



Full length article

Mobile-Based Assessment: Integrating acceptance and motivational factors into a combined model of Self-Determination Theory and Technology Acceptance



Stavros A. Nikou*, Anastasios A. Economides

Interdepartmental Programme of Postgraduate Studies in Information Systems, University of Macedonia, Egnatia Street 156, 546 36, Thessaloniki, Greece

ARTICLE INFO

Article history:

Received 11 October 2016

Accepted 15 November 2016

Keywords:

Mobile learning

Mobile-based assessment

Technology acceptance model

Self-determination theory of motivation

ABSTRACT

Mobile-Based Assessment (MBA) is an alternative or complementary to paper- or computer-based assessment delivery mode. Its successful implementation depends on users' acceptance. However, no study exists exploring the factors that influence students' acceptance of mobile-based assessment. Furthermore, research that combines acceptance with motivational factors is limited. The current study builds on the theoretical framework of the Self-Determination Theory (SDT) of Motivation and the Technology Acceptance Model (TAM) and proposes the Mobile Based Assessment - Motivational and Acceptance Model (MBA-MAM), a combined model that explains and predicts Behavioral Intention to Use Mobile-based Assessment. One-hundred and forty students ($N = 140$) from a European senior-level secondary school participated in mobile-assisted assessment activities and self-reported their perceptions about MBA afterwards. Structured equation modeling used to analyze quantitative survey data. The study confirmed the proposed model, explaining and predicting students' intention to use MBA in terms of both acceptance and motivational (autonomy, competence and relatedness) factors. The study provides a better understanding towards the development of mobile-based assessments by relating acceptance and motivational factors into an integrated model. Implications are discussed within the wider context of mobile learning acceptance research.

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1. Introduction

With the rapid growth of mobile technologies and the widespread adoption of BYOD policies, Mobile-Based Assessment (MBA) has started to emerge as another delivery mode of assessment – alternative and/or complementary to paper- or computer-based testing (Johnson et al., 2016). MBA offers a number of benefits such as easier administration, time and location independence, ubiquity and context awareness, adaptivity, personalization and social interactivity (Nikou & Economides, 2013). However, despite the important learning opportunities that MBA may provide, its successful development depends on user acceptance. The current study investigates acceptance and motivational factors that influence the acceptance of Mobile-Based Assessment.

The study is based on the Self-Determination Theory (SDT) of

Motivation (Deci & Ryan, 2002) and the Technology Acceptance Model (TAM) (Davis, 1989) and has two research objectives.

The first objective is to build a model about the acceptance of mobile-based assessment. While many studies exist about mobile learning acceptance (Liu, Han, & Li, 2010; Park, Nam, & Cha, 2012), no study exists to investigate the acceptance of mobile-based assessment. The current study explores students' acceptance of mobile-based assessment introducing the following external variables: *educational content with feedback*, students' *mobile device-self efficacy*, *interactivity* and *collaboration* during the assessment process, and the *ubiquity* features of mobile device. The study examines the impact of these factors on the behavioral intention to use MBA.

The second objective is to introduce motivational variables into technology acceptance. Researchers argue that in order to achieve a more inclusive approach to technology acceptance in educational contexts, there is a need to introduce motivational variables into the technology acceptance models (Pedrotti & Nistor, 2016). The current study introduces into TAM, the SDT motivational variables of *autonomy*, *competence* and *relatedness* and examines their impact

* Corresponding author.

E-mail addresses: stavrosnikou@sch.gr (S.A. Nikou), economid@uom.gr (A.A. Economides).

on *perceived ease of use* and *perceived usefulness*, predicting *behavioral intention to use*. While studies exist that relate SDT with information technology (Chen & Jang, 2010; Lee, Lee, & Hwang, 2015) and e-learning acceptance (Sørebo, Halvari, Gulli, & Kristiansen, 2009), to the best of our knowledge, no study exists to investigate mobile-based acceptance based on both TAM and SDT. Our study is aiming to propose a combined model of both acceptance and motivational factors towards the prediction of students' behavioral intention to use mobile-based assessment.

The study is organized as follows: the next section provides a brief literature review about the Technology Acceptance Model, Self-Determination Theory of Motivation and a combined view of Technology Acceptance and Self-Determination for e-learning and mobile learning and assessment, providing the rationale for modeling MBA acceptance based on SDT and TAM. Next, the study presents the proposed conceptual model with the hypotheses to be tested. Following that, the sections of methodology (participants, instruments and procedure) and the data analysis and results follow. Discussions and conclusions for the impact in education follow next along with the study limitations and future work.

