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Measuring Usability on Mobile Education Game: the UMUX

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Abstract

Layout inconsistencies within the system, redundant functionality, or the absence of a help button. All of these are instances of elements that make mobile gaming education quite frustrating. The purpose of this study is to assess the level of usefulness and value that may be found in mobile game education. The use of UMUX as a measuring instrument is a new addition to the usual collection of usability questionnaires, to test the perceived usability of a product or service by employing a smaller number of items that are more closely aligned with the definition of usability. In our study, we used method UMUX for online questionnaire. Respondents on this study is 50 people. The usability testing is done on a total of eight different instructional mobile game layouts. Result showed that layout with the highest value and grade is number 8 (85/A+), which displays the page for the "Tes Hafalan". The layout with the lowest value and grade is number 5 (77/B+), which presents a page view of the Tajweed Law. Based on the CGS Table, mobile game education that was researched obtained an average score of 80.5, which corresponds to a grade of A-. These findings indicate a positive user experience, which is relevant to usability. On the other hand, UMUX is capable of interpreting a system in a way that is usable, albeit subject to a number of restrictions.

Keywords: usability, UMUX, mobile game education.

1 Introduction

Inconsistent system layout, redundant functionality, or the lack of a help button [1]. These are all examples of annoying features of mobile game education. Inefficient interfaces can increase mental stress [2], [3]. A focus on user-friendliness in the design of systems and applications can prevent this and make our interactions with technology easier and more pleasurable [4]. The term for this concept is Usability.

Standardized Usability Questionnaires or SUQ are a cost-effective method for evaluating a system's efficacy [5]. Such questionnaires assess the perceived efficacy of computer systems based on previous user interactions. One of the most well-known SUQ is the Usability Metric for User Experience (UMUX). It includes four alternating usability statements that participants rate on a 7-point Likert scale, and generating a usability score ranging from 0 to 100 [6].

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Through an investigation of the information that was gathered through the use of UMUX in mobile game education [7], our research makes a contribution to the usability testing of UMUX, presenting new evidence for their reliability, validity, and sensitivity.

2 Related Work

Few studies have explicitly addressed usability measurement on mobile application with any method. Table 1 shows some usability studies on mobile applications.

Table 1: Study on Usability testing of mobile apps

Author	Methods	Object
Kaya et al. [7]	SUS	mobile applications (WhatsApp, Facebook, YouTube, and Mail)
Adinda and Suzianti [8]	SUS	e-government mobile application
Darmawan et al. [9]	UEQ	Mobile-Apps application services
Sieber et al. [10]	UTAUT	Mobile application

Based on Table 1, there have been many usability methods used to test mobile applications such as SUS, UEQ, UTAUT except UMUX. The study [11] compared various methods, including SUS, UMUX, and UEQ. Usability tests revealed that SUS and UMUX had comparable results. Meanwhile, study [12] shows the only usability design factor that can influence learning is consistent system layout, visual, and design.

Borsci et al [13] investigated whether there was a difference in the results of three standardized user satisfaction scores (SUS, UMUX, and UMUX-LITE) when they were completed by users who had spent varying amounts of time interacting with a website. According to the findings [13], the length of time consumers spend interacting with the product being evaluated has an impact on how each scale is completed. There was a substantial main effect that UMUX had on duration, as well as an interaction between frequency of usage and duration. The participants' scores on the questionnaires used to evaluate the product improved as their frequency of contact with the product did as well.

3 Method

3.1 UMUX

The UMUX was created in 2010 at Intel by Kraig Finstad and his colleagues as a shorter alternative to the 10-item SUS questionnaire. It was also intended to answer the International Organization for Standardization's (ISO) revised concept of usability. Unlike SUS, which evaluates perceived usability and learnability, UMUX evaluates usability by evaluating effectiveness, efficiency, and satisfaction [14], [15].

In order to minimize time, cost, and user effort, practitioners are sometimes required to use reliable scales that are even shorter than the SUS. UMUX is a brief questionnaire with only four questions (Finstad, 2010). The elements are concise descriptions of UX aspects. On a seven-point scale, participants can indicate their disagreement or agreement with these statements.

1) I have to spend too much time correcting things with this mobile education game.
2) This mobile education game's capabilities meet my requirements.
3) This mobile education game is easy to use.
4) Using this mobile education game is a frustrating experience.

3.2 Procedures

The scale for the UMUX items ranged from a score of one point for "Strongly Disagree" to a score of seven points for "Strongly Agree." The scores of the participants were recoded using the approach outlined: "Odd items are scored as [score 1], and even items are scored as [7 – respondents score]". This allowed for a score that ranged from 0 to 6. This technique of subtracting, which comes from the SUS, does away with the need to key the objects as either positive or negative. In order to attain an equivalent value to the SUS score, the total of the four components of the UMUX scale were summed up, then divided by 24, and then multiplied by 100. To provide a more detailed explanation, the formula for determining the UMUX score is as follows:

$$UMUX = [(UMUXitem1 - 1) + (UMUXitem3 - 1) + (7 - UMUXitem2) + (7 - UMUXitem4)] \times \frac{100}{24}$$

