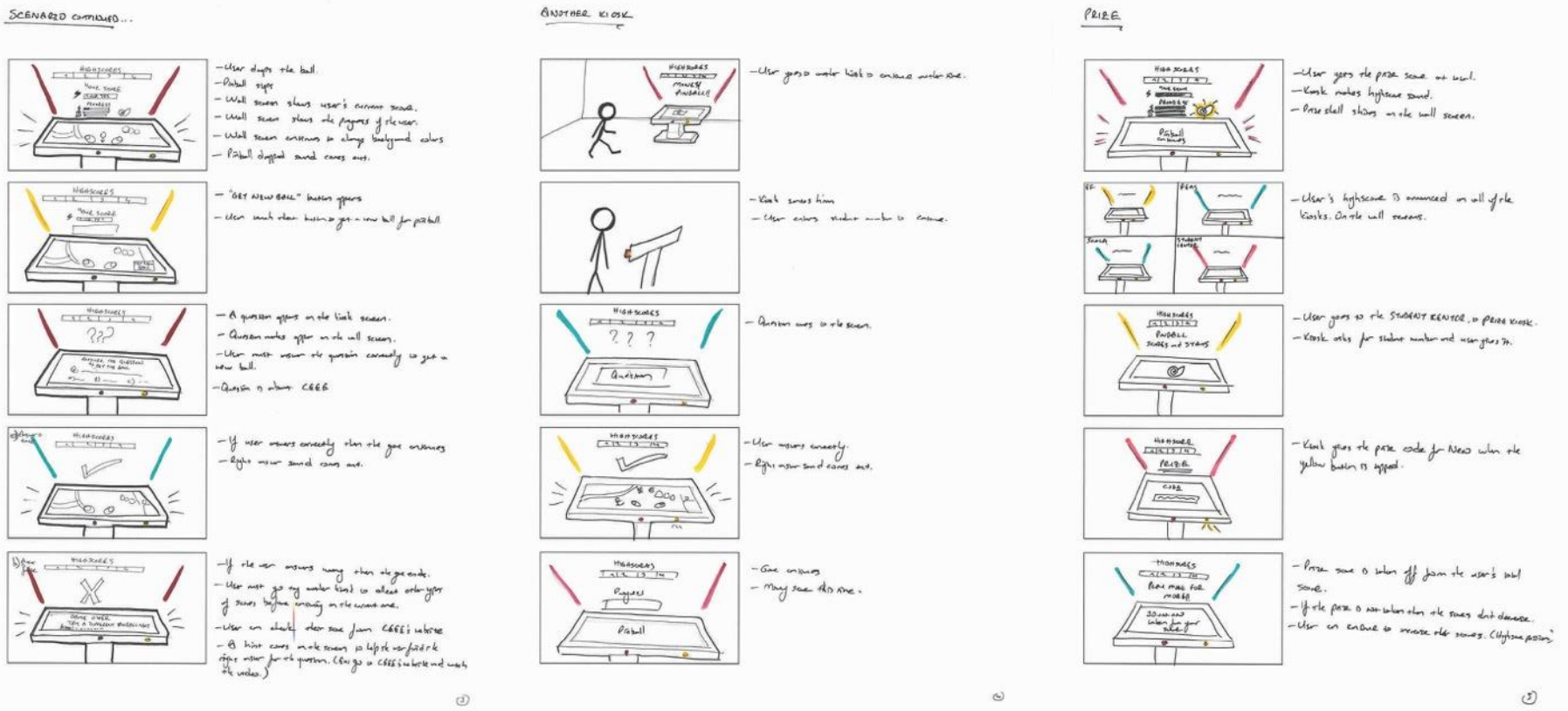
Designer: Hazal D. Kılıçkap / Industrial Design



