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Mobile Learning: Modelling the Influencing Factors on Mobile Devices

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***Abstract*—With the popularity of mobile devices, learning through mobile device proliferated in the education sector. Now a day's mobile devices and mobile technologies are advancing rapidly. Therefore, mobile learning surpassing all other educational servicing methods. On the other hand, human life style averts stagnated education and demanding synchronous mode education such as learning while working. In this study we set out to look-over influencing factors on mobile devices for applicable and sustainable mobile learning environment. In this study we propose an impact model consists six influencing factors i.e. screen size, supportive software, screen zooming, video playback control, touch screen keyboard, and language predictive tools. 120 university teachers and learners with equal portion in each category participated on the model evaluation through pre and post survey questionnaires. Initially they faced pre survey questionnaire with their prior mobile learning experience and finally took the post survey questionnaire after successfully working on the Moodle mobile app modified by first author. The results revealed that the most significant impact factor in the proposed model was 'screen zooming'. Hence, when designing applicable and sustainable mobile learning environment it should be considered that, the screen zooming as the most significant mobile device feature for learner and teacher to adopt in mobile learning.**

Keywords— Mobile learning, Mobile device features, Influencing factors, Higher education, Moodle mobile app

I. INTRODUCTION

Smart features of mobile phones support for augmented reality enables learners to study in outdoor situated learning environments as well as other collaborative student learning environments [1]. The aim of this study to explore influencing factors for learner and teacher to use mobile devices in higher education. For that we considered application specific smartphone features effect to applicable and sustainable mobile learning system associate with mobile learning application. We didn't consider hardware specific features here as modern smartphones have similar hardware features.

1) Mobile device features : In mobile learning teachers and learners (ml-users) able to pursue mobile device based academic activities with the help of various features associated in mobile devices. In this study for an applicable and sustainable mobile learning framework we designated six popular features.

2) Screen size : Mobile device screen is very important for ml-users to interact with academic activities. Smartphones with various screen sizes available in the market today, but 4.3 inches is the lowest convenient size for knowledge acquiring [2]. Screen limitation is deciding factor for usability.

3) Supportive Software : Mobile learning (ML) needs various utilities as supporting software to interact with mobile learning application (MLA) in the mobile device such as document creators/viewers, image and video viewers, and security and authentication and etc [4].

4) Screen Zooming : This is another interesting feature in the mobile devices and it increase the usability of smartphone due to the advancement of readability and visibility. Zooming can be performed double hand with pinch gesture or single hand with tap, double tap, button press, or sliding [5].

5) Video playback control : Videos are very useful in ML. Sometimes quality of the video depends on associated device hardware, device connectivity, recording quality, and video player standards. Video playback controls are start, stop, pause, resume, seek, video quality, and caption on/off. More advanced control actions include zoom, pan, and rotate [6].

6) Touch screen keyboard : Now a days mobile touch screen keyboard or soft keyboards are very popular in mobile devices. It enhancing usability by allowing maximum display by without allocating space for fixed physical keyboard [7].

7) Language predictive tools : Predictive text, auto complete, sentence completion are some of typing aids in modern smartphones. Typing aids are very useful interactions for mobile user specially with the ML to avoid usability limitation in text input in mobile touch screens [8].

II. IMPACT MODEL AND HYPOTHESIS

By literature six variables are identified as impact factors in the proposed model and they are depicted in Fig 1.

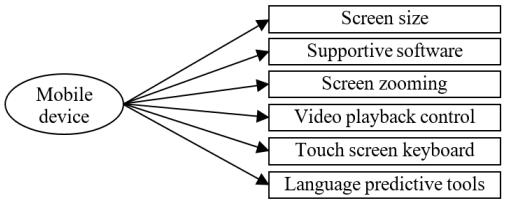

Fig. 1. Proposed impact model for mobile device adoption

The hypothesis is constructed as follows,
H_1: Screen size/ supportive software/ screen zooming/ video playback control/ touch screen keyboard/ language predictive tools of the device have effect on teacher and learner to adopt applicable and sustainable mobile learning system.

III. SYSTEM FUNCTIONS AND ARCHITECTURE

We used modified Moodle mobile app (MMA), modified by the first author to implement the proposed impact model. Moodle mobile architecture allows integrating various functionalities to MMA as plugins with mobile support files

[9]. In this study MMA was integrated features such as learning videos, forums, messages, and educational chatting.

