

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

Iuliana DOROBĂȚ

The Bucharest University of Economic Studies, Bucharest, Romania

iuliana.dorobat@ie.ase.ro

*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.

## 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

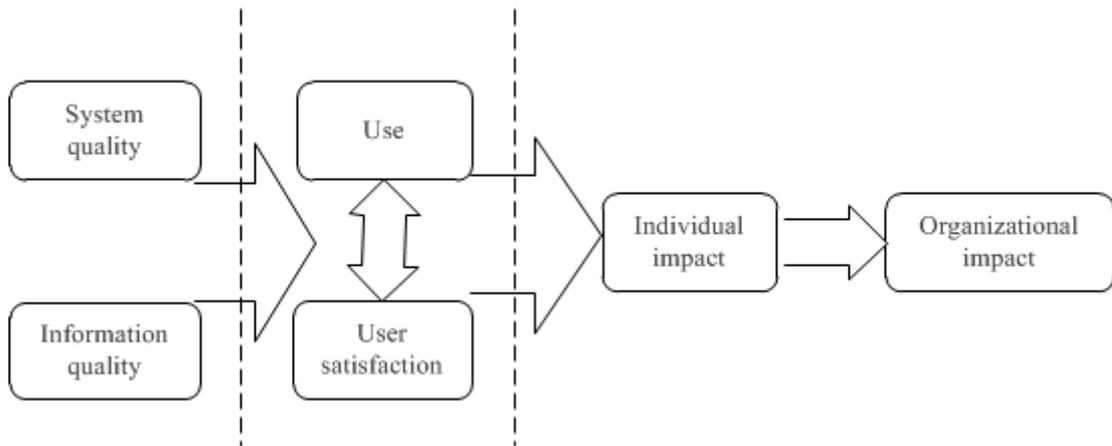
Assessing the success of e-learning systems was done by using multiple criteria and approaches especially due to the numerous ways of defining the e-learning term [10], [55]. I have identified four such approaches in the academic literature:

- 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).

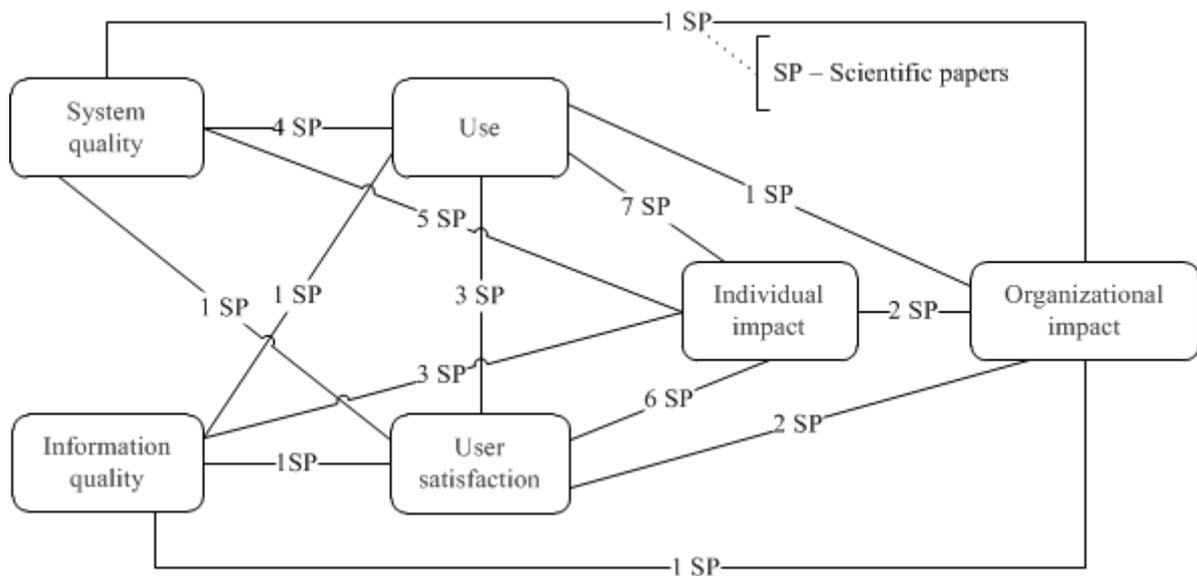
One of the most prolific models that have been used for measuring the success of an e-learning system is the D&M model, which was first presented in 1992 and, since then, it has been used in over 300 scientific papers [6]. This model includes six components: the quality of the system, the quality of 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.



