



# E-learning system use and its outcomes: Moderating role of perceived compatibility



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## ABSTRACT

This paper explores the moderating role of perceived compatibility on the relationship between e-learning system use and its outcomes. We conceptualize e-learning outcomes using academic performance, perceived learning assistance, and perceived community building assistance. We further hypothesize that perceived compatibility moderates the relationships between e-learning system use and these outcome variables. The model was tested by collecting data from university students ( $n = 179$ ) participating in hybrid courses using a popular learning management system, Moodle.

The findings suggest that perceived compatibility moderates the relationship between e-learning system use and academic performance. However, it did not moderate the other two relationships, i.e. (1) the relationship between e-learning system use and perceived learning assistance, and (2) the relationship between e-learning system use and perceived community building assistance.

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## 1. Introduction

Teaching and learning using e-learning systems have become a very common phenomena in the recent years. Prior literature utilized e-learning as an umbrella term to describe teaching and learning activities using the information and communication technologies (Islam, 2013). One type of e-learning system that has become very popular among universities is a learning management system (LMS).

The LMS, also known as course management system (CMS) or the virtual learning environment (VLE), is an e-learning system that has been widely adopted by universities (McGill and Klobas, 2009; Islam, 2014). The LMS is web-based software that is used for the delivery, tracking and managing of education and training online (Limayem and Cheung, 2011). It contains features for distributing courses over the Internet and online collaboration.

Since the late 1990s, the utilization of LMSs for online education has steadily increased in higher education. Nowadays, LMSs have become indispensable tools for online education. Whether focusing on distance education or class-room based education, most universities use LMSs to support and improve learning and teaching processes (McGill and Klobas, 2009; Limayem and Cheung, 2011; Islam, 2013).

LMSs are usually implemented across an entire university, faculty, or school, and then adopted by educators who use them in a variety of ways to support course management and student learning (McGill and Klobas, 2009). The use of the LMSs in university education has made it easy to augment online education with traditional face-to-face classroom instruction. Such a hybrid or mixed delivery approach allows educators to combine the advantages of online learning with the benefits of face-to-face instruction (Edling, 2000).

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Prior research has investigated e-learning system adoption and use extensively (Sumak et al., 2011; Al-Busaidi, 2013). These studies utilized e-learning system usage intention as the main dependent variable and its antecedents or determinants were investigated. These studies overlooked the outcomes (e.g. academic performance) of e-learning systems (Islam, 2013). In order to understand the impact of e-learning systems on students' learning outcomes and take potential advantage of the e-learning systems, research that investigates the influence of e-learning systems on academic performance is needed. This kind of research is particularly important if we are to evaluate the success of such systems, plan for their future development and achieve better learning outcomes.

There are some inconclusive findings regarding the role of e-learning for improving learning outcomes in prior literature. A mix of face-to-face (somewhere between 90% and 10%) and online instruction (somewhere between 10% and 90%) has been argued to be superior to either 100% face-to-face or 100% online courses (Woods et al., 2004). However, many studies have debated the appropriateness of e-learning in achieving better learning outcomes (Shih et al., 2008). For example, Islam (2013) found that e-learning system use had a weak influence on students' academic performance. This weak relationship may be due to the fact that the relationship depends on other factors, especially compatibility (the degree to which an e-learning system is perceived as being consistent with the existing values, needs and experiences of students). In fact, several prior studies pointed that e-learning systems may not bring benefits for all scenarios (Shih et al., 2008). Benefits are materialized when the e-learning system is compatible with the course and students' learning style (Islam, 2013). Consequently, it is meaningful to test perceived compatibility as a moderator between e-learning system use and its outcomes.

In order to address the above mentioned limitation, we address the following research question in this paper:

- *How do e-learning system use and perceived compatibility influence e-learning system use outcomes?*

The paper proceeds as follows. In Section 2 we present the literature review and theory development. Section 3 is dedicated to the research method and Section 4 presents the data analysis results and discussion. Finally, Section 5 discusses the implications.

## 2. Literature review and theory development

### 2.1. E-learning system use outcome research

One of the major focuses of prior e-learning research has been the adoption and continued use of e-learning systems (Islam, 2012, 2013; Limayem and Cheung, 2011; Lee et al., 2013; Sumak et al., 2011). This research stream has mainly used two theoretical frameworks: the technology acceptance model (TAM) (Davis, 1989) and the expectation-confirmation model (ECM) (Bhattacharjee, 2001) in order to investigate individuals' e-learning system adoption and continued use. These two theories are often extended by other complementary theories such as information systems (IS) success model (Islam, 2011), task-technology fit (Larsen et al., 2009) and theory of planned behavior (Liao et al., 2007).

Most prior studies mainly investigated the factors that affect the adoption and use of e-learning systems, but they do not consider how these factors, or the use of the e-learning system itself is associated with learning outcomes (Chen, 2010; Islam, 2013; Mohammadi, 2015). Indeed, few studies have gone beyond use to explore the factors associated with learning. For example, McGill and Klobas (2009) found that e-learning system utilization influences the perceived impact on learning. In contrast, Islam (2013) reported a weak relationship between e-learning system use and its outcomes. The weak relationship was explained by the fact that there might be other factors such as teaching style, learning style, and type of course would influence e-learning outcomes. Lee and Lee (2008) revealed that a number of e-learning environment quality related variables affect satisfaction with e-learning. In turn, satisfaction was found to influence academic achievement. Liaw (2008) found high correlation between intention to use e-learning and e-learning effectiveness. These studies provide some empirical support about the possible relationships between e-learning system use and students' academic achievement. However, Islam (2013) argued that most of these studies have been conducted with a variety of outcome variables that use different explanatory variables and this has led to models that offer only weak theoretical support. Hence, he called for more research on investigating e-learning system usage outcomes.

Following Islam (2013), we conceptualize e-learning system use using three constructs: perceived learning assistance, perceived community building assistance, and academic grade. Perceived learning assistance refers to the extent to which the e-learning system assists an individual's learning. Perceived community building assistance refers to the extent to which the e-learning system assists individuals in building a social community. Finally, academic grade refers to the grade received for a course.

Although the adoption models (e.g. TAM) ignored the system usage outcomes, the information system success model (DeLone and McLean, 1992, 2003) suggested a direct relationship between system usage and net benefits (a performance outcome related variable). This relationship has been extensively verified in literature (Petter and McLean, 2009). The relationship implies that when students participate in online activities, their academic performance is improved. Although, students and educators are physically separated in an e-learning environment, it has been argued that students' engagement is greatly increased in such a learning environment (Northrup, 2001). Increased student engagement can improve learning outcomes, such as problem solving and critical thinking skills (Liaw et al., 2007). Individuals are assumed

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