

Usability in Mobile Learning Application

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Abstract. Nowadays, mobile phones and tablets are more widely available and less expensive. Thus, it is easier for students to obtain a device for their studies. Mobile learning or m-learning also benefited from this occurrence. Usability in an application is vital in catering to the various need of students to ensure immaculate learning conditions. This paper aims to find a connection between student performance and the usability of the application. This paper focuses on three (3) main usability criteria; user engagement, satisfaction, and ease of use. The findings indicate that there is an association between a usable application and student performance.

Keywords: M-learning, mobile, user interface, usability, information management, library management.

1 Introduction

As mobile devices become more indispensable, so did mobile applications. Mobile applications are software that runs on mobile devices such as tablets and mobile phones. By 2023, 935 billion us dollars are expected to be generated by mobile application revenues (Lauren, 2022). Due to its extensive functionality, mobile applications were used for a variety of purposes, including gaming, calling, and texting. This coupled with the easy availability of mobile devices, leads to booming mobile application development. Contraries to the growth of mobile applications, research shows that applications that are overcomplex do not stay long on the user list of applications. Mobile Commerce Daily (2018) stated around 45% of users had a poor experience with their mobile applications and it showed that roughly 77% of users uninstall within three (3) days after installation (Swaid & Suid, 2018). An article by Lionel Valdellon (2020) stated the factors for uninstalling applications are poor user experience as in too complex, not meeting the initial expectation, and buggy and puzzling user interface. Other than that,

taking unreasonable time to learn, not feeling that the application is important enough in their daily lives, lack of space, and privacy concerns also determine whether users will uninstall the application. These issues indicate the importance of usability in mobile applications and the significance of making sure the applications are usable.

Consequently, usability evaluation is conducted to guarantee that mobile applications are functioning as intended. Nielsen defined usability as the ease at which users can reach certain goals (Nielsen, 1993). Usability evaluation can be done in multiple ways such as pluralistic walkthrough and heuristics evaluation (Kumar & Goundar, 2019). A mobile application's success is dependent on good usability evaluation results. A higher degree of usability means less maintenance and development costs as well as increased user retention. A happy user is likelier to continue using the application than an unhappy one. Iglar et al., also cited Goldmedia Custom Research, which concluded that usability is the most important factor in customer satisfaction among other factors (Iglar, Braumann, & Böhm, 2008).

In China, almost 260 million personal computer users and 440 million mobile device users are using their devices for online education services in 2019 alone (Statista Search Department, 2021). Mobile devices for students are very much a fixture in their daily lives. It was used routinely for communication to studying, hence, making it usable is vital in ensuring student performance.

The following is a breakdown of each section that will be included in this paper. This paper will be divided into the following sections. Section 2 will explain the background of this study, which is associated with usability, and then broke down into three (3) main categories, the definition of mobile and mobile learning applications. Then Section 3 will discuss factors affecting mobile application usage among students and followed by the effect on students in Section 4. Finally, Section 5 will provide the conclusion of this paper.

2 Background and Related Works

In this section, the background of this study will be explained including the prior research that was done on the study as well as the solutions that other researchers suggested.

2.1 Usability

Usability, as defined by the International Standard Organization (ISO) is the extent to which the product can achieve users' goals with satisfaction, effectiveness, and efficiency (ISO, 1994). A product's usability must consider three (3) aspects: efficiency, ease of learning, and user satisfaction (N. A. Ismail, F. Ahmad, N. A. Kamaruddin, Ismail, Ahmad, Kamaruddin, & Ibrahim, 2016). In HCI, usability is essential. The purpose of applying usability in HCI is to boost user efficiency, satisfaction, and productivity. The goal of usability is to guide system users in performing their tasks smoothly without spending a large amount of time learning about the system or being computer experts (Mazumder & Das, 2014).