**Fig. 1.** The D&M 1992 model [6].

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

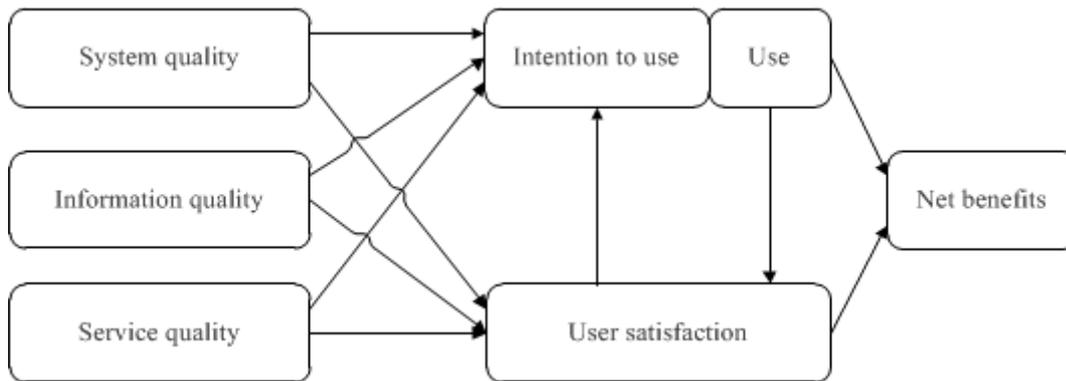
research carried out between 1992 and 2003 (on the overall, 16 scientific papers with remarkable results were identified by Delone and McLean [30]) this model was revised in 2003 by its authors.



**Fig. 2.** The D&M 1992 model validation (adapted after [6]).

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.



**Fig. 3.** The D&M 2003 model [6].

The brief description of each component is to be found in Table 1.

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

Component	Description
The system quality	The system performance.
The information quality	The quality of the system output.
The services quality	The efficiency of the support services provided for the system users.
The intent to use  The use of the system	The perceived behavior of system use  The actual behavior of system use.
The user satisfaction	The general perspective of users on the system.
Benefits	The advantages of using an IS.

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]; attractiveness [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 distribu-

tion 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];

- 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 refineries of this model in 2009 [54].

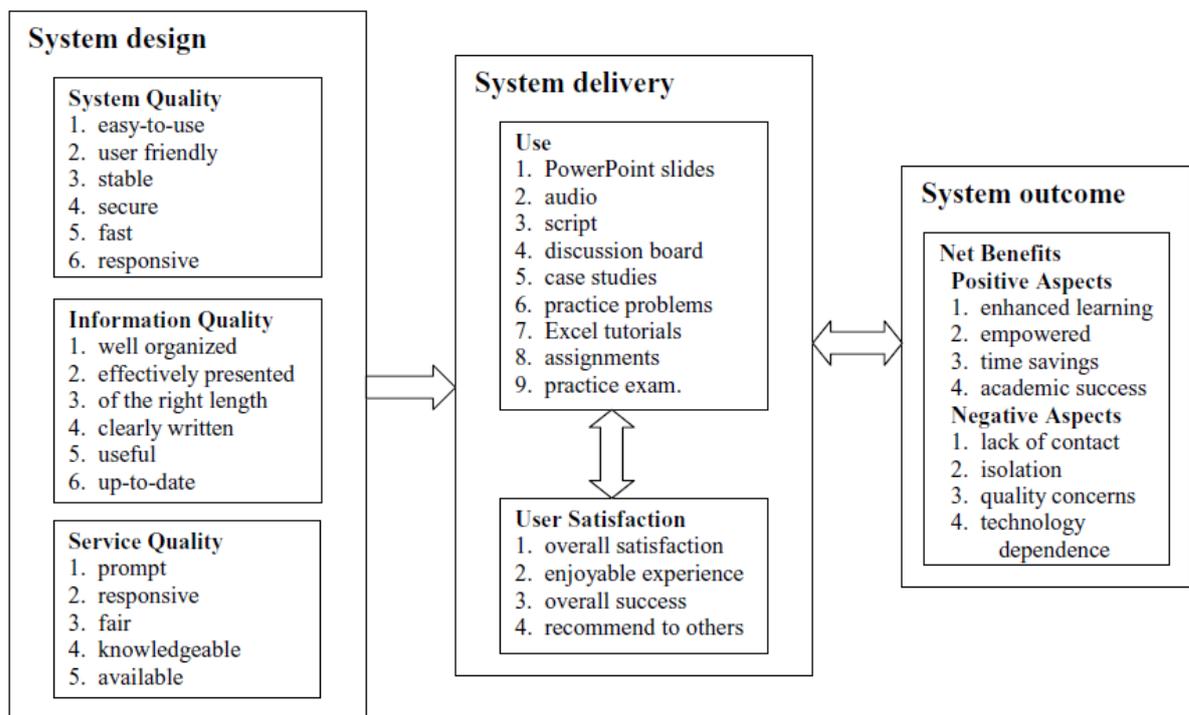


Fig. 4. The Holsapple and Lee-Post 2006 model [30].

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 suc-

cess 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

„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).

