Usability and User Experience in the Design of Bike Rental Systems
Case of Isbike Bike Renting System

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Abstract

One of the most important indicators emphasizing the quality of these products or services is the concept of usability. The concept of user experience deals with what the user feels from this service or product.

In this study, in order to examine the effects of usability and user experience concepts on product development, it is aimed to examine the roles of usability and user experience in product design through the Isbike bicycle rental system. For this purpose, determinations have been made through the product developers who have worked in Isbike bicycle rental systems and the participants who have experienced the Isbike bicycle rental system, and in this way, it is aimed to determine a road map for future studies.

Keywords: Experience; Isbıke; Usability; User;

INTRODUCTION

One of the most important indicators emphasizing the quality of these products or services is the concept of usability. The concept of user experience deals with what the user feels from this service or product. In the introduction section, the subject, purpose, scope, main questions, hypothesis and method of the study are explained.In the rest of the study, the concepts of usability and user experience, which are the focus of the research, are discussed, and the concept of user experience design is explained by determining the definitions of these concepts, their components and inquiry methods.In the following section, the concept of design is defined and the relationship between design and usability concepts is examined.In the rest of the study, the concept of bicycle is defined and the evolution of the use of bicycle in the city is located, bicycle rental systems and Isbike bicycle rental system in Turkey are focused on. In the fourth part of the study, data was collected from the participants and product developers using the interview technique in order to classify, evaluate, make sense of and develop the findings related to the whole process of the research, and after the evaluation of this data, new data was obtained and as a result, the effects of usability and user experience on the Isbike bicycle rental system were revealed and suggestions for the design of the Isbike bicycle rental system were put forward. Cities are residential areas where areas such as industry, trade, service, culture, education and health come together. These features are the reasons that increase the population density of cities. People migrate to cities where industry and trade are intense in search of jobs.

In order to improve the quality of life in big cities, information technologies and smart applications have gained importance.Smart cities are created by using smart technologies to find solutions to problems such as transportation, energy, water, health, environment and security.In this way, living spaces become interactive spaces that can change according to the wishes and needs of users.Smart cities are defined not only by being technologically advanced, but also by the joint action of all stakeholders on livability, access, traffic and environmental problems.Mobile applications include elements that make people's lives easier in many areas such as communication, health, shopping and entertainment. These applications, which are accessible from everywhere with smartphones, play an important

role in people's lives. If the population density in cities increases uncontrollably, systems such as transportation, energy, water and health may become inadequate. Therefore, there is a tendency to turn to alternative means of transportation. The traffic density in big cities has encouraged people to use individual vehicles such as bicycles and scooters, which has led to the emergence of bicycle rental systems. The concept of usability is important for the development of bicycle rental systems.Usability measures elements such as effectiveness, efficiency, learnability, satisfaction and memorability of the system.In addition to this concept, bicycle rental systems are designed by using user experience.Isbike bicycle rental system in Istanbul and user experiences are discussed as a case study.

This thesis focuses on the concepts of usability and user experience in bicycle rental systems and aims to examine the version of the Isbike bicycle rental system connected to Ispark in Istanbul.In the study, the system interface and rental units will be analyzed in detail with their digital and physical dimensions.The research will focus on users between the ages of 18-65 who use Isbike's rental systems on the Anatolian side of Istanbul.

RESULTS

Usability And User Experience

Usability refers to the extent to which a product, system or service can be used effectively, efficiently and satisfactorily by users in a given context of use. Usability measures the ability of users to perform their desired tasks easily and effectively. This concept includes factors related to its design (website, software interface, device ergonomics, etc.) and refers to the ease of use and learnability of a product.

