Ebru Erkan

Ön Lisans Öğrencisi, Yozgat, Türkiye
Associate Degree Student, Yozgat, Turkiye
eposta: ebruerkan458@gmail.com
https://orcid.org/0009-0004-9739-9747

Tuğba Mutlu

Doktor Öğretim Üyesi, Yozgat Bozok Üniversitesi, Yozgat Meslek Yüksekokulu, Büro Hizmetleri ve Sekreterlik Bölümü, Yozgat, Türkiye
Assistant Professor, Yozgat Bozok University, Yozgat Vocational School, Office Services and Secretarial Department, Yozgat, Turkiye
eposta: tugba.mutlu@bozok.edu.tr
https://orcid.org/0000-0001-6928-6658

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AN EVALUATION OF PERCEIVED USABILITY: BOZOK LEARNING MANAGEMENT SYSTEM[1]

Abstract

Technology has been a significant driver of sociological change throughout history. The relationship between technology and society is complex, with technology both shaping and being shaped by social forces. Technological developments, which started with the industrial revolution and gained a new dimension with Industry 4.0, have brought about radical changes in the ways technology is used to offer new products and services (Petrasch and Hentschke 2016). In addition, the 2020 Covid-19 pandemic has accelerated digital transformation causing many services and activities to be transferred to the digital environment and education was no exception. Advances in technology, changes in social structure and unforeseen epidemics and natural disasters have brought learning management systems in the center of our lives as a main part of education services. Although there existed several learning management systems for a while, after the 2020 pandemic we started to see a rapid increase in such systems.

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However, usability of these systems need to be evaluated preferably before and after their release. In this paper, we examined the usability of Bozok Learning Management System (BOYSIS) developed within Yozgat Bozok University and designed in line with the needs of the university. Since every system performs differently depending on the social and cultural environment it belongs, system usability needs to be evaluated from the point of final users. For this purpose, the System Usability Scale (SUS) was employed and we found that the BOYSIS has acceptable level of usability, yet it is below the expected industry standard.

Keywords: Usability evaluation, system usability scale, learning management system, SUS, Bozok Learning Management System.

ALGILANAN KULLANILABİLİRLİK ÜZERİNE BİR DEĞERLENDİRME: BOZOK ÖĞRENME YÖNETİM SİSTEMİ

Öz

Teknoloji, tarih boyunca sosyolojik değişimin önemli bir itici gücü olmuştur. Teknoloji ve toplum arasındaki ilişki karmaşıktır; teknoloji hem sosyal güçleri şekillendirir hem de sosyal güçler tarafından şekillendirilir. Sanayi devrimiyle başlayan ve Endüstri 4.0 ile yeni bir boyut kazanan teknolojik gelişmeler, yeni ürün ve hizmetler sunmak için teknolojinin kullanılma biçimlerinde köklü değişiklikler meydana getirmiştir (Petrasch ve Hentschke 2016). Ayrıca 2020 Covid-19 pandemisi de dijital dönüşümü hızlandırarak birçok hizmet ve faaliyetin dijital ortama taşınmasına neden olmuş ve eğitim de bu durumdan istisna olmamıştır. Teknolojideki gelişmeler, toplumsal yapıdaki değişimler ve öngörülemeyen salgın hastalıklar ve doğal afetler, öğrenme yönetim sistemlerini eğitim hizmetlerinin ana bir parçası olarak hayatımızın merkezine taşımıştır. Çeşitli öğrenme yönetim sistemleri daha önce de mevcut olsa da 2020 pandemisinden sonra bu tür sistemlerde hızlı bir artış gözlemlenmiştir. Ancak bu sistemlerin kullanılabilirliğinin tercihen piyasaya sürülmeden önce ve sonra değerlendirilmesi gerekmektedir. Bu çalışmada Yozgat Bozok Üniversitesi bünyesinde geliştirilen ve üniversitenin ihtiyaçları doğrultusunda tasarlanan Bozok Öğrenme Yönetim Sistemi'nin (BOYSİS) kullanılabilirliğini incelenmiştir. Her sistem ait olduğu sosyal ve kültürel çevreye bağlı olarak farklı performans gösterdiğinden, sistem kullanılabilirliğinin nihai kullanıcılar açısından değerlendirilmesi önemlidir. Bu amaçla, Sistem Kullanılabilirlik Ölçeği (SUS) kullanılmış ve BOYSİS'in kabul edilebilir düzeyde kullanılabilirliğe sahip olduğu, ancak beklenen endüstri standardının altında olduğu tespit edilmiştir.