Interactions Based on Activity

Storyboard 3

Designer: Hazal D. Kılıçkap / Industrial Design



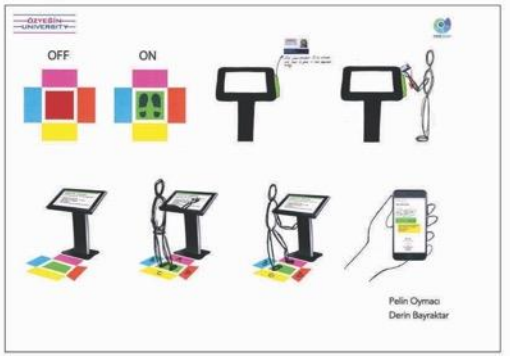
Interactions Based on Activity

Storyboard 4

Designers: Pelin Oymacı & Derin Bayraktar / Communication Design

Description:

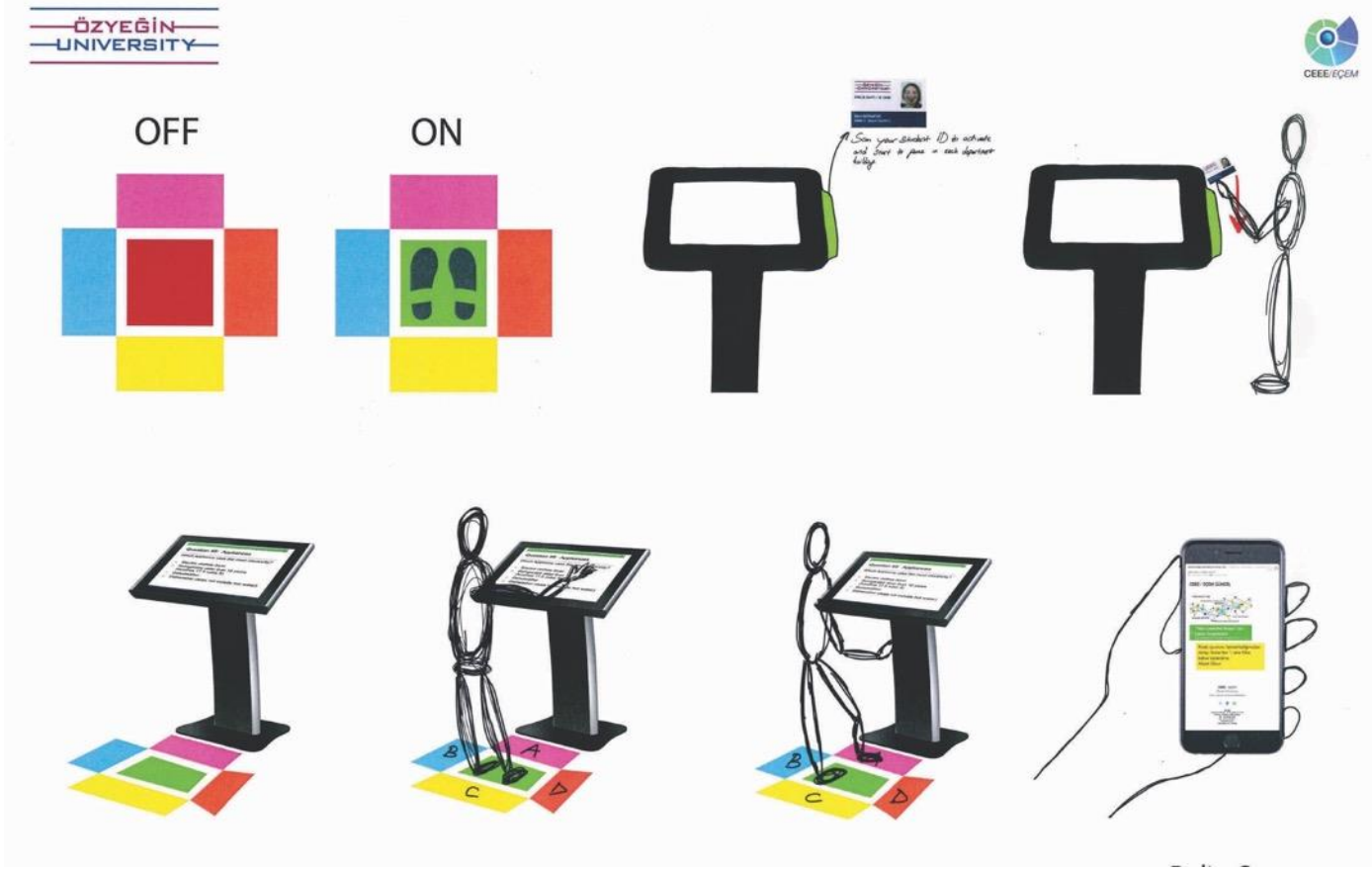
In this scenario, the designers attempted to adapt physical actions to system without interfering with the existing applications of the kiosks. For this purpose, they set up a led dance platform on the floor in front of the kiosk. When the user stood on this platform, the kiosk system became active. The user entered the system with his/her ID card and a quiz appeared on the screen. In parallel to this, the leds on the floor were converted into buttons representing the letters A, B, C, D. And the users answered the questions asked by pressing these tiles. The purpose of this platform was to make the kiosk's applications more playful.. When the user solved all the questions, the system sent an e-mail to the user stating the reward. The user earned a filter coffee. The system directed the user to the nearest coffeeshop. For example, if the user was at the Business faculty, he/she took the reward from Kahve Dunyası.