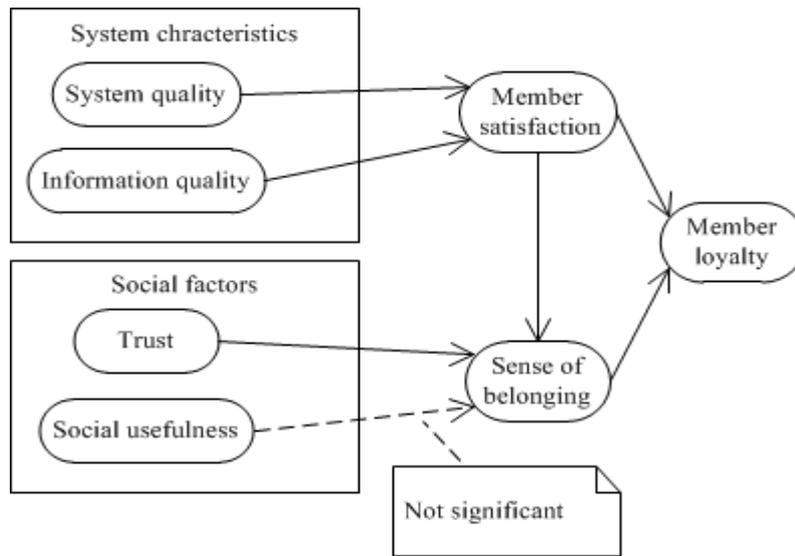


Fig. 5. The 2008 Lin's virtual communities model [53].

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 the system [22], [7]; promotion of the system [32], [30], [31], [52].

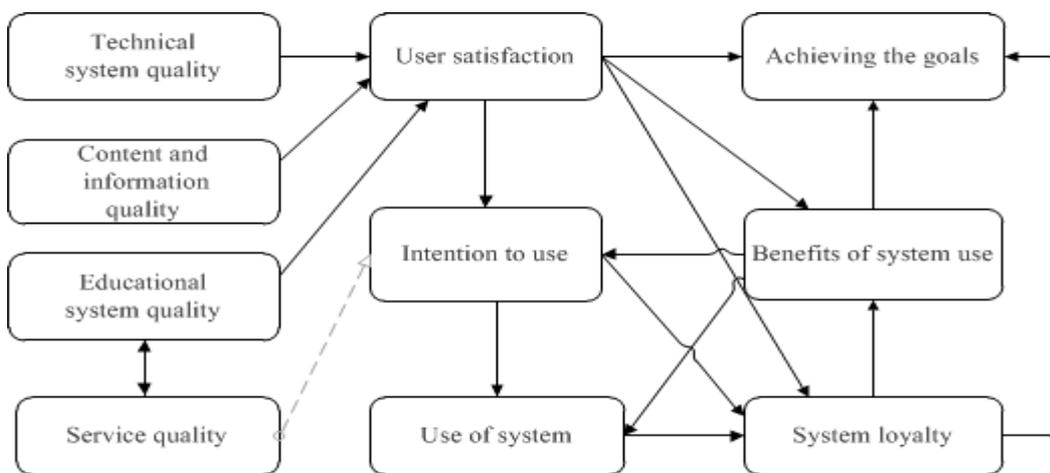


Fig. 6. The MELSS model [52].

- 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

- 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 de-

cide 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.

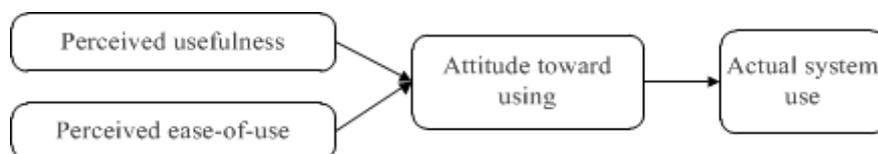


Fig. 7. The 1998 TAM model [9], [56].

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).

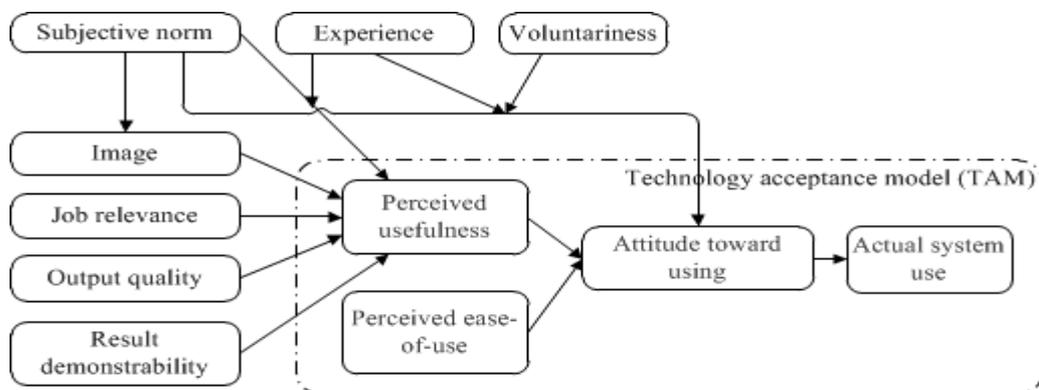


Fig. 8. The 2000 TAM model [9].

