CRITICAL SUCCESS FACTORS FOR E-LEARNING AT UNIVERSITY LEVEL: A CASE STUDY FROM DA NANG UNIVERSITY OF TECHNOLOGY AND EDUCATION (UTE-DN)

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ABSTRACT

E-learning has become a trend in university education around the world. Also, the EMVITET Erasmus+ project in developing Education 4.0 has focused on developing e-learning. This study investigates the effect of critical success factors (CSFs) on e-learning at Da Nang University of Technology and Education (UTE-DN), a member of The University of Danang. Five categories were firstly identified via the literature and a questionnaire using the Likert scale was then carried out to evaluate the importance of each factor from students' perspective. Analytical results indicated 20 CSFs that influence the success of e-learning. Internet quality, self-efficacy, content quality of the lectures, enthusiasm while teaching, and accessible and up-to-date learning materials are the top five influential factors that impact e-learning success. This study, thus, supports leaders and teachers at UTE-DN in making decisions and strategies about e-learning.

***Keywords**: critical success factors; e-learning; questionnaire; Likert scale; universities.*

1. INTRODUCTION

The development of Information Technology (IT) has resulted in massive growth in a wide range of fields such as finance, business, education, health. In education, e-learning has become mainstream being widely adopted in many educational institutions. E-learning is defined as "*an approach to teaching and learning, representing all or part of the educational model applied, that is based on the use of electronic media and devices as tools for improving access to training, communication and interaction and that facilitates the adoption of new ways of understanding and developing learning*" (Sangrà, Dimitrios, & Nati, 2012). In another way, e-learning is considered as the use of modern Information and Communications Technology (ICT) and computers to deliver instruction, information, and learning content (Selim, 2007). E-learning brings many benefits to learners and institutions. It reduces the cost of travel, classroom and facilities, labour, and printed materials. It increases accessibility to information, better content delivery, personalized instruction, content standardization, accountability, on-demand availability, self-pacing, interactivity, confidence, and increased convenience (Bhuasiri et al., 2012).

Critical success factors (CSFs) are defined as "*those things that must be done if a company is to be successful*" (Freund, 1988). This term appeared from the fact that some organizations seemed to be more successful than others, and researchers wanted to investigate the success components (Ingram et al., 2000). CSFs should be few in number, measurable and controllable (Selim, 2007).

In past decades, many studies have explored CSFs for e-learning at all levels, from the perspective of a student, teacher, to an institution (Alhabeeb & Rowley, 2018; Bhuasiri et al., 2012; McGill, Klobas, & Renzi, 2014; Selim, 2007). For example,

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(Bhuasiri et al., 2012) investigated the influence of multiple factors on the success of e-learning systems in developing countries. A questionnaire was designed to collect responses from ICT experts and faculties. Six CSF dimensions that were identified include learners' characteristics, instructors' characteristics, institution and service quality, infrastructure and system quality, course and information quality, and extrinsic motivation. (Alhabeeb & Rowley, 2018) compared the e-learning CSFs from the perspectives of students and academic staff in Saudi Arabia. For students, technology infrastructure, instructor characteristics, and student characteristics were the three most important CSFs. An investigation conducted by (Taha, 2014) to identify the factors that affect the implementation and development of e-learning secondary schools. Four categories were explored including students' characteristics, teachers' characteristics, technology, design and content.

The University of Technology and Education (UTE-DN) is a member of The University of Danang. Established in 1962, it has been one of the leading training institutions about technology in the Central land of Vietnam. Since 2019, the UTE-DN has been one of the partner institutions of the EMVITET project which is co-funded by the Erasmus+ Programme of the European Union. The EMVITET project aims to support Vietnamese teachers in creating a new learning ecosystem for university education in Vietnam. The participants are trained to develop their competencies in three main areas including pedagogy, technology, and learning ecosystem. In September 2019, the author along with some lecturers at UTE-DN participated in a 3-week training program at Häme University of Applied Sciences (HAMK), Finland. The UTE-DN team obtained useful knowledge about Education 4.0 which positively contributed to the e-learning deployment later at UTE-DN.