Anahtar Kelimeler: Kullanılabilirlik değerlendirmesi, sistem kullanılabilirlik ölçeği, öğrenme yönetim sistemi, SKÖ, Bozok Öğrenme Yönetim Sistemi.

Introduction

Since the first introduction of digital devices, technology has become an indispensable part of both our professional and social lives. Its role as a driver of sociological

change has opened new pathways in the functioning of life. Industry 4.0 has revolutionalized the ways technology is used to deliver new products and services (Petrasch and Hentschke 2016). In addition, the 2020 Covid-19 pandemic has accelerated digital transformation causing many services and activities from health to government services; art to social life to be transferred to the digital environment. It is a natural and inevitable result of the transformation process that education services were also deeply affected by the widespread impact of Industry 4.0 and Covid-19 pandemic.

The Covid-19 pandemic, especially, played a decisive and driving role in moving educational services to the digital environment in a short period of time and forced educational institutions at all levels around the world to switch to and adapt to this new system. In order to keep educational activities running efficiently and effectively without interruption, educational institutions that did not have the necessary infrastructure turned to paid or open source learning management systems in this period. Learning management systems are web-based softwares that contain electronic tools such as discussion boards, files, notebooks, e-mail, announcements, evaluations and multimedia elements (Gautreau 2011). These systems provide both students and educators with necessary tools to continue educational activities from a distance, which was necessary during the pandemic. Although life began to normalize again after the pandemic, learning management systems have proven to be indispensable tools for higher education institutions. Especially in Turkey, after the pandemic, the requirement that up to 40% of educational activities be carried out online with the regulations of the Council of Higher Education (YÖK) ensured the continuity of the need for learning management systems. Later, the need for these systems continued due to the earthquake that shook the country in 2023. In this regard, educational institutions were forced to improve or update the learning management systems they use. In other words, these processes have made the increase in human-computer interaction and the acceleration of development/improvement efforts a necessity. Therefore, examining the usability of learning management systems has become important to understand the strength or shortcomings of a system.

Literature Review

Given the fact that learning management systems will be with us hereinafter, the concept of 'user experience' needs to be taken into consideration. Although there are various definitions of user experience in the literature, one of the most commonly used definitions is the one recommended by the International Organization for Standardization (ISO) “a person's perceptions and responses that result from the use or anticipated use of a product, system or service” (2018: 2). In other words, user experience is the set of positive or negative

reactions that users have when using a system (Türkmenoğlu and Atalar 2020). As the inventor of the term 'user experince' Norman (2010) explains it as:

> A product is more than the product. It is a cohesive, integrated set of experiences. Think through all of the stages of a product or service – from initial intentions through final reflections, from the first usage to help, service, and maintenance. Make them all work together seamlessly. That's systems thinking.

