KADİR HAS UNIVERSITY
SCHOOL OF GRADUATE STUDIES

WEB PAGE REDESIGN WITH THE USER EXPERIENCE COMPONENT OF USABILITY: THE TKSD CASE STUDY

BURCU BAĞAN

SUPERVISOR: PROF. DR. HASAN DAĞ

MASTER THESIS

ISTANBUL, JANUARY, 2020

BURCU BAĞAN	M.Sc Thesis	2020

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MASTER'S THESIS

Submitted to the School of Graduate Studies of Kadir Has University in partial fulfillment of the requirements for the degree of Master's Program of Management Information Systems

ISTANBUL, JANUARY, 2020

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APPROVED BY:

(Prof. Dr. Hasan Dağ) (Advisor)
(Kadir Has University)

(Prof. Dr. Mustafa Bağrıyanık)
(Istanbul Technical University)

(Asst. Prof. Oğuzhan Ceylan)
(Kadir Has University)

I certify that the above signatures belong to the faculty members named above.

Prof. Dr. Sinem Akgül Akıncıoğlu
Dean of School of Graduate Studies

DATE OF APPROVAL
06/01/2020

WEB PAGE REDESIGN WITH THE USER EXPERIENCE COMPONENT OF USABILITY:
THE TKSD CASE STUDY

ABSTRACT

User experience design changes the perspective of human-computer interaction in product design with the concept of usability. The availability of the product makes the company stand out in the market in its field and increases the satisfaction rate of the user. Nowadays, companies use their web sites as one of the tools of promotion themselves in the market. In this context, the applicability of the concept of usability in web site designs has started to gain importance. The company focuses on the user in the design of the web page, collects data about the target audience through usability testing and makes product design. This thesis was designed to measure the usability of a web page by using usability testing, one of the user experience research methods. During the test planning process, *"Handbook of Usability Testing (Second Edition): How to Plan, Design and Conduct Effective Tests (2 e*d)" was chosen as a guide. The test was carried out with two different focus groups with a total of 30 participants using the unmoderated-remote test method. In the unmoderated-remote test design, Google sheet forms open source automation software testing was used. Paper-based test was used to measure the demographic profile of the participants before the usability test. According to the results of the test, web page usability can be improved in terms of loading speed, visual and social media. According to the findings, solution suggestions were made and a sample wireframe design was made.

Keywords: Human–Computer Interaction, User Experience, System Usability, Usability Testing, Web Page Redesign, Web Page Maintenance, Software Testing, TKSD

KULLANICI DENEYİMİ BİLEŞENİ KULLANILABİLİRLİK İLE WEB SAYFASININ YENİDEN TASARLANMASI:
TKSD VAKA ÇALIŞMASI

ÖZET

Kullanıcı deneyimi tasarımı, kullanılabilirlik kavramı sayesinde firmaların ürün tasarımında insan-bilgisayar etkileşimine bakış açısı değiştirmektedir. Ürünün kullanılabilir olması firmanın kendi alanındaki pazarda öne çıkmasını sağlamakta ve kullanıcının memnuniyet oranını arttırmaktadır. Günümüzde firmalar pazarda kendini tanıtma araçlarından biri olarak web sitelerini kullanmaktadır. Bu noktada kullanılabilirlik kavramının web sitesi buna bağlı olarak da web sayfası tasarımlarında uygulanabilirliği önem kazanmaya başlamıştır. Firma web sayfasının tasarımında kullanıcıyı odak noktasına alarak, kullanılabilirlik testi aracılığı ile hedef kitle hakkında veri toplayıp ürün tasarımını yapmaktadır. Bu tez çalışması, kullanıcı deneyimi araştırma metotlarından biri olan kullanılabilirlik testi tekniğini kullanarak bir web sayfasının yeniden tasarımında uygulanabilirliğini ölçmek için yapılmıştır. Test planlama sürecinde "*Handbook of Usability Testing (Second Edition): How to Plan, Design, and Conduct Effective Tests (2 ed.)"* kitabı rehber olarak tercih edilmiştir. Test çalışması, iki ayrı odak grubu ile toplamda 30 katılımcı ile uzaktan-denetlenmeyen test yöntemi kullanılarak yapılmıştır. Uzaktan-denetlenmeyen test tasarımında Google Forms adlı açık kaynak kodlu otomasyon yazılım testi programından yararlanılmıştır. Kullanılabilirlik testi öncesinde eğitim programına katılan kişilerin demografik profilini ölçmek amacı ile kağıt üzerinde tasarlanmış test yönteminden yararlanılmıştır. Test sonuçlarına göre web sayfası kullanılabilirliğinin yüklenme hızı, görsel ve sosyal medya konularında geliştirilebileceği kanısına varılmıştır. Elde edilen bulgulara göre çözüm önerilerinde bulunulmuş ve örnek bir web sayfası şema tasarımı yapılmıştır.

Anahtar Sözcükler: İnsan-Bilgisayar Etkileşimi, Kullanıcı Deneyimi, Sistem Kullanılabilirliği, Kullanılabilirlik Testi, Web sayfası Yeniden Tasarımı, Web sayfası Bakımı, Yazılım Testi, TKSD

ACKNOWLEDGEMENTS

I would like to thank my thesis advisor highly respected Prof. Dr. Hasan Dağ for his support from the beginning till the end of the thesis for giving right guidance and valuable advices.

I would like to thank especially, highly respected Assoc. Prof. Birgit Oberer for being an incredible mentor both on academic side and business life side.

I would like to thank my dear family, especially my mom and my friends for their understanding and patience in this process for never giving up their support.

Also, I would like to thank Mustafa Dalcı who encouraged me to prefer Management Information Systems Department.

To My Mom and Birgit OBERER…

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LIST OF ABBREVIATIONS

CAS	Chemical Abstract Service
CEFIC	The European Chemical Industry Council
FAQ	Frequently Asked Questions
GSI	Google Speed Insight
KKDIK	Turkish Reach Regulation
IDF	Interaction Design Foundation
ISO	International Standarts Organization
MSDS	Material Safety Datasheet
SEO	Search Engine Optimization
TCMA	Turkish Chemical Manufacturers Association (TKSD)
TSE	Turkish Standarts Institute
TURKAK	Turkish Accreditation Agency
UX	User Experience
URL	A Uniform Resource Locators

1. INTRODUCTION

Every product that we use in daily life is designed to make life easier. In order to adapt product designs to present-day needs, studies are also being carried out in the digital field. Digital products have become an integral part of our lives. In this context, besides products such as mobile phones, laptop computers, and desktop computers, there are developments in the fields of websites, mobile application, and digital marketing. In the field of design, studies on user experiences have been started in product design in order to make the use of these digital products easier for users.

In this thesis, research on user experience has been conducted to measure interaction with a website, which is one of these digital products that we frequently use today.

In this section, the motivation for the thesis, the aims of the research, the limits that restrict the research, and the research topic are explained.

1.1 Motivation and Research Objectives

This study was carried out to emphasize the importance of the design process of corporate digital products in interactions with users. The design process consists of user research, analysis of results, design, and software implementation. In designing this process, the role of user experience and research methods as explained in the literature were used as guidance. According to research results, companies have to integrate user experience into the design stage in today's conditions while presenting their products in the market. Companies that want to apply the research methods used in previous studies to their own products should take into consideration the business plans of the organization as a priority, remain faithful to the service purpose of the product, and obtain user feedback after the design regularly.

1.2 Thesis Structure

This study consists of two parts, devoted to theoretical and practical research.

Theoretical research: This section reviews the literature on user experience in order to find identify the applicable and appropriate method(s).

- Chapter 2: In the first part of this chapter, the beginning of human interactions with computers, human–computer interaction (HCI), the HCI discipline, and HCI models are examined. The process, definition, application, and stages of conversion of HCI to human-centered design (HCD) over time are the examined. Subsequent to user-centered design (UCD), the definition, application process, and principles of HCD represent the next step of research in the literature.

  Through the above stages of user experience, the philosophical aspects of HCI and its definition, dynamics, elements, criteria, framework, and finally methodology types are examined.

Practical research: This is the section in which experimental results are obtained.

- Chapter 3: Software testing methodologies are described.
- Chapter 4: The research method is chosen and participant profile tests are executed based on the selected test method. Results are analyzed and shared.
- Chapter 5: User research test design, results, and analyses are presented.
- Chapter 6: In this part of the work, based on the analytical outcomes of Chapter 5, solutions are suggested for web page redesign. A wireframe design is made according to the presented suggestions.

1.3 Limitations

In this study, some limitations were encountered. The project stakeholder did not provide a budget, so free and semi-free tools were selected. However, there were benefits to these programs in spite of them being free of charge. Google Sheets/Forms and Google PageSpeed Insights were chosen to perform the usability testing. Google Sheets/Forms is an unmoderated remote testing software tool. Google PageSpeed Insights is an open source software testing tool. Detailed explanation is given in Chapter 3 about the software testing tools used in website maintenance and usability tests.

It is preferred in many studies that the number of people participating in qualitative tests be high. However, a sufficient number of participants in a study on a particular subject

may still be insufficient to see robust results of the test. In the usability tests, 20-30 people were considered as sufficient test participants in remote tests. The testing was conducted with two different training groups. In total, thirty people completed the test.

The test results were analyzed and solutions were suggested according to the outcomes. A wireframe was designed in light of these suggested solutions. As a wireframe design software tool, MockFlow was chosen. MockFlow is a semi-free tool with diversity of user profiles that can be used as a design tool. This program can be used anywhere, like Google Sheets/Forms.

1.4 Case Study

The Turkish Chemical Manufacturers Association (TKSD) is the stakeholder in this case study. It was founded in 1986 by Alber Bilen, who has introduced many innovations to the Turkish chemical industry in coordination with the Turkish government, working in coordination with members of the association, government ministries, and the European Chemical Industry Council (CEFIC), of which the association is a member. Its aim is to search for sectoral solutions together with political authorities, ministries, and formal and informal establishments. The origin of sectoral problems has often been proven to lie in the training of the employees of the association's member companies. In order to improve the sector, the association organizes seminars, conferences, certificate programs, and meetings related to industry needs.

This case study for this thesis is related to a certificate program called "Materials Safety Data Sheet" (MSDS). This data sheet is a very important tool in risk communication and in chemical product management. Chemical products are widely used not only in the industry but also in daily life. More than 128 million organic and inorganic chemicals have been registered according to studies conducted by the Chemical Abstract Service (CAS), a division of the American Chemical Society, and each has its own CAS Register Number. The presence of such a large number of chemical substances means more risks to human health and the environment. Chemical production has to be managed to prevent industrial accidents in the future. The MSDS

certificate program provides a government-validated certificate to product managers to prepare safety data sheets for chemical products.

The certificate program is coordinated with the Turkish Standards Institute (TSE), an accredited institution in charge of providing certificates and organizing exams. The TKSD plays a role as a training company in charge of the education for these certificate programs, or in other words, as an instructor. The TKSD, which has been recognized in the chemical industry for many years, is one of the leading organizations providing such training. The training program was launched in 2003, and until 2010, the TKSD was the only association providing such training in this sector. In 2010, other organizations accredited by the Turkish Accreditation Agency (TÜRKAK) started to issue certificates and work with subcontractors. In order to compete with other organizations, the TKSD launched a formal organizational website, which has a page for MSDS training and gives information about the program. The MSDS training web page has been updated in terms of its graphical parts and its contents. However, the stakeholder stated that these improvements made to adapt to changes in the field did not yield any results. In order to move the association a step ahead of its competitors, it was requested that the training page be reviewed.

An instructor was interviewed to get detailed information about the training and to identify problems. Problems identified as a result of this interview were as follows:

1. There has been a decrease in the number of applicants participating in the training as a result of the increase in the number of competing organizations.
2. Inadequate information is provided for participants about the training.
3. "They only want to learn the content of the training to pass the exam. This leads to continuous questions after the training. That is, I have to spend 3 to 5 minutes on each question." E-mail and telephone are the communication methods used for such questions.
4. This training generates a large part of the TKSD's income. For this reason, it is desired to increase the recognition of the association and reach more people.

It was discussed with the instructor that the digital strategy should be changed in order to move the TKSD to the forefront and increase the number of participants, and approval for this was obtained. Based on this, it was found appropriate to evaluate the training web page. The concept of usability, which is one of the components of user experience, was used to evaluate the web page.

Usability test results were analyzed and solutions were offered for the website in the scope of digital marketing and design. A sample wireframe design was made based on the solution suggestions.

2. USER EXPERIENCE LITERATURE REVIEW

2.1 Objective of the Chapter

In this chapter, the changes in the field of user experience up to the present are discussed based on a literature review.

2.2 Human–Computer Interaction

Abraham Maslow, who designed the hierarchy of human needs pyramid, stated that humans have certain types of needs that must be met. Simply put, these needs move up to the top of the pyramid from the most fundamental needs at the bottom, from physiological needs to feeling secure, loving and belonging, and achieving esteem or success and personal goals. Physiological needs are air, water, food, shelter, and clothing. Security entails feeling safe, working, and having a family and health insurance. Loving and belonging can be defined as having loved ones, feeling intimacy, and having friends. Needs for esteem consist of both having self-esteem and respect for others, and getting respect from others. At the top of the pyramid, the last step is self-actualization, which consists of being creative, solving problems, feeling acceptance, and living in an ethical manner (McLeod, 2018).

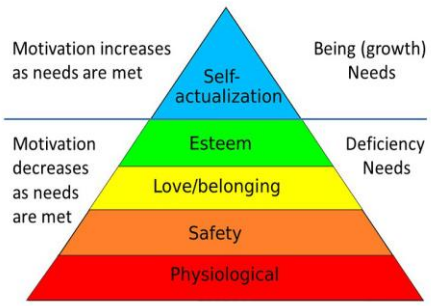

Figure 2.1: Maslow's hierarchy of human needs pyramid, adopted by McLeod (2018)

People can live healthy lives when they meet these needs, and failure on one step of the pyramid can create an obstacle for achievement of success in other steps. The need to adapt to developments over time has also forced people to keep pace with technological developments. Humanity's relationship with technology has led to the phenomenon of

HCI. In design, the role of HCI leads to solutions to daily problems by following Maslow's pyramid and its steps of basic needs. It is conceivable that the concept of HCI will continue being developed for user approaches to technological products.

Inadequate system support in software development has also played an important role in the evolution of HCI as a professional discipline because of the excessive use of budget expenditures. As stated by Carrol (2001), the workflow process, which begins with the very idea of the structure, followed by software development and lasting until the end users and test construction, is called the "waterfall" project method.

With the help of usability professionals who want to incorporate these standards into their working processes, software engineers and system engineers have responsibilities in various areas of these projects in order to produce a good final product. In this sense, HCI and human ergonomics factors should be taught during educational and professional processes. From a scientific point of view, a framework is necessary to determine the direction and focus of standard practices (Earthy et al., 2001).

The design of a model enables us to see the theory within a certain structure. HCI models have multiple versions of themselves. The best known model, Norman's model, takes the user as fundamental and applies this to the interface. The model developed by Abowd and Beale took Norman's model as a fundamental basis in the design process. In this model, with the help of input language and output language, interactions are provided between users and systems. A subsequent model was designed by Nemirovksy to give a new perspective on other models. In this model, attention is paid to users as an audience in system usage, not as participants in program usage. In this approach to the HCI model, usability seems to impact every part of the process (Hinze-Hoare, 2007). HCI is a set of principles that accommodate different disciplines depending on the field of study. This includes ergonomics, computer science, psychology, and so on.

