Models for Measuring E-Learning Success in Universities: A Literature Review

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It is obvious that in the Internet era the higher education institutions (HEIs) must innovate the services they offer by integrating ICT (Information and Communication Technology) in the learning process. According to the theoreticians and practitioners insights in the matter, the e-learning systems offer many advantages and compensate the weaknesses of the traditional learning methods. In consequence, it emerged the need for developing a model that measures the success of the e-learning systems. This paper presents results of the research conducted in order to develop a comprehensive model for measuring e-learning system success in universities.

Keywords: E-Learning, Blended Learning, E-Learning Systems, E-Learning Systems Success, Measuring E-Learning System Success

1 Introduction

The fundamental terms that define the paradigm of the contemporary society are information, knowledge and communication. The European Programs (FP6, FP7) are issued in order to sustain, between 2010 and 2030, the passage from an information society to a knowledge society. The formation and consolidation of a knowledge society implies setting priorities. Among these priorities, I mention the investment in education, which aims at increasing the level of human capital, the fluidization of the knowledge use and dissemination, as well as the existence of an efficient innovative system that should include universities that allow the increase of the knowledge global stock, the assimilation, adjustment, creation of new technologies and the development through the use of ICT.

The knowledge society provides new dimensions to the learning process and, as such, in the higher education system it emerges the need to introduce modern teaching techniques, based on the use of the ICT.

In order to achieve the educational reform aligned with the European standards, to withstand the challenges of an increasingly competitive environment and to increase the academic reputation, the Romanian universities perform steps for a strategic shift by acknowledging the university- knowledge binomial and thus innovate the services they offer.

The students’ learning experience continues to be influenced by the modality in which teachers integrate information and ICT in their university courses.

Since it is obvious that the use of the ICT is not absolutely necessary only for universities that provide distance learning programs and it is more and more encouraged in order to improve students’ experience, universities have focused their attention to determine a model for integrating ICT in the learning process, so as to provide students know-how and skills adapted to our current and future society. Thus, we notice that universities make efforts to implement or develop e-learning systems adapted to their organizational structure and to use blended learning in their academic programs.

The e-learning systems offer significant improvements to the learning process and considerably reduce the negative effects of the singular application of traditional teaching methods. Hence, the success of e-learning systems implementation (and its measurement) is imperative:

- to be able to determine their added value;
- to understand the overall effect on the activity and the learning process within the HEIs, and
- to justify the investment into such systems.

DOI: 10.12948/issn14531305/18.3.2014.07
2 E-learning, E-Learning Systems and Blended Learning

In a broad sense, by e-learning, one understands the totality of education situations where the ICT is significantly used. In a restricted sense, e-learning is a type of distance education, as a planned teaching-learning experience organized by a HEI that provides (using an e-learning technology and the web browser as the main interaction tool) study materials in a sequential and logical order, so as to be assimilated by students in their own manner.

The e-learning technology refers to an online system that replicates and adapts the traditional didactic endeavor components: planning, specific content and methodology, interaction, support and assessment. The e-learning systems are platforms facilitating the learning process [3] that aim at the learning process flexibility [4] and the adaptation of the teaching methods to the individual learning style of students. Because of the significant differences between traditional teaching methods and online teaching methods, the conversion of the traditional courses into online courses needs careful planning, monitoring and control [5].

In the academic literature, there is only one globally valid definition that can comprise all the aspects related to the blended learning concept. Blended learning (or combined/hybrid/integrative) aims at achieving the learning objectives through the application of specific technologies in order to customize the act of learning and to transfer knowledge and skills to the right person at the right time. „Blended” means the combination of several teaching methods: asynchronous and synchronous, off-site and on-site, offline and online, individual and collaborative, structured and non-structured.