E-learning was firstly deployed at the UTE-DN for the second semester of the academic year 2019-2020 (beginning in March 2020). The reason for this conduction is students cannot go to classrooms due to the social distance caused Covid-19 pandemic. Notably, there has not been any survey that investigated CSFs for e-learning in the UTE-DN. This study, thus, aims to explore critical factors that affect the success of e-learning at the UTE from the student perspective.

The rest of this paper is organized as follows. Section 2 and Section 3 establish dimensions and critical factors for e-learning success, respectively. Data collection and analytical results are presented in Section 4. Finally, Section 5 presents conclusions and recommendations.

2. DIMENSIONS OF CSFS FOR E-LEARNING

From the literature, five categories/dimensions for e-learning success in UTE-DN were identified. They included learners' features, instructors' features, technology infrastructure, e-learning system quality, and course's features (Figure 1).

***Figure 1**. Categories of success factors for E-learning.*

In e-learning, the role of learners is central. With an e-learning based course, learners are responsible for their learning pace. Previous studies indicated some relevant learner characteristics such as computer self-efficacy, internet self-efficacy, attitude toward e-learning (Alhabeeb &

Rowley, 2018; Bhuasiri et al., 2012). Along with learners, instructors play a crucial role in the effectiveness and success of e-learning. Some relevant features of an instructor that affect e-learning success are timely response, self-efficacy, focus on interaction and technology control.

Different from traditional learning where learners and instructors are in face to face communication, participants in a virtual learning environment interact through digital tools. Reliability and robustness of physical infrastructure are considered to be important institutional conditions so that e-learning could be successfully applied (Marshall, 2012). Technological facilities, thus, have a positive effect on learners' satisfaction. Success factors that are relevant for technology infrastructure consist of internet quality, equipment accessibility, reliability of technical infrastructure, etc.

A learning management system (LMS) is a web-based technology that enables universities or educational institutions to create, distribute, and manage lessons, courses, quizzes, and other training materials. It is one of the crucial determinants of e-learning that could be conducted. The quality of LMS that relates to the belief of learners about e-learning's performance is measured by ease of use, interactivity, functionality, support in language, etc. A well-designed course has a strong positive effect on learners' satisfaction. Relevant factors for the course's features are flexibility, learning materials, etc.

3. SUCCESS FACTORS FOR E-LEARNING

Five CSF categories that contained 24 different factors were identified from previous studies. Table 1 presents these five categories (i.e, learners' features, instructors' features, technology infrastructure, e-learning system quality, and course's features). The definition of each factor was also specified and Table 1 was used as a basis for the questionnaire survey design.

Table 1. *Definitions of CSF for e-learning.*

Categories	Factor		Definition
Learners' features	L1	Attitude toward e-learning	Willingness to participate in online learning
	L2	Experience and knowledge about computers	Ability to use computer to finish a particular assignment.
	L3	Internet self-efficacy	Ability to interact with the Internet
	L4	Self-study and self-discipline	Ability to make herself or himself study and do something, especially something difficult
	L5	English proficiency	The understanding of English while using digital tools
Instructors' features	I1	Self-efficacy	The clear presentation and explanation about online lectures
	I2	Proficiency in e-learning system	Ability to effectively manipulation the e-learning system and digital tools
	I3	Focus on interaction	Ability to motivate learners to participate in online discussions
	I4	Timely feedback	The instructor responses quickly to learners' problems

Categories	Factor		Definition
	I5	Fair interaction and assessment	The instructor treats learners fairly during their online learning period
	I6	Enthusiasm while teaching	The enthusiasm of instructor while teaching using e-learning tools
Course features	C1	Content quality	The quality of writing, videos, images, etc. to meet generally accepted standards.
	C2	Course flexibility	Learners' perception of the efficiency and effects of adopting e-learning in their working, learning, and commuting hours
	C3	Learning materials are available and up-to-date	The prompt provision of learning materials
Technology infrastructure	T1	Internet quality	The quality of Internet can be evaluated by data transmission speed, error rates,…
	T2	Reliable technical infrastructure	The degree of accuracy, reliability, and consistency of the information
	T3	Available online communication tools	Availability of online communication tools (e.g, email, Facebook,…)
	T4	Technical support in teaching	Availability of training and offline technical support, ability to access equipment
E-learning system quality	E1	Ease of registration	Ease of registration on e-learning course
	E2	Ease of use	The degree to which users expect the use of the e-learning system to be free of effort
	E3	System functionality	The ability to which the e-learning system could provide flexible access to instructional and assessment media
	E4	System interactivity	Availability of communications with the instructor in the e-learning system
	E5	Language Support	The ability to explain terminologies of the system so that users could be understandable
	E6	System response	The time that elapes from manipulation of a user until feedback from the system is received