HCI involves voice or physical commands, contents, figures, intelligence, images, and other tools (Chao, 2009). Voice plays a role in communication as instructions are voiced to the computer. Images are used in the detection, filtering, and acceptance of images

uploaded to the computer from outside. Intelligence recognizes the actions of the user and enables him or her to react and adapt accordingly. Data are communication means used to interact with the user in various ways.

From the perspective of computers, HCI has had a deep impact on many applications, including user interactions with interfaces, software, and hardware as well.

2.3 Human-Centered Design

HCD is a term commonly used in the literature to describe design processes for humans. ISO 13407:1999, which was published in 1999 by the International Organization for Standardization (ISO), was the first document to form a basis for this topic. This standard was updated by ISO 9241-210:2010 (2019), which has the most current content. However, according to ISO 9241, HCD principles and related activities have not changed significantly since ISO 13407 was produced and approved ten years earlier.

HCD is defined in ISO 9241-210:2010 (E) as follows: "Human-centered design is an approach to interactive systems development that aims to make systems usable and useful by focusing on the users, their needs and requirements, and by applying human factors/ergonomics, and usability knowledge and techniques."

The concept of HCD as mentioned in the ISO 9241-210 standard has been actively used in IT. This standard is designed to implement the concept practically. In practice, there are six stages in the standard (Fukuzumi et al., 2017).

The process of implementation, the first stage of HCD, serves to give information for the second stage, regarding the content of the target system and the interaction of the user with the product. The third stage addresses the needs and expectations of the user in the target system. In the fourth stage, a prototype is prepared in order to solve the problems in line with the needs identified in the previous stage. In the fifth stage, the prepared prototypes are evaluated in terms of user needs. In the sixth stage, if the solutions offered after the evaluation meet the needs, the product design is completed.

In both product development projects and project implementation, the design process for the capability of the product and internationally accepted and defined processes of HCD are applied (Earthy et al., 2001).

A working group was created under the leadership of Tom Stewart to provide guidance for project managers under the ergonomics of human-system interaction standart in order to elaborate on the data on the interaction of the human factor with interactive systems. As a result of this study, the 13407:1999 standard guide was created. The design principles defined in the standard are as follows:

- Active involvement of users and a clear understanding of the user's task requirements.
- Appropriate allocation of functions between users and technology.
- Iteration of design solutions.
- Multidisciplinary design.

The above principles led to the following processes:

- Planning of the HCD process.
- Specification of user and organizational requirements.
- Understanding and specification of the context of use.
- Production of design solutions.
- Evaluation of designs in light of requirements.
-

2.4 User-Centered Design

The notion of UCD originated from a variety of applied research and general disciplines. These include:

- Organizational behavior
- Cognitive psychology
- Computer science

- Human ergonomics
- Mathematics and engineering
- Applied science

The term describes the product design process that takes shape with the influence of the end user. HCI is considered to be included in this process from the very beginning, as stated by experts. In order to understand the user in the process, it is recognized by experts on HCI that many variables will change over time, including the culture and working areas of the organization to which the user belongs, the areas where he/she can move freely while taking action, the constraints and related resources, the tasks that can be carried out on a daily basis and in the future, and changes to be made. In light of the information provided, the necessary information is collected by working with users in a one-to-one project process and observing them in the study areas (Schulze, 2001).

UCD is a user-focused design principle wherein participants work together on the development process of a product. Participatory design is intended to create a solution acceptable for both the user and designer. This leads to the product development process. In 2003, through his experience with UCD processes, Gulliksen listed 12 principles for usage in the process of software development projects (Gulliksen et. al., 2003).

The most important feature of principles is that it be used during the development process and after the development process.The choice of UCD methodology depends on the features of a project. In addition to this, it is critical that a measurement process take place within the development process for the project. In the implementation of user-centered project methods, the role of the facilitator, the selection of the participants to participate in product tests, the design process related to this, the cost of applying this process, and the duration should all be considered.

2.5 User Experience

Throughout history, philosophy has addressed the subject of human life. It aims to provide a source for questions that did not have scientific answers. Philosophy is an aspect of Western culture that emerged in ancient Greece. The philosophy of technology

is based on this origin (Feenberg, 2009). Technology serves as a bridge in finding questions and answers in scientific research. For this reason, science uses technology to achieve the most effective and efficient results for itself.

One of the psychological topics addressed in philosophy is cognitive science. Cognitive science is used to understand human behavior in HCI. The basic needs of the consumer have been the elements that constitute the cognitive interaction within the limits. It can thus be said that the element of users plays an important role in interface design. Computers and humans have increased their interactions, working on common grounds (Torok, 2016).

Computer development has shaped the cognitive science of information processing. Cognitive science is necessary in this field because HCI is used in research on the decisions of the user, the extent and usage of information, and how information is processed. This approach plays an important role in the interactions of computers and humans.

Over time, HCI has shifted its perspective from its approach to beauty and has focused more on the needs of users. The main goal is to design products that will improve the quality of life now and in the future (Hassenzahl and Tractinsky, 2006). The phenomenon of user experience, also known as UX, was not taken seriously when it first emerged; rather, it was adopted by the HCI community over time. Although writings and programs from the early stages included definite proposals, the main purpose was to show that HCI was more than just completing a task. User-oriented task analysis was taken into account in the earlier periods of HCI before UX.

User experience does not have a definitive definition on an academic and industrial basis, and there is also a large gap in the measuring of this experience. This means that the evaluation criteria for UX currently remain vague (Vermeeren et al., 2010).

In a study that aimed to gather definitions of UX under a common umbrella, a survey was conducted among professionals involved with UX in practical and scientific fields.

The results showed that the concept of UX must be a part of HCI, and UCD has to be taken as the starting point in the application process (Law et al., 2009).

The definition of the UX phenomenon involves types, conditions, and results. When it is considered as a research subject, it is examined it terms of how it is done, experienced, and developed. When it is put into action, the evaluation of UX is then discussed in terms of the yield and application of a particular UX design, the prototype design and its interaction with other people, and whether the design yields the expected results.

The term "user experience" covers a very large field. The general point of view is that UX is a phenomenon. Researchers and practitioners who wanted to give a common definition of the term "UX" from different perspectives released a whitepaper after three days of study. One part argued that it would be wrong to describe UX with precise patterns, while another part defended having a definite definition (Roto et al., 2011).

There is no consensus definition of user experience as a result of these works, but the definitions made by UX professionals according to their own perspectives and experiences are available:

> All the aspects of how people use an interactive product: the way it feels in their hands, how well they understand how it works, how they feel about it while they're using it, how well it serves their purposes, and how well it fits into the entire context in which they are using it.
>
> (Alben, 1996)

It is thus a collection of dynamic concepts with hedonic, pragmatic, experimental, and aesthetic values. UX has a flexible structure. Research can be done on it in general, as well as personalized research, and evaluations can be performed of companies that bridge multiple disciplines and the services they provide.

The interactions of the product and the user vary due to aesthetics and many other features. Clarifying this situation, research has shown that the transition between the

product and the user can be grouped under three headings (Karapanos et al., 2009), as shown in Table 2.1.

Table 2.1: User experience over time: an initial framework (Karapanos et al., 2009)

Familiarity	Loss of excitement at first sight when learning to use the product, increasing product use during the process
Emotional attachment	Starting to live with the product and make it a part of daily life
Functional dependency	Product becomes a special object for personal use in private life, sharing it with others to maximize emotional use

The results of the research on HCI studies showed that the quality of a product in long-term use varies according to the wishes of the user.

Product development in terms of what people feel when interacting with any tool has also played an important role. Therefore, in product development, the focus is now placed on what people feel when using a product rather than the content of the offered product (Hassenzahl, 2008).

UX includes the feelings acquired in this context in terms of product quality and use. Minge (2008) concluded that there are three main UX dynamics, as stated in this study. First, it was observed that the user begins to pay attention to usability rather than visual aspects after the first encounter with the product. Secondly, it emerged that system design provides innovative development not from usability but from the design itself. Thirdly, it was stated that emotions affect product use. In this case, it was concluded that the approach towards a product may change over time for certain reasons.

According to our simplest needs, senses like hearing, sight, and touch give rise to aesthetic pleasure. The aim of aesthetics in design is to provide effective return of the product with little effort (Hekkert, 2006).

As mentioned before, usability takes into account the interaction of task fulfillment and information processing. Different approaches have been developed to improve this

situation and to determine other aspects of the user's characteristics (Forlizzi and Battarbee, 2004).

The ways in which a product is used in quality experiences, and whether it serves its purpose or not, include the components that are encountered while using it. Alben (1996) remarked that a quality experience will meet certain criteria.

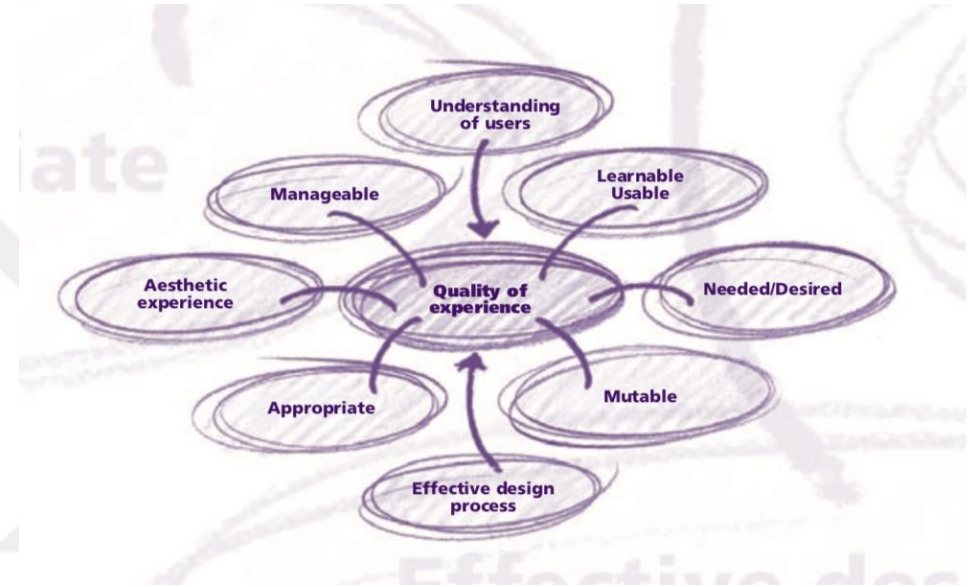

Figure 2.2: Criteria for effective interaction design (Alben, 1996)

Experience has been a leading element for consumers. As stated by Hassenzahl (2011), experience is valued because it emphasizes interactions and how the user feels while using the product, and it facilitates learning for re-use. In the field of technology, various innovations are made to increase market sales and improve products. It is argued that these innovations should be human-centered rather than technology-centered.

Product design is intended to support fun, aesthetic, hedonic, and pragmatic values for long-term use. However, HCI could not fully comprehend and implement designs with these features. Hassenzahl (2005) stated that product design should have pragmatic and hedonic functions. Such functions allow the product to be developed individually and to promote its identity. Beyond that, it has symbolic value and allows previously acquired

memories to be revealed. Pragmatic features are instrumental. With this feature, a product is supportive and usable, and the user can control and direct it. Entertainment features include activities to experience technological products for their own sake. There are no large-scale or serious tasks. The main aim in this case should be to create a fun structure that can implement pragmatic and entertainment features together. An entertaining interface design incorporates improved capabilities and usability that can make the user an authority to make decisions (Brandtzæg, and Følstad, 2001).

User experience covers all mentioned areas in interactions with the product. This may vary individually. In UX model design, considering these features, how people value objects and the key elements of models should both be measurable.

The framework proposed by Forlizzi and Battarbee for user experience interactions addresses the individual, the product, and the results of the experience derived from it. This framework also addresses the interaction arising between the user and the product. Various types of product and user interactions and experiences are grouped under different headings (Forlizzi and Battarbee, 2004), as seen in Table 2.2

Table 2.2: Understanding experiences in interactive systems (Forlizzi and Battarbee, 2004)

Expressive	Enables the user to communicate with the product. In this way, the person can modify the product in his own way and make it suitable for himself.
Cognitive	The user's previous experience with the product is in contradiction with the new product being used.
Fluent	Result-oriented actions in interacting with the product precede the user's interest.
If interaction involves experiences gained through a journey:	
Co-experience	It is the act of putting product use together with other people into action.
An experience	It is defined as the emotional or behavioral change of the user during the process of interaction.
Experience	The user alone interacts with the product.

Many factors are considered when designing user experiences. The movements of the user are brought together by all the components of user experience that they feel in the interaction, including their understanding of the usage (Garrett, 2010).

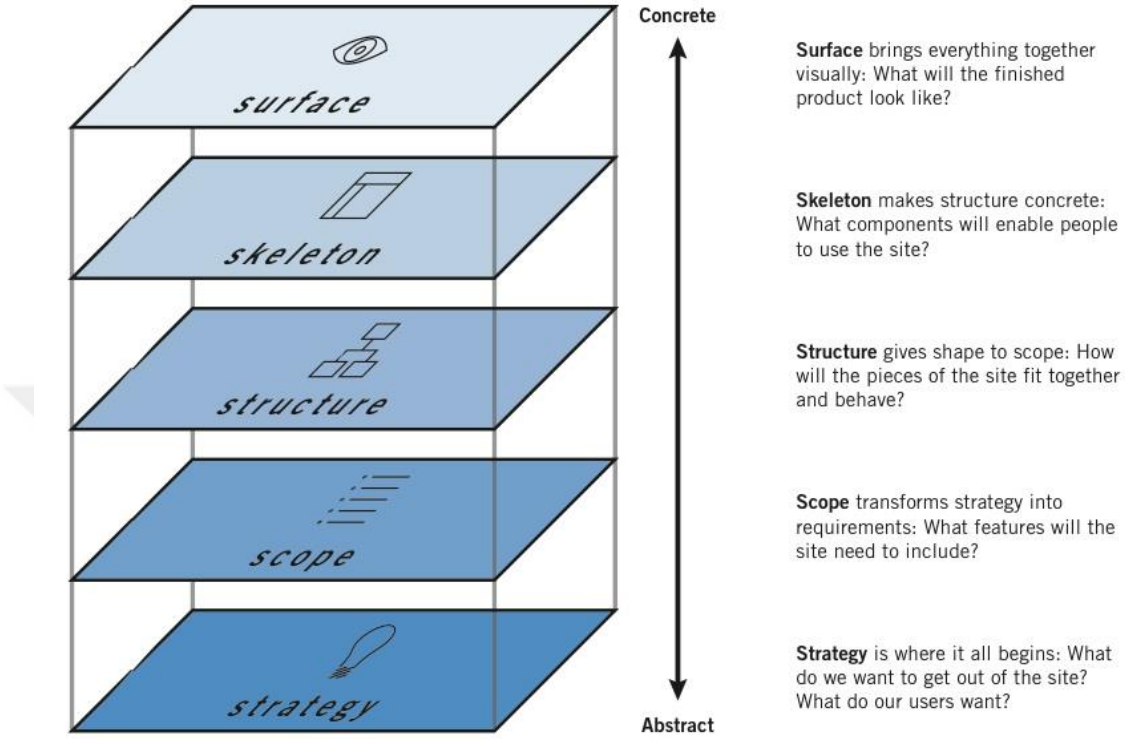

Figure 2.3: The elements of user experience (Garret, 2010)

As can be seen in the figure above, throughout a project, the path taken and the decisions made in one stage affect the next stage. The design process continues from bottom to top. This process forms the whole user experience.

