The role of Personal Innovativeness and Previous Experience in explaining and predicting Mobile-based Assessment adoption

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Abstract:
Mobile learning is gaining great popularity in informal and formal educational settings. Mobile devices can deliver learning content and assessment “anywhere” and “anytime”, offering new opportunities for ubiquitous and personalized learning experiences. Despite the growing interest for mobile learning and mobile-based assessment, little research exists about the factors that influence students to adopt these new technologies. The current study applies the Technology Acceptance Model (TAM) to explain and predict the acceptance of mobile-based assessment in a European University. It proposes two additional variables, Personal Innovativeness and Previous Experience to the already known ones (Perceived Usefulness and Perceived Ease of Use) investigating how they influence Behavioral Intention to Use Mobile-Based Assessment. Partial Least Squares (PLS) was used for data analysis. Results indicate that Previous Experience and Personal Innovativeness have a significant influence on mobile-based assessment adoption. Overall, the study confirms the proposed extended TAM model, explaining and predicting students’ acceptance of the mobile-based assessment and provides a better understanding to develop acceptable assessments delivered through mobile devices. Practical implications are discussed.

Introduction

Mobile devices can deliver learning content and assessment “anywhere” and “anytime” offering new opportunities for ubiquitous and personalized learning experiences. Mobile-based assessment can be used in a wider e-learning perspective, since it can be implemented both inside and outside the boundaries of classrooms and lecture halls, into field trips, museums, etc. However, for a successful implementation of a mobile-based assessment strategy from educational institutions, it is essential to investigate the factors that influence its adoption from students. Despite the growing interest for mobile learning and mobile-based assessment (MBA), little research has been done towards the factors that influence students’ adoption of these new technologies. Technology Acceptance Models (Davis, 1989) is a widely used and validated instrument measuring Technology Acceptance in many educational settings. This study extends the Technology Acceptance Model with two external variables (Previous Experience and Personal Innovativeness) in order to explain and predict mobile-based assessment acceptance by University students. The study first describes the proposed research model and then it presents the methodology used. Finally research results with conclusions follow.

Research Model

The current research model is based on Technology Acceptance Model (TAM) (Davis, 1989). TAM model was developed based on the assumption that the acceptance of any technology can be predicted by the Perceived Usefulness and the Perceived Ease of Use. Perceived Usefulness (PU) is defined as “the degree to which a person believes that using a particular system will enhance his/her job performance” (Davis, 1989). Perceived Ease of Use (PEOU) is defined as “the degree to which a person believes that using the system would be free of effort” (Davis, 1989). In TAM, Behavioral Intention to Use (BIU) a system is influenced by Perceived Usefulness (PU) and Perceived Ease of Use (PEOU).

TAM has been successfully used as a framework to explain and predict student's acceptance of mobile learning (Abu-Al-Aish & Love, 2013; Hwang & Wu, 2014; Park, Nam, & Cha, 2012) and computer-based assessment acceptance as well (Terzis & Economides, 2011; Terzis & Economides, 2012; Terzis, Moridis, Economides, & Rebolledo-Mendez, 2013).

Since its creation, beyond its before-mentioned core constructs, a number of external variables (contextual factors or factors from other theories) have been added to TAM. The current study introduces Personal Innovativeness (PI) and Previous experience (PE) as external factors and investigates how these factors contribute to the user's perception of how easy mobile-based assessment is and how useful it is.

In-line with the classic TAM approach, our model about mobile-based assessment proposes the following hypotheses:

H1a: Perceived Ease of Use (PEOU) has a positive effect on Perceived Usefulness (PU).
H1b: Perceived Ease of Use (PEOU) has a positive effect on Behavioral Intention to Use (BIU).
H2: Perceived Usefulness (PU) has a positive effect on Behavioral Intention to Use (BIU).

Personal innovativeness in the domain of information technology is a construct that have been developed and validated by Agarwal and Prasad (1998). It has been defined as "the willingness of an individual to try out any new information technology" (Agarwal & Prasad, 1998, p. 206). Previous research has shown that personal innovativeness in the domain of information technology is an important factor in technology acceptance. We hypothesize that:

H3a: Personal Innovativeness (PI) has a positive effect on Perceived Ease of Use (PEOU).
H3b: Personal Innovativeness (PI) has a positive effect on Perceived Usefulness (PU).
H3c: Personal Innovativeness (PI) has a positive effect on Behavioral Intention to Use (BIU).

Many authors consider that the previous experience is the more efficient moderating factor in accepting an information system (King & He, 2006). As a result, we assume that students who have already experience in using mobile devices for learning purposes will be more willing to use the mobile-based assessment than inexperienced students. Therefore we assume that:

H4a: Previous experience (PE) has a positive effect on Perceived Ease of Use (PEOU).
H4b: Previous experience (PE) has a positive effect on Behavioral Intention to Use (BIU).

Fig. 1 presents the theoretical research model under investigation.