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]).

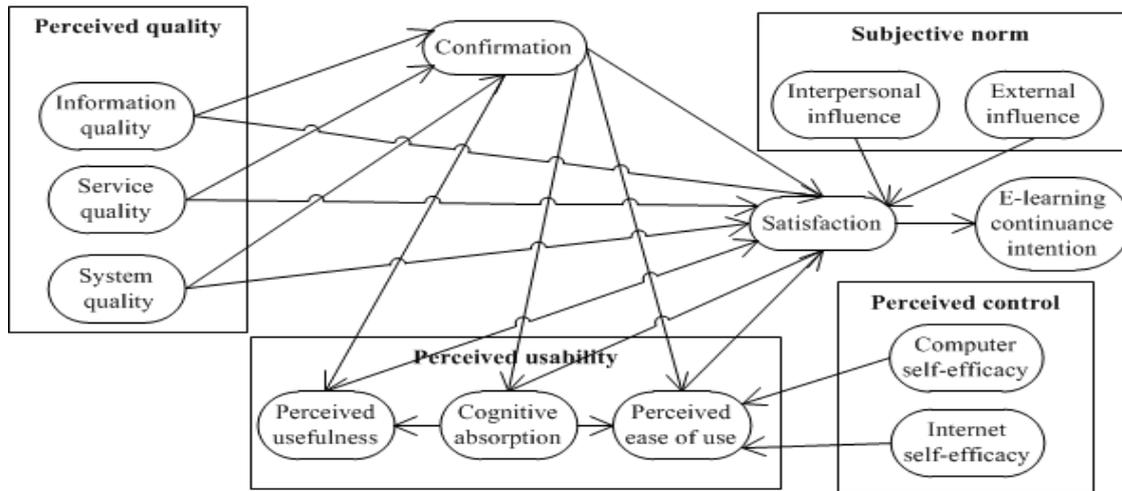


Fig. 9. The Roca model (adapted after [23]).

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).

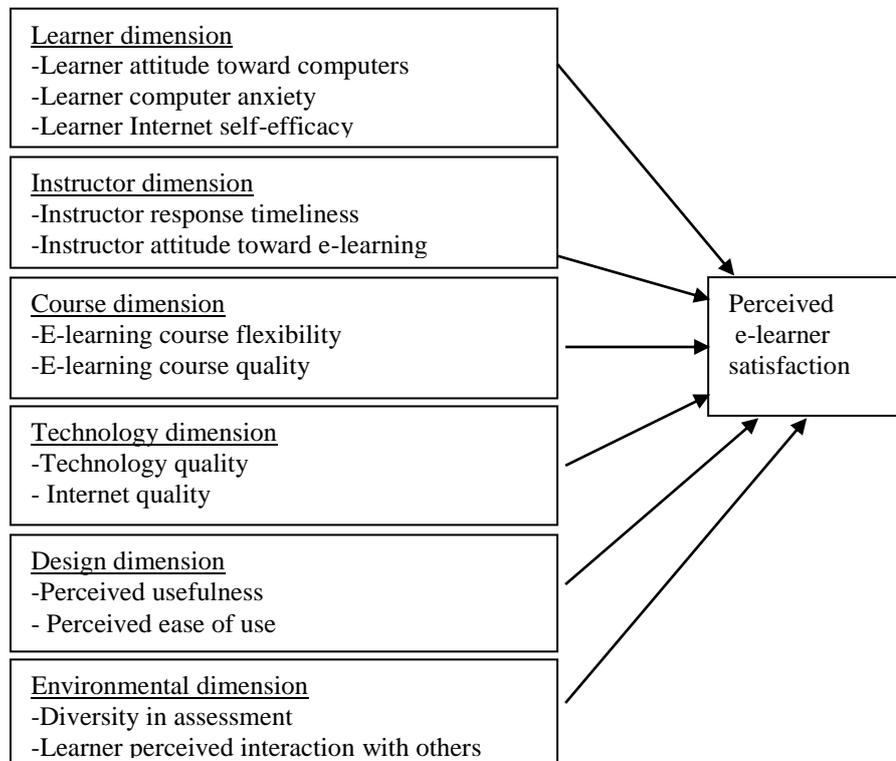


Fig. 10. Dimensions of perceived e-learner satisfaction [26]

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].