User experience components are collected under an "umbrella," which covers the components that UX uses to produce solutions to problems. The layers of the phenomenon known as the Dan Willis umbrella (2011) are as follows:

- Visual design
- Information architecture
- Interaction design
- Usability

- User research
- Content strategy

First, visual design is an element that enables the user to access information easily by taking the content as the focus (Watzman, 2002). Fundamental elements of visual design are layout, graphics, type, and color.

Second, "architecture" is used to define multilayered structures of different sizes, but "information architecture," on the other hand, allows users to easily access the information they are looking for on a website or in other structures. The navigation system constitutes the whole of the information architecture, making it possible to organize information, search for information, label information, and direct it when accessing information (Morville and Rosenfeld, 2006).

Third, interaction design is the cornerstone of research and development in different disciplines, approaches, and areas when designing products for people. It is critical in cognitive science, HCI, information systems, and graphic design. Human cognitive science, which is one of these important fields, contributes to the design of the computer by evaluating the interaction of the user with the computer according to psychological and physiological aspects (Preece et al., 2002).

Usability is the fourth subcategory of the UX concept. Usability plays a role in the measurement of UX. Usability and UX cannot be considered as separate. It provides the loyalty of the user to re-use the product and it meets the user's needs (Hassan and Galal-Edeen, 2017).

Usability only evaluates task-oriented interactive systems. UX focuses on aesthetic anxiety, emotions, and effective stimuli in interactions. Research models are divided into two types, as quantitative and qualitative. Quantitative research measures emotions in the simplest form with questions prepared considering aesthetics. This is the most widely used research method. Qualitative research is performed according to the subject and the depth of the product description.

Fifth, user research is defined by the Interaction Design Foundation (IDF) as research to understand a user's characteristics, aims, and behaviors towards achieving those aims. The goal of such research is to facilitate the use of the product in the user's workspace and daily life.

The test research conducted in user surveys should be carried out before the design of the product, during the design phase, and after the design is implemented and the product development continues. There are again two types of research methods, qualitative and quantitative research, for the usage area of the product, content needs, and potential users. These methods are described in detail in the following sections.

Finally, in terms of content strategy, communicators are always needed in organizations to improve the product. Content strategy comprises the whole context of planning, managing, presenting, and influencing the content used in such communication (Clark, 2016). All departments should work in harmony in determining the strategy. Such an undertaking is important to increase interactions with the product in all areas. The organization of the business plan in coordination with the content strategy is therefore of the utmost importance.

3. TODAY'S SOFTWARE TESTING METHODOLOGIES

3.1 Objective of the Chapter

The aim of this chapter is to examine the effects of the software tools used in the thesis research on the usability of a website.

3.2 Website Design

It is stated that the purpose of creating a website is to ensure that the content of the site is delivered to the targeted audience in the most effective and appropriate manner. The content should be designed according to a specific layout so that it can be edited correctly via an interface (Ivory and Hearst, 2002). Effective website design is not just about physical interaction. The focus is on the user's experiences while using the site (Rosen and Purinton, 2004). Blair-Early and Zender (2008) stated that product interfaces have ceased to be used only as a means of interaction with the user. Website design indicates that content-oriented designs are made according to the needs of the user.

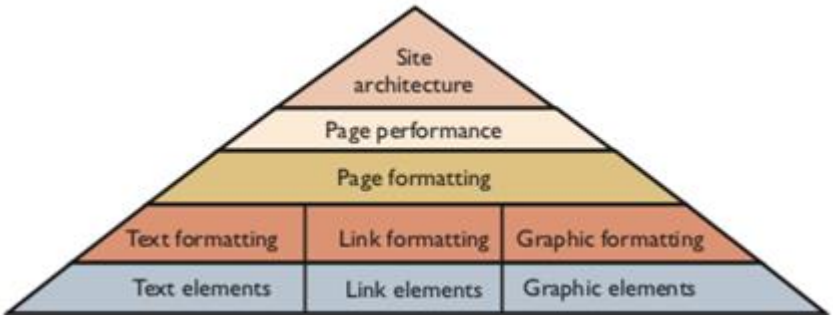

Figure 3.1: Ivory and Hearst's improved website design (Ivory and Hearst, 2002)

As seen in Figure 3.2.1, a website interface is primarily based on graphic format, text format, and link format. The information architecture of the site constitutes the specified categories and levels and the page format. In order to maintain order between these levels, a website design must have simplicity, harmony and unity, consistency, balance, and clarity (Costa et al., 2004).

Table 3.1: Principles for creating websites: a design perspective (Costa et al., 2004: 484-488)

Simplicity	To transfer the texts related to the subject clearly and briefly and to publish the graphics with soft colors instead of bright colors that may distract attention
Harmony and unity	Colors, images, fonts, etc. used for page design items are selected and placed to reflect a whole from top to bottom within the page
Consistency	Simplicity and harmony as a whole application
Balance	Placing content-related images on the site symmetrically or asymmetrically without disturbing the integrity of the design
Clarity	Transcribing the message on the site in a language that appeals to the intended audience

The content of a website should be prepared taking into account the features listed in Table 3. The content of a site consists of the web page layout. Page layout, images, videos, visuals, sounds, etc. are elements of a web page. The correct usage of these elements in web page layout makes it easier to present the information to the user. Factors such as the right amount of space between the elements to be placed on the web page, color preference, font type, brand logo, and content-related items such as the selection of the web page layout design should be taken into account in the first stage (Heer et al., 2012).

It is stated that web pages are important in terms of appealing to the eye of the user and helping them comfortably find what they are looking for within the site. Proper design

of a web page will encourage the user to visit the site again. The number of a user's returns to the site is also cited as a measure of the availability of the page. The number of times a user searches within a web page and the number of times the page is viewed are other analytic metrics defining web page availability (Beri and Singh, 2013). The analytic calculations of web page metrics as discussed in this thesis were performed with Google PageSpeed Insights. A solution was proposed according to the data obtained from the measurements. These recommendations are based only on the results of Google PageSpeed Insights. Different results could be achieved with different programs.

3.2.1 Website usability

Usability is said to be the most important feature that a website must have in order to exist on the web. The usability principles that Nielsen (2012) mentioned should be supported in web application designs, including effectiveness, satisfaction, learnability, memorability, and low error rates.

It is stated that designing the interface of the content presented in a web application with the same layout on each page may facilitate the use of the site. The specific interface of a page allows the user to adapt more easily when navigating that page. An adapted user can remember the navigation even if he or she re-visits the site after a long time has passed. It is stated that a user who can easily find what he or she is looking for in a website and who is in control of the navigation will be satisfied. In addition, a lower number of errors on the site will increase the user's confidence in the site (Abrahão et al., 2008).

Usability principles makes the site accessible. An accessible website facilitates the use of the Internet for users from different categories (Abuaddous et al., 2016).

In his article, Lofgren (2019) listed the practices that must be followed in order for a website to have usability:

- The design of the website should be compatible with mobile usage.
- It must be accessible to users from different categories.

- Design patterns that are customary for users should be preferred.
- In the design, elements are to be placed in a way that ensures visual hierarchical integrity (position, size, space, alignment, color, etc.).
- Navigation should be easy and simple to use.
- Site content should provide clear, transparent, and accurate information, which will increase the credibility of the site.
- For the content to be legible, font selection, paragraph layout, and spacing between text should be considered.
- The layout and frame of each page on the website should be in the same order for the contents to follow each other.

Usability is one of the subcomponents of user experience. These components were explained in more detail in the previous chapter. Although usability does not fully create a user experience alone, its contribution to the design and evaluation phase is important. User experience research methods are used in the evaluation of website design. These research methods are divided into two groups: quantitative and qualitative methods.

The quantitative method is applied to determine the problems to be investigated, to prepare research questions by reviewing the literature, and to analyze collected data with statistical methods (Apuke, 2017).

The qualitative method represents a search for "why" and "how" instead of the statistics of the quantitative method. This method is focused on groups of people. However, one group's research results do not define the opinions of a larger group of people. In the case study of this thesis, the qualitative method is used for research while also describing the results of demographic profile research for a group of people, i.e. a focus group. However, if this test were to be performed among a larger group of people, the results would be different (Hancock et al., 2007).

The main topic of this thesis is the evaluation of a web page via the user experience research method, focused on usability. Since user experience research methods

themselves are not the subject of this thesis, a detailed explanation of the methods will not be given.

3.2.2 Website and Web Page Usability Testing

As one of the web testing methods, usability testing aims to determine the factors that prevent communication between the user and the interface and prevent the user from performing the tasks he or she wants to perform. Navigation, content, and other information that helps the user to use the site comfortably are the topics covered in this regard.

The points to consider in designing a usability test are as follows (TechSmith):

- Product content, properties, and reasons for the investigation
- Characteristics of the users of the product, determination of the participants
- Intended outcome of the test
- Time of the test
- Other factors that are considered important to the product and are required to be included in the test

In this case study, the literature was used as a guide to organize the stages of the usability test. A detailed explanation of this process is given in the user experience literature. A usability testing method was used in product development. Software testing tools were chosen to apply the usability testing.

3.3 Software Testing Tools

3.3.1 What is software testing?

Software testing is the application of one software program used to find errors in another software system. Comparison of the outputs intended to be produced in the program, comparison of the post-production results, and evaluation of whether the expected results are obtained are the steps of the process applied to measure the characteristics of the application (Felici, 2004-2006).

The purpose of software testing is to check the quality of the software. Findings that can be obtained in a test for quality includes errors, faults, defects, bugs, and failures. Errors may occur due to system malfunction. A fault is a type of carelessness that is not noticed by the product user. A defect is a difference between the expected result and the test result. A bug is an error caused by a computer program. In failure, the system stops working at that time; this may also be called a system crash (Kale et al., 2019).

Software testing planning has a lifecycle just like project management. The purpose of the testing is to check the quality of the software. The simplest known test process cycle works as shown in Figure 3.3.

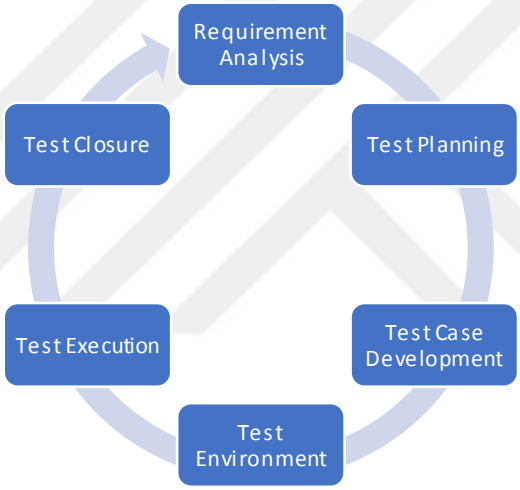

Figure 3.3: Software test process, testing types, and techniques (Hooda and Chhillar, 2015)

According to the research results of Hooda and Chhillar (2015), a standard lifecycle, as seen in the figure, should be developed according to the subject of the software to be tested. Lifecycle methods are used during the testing process.

3.3.2 Software testing techniques

Testing software ensures that the produced application runs smoothly with minimal errors. Another benefit of this testing is that the produced software provides an objective view of business investment. It is stated that more time is devoted to the tests

than the production of the software itself. For this reason, software testing is an important part of software engineering (Ghuman, 2014).

There are two traditional test techniques used: white-box testing and black-box testing.

3.3.3 White-box testing (Structural)

The white-box testing technique is a strategy that designs tests that run multiple lines of source code alone or test all functions alone. The aim of the method is to examine each branch of code individually through different input states to see if the codes behave differently than expected. The structure of the software is used to reveal each life by assessing each class (Ahamed, 2010). White-box testing is also referred to as clear-box, structural, and glass-box testing. These names are based on the data to be tested, as can be selected from within the software.

3.3.4 Black-box testing (Functional)

Functional testing focuses on the preparation of test cases according to the characteristics of the product and the outputs obtained through inputs. Contrary to white-box testing, in this technique the system is not visible to developers. Since in this test technique, it is not possible to access the source code of the system, it can only be performed through prepared scenarios. Only the developer knows the required input information and the outputs to be put into the black box. The developer performs these tests to check that the outputs normally required to come from the product are delivered as expected (Nidhra and Dondeti, 2012).

3.3.5 Gray-box testing

Besides these traditional methods, there is a third method designed to combine the white-box and black-box methods. Because the test cases are written as code in white-box tests, errors in the code may be overlooked. This testing must also be performed by a professional tester. This leads to an increase in spending. Since black-box testers have access to only external information, prepared test cases are only suitable for trial-and-error information. Therefore, it is difficult to determine test designs correctly.

The selection of the gray-box technique allows the testing of a combination of internal and external information. Problems caused by the content of web systems can be seen with this test. In a black-box test, only the interface test can be performed, while gray-box tests allow access to both data and design documents (Saxena and Singh, 2014).

3.3.6 Software testing strategies

Designs for software testing are a strategic part of the planning of the process so that various test cases can work properly. Thanks to the strategy determined in the first stage of test planning, the project can be carried out with the targeted process (Chauhan and Singh, 2014).

Testing strategies are as follows (Sawant et al., 2012):

- Unit testing: Testing the operation of the smallest module of the software program.
- Integration testing: Testing the software interface errors and the interaction of integrated software components.
- System testing: Measuring the functionality of the software or web application. The main focuses of these tests are safety, usability, performance, and surface testing.
- Acceptance testing: For final control and approval of the software or application before it is released. There are two types of methods: alpha and beta testing. Alpha testing is a test in internal form with the customer or a software team independent of the design team. Beta testing is an external test of the beta version of the product, which is offered to a different group of users after the alpha test has been approved.

The test evaluation of software is performed in the order given above. The web page that is the subject of this thesis was evaluated by usability testing, which is one of the system test methods. Usability testing checks the ease of use of the application, its flexibility, and convenience criteria to meet the system requirements (Mahajan and Pune, 2016). The user experience design process is followed to ensure that users

achieve their goals in using the application. The usability of the web application or software is measured to create and enhance user experience.

3.3.7 Software testing tools

These are tools used for the application of repetitive or defined by content actions based on the methods used in the software development cycle. These tools allow the engineer to focus on the design process instead of performing these tests manually. Tool selection is made according to the needs of the project.

The web page examined in the present case study is examined by using web application software test tools. Web applications have become important products in every field. However, there are problems in the design quality of products. For this reason, tests are performed to develop application software. Web application software testing types include the following (Shikha and Bahl, 2015):

- Usability: The ability of the targeted population to use the application is tested based content of the product.
- Compatibility: The application is tested for compatibility with different browsers, devices, security profiles, and operating systems.
- Performance: Loading time of the application is tested, multiple unanswered requests sent by the user to the software are investigated.
- Database: Errors related to the function of application data and data integrity are tested.
- Functionality: Tests links, forms, and cookies.
- Interface: Requests sent by the client-side to reach the database and get the expected output are tested to ensure that the system works correctly.
- Security: The security of application resources and data is tested.
- Stress: Tests measure the response of the system under pressure by making the system work more than normal.

Manual and automated web-based tools can be used to implement testing types. With manual testing tools, a professional tester can find the errors in newly written code.

However, manual testing is difficult and costly. Automated testing tools examine the software as a whole in a short period of time, are cost-effective, can be used even by people without programming knowledge, will compare the results with previous tests, and can be used at any time (Devi et al., 2017).