The term usability is recognized approximately 10 years ago replacing the term “user friendly” which has been known as something that had developed a bit of unwanted vague and biased associations in the early 1980s. In the past years, however, the term usability has also been regarded the same as the term “user friendly” as there is no definite definition for the term for there is a multitude of ways to make a product usable (Bevan, Kirakowski, & Maissel, 1991). Oyibo & Vassileva (2017) has cited multiple authors on the importance of usability and aesthetics in predicting the credibility of mobile websites and the resolution to use a website. Furthermore, proper usability practice will significantly reduce the cost of system support in the future time (Mazumder & Das, 2014). This paper will be discussing three (3) dimensions of usability, that is ease of use, satisfaction, and user engagement.

2.1.1 Ease of use

The definition of usability in ISO standard can be further explained by incorporating five (5) characteristics; effective efficient, effective efficient engaging, efficient engaging error tolerant, engaging error tolerant easy to learn, and error-tolerant easy to learn (Quesenbery, 2001). According to Allison, Hayes, McNulty, & Young (2019), usability can be defined as how a website can be used to reach a given goal. Alrfooh and Lakulu (2020) cited that ease of use and usefulness are important in determining acceptance of information technology.

According to the Interaction Design Foundation webpage, ease of use describes the easiness of using a product for a user as the example given on the webpage cited, “Users must be able to tap Find within 3 seconds of accessing the interface” (Interaction Design Foundation, 2019). Emphasizing the concept of ease of use gives the user maximums functionality. Ali et al., (2014), mentioned that one of the key components of good educational applicative is ease of use. Many great applications fail to succeed due to the complex, unattractive and hard-to-understand interfaces. Dwidienawati et al. (2020), in their paper, confirm that perceived ease of use does affect satisfaction in e-learning. This paper measured their perceived ease of use with the easiness of navigation, flexibility, and ease to understand. Ease of use in an application is conducive to user judgment in using the application as a user that is not satisfied with the application may stop using it after the first use. Users that consider the application challenging to use may stop using it altogether. The paper also cited that although the current generation is exposed to gadgets earlier than any other generation, they also want a simple and convenient product regardless of their capability level.

2.1.2 Satisfaction

ISO 9241-11 standard stated that user satisfaction should contribute to usability, effectiveness, and efficiency (ISO, 1997). Lindgaard & Dudek (2002) cited that emotional responses occurred within 3 - 4 milliseconds of a stimulus being shown, meaning if the user does not like what they see, they will move to another website even before comprehending the information available on the site. This, in turn, will affect the judgment of whether the site is satisfactory enough or not.

Satisfaction is crucial in measuring the success of e-learning as cited by Dwidienawati et al. (2020), and it positively impacts performance. Maintaining an existing user is more imperative than gaining a new user as users can influence others through their behavior. User satisfaction is the basis of marketing theory and practice, it can also be applied in m-learning. The paper shows that there is a relationship between perceived performance and satisfaction and further states that satisfied people are more committed, which will lead to better performance.

2.1.3 User Engagement

Engagement is when something is pleasant and satisfying to use. In the user interface, user engagement is important in ensuring successful information exchange between user and system. Visual design is a vital element in the style of media used, the presentation, and graphics types in achieving engagement (Quesenbery, 2001). As stated by Bødker in *Aesthetic Approaches to Human-Computer Interaction*, engagement and attachment, like in human-human relations, are the prerequisites for trusting, lasting, pleasurable, and strong interactions. This, with some consideration, is also the case with human-technology relations (Bertelsen, Petersen, & Pold, 2004).

Engaging a user will give the motivation to continue with the application usage. Students need to be engaged in their lesson for it to be effective (Sari & Alversia, 2019). They also stated that engagement positively influences the intention to use the application. A paper by Bitri'an et al. (2021), indicated from the data gathered by Statista in 2020, the number of mobile application downloads grew to 20 million in 2019 however, only 32% of users used the application downloaded, more than ten times, and 25% only used it once. The paper concluded that user engagement with the said application is not strong and application developers need to consider how to keep users engaged longer. User engagement is important in m-learning as well since the main objective of it is for the students to learn from the application. If the students are not engaged, they will not be motivated to continue using it. An engaging application can attract and provide students with a more conducive learning experience.