User experience (UX) is a broad concept that encompasses the emotional and perceptual factors that a user experiences when interacting with a product, website or application. This experience includes the user's overall satisfaction, enjoyment, and engagement with the product or service. Elements such as usability, accessibility, aesthetics, and emotional engagement are part of this concept. User experience is a multidisciplinary field that

combines psychology, human-computer interaction, design, and other disciplines. User experience is not limited to the usability of the interface, but also emphasizes the emotional and aesthetic aspects of the user's interaction with the product, website or application. The aim of UX design is to create efficient and satisfying products that users can easily use, and it also aims to create a sense of commitment and enjoyment among users. User experience can be evaluated through a variety of methods. Methods such as user tests, surveys, and interviews help researchers gather feedback on the user experience and identify areas for improvement. These methods make it possible to understand users' expectations and provide design and functionality to better meet them. The user experience should be constantly reviewed to increase the user's overall satisfaction and provide a more satisfying experience by making continuous improvements.

User experience design (UXD) is the process of designing and developing products, websites, or applications taking into account the needs, goals, and overall experience of users. The main goal of this approach is to create interfaces that are easy to use, efficient, and satisfying for users, thus meeting their needs and goals. UXD covers a multidisciplinary field, drawing on psychology, human-computer interaction, design, and other disciplines. The process uses a combination of user research, design, and evaluation methods that involve understanding users' needs, goals, and mental models and creating interfaces that meet those needs. As a user-centered design process, UXD emphasizes involving users throughout the design process to ensure that the final product meets user needs. The UXD process usually involves several steps such as research, design, prototyping, testing and implementation. In the research phase, user researchers gather information about users, their needs, goals and mental models. In the design phase, designers create wireframes, mock-ups and prototypes of the product, website or app. The prototype is then tested with users to gather user feedback and the final product is brought to life.

Usability refers to the ability of a product, system or service to provide easy usability and effectiveness for its users. Usability is an important element of the design process and aims to ensure that the end product is user-friendly and meets the needs of users.

Bike Rental Systems

Bicycle rental systems are programs that provide short-term bicycle rentals and are widely used to encourage active transportation, especially in urban areas, and to reduce traffic congestion and air pollution.These systems use automated kiosks or docks to rent and return bicycles.These kiosks are usually located near city centers or public transportation hubs so that users can easily access and return bicycles. (Shaheen, 2016) Tools such as smart card technology or mobile apps enable users to rent and return bicycles quickly and easily. These technologies make bicycle rental systems more user-friendly, increasing usage and making it easier for people to integrate cycling into their daily travel habits.Bicycle rental systems have several benefits for cities and communities. Research shows that these systems can reduce traffic congestion and air pollution and encourage more active transportation options.(Guzman, 2017) In addition, bicycle rental systems increase foot traffic and can support local businesses by providing additional transportation options.(Guzman, 2017) In conclusion, bicycle rental systems enable individuals to rent bicycles for short periods of time in a user-friendly manner and are an effective method to promote cycling in cities.(Dill and McNeil, 2017) They are also noted for their positive impacts on cities and societies.
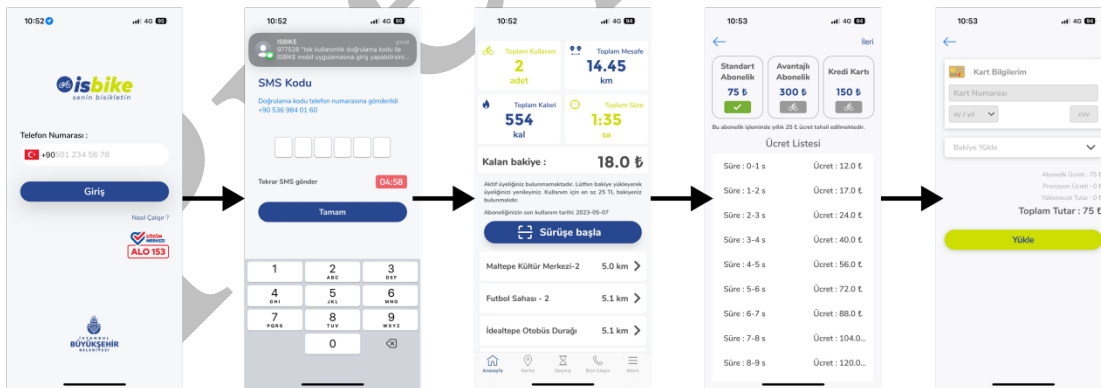