The biggest advantage of applying the blended learning concept is the adapting of teaching methods to the learning individual style. An individual learning style may be defined as the user's (student's) preferred modality (by means of study or experience) to assimilate new knowledge and skills. This does not mean that all the knowledge and know-how of the student will be assimilated in the same manner, but only that to him/her this learning style is more efficient [1]. By adapting the learning process to the students’ individual learning styles, two important benefits are obtained: students become aware of their individual learning style (an important factor of personal and professional development) and the improvement of the student’s response to the learning process [2].

3 Measuring the Success of the E-Learning Systems

Assessing the success of e-learning systems was done by using multiple criteria and approaches especially due to the numerous ways of defining the e-learning term [10], [55]. I have identified four such approaches in the academic literature:
- the DeLone and McLean (D&M) model;
- the TAM model (Technology Acceptance Model);
- models focused on users’ satisfaction;
- models focused on the e-learning quality.

3.1 The D&M Model

The success and quality of an e-learning system may be measured in the same manner like the success and quality of an IS (Information System).

One of the most prolific models that have been used for measuring the success of an e-learning system is the D&M model, which was first presented in 1992 and, since then, it has been used in over 300 scientific papers [6]. This model includes six components: the quality of the system, the quality of the information, the use of the system, the user satisfaction, the individual impact and the organizational impact; the relations between them are emphasized in Figure 1.
Till 2003, the relations between the components/constructions of this model have made the subject matter of several scientific undertakings [6]. The number of scientific papers drawn up for each and every such relation is presented in Figure 2. Based on the scientific research carried out between 1992 and 2003 (on the overall, 16 scientific papers with remarkable results were identified by Delone and McLean [30]) this model was revised in 2003 by its authors.

For the time being, the D&M model includes six dimensions [6], [7], [8]: the system quality; the information quality; the services quality; the use of the system/the intention to use the system; the user satisfaction; the benefits of using the system. The relations between the model components are presented in Figure 3.
The brief description of each component is to be found in Table 1.

### Table 1. D&M2003 factors [21].

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>The system quality</td>
<td>The system performance.</td>
</tr>
<tr>
<td>The information quality</td>
<td>The quality of the system output.</td>
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<tr>
<td>The services quality</td>
<td>The efficiency of the support services provided for the system users.</td>
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<tr>
<td>The intent to use</td>
<td>The perceived behavior of system use</td>
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<tr>
<td>The use of the system</td>
<td></td>
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<tr>
<td>The user satisfaction</td>
<td>The general perspective of users on the system.</td>
</tr>
<tr>
<td>Benefits</td>
<td>The advantages of using an IS.</td>
</tr>
</tbody>
</table>

The use of the D&M model with a view to measuring the success of the e-learning systems was criticized, because one did not take into account aspects related to culture, the trainer’s perspective, the relation between the model components [7], the loyalty of the user to the system [52], etc. In the academic literature, I identified numerous papers aiming at analyzing indicators that allow the measuring of the impact of the D&M model components (in these papers, after an analysis of these indicators, the authors usually propose new versions of the model subject to survey). Thus, for the component:

- **System quality**, I identified the following impact measuring indicators: easy access [7], [10], [11]; easy use [7],[10], [12]; user friendly interface [7],[10], [13]; interactivity [7],[10], [11], [14]; personalization [7], [10], [11]; attractivity [7], [15]; system speed [7], [52]; security [10]; reliability [10], [12]; design [5], [10], [17], [18]; usability [10], [19]; maintenance [10], [12], [18]; flexibility[18], [20], easy integration [20]; aesthetics and distribution of functions in to the system menus[17], [21];

- **Information quality**, I identified the following impact measuring indicators: mandatory information and content [7], [52], [22]; timely information and content [7], [20]; optional/related information and content [7], [20], [52]; useful information and content [7], [52], [24]; complete information and complete content [17], [52], [11], [10], [7]; intelligible information and content [7], [10], [11], [25]; updated information and updated content [7], [52], [10], [12], [22]; exact, precise information and exact content [20],[52], [21]; well structured content and information [10];

