



Determinants of perceived usefulness of e-learning systems



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ABSTRACT

E-learning systems are increasingly essential in universities, schools, government departments and other organizations that provide an education or training service. The objective for adopting e-learning systems is to provide students with educational services via electronic channels. The focus of this study is on the impact of IT infrastructure services and IT quality on perceptions of usefulness of e-learning systems. A model is proposed which includes five constructs: IT infrastructure services, system quality, information quality, service delivery quality, and perceived usefulness. A quantitative study was conducted at an Australian university with 720 survey responses from students who were enrolled in online courses. The results suggest that IT infrastructure services play a critical role in generating information with high quality, enhancing the aspects of e-learning system quality, and improving service delivery quality. The impact of IT infrastructure services, system quality, and information quality on perceived usefulness is fully mediated by service delivery quality. Universities need to be aware of the critical impact of IT infrastructure services and consider how investment in these services could improve system and information quality, service delivery quality, and the usefulness and success of e-learning systems.

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1. Introduction

Educational institutions invest in information systems to derive benefits such as increasing the accessibility of education, improving self-efficacy, knowledge generation, cost effectiveness, learner flexibility and interactivity (Sinclair, Kable, Levett-Jones, & Booth, 2016). Benefits are no longer limited to organizational activities and to support decision-making but also include benefits for different stakeholders, specifically external customers. Development in information technologies has led to emerging applications such as e-commerce, e-banking, e-health, and e-learning. E-learning systems are one of the most important and advanced web-based applications in the education sector (Islam, 2016). Today, different stakeholders such as students, trainers, academic staff, and ICT staff widely use web-based applications.

Perceived usefulness of e-learning systems by stakeholders can be considered as a result of different inputs, for instance, organizational, informatics and human inputs. These factors should be taken into account when evaluating the perceived usefulness of e-

learning systems. In addition, identifying determinates of perceived usefulness can contribute to support and enhance the effectiveness and success of e-learning systems.

This study focuses on identifying factors that impact the perceived usefulness of e-learning systems based on students' perspectives. IT infrastructure services, system quality, information quality, and service delivery quality (SDQ) are proposed as determinants of perceived usefulness. The study investigates the mediation role of SDQ between the predictor factors (IT infrastructure services, system quality, and information quality) and the dependent factor (perceived usefulness).

1.1. Research problem

Despite considerable funds invested some organizations fail to achieve the expected benefits from e-learning projects (Crawford & Persaud, 2013). For students the main expected benefits are academic performance, social value, and career development. E-learning systems are dependent upon digital media and telecommunications, and any shortcomings may negatively impact user satisfaction. Perceived usefulness is the main measure to assess the acceptance and success of e-learning systems. There are issues related to this construct. Firstly, there is a shortfall in evidence about the role of IT infrastructure services in the perceived

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usefulness of e-learning systems. Secondly, the mediation role of service delivery quality (SDQ) in achieving perceived usefulness needs more investigation. To achieve this purpose, three research questions were formulated:

- RQ1. What factors affect perceived usefulness of e-learning systems?
 RQ2. Is the model proposed to identify factors affecting perceived usefulness valid and reliable?
 RQ3. Does SDQ of e-learning systems play a significant mediator role between the predictor factors (IT infrastructure services, system quality, and information quality) and the dependent factor (perceived usefulness) in the proposed model?

1.2. Study objectives

E-learning systems represent a major infrastructure investment for universities (Georgina & Olson, 2008; Stoffregen, Pawlowski, & Pirkkalainen, 2015). Users of e-learning expect to receive useful educational services with high quality. The study aims to investigate perceived usefulness of e-learning systems for students, a key external stakeholder group. The objectives of this study are three-fold: (i) select factors as determinants of perceived usefulness; (ii) test measurement models to investigate the ability of these constructs to measure the success of e-learning systems; and (iii) test the study model and examine the direct relationships between the constructs. In addition, SDQ as a mediation factor between predictor factors and perceived usefulness is examined in this study.

