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Do learners' characteristics matter? An exploration of mobile-learning adoption in self-directed learning

Sahar Karimi

Edge Hill University, Business School, St Helens Rd, Ormskirk, Lancashire L39 4QP, UK

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ABSTRACT

This paper aims to identify individual characteristics that motivate learners to use mobile-learning. It sheds light on our current knowledge by a) examining an m-learning adoption model which accounts for learners' characteristics (learning style and personal innovativeness) in addition to previously studied mobile platform characteristics and b) considering the context in which learning occurs (formal and informal). A framework has been introduced and empirically tested. Results suggest that individuals' learning style and perceived playfulness influence m-learning usage in both learning situations; while performance expectancy and personal innovativeness are only influential in specific learning contexts. This study highlights the role of learners' characteristics in m-learning adoption and emphasizes the importance of distinguishing between various types of m-learning. This multi-disciplinary research enriches m-learning literature and offers practical implications for educators using mobile technologies as well as developers of virtual learning platforms.

1. Introduction

In recent years, increase in the use of mobile technologies has affected various service sectors such as banking, tourism, and library research. Mobile devices, as a consequence of this growth, have entered into museums, workplaces and classrooms supporting learners inside or outside the formal education systems (Liu, Li, & Carlsson, 2010). Higher education has also been influenced by the use of mobile devices for educational purposes. Advances of mobile technology facilitates moving from traditional learning which was limited with time and space to learning embedded into our everyday environment. Shift of focus from teaching to learning, where education involves learners' engagement both within and outside the classroom (Taylor, Sharples, O'Malley, Vavoula, & Waycott, 2006), also escalates the importance of mobile platform in education.

Mobile learning (m-learning) which is defined as e-learning using mobile devices (Ktoridou & Eteokleous, 2005; Şad & Göktaş, 2014) such as smart phones, personal digital assistants (PDAs) and tablets, allows learners to learn anywhere and anytime. It is an effective component of learning as today's learners are mobile and frequently utilize mobile devices to study on the move (El-Hussein & Cronje, 2010; Sarrab, Elbasir & Alnaeli, 2016). This can clearly affect their learning experience by making ubiquitous learning possible (Sandberg, Maris, & Gees, 2011) and turning them to active participants of learning process, rather than passive receivers of knowledge (Looi et al., 2010). M-learning enriches the learning process by offering an active learning tool (Ozdamli, 2012), collaborative learning opportunities (Lipponen, Rahikainen, Lallimo, & Hakkarainen, 2003; Peck, Deans, & Stockhausen, 2010), and flexible learning which is 'just enough, just in time, just for me' (Abu-Al-Aish & Love, 2013; Peters, 2007). It can supports blended-learning environments in which students become active and interactive learners (Dziuban, Hartman, & Moskal, 2004) and facilitate self-directed and informal learning (Taylor et al., 2006). Students would be able to engage with learning when they are in their best cognitive ability (Bonnici, Maatta, Klose, Julien, & Bajjaly, 2014). M-learning can also be individualized and adopted differently based on the needs of learners, making the learning process more efficient and effective (Sun, Joy, & Griffiths, 2007). It has, therefore, the potential to help achieving educational goals (Şad & Göktaş, 2014). However, adoption of web-based applications in higher education is still encountered by challenges (Macharia & Pelser, 2014). It is therefore crucial to understand what motivates or discourages learners and educators to use them.

There is a growing body of literature that explores the use of mobile platforms in higher education. However, our current

E-mail address: Karimis@edgehill.ac.uk.

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understanding is mostly related to its technological characteristics (Sarrab et al., 2016) or motivational factors that influence educators' use of m-learning (Şad & Göktaş, 2014), with merely a handful of studies examining learners' motivational factors. Educators and learners are both important components of m-learning adoption. Nevertheless, there is little known about students' preferences for online learning activities (Bonnici et al., 2014). It is essential to explore the use of mobile devices for learning purposes from their perspective.

As Terras and Ramsay (2012, p827) have pointed out, "the individual can shape and be shaped by the context". Ignoring the role of context and individuals is therefore deficient. M-learning research ought to examine the relationship between learners and their learning context. This paper attempts to explore factors that motivate learners to use mobile devices in both formal and informal learning contexts. Although mobile technology is utilized very differently in formal and informal learning (Laurillard, 2007), previous research does not differentiate between learners' intention to use m-learning in these two settings. The focus of existing literature is mainly on formal learning (Looi et al., 2016) in which virtual learning platforms are used on mobile devices (see for example Wang, Wu, & Wang, 2009; Liu et al., 2010). However, learners not only use virtual learning platforms but also access online information to facilitate their learning. Despite being informal, this is an important aspect of learning process. There is insufficient empirical evidence for m-learning usage in informal learning (Jones, Scanlon, & Clough, 2013). This could be due to the difficulty of capturing use of technology in this context (Pachler, 2007). As the design of mobile learning activities for informal contexts is scaling up (Looi et al., 2014), this environment needs further investigation (Kearney, Schuck, Burden, & Aubusson, 2012). Moreover, it is known that individual differences of learners affect self-directed learning (Kreber, 1998). Extant research neglects the impact of individual characteristics (i.e. learning style) on m-learning usage which is highly dependent on self-direction. This study contributes to current literature by considering and examining the relationship between the context of learning and learners' characteristics. Accordingly, it introduces and tests an m-learning adoption framework which:

