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The use of a mobile learning management system and academic achievement of online students

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ABSTRACT

Mobile learning has become widespread, and higher education institutions have started adopting mobile technology to cope with the needs of students. Despite its adoption in higher education settings, little research has been done to examine factors influencing the adoption of mobile learning management systems (LMSs) and the learning effects on students' academic achievement. To explore the relationships among factors and the educational effectiveness of mobile LMSs, students' demographic backgrounds (age and employment status), self-reported psychological data (self-efficacy, innovativeness, perceived ease of use, and perceived usefulness of mobile LMSs), and external factors (subjective norms) were collected from 1604 students from 10 repetitions of the same course in an online university in Korea, in addition to their test scores. The logistic regression results showed that age and employment status were significant factors in predicting students' adoption of mobile LMSs and that there were potential connections between mobile LMS use and students' gender, age, and psychological characteristics. In addition, the study demonstrated that the use of a mobile LMS positively influenced online students' academic achievement. The findings from this empirical study present a better understanding of students' usage of mobile devices in higher education.

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1. Introduction

Mobile learning has been defined as learning facilitated by mobile devices such as mobile phones, tablet PCs, and personal media players (Herrington & Herrington, 2007; Valk, Rashid, & Elder, 2010) in both formal and informal educational settings (Quinn, 2011; Traxler, 2010). Mobile learning has become widespread as the development of mobile devices with advanced wireless communication technology has encouraged learning “on the move,” using mobile devices in educational settings. It allows students to access learning content from various locations and times (Jones, Scanlon, & Clough, 2013; Hyman, Moser, & Segala, 2014; Garcia-Cabot, de-Marcos, & Garcia-Lopez, 2015), and share learning contents with others (Woodill, 2011).

This technological innovation has encouraged higher education institutions to increase the use of mobile technology to fulfill their students' expectations and needs. At present, many undergraduate students bring their own digital devices to university, especially small, portable ones such as smartphones and tablets (Dahlstrom, Walker, & Dziuban, 2012; O'Bannon & Thomas, 2015), and they expect to access academic resources using their mobile devices. Additionally, according to the

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statistics from the US Department of Education, the population of online students has dramatically increased. In 2012, about 5.5 million students were enrolled in online courses in the US, which was roughly one quarter of the total enrollment in higher education institutions (Straumsheim, 2014). Among those 5.5 million students, about 2.6 million were enrolled in fully online programs (i.e., they did not physically attend classes at all). This phenomenon of an increasing number of students taking online courses can also be found internationally (Dahlstrom et al., 2012). To serve this growing population of on-campus mobile users and increase their access to learning contents and activities, many higher educational institutions have endeavored to develop mobile learning management systems (LMSs) that provide similar functions to a traditional, PC-based LMS but via mobile devices. Their functions include accessing course materials and grades, sharing resources with other students or instructors, uploading assignments, and collaborating with classmates. Moreover, a mobile LMS has the advantage over a traditional LMS in that students are able to access their courses anytime and anywhere by taking advantage of the unique features of mobile devices (Lowenthal, 2010).

Regardless of the recent deployment of formal learning management systems in a mobile context, however, research on mobile learning still remains focused on exploring the potential of informal mobile learning (Chen & Denoyelles, 2013; Hwang & Chang, 2011; Jones et al., 2013; Martin & Ertzberger, 2013) and on its use as a support tool in formal learning delivered at least partially by other means (e.g., as traditional online or face-to-face learning) (Gikas & Grant, 2013). Among several previous studies that have addressed the provision of mobile learning as a tool to provide full access to academic, social, and administrative materials in the same way as a traditional LMS, only a few studies have examined students' perceptions and behaviors when using this new technology (Cavus, 2011; Han & Han, 2014; Mödritscher, Neumann, & Brauer, 2012). For example, Cavus (2011) examined students' perspectives on the use of mobile LMSs in higher education settings, and found that most of the students had favorable perceptions toward the use of mobile devices in accessing an LMS. In a further examination of the differences in perceptions between users and non-users of mobile LMSs, one study revealed that even while acknowledging the advantages of mobile LMSs, non-users were reluctant to adopt them due to their perception that they were overly complex, and thus were psychologically resistant to using them (Han & Han, 2014). Meanwhile, users adopt the use of a mobile LMS because they perceive the new system to be less challenging and complex. The reasons users and non-users differ in terms of their perception of the challenges of mobile LMSs can depend on individual backgrounds and psychological characteristics as well as external factors; however, this has yet to be explored in detail. Since the mere existence of a mobile LMS does not guarantee its use by students, further investigation of who chooses to use a mobile LMS and what characteristics they have is necessary. This study thus aims to examine (1) which factors affect the use of mobile LMSs and (2) the relationships that exist among these factors.

Additionally, since mobile learning in higher education is still in its early stages (Cheon, Lee, Crooks, & Song, 2012; Hwang & Wu, 2014; Park, 2011), few studies have reported how mobile LMS use affects students' academic achievement in formal educational settings. Hence, more research needs to be conducted to explain why students use mobile LMSs in formal education and how mobile LMSs influence student academic achievement.

Considering the above-mentioned research needs, the purpose of this study is to examine factors influencing the use of mobile LMSs by online students. More specifically, this study investigates influential variables and the relationships among them by comparing regression models including different sets of variables, such as students' individual backgrounds and psychological characteristics, as well as external factors. In addition, this study also examines the effect of using mobile LMSs on online students' academic achievement.

2. Background

2.1. Factors affecting the use of mobile LMSs

Since the use of mobile LMSs in formal learning settings is a relatively new technological advancement, until now, few studies have explored the factors that can affect their use. However, some studies have examined factors influencing the acceptance of various new technologies such as studies that applied the Technology Acceptance Model (TAM) framework originally proposed by Davis in 1989. The TAM emphasizes the perceived usefulness and perceived ease of use as determinant factors that influence the behavioral intention of using new technologies (Davis, 1989). This model has been extended by various other researchers, who studied the acceptance and usage of various forms of technologies. For example, technological complexity, computer self-efficacy, and organizational support were claimed to be included in the model (Teo, 2010). Subjective norms and system accessibility (Park, 2009), as well as personal innovativeness (Liu, Li, & Carlsson, 2010) were also explored as factors to be considered in understanding technology adoption.

Among the various previous studies that applied the TAM or the extended TAM in technology adoption, studies focusing on mobile learning in general may provide us insight into the factors that might affect the use of mobile LMSs. The most examined factors in this regard have been users' psychological characteristics and external factors. Previous studies have found that the users' psychological characteristics, including self-efficacy, innovativeness, perceived usefulness, perceived ease of use, and attitude toward technology are significant predictors of the use of mobile devices in learning. For example, Park, Nam, and Cha (2012) investigated the intention to engage in mobile learning among Korean college students and determined that attitude was the most important construct in explaining the acceptance of mobile learning. Meanwhile, Liu et al. (2010) found that perceived usefulness and innovativeness were the two most influential factors in adopting mobile learning among Chinese college students. These factors have also been recognized as influential in other studies (e.g., Cheon

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