One of the most fundamental parts of user experience is 'usability'. Usability is a quality that includes the learnability, efficiency and memorability of a system, the mistakes the user makes while using the product, and the user's satisfaction with using the product (Nielsen 2012). According to the definition suggested by the ISO, usability is defined as a user's ability to use a product/system/interface effectively, efficiently and satisfactorily in a suitable environment within the framework of a specific task (2018). That is, for a system to provide a satisfactory user experience, it must be usable. As technology becomes more sophisticated and complex, and the number and diversity of users increases, the need for more usable systems has increased. Although usability seems to be an important feature for the user, it actually has multidimensional importance. It enables the user to easily complete a job or task without spending too much time and energy, and thus to get pleasure from using the system. While usability demonstrates the success of the system for system developers, it has an importance for managers in increasing the efficiency of the entire organization (Çağıltay 2018; Smith 2017). In this regard, a product or system designed by ignoring the user's wishes, needs, expectations and constraints may result in failure (Jordan et al. 1996; Nielsen 2012). Considering the wide range of uses of technology, usability studies rapidly continue from ergonomics to computer science; education to design; psychology to health and so on. Usability, which was once a luxury enjoyed, has now become a mandatory feature. In this respect, it is a current and important research field. With the prevalence of learning management systems, evaluating their usability has come into prominance.

In fact, there are various studies in the literature on the usability of widely known systems such as Moodle and Blackboard. The aim of these studies is to evaluate the systems from the user's perspective and to improve their shortcomings, if any. To instantiate some of such studies, Marco, Penichet, and Gallud (2013) conducted a research on Moodle; Binyamin; Rutter and Smith (2016) investigated the usability of Blackboard from the students' perception; Thuseethan, Achchuthan and Kuhanesan (2015) also evaluated the Moodle's usability in Sri Lankan universities; Emiroğlu (2019) looked at the usability level of Edmodo and analyzed the usability problems; Orfanou, Tselios and Katsanos (2015) used eClass and Moodle to investigate system usability, Kaewsaiha (2019) evaluated the usability of Google classroom and Moodle.

It's important to note that while technology is a driver of sociological change, it is also influenced by societal values and norms. Societies make choices about the development and use of technology, and these choices, in turn, have sociological implications. Additionally, the impact of technology on society is not uniform and can vary greatly depending on factors

such as culture, economic conditions, and political systems. Accordingly, the impact of technology on education is no exception and this impact is shaped by the social fabric of a given environment. Therefore, even though there have been several popular learning management systems available for the use of higher education institutions, many of them preferred to develop their own systems which suits their needs.

Bozok Learning Management System (BOYSIS), the subject of this study, is a learning management system developed within Yozgat Bozok University and designed in line with the needs of the university. After completing their registration at the beginning of each academic year, students are obliged to log in to their BOYSIS accounts and follow the information and documents regarding the courses they are registered for. Considering that the BOYSIS is used by both students and academic staff in Yozgat Bozok University, thus has a significant number of users (approximately 24000) (Bozok University 2023), it is important to examine the usability of it and identify its aspects which may be open to improvement.

User needs and experiences are closely related to social environment they belong. A product designed for certain people living in a certain area may not perform the same for other group of people who live in another city or country. That is because human is a social animal and understanding how people think, feel, and behave in their own environment can inform the design processes for creating usable products/systems. Thus, evaluating the usability of a leraning management system, in this case BOYSIS, in its own context can provide valuable information to the usability literature.

Method

This section covers the methodology employed to answer the research questions and the steps taken in order to analyze and interpret the data. For the analysis of quantitative data IBM SPSS Statistics 25 was utilized and we followed Braun and Clarke (2006)'s procedure in orter to analyze the qualitative data which are presented in detail in the following sections.

The Survey

In this study, the main tool to gather data was the System Usability Scale (SUS). According to Walker (1985), questionnaires are effective tools to collect large amounts of data in a short period of time; easy to administer; and familiar to the majority of the respondents (Lazar, Feng, and Hochheiser 2017).

In this study, the System Usability Scale (SUS), a 5-option Likert scale consisting of 10 questions developed by John Brooke in 1986, was used as a data collection tool. The SUS, more spesifically, is a widely accepted, 'quick and dirty'evaluation method (Brooke 1996) with only 10 questions which makes it easily applicaple without causing survey fatigue. Due

to its benefits for this study, The SUS was chosen as the main data collection tool. The SUS is accepted as an 'industry standard' (Klug 2017) due to its reliable results; 'technology agnostic' nature (Bangor et al. 2008), with which any product, service, system or device could be evaluated; flexibility to some minor changes in scale (Lewis 2018). In addition, calculation and interpretation of the SUS scores are fairly straightforward and easily comprehensible to even non-experts. Numerous studies have been conducted on the validity, reliability and sensitivity of the SUS, and it has been shown that the scale gives 0.90 and higher results (Bangor et al. 2008; Lewis and Sauro 2009; Lewis et al. 2015a; Lewis et al. 2015b), above the typical criterion of 0.70 (Nunnally 1978).