- **Services quality**, I identified the following impact measuring indicators: providing guidance and support services [10], [21], [7]; request response time [20]; reflecting users’ opinions in design and development [7]; courses management [20], [10], [11], [26]; the promptness of provided services [52];

DOI: 10.12948/issn14531305/18.3.2014.07
- User satisfaction, I identified the following impact measuring indicators: perception on the system usefulness [7], [26], [27], [28], [13]; the user’s satisfaction in relation with the system performance [7], [27], [29], [11]; maintenance of a high level of the user’s satisfaction [30], [31]; providing the users’ training needs [32], [33], [34]; winning the users’ trust [35], [36], [37];
- Benefits, I identified the following impact measuring indicators: improvement of performances/training efficiency [32], [38], [30], [7], [13]; acquiring new knowledge [39]; the user’s autonomy [40], [41], [39]; cost reduction [17], [13], [7]; time economy [17], [30], [13], [7], [22];
- The intent to use the system, I identified the following impact measuring indicators: the conviction that the use of the system provides advantages/benefits[52], [42]; the tendency to use the system [52], [43], [21];
- The use of the system, I identified following impact measuring indicators: the system use frequency [29], [22], [7], [25]; the system use duration [10].

In 2006, Holsapple and Lee-Post [30] presented a version of the D&M2003 model, adapted so as to measure the success of an e-learning system. This model comprises a series of matrixes emphasized in figure 4, which were subject to analysis, with a view to confirming the dependency relations between the model components. The authors suggest that future research should focus on validating the associations done between the three dimensions of success: the design and the development of the system, the use of the system and the system outcome. Lee-Post accomplished and presented subsequent refinements of this model in 2009 [54].

Also in 2006, Lin and Lee presented a success model for the online community, which was developed starting from the same model [52]. In 2008, Lin [53] presented a series of determining factors, which provide the success of an online community, and developed a model by translating components of the D&M2003 model in the social context of virtual communities. Thus, the component „Use” was replaced by the component

Fig. 4. The Holsapple and Lee-Post 2006 model [30].

DOI: 10.12948/issn14531305/18.3.2014.07
„Sense of belonging”, while the component „Benefits” was replaced by the component „Member loyalty”. This study also emphasized the impact of the system characteristics (as defined by the components „System quality” and „Information quality”) and some social factors („Trust” and „Usefulness”) with a view to providing the success of virtual communities. The conclusions of this study is: „System quality” and „Information quality” are closely related to „Sense of belonging”, while out of the social factors, only „Trust” has a significant influence on the component „Sense of belonging” (Figure 5).

**Fig. 5.** The 2008 Lin’s virtual communities model [53].

Other components extensively investigated by Hassanzadeh, Kanaaniand and Elahi [52], which led to the appearance in 2012 of a new release of the D&M model, called MELSS (presented in figure 6) are:

- The users’ loyalty, with the following indicators standing out: dependence on to the system [22], [7]; promotion of the system [32], [30], [31], [52].

**Fig. 6.** The MELSS model [52].

- The quality of the education services provided by the system, with the following indicators standing out: the existence of some functionalities like chat, forum, etc. into the system [31]; communication facilities among students [45], [31], [46]; the adaptability of the system to individual learning styles [47], [48]; facilities for

DOI: 10.12948/issn14531305/18.3.2014.07
active and collaborative learning [49];

- The attaining of goals, with the following indicators standing out: learning objectives accomplishment [50]; personal objectives accomplishment [50], [51].

### 3.2. The TAM model

TAM is an IS (Information Systems) theory that models how users accept and use a new technology. The first release of this model was created by Fred Davis in 1989 [56]. This model (Figure 7) suggests that the users are influenced by certain factors when they decide upon how and when they are going to use the new technology:

- Perceived usefulness or the extent to which a user believes that, by using a certain system, he/she will obtain increased professional performance;
- Perceived ease-of-use or the extent to which a user believes that he/she will make considerably less efforts, by using this system, in order to fulfill his/her current tasks.