Automated software testing tools have two subclassifications: open source testing tools and proprietary testing tools. Open source testing tools are free of charge and code source software that is being developed by software companies. Angmo and Sharma (2014) compared the ten most preferred web-based automation testing tools. According to the results of their research, the most suitable tool to test Selenium websites was found. Selenium is open source software that supports various program languages and allows testing on various browsers. It is said to support only web-based applications. Proprietary testing tools are software programs that are produced individually by companies or organizations. Open access to the source code is not allowed and it can only be rented or purchased from its developer. Examples of such testing software are Windows, Adobe Flash Player, and the Microsoft package (Singh et.al., 2015).

3.4 User Experience with Software Testing

The purpose of software testing is to measure the quality of a product to find technical problems or errors. Automated and manual tests can be performed as described in the previous section. With the development of software products in every field, developers frequently come across the concept of usability. Usability testing is a software test that addresses product usage, understanding, and easy learning through certain methods. Testing the usability of a product can be seen as monitoring the user experience of the product. User experience is the actual starting point targeted here. Usability is a subcomponent of UX.

Usability testing can be done manually. In this method, the person who designed the test or those who applied the test may miss the errors. Automated usability testing tools are software tools developed to make this process more effective. Various tools are included in the software development process. In addition, Au et al. (2008) stated that it is not possible to say that the tools available on the market fulfill all the requirements. It was concluded that usability tools are only to be used for evaluation.

The fact that user experience is considered in the process of developing software for the end user will increase the quality of the product. In addition, considering the features that need to be added to the website for business purposes, there may be conflict with the user experience. In order to close the gap between organizational requirements and user experience, Kashfi et al. (2016) employed retrospective meetings to investigate their impacts. It was observed that the problems of integrating UX into the development process were more clearly revealed by sharing ideas about the method and software between different units.

3.5 Website Maintenance with Software Testing

A website needs to be updated regularly to remain active and harmonious. In this way, the rate of return to the site increases, the number of new visitors increases, and it becomes compatible with SEO (Informa Healthcare, 2008). The entire site should be regularly reviewed and tested in maintenance processes. Here is a checklist that can be followed in this review process (Kucheriavy, n.d):

• The forms on the site and the checkout procedure, if any, are checked. Bugs and vulnerabilities found can make the site vulnerable to risk, so this should be checked regularly.
• The currency of the domain of the site should be checked.
• The compatibility of the website should be checked with new updates in different browsers.
• Expired copyright and information updates should be checked.
• The contact information on the website should be up-to-date.
• The legal information required to be on the site should be kept up-to-date.

Websites can be updated manually or through maintenance software. Allocating a budget for maintenance during the site development process is important for the use of the site.

In this thesis, maintenance of a web page has been performed. The page was evaluated by testing its usability, which is one of the user experience components. Google spreadsheets were used as open source software testing tools.

Google Sheets was selected for usability testing because it can collect test results on an Excel spreadsheet and facilitate the processing of data, can be shared with other teammates, is free, and can be used on a wide range of devices.

4. RESEARCH DESIGN

User experience methodology focuses on the usability of a product in a multidisciplinary HCI setting. Any type of product has to respond to user needs with satisfactory usage, has to be time-efficient, must support the user in remembering how to perform tasks in subsequent usages, should be easy to learn, and should anticipate what or how many types of errors a user will have in completing tasks. These components make a product usable from the perspective of user experience methodology.

In the context of HCI, constituent parts of a product can be measured by user experience research methods. These research methods comprise two types of evaluation measurements: qualitative and quantitative. The qualitative method is a verbal method including scenarios, case studies, interviews, and observations (MacKenzie, 2012). The quantitative method is a numerical method involving surveys and questionnaire test techniques (Jokela et al., 2006).

In qualitative and basic research on case studies, the research can be designed according to project management methodologies (Taylor, 2003). Project management methodologies are also separated into groups. For all case study subjects, choosing the project management methodology is based on the subject content. Traditional, agile, and extreme management methodologies are typically used in IT project management systems. These approaches can be defined as follows:

Waterfall project management: Traditional project management is generally known as the waterfall model. In every step of this model, each and every one of the steps is handled one by one. The current step has to be completely finished before moving on to the next step. In this approach, if a mistake is made in the process, there is no chance to turn back and correct it. The waterfall method process is handled in this way (Armstrong, 2018).

Agile project management: Derived from the waterfall method, agile project management is applied for more complex software development projects. Contrary to waterfall management, this model approaches projects from a broader perspective and involves more interaction with customers throughout the process (Darrin and Devereux, 2017).

Extreme project management: This is the most uncertain model to be followed in a project's lifecycle. The potential failure ratio is higher rather than that of other models. In the planned lifecycle, there can be a transition from the starting point to other stages of the model in a rapid the process (Wysocki, 2014).

In selecting the user experience research methodology, metrics that constitute the concept of usability are taken into consideration. Usability metrics comprise the components that make a product complete. The content of the test to be performed in the product research and the test result evaluation criteria are selected according to these metrics (Seffah et al., 2006).

In examining a product, a notification made by the end user is critical in determining the metrics that will be used in the test research. Such statements help shape the research topic and highlight the points that need to be focused on (Zeng et al., 2012). "Product" refers to the web page of the case study, "Users" refers to potential and existing groups of students participating in the usability testing of the web page, "Goals" refers to tasks created for each group of participants to test the usability, and "Context" refers to the participants' test environments, such as desktop, mobile, tablet, remote testing, survey, or office-based (Speicher, 2015).

4.1 Purpose of Testing

The purpose of this test is to evaluate the training program web page by user experience methodology for current and potential students of the course. It is aimed to make the web page's information architecture more user-friendly and to increase the popularity of the association's training program among its competitors in the market. Evaluation of the web page is done with usability testing measurements. Metrics are tested by qualitative and quantitative methods. The qualitative method focuses on the design of

the interface and gives verbal results. The quantitative method gives statistical and graphical results (Nielsen, 2012).

The usability testing method was chosen to measure the web page's usability. Testing was executed with novice users for the first time since its release to the market. The study has primarily addressed user problems in terms of usability measurements of the web page. Considering the usability criteria, it was observed that users were searching for content on this web page, interacting with the elements on the page, finding it visually appealing to the eye, and proving able to perform the same tasks successfully on their next visits to the page. Based on these metrics, questions about the web page were prepared as follows:

- Is the training page easy to access via the home page?
- Do students directly connect with the education web page after registering for the training program?
- Which paths do students follow in registering for training? Does the site support these paths and other transactions?
- Do participants find what they are looking for on the page?
- Does the interface look appealing to students?
- Do they get enough information about the training and the instructor on the web page?
- Do they use the association's social media accounts before, during, and after the program?
- Can they find the web page via a search engine organically?
- Do they find elements on the web page usable (icons, images, etc.)?
- Would they go to a competitor's web page to find the information they need if they can't find enough information about the training process?
- Do students easily understand what they're clicking on?

In this part of the study, the user is taken as the focal point and the metrics to be included in the test are determined.

4.2 Test Environment and Implementation

The Usability Body of Knowledge (BoK, 2002) describes remote evaluation as a usability testing method that can be conducted with moderated and automated or unmoderated approaches. In moderated usability testing, a qualitative method is applied to gather verbal data, while in unmoderated or automated testing a quantitative method is used to gather numerical data. The remote evaluation research method is chosen considering this case study's research object, the participants of the program, and the budget (Asjes, 2014).

In this research study an unmoderated testing survey was chosen to gather insights from participants. The survey method may be executed with unmoderated web-based Internet programs (Blair et al., 2013). A Google Forms survey testing tool was selected to implement test questions as a task for participants. This survey tool is a web-based platform with a user-friendly interface for users with even limited knowledge with technical product interaction. It can be deployed on web-based and mobile-based platforms, including Android and iOS native versions.

Implementation of the survey questions stage was done with Google Sheets/Forms starting with process guidance. Blocks of questions, the design, the logical jumps between questions, and support for 28 different languages around the world provide diversity in creating the survey template (Google).

4.3 Participants

This study aims to focus on evaluating participants' interactions with the web page's user interface by user experience methods. Participants were taken as focal points in the test studies. Demographic information was needed to identify the test participants' profile characteristics. The information obtained from the company as a second-hand source was found to be insufficient for the research. For this reason, a quantitative test method was used to determine the profile characteristics of the participants. The test questions covered the demographic information of the people, their participation in the training, and the equipment they use in their daily lives (Rubin and Chisnell, 2008).

Test questions were prepared in Word following a fill-in-the-blank, closed-ended question model. The test was delivered to the instructor as the output for a quick return from the participants.

Table4.1:Participants' survey test results

Profile Characteristic	% Target
Social Media Usage for Networking	
Yes	0,55
No	0,45
Attendence type	
Individual	0,09
Firm	0,91
Gender of participants	
Woman	0,72
Man	0,28
Age Reference	29 - 37
Type of Technical Equipment's	
Mobile	0,58
Notebook – Laptop	0,23
Desktop	0,1
Tablet	0,09
Suitable for Training	
Yes	1
no	0
The City They Attend	
From İstanbul	0,41
Outside of İstanbul	0,59
Attempts to Class	
First	0,86
Second	0,14

The test was conducted with 22 people. Participants were in the age range of 29 to 37 years old (average age: 29.71 years), including 17 women and 5 men. Participants were sent to this course by their firms. The majority came from outside of Istanbul. The regulations of the Ministry of Environment and Urbanization state that it is necessary to be successful in the examination of an accredited institution in order to obtain the

certificate for preparing safety data sheets. These certificates are valid for three years. Candidates must undergo an exam again after three years for the renewal of the certificate. All the participants were suitable candidates to attend this course.

While 55% of the participants were using social media to obtain regular information on developments in the chemical sector, 45% were not using social media at all. The most common technical equipment used by participants was a mobile phone. The other technical equipment, in order of popularity, were notebook/laptop, desktop, and tablet computers.

As a result of the research, a user profile was prepared according to the results of the other components. In order to maintain balance in a study, different profile characteristic groups must also be considered (Rubin et al., 2008). The test participants' profiles as created above were examined for novice and expert users. Novice users were those participating in the training for the first time and who had only recently interacted with the web page, and expert users were those who had joined the training program previously and had already interacted with the training web page (Geisen and Berstrom, 2017).

In this part of the study, user profile characteristics were determined by a quick survey to find demographic data. The results obtained in this study were based on a certain group and time. The results of the test may therefore vary according to different types of participants and time intervals. It cannot be said that the results fully reflect all participants.

5. TEST DESIGN, RESULTS, AND ANALYSIS

5.1 Objective of the Chapter

In light of the information mentioned in the previous chapter, user experience with websites is of the utmost importance. User experience includes a wide range of features defined in ISO 9241-210:2010 (2010) standards. These features are the criteria that a website must meet.

In this study, a training web page interface is evaluated by the user experience method in terms of usability. The reasons for choosing this method were determined after an interview with the association's instructor. The outcomes of that interview were as follows:

- There has been a decrease in the number of students as a result of the increase of competing organizations, with financial loss.
- Inadequate information is provided about the training.
- Students contacting the instructor after the training and asking questions increases the time spent by the instructor.
- The training generates a large proportion of the association's income. That is why it should be more visible for potential students.

According to the results of the interview, the TKSD wants to get ahead of its competitors and needs to provide more detailed information about the training. These were therefore the topics selected for analysis.

In this chapter of the thesis, analysis and interpretation of usability test results are performed according to the types of questions and the content of the research.

5.2 Test Plan

Usability test planning consists of the determination of objects, selection of participants, design of test questions, creation of test environment, and identification of the tasks of the moderator and other tasks.

5.2.1 Objective of the test

It was decided to evaluate the website in terms of owner and user experience based on the outcomes of the interview with the TKSD, as has been previously mentioned. Based on the test results, it was measured whether or not the design fulfills user satisfaction and expectations.

The usability of the design of a product is tested during the project before it is released. This is generally done for products that have not been tested before. The website being evaluated in this case study was published in 1998. However, it was not subjected to any measurements after its initial publication. It was therefore decided to evaluate the web page based on a cause-and-effect relationship.

The benchmark method was deemed appropriate to observe the TKSD's position in the field. In order to be able to compare it with its competitors, business information was also needed from other organizations. As information could not be obtained from competing organizations in this field, this evaluation could not be performed.

5.2.2 Participant selection

The participants were determined according to the content of the subject to be studied. Since the subject of the study is in a specific field, a specific group of relevant people were identified as participants in the test. This method is called the focus group method.

A paper-based profile test was conducted during a training session to obtain preliminary information about the participants. This provides information about the general student profile. According to the test results, it was decided that the training participants should be utilized as test participants. In order to be able to work with a sufficient number of subjects as a focus group, students who participated in two different training sessions were tested. The participant group consisted of a total of 30 men and women.

5.2.3 Question preparation

Questions are directed to research participants to gather information and collect qualitative or quantitative answers according to the type of research. Table 6 outlines the question types generally used in research (Typeform).

Table 5.1: Generally used question types

(Typeform, https://www.typeform.com/surveys/question-types/)

Close-ended questions	The answer is yes or no. This is the method used to answer the most basic questions.
Open-ended questions	This is a type of question used to get detailed information directly from the user without a yes or no answer.
Multiple-choice questions	There are two different types of multiple-choice questions. The first allows a single answer to be selected and the second allows for multiple answers. Single selection questions are usually constructed with the radio button option. Check boxes are preferred for multiple answers.
Rating questions	This format measures what the respondent's predominant inclination is.
Likert scale questions	This format is used to learn the user's opinion about product usage and service satisfaction.
Picture choice questions	This type of question is answered by observing the answer visually while explaining a subject to the person being questioned.
Demographic questions	These questions are prepared by selecting one or more of the above-mentioned question types.

Close-ended and open-ended questions were used in the demographic test. In the results obtained from this test, the answers of the close-ended questions were evaluated based on the scale of predominantly given answers on a quantitative basis. Open-ended questions were evaluated on a qualitative basis.

In the usability testing, 21 out of 22 questions were multiple-choice, and at the end of the test, 1 question was prepared as an open-ended question to get opinions about the test.

The questions were based on the problems identified as a result of the interview:

1- Is the website easy to access for potential training participants?

2- Do the participants return to the site after the training?

3- Does it help to provide sufficient guidance on the path to be followed during the registration stage?

4- Can the participant find the information sought on the training page?

5- What is the most important feature the participant seeks on the website?

6- Does the web page appeal to the eye?

7- Can they find what they are looking for on the web page?

8- Can they reach the web page organically via a search engine?

9- Do they find the icons, images, etc. useful on the web page?

10- Is the information given on the web page about the education process sufficient?

With the first 9 questions, the goal was to evaluate the approach of the user to the technology and the position of the TKSD in the sector, as well as how the student learns about education, in terms of the association, as mentioned before. With the remaining 12 questions, the interaction of the user with the training website was measured. Questions and answers were not shared with third parties. Informed consent was obtained from all participants. At the end of the test, an open-ended comment section was included to get the opinions of the participants about the test.

5.2.4 Test environment

A paper-based method was used for demographic testing on the first day of training under the supervision of the trainer. It was determined that 41% of the participants were from Istanbul, 59% were from outside Istanbul, and 100% were working full-time.

Based on these results, it was concluded that the usability test could be performed in an unmoderated fashion in the user's personal time via a web survey.

It was found that 86% of the test subjects were participating in the training for the first time. This shows that the interaction with the website was possibly occurring for the first time; there may have also been interaction while searching for information about training on the web. However, since there was no definite information about the time and date of such possible interaction, it was accepted test participants as first time interaction with the web page.

The Google Forms platform was used in preparing web-based surveys. This platform is free and supports many types of questions. Survey answers are collected in Excel files and reports are prepared automatically. This makes it easier to evaluate the results. This platform is commonly used for academic, industrial, and research purposes.