1.3. Study significance

Meeting students' requirements and providing them with new experiences and skills should motivate them to re-use educational services. This study investigates the role of IT infrastructure services, system quality, information quality, and SDQ in enhancing perceived usefulness. IT infrastructure services is used as an exogenous factor in this model. To the author's knowledge, this factor has rarely been used as a determinant construct of perceived usefulness in the e-learning system area. The validity and reliability of this construct as a determiner factor of perceived usefulness is tested in the context of this model. Based on the analysis, recommendations are provided to educational institutions to employ these factors to support and improve the perceived usefulness of e-learning systems.

2. Literature review

The main objective of this study is to propose and test a model to investigate the factors that impact the perceived usefulness of e-learning systems. The review of the literature focused on five constructs based on the study model: IT infrastructure services; system quality; information quality; service delivery quality; and perceived usefulness. Next, the definition of e-learning systems is provided and followed by a review of previous studies of the five constructs.

E-learning systems are a major application of IT in educational organizations. There is not a uniform view of e-learning systems (Byoung-Chan, Jeong-Ok, & In, 2009). Four general categories of e-learning systems definitions were identified by Sangrà, Vlachopoulos, and Cabrera (2012): technology-driven; delivery-system-oriented; communication-oriented; and educational-paradigm-oriented. Most definitions of e-learning have focused on the delivery of a learning service through electronic media (Byoung-Chan et al., 2009; Engelbrecht, 2005; Lee, 2009). This

study agrees with this direction.

2.1. IT infrastructure services

IT infrastructure is one of the key concerns in information systems. IT infrastructure can be a significant barrier or enabler in obtaining the competitive performance of firms, new competitive strategies, progression through higher levels of organizational transformation, and planning and changing business processes (Broadbent, Weill, Brien, & Neo, 1996).

The dominate approach in the information systems area to define IT infrastructure focuses on considering IT infrastructure as a collection of services (Fink & Neumann, 2007). According to this approach, Weill and Vitale (2002) defined IT infrastructure as "a set of services that users can understand, draw upon, and share, to conduct their business" (p. 19). In the same direction, Hwang, Yeh, Chen, Jiang, and Klein (2002) define IT infrastructure as "the base foundation for building business applications, which is shared throughout the firm as reliable services" (p. 56). IT infrastructure is also defined as "the shared IT services providing the foundation for the enterprise's IT capability and typically created before precise usage needs are known" (Weill & Ross, 2004, p. 3).

In this paper, IT infrastructure services are defined as IT services provided by universities and the educational institutions to enable the internal and external users (or customers) to provide, receive, exchange, and share information and electronic educational services effectively.

Previous researchers have considered the crucial role of IT infrastructure services on organizational outcomes and growth (Sobol & Klein, 2009). The added value of IT infrastructure services is extended to include fast response, organizational learning, fact-based decision making, productivity improvement, inter-organizational coordination and organizational flexibility (Davenport & Linder, 1994).

Little attention has been paid to the role of IT infrastructure services in e-learning success. Studies dealing with this construct adopted a narrow approach and limited measures to investigate the role of this factor in the system's success. Soong, Chan, Chua, and Loh (2001) studied the critical factors in the online courses field and found that IT infrastructure was an important factor in the success of online courses. The measures of IT infrastructure focused on the software used to implement online courses. This measure is limited and insufficient because there are different aspects that should be considered in measuring this construct such as IT education, channel management, data management, and application management. Selim (2007) studied critical success factors affecting acceptance of e-learning systems. The results concluded that IT infrastructure was a significant factor affecting e-learning system acceptance. The study used a narrow range of measures to gauge this construct: computer access and computer network reliability. A similar study conducted by Ahmed (2010) found IT infrastructure significantly affected acceptance of hybrid e-learning courses by students. The measure of IT infrastructure used in that study was limited to computer access.

The review of the literature on IT infrastructure services in the e-learning systems area reveals two key points:

- Little attention has been paid by researchers to this construct in the e-learning area. There are few investigations of the role of IT infrastructure services as an exogenous factor and the factors that impact it as an endogenous factor.
- The measurements used to gauge this construct were restricted to one or two aspects of IT infrastructure and ignored other aspects.

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