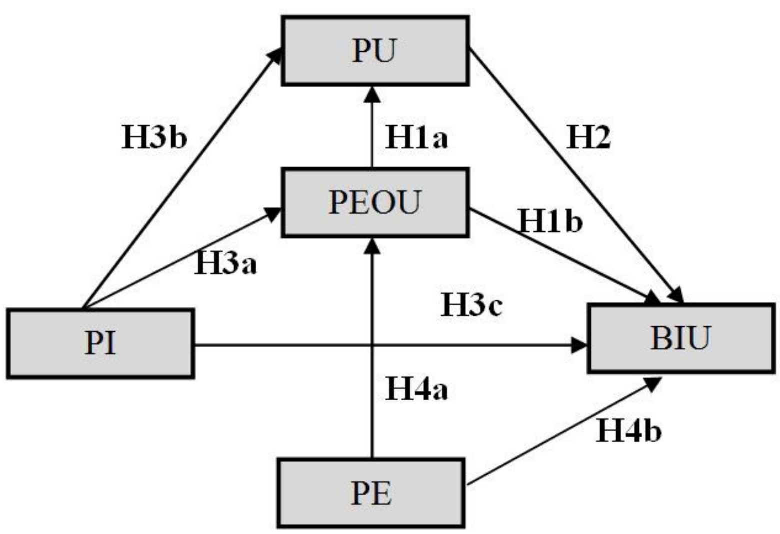

Fig.1: The Research Model

The Study

The participants in the study were 193 first-year undergraduate students from an introductory informatics course, in the Department of Economic Sciences of a Greek University. There were 103 males (53%) and 90 females (47%). The average age of students was 19.5 (SD = 1.23). Students participated, in a voluntary basis, in a low-stake mobile-based assessment procedure that took place towards the end of the fall semester inside the lecture hall. They used their own wi-fi enabled smartphones (80% Android, 12% iOS, 7% Windows Phone and 1% other) in order to answer a total of 30 multiple-choice questions delivered from a questions database through a mobile quiz application.

For Perceived Usefulness, Perceived Ease of Use and Behavioral Intention to Use we adopted items from (Davis, 1989). For Personal Innovativeness toward IT we adopted items from Agarwal and Prasad (1998). Previous experience was conceptualized as how long and to what extend students have been used mobile devices for searching the internet and answering quizzes for educational purposes. All items were measured on a seven point Likert-type scale with 1 corresponding to “strongly disagree” and 7 to “strongly agree”.

Partial Least-Squares (PLS) with Smart PLS 2.0 (Ringle, Wende, & Will, 2005) was used as the analysis technique to predict factors influencing mobile-based assessment adoption. Both convergent and discriminant validity for the proposed research model are verified. All factor loadings on their relative construct exceed 0.70, composite reliability of each construct exceed 0.70 and all average variance extracted (AVE) values range from 0.547 to 0.734 (AVE > 0.50) exceeding the variance due to measurement error for that construct (Table 1). Discriminant validity is also supported since the square root of the average variance extracted (AVE) of a construct is higher than any correlation with another construct (Table 2).

Construct Items	**Mean (SD)**	**Factor Loading (>0.70)**	**Cronbach's a (>0.70)**	**Composite Reliability (>0.70)**	**Average Variance Extracted (>0.50)**
Perceived Ease of Use	5.76 (0.86)		0.817	0.831	0.734
PEOU1		0.786			
PEOU2		0.897			
Perceived Usefulness	5.39 (1.22)		0.845	0.824	0.715
PU1		0.810			
PU2		0.824			
PU3		0.702			
Personal Innovativeness	4.78 (1.17)		0.823	0.799	0.547
PI1		0.714			
PI2		0.832			
PI3		0.753			
Previous Experience	4.98 (0.89)		0.770	0.811	0.679
PE1		0.835			
PE2		0.892			
PE3		0.736			
Behavioral Intention to Use	5.91 (0.77)		0.902	0.897	0.602
BIU1		0.910			
BIU2		0.824			
BIU3		0.745			

Table 1: Descriptive statistics and results for convergent validity for the measurement model

Construct	PEOU	PU	PE	PI	BIU
Perceived Ease of Use (PEU)	**0.86**				
Perceived Usefulness (PU)	0.62	**0.85**			

Previous Experience (PE)	0.45	0.22	**0.82**		
Personal Innovativeness (PI)	0.36	0.39	0.65	**0.74**	
Behavioral Intention to Use (BIU)	0.11	0.67	0.48	0.21	**0.77**

Table 2: Discriminant validity for the measurement model

The results from the PLS analysis support all eight hypotheses; the path coefficient for each path is shown in the parentheses:

1) Perceived Ease of Use has a positive effect on Perceived Usefulness (0.29),
2) Perceived Ease of Use has a positive effect on Behavioral Intention to Use (0.42),
3) Perceived Usefulness has a positive effect on Behavioral Intention to Use (0.34),
4) Personal Innovativeness has a positive effect on Perceived Ease of Use (0.31),
5) Personal Innovativeness has a positive effect on Perceive Usefulness (0.19),
6) Personal Innovativeness has a positive effect on Behavioral Intention to Use (0.14),
7) Previous Experience has a positive effect on Perceived Ease of Use (0.15),
8) Previous Experience has a positive effect on Behavioral Intention to Use (0.12)

The values of R^2 for the four endogenous variables of our model, i.e. Perceived Usefulness, Perceived Ease of Use and Behavioral Intention to Use are 0.27, 0.32 and 0.45 respectively. According to the model:

1) Perceived Ease of Use and Personal Innovativeness explain about 32% of the total variance in Perceived Usefulness.
2) Previous Experience and Personal Innovativeness explain about 27% of the total variance in Perceived Ease of Use.
3) Previous Experience, Personal Innovativeness, Perceived Ease of Use and Perceived Usefulness explain about 45% of the total variance in Behavioral Intention to Use.