4. DATA COLLECTION AND ANALYTICAL RESULTS

4.1. Data collection

This study was carried out in Da Nang University of Technology and Education (UTE-DN), The University of Danang during the EMVITET Eramus+ - project. E-learning was firstly implemented/conducted in UTE-DN in the second semester of the academic year 2019-2020. The reason for this deployment is students could not go to class due to the social distance caused by the Covid-19 pandemic. This study was focused on collecting perspectives of students who are trained for a bachelor's degree.

A five-point Likert-style statement was designed for each e-learning CSF, for which participants were asked to show their opinion regarding its importance to the success of e-learning. Five-point Likert scale that ranges from 1 to 5 includes Very unimportant,

Unimportant, Normal, Important, and Very important, respectively. The threshold for the importance of factors is determined if their average mean values equal to or higher than 4. The development of the survey includes two stages. At the first stage, a paper-based questionnaire was designed and then sent to some experts in education to assure validity. Based on their feedback, a web-based questionnaire was redesigned at the second stage to collect data from participants.

Data was collected from students who are studying in UTE-DN. Table 2 summarises the demographic profile and descriptive statistics of surveyed students in terms of gender, academic year, and which department they are studying. Total received responses are 296 in which 282 responses are valid (accounting for 95.27%). The majority of respondents are male which accounts for 89.36% (252 replies) compared to 10.64% of female. This is quite understandable since UTE-DN is a technical training institution that attracts more males than females. This table indicates that most of the participants are studying in the second year and the third year of their course (accounting for up to 81.56%)

Table 2. *Learners' demographic data.*

		Frequency	**Percentage (%)**
Gender	Male	252	89.36
	Female	30	10.64
	Other	0	0
Academic year	1	40	14.18
	2-3	230	81.56
	4	12	4.26
	More than fourth	0	0.00
Department	Civil engineering	71	25.18
	Chemical and environmental engineering	33	11.70
	Electrical and electronics engineering	71	25.18
	Mechanical engineering	97	34.40
	Industrial Education	10	3.55

4.2. Results and discussion

Table 3 shows the mean and standard deviation of 24 CSFs in the e-learning assessment. It can be seen that 20 among 24 factors have a mean response equal to or higher than four. Factors have a mean lower than four should be removed from the CSFs' list because they are almost unimportant to the success of e-learning (i.e, technical support in teaching (T4); ease of use (E2), system functionality (E3), and language support (E5) of the e-learning system).

Table 3. *Descriptive statistics of CSF indicators for e-learning.*

Categories	Factor	Min	Max	Mean	Standard deviation
Learners' features	L1	1	5	4.07	0.87
	L2	1	5	4.05	0.80
	L3	2	5	4.06	0.72
	L4	**2**	**5**	**4.22**	**0.79**
	L5	1	5	4.00	0.84
Instructors' features	**I1**	**1**	**5**	**4.51**	**0.70**
	I2	1	5	4.28	0.74
	I3	1	5	4.16	0.80
	I4	1	5	4.28	0.77
	I5	1	5	4.18	0.77
	I6	1	5	4.41	0.76
Course's features	**C1**	**1**	**5**	**4.43**	**0.77**
	C2	1	5	4.25	0.73
	C3	1	5	4.37	0.78
Technology infrastructure	**T1**	**1**	**5**	**4.53**	**0.80**
	T2	1	5	4.21	0.82
	T3	1	5	4.21	0.79
	T4	1	5	3.60	0.98
E-learning system quality	E1	1	5	4.06	0.77
	E2	1	5	3.98	0.84
	E3	1	5	3.89	0.86
	E4	1	5	4.01	0.85
	E5	1	5	3.91	0.84
	E6	**1**	**5**	**4.09**	**0.91**

For the dimension of learners' features, students showed that self-study and self-discipline (L4) was the most important factor with the mean value of 4.22. Students who participate in online classes feel less excited and motivated than in face-to-face classes. Thus, students with high self-discipline generally obtain better academic performance than those who have low self-discipline.