Llin (2022) cited a paper by Lei et al, that there is strong evidence that students' performance is influenced by their engagement with the study material. An online article dated March 20, 2021 (Amesite, 2021) discussed the importance of engagement to students. The article quoted engagement as "a measure of how much we are attending to a purpose, task, or activity. When it comes to learning, engagement is influenced by a learner's level of motivation, focus and cognitive ability as well as online course design and a teacher's decisions regarding facilitation style". It also stated that the main culprit in disengagement among students is boredom and for learning to commence, students need to be engaged first. The article quoted resources that showed that students who are engaged are 2.5 times more likely to ace school and 4.5 times more positive about their future compared to their peers., Engaged students are more satisfied with their learning experience and have higher achievement and graduation rates. Students that are engaged are more invested in the learning and therefore more likely to retain the information given.

2.2 Mobile Devices

In 2017, smartphones make up 77% of global mobile devices and over 32% of the global population uses smartphones (Weichbroth, 2020). This is also reflected in students, as shown in data from Germany that shows 95% of students ranging from 14 to 29 years old used smartphones in 2016 (Kuhnel, Seiler, Honal, & Ifenthaler, 2018). Mobile devices can be smartphones, tablets, or laptops, and judging by the data above, pretty much a part of our everyday lives. Mobile devices differ from personal computers by their many uses, sizes, and functionality.

2.3 Mobile Learning

Mobile learning is also known as m-learning, is a way to gain access to instructional material through mobile devices. M-learning involves the use of mobile devices to provide continuous access to the learning process. Tablets and mobile phones are examples of the kind of wireless handheld devices that are essential to m-learning. Compared to more conventional forms of online education, m-learning is making rapid developments in the education sector. The advantages of m-learning have been implied for various reasons, ranging from convenient access to location-based services and reduced costs (Ansari & Tripathi, 2017).

Franklin (2011) defined m-learning as "learning that occurs anywhere and at any time." This definition emphasizes the learner's capacity to communicate with other professionals, as well as their adaptability and empowerment, regardless of the learner's location, cultural background, or political convictions. Steinberg et al. (2020), stated that the use of the mobile device is essential and has become indispensable for young people as at least one device is available per person in every household. They further quoted another study which concluded that students are quick to integrate new media technologies into their daily lives, making them more likely to rely on them to organize their learning process.

M-learning definition as cited in a paper by Wu et al., (2012) is understood as the learner's ability to proceed in a way that the learner is not limited by physical location to take part in educational activities. As a result, m-learning makes it possible for users to participate in the educational process by employing technology as a facilitator tool, such as mobile phones. The mobility, speed of connectivity, and sensitivity to their surroundings (whether it be actual or virtual data) are the criteria used to categorize mobile devices into their respective classes (Ansari & Tripathi, 2017). According to Motiwalla (2007), the many different settings and circumstances made available by mobile devices can benefit one's ability to study. UNESCO (2012) revealed the necessity of using mobile devices for education, particularly when there are difficulties in obtaining specific resources, a lack of structured learning environments, and the ability to be present regardless of place and time.

Most m-learning courses run on Android or IOS, as Internet has become essential and digital learning is also implemented in schools due to the recent pandemic situation (Parlaklıç, 2019). Parlaklıç (2019) cited that mobile technology and the Internet of Things (IoT) help teachers in the learning process and make it accessible from any

device through fog computing. Google Classroom, Duolingo, and Chegg Prep are among the applications for studying available in the Google Play Store. These applications delivered the learning experience through videos, exercises, and tests. Khan Academy, for example, is quite popular and rated rather highly on Google Play Store.

As a result, based on the discussion of the previous literatures, usability is interseam with the mobile application, and most studies evaluate usability in their interpretation. However, few studied the impact of ease of use, satisfaction, and user engagement as criteria alone and more as usability as a whole.