Interactions Based on Activity

Storyboard 4

Designers: Pelin Oymacı & Derin Bayraktar / Communication Design



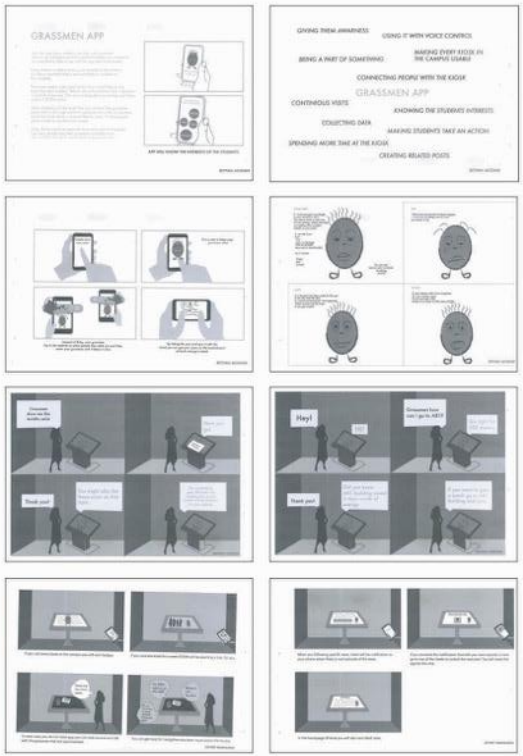
Interactions Based on Activity & Dialogue

Storyboard 1

Designers: Reyhan Akdemir & Zeynep Marmaralı / Communication Design

Description:

In this scenario a mobile application was created which provided users an intelligent personal assistant called “grassman”. When students visited the kiosks, they could connect their grassman with a QR code and their grassman turned into an assistant. Users could communicate with their grassmen via voice instead of touching the screen. In order to keep the their grassmen alive, the users had to perform a number of actions. For example, there were weekly tasks were given to the users. If users completed the tasks they earned batches, this batches turned into a donation which was planting a tree by EÇEM on behalf of the users. User also could create post which was appeared on the kiosks as a newsfeed. The episodic news series were run every month in kiosks and users could follow this series when they synced their app with kiosks. It was also a necessity to keep their own grassman alive because grassman's emotional state was related to the usage frequency. Users needed to visited kiosks on site, and continued to produce posts that will attract other users in order to keep their grassmen happy.
Another reason for these given tasks was to keep user visiting kiosks regularly on campus.