3.3 Layouts

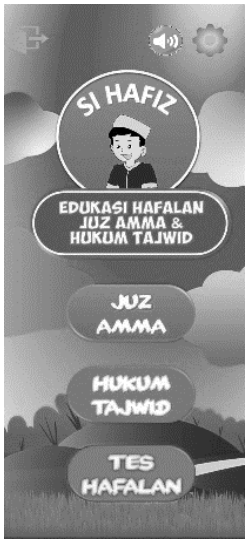

Figure 1: Layout 1

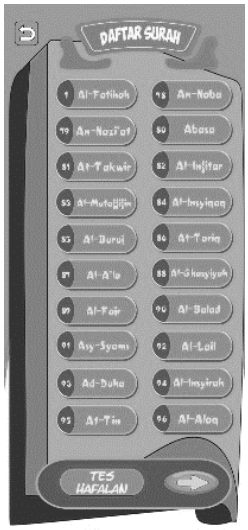

Figure 1: Layout 2

Figure 1: Layout 3

Figure 1: Layout 4

Figure 1: Layout 5

Figure 1: Layout 6

Figure 1: Layout 7

Figure 1: Layout 8

Layout 1 on Figure 1 is the main page display in Mobile Game Education which contains “Juz Amma”, “Tajweed Law”, and “Tes Hafalan”. Layout 2 on Figure 2 is the list of surah in Juz Amma menu. Layout 3 on Figure 3 is one of the surah displays. Layout 4 on Figure 4 is list of Tajweed Law displays which contains Idgham Bigunnah, Idgham Bilagunnah, Ikhfa, Iqlab, Qal-qalah and Waqaf. Layout 5 on Figure 5 is one of the Tajweed Law displays. Layout 6 on Figure 6 is list of Tes Hafalan displays which contains level 1 to 10. Layout 7 on Figure 7 is the start display on Tes Hafalan. Layout 8 on Figure 8 is the main display of Tes Hafalan.

4 Result

Participants for the studies were recruited between March 2023 and a total of 50 participants. Participants voluntarily participated in the research by completing an online questionnaire. Based on data collection from the results of the UMUX questionnaire that:

1) Layout 1 score : 80,7
2) Layout 2 score : 79
3) Layout 3 score : 84
4) Layout 4 score : 79,9
5) Layout 5 score : 77
6) Layout 6 score : 80,5
7) Layout 7 score : 78
8) Layout 8 score : 85

In addition, Lewis and Sauro [16] suggest using The Curved Grading Scale (CGS) Table in order to analyze the results of the UMUX score that was produced. According to Mol et al. [17], although the CGS Table is designed for SUS, it is also compatible with UMUX. CGS Table show on Tabel 2.

Table 2: The Sauro-Lewis Curved Grading Scale (CGS)

Score Range	Grade
84,1 – 100	A+
80,8 – 84	A
78,9 – 80,7	A-
77,2 – 78,8	B+
74,1 – 77,1	B
72,6 – 74	B-
71,1 – 72,5	C+
65 – 71	C
62,7 – 64,9	C-
51,7 – 62,6	D
0 – 51,6	F

Based on CGS Table we find layout 8 is the only one that gets grade A+ and the lowest grade belongs to layout 5, which is B+. The grades are detailed as follows Table 3.

Table 3: UMUX Score

Layout	UMUX Score	Grade
Layout 1	80,7	A-
Layout 2	79	A-
Layout 3	84	A
Layout 4	79,9	A-
Layout 5	77	B+
Layout 6	80,5	A-

Layout	UMUX Score	Grade
Layout 7	78	B+
Layout 8	85	A+
Average	80,5	A-

It was discovered that mobile game education had an average score of 80, which is equivalent to a grade of A. This indicates that the usability is strong and does not make it difficult for consumers to utilize. Berkman and Karahoca [18] show that UMUX items were also sensitive to users' level of experience with the evaluated software. It was determined that neither of the scales was sensitive to the participants' age, gender, or status as native English speakers. The correlations between the scales and the System Usability Scale (SUS) and the Computer System Usability Questionnaire (CSUQ) are statistically significant, indicating their concurrent validity.

Based on the findings, both variations of the UMUX and the original UMUX are reliable scaling methods with highly associated items. The lower level of internal dependability that was observed in our study in comparison to other studies provides a rebuttal to those who believe that UMUX has a limited usefulness. There is evidence that suggest that UMUX are quite sensitive to variations in the level of user experience with the mobile education games that were tested. Because of this, having participants with a varied degree of experience can lead to results that are mostly based on the participant's level of experience rather than the characteristics of the mobile education game that is being reviewed.

5 Conclusion

The usability testing is done on a total of eight different instructional mobile game layouts. The layout with the highest value and grade is number 8 (85/A+), which displays the page for the Tes Hafalan. The layout with the lowest value and grade is number 5 (77/B+), which presents a page view of the Tajweed Law. Based on the CGS Table, the results showed that the mobile game education that was researched obtained an average score of 80.5, which corresponds to a grade of A-. The usability of the mobile game was evaluated with UMUX, and the results showed that it was favorable and offered a pleasant user experience. UMUX, on the other hand, is able to interpret a system in a manner that is usable, albeit subject to certain constraints.

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