Figure 1. Isbike mobile application usage flow

Isbike, operated by the Istanbul Metropolitan Municipality, is a bicycle rental system and bike sharing service that enables both residents and visitors in Istanbul to easily rent bicycles for transportation and sightseeing. Its primary goal is to alleviate urban traffic,

provide an eco-friendly transportation alternative, and encourage a healthy lifestyle. By offering bicycles as a faster, more environmentally friendly, and cost-effective mode of transportation, Isbike aims to popularize this option, particularly in areas with heavy traffic.The Isbike system functions through strategically placed bicycle stations throughout Istanbul, where users can perform rental transactions. Prior to using Isbike, individuals must register or purchase a subscription, typically done through online platforms or mobile applications. Once the registration or subscription process is completed, users can begin renting bicycles from the Isbike stations To rent a bike from an Isbike station, users can utilize a user interface available on mobile apps or kiosk-like devices. They can scan the QR code on the bikes at the station or manually enter the bike number. Users can select their desired bicycle and commence the rental process. Once the rental is finalized, the user has the freedom to travel to their desired destinations. Isbike bicycles are specifically designed to traverse the city using designated bicycle paths and bike-friendly roads. Bicycles must be returned to the designated Isbike stations, which are predominantly located in central areas and popular spots. The rental duration is typically measured in hours or days, granting users the flexibility to rent a bicycle for a specific period. Upon the completion of the rental period, users must return the bicycle to a designated Isbike station. Once the bicycle is securely returned, the rental process concludes The Isbike system commonly requires a membership or subscription, offering various options that allow users to rent bicycles for specific durations. Additionally, there may be alternative pricing options for one-time use in some cases. Isbike collaborates with similar bike sharing systems in other cities, fostering a cycling culture and providing a sustainable transportation alternative. IsBike, which commenced operations in Istanbul in 2016, operates on a dockless bike sharing model. This means that users can rent and return bikes anywhere within the service area, providing utmost convenience. Through a mobile app, users can easily locate, reserve, and unlock the available bikes. According to a study conducted by Özkan et al. (2019), the IsBike program currently boasts over 2,000 rental bikes, primarily concentrated in the city center, including tourist and commercial areas. This accessibility makes it suitable for both tourists and city residents. The program is also integrated with other transportation options, such as public transport, facilitating seamless transitions between different modes of transportation.The study by Özkan et al. (2019)

reveals that the IstBike program has effectively contributed to the increase in cycling and the promotion of active transportation in Istanbul. The success of the program is attributed to the convenience and flexibility offered by the dockless bike sharing model. However, the authors argue that additional infrastructure improvements are necessary to further support cycling in Istanbul, including the expansion of bike lanes and an increase in the availability of bicycle parking spaces.In summary, IstBike is a successful dockless bike rental system that promotes cycling and active transportation in Istanbul. It offers an easily accessible transportation option for both residents and visitors, aiming to reduce traffic congestion and foster an environmentally friendly transportation culture. However, to enhance cycling in the city, further infrastructure improvements are needed.

DISCUSSION

Methodology is of great importance in the classification, evaluation, interpretation and development of the data obtained at every stage of the research.This study adopts qualitative research methodology to discover the underlying causes of phenomena and to reach findings on how phenomena occur. In this study, qualitative research methodology was preferred to uncover the underlying causes of phenomena and to reach findings on how phenomena occur. Methodology has a significant impact on the classification, evaluation, interpretation and development of the findings obtained in relation to the whole process of the research. In this study, qualitative research method is used to reveal the underlying causes of phenomena and to reach findings on how phenomena occur. Methodology stands out as an important factor in terms of classifying, evaluating, interpreting and developing the findings obtained in the whole process of the research.In this study, qualitative research method was preferred in order to reveal the underlying causes of the phenomena and to reach findings on how the phenomena occurred. Qualitative research methods are frequently used in research and provide a range of benefits for exploring complex phenomena, experiences and social processes. It involves collecting and analyzing non-numerical data through a variety of techniques such as interviews, observations and document analysis. Case studies are a method used in dissertations to conduct a detailed and in-depth analysis of a specific phenomenon, event or situation. This method of study examines a specific case or cases using a variety of