5.3 Results

In order to measure a user's interactions in terms of usability of the web page, it was necessary to test with two groups, and it was determined that the number of participants should be 30 or above.

Test were conducted on 18-21 February 2019 and 4-7 March 2019. The number of respondents was 17. The second test was conducted 4-7 March 2019, when first focus group participants completed the test. Four participants completed the test 4-7 March 2019.

Thirteen people completed the test on mobile phones and 4 people answered on laptops. The test was completed with one's own technological products on the individual's own time. Nine people completed the test via the Chrome browser and 4 people via Safari on mobile phones. Those who completed the test on laptops preferred Internet Explorer. Participants named the most important website feature as efficiency according to percentages, followed by content and safety, respectively.

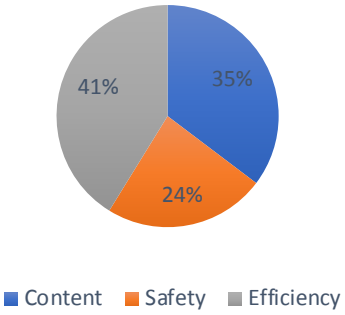

Figure 5.1: Question 3: Most important feature of a website

In response to the questions asked in order to identify the position of the TKSD in the sector, participants stated that they obtained the most information from the Turkish Standards Institute.

The rate of those who had received advice from participants who had participated in the training before was 17.6%, the individual participants who searched for training on web were 11.8%, and those who obtained information from other resources were 17.6%. No one reported having received information about the training via social media.

The main reasons for choosing to receive the MSDS training from the TKSD were due to the trainer or to the content of the training, as both of these choices received 29.4% of the overall responses. The rate of people sent for training was 17.6% and those who attended for other reasons were 23.5%.

A question was asked to determine the order of visibility using the Google search engine; 52.9% replied that the web page appeared as the first answer, while 41.2% stated that it was in the first lines of the results, albeit not directly ranking in first place, and 5.8% stated that it could be found on the following pages.

The overall rate of interaction with the site before was 76.5%, and the rate of those who had never interacted was 23.5%. The site was found by 52.9% to be fast loading, by 5.9% to be very fast loading, and by 41.2% to load with medium speed.

The first of the questions asked to measure the usability of the training web page aimed to determine organic access to the web page via the Google search engine. In response,

88.2% of participants stated that the web page was the first result and 11.8% said that they searched for the training page for a long time.

Furthermore, 88.2% of the visitors stated that the association's website was appealing to users, while 11.8% did not understand what the intent or purpose of the website was.

Access to the education page from the main home page of the website was found to be of medium difficulty by 58.8%, while 41.2% of the visitors reached the page easily.

The rate of those who had visited the website before was 52.9%, and 11.8% did not remember fully interacting with the website, while 35.3% of the participants had never visited the website before.

The loading speed of the page was found to be medium by 50% of the participants, whereas 43.8% found the loading to be fast and 0.02% found it to be very fast.

When interacting with the education page, visuals and menu titles were the first items that attracted attention, and 11.8% of the participants received information about education. Meanwhile, 15.8% of the participants indicated that other elements on the page attracted their attention at first glance.

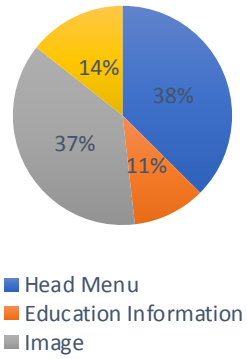

Figure 5.2: Question 14: Things attracting attention at first sight in web page interaction

In terms of visuals, 88.2% of the participants thought that they contained information about the education given, while 11.8% thought that the visuals were not relevant.

Menu functionality was noted by 87.5% of the participants, and 12.5% found that the menu buttons were not functional enough.

The rate of those who wanted to share the education page with others by using the social media buttons on the page was 52.9%, while 47.1% did not plan to share.

Two of 4 laptop users stated that the social media buttons did not work and 2 of them said that they shared the information. Out of 13 test participants used mobile phone to reply, 6 of them could share web page the information through social media buttons.

The search engine on the web page to find the word search 88.2% said that information was found easily and 11.8% stated that they could not find what they were looking for.

In terms of content, 88.2% of the participants stated that there was enough information about training. In addition to the formal safety data sheet training, the awareness of the person giving the training is also important. Those who obtained information from the TKSD website about the educator constituted 23.53%. The person who provides the education is also an employee in the chemical sector. On the other hand, 23.6% gained their information about the person during the training itself.

Demographically speaking, the majority of the participants came from outside Istanbul. Therefore, it can be assumed that transportation to the place of education is important. In this regard, 94.1% stated that information about the training location was provided on the web page. However, 5.9% of the participants thought that no information was given.

Regarding adaptability in usability, 64.7% of participants said that they easily adapted to the website when they evaluated it in terms of learning. However, 17.6% found it difficult to find what they were looking for and 5.9% evaluated it in other respects.

The rate of participants using the web page again or making recommendations to return to the page was 94.1%. Those who did not intend to recommend the page were 5.9%. To increase the user's return to page a question was asked. Among the answers, it was

commented that “raw material links” could be added to the search engine. Test participants reached the web page via mobile phone stated that they couldn’t for any features.

In general, there were three answers about the test itself, which were that it was good for informative purposes, that it was an efficient test, and that the purpose of the test was not understood.

5.4 Analysis

Nine people answered the test via mobile phone using the Chrome browser. Chrome is preferred by many people in daily life and general usage. According to Google, users can log in and customize Chrome, upload files, and ensure that files are available on the phone, computer, and tablet (Google). As stated, Chrome can also be used from mobile devices. As for those who responded via the Safari browser, it is a browser that comes loaded with Mac OS and iPhone, belonging to Apple. In this system, navigation on tablets, laptops, and iPhones is easy thanks to iCloud.

According to the information mentioned above, the test was completed on iPhone for Safari users using mobile platforms. For Chrome, both Android and iPhone can be used. Participants who completed the test via laptop used Internet Explorer. Internet Explorer is a browser for the Windows operating system. It can be assumed that users of laptops use Windows as their operating system.

As stated in ISO 9241-210 (2010), the features that should be available on a website include functionality as the most important feature of the website, along with learnability, memorability, efficiency, flexibility, and safety. According to the results, it is of the utmost importance that the site be able to be used. In this case study, it was found that functionality should be at the forefront of design for this focus group.

The rate of people who chose to receive training from the TKSD due to the content of the training was 29.4%, while 17.6% were sent by the companies they worked for and 23.6% came for other reasons. The person who prepared the training was the same as the person providing the training. We may say that the people coming here may have

preferred the person providing the training. But we cannot be sure about this assumption. 23.5% of the participant prefer this training from TKSD for other reasons.

Participants who found the TKSD corporate website via the Google search engine as the very first result were 52.9%. Another 41.2% stated that they saw it in the first lines of the results, though not directly in first place. It ranked first when searching for TKSD in the search engine. In addition, it is not known which keywords people used on other pages. There are several features that affect website visibility. These features can be manipulated by promoters and marketers. An example of this is repetitively writing the same word (Bonzi and Soldani, 2008). This may cause a site to lag behind even though it was built with quality. Based on this, it can be noted that 5.8% of participants only found the site after the first page of search results. Rearranging the keywords of the website may be helpful. This was also the case for the training page.

Those who said that the web page was organically ranked first by the Google search engine were 88.2% of participants, while 11.8% stated that they searched for a long time. Searching in Turkish for "information about TKSD's mSDS training" in the search engine, the website ranks organically in first place. When searching for "safety data sheet training," however, it is in 16th place. One of the customer-related problems is to increase the visibility of the training. However, those who do not know the name of the association do not encounter the site directly while researching the training. Above Bonzi and Soldani (2008) mentioned the importance of using the right keywords for ranking, which is once again proven to be important here.

Among the participants, 88.2% found the home page of the association's website appealing, while 11.8% said they did not understand it. Petersen et al. (2004) stated that aesthetics are as important as usability criteria. While trying to design an aesthetic product, it is possible to deviate from the desired features. For this reason, 11.8% of participants did not understand the intent of the website. It can be said that the correct steps were taken in product design since the proportion of those respondents who came into contact with the product and found it appealing was high, but we cannot be sure whether the process was conducted in the right direction.

The rate of those who had previously interacted with the site was 76.5%. However, the site has never been tested before. This can be considered as the starting point for measuring the usability rating of the site.

The loading rate of the site was found to be fast by 52.9%, medium by 41.2%, and very fast by 5.9%. It can be concluded from this that the majority of pages load fast. The Google PageSpeed Insights page gives an opportunity to test web pages' loading speeds. The mobile and desktop web page loading time results are illustrated in the following figures.

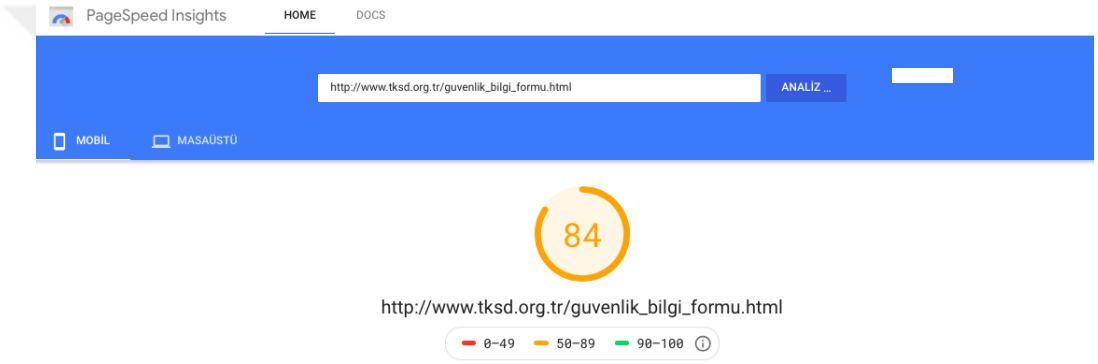

Figure 5.3: Safety data sheet training web page loading time on mobile phone (Google PageSpeed Insights)

Figure 5.4: Safety data sheet training web page loading time on desktop computer (Google PageSpeed Insights)

Of the participants, 52.9% had previously interacted with the test page. However, 11.8% did not remember whether they had interacted. Meanwhile, 35.2% of the participants had visited the website.

Additionally, 58.8% of participants reported moderate difficulty in reaching the safety data sheet training page from the website's home page, while 41.2% said it was easily reached. Eight people said that they could reach it with medium ease in the tests that they conducted on mobile phones. Five people could easily go to the page. Of those who used a laptop, two people reported it to be easy and two people to be moderately easy.

It was reported by 41% of participants that on the education page the first striking points were visuals and menu buttons. This supports the theory (Watzman, 2002) that continuity of grouping perceptions based on organizational theory also includes a design pattern in a certain order.

Furthermore, 88.2% of respondents thought that the visuals on the page were related to the contents of the education program, while 11% thought they were not relevant. Brand images are visual elements are determined by consumer demand. It can be said that according to these test results the images on the website were approved by the majority of participants. It can thus be concluded that the images are sufficient. However, this can only be assumed for this particular group of test takers.

The menu buttons, which were tested as a representation of usability, were found functional by 87.5% of participants, while 12% found the buttons to be useless. This ratio shows that the buttons are sufficient in terms of usability for the majority of users.

The TKSD does not have any social media accounts. However, there are social media buttons on the website. In order to measure the interest of users, they were asked whether they shared the web page by using the social media buttons. In response, 52.9% said they did and 47.1% could not share the web page. In both mobile and laptop versions, the social media buttons do not work. Therefore, it can be concluded that those who said they shared the web page did not understand the question or were sloppy in their response. Only 47.1% of the respondents answered this question correctly.

The search engine on the page that should make it possible to search for specific topics was found by 88.2% of participants to be easy to use, while 11.8% said they could not find what they were looking for. The search engine does not respond on mobile and laptop platforms, even when searching for specific words. The research has thus shown that this search engine not working. Also, in the comments section, "Raw material links" was requested to be added to the search engine database.

Website's home page serves as a link, which contains the relevant information on pages relevant to the overall website. It can be assumed that the content specified on the website homepage is starting point and webpages are linked to this content (Djonov, 2007). On the website, detailed information about training is given on the web page. The adequacy of the information given was found to be sufficient by 88.2% of participants, while 11.8% did not find it sufficient. Considering that a large majority responded positively, it can be said that sufficient information is given about education.

It was seen that 29.4% of participants chose this training program because of the program's contents. Another 29.4% chose it because of the instructor, while 17.6% were sent as employees of various companies and 23.5% participated for other reasons. Considering these results, it can be concluded that the content of the training program and the instructor are most influential in participants' decisions to enroll.

Webpage usability features were easily adapted to by 64.7%, but 17.6% could not find what they were looking for. Again, as a large majority responded positively, it can be said that the site meets expectations on average.

Of the participants, 94.1% said they would like to return to the site for further information. The percentage of participants who would not recommend a return visit was 5.9%. A quality website design is one that can keep existing customers as well as bring in new ones. For this, the customer return rate can be monitored and determined. Retention rate (Ascarza et al., 2018) can be obtained by evaluating the number of newcomers to the training in terms of UX. However, since sufficient data were not

shared by the TKSD, comments can be made about the retention rate only by looking at usability testing results.

Participants were asked to give their opinions about this usability test. Three main points of feedback were received:

- Good, informative test
- Effective test
- Did not understand the purpose of the test

6. WEB PAGE REDESIGN

6.1 Objective of the Chapter

In this chapter of the thesis, the results of the analysis of the answers obtained in the previous chapter will be evaluated. According to the results of the analysis, solutions will be proposed for the problems that were determined. These solutions will lead to the design of a web page wireframe according to the suggestions.

6.2 Results of Analyses

On 18-21 February 2019 and 4-7 March 2019, usability tests were conducted with two focus groups having the same characteristics. Test participants completed the test using mobile phones or laptops. According to the analysis results, the participants used various browsers. Considering that the website was open during the test and the questions were answered using the site, it was concluded that the site was prepared in accordance with these various operating systems.

The biggest factor in choosing this education program was the Turkish Standards Institute at a rate of 52.9%. It was noted by stakeholder that the association works in partnership with the TSE. The percentage of those who obtained information from a source other than the TSE was 17.6%. The TKSD should increase this rate of recognition to become more visible. As indicated in the analysis, studies should be carried out in the field of marketing. For this, certain strategies should be followed.

As mentioned above, according to the results of the analysis of the marketing-oriented study among people who were already receiving training and potential participants, training was found to be appropriate. The training is not compulsory, but students still prefer to receive the training before the exam. The topics of the questions are determined by the Ministry of Environment and Urbanization. It prepares the content according to the categories in which the TKSD will provide training. As stated, in the present test results, the person who prepared the content of the training and led the training program was one of the two factors that received the most votes in terms of why participants decided to enroll in the program. A different approach should be

followed in the field of marketing by looking at the data obtained and more research should be done on this subject. However, as mentioned, marketing is not within the scopeofthisthesis.

The TKSD website and its training web page were searched using the Google search engine page with specified keywords and the resulting rankings were analyzed. The website must first of all provide convenience for someone who wants to research the TKSD and this can be said to increase the demand. However, the main goal is to bring training web page to the forefront.

When the whole website is analyzed, according to the results, the site is appealing on the whole in terms of aesthetics. However, 11.8% of respondents disagreed. Further research may be done to improve this rate.