3 Factors Affecting Mobile Application Usage

M-learning application usage has increased rapidly due to the pandemic that hit globally when students are forced to adapt to m-learning and forgo the traditional learning environment. This, in turn, helps in advancing m-learning application development. Educational institutions have tried to make online learning available for students regardless of their circumstances. M-learning application usage drive students to be more independent and productive in learning.

Ease of communicate also influence the application usage as it allows the student to communicate better with the institution. The current medium of using email to notify students on update is inefficient and students tend to overlook their email. With the application, notification is instantly received by the student.

To encourage students' participation in learning, the main factor to be considered is the ease for the student to get the material for learning. They should be able to navigate, choose and engage in what they want to learn (Almaiah, Al-Lozi, Al-Khasawneh, Shishakly, & Nachouki, 2021). In NMC Horizon Report 2017, there are six (6) key vital trends in adopting technologies in the higher education field. The first is the advancing cultures of learning, then deeper learning approaches, growing focus on measuring learning, redesigning learning spaces, blended learning designs, and lastly, collaborative learning (Kuhnel et al., 2018).

4 Effects of Usability of Mobile Learning Application on Student Performance

There are reports of the benefit of m-learning for students' performance in general. It has been shown that mobile technology has encouraged students' feelings on learning, engagement, and assessment scores. A study was done in 2016 where 110 studies from 1993 to 2013 indicate that there is a positive effect on integrating mobile devices on student learning compared to just using a personal computer or no device at all. Teachers or instructors were suggested to design the framework of the course by the device available by the authors. This ensures the most effective use of the mobile application (Heflin, Shewmaker, & Nguyen, 2017).

Cheng (2012) has been cited by Almaiah and Alismaiel (2019) as stating that there is a need to identify the relationship between satisfaction, factors determining quality,

opinions, beliefs, and the learner's outlook as it defines the success of an information system. Cheng (2012) also observed that the student's intention to use the learning system rests on the quality of the information, service, and system in addition to perceived ease of use, perceived enjoyment, and perceived usefulness. This paper also cited Almarasdeh et al. (2010) who evaluated the success of the university management systems in Malaysia. They documented information quality, service quality, and system quality, as well as perceived ease of use and perceived usefulness influence user satisfaction and intention to use. This statement reflects the statement cited by Cheng.

Wang and Huang (2015) concluded that the aesthetic value, level of achievement, and friendliness of an application did affect users. They studied sixteen different interface features in addition to four (4) usability principles in the context of mobile e-books. The finding indicates that users are influenced by their experience of using interfaces, meaning a more familiar interface encourages further engagement and familiarization. The first impression of the interface, however, is not influenced by experience and depends more on the user's subjective impression. Interfaces that are pleasant or appealing to the students are more likely to be used and will lead to a more positive learning experience. These studies point to the significance of aesthetics in the educational experience of students. Ismail et al., (2016) stated that it is important for a learner to adapt to the user interface content for the m-learning to be considered to be usable.

Learning medium that facilitates students in their learning, thus enhancing their performance and scores, will be more likely to be accepted. System quality mentioned above is justified by the system's ease of use, flexibility, user-friendliness, and many more. All this criterion directly influences the intention to use and the reason for it might be because of the effect of perceived ease of use of the system that acts as the facilitator between the two (Almaiah et al., 2021).

5 Conclusion

Usability is important for the user and mobile applications. An application that is high in usability will gather more user attention and be more prone to be used in the long term. Although there are many gaps in mobile usability research at the moment, the development of mobile applications is still growing rapidly. M-learning applications also garner much attention due to the pandemic and are essential in helping students learn despite the obstacles present. Usability in m-learning applications is crucial as they decide the student's comprehension of the subject. An application that is only pleasing to look at but cannot be used is not usable even if aesthetic can also be considered a part of usability. Besides, the studies of m-learning applications will contribute to the advancement of the Malaysian education industry in accordance with the rapid growth of mobile and education technology to produce more competent students. For future works, other usability factors can be studied and their impact on mobile learning applications and the students can be investigated further.

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