research techniques such as interviews, observations and document analysis. Case studies can include a variety of elements, from individuals to groups, organizations, communities and even countries. The main objective of this study is to identify how usability and user experience influenced the product development process of the Isbike bicycle rental system operating in Istanbul, Turkey. In this context, the study seeks answers to the following questions:

- How do usability and user experience contribute to the design of the bike rental system in Istanbul?
- What are the problems experienced by people using the Isbike bicycle rental service?
- In terms of usability, how do the designers working for/consulting with Isbike carry out the product development process?

As it can be understood from the literature review, specific studies on the usability of the Isbike bicycle rental system have not been conducted before. The focus of this study will be on the Isbike rental system operating on the Anatolian side of Istanbul among users between the ages of 18-65. Within the scope of this research, in-depth interviews were conducted with a total of 12 participants, divided into two separate groups to examine the issue. One of these interviews was conducted as a pilot study. The first group consisted of 2 product developers and the second group consisted of 10 users of the Isbike bicycle rental system.In the interviews with Isbike users, a purposive selection was made using the snowball sampling method. In this research, participants were selected from people living on the Anatolian side of Istanbul.In the research, people who had previously experienced the Isbike bicycle rental system were preferred.Participants are required to have a credit card in order to use the Isbike system.Therefore, the selected participants were required to be over the age of 18.University students were preferred as the lowest level in terms of education level.In addition, attention was paid to the participants' ability to use mobile applications.In total, 12 people were contacted, but the number of participants interviewed was 10. In this research, product developer participants who have worked or are currently working in the Isbike bicycle rental system were included.Product developer participants work in senior positions.A total of 6 product developers were contacted, but only 2 of them

could be interviewed. The following table shows the number of participants contacted and how many of these contacted participants could be interviewed.

In this phase of this study, the usability and design visions of the Isbike bicycle rental system operated by Ispark, a subsidiary of Istanbul Municipality, were examined through interviews with the employees actively involved in the system. The interviews provided information about how Isbike came to be, what the design criteria are, which usability principles are followed, how the user experience is evaluated, and how Isbike will evolve in the past, present and future. These interviews aim to provide an important insight into the development and user experience of the Isbike bicycle rental system. In the continuation of this study, Isbike users in the Anatolian side of Istanbul were asked about their thoughts on Isbike, their purpose of use, their experiences, and their thoughts on the Isbike mobile application.In addition, observations were made to examine how users use the Isbike bike rental system.The overall conclusion of these interview groups and observations is that usability and user experience are influential in the design of bike rental systems.These findings aim to provide greater understanding of Isbike's users and provide an important resource for future design improvements.

In the following research, it is aimed to examine the developments of Isbike bicycle rental systems in terms of usability and user experience and to formulate possible strategies.This study was carried out in a limited scope. Within the scope of the study, interviews were conducted with the officials in charge of Isbike bicycle rental systems operated by Ispark, which is affiliated with Istanbul Metropolitan Municipality.In addition, interviews were conducted with users who use the Isbike bicycle rental system on the Anatolian side of Istanbul.The results of the interviews were analyzed and a case study analysis was conducted.However, the results of this study should not be seen as the common approach of all Isbike officials and users.