In order to measure the loading speed of the web page, two separate application areas were examined: mobile and desktop usage. Satisfaction rates were 84% for mobile webpage loading and 98% for desktop webpage loading. However, other data affect the loading speed in Google PageSpeed Insights. According to the results of this analysis, in order to speed up the page, data affecting the loading should be examined in terms of text, images, and coding and collaboration should be pursued with these different departments.

When the rates of interaction with the training page are examined, it can be said that the users are mainly informed about the page. However, 35.3% had not visited before. Based on the analysis outputs, there are many factors affecting the interaction. These factors should be listed to examine the ways in which a user follows the site. We cannot be sure exactly when or how participants interacted with the web page.

Direct access to the training page from the home page is also average easy on mobile phones and laptops based on the analysis results. This can lead users to become bored and leave the site during redirection. Therefore, it is necessary to determine the circulation cycle of the site correctly.

After reaching the training web page, the elements that first attracted the attention of the users were visuals and menus according to the results. The functional arrangement of menu buttons in order to guide the user and their organizational placement were found to be successful by the participants. In addition, one of the first striking elements, visuals, was linked to the content of the education program. According to the results of the analysis, change is not necessary in this regard because the visuals are sufficient. It can be said that, according to participants' answers, the layout of the menu buttons on the web page is correctly designed for navigation when users are searching for what they want. In this case, it may not be necessary to take action to edit the buttons on the web page.

Social media has great importance in our age. Instant sharing is possible through various social media channels. The user can share his or her instant content via other channels with buttons on the site or on the page. However, according to the analysis, the social media buttons of the website of the TKSD do not work. In order to increase the rate of return to the website and the education page, users should be able to share the page instantly and actively participate in social media.

Like the social media buttons, the search engine on the web page was not functional on the mobile and desktop sites. The results of this test analysis revealed that the problem was not understood by the participants, as in the question about the social media buttons. However, as mentioned earlier, an instant stream of information can encourage the user to visit the page again to find what he or she is looking for on the site. According to analysis of the test's comments section, the title and content of "raw material links" should be added to the search engine. The contents given on the website and the related web pages are of great importance to increase the number of students participating in the training and to emphasize the education. According to the results of the analysis, the information given on the study sheet was considered sufficient. Therefore, it may not be necessary to make changes to the text contents on the page. On the other hand, using different test participants, new results may reveal that the content is not sufficient.

Among the reasons for deciding to receive training from the TKSD, the instructor was mentioned at a rate of 29.4%. According to the results of the analysis, information about the person providing the training was mostly obtained from the TKSD website. The website has only the name of the trainer. From the results of the previous analysis, it was revealed that the person preparing the training and the person providing the training were the same. In this case, it can be said that the instructor is potentially important for the people who participated in the training, and promotion of that person can be given more space on the training website.

Adaptability, one of the usability components, must also be present for a website. In this way, a person using and adapting to the site can then easily return to it. In this case study, 64.7% of participants stated that they could easily adapt to the site, but 17.6% said it was difficult to find what they were looking for. According to the analysis, the site meets expectations on average. These responses are influenced by features such as the content of the site and redirection through the home page. Overall, the rate of people who would recommend the site to someone else is quite high. Determining the flow rates of users coming to the site and how they found the site could increase the rate of return. This can be useful in determining strategies for sales and marketing. However, this is only based on the present test results and these results could be different in another test.

In usability testing, according to the results of the analysis, participants may have incorrectly answered 3 questions or did not understand those question. Among these questions are two questions that need to be re-evaluated. These questions addressed the social media buttons and the evaluation of the site's search engine.

Overall, 77.5% of the answers were obtained, with the exception of 3 out of the total 24 questions asked. On the other hand, 2 of the 3 main answers regarding the test itself were positive in the comments about the test. It can be said that 66.6% of the test participants had a positive attitude towards the test.

6.3 Solution Suggestions

These suggested solutions are based only on the present test results and cannot be generalized to other tests or analyses.

According to the results of the present analysis, suggestions may be made in the following areas:

1. Google search engine optimization of the site in the first place to improve search engine optimization.
2. Reviewing the results of Google PageSpeed Insights analysis to improve page loading speed and fix errors.
3. Making a search engine available on the website.
4. Improving users' access to the web page via the homepage

Training participants may have access to the website in various ways. What is important here are the steps followed by those who decide to take the training from the TSE and therefore from the TKSD, and how much the TKSD is considered in this flow. Therefore, the character or persona of the user is determined to identify the characteristics and needs of users according to the test results (Chang et al., 2008).

A user flow was created according to the designed persona types and the obstacles and deficiencies experienced in the process were observed. Looking at the user flow table, there is no information to direct the participants from the TSE safety data sheet training page to the TKSD website or the safety data sheet web page. When access to the web page is accepted as one of the tasks in the user flow, the solution can be produced by sharing the link of the web page as content directly from the training page. A joint study could be conducted by the TKSD to contact the TSE, which is an educational partner of the association, to have the TSE place this information on its website.

According to the results of the analysis, the information about the training on the website is sufficient. However, the website states that "Education Program can be found at the following link." No active link is provided there. A link would be helpful.

Software solutions are not the subject of this thesis. However, according to the analysis results, a functional site is the most important feature for the user. It is necessary to activate the search engine on the TKSD site. Such work is to be included in the planned workflow of the site in line with the interviews with the website project manager. In addition, information including "raw material links," as per participants' comments in the usability test, should be added to the search engine data.

In the usability test, the loading speed of the web page was investigated for two different formats: Google PageSpeed Insights results were obtained for both mobile and desktop usage. In order to increase the speed of the page, PageSpeed Insights was suggested. This input can be shared with the software department to produce solutions.

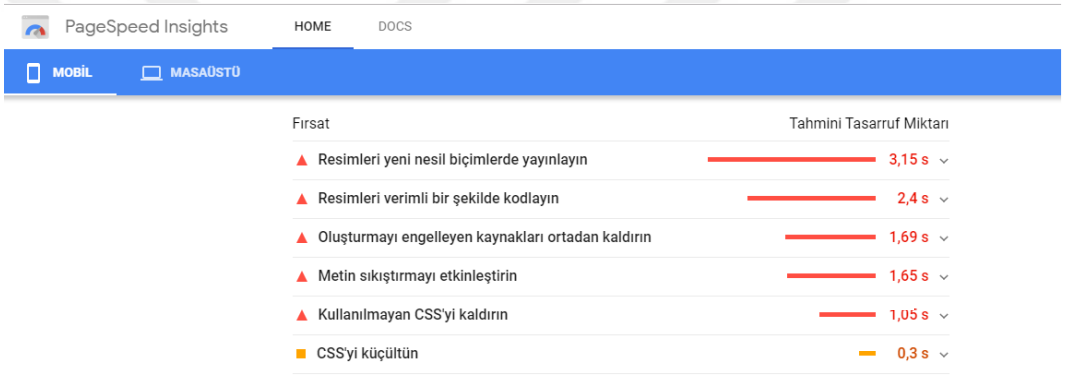

Figure 6.1: TKSD web page mobile version, Google PageSpeed Insights evaluation opportunities (https://bit.ly/2m0P9KK)

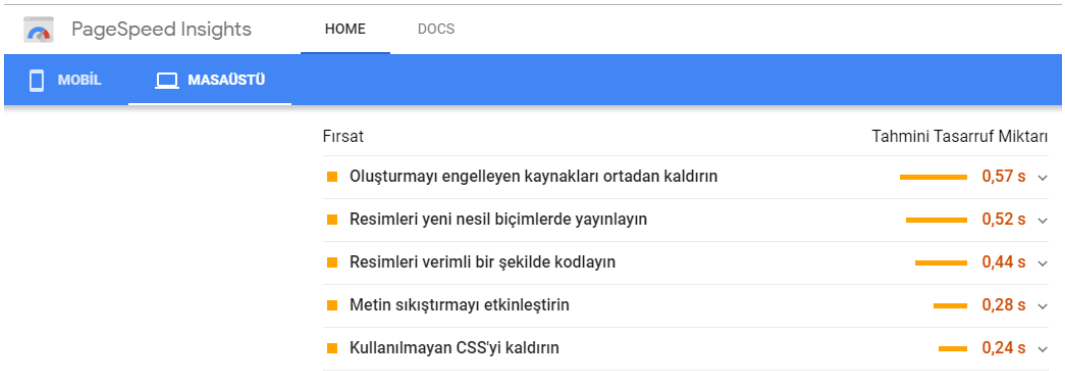

Figure 6.2: TKSD web page desktop version, Google PageSpeed Insights evaluation opportunities (https://bit.ly/2kQK6MU)

The proportion of usability testers using mobile phones seems to be quite high based on the test answers. It was assumed that participants accessed the main page of the website using a convenient medium. Mobile access to the web page is done through the main menu. A mobile-responsive design of the website should be provided for the continuation of the information sequence flow that provides convenience in terms of usability on the desktop. It would be appropriate to have a professional team work on this solution.

Search engine optimization is a type of software application that collects data about websites (Yalçın and Köse, 2011). Data are indexed and collected in a database. All of these operations are performed by software programs called bots, crawlers, and spiders. When a user types a keyword into the search engine, references to that word are reviewed in the database and the specified results are sent to the user. In the results, it is important that the web page that is desired to be marketed rank among the first five results.

The "tksd.org.tr" link ranks first in the search engine. However, the education web page ranks 16th. In order to get the site into the top rankings of Google, the Google Search Engine Optimization Starter Guide can be used. In order to get to the top of the list, a URL checking tool can be used to check whether the site sees each piece of content while browsing Googlebot. The web page would be scanned in the URL and the file suggested by the Google search console could be upload to the site. On the other hand, there are other tools for checking URLs, so it is not possible to be sure that Google is the best tool for making this decision.

The <title> tag can be created after the URL check. The guide states that a unique title should be created for each page on each site. It is stated in any search engine that information about the page is available via the metatag. It is recommended to place the metatag <head> section of the html document of the page. The metatag can be written in the form of a short paragraph or sentence. As stated above, studies that are planned in the field of software should be designed and applied in cooperation with the software

developer of the site. According to Google's recommendations, the metatag of a web page must also be added as unique content.

The elements used in the design of the website can be seen to be important for search optimization. It is recommended by Google that the used elements should be used within the limits that Googlebot can crawl. The effects of the elements on the training web page's loading speed were measured with Google PageSpeed Insights. According to the results, if changes are made considering the suggestions here, the site's loading speed could be increased and Googlebot could crawl more easily.

It seems to be important to find the organization via social media channels based on the results of the analysis. Social media is used to position a company in the market and to make customers loyal to the brand. By virtue of social media, it is possible to reach different user groups for large companies as well as small companies. Erdogmus and Cicek (2012) suggested that, unlike traditional marketing, a special social media strategy may be needed for extra attention and brand image.

Brhel (2013) suggested the following steps as a way to follow a social media marketing strategy:

1. Business objectives and outcomes from this project
2. Demographic group to create content by identification and recognition
3. Social media strategy should include the company's brand line
4. Social media integration of the digital assets/channels should be checked

These suggested steps for a social media marketing strategy can be used by the TKSD. For the redesign section of this thesis, the user profile was researched. According to the results of the research, LinkedIn, Facebook, Instagram, and Ministry of Health applications are used by 55% of the participants while 45% do not use any applications. However, this test was performed with 30 people, so it cannot be said that these results show exactly which social media platform should be targeted.

The social media icons currently on the website do not work because the association has no social media accounts. Once such accounts are activated, they can be placed on the site with the current icons in accordance with the information architecture.

6.4 UI Design

In this part of the thesis, a proposal is made for redesigning the website regarding the "training" information in terms of information architecture and accordingly drawing a wireframe.

6.4.1 Information architecture of the "Education" ("Eğitimler") category

In order to redesign the web page according to the suggestions, information architecture definitions are used. Information architecture does not have a single definition and it comprises many tasks (Morville and Rosenfeld, 2006):

1. Gathering and evaluating data for information management.
2. To structure this information, deciding what is important for the site's purpose according to informative, distinctive, and meaningful categories. Labeling the categories and links that navigate to them.
3. Managing information correctly to ensure that users find what they are looking for on the site. Effective content management, clarity of policies, and procedures used should comply with the firm's business objectives.
4. Seeking creativity, knowledge, and experience while building information architecture. These should not be evaluated only numerically.

In order to redesign the web page, efforts were primarily made to collect information about users, conduct user research, determine how they access the information they seek on the website, and collect information about the categories of content on the site.

Questions were asked about the content provided on the site and on the page. According to the results of the analysis of the relevant questions, sufficient content information is provided on the web page. Therefore, no content changes will be made. However, it was

deemed appropriate to conduct a separate usability test to gather more detailed information about the content.

Information architecture patterns were used as the first stage of the redesign of the website and information architecture. There are many patterns for websites with different contents and serving different purposes. The hierarchy pattern was preferred for the website in this case study. Hierarchy patterns are suitable for sites with a home page and several lower levels (Spencer, 2010).

The hierarchy of the site has been extracted to determine the location of the training page (Figure 6.3: Turkish Chemical Association website hierarchy).

As seen in the hierarchy, there are 22 sublevels assigned to a headline, eight categories, communication, and other titles besides the responsible care label. The labels for these levels are determined depending on the content of the website and the business strategy during the site design by the association. The safety data sheet training page can be found under the "Training" label. Under the "Training" label, there are also training and consultancy sublevels. In the analysis of the test results, it was stated that access to the safety data sheet training page on the home page was of medium difficulty. When determining the navigation of a website, it is recommended that the subpages be defined and the main page be designed accordingly. The association may be contacted again for the contents of each predetermined label.

In order to edit the information architecture of the site, it may be appropriate to check the content of the site first. This thesis only evaluates the usability of the safety data sheet training web page; no data are available on the website regarding user experience. In the research conducted for the web page, the results showed that the page was sufficient in terms of the information given about training. The TKSD is the contracted institution of the TSE. The TSE is the first company that stands out in educational research. In this situation it may not be a correct step to benchmark web page based on the information architecture of the TSE's competitors' sites.

The association was interviewed about the "Consultancy" sublevel within the "Training" category and it was stated that there is currently no work reported. In addition, the TKSD has been appointed as the competent authority by the Ministry of Environment and Urbanization in order to provide the necessary training in accordance with the legislation briefly referred to as KKDİK in Turkey and REACH in the European Union.

This information is mentioned at the level of "Training." The "Training" level also includes information that has already been presented. In order to access the safety data sheet training page, the category titles for the page should be agreed on with the association, as stated above.

Suggestions that can be made to the TKSD regarding category and level titles are as follows:

- In the information architecture, "Training" can be changed to "Trainings" since there is more than one training program offered by the TKSD.
- The "Consultancy" page that has lost its function should be removed from the lower levels of the "Training" category.
- A separate web page should be created with information on the training of chemical assessors (KKDİK).
- The "Safety data sheet" level title can be maintained.