2. Literature review

2.1. Technology acceptance model

A critical factor for the successful implementation of any information system is its user acceptance. Technology Acceptance Model (TAM) (Davis, 1989) is a well-established model that is based on the psychological interaction of a user with technology and it addresses the issue of how users accept and use information technology. TAM utilizes the constructs of Perceived Usefulness (PU), Perceived Ease of Use (PEOU) and Attitudes Towards Usage (ATU) to explain and predict technology system adoption (Davis, 1989). According to Davis (1989), Perceived Usefulness (PU) is defined as the degree to which a person believes that using a particular system will enhance his/her job performance. Perceived Ease of Use (PEOU) is defined as the degree to which a person believes that using the system would be free of effort. In TAM, Behavioral Intention to Use a system (BIU) is influenced by Attitude Towards Use (ATU), as well as the direct and indirect effects of Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Acceptance research (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989) suggests that perceived ease of use and perceived usefulness are the two key determinants that influence the attitudes of users toward using e-learning technology. Beyond these two constructs, a meta-analysis review by Sumak, Hericko and Pušnik (2011) highlights the large number of external variables that have been added since the early days of TAM, significantly affecting e-learning acceptance. These variables may be related to user characteristics, supporting technology, facilitating conditions, subjective norms etc. However, some researchers (van der Heijden, 2004) argue that the predicting power of TAM is limited to productivity-oriented (or utilitarian) systems, with the influence of intrinsic motivation (conceptualized as perceived enjoyment) to be usually underestimated. In pleasure- (or hedonic) oriented systems, perceived enjoyment dominates over perceived usefulness (Ha, Yoon, & Choi, 2007). Furthermore, as previous research suggests, motivation is a significant factor in affecting users' acceptance of technologies (Davis et al., 1989). Previous studies highlight the importance of investigating the impact of motivational factors on the intention to use e-learning systems (Fagan, Neill, & Wooldridge, 2008; Huang, 2015; Pedrotti & Nistor, 2016). In the context of knowledge-acquisition-oriented (or educational) systems, further research is needed in order to understand the motivating factors towards intention to use technology.

2.2. Self-determination theory (SDT) of motivation

Self-Determination Theory (SDT) of motivation (Ryan & Deci, 2000a, 2000b) is a contemporary macro-theory of motivation assuming that humans have a natural tendency to be intrinsically motivated integrating external regulations into self-regulations towards personal psychological growth, social integration and well-being (Deci & Ryan, 2002). The theory distinguishes between two basic types of motivations: extrinsic and intrinsic (Deci & Ryan, 1985). Extrinsic motivation is the type of motivation that is built upon external rewards or punishments - further categorized into external regulation, introjected regulation, identified regulation and integrated regulation. Intrinsic motivation is the type of motivation that leads to a behavior that is inherently interesting and pleasant. When people are intrinsically motivated they engage in activities for the inherent satisfaction, enjoyment or challenge. SDT argues that intrinsic motivation is supported when the three basic and universal human psychological needs of autonomy, competency and relatedness are satisfied (Deci & Ryan, 1985). Autonomy refers to the desire of people to regulate and self-control their own behavior. Relatedness refers to the desire of people to feel connected and associated with others. Competence refers to the desire of being effective and sufficient when performing an activity. There is a large body of research supporting the SDT postulate that autonomy, competence and relatedness are necessary conditions for the maintenance of intrinsic motivation (Niemi & Ryan, 2009). Literature describes also intrinsic motivation as autonomous motivation (versus controlled or external motivation) leading to a self-determined behavior.

The current study uses the SDT motivation framework. SDT has been already successfully applied to education (Deci, Vallerand, Pelletier, & Ryan, 1991; Naeghel, Keer, Vansteenkiste, Haerens, & Aelterman, 2016; Niemi & Ryan, 2009) and on-line learning (Hartnett, 2015; Sørebo et al., 2009). Furthermore, a study by Lee et al. (2015) confirmed the significant relationship across Self-Determination Theory and Technology Acceptance.

2.3. Technology acceptance from the perspective of the Self-Determination Theory of Motivation

Since the early days of TAM, Davis et al. (1989) highlighted the importance of motivation and self-determination towards user's decision to adopt an e-learning system. They showed that perceived enjoyment is an example of intrinsic motivation while perceived usefulness is an example of extrinsic motivation for intention to use information services. Venkatesh (2000) conceptualized intrinsic motivation as computer playfulness that influences perceived ease of use and system acceptance. Lee, Cheung, and Chen (2005) integrated a motivational perspective into the technology acceptance model, capturing both extrinsic (perceived usefulness and ease of use) and intrinsic (perceived enjoyment) motivators for explaining students' intention to use an Internet-based learning medium. An intrinsic motivation perspective was also added to TAM by Zhang, Zhao, and Tan (2008). Drawing on SDT, Chen and Jang (2010) proposed and tested a model for online learner motivation supporting the SDT's main postulate that human motivation is a rather multidimensional construct consisting of intrinsic motivation, external, introjected, and identified regulations, and amotivation.

In the context of e-learning in the workplace, Roca and Gagne (2008), extended TAM with perceived autonomy support, perceived competence and perceived relatedness. All these SDT constructs were found to influence perceived usefulness, perceived playfulness and perceived ease of use. Sorebo et al. (2009) showed that the basic SDT psychological needs and intrinsic motivation can

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