Interactions Based on Activity & Dialogue

Storyboard 1

Designers: Reyhan Akdemir & Zeynep Marmaralı / Communication Design

GRASSMEN APP

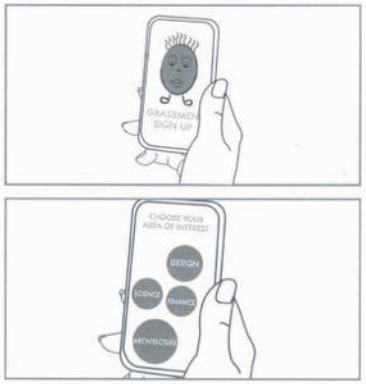
With this app every students has their own grassmen which is an intelligent personal assistant people can command via voice that is able to use with the app and at the kiosks.

Every student is able to every post created by the students it is like a newsfeed that is only available to students at the university.

There are weekly tasks given to the users and if they do the tasks they earn batches. Which will at the end turn into a donation on behalf of the user. This aims to keep the user coming and being a part of ECEM world.

When Students visit the kiosk they can connect their grassmen easily with a QR code and their grassmen turns into an assistant inside the kiosk which is commanded by voice. So that people doesn't have to use the touch screen.

Lastly, Every month an episodik news serie start at the kiosks and users should sync their grassmens to kiosks to be able to follow the serie and keep their grassmen alive.