- Distinguishes between two learning contexts in which m-learning occurs (informal and formal learning)
- Examines the impact of learners' characteristics (learning style and personal innovativeness) on m-learning adoption, in addition to system characteristics

2. Theoretical framework

2.1. Learning context

The way mobile devices are used by learners in order to perform different types of learning activities is underexplored in previous research. Self-directed learning, which is the ability of learners to direct their own learning (Hartley & Bendixen, 2001), is an important aspect of online learning environments (Song & Hill, 2007). Mobile learning facilitates self-directed learning as it embraces considerable amount of learning that happens outside classrooms and is structured by learners themselves (Sharples, Taylor, & Vavoula, 2005). Such self-directed learning activities can be supported by teacher-supplied or learner self-identified resources (Wong, 2012). Hence m-learning can occur in both formal and informal forms. Formal learning occurs when the learner is encouraged to manage his/her own learning process within the constraints of a designed curriculum and teacher-supplied resources (Marsick & Watkins, 2001). It includes the use of virtual learning environments through mobile devices where learning objectives and resources are in the control of the institution. Informal learning involves any activity that occurs outside the curricula of educational institutions, or the courses or workshops offered by educational institutions (Livingstone, 1999). It is related to the use of publically available online resources through mobile devices with the intention of learning. Mobile devices facilitate learning by offering learners the possibility to switch from one scenario or context (i.e. formal and informal learning) to another easily and quickly (Wong, 2012). Although students may switch between them, it is important to separate these settings in order to understand their adoption behaviour. This study explores the use of mobile technology for two types of learning: formal and informal.

2.2. Models of m-learning adoption and their antecedents

In order to examine learners' motivation to use m-learning, adoption models are utilized. Various models have been previously developed to examine users' acceptance and intention to adopt a new technology. Recently, these models have found their way to studies of e-learning (Macharia & Pelser, 2014; Renda dos Santos & Okazaki, 2015) and m-learning. For example, technology acceptance model (TAM), introduced by Davis (1989), has been utilized to explore m-learning acceptance (Ju, Sriprapaipong, & Minh, 2007; Liu et al., 2010; Tan, Ooi, Leong, & Lin, 2014). The unified theory of acceptance and use of technology (UTAUT), proposed by Venkatesh, Morris, Davis, and Davis (2003), has also been adopted in this line of studies (Wang et al., 2009). This comprehensive model integrates eight prominent models of technology adoption research, including: the theory of reasoned action (TRA) (Fishbein & Ajzen, 1975), the technology acceptance model (TAM) (Davis, 1989), the theory of planned behaviour (TPB) (Ajzen, 1991), the combined TAM and TPB (C-TAM-TPB) (Taylor & Todd, 1995a), the motivational model (MM) (Davis, Bagozzi, & Warshaw, 1992), the model of PC utilisation (MPCU) (Thompson, Higgins, & Howell, 1991), the innovation diffusion theory (IDT) (Moore & Benbasat, 1991; Rogers, 2003) and the social cognitive theory (SCT) (Bandura, 1986). UTAUT suggests that performance expectancy, effort expectancy, social influence, and facilitating conditions are direct determinants of behavioural intention. Studies of m-learning have incorporated new concepts of perceived playfulness and self-management of learning into this model. While playfulness was consistently found influential, results for self-management are contradictory. A study by Wang et al., (2009) reported a significant effect; whereas Lowenthal (2010) didn't found a significant influence. Later, Abu-Al-Aish and Love (2013) added personal innovativeness to antecedents of intention to use m-learning. As suggested by Pedersen and Ling (2003) and Wang et al. (2009), the main constructs of UTAUT may not be fully relevant to m-learning adoption. It is, in fact, essential to test and verify this model by modifying and extending it with other determinant factors. This paper follows the above literature and introduces and empirically tests an m-learning adoption model for different learning contexts. The definition of UTAUT constructs included in the model and their relation to m-learning adoption are explained as follows.

Performance expectancy defines the extent to which a person believes using m-learning would improve his/her learning performance and productivity. It reflects on the usefulness of m-learning by enabling faster and more flexible learning activities which can enhance learning effectiveness (Wang et al., 2009). *Effort expectancy* is the degree of ease of use that individuals associate with m-learning. Learners are more willing to use m-learning if they believe that the technology can be easily used (Liu et al., 2010). This is particularly important due to the incompatibility of certain e-