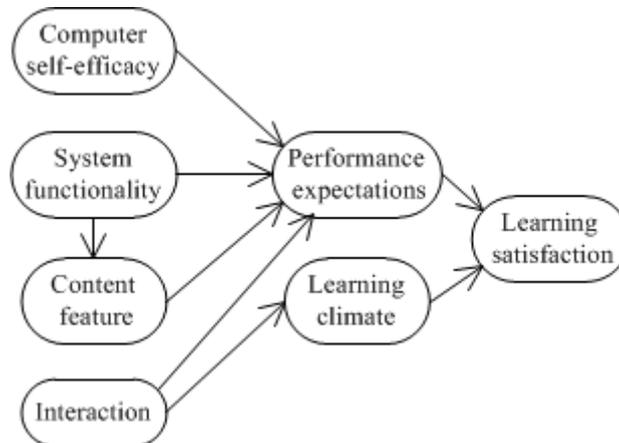


Fig. 11. The research model for BELS learning satisfaction [27].

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).

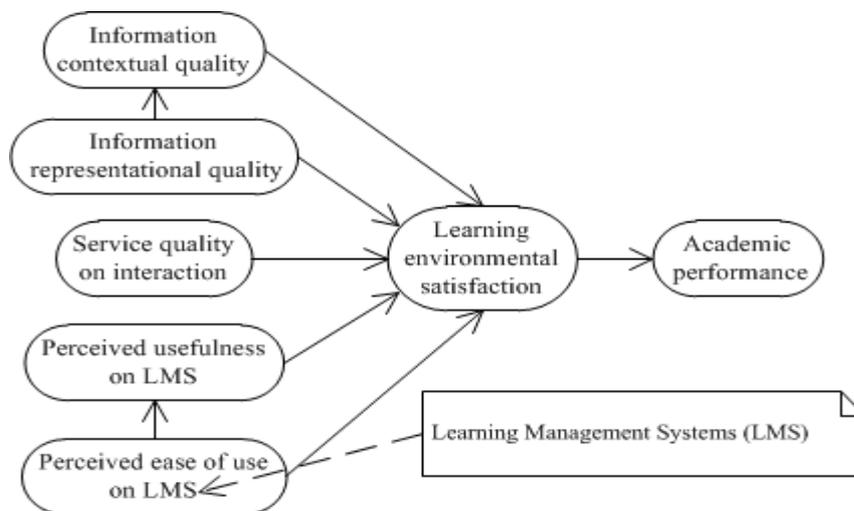


Fig. 12. The Lee and Lee 2008 research model [4].

**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).

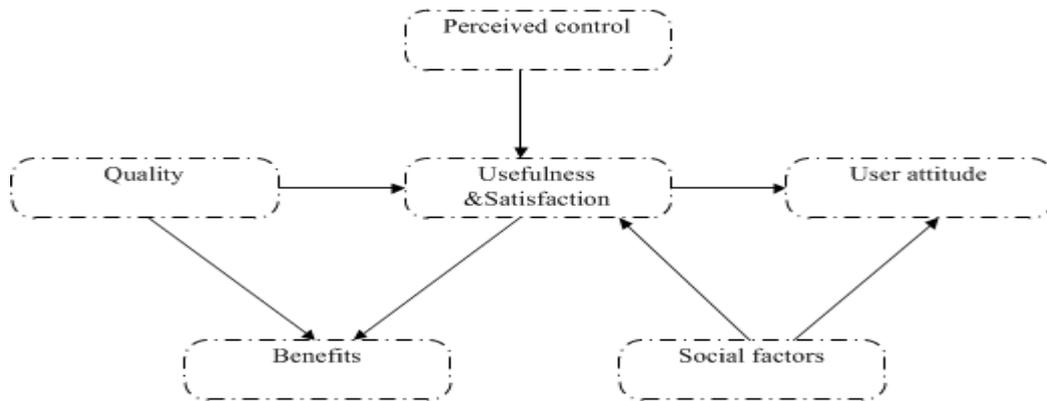


Fig. 13. The simplified ELSS model.

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.