Participants were presented with the Turkish version of the SUS obtained from Çağıltay (2018). The questionnarie consisted of three main sections. First section included two demographic questions where the participants were asked about their gender and age. Second part contained the SUS in a form of 5-point Likert scale. The final section presented an open-ended question where the students could specify the usability problems that they had faced while using the system.

Participants

The participants of the study were selected among the students who registered to Yozgat Bozok University for the first time in the 2022-2023 Fall Semester. Due to the nature of the SUS, applying the scale for a short time after the user's first experience with the system will provide healthier results (Brooke 2013). For this reason, the first two weeks of the 2022-2023 Fall semester was chosen for data collection. However, due to some technical problems with the system and late registration of some students, the process was extended to the third week of the semester. By the end of the week three, all students completed their registraion to the university and the BOYSIS, and had some time to experience it.

The SUS has been proved to be a robust measure of system usability even with small samples. In their study, Tullis and Stetson (2006) demonstrated that the SUS satiably reflected the users opinions about the system or the product being tested even with 8-12 participants. Nielsen (1993), one of the pioneers of usability methods, states that usability testing could be performed with as low as 5 participants. According to Faulkner (2003), 99% of usability problems could be detected with the participation of 5 randomly selected users. As the previous research sugguest, although small sample sizes are enough to test system usability, we aimed to reach as many students as possible from different departments to cover a wide range of opinions. For the purposes of this study, total of 425 questionnaires were administered and 361 returned valid.

After data cleansing, 324 questionnaires were considered for the analysis. Of the total number of respondents, 47,8% were male and 52,2% were female. Majority of the participants were younger than 25 years, which puts them into Generation Z and Generation Alpha, who are known to be the 'digital natives'. More spesificaly, 96% of the participants

were under 25 years old and 4% were 25 years or older. Table 1 presents the demographic data of the participants.

Table 1. Summary statistics of demographic characteristics of participants

Demographic Attributes		Number of respondents	Percentage (%)
Gender	Male	173	47,9
	Female	188	52,1
Age	<25	311	96
	>=25	13	4

Results

In this section we provide the results obtained from the analysis. In order to analyze the quantitave data obtained through the questionnaire IBM SPSS Statistics 25 was used. Later in the section, results from the qualitative analysis is presented. Braun and Clarke (2006)'s procedure was followed for the analysis of open-ended questions.

Construct Validity

Researchers have long been in a debate on the uni/bi-dimensitonality of the SUS. In their highly cited study Bangor et al. (2008) analyzed 2324 questionnaires and concluded that the SUS has only one significant factor, thus, unidimensional. Shortly after, Lewis and Sauro (2009) conducted another study with 324 questionnaires and suggested that the SUS has two significant factors which could be divided as the Usability and Learnability scales, instead of one single Perceived Usability scale. Later, Lewis and Sauro (2017: 189) revisited their results and conducted another study with a much larger data set (over 9000 questionnaires) and confirmed that the SUS is infact bidimensional, "but not in any interesting or useful way". They concluded that mixed tone questionnaires (where negative and positive toned questions exist) tend to exibit this type of behaviour during factor analysis. They suggest that researchers should no longer compute and report the Usability and Learnability subscales unless there are special circumstances in providing these results but rather treat it as a unidimensional scale and report the overal SUS scores. In our study, examination of eigenvalues and factor-loadings suggested a two factor solution, same as Lewis and Sauro (2009) study, where the items 1, 2, 3, 5, 6, 7, 8, 9 aligned with the first factor while the items 4 and 10 loaded on to the second factor. Parallel analysis also supported a two-factor structure.