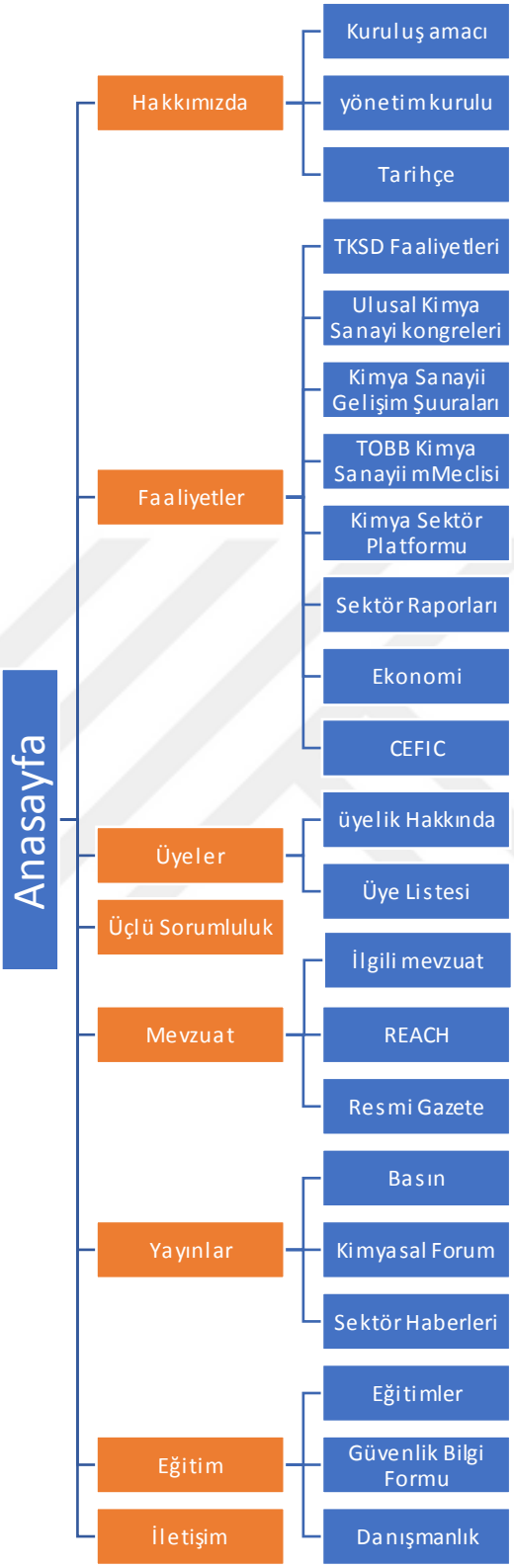

Figure 6.3: "Education" (Eğitimler)category information architecture

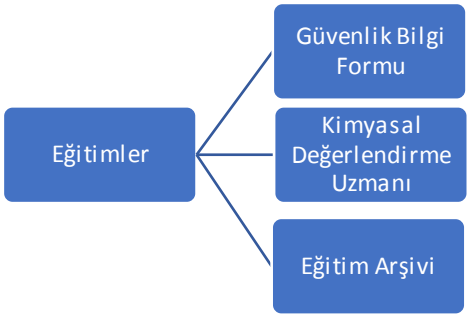

Figure 6.4: Information architecture of the "Education" ("Eğitimler") category

- The title of "Trainings" given to introduce previous trainings can be published under the title "Training archive" at the end of the category in the new architecture.

According to the above suggestions, the information architecture to be arranged for trainings can be designed as follows in the next subsection.

6.4.2 Wireframe

At the end of the skeleton formation stage, the product or service is sketched. This determines the structure that will support the system. A wireframe is used to represent and visualize this structure. Wireframes are two-dimensional drawings that illustrate the functioning of a site, how visual components will be placed, and how interactions will occur.

The web page wireframe was designed using a tool called MockFlow. It has an easy-to-use and simple interface and is compatible with most devices. It has the ability to share the prototype design with customers and others on the project team. This allows for quicker feedback on the design. There are a variety of components that can be added to the design: videos, images, social media bars, etc. Other advanced features are available with extra payment. The wireframe proposed in this thesis was designed with the free version of this design tool.

The process followed in wireframe design is as follows:

First, the "Trainings" category label suggestion is based on the usability test results of the mSDS web page. In this design proposal, the user becomes a focal point and solutions are applied according to the analysis of the test results.

The TKSD's logo is located above the header. The buttons above the logo have been removed in order to preserve the information order and page integrity. To ensure continuity of the pages on the site, the visual part is kept at the top. The position of the search engine is not changed. The "EN" button is placed at the search engine to switch to the English version of the site.

The "Responsible Care" logo was deemed appropriate to be removed after consultation with a TKSD official. This logo does not provide information about the safety data sheet.

Regarding the arrangement of content, the text about the training is placed in the center of the page and in accordance with the white-space rule (UXPin, 2015). In this way, users can find what they are looking for by focusing directly on the content.

Since social media accounts are included in the content, they are updated instantly on the left side of the training information, allowing the user to follow the responses on social media.

As a marketing strategy, the TKSD representative stated that they had previously prepared monthly bulletins for their members. He stated that they could put this into practice again in the future. For this reason, the content of the page placed in the design after the above information flow is maintained.

In the proposed information architecture scheme, the "Training archive" within the category was created for publications on previous training programs. In this way, participants can gain a preliminary impression of the training process. A "News" section has been added to learn about MSDS training and other trainings. Current news can be provided here as well as information about old training programs.

In the footer section of the page, the FAQ (frequently asked questions), social media buttons, and contact information, which had been removed from the header section,

have been added. The TKSD logo is placed here and an “About” section is added to give information about the association. It is designed for those who want to get detailed top-down information about the TKSD.

Copyrights are mandatory descriptions for every site. In this case, it is placed at the bottom right of the footer of the page.

The “UP” feature, which had been added to the bottom of other pages to quickly return to the menu above, is also included in the design.

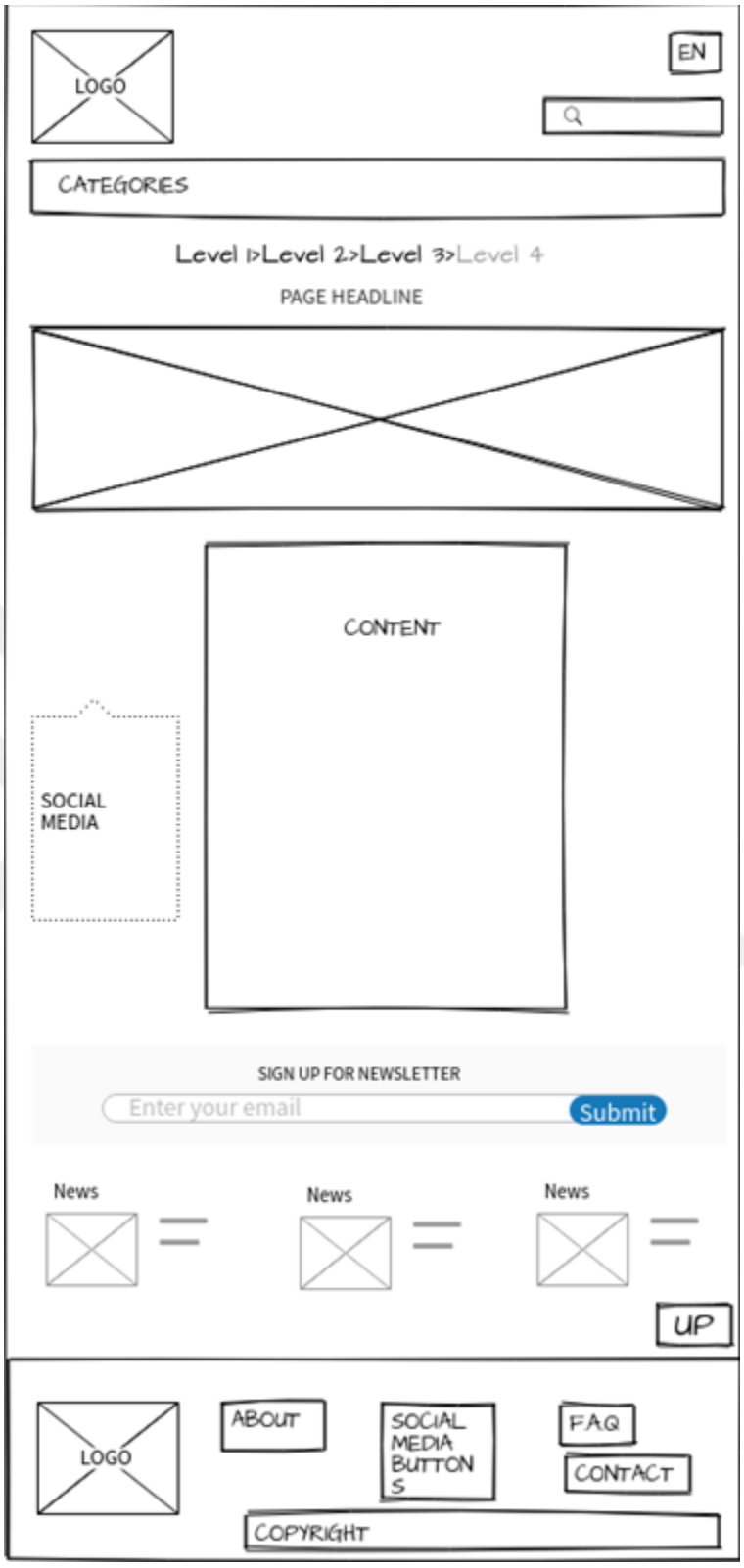

Figure 6.5: mSDS web page wireframe – MockFlow Tool

7. CONCLUSION

The aim of this case study has been to evaluate web page usability, which is a digital product in terms of user experience, with reference studies, research, and articles. User experience is an important principle in many product designs. In this study, the usability feature was investigated, which is one of the subcomponents of user experience.

In order to understand user experience, the reason for the emergence of this concept and its changes in the process were first investigated in a literature review. When the interaction of human beings with computers is examined, it can be seen that user experience was not immediately accepted, but it gradually started to be explained in articles, symposiums, and seminars and became accepted by authorities over time. The issue of whether user experience could be fully defined remained controversial among authorities for a long time, and the consensus reached by a panel in 2009 was that it does not have one set definition. It is possible to see this in the various definitions given in the literature. Experts who wanted to hold user experience to a certain standard in order to apply it in every field developed the ISO 9241-210 standard. This was an updated version of the previously prepared ISO 13407:1999 standard. The purpose of the standard is to take the user as the focal point in the design of products by utilizing user experience. In this study, user experience methodologies have been used as the focal point when redesigning the TKSD web page.

Different methodologies can be selected according to the subject and content of each project in user experience research. In this study, an unmoderated remote test was chosen for the usability test. Among the reasons for this preference, it made it possible to reach more people.

The web page studied in this thesis is intended for a specific audience. Therefore, a focus group study method of 30 people were preferred and user profile research was conducted. Usability test questions were prepared within 3 weeks and administered between two groups of people who participated in two different trainings in the same month. A total of 30 people completed the test. Test results were collected over a

1-month period. According to the results of the analysis of the collected tests, solutions for the redesign of the website were presented. Information architecture, which encompasses the entire website, is generally employed for solution proposals. From this point of view, a new wireframe was created.

The answers of the test participants revealed that the current version of the website is moderate in terms of usability. It is aimed to make the site more active by updating it according to the proposed solutions in the fields of design and software.

Measurements should be continued after the design is updated to keep user experience at a high level. Data from users are important in maintaining user experience.

In future studies by the association, evaluation of the whole website in terms of user experience would help to move the TKSD one step further ahead in the digital field.

REFERENCES

A Division of the American Chemical Society. (n.d.). Empowering Innovation & Scientific Discoveries. Retrieved from: https://www.cas.org/about/faqs

Abrahão, S., Cachero, C. & Matera, M. (2008). Web usability and accessibility. Journal of Web Engineering. 7(4), 257-257.

Abras, C., Maloney-Krichmar, D., & Preece, J. (2004). User-centered design. Bainbridge, W. Encyclopedia of Human-Computer Interaction. Thousand Oaks: Sage Publications, 37(4), 445-456.

Abuaddous, H.Y., Zalisham, M. & Basir, N. (2016). Web Accessibility Challenges. International Journal of Advanced Computer Science and Applications. 7(10).

Ahamed, S. S. (2010). Studying the feasibility and importance of software testing: An Analysis. doi:1001.4193

Alben, L. (1996). Quality of experience: Defining the criteria for effective interaction design. Interactions, 3(3), 11–15. doi:10.1145/235008.235010

Allam, A., & Dahlan, H. M. (2013). User experience: challenges and opportunities. Journal of Information Systems Research and Innovation, 3, 28-36.

Angmo, R., & Sharma, M. (2014), September. Performance evaluation of web based automation testing tools. In 2014 5th International Conference-Confluence The Next Generation Information Technology Summit (Confluence) (pp. 731-735). IEEE.

Apuke, O. D. (2017). Quantitative research methods a synopsis approach. Kuwait Chapter of the Arabian Journal of Business and Management Review, 6(11), 40-47.

Armstrong, I. (2018) UX Planet. The Evolations of Ux Process Methodology. Retrieved from: https://uxplanet.org/the-evolution-of-ux-process-methodology-47f52557178b

Asjes, K. 2014. UXBOOTH: The hidden benefits of Remote Research. Retrieved from: https://www.uxbooth.com/articles/hidden-benefits-remote-research/

Ascarza, E. et al., (2018). In pursuit of enhanced customer retention management: Review, key issues, and future directions. Customer Needs and Solutions, 5(1-2), 65-81.

Au, F. T., Baker, S., Warren, I., & Dobbie, G. (2008, January). Automated usability testing framework. In Proceedings of the ninth conference on Australasian user interface-Volume 76 (pp. 55-64). Australian Computer Society, Inc

Beri, B., & Singh, P. (2013). Web analytics: Increasing website's usability and conversion rate. International Journal of Computer Applications, 72(6)

Blair-Early, A., & Zender, M. (2008). User interface design principles for interaction design. Design Issues, 24(3), 85-107.

Blair, J., Czaja, R. F. & Blair, E. A. (2013). Designing surveys: A guide to decisions and procedures. Sage Publications.

Bolt, N., & Tulathimutte, T. (2010). Remote research: Real users, real time, real research. Rosenfeld Media.

Bonzi, A., & Soldani, N. (2008). Systems and methods for ranking search engine results. U.S. Patent Application No. 11/902,808. Retrieved from: https://patentimages.storage.googleapis.com/3f/7b/9d/2a2f87c876be1b/US20080082528A1.pdf

Brandtzæg, P. B., &Følstad, A. (2001). How to Understand Fun: Using Demands, decision latitude and social support to understand fun in Human Factors Design.

In Proceedings of the International Conference on Affective Human Factors Design, Asean Academic Press, London (pp. 131-130).

Brhel, J. (2013) Objectives to an Effective Social Media Marketing Strategy.Retrieved from: https://www.business2community.com/social-media/how-to-connect-your-business-objectives-to-an-effective-social-media-marketing-strategy-0526068

Carroll, J. (2001). Human-Computer Interaction in the New Millennium. Addison-Wesley.

Chang, Y. N., Lim, Y. K., & Stolterman, E. (2008, October). Personas: from theory to practices. In Proceedings of the 5th Nordic conference on Human-computer interaction: building bridges (pp. 439-442). ACM.

Chao, G. (2009) Human- Computer Interaction: Process and Principles Of Human-Computer Interface Design. International Conference on Computer and Automation Engineering, IEEE Computer Society, 230-232

Chauhan, K.C, & Singh, I. (2014). Latest Research and Development on Software Testing Techniques. International Journal of Current Engineering and Technology. 4(4), 2368-2372.

Clark, D. (2016). Content strategy: An integrative literature review. IEEE Transactions on Professional Communication, 59(1), 7-23.

Costa, C. J., Costa, P., & Aparicio, M. (2004, April). Principles for Creating Web Sites: A Design Perspective. In ICEIS (4) (pp. 484-488).

Darrin, M. A. G., & Devereux, W. S. (2017, April). The Agile Manifesto, design thinking and systems engineering. In 2017 Annual IEEE International Systems Conference (SysCon) (pp. 1-5). IEEE.