Data Analysis and Findings

In this study, descriptive analysis approach was preferred in qualitative data analysis. Descriptive analysis means summarizing and interpreting the data obtained according to predetermined themes and categories. This analysis method helps to evaluate the data in a

more meaningful way and to make inferences. Descriptive analysis is a method that aims to present the information obtained in an organized and interpreted manner (Kıncal, 2017). This method of analysis enables the data to be systematically classified, patterns and themes to be revealed, and the results to be conveyed in a specific and understandable way. Descriptive analysis aims to present the collected data in an organized and meaningful way (Kıncal, 2017). In this study, a framework for data analysis was created based on the research questions and the dimensions obtained from the interviews. The data obtained were read and organized by transcribing the audio recordings. Using the framework determined for the analysis of interviews and observations, the audio recordings of the interviews with 10 participants and 2 product developers were transcribed and the data were read and defined. A sample appendix for the transcription and data reading/identification process is shared in the appendix section of the study. The opinions of individuals involved in the development of the isbike bicycle rental system, as well as feedback from users and observations, indicate that usability and user experience play a significant role in the product development of such systems. Interviews and face-to-face discussions with stakeholders and users reveal similar findings. Understanding the concepts of usability and user experience can provide valuable insights for addressing the research questions introduced in this study.

The research findings and literature review indicate that usability has a positive impact on the product development of Isbike bicycle rental systems. Users' interviews reveal an increasing effect of usability in Isbike's development over time. Learnability, memorability, and satisfaction are key concepts incorporated in Isbike's usability criteria. Around 70% of users find the Isbike mobile application easy to use, with the remaining 30% comprising non-users or elderly individuals who faced challenges. Regarding satisfaction, approximately 90% of users responded positively based on their experiences. However, Isbike has not progressed significantly in terms of efficiency, which is a usability criterion. Interviews with product developers suggest that while Isbike's initial purpose was transportation, it is now predominantly used for recreation. Overall, the research findings align with Nielsen's assertion that good usability design requires a user-centered approach.

The product developers at Isbike demonstrate a serious consideration for usability and user experience based on the literature research, interviews, and observations conducted during the study period. However, user interviews reveal that Isbike falls short in terms of efficiency, one of the usability criteria. The developers attribute this lack of improvement to cost constraints. It is expected that Isbike employees engage in more accurate planning, design, and market research with lower costs to develop products that meet usability criteria. The use of 153 white tables as a data collection method in usability has been observed among the individuals involved in Isbike's product development process. The data obtained from these data banks were compared with user interviews, yielding positive information. Additionally, Isbike employees utilize data collection, analysis, and synthesis techniques as inquiry-based methods in usability, specifically employing the Think-aloud technique by gathering data from a platform where users can voice their complaints and suggestions.

The research conducted highlighted several problems in Isbike based on user interviews. One of the identified issues is a synchronization problem between the Isbike mobile application and the kiosks. To address this, it is suggested to update the hardware in the kiosks and update the mobile application accordingly. Another problem is the limited capacity of kiosks and the long distances between them. The proposed solution involves replacing the outdated kiosk system with a new system that includes bike renewal, GPS installation, and the establishment of designated gathering areas on maps using a geofence system. This solution aims to enhance the transportation aspect of Isbike and improve convenience for users.

CONCLUSION

Based on the data presented in the chart, the research has captured the expectations of both participants and product developers. By synthesizing this data, new design ideas have emerged to enhance the Isbike bicycle rental system. One of the proposed suggestions is to replace the existing Isbike bicycles with e-bikes. E-bikes offer advantages such as being lighter and equipped with GPS and electric motors. By utilizing the GPS devices on e-bikes, a geofence system can be implemented, allowing bikes to be conveniently dropped