Self-efficacy (I1) was the most important factor in the dimension of instructors' features. This factor could be presented by the clear presentation and explanation of the instructors about their online lectures. With regards to the course's features, content quality (C1) of the online course that is described by writing, videos, images, etc. has the biggest influence on students' e-learning performance.

Most of the responses indicated that internet quality (T1) significantly contributes to the success of virtual learning. The mean of T1 was highest among considered factors with a value of 4.53. In e-learning, teachers and learners communicate through a virtual environment based on electronic technologies. Thus, the success of an online session, thus, is much affected by the quality of the internet connection.

In UTE-DN, the quality of the e-learning system was presented by the learning management system (LMS) whose address at http://lms.ute.udn.vn/. The UTE-DN adopted the LMS to deploy online training in 2020. Students replied that system response (E6) was the most important influential factor in their online learning. The system response could be explained by the lag of the system when users manipulate the LMS. With a stable internet transmission, the lag of LMS depends on its server capacity.

After removing 4 factors having a value under 4.0, there are 20 CSFs for e-learning (Fig. 2). It can be seen that internet quality, self-efficacy, content quality of the lectures, enthusiasm while teaching and learning materials are available and up-to-date are the top five essential factors that influence e-learning success in the UTE-DN from students' perspective. On the other hand, system interactivity, English proficiency, and three factors of learners group including ease of registration, internet self-efficacy, experience and knowledge about computers are the five least influential factors for e-learning.

The importance of categories is ranked in Table 4. According to the students' responses, the course feature was the most influential group on e-learning success with an average of 4.35. Technology infrastructure and instructors' features have a similar impact on e-learning. Notably, learners' features and the quality of e-learning were not appreciated by UTE students. Fig. 3 compares the influence of CSF's groups on the success of e-learning.