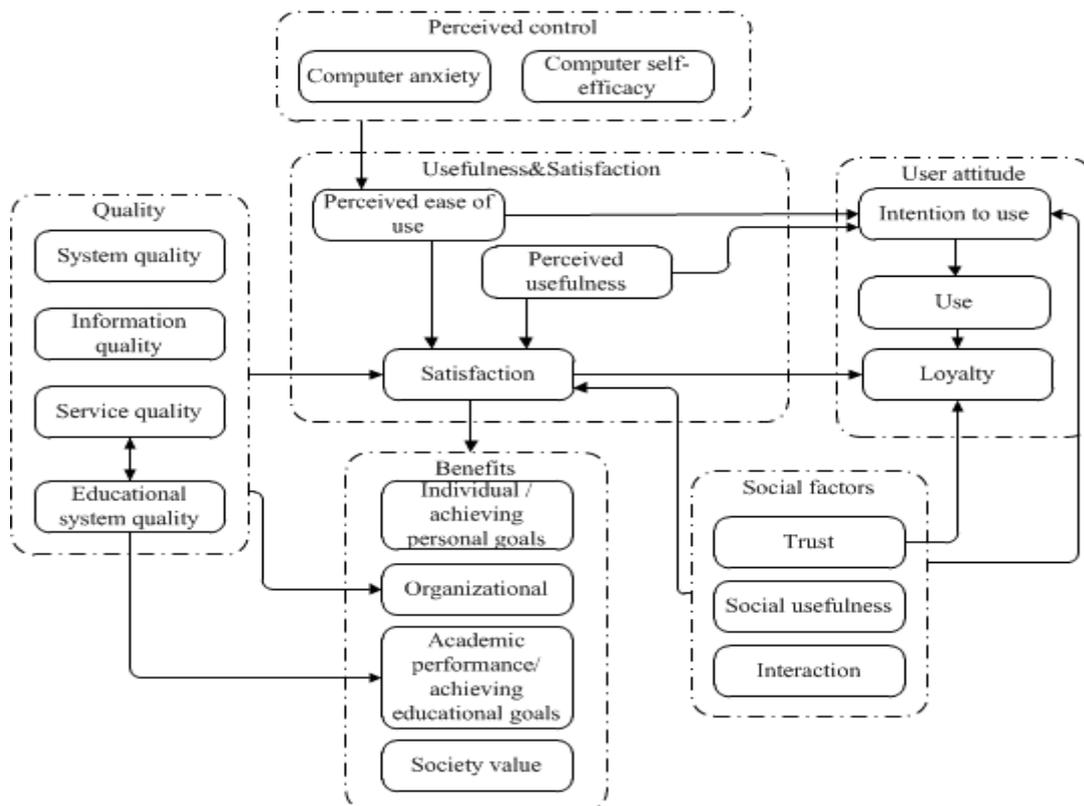


Fig. 14. The proposed ELSS model.

**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 improve-

ments 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.

## References

- [1] J. Liegle, T. Janicki, „The effect of learning styles on the navigation needs of Web-based learners”, *Computers in Human Behavior*, vol. 22, pp. 885–898, 2006.
- [2] H. Henke, *Learning Theory: Applying Kolb's Learning Style Inventory with Computer Based Training*, Course on Learning Theory, 2001.
- [3] B.J. Ferdousi, *A Study of Factors that Affect Instructors' Intention to Use E-Learning Systems in Two-Year Colleges*, PhD. Thesis, Nova Southeastern University, 2009.
- [4] J.K. Lee, W.K. Lee, „The relationship of e-Learner's self-regulatory efficacy and perception of e-Learning environmental quality”, *Computers in Human Behavior*, vol. 24, pp. 32–47, 2008.
- [5] V. Cantoni, M. Cellario, M. Porta, „Perspectives and challenges in e-learning: Towards natural interaction paradigms”, *Journal of Visual Languages and Computing*, vol. 15, pp. 333–345, 2004.
- [6] W.H. DeLone, E.R. McLean, „The DeLone and McLean model of information systems success: A ten-year update”, *Journal of Management Information Systems*, vol.19, pp. 9–30, 2003.
- [7] Y.S. Wang, H.Y. Wang, D.Y. Shee, „Measuring e-learning systems success in an organizational context: Scale development and validation”, *Computers in Human Behavior*, vol. 23 pp. 1792–1808, 2007.
- [8] J.H. Wu, Y.M. Wang, „Measuring KMS success: A respecification of the DeLone and McLean's model”, *Information & Management*, vol. 43, pp. 728–739, 2006.
- [9] N. Marangunic, A. Granic, „Technology acceptance model: a literature review from 1986 to 2013”, *Universal Access in the Information Society*, 2014.
- [10] S. Ozkan, R. Koseler, „Multi-dimensional students' evaluation of e-learning systems in the higher education context: An empirical investigation”, *Computers & Education*, vol. 53, pp. 1285–1296, 2009.
- [11] A. Oztekin, Z.J. Kong, O. Uysal, „UseLearn: A novel checklist and usability evaluation method for eLearning systems by criticality metric analysis”, *International Journal of Industrial Ergonomics*, vol. 40, pp. 455–469, 2010.
- [12] D.Y. Shee, Y.S. Wang, „Multi-criteria evaluation of the web-based e-learning system: A methodology based on learner satisfaction and its applications”, *Computers & Education*, vol. 50, pp. 894–905, 2008.
- [13] M.A. Parker, F. Martin, „Using virtual classrooms: Student perceptions of features and characteristics in an online and a blended course”, *MERLOT Journal of Online Learning and Teaching*, vol. 6, pp. 135–147, 2010.
- [14] P.S.D. Chen, A.D. Lambert, K.R. Guidry, „Engaging online learners: The impact of Web-based learning technology on college student engagement”, *Computers & Education*, vol. 54, pp. 1222–1232, 2010.
- [15] M. Wrzesien, M.A. Raya, „Learning in serious virtual worlds: Evaluation of learning effectiveness and appeal to students in the e-junior project”, *Computers & Education*, vol. 55, pp. 178–187, 2010.
- [16] E. Ngai, J. Poon, Y. Chan, „Empirical examination of the adoption of WebCT using TAM”, *Computers & Education*, vol. 48, no. 2, pp. 250–267, 2007.
- [17] C.L. Ho, R.J. Dzeneg, „Construction safety training via e-Learning: Learning effectiveness and user satisfaction”, *Computers & Education*, vol. 55, pp. 858–867, 2010.
- [18] M. Cukusic, N. Alfirevic, A. Granic, Z. Garaca, „E-Learning process management and the e-learning performance: Results of a European empirical study”, *Computers & Education*, vol. 55, pp. 554–565, 2010.
- [19] J.R. Chou, S.W. Hsiao, „A usability study on human–computer interface for middle-aged learners”, *Computers in Human Behavior*, vol. 23, pp. 2040–2063, 2007.
- [20] N. Au, E.W.T. Ngai, T.C.E. Cheng,