![Fig. 7. The 1998 TAM model [9], [56].](image)

In the academic literature, between 1985 and 2013, there were published over 10 scientific papers that aimed at developing the model; over 20 scientific papers published extensions of this model, and over 30 scientific papers emphasizing its applicability (an excerpt from these papers may be found in [9]). The second version of the TAM model was issued by Venkatesh and Davis, and published in 2000 [9] (Figure 8).

![Fig. 8. The 2000 TAM model [9].](image)

In 2006, Roca et al. [23] combined the EDT (Expectancy Disconfirmation theory) and the TAM model, in order to create a new model for measuring the continuity of the intention to use an e-learning system (figure 9). Other researchers, Selim in 2007 [42], Ngai et al. in 2007 [16] adopted the TAM model and made some essential changes on it, with a view to increasing its relevance in the context of the assessment of the e-learning systems (like the creation of a four-dimension model: trainer, student, technology and support, and their separate analysis [42] or the introduction and analysis of the interdependences of some components like „Attitude” and „Technical support” [16]).
In 2008, Venkatesh and Bala published version 3 of the TAM model adapted for e-commerce, which includes the effects of components like „Trust” and „Risk” on the system use degree [44].

3.3 Models focused on the users’ satisfaction
The user’s satisfaction is considered to be one of the most important criteria that may be applied for the assessment of an e-learning system’s success. In 2008, Sun et al. [26] classified the critical factors leading to the success of an e-learning system, using six dimensions: student, trainer, course, technology, design and context (Figure 10).

Other studies that used this approach for measuring the success of an online training system were performed by Shee and Wang [12] in 2008 or Wu et al. [27] in 2010. One
of the resulting models is BELS (Blended E-Learning System) presented in Figure 11 [27].

3.4 Models focused on the e-learning quality
Scientific papers that adopted this approach for measuring the success of an e-learning system focused on the overall quality of the system and not only on the quality of the services. Such a model was created by Lee and Lee in 2008 [4] (Figure 12).

4 Proposed Model and Future Research Direction
As a result of the above performed analysis I propose a more comprehensive model for the evaluation of an E-Learning System Success (ELSS). This model is based on four perspectives: overall system quality, user perceived control, usefulness and user satisfaction, user attitude, social factors and benefits of using the e-learning systems. A simplified version is presented in figure 13. Each ELSS model component is detailed in figure 14. In the future I intend to explore more the „Educational system quality” component with the intent to quantify the influence of the „User learning style” indicator on the overall user satisfaction and (I identified only few scientific papers that focus on this matter).
I also aim to explain the causal relationships established between the constructs of the model and to validate these hypotheses by conducting a study in the Bucharest University of Economic Studies. The support of this study will be an e-learning system developed in-house that facilitates the applying of the blended learning concept. After validation I intend to compare the results of my study (thus, the model) with similar results that have been briefly presented above.

5 Conclusions
In this paper I presented previous studies conducted in order to provide models for evaluating the e-learning systems success. Even if these identified models were updated several times over the years, by many researchers, there is still room for improvements and extensions [9], [52]. In consequence, by combining these previous models, I propose a more comprehensive model – ELSS. The testing of the model’s hypothesis and the overall validation will be the subject of a future study.

DOI: 10.12948/issn14531305/18.3.2014.07
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DOI: 10.12948/issn14531305/18.3.2014.07


Acknowledgments

This paper was co-financed from the European Social Fund, through the Sectorial Operational Programme Human Resources Development 2007-2013, project number POSDRU/159/1.5/S/138907 “Excellence in scientific interdisciplinary research, doctoral and postdoctoral, in the economic, social and medical fields - EXCELIS”, coordinator The Bucharest University of Economic Studies.
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