Dennis, A., Wixom, BH. & Roth, RM. (2013). System Analysis and Design. (5th Edition). Singapore. pg.114.

Devi, J., Bhatia, K., & Sharma, R. (2017). A Relative Analysis of Programmed Web Testing Tools. International Research Journal of Engineering and Technology (IRJET), 4(5), 386-389.

Dingeldein, T. (2018). The 12 Best free and open source survey tools to power your research. Retrieved from: https://blog.capterra.com/best-free-survey-tools-power-your-research/

Dix, Alan. (2016). Human computer interaction, foundations and new paradigms. Journal of Visual Languages & Computing. 42. doi: 10.1016/j.jvlc.2016.04.001.

Djonov, E. (2007). Website hierarchy and the interaction between content organization, webpage and navigation design: A systemic functional hypermedia discourse analysis perspective. Information Design Journal, 15(2), 144-162.

Earthy, J., Jones, B.S., & Bevan, N. (2001). The improvement of human-centered processes-facing the challenge and reaping the benefit of ISO 13407. Int. J. Hum.-Comput. Stud., 55, 553-585.

Erdoğmuş, İ. E., & Cicek, M. (2012). The impact of social media marketing on brand loyalty. Procedia-Social and Behavioral Sciences, 58, 1353-1360.

E.U.M.Regulations. (2014). Çevre Ve Şehircilik Bakanlığından Yönetmelik , Zararlı Maddeler Ve Karışımlara İlişkin Güvenlik Bilgi Formlari Hakkında Yönetmelik Birinci Bölüm. Retrieved from: http://www.resmigazete.gov.tr/eskiler/2014/12/20141213-1.htm

Feenberg, A. (2009). What is philosophy of technology?. In International Handbook of Research and Development in Technology Education (pp. 159-166). Brill Sense.

Felici, M. (2004-2006). Software Testing: SEO Lecture Notes 17. The University of Edinburgh. Retrieved from: http://www.inf.ed.ac.uk/teaching/courses/seoc/2006_2007/notes/LectureNote17_SoftwareTesting.pdf

Forlizzi, J., & Battarbee, K. (2004, August). Understanding experience in interactive systems. In Proceedings of the 5th conference on Designing interactive systems: processes, practices, methods, and techniques (pp. 261-268). ACM

Fukuzumi, S., Noda, N., & Tanikawa, Y. (2017). How to Apply Human-Centered Design Process (HCDP) to Software Development Process?. 2017 IEEE/ACM 1st International Workshop on Design and Innovation in Software Engineering (DISE), 13-16.

Garrett, J. J. (2010). The elements of user experience: user-centered design for the web and beyond. Pearson Education, pg.21-24.
Retrieved from: http://www.jjg.net/elements/pdf/elements_ch02.pdf

Geisen, E., & Bergstrom, J. R. (2017). Usability testing for survey research. Morgan Kaufmann.1th edition, pg. 80-81.

Gill, P., Stewart, K., Treasure, E., & Chadwick, B. (2008). Methods of data collection in qualitative research: interviews and focus groups. British dental journal, 204(6), 291.

Ghuman, S. S. (2014). Software Testing Techniques. International Journal of Computer Science and Mobile Computing, 3(10), 988-993.

Google Chrome. (n.d.). Retrieved from: https://www.google.com/intl/tr_tr/chrome/

Google Formlar - Ücretsiz olarak anketler oluşturun ve anketlerinizi analiz edin. (n.d.) Retrieved from: https://www.google.com/intl/tr_tr/forms/about/

Google PageSpeed Insight. (n.d.) Developers.google.com. Retrieved from: https://developers.google.com/speed/pagespeed/insights/?hl=TR

Gulliksen, J., et al., (2003). Key principles for user-centered systems design. Behaviour and Information Technology, 22(6), 397-409.

Hassan, H. M., & Galal-Edeen, G. H. (2017), November. From usability to user experience. In 2017 International Conference on Intelligent Informatics and Biomedical Sciences (ICIIBMS) (pp. 216-222). IEEE.

Hancock, B., Ockleford, E. & Windridge, K. (2007). An Introduction to Qualitative Research. Trent RDSU. pp.7.

Hassenzahl, M., & Tractinsky, N. (2006). User experience-a research agenda. Behaviour & information technology, 25(2), 91-97.

Hassenzahl, M. (2008). User experience (UX): towards an experiential perspective on product quality. In IHM (Vol. 8, pp. 11-15).

Hassenzahl, M. (2011). User Experience and Experience Design. Encyclopedia of Human-Computer Interaction.

Hooda, I., & Chhillar, R. S. (2015). Software test process, testing types and techniques. International Journal of Computer Applications, 111(13), 10-14.

Heer, I. et al., Brown, J. et al. & Schneiter, S. et al., (2012). Web Design Specialist (Adobe CS6 Web Edition)
Retrieved from: https://www.ciwcertified.com/resources/documents/sample-chapter/CCL05CDWDSGKL1211.pdf

Hekkert, P. (2006). Design aesthetics: principles of pleasure in design. Psychology science, 48(2), 157.

Hinze-Hoare, V. (2007). The Review and Analysis of Human Computer Interaction (HCI) Principles. Southampton University.

Interaction Design Foundation (n.d.). Human-Computer Interaction (HCI). What is Human- Computer Interaction (HCI)?. Retrieved from: https://www.interaction-design.org/literature/topics/human-computer-interaction

Interaction Design Foundation (n.d.). User Research. What is User Research?. Retrieved from: https://www.interaction-design.org/literature/topics/user-research

International Organization for Standardization (ISO). (1998). ISO 9241–11, Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs). Part 11: Guidance of Usability. Revised: 2018. Geneva, Switzerland.

International Organization for Standardization (ISO). (2019). ISO 9241-210:2010, Ergonomics of human – system interaction part: 210 Human-centered design for interactive systems – first edition 2010-03-15, PG. Vİ.

Ivory, M. Y., & Hearst, M. A. (2002). Improving web site design. IEEE Internet Computing, 6(2), 57.

Jokela, T., et al., (2006). Methods for quantitative usability requirements: a case study on the development of the user interface of a mobile phone. Personal and Ubiquitous computing, 10(6), 345-355.

Journal of Visual Communication in Medicine [J Vis Commun Med]. (2008). Content Management Systems in Website Design. 31 (3),120-1. Informa Healthcare.

Kale, A. M., Bandal, V. V. & Chaudhari, K. (2019). A Review Paper on Software Testing. International Research Journal of Engineering and Technology (IRJET), 6(1), 1268-1273.

Karapanos, E., Zimmerman, J., Forlizzi, J., & Martens, J. B. (2009). User experience over time: an initial framework. In Proceedings of the SIGCHI conference on human factors in computing systems (pp. 729-738). ACM.

Kashfi, P., Feldt, R., Nilsson, A., & Svensson, R. B. (2016). Cross-Section Evidence-based Timelines for Software Process Improvement Retrospectives: A Case Study of User experience Integration. doi: 1605.03883.

Kashfi, P., Nilsson, A., & Feldt, R. (2017). Integrating User experience practices into software development processes: implications of the UX characteristics. PeerJ Computer Science, 3, e130.

Kucheriavy, A. (n.d.) 10 things you must review on your website on a regular basis. Intechnic. Retrieved from: https://www.intechnic.com/blog/10-things-you-must-review-on-your-website-on-a-regular-basis/

Law, E. L. C. et al., (2009, April). Understanding, scoping and defining user experience: a survey approach. In Proceedings of the SIGCHI conference on human factors in computing systems (pp. 719-728). ACM.

Leake, D. B. & Scherle, R. (2001, January). Towards context-based search engine selection. In Proceedings of the 6th international conference on Intelligent user interfaces (pp. 109-112). ACM.

Leskovec, J., Adamic, L. A. & Huberman, B. A. (2007). The dynamics of viral marketing. ACM Transactions on the Web (TWEB), 1(1), 5.

Lofgren,L. (2019). Quicksprout. Website Usability Guide. Retrieved from: https://www.quicksprout.com/website-usability/

MacKenzie, I. S. (2012). Human-computer interaction: An empirical research perspective. Newnes. p. 28.

Macleod,S. (2018). Simply Psychology, Maslow's Hierarchy of Needs. Retrieved from: https://www.simplypsychology.org/maslow.html

Maguire, M. (2001). Methods to support human-centered design. International journal of human-computer studies, 55(4), 587-634.

Mahajan, P. & Pune, V.B. (2016). Different Types of Testing in Software Testing. In International Research Journal of Engineering and Technology ,3(4), 1661-1664.

Minge, M. (2008, October). Dynamics of user experience. In Proceedings of the Workshop on Research Goals and Strategies for Studying User Experience and Emotion, NordiCHI (Vol. 8).

Mockflow. (n.d.) Brainstorm user interface ideas. Retrieved from: https://mockflow.com

Morville, P., & Rosenfeld, L. (2006). Information architecture for the world wide web. Rosenfield Media.

Munyaradzi, Z., Maxmillan, G. and Amanda, M. N. (2013). Effects of Web Page Contents on Load Time over the Internet. Int Journal of Science and Research, 2(9), 75-79.

Nielsen J. (2012). Usability 101: Introduction to Usability, Human Computer Interaction. Retrieved from: https://www.nngroup.com/articles/usability-101-introduction-to-usability/

Nielsen, J. (2014). The Need for Web Design Standarts. Retrieved from: https://www.nngroup.com/articles/the-need-for-web-design-standards/

Petersen, M. G., Iversen, O. S. & Krogh, P. G., and Ludvigsen, M. (2004, August). Aesthetic interaction: a pragmatist's aesthetics of interactive systems. In Proceedings of the 5th conference on Designing interactive systems: processes, practices, methods, and techniques (pp. 269-276). ACM.

Petrie, H., & Bevan, N. (2009). The Evaluation of Accessibility, Usability, and User Experience. The universal access handbook, 1, 1-16.

Preece, J. R., Rogers, Y. Y. & Sharp, H. (2002). Interaction Design. Beyond Human–Computer Interaction. John Wiley & Sons, Inc.

Rubin, J., & Chisnell, D. (2008). Handbook of Usability Testing: How to Plan, Design, and Conduct Effective Tests, 2nd edn. Wiley Publishing.

Rosen, D. E., & Purinton, E. (2004). Website design: Viewing the web as a cognitive landscape. Journal of Business Research, 57(7), 787-794.

Roto, V., Law, E. L. C., Vermeeren, A., & Hoonhout, J. (2011). 10373 Abstracts Collection--Demarcating User Experience. In Dagstuhl Seminar Proceedings. Retrieved from: https://drops.dagstuhl.de/opus/volltexte/2011/2949/pdf/10373_AbstractsCollection.2949.pdf

Safari.(n.d). Apple (Türkiye). Retrieved from:https://www.apple.com/tr/safari/

Sauro, J. PhD (2011). 10 Essential Usability Metrics.
Retrieved from: https://measuringu.com/essential-metrics/

Sawant, A. A., Bari, P. H., and Chawan, P. M. (2012). Software testing techniques and strategies. International Journal of Engineering Research and Applications (IJERA), 2(3), 980-986.

Saxena, R., & Singh, M. (2014). Gray Box Testing: Proactive Methodology for the Future Design of Test Cases to Reduce Overall System Cost. Journal of Basic and Applied Engineering Research, 1(2350–0255).

Schulze, A. N. (2001). User-centered design for information professionals. Journal of education for library and information science, 116-122.

Seffah, A., Donyaee, M., Kline, R. B. & Padda, H. K. (2006). Usability measurement and metrics: A consolidated model. Software quality journal, 14(2), 159-178.

Shikha, D., & Bahl, K. (2015). Software Testing Tools & Techniques for Web Applications. International Journal of Engineering and Technical Research (IJETR), 3(5), 315-318.

Singh, S., Verma, m., & N, N. K. (2015). Open Source Software Vs Proprietary Software. International Journal of Scientific & Engineering Research, 8(12), 735-742.

Solomon, D. J. (2001). Conducting web-based surveys. Practical Assessment, Research & Evaluation, 7(19). Retrieved from:
http://PAREonline.net/getvn.asp?v=7&n=19

Speicher, M. (2015). What is usability? a characterization based on ISO 9241-11 and ISO/IEC 25010. doi:1502.06792.

Spencer, D. (2010). A practical guide to information architecture (Vol.1). Penarth: Five Simple Steps.

Spool, J. M., Schroeder, W., Scanlon, T. & Snyder, C. (1999, May). Web sites that work: Designing with your eyes open. In CHI'99 Extended Abstracts on Human Factors in Computing Systems (pp. 141-142). ACM.

Taylor, J. (2003). Managing information technology projects: applying project management strategies to software, hardware, and integration initiatives. Amacom.

TechSmith. (n.d.) Usability Testing Basics: An Overview. Retrieved from: http://webservices.itcs.umich.edu/drupal/wwwsig/sites/webservices.itcs.umich.edu.drupal.wwwsig/files/Usability-Testing-Basics.pdf

The Usability Body of Knowledge (2002). The Usability Professionals' Association (UPA). Retrieved from: https://www.usabilitybok.org/about

Torok, A. (2016). From human-computer interaction to cognitive infocommunications: a cognitive science perspective. In 2016 7th IEEE International Conference on Cognitive Infocommunications (CogInfoCom) (pp. 000433-000438). IEEE.

Typeform. (N.d.) Survey Questions 101: Question Types, Examples, and Tips. Retrieved from: https://www.typeform.com/surveys/question-types/

UXPin. (2015). Designing for Space: Sculpture Through Substraction. Web UI Design for the Human Eye: Colors, Space, Contrast, p.26 Retrieved from: https://www.uxpin.com/studio/ebooks/visual-web-ui-design-colors-space-contrast/

Vermeeren, A. P. et al., (2010, October). User experience evaluation methods: current state and development needs. In Proceedings of the 6th Nordic conference on human-computer interaction: Extending boundaries (pp. 521-530). ACM.

Väänänen-Vainio-Mattila, K., Roto, V., & Hassenzahl, M. 2008. Towards practical user experience evaluation methods. Meaningful measures: Valid useful user experience measurement (VUUM), 19-22.

Watzman, S. (2002). Visual design principles for usable interfaces. The human-computer interaction handbook: Fundamentals, evolving technologies and emerging applications, 263-285.

Willis, E. (2011). The UX Umbrella. DC Startup Weekend on Nov. 19.2011. Retrieved from: http://www.dswillis.com/talks/2014/4/the-ux-umbrella

Wysocki, R. K. (2011). Effective project management: traditional, agile, extreme. John Wiley & Sons.

Yalçın, N., & Köse, U. (2010). What is search engine optimization: SEO?. Procedia-Social and Behavioral Sciences, 9, 487-493.

Zeng, L., & Proctor, R. W. & Salvendy, G. 2012. User-based assessment of website creativity: a review and appraisal. Behaviour & Information Technology, 31(4), 383-400.

CURRICULUM VITAE

Personal Information

Name Surname	: Burcu Bağan
Place and Date of Birth	: Istanbul / 23.05.1985

Education

Undergraduate Education	: Business Management, Anadolu University
Graduate Education	: Management Information Systems, Kadir Has University
Foreign Language Skills	: English

Work Experience

Name of Employer and Dates of Employment:

Vodace Agency	May 2014 - January 2015
Userspots (Intern)	October - November 2013
Pixelplus	June - September 2012
Lava Agency (FEM)	September 2010 - January 2011

Contact:

Telephone	: +90 555 638 39 35
E-mail Address	: burcubagan@hotmail.com