Table 2: Component matrix

	Component	
	1	2
S1	**,636**	,107
S2	**,584**	,165
S3	**,714**	,299
S4	,159	**,771**
S5	**,712**	,199
S6	**,588**	,113
S7	**,660**	,424
S8	**,584**	,157
S9	**,584**	-,353
S10	,089	**,771**

Hair et al. (2010) suggest that all factor loadings should be above the 0.5 cut-off point in order to be considered as a useful part of the scale. All 10 items met the requirement and were kept for further analysis.

As the interest of this research is to identify the perceived usability of BOYSIS, rather than distinctively look for its usability and learnability aspects, we treat it as unidimensional as suggested by Lewis and Sauro (2017).

Reliability

As a rule of thumb, when coefficient alpha equals or above 0.7 (Nunnally 1978), reliability of a scale is deemed acceptable. For this study, coefficient alpha value was computed 0,71; thus confirm the variables' internal consistency and reliability.

Perceived Usability of the SUS

The scores obtained from the SUS is just numbers; without a criterion, they have no meaning; neither good nor bad. Thus, there have been several attempts to provide an item-level benchmark for researchers and practitioners to compare their SUS scores and create a meaningful interpretation from it. In an attempt to create a benchmark, Bangor et al. (2008) created an absolute grading scale, and Lewis and Sauro (2011) developed a curved-grading scale both of which offer similar interpretations. The average usability score for BOYSIS was 59,8 (SD=17,8), meaning that while the system has an acceptable level of usability, it is below average, thus have some serious usability issues. Moreover, achieving 80 or above usability score has become the common industrial goal to provide a satisfying user experience (Lewis & Sauro, 2018). Therefore, BOYSIS needs some serious improvements to reach good level of usability.