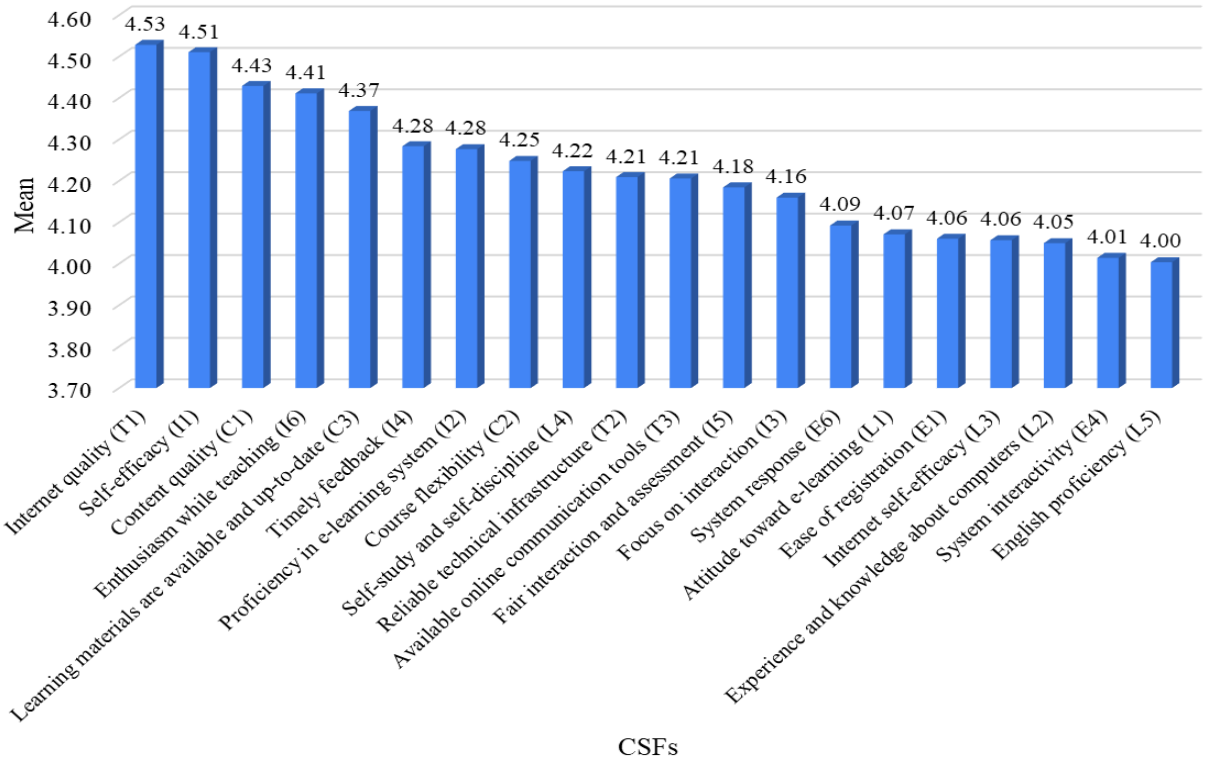

Fig. 2. *CSFs for e-learning at UTE-DN from students' perspective.*

Table 4. *Summary of critical success factors for e-learning from UTE student perspective.*

Categories		CSFs	Average	Rank
Course's features	C1	Content quality	4.35	1
	C2	Course flexibility		
	C3	Learning materials are available and up-to-date		
Technology infrastructure	T1	Internet quality	4.31	2
	T2	Reliable technical infrastructure		
	T3	Available online communication tools		
Instructors' features	I1	Self-efficacy	4.30	3
	I2	Proficiency in e-learning system		
	I3	Focus on interaction		
	I4	Timely feedback		
	I5	Fair interaction and assessment		
	I6	Enthusiasm while teaching		
Learners' features	L1	Attitude toward e-learning	4.08	4
	L2	Experience and knowledge about computers		
	L3	Internet self-efficacy		
	L4	Self-study and self-discipline		
	L5	English proficiency		
E-learning system quality	E1	Ease of registration	4.06	5
	E4	System interactivity		
	E6	System response		

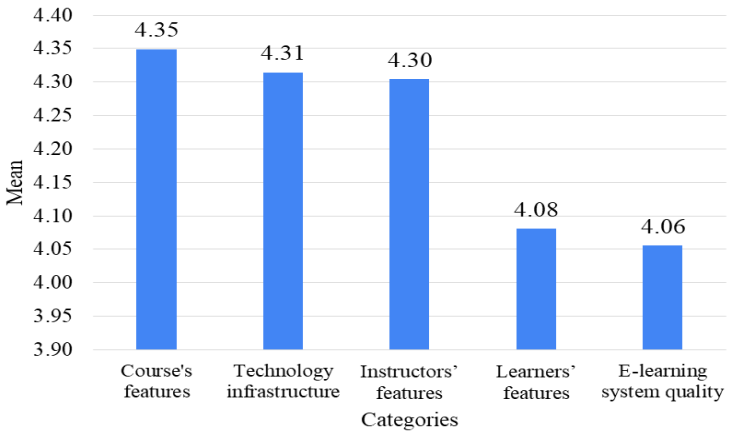

Fig. 3. *Comparison of the influence of CSF's groups on the success of e-learning*

5. CONCLUSIONS

This study aims to discover the CSFs that might influence the success of e-learning from the students' perspectives. Five dimensions including learners' features, instructors' features, course's features, technology infrastructure, and system quality were first identified. A questionnaire using a five-point Likert scale was then conducted to collect responses of students who are studying at UTE-DN. Analytical results revealed that 20 out of 24 factors are essential to the success of e-learning. For students, the course's features were the most important group that might affect their online learning. In particular, internet quality was the most influential CSFs to the success of e-learning.

Results obtained from this study could be utilized by leaders and decision-makers in UTE-DN to make suitable policies and strategies. Lecturers also use findings from this study to have suitable online teaching programs. In the future, feedback from teachers needs to collect to compare the CSFs between students' and teachers' perspectives. In addition, CSFs between males' and females' perspectives need to be compared. Knowledgement obtained from the EMVITET project was effectively disseminated to lecturers in UTE. During the period of social distance due to the Covid-19 pandemic, the UTE deployed online learning using digital platforms such as Zoom, MS Teams. A learning management system whose website address at http://lms.ute.udn.vn/ was established to serve online teaching. Notably, final-year students performed oral defences for their bachelor's thesis via the MS Teams platform. Such timely actions ensured the training program for UTE students.

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