Table 3 and Figure 2 summarize the structural model results. The figure shows the path coefficient for each path with its significance (as asterisks) and the R^2 for each endogenous variable.

Hypothesis	Effect	Coefficient	support
H1a	PEOU → PU	0.29***	yes
H1b	PEOU →BIU	0.42***	yes
H2	PU → BIU	0.34**	yes
H3a	PI → PEOU	0.31***	yes
H3b	PI → PU	0.19**	yes
H3c	PI → BIU	0.14***	yes
H4a	PE → PEOU	0.15**	yes
H4b	PE → BIU	0.12***	yes

*p < .05,**p < .01, ***p < .001.

Table 3: Summary of findings

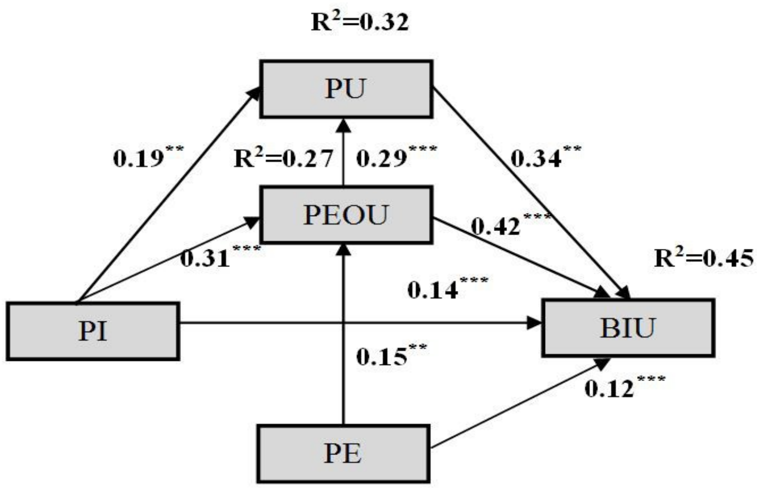

Fig.2: The Research Model – SEM Analysis

Overall, the study found evidence that Previous Experience and Personal Innovativeness are associated with higher perceptions of easiness and usefulness of mobile-based assessment and therefore with higher level of adoption.

Conclusions

The current study belongs to the wider context of our research about the factors that influence students and teachers to adopt mobile-based assessment. While research about mobile-learning adoption (Abu-Al-Aish & Love, 2013; Hwang & Wu, 2014; Park, Nam, & Cha, 2012) and computer-based assessment adoption (Terzis & Economides, 2011; Terzis & Economides, 2012; Terzis, Moridis, Economides, & Rebolledo-Mendez, 2013) exist, research about mobile-based assessment adoption is limited (Triantafillou, Georgiadou, & Economides, 2008; Nikou & Economides, 2014a; Nikou & Economides, 2014b).

The model explains 45% of the total variance in Behavioral Intention to Use Mobile-Based Assessment (MBA) and provides evidence that there are significant relations between Previous Experience in mobile learning and Behavioral Intention to Use MBA and between Personal Innovativeness and Behavioral Intention to Use MBA. The perception of how easy is to use a mobile-based assessment system, positively influences the intention to use the system. Also when MBA is considered useful, it is more likely that students will use it. This is in-line with the general literature about Technology Acceptance (Davis, 1989) and also with the specific literature about mobile learning acceptance (Abu-Al-Aish & Love, 2013; Hwang & Wu, 2014; Park, Nam, & Cha, 2012). The positive influence of Personal Innovativeness on adoption to use MBA is in-line with the study results from the research on the innovation diffusion theory (Agarwal & Prasad, 1998; Lu, Yao, & Yu, 2005). Also Previous experience is the more efficient moderating factor in TAM research (Venkatesh, 2000; King & He, 2006). This is also confirmed by the current study in the context of mobile-based assessment.

From the previous analysis, it appears that designers of mobile-based assessments, educational policy administrators and educators should take into consideration all the above factors that influence MBA acceptance when they design and implement assessments to be delivered through mobile devices.

Mobile learning (including mobile-based assessment) has a huge potential to transform learning processes. For a successful mobile learning implementation strategy, more research about the factors that influence students' acceptance need to be done. The contribution of the current study is in this direction. However, more studies that incorporate additional external variables into the basic technology acceptance model should be conducted. Investigating the impact of these external variables on students' MBA adoption will lead to a better understanding of mobile-based assessment adoption and more successful implementation strategies.

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