Figure 1. Average score of students' responses for each question

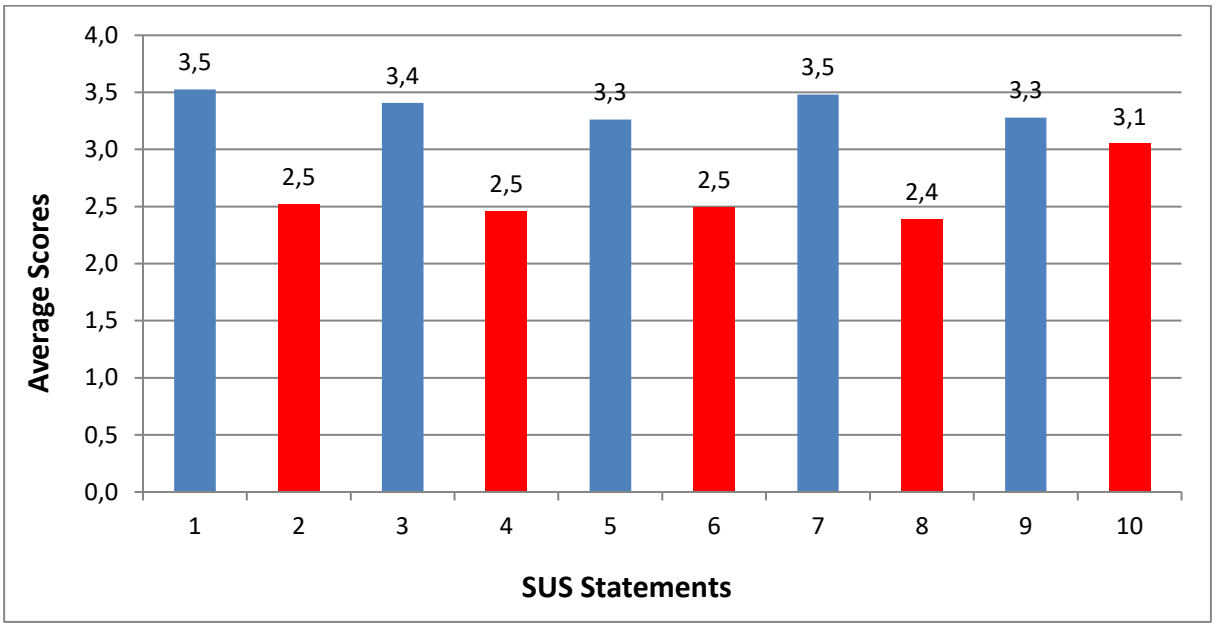

Figure 1 displays average of 324 participants' responses to each statement in the SUS questionnaire. As mentioned earlier, the SUS is a 5-point likert scale where 1 is strongly disagree while 5 represents strongly agree. Positive-toned items (1, 3, 5, 7 and 9) were graded above mid-point which means that students found the system easy to use, well-designed and well-integrated. However, their responses to negative-toned items signaled that even though the system achieved user-friendliness, it has some level of complexity and inconsistency. This result coincides with the overal SUS score.

Investigation of Demographic Attributes on the SUS

Additional analyses were conducted to investigate the effects of demographic on the overal SUS score. Participants' age and gender data were collected.

In order to test the effect of gender on the overall SUS score, non-parametric two-tailed Mann-Whitney U test was used since the data violated the normality assumptions. SUS score distribution significantly deviated from the normal distrubition both for women and men. Results showed no significant difference between women (mean =7,8) and men (mean=8,3); U=12347,500, z=-0,941 and p=0,346. This finding is consistent with previous research of Bangor et al. (2008), Orfanou et al. (2015), Alhadreti (2020).

In terms of the effect of age on the overall SUS score we found no significant correlation. A Spearman's rho test yielded rs=0,004 and p=0,94; thus, age does not seem to be associated with participants' perception of usability. However, as presented earlier, 96% of

our participants were 25 years of age or younger, meaning that the data set did not have enough diversity in terms of age groups. Therefore, a richer data set could provide more definitive answer.

Thematic Analysis

230 of 324 students commented on the open-ended questions. In order to analyze the qualitative data Braun and Clarke (2006)'s procedure was followed. The researchers first familiarized themselves with the data by going through the answers and taking notes. Then these notes were systematically grouped into codes which then collated into potential themes. This process was followed by both researchers and the themes were reviewed in the final stage to create the final result. Four main themes emerged from the data.

1. Complexity of the system: Students found the system complicted and hard to navigate. They were not sure how to access to notes or lectures.

2. Promlems with connection: Students mentioned several problems under this theme. They found the system slow, taking too long to load. In some cases system froze or kicked them out of the lecture or an exam. This was reported across almost all questionnaires.

3. Poor interface design: The second main problem was system design. Participants did not find the design appealing, and found the overal organization unintuitive.

4. Poor mobile design: Students mentioned problems with the mobile application. They reported that some functions which worked well with the desktop version did not work well with the mobile app.

Conclusion And Discussion

The aim of this study was to evaluate the usability of the BOYSIS platform from the students' perspectives as the main users of the system. The SUS questionnaire was employed due to its commonly accepted benefits (freely available, quick, easy, technology-agnostic nature etc.) as mentioned earlier. Participants were presented the Turkish version of the questionnaire in a form of 5-point Likert scale. Demographic attributes age and gender were also considered to evaluate their effects on the final SUS score. The system has an acceptable level of usability (mean SUS score= 59,8), according to Bangor et al. (2008), yet it is below the expected industry standard (Lewis & Sauro, 2018). This finding indicates that even though students could somehow use the system, they found several problems which negatively affected their experience. Thematic analysis revealed that the problems students faced while using the system could be categorized as the complex nature of the system which makes it hard to navigate; connection problems where the system either takes too long to load or froze entirely. In some cases students reported that they were kicked out of the system during a lecture or an exam. The poor design of the system interface and the poor mobile

application design were other factors that directly and negatively affected students' usage experiences. Analysis of the demographic data showed no significant difference or correlation for gender and age.

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