- „Extending the understanding of end user information systems satisfaction formation: An equitable needs fulfillment model approach”, *MIS Quarterly*, vol. 32, pp. 43–66, 2008.
- [21] W.T. Wang, C.C. Wang, „An empirical study of instructor adoption of web-based learning systems”, *Computers & Education*, vol. 53, pp. 761–774, 2009.
- [22] Y.S. Wang, Y.-W. Liao, „Assessing e-Government systems success: A validation of the Delone and Mclean model of information systems success”, *Government Information Quarterly*, vol. 25, pp. 717–733, 2008.
- [23] J. Roca, C. Chiu, F. Martínez, „Understanding e-learning continuance intention: An extension of the Technology Acceptance Model”, *International Journal of Human-Computer Studies*, vol. 64, no. 8, pp. 683–696, 2006.
- [24] O’Dell, T., *Generational differences in satisfaction with e-learning environment*, PhD. Thesis. College of Education University of Houston.
- [25] D. Kember, C. McNaught, F.C.Y. Chong, P. Lam, K.F. Cheng, „Understanding the ways in which design features of educational websites impact upon student learning outcomes in blended learning environments”, *Computers & Education*, vol. 55, pp. 1183–1192, 2010.
- [26] P.C. Sun, R.J. Tsai, G. Finger, Y.Y. Chen, D. Yeh, „What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction”, *Computers & Education*, vol. 50, pp. 1183–1202, 2008.
- [27] J.H. Wu, R.D. Tennyson, T.L. Hsia, „A study of student satisfaction in a blended e-learning system environment”, *Computers & Education*, vol. 55, pp. 155–164, 2010.
- [28] M. Abdous, M. Yoshimura, „Learner outcomes and satisfaction: A comparison of live video-streamed instruction, satellite broadcast instruction, and face-to-face instruction”, *Computers & Education*, vol. 55, pp. 733–741, 2010.
- [29] K.C. Chen, S.J. Jang, „Motivation in online learning: Testing a model of self-determination theory”, *Computers in Human Behavior*, vol. 26, pp. 741–752, 2010.
- [30] C.W. Holsapple, A. Lee-Post, „Defining, assessing, and promoting e-learning success: An information systems perspective”, *Decision Sciences Journal of Innovative Education*, vol. 4, pp. 67–85, 2006.
- [31] M.C. Lee, „Explaining and predicting users’ continuance intention toward e-learning: An extension of the expectation–confirmation model”, *Computers & Education*, vol. 54, pp. 506–516, 2010.
- [32] Y. Duan, Q. He, W. Feng, D. Li, Z. Fu, „A study on e-learning take-up intention from an innovation adoption perspective: A case in China”, *Computers & Education*, vol. 3, pp. 1–10, 2010.
- [33] B.C. Lee, J.O. Yoon, I. Lee, „Learners’ acceptance of e-learning in South Korea: Theories and results”, *Computers & Education*, vol. 53, pp. 1320–1329, 2009.
- [34] Z. Sheng, Z. Jue, T. Weiwei, „Extending TAM for Online Learning Systems: An Intrinsic Motivation Perspective”, *Tsinghua science and technology*, vol. 13, pp. 312–317, 2008.
- [35] E. Diez, B.S. McIntosh, „A review of the factors which influence the use and usefulness of information systems”, *Environmental Modelling & Software*, vol. 24, pp. 588–602, 2009.
- [36] H.M. Hutchins, D. Hutchison, „Cross-disciplinary contributions to e-learning design: A tripartite design model”, *Journal of Workplace Learning*, vol. 20, pp. 364–380, 2008.
- [37] A. Molla, P.S. Licker, „E-commerce systems success: An attempt to extend and respecify the DeLone and McLean model of IS success”, *Journal of Electronic Commerce Success*, pp. 1–11, 2001.
- [38] A. Gonzalez, L. Jover, E. Cobo, P. Munoz, „A web-based learning tool improves student performance in statistics: A randomized masked trial”, *Computers & Education*, vol. 55, pp. 704–713, 2010.
- [39] Ssemugabi, S., *Usability evaluation of a web-based e-learning application: a*