APP WILL KNOW THE INTERESTS OF THE STUDENTS

REYHAN AKDEMIR

GIVING THEM AWARNESS

USING IT WITH VOICE CONTROL

MAKING EVERY KIOSK IN THE CAMPUS USABLE

BEING A PART OF SOMETHING

CONNECTING PEOPLE WITH THE KIOSK

GRASSMEN APP

CONTINIOUS VISITS

KNOWING THE STUDENTS INTERESTS

COLLECTING DATA

MAKING STUDENTS TAKE AN ACTION

SPENDING MORE TIME AT THE KIOSK

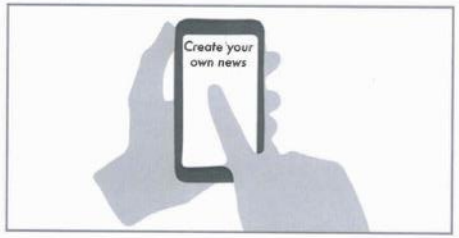
CREATING RELATED POSTS

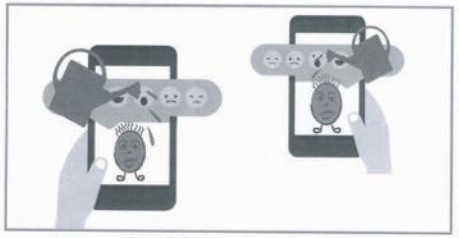
REYHAN AKDEMIR

Interactions Based on Activity & Dialogue

Storyboard 1

Designers: Reyhan Akdemir & Zeynep Marmaralı / Communication Design

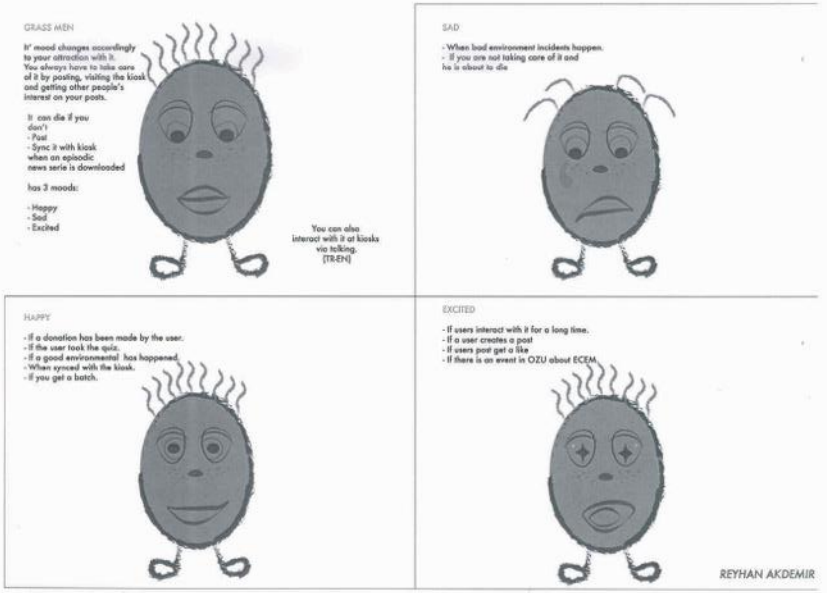




Instead of liking, your grassmen has to be watered so when people likes what you post they water your grassmen and it keeps it alive

By taking the quiz and sync it with the kiosk you can get your name on the leaderboard at kiosk and get a batch