IV. METHODOLOGY

60 students and 60 teachers participated in the survey and they belong to various faculties of the University of Kelaniya, Sri Lanka. Questionnaire consists six questions grouped under above considered six factors was used for both learners and teachers. The five-point Likert scale (-10 – strongly disagree, -5 – disagree, 0 – neutral, 5 – agree and 10 – strongly agree) was used. Firstly, selected group of ml-users were asked to fill the pre survey questionnaire according to their current ML knowledge. Next they were asked to use the MMA integrated various ML functionalities such as videos, forums, messages, chat, and etc., using their smartphone. Finally, they were asked to complete the post survey questionnaire. The mean values of bar charts, Anderson-Darling normality (ADN) test, the paired sample t-test and Pearson correlation coefficient (PCC) were used to data analysis and results discussions.

V. RESULTS AND DISCUSSION

ADN test results are, overall post responses mean is 6.3819, P value <0.005, and confidence interval is (6.0990-6.6649). According to the Likert scales given in methodology, results imply university teachers and learners are strongly accepted the considered device features in the ML.

TABLE I. MEANS OF EACH ATTRIBUTE IN POST-TEST SURVEY

Attribute	Mean
Screen size	6.208
Supportive Software	8.250
Screen Zooming	6.000
Video playback control	6.250
Touch screen keyboard	6.083
Language predictive tools	5.500

Table I results denote that the university community accepted the mobile device features for the ML with the modified MMA. According to the experimental conditions, paired sample t-test can be applied with the hypothesis setting below.

$$H_0 : \mu = 0 \quad \text{VS} \quad H_0 : \mu > 0 \qquad (1)$$

Where, H_0= screen size/ supportive software/ screen zooming/ video playback control/ touch screen keyboard/ language predictive tools of the device doesn't have any effect for teacher and learner to adopt applicable and sustainable ML.

According to the paired sample t-test results, p-value of each factor equal to 0.000 (<0.005). This implies that the H_0 is rejected and H_1 is accepted. Also mean value greater than zero. Thus, results of paired sample *t*-test denote that the considered mobile device features are positively effect for teacher and learner to adopt applicable and sustainable mobile learning. Finally, PCC was calculated to describe the correlation in the proposed impact model.

TABLE II. PEARSON CORRELATION COEFFICIENT TEST RESULTS

Variable	Correlation	P-value
Screen size	0.957	0.011
Supportive software	0.888	0.044
Screen zooming	0.980	0.003
Video playback control	0.955	0.011
Touch screen keyboard	0.731	0.041
Language predictive tools	0.932	0.021

$$H_0: \rho = 0 \quad \text{VS} \quad H_1 : \rho \neq 0 \qquad (2)$$

As per the PCC results, each p-value is less than 0.05 denotes H_0 is rejected and H_1 is accepted. Hence, it implies the above considered six mobile device features have positive effect for teacher and learner to adopt applicable and sustainable mobile learning. Also each variable's correlation close to 1. This means each observed variable of the proposed impact model is strongly correlated with mobile device usage for ML. Finally proposed impact model with correlations were depicted in Fig. 2. Hence, the most significant factor for teacher and learner to use mobile devices in ML is screen zooming.

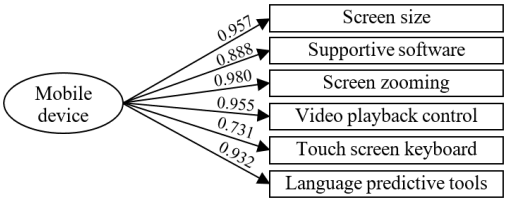

Fig. 2. The impact model for mobile device adoption with correlations

VI. CONCLUSION

Though screen zooming is the most influencing factor in the mobile devices for mobile learning, other factors such as screen size, supportive software, video playback control, touch screen keyboard, and language predictive tools also do a remarkable influence on learner and teacher to engage mobile learning. Finally, we can conclude that educators and mobile learning designers should consider these mobile device features, specially screen zooming when developing mobile device based academic activities on applicable and sustainable mobile learning environments.

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