- study of two evaluation methods, Master thesis, University Of South Africa, 2006.
- [40] C.M. Chiu, E.T.G. Wang, „Understanding Web-based learning continuance intention: The role of subjective task value”, *Information & Management*, vol. 45, pp. 194–201, 2008.
- [41] G. Piccoli, R. Ahmad, B. Ives, „Web-based virtual learning environments: A research framework and a preliminary assessment of effectiveness in basic IT skills training”, *MIS Quarterly*, vol. 25, pp. 401–426, 2001.
- [42] H.M. Selim, „Critical success factors for e-learning acceptance: Confirmatory factor models”, *Computer & Education*, vol. 49, pp. 396–413, 2007.
- [43] G. Naveh, D. Tubin, N. Pliskin, „Student LMS use and satisfaction in academic institutions: The organizational perspective”, *Internet and Higher Education*, vol. 13, pp. 127–133, 2010.
- [44] V. Venkatesh, H. Bala, „Technology Acceptance Model 3 and a Research Agenda on Interventions”, *Decision Sciences*, vol. 39, no. 2, pp. 273–315, 2008.
- [45] H. Fardoun, F. Montero, V.L. Jaquero, „eLearnXML: Towards a model-based approach for the development of e-Learning systems considering quality”, *Advances in Engineering Software*, vol. 40, pp. 1297–1305, 2009.
- [46] S. Lonn, S.D. Teasley, „Saving time or innovating practice: Investigating perceptions and uses of learning management systems”, *Computers & Education*, vol. 53, pp. 686–694, 2009.
- [47] M.S. Kerr, K. Rynearson, M.C. Kerr, „Student characteristics for online learning success”, *Internet and Higher Education*, vol. 9, pp. 91–105, 2006.
- [48] N. Vernadakis, P. Antoniou, M. Gianousi, E. Zetou, E. Kioumourtzoglou, „Comparing hybrid learning with traditional approaches on learning the Microsoft Office Power Point 2003 program in tertiary education”, *Computers & Education*, vol. 56, pp. 188–199, 2011.
- [49] H. EL-Deghaidy, A. Nouby, „Effectiveness of a blended e-learning cooperative approach in an Egyptian instructor education programme”, *Computers & Education*, vol. 51, pp. 988–1006, 2008.
- [50] B. Beldagli, T. Adiguzel, „Illustrating an ideal adaptive e-learning: A conceptual framework”, *Procedia Social and Behavioral Sciences*, vol. 2: 5755–5761, 2010.
- [51] K.M.Y. Law, V.C.S. Lee, Y.T. Yu, „Learning motivation in e-learning facilitated computer programming courses”, *Computers & Education*, vol. 55, pp. 218–228, 2010.
- [52] A. Hassanzadeh, F. Kanaani, S. Elahi, „A model for measuring e-learning systems success in universities”, *Expert Systems with Applications*, vol. 39, pp. 10959–10966, 2012.
- [53] H.F. Lin, „Determinants of successful virtual communities: Contributions from system characteristics and social factors”, *Information & Management*, vol. 45, no. 8, pp. 522–527, 2008.
- [54] A. Lee-Post, „e-Learning Success Model: an Information Systems Perspective”, *Electronic Journal of e-Learning*, vol. 7, no. 1, pp. 61 – 70, 2009.
- [55] A. Y. Alsabawy, A. Cater-Steel, J. Soar, „Measuring E-Learning System Success (Research In Progress)”, in Proc. *Pacific Asia Conference on Information Systems*, art.15, 2011, published by AISeL.
- [56] F. D. Davis, „Perceived usefulness, perceived ease of use, and user acceptance of information technology”, *MIS Quarterly*, vol. 13, no.3, pp.319–340, 1989.

### 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.



**Iuliana DOROBĂȚ** has graduated the Faculty of Economic Studies, University “Dunărea de Jos”, Galați in 2002. She holds a PhD diploma in Cybernetics and Economic Statistics from March 2010. She is an ERP system consultant and from 2005 she joined the staff of the Bucharest Academy of Economic Studies, teaching. Currently she is a senior lecturer within the Department of Economic Informatics and Cybernetics at the Faculty of Cybernetics, Statistics and Economic Informatics from the Academy of Economic Studies.

She is the author of over 25 papers in the field of information systems published in national and international journals or conference proceedings. She was a research member in 8 national and international research projects. Her work focuses on the analysis of ERP systems implementations, Business process modeling, ERP training, e-learning, e-learning systems, blended learning.