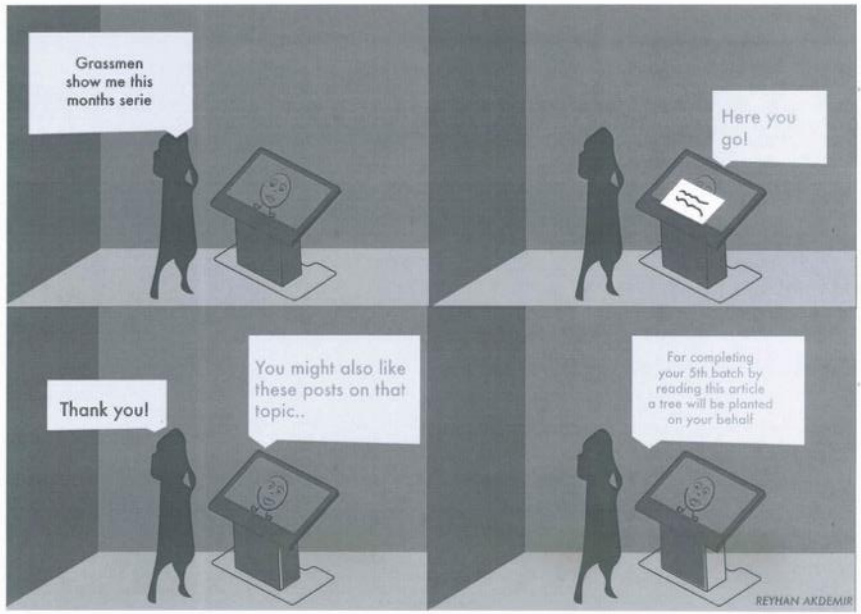
REYHAN AKDEMIR

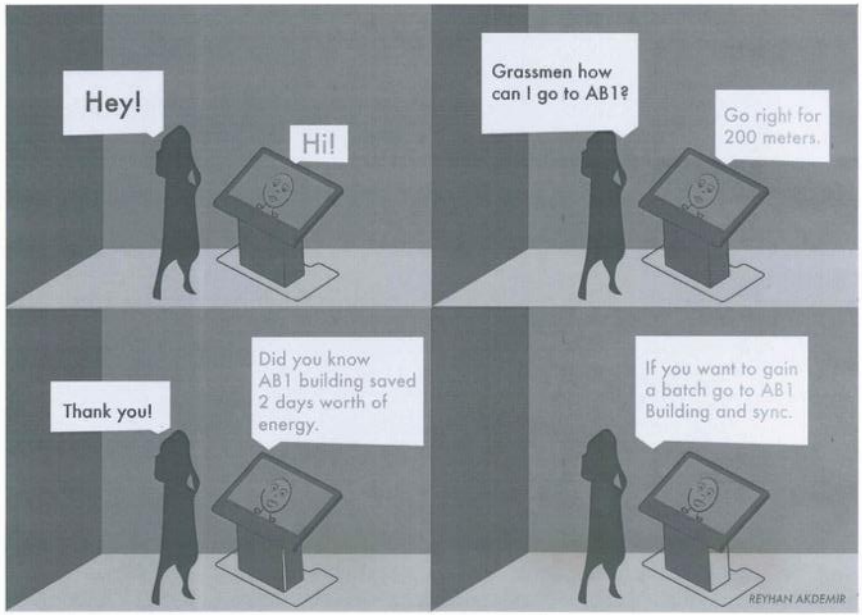


Interactions Based on Activity & Dialogue

Storyboard 1

Designers: Reyhan Akdemir & Zeynep Marmaralı / Communication Design

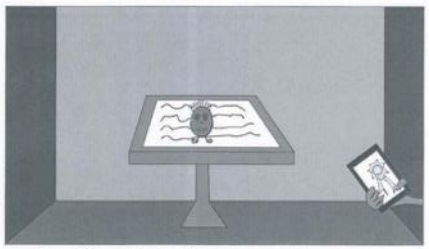




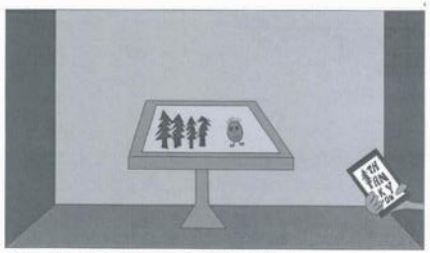
Interactions Based on Activity & Dialogue

Storyboard 1

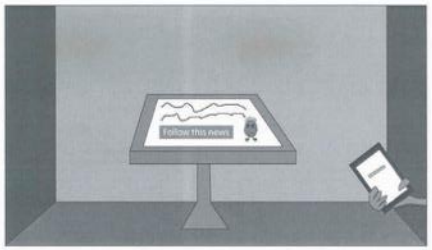
Designers: Reyhan Akdemir & Zeynep Marmaralı / Communication Design



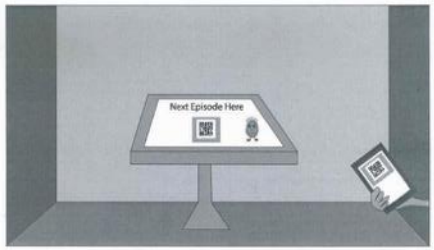
If you visit every kiosk on the campus you will earn badges.



If you visit one kiosk for a week ECEEM will be planting a tree for you.



When you following specific news, there will be notification to your phone when there is next episode of the news.

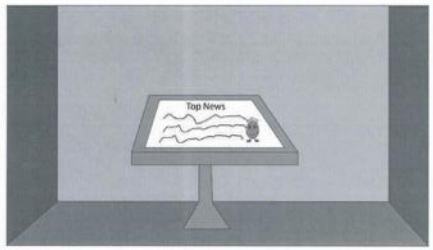


If you received the notification that tells you next episode is here go to one of the kiosks to unlock the next part. You will need the app for this one.

To read news you do not need app, you can look around and talk with the grassman that last synchronized.

You can get help for navigation also learn more about the faculty.

ZEYNEP MARMARALI



In the homepage of kiosk you will see most liked news.