off at designated areas displayed on maps. This approach eliminates the need for traditional kiosks and enables the creation of more bike pick-up and drop-off points, thereby addressing potential capacity issues in specific locations. To support this system, the design of the mobile application would need to be updated accordingly to accommodate these new features. Throughout history, usability and user experience have been fundamental considerations in the development of products and services that involve human interaction. Usability refers to the extent to which individuals can efficiently and effortlessly accomplish their desired tasks using a specific product or service. This research specifically focuses on Isbike bicycle rental systems to investigate the impact of usability and user experience on the product development process. Upon analyzing Isbike bicycle rental systems, it becomes evident that usability and user experience play a positive role in the design phase of the product development process. The presence of usability criteria offers several benefits when designing Isbike bicycle rental systems.
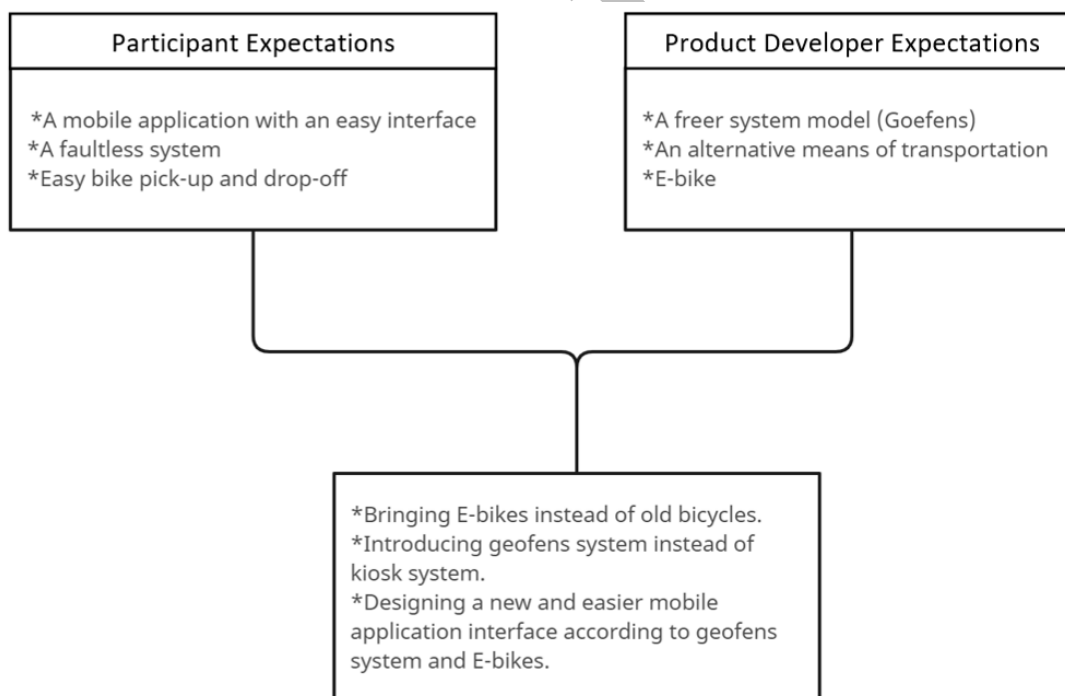

Figure 2. Synthesis of expectations of participants and product developers.

The research findings have identified two primary issues with the Isbike bicycle rental system. Firstly, there is a synchronization problem that can be addressed by updating the hardware and upgrading the mobile application. Secondly, the capacity limitations of the existing kiosks and the long distances between them present a challenge. To resolve this, it is suggested to replace the kiosk system with a geofence system, creating a more flexible and efficient model that eliminates capacity-related problems. The research aims to answer three key questions regarding the design and functioning of the bicycle rental system in Istanbul. Firstly, it investigates how usability and user experience contribute to the design of the system. The findings indicate that usability criteria are utilized to enhance both the digital and physical aspects of the bicycle rental system based on user experience data. Secondly, the research explores the problems faced by users of the Isbike bicycle rental system. Users have identified issues such as capacity limitations in kiosks, long distances between kiosks, and synchronization problems between kiosks and the mobile application. Lastly, the study investigates how designers at Isbike incorporate usability concepts in the product development process. The research findings reveal that designers analyze user experience data to propose new design ideas and system models. The research hypothesis stating the importance of usability and user experience in bike rental system design and development is supported by the data obtained. Overall, the presence of usability and user experience concepts is crucial in a system that interacts with people.

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