



# Moderating effect of learning styles on a learning management system's success



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## ABSTRACT

This study uses the DeLone and McLean model to determine the moderating impact of learning styles on the success of learning management systems from a student's point of view. The main objectives of this research are: (1) to evaluate the DeLone and McLean model of information system success in the context of learning management systems and, (2) to determine the effect of the learning styles of students on this model. An in-person survey of 258 engineering students was used to evaluate the research model. The analysis is based on structural equation modelling, specifically partial least squares. The results indicate that the research model explains use, user satisfaction, and perceived benefits of a learning management system. In addition, the Felder-Silverman learning styles (sensing-intuitive, visual-verbal; active-reflective; sequential-global) modify the strength of the relationships between the variables of the success model.

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## 1. Introduction

The huge expansion of Learning Management Systems (LMS)-based education is a reality. In fact, the number of students who have enrolled in at least one online course is increasing ten times faster than actual enrolments in college education (Omar et al., 2011). It is expected that the global market for this technology will reach 51.5 million dollars in 2016, due to the double-digit growth in regions such as Africa, Asia, Eastern Europe and Latin America (Docebo, 2014).

While there is substantial progress in the understanding of the parameters that influence the efficiency of LMS-based education, there are gaps in the understanding of the causes of variations in the results of learning (Sahasrabudhe and Kanungo, 2014). One of the main problems of e-learning is the high drop-out rates in comparison to face-to-face courses (Patterson and McFadden, 2009; Rovai, 2003). Consequently, it has become vital for course managers to know the aspects affecting the user acceptance of web-based learning systems with a view to improving the students' learning experiences (Tarhini et al., 2013). This work aims to contribute to the understanding of these causes, in particular through the use of the success of the information system (IS) model originated by DeLone and McLean (D&M) (DeLone and McLean, 1992). We propose to explain influence as a moderator of the learning styles in the success of LMS from a student's point of view.

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Concretely, the main objectives of this research are: (1) to evaluate the D&M model (DeLone and McLean, 2003) of IS success in the context of LMS and, (2) to determine the effect of the learning styles of students on this model.

Learning styles define different strengths and preferences in the way how information is acquired and processed (Felder and Silverman, 1988a). Research results coincide in indicating that the understanding of the learning styles of students is a cornerstone for: (1) adapting the instructional process, (2) improving the satisfaction of the educational needs, and (3) enriching the learning experiences. All this is based on information technologies, especially in learning environments (Cheng, 2014a). To understand how these styles have an impact on the success of a particular LMS is very relevant.

The literature proposes different models for identifying learning styles. In particular, the Felder-Silverman (F-S) model of learning styles is well-recognized in engineering education (Felder and Silverman, 1988a; Felder and Spurlin, 2005). The F-S model performs a four-dimension classification: (i) sensing-intuitive, (ii) visual-verbal, (iii) active-reflective, and (iv) sequential-global.

From the point of view of IS, we can distinguish two major lines of research in the study of LMS (Islam, 2013). In the first, adoption is addressed from the perspective of the characteristics of the system itself. To do so, models such as TAM (Davis, 1989), TPB (Ajzen, 1991) or UTAUT (Venkatesh et al., 2003) are used. A second research line deals with the continuity of use and the success of the system. In this line of research, the model used most frequently (Eom, 2012; Estelami and Eom, 2012) has been proposed by DeLone and McLean (DeLone and McLean, 1992, 2003). This is the theoretical context of this work.

The D&M model has an extensive level of empirical validation. It has been applied in numerous areas of IS since it was proposed two decades ago. Therefore, the D&M model is highly accepted in the scientific community (DeLone and McLean, 2003; Petter et al., 2013). Since the proposal of this model, the authors have pointed out that the model's multidimensional and interdependent nature requires careful attention concerning the definition and measurement of every aspect of this dependent variable. It is therefore important to measure the possible interactions between each of these dimensions to isolate the effect of several independent variables with one or more of these dependent dimensions. Similarly, the fact that the selection of dimensions and measures of success should be contingent on the objectives and the context of empirical research is highlighted. But, as far as possible, proven measures should be used (DeLone and McLean, 1992). In particular, the model of success has shown behaviors that strengthen the relations of causality proposed in the context of LMS (Freeze et al., 2010).

This study provides two important contributions to the existing literature. First of all, although there are studies which consider learning styles as a contingent variable in the explanation of the satisfaction of LMS (Eom et al., 2006; Lu and Chiou, 2010), there is a lack of articles that consider the influence of these styles on a global model of success, such as the D&M model. Secondly, most of the studies which have applied the D&M model in the context of LMS have been conducted with samples from Anglo-Saxon (Eom, 2012) or Asian countries (Cheng, 2012, 2014b). This research's test and demonstration endorses the results of the D&M model in the scope of LMS in the Latin American context.

In order to achieve the objectives proposed, we proceed as follows. In the next section, we establish the study's conceptual framework. We delve into LMS as an example of an IS applied with the D&M model. Then, we propose a set of hypotheses to test on the basis of the D&M model and learning styles. Thirdly, we provide the work's main methodological features. Next, the principal results of the statistical analyses are presented. Fifthly, we communicate the discussion and the connections to other works on this topic. Finally, the major findings are summarized and the limitations and future lines of research are put forward.

## 2. Conceptual framework

In this section, the main theoretical developments of this study are exposed. In addition, the hypotheses and research model are shown.

### 2.1. Learning management systems

There are four types of e-learning systems to support e-learning: (1) learning management systems (LMS), (2) learning content management systems (LCMS), (3) learning design systems (LDS), and (4) learning support systems (LSS) (Ismail, 2001). All these tools have been developed for organizations (Ngai et al., 2007), and several mixtures of audio, video, text, and graphics can be combined into these tools (Cheng, 2012; Liu et al., 2009).

An LMS is defined as a process of learning enabled by Internet (Gunasekaran et al., 2002), whose main objective is to complement traditional teaching, enabling the development of more portable and flexible learning methods (Zhang and Nunamaker, 2003). The LMS is an instrument which offers an e-learning platform that uses internet, extranet, intranets or other networks as a transfer tool to process, put in safekeeping and propagate learning resources and support administration and communication related to learning and teaching (McGill and Klobas, 2009). In addition, these tools enable students to organize their instructing tempo and to adapt learning in line with their personal requirements (Baylari and Montazer, 2009; Cheng, 2014a,b). Furthermore, LMS is intended to help trainers to send learning resources and to follow the learners' evolution, and also to allow students to gain access to learning tools for their e-learning lessons (Cheng, 2014b; Rodrigues et al., 2011).

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