ZEYNEP MARMARALI

APPENDIX C - Publications from the Thesis Study

1. Yıldırım, Y., & Orhun, S. E. (2017). Exploring the mutual relationship between research and consultancy for a commercial design product in the area of communication design. *Proceedings of The 21th World Multi-conference on Systemics, Cybernetics and Informatics, WMSCI 2017*(Vol. 1, pp. 302-307). Orlando, FL: International Institute of Informatics and Systemics, IIIS. ISBN: 978-1-941763-59-9 (Scopus Indexed)

2. Yıldırım, Y., Orhun, S. E (2017). Bir Katılımcı Tasarım Süreci: Etkileşimli Kiosklar için Örnek Olay Çalışması, UTAK 2016 İkinci Ulusal Tasarım Araştırmaları Konferansı: Sorumluluk, Bağlam, Deneyim ve Tasarım, 2017 (pp. 437-456) Ankara: ODTÜ Basım İşliği. ISBN: 978-975-429-367-8

Exploring the Mutual Relationship between Research and Consultancy for a Commercial Design Product in the Area of Communication Design

Yasemin YILDIRIM, Department of Communication Design, Ozyegin University
Simge Esin ORHUN, Department of Communication Design, Ozyegin University

ABSTRACT

Due to challenges brought by the advancements in information technologies, transferring the knowledge and obtaining effective solutions in the early design process has gained importance, as it has become very difficult to obtain the desired efficiency and user satisfaction of any service of a product, if it has been developed in the methodological perspective of one discipline. This paper tries to explore the potential of the discipline of Communication Design (CoD) to provide consultation to engineers, with regard to its expertise on developing interactions and methodologies for the design of tools and products using advanced technology. For this purpose, a research was conducted with the aim of giving consultancy for the analysis of the efficiency of four kiosks located in Ozyegin University and four alternative user scenarios, which were developed in collaboration with CoD students in Interaction Design Ergonomics course of the 2015 Fall semester, were shared with the provider group. The outcomes brought by the relationship between research and consulting are discussed in terms of obtained achievements and benefits for researchers, design students as well as engineers.

Keywords: User Scenario, Human Computer Interaction, Interactive Kiosks, Research, Consulting.

Bir Katılımcı Tasarım Süreci: Etkileşimli Kiosklar için Örnek Olay Çalışması

Yasemin Yıldırım, Özyeğin Üniversitesi, İletişim Tasarımı Bölümü
Simge Esin Orhun, Özyeğin Üniversitesi, İletişim Tasarımı Bölümü

ÖZET

Günümüzde bilgiye erişim sağlanabilmesi amacı ile tasarlanan etkileşimli kioskların üstlendikleri işlevler artmakta ve kullanımları hızla yaygınlaşmaktadır. Bu sabit etkileşimli araçların, sundukları içeriğin organizasyonu veya sunumu veya fiziksel olarak konumlandıkları noktalar sebebi ile kullanıcıların ihtiyaçlarına yeteri kadar karşılık veremedikleri ve işlevlerini yerine getiremedikleri gözlemlenmektedir. Yapılan araştırmalar, etkileşimli tasarımlarda hedeflenen bilgi alışverişinin kullanıcı senaryolarının oluşturulması üzerinden kurgulanabilmesini vurgulamaktadır. Bu çalışmanın amacı, kullanıcı senaryosu yaratım sürecinde, tasarımcıların birer aktör olarak aktif rol alması ve araştırmacılar ve hizmet sağlayıcıları ile iş birliği içerisinde araştırma sürecinin gerçekleştirilmesinin etkili çözümler üretmedeki önemini vurgulamaktır. Bu çerçevede, katılımcı tasarım yöntemi kullanılarak Özyeğin Üniversitesi'nde konumlandırılmış dört adet etkileşimli kioskun yeniden işlevlendirilmesi için, Özyeğin Üniversitesi tasarım öğrencileri, araştırmacılar ve hizmet sağlayıcılar ile beraber oluşturulan dört grup ile örnek olay çalışması gerçekleştirilmiştir. Elde edilen sonuçların analizi doğrultusunda katılımcı tasarım sürecinin kullanıcı senaryosu oluşturulmasındaki etkileri ve sabit etkileşimli ürünlerin tasarlanmasındaki yönlendiriciliği tartışılmıştır.

Anahtar Kelimeler: Katılımcı tasarım; etkileşimli kiosklar; kullanıcı odaklı tasarım; kullanıcı senaryosu.