

Key Success Factors of e-Learning Implementation in Higher Education

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Abstract—This study aims to analyze the Key Success Factors (KSFs) of e-learning implementation so that e-learning can work well and provide maximum benefits for the learning activities process in higher education. The method used in this research begins to investigate the determinant factors based on the results of literature studies and survey techniques. To obtain a more in-depth analysis, then the factors are weighted using the Multi-Attribute Utility Theory (MAUT) method. The results showed that the determinant factors that need to be used as the primary consideration in the implementation of e-learning at higher education are organizational factors, technology, and human resources. The dominant factor that needs attention in realizing the effectiveness of the implementation of e-learning in higher education is the organizational aspect, which is recognized in the form of creating a work culture and setting policies that are binding on the academic community to carry out e-learning.

Keywords—Determinant factors; e-learning; key success factors; multi-attribute utility theory.

1 Introduction

The development of information technology became a part of the emergence of the digital revolution era. The rapid development of information technology has given a big influence and dominates all sectors of people's lives, including in the world of education [1]. The central role of the information technology implementation in higher education is marked by the emergence of various terms of the application of technology in higher education, such as Techno University [2], Digital Campus [3,4], Smart Campus [5–8], Green Campus [9], and various other terms. These terms basically indicate that technology is applied in every activity in higher education with

various technological approaches, ranging from information systems, artificial intelligence, and the Internet of Things (IoT), including e-learning inside.

The learning process with the face to face system is the main model in the learning process in higher education. However, in recent developments, the transformation of learning models by utilizing e-learning has been widely implemented in higher education. E-learning is the use of technology as an effective solution for the active, independent, quality, and sustainable learning process. The implementation of e-learning is seen as having excellence in shaping independence in the learning process to achieve educational goals [10]. One important thing that becomes the background of this research is the implementation of e-learning that conducted to ensure an effective and sustainable education process. Today, in Indonesia and several other countries, set lock-down policies for learning activities in several universities. This lock-down activity is carried out as anticipation to reduce the transmission of the Corona Virus Disease 2019 (COVID-19) [11–14]. E-learning is used as an alternative learning process that is considered safe from human interaction activities that can trigger the transmission of the virus; on the other hand, the learning process can continue to run well.

The related previous research has been conducted to evaluate e-learning, either using KSF or other, including:

- 1) Analysis of determinant factors in software design for computer-assisted instruction [15]
- 2) Investigating key factors for successful e-learning implementation [16]
- 3) Determinant factors in multimedia-based e-learning design [17]
- 4) Another research evaluate e-learning using Technology Acceptance Test (TAM) [18–25]
- 5) Critical success factors to evaluate e-learning implementation [26,27]
- 6) Knowledge management and e-learning effectiveness had been proven capable to improve efficiency in learning process [28]
- 7) Research and Development using ADDIE (Analysis Design Develop Implement Evaluate) used model to evaluate blended learning [29]
- 8) Actually, e-learning innovation based on research-based learning approach can improve student capabilities in learning [30]
- 9) Also the empirical study which evaluate using DeLone and McLeane success model, TAM, user satisfaction methods, and e-learning quality model [31]

However, different from others, this research focuses on determining, weighting, and analyzing KSFs in implementing e-learning in higher education using Multi-Attribute Utility Theory (MAUT).

Based on the observations on the research object, although various supporting devices have been provided, the implementation of e-learning is not optimal, even in most lectures are not using e-learning. Moreover, in much other higher education, it was indicated that the use of e-learning was not optimal, as reported by Lestari and Hamka (2019) [32]. There are many reasons for the ineffectiveness of e-learning implementation, including the fact that lecturers are comfortable doing the learning process using only face-to-face models, policies that do not support the implementation

of e-learning [32], user inconvenience in running the application program [33], human resource capacity, availability of supporting facilities and infrastructure [34], technological knowledge level, and work culture.

This research was conducted to analyze Key Success Factors (KSFs) to identify the determinants of the e-learning implementation. KSFs will be useful as a basis for university policy in the implementation of e-learning systems. Therefore, the implication of this study is the creation and awakening of the optimization of the e-learning implementation in higher education. The optimization considers several aspects that support the successful use of e-learning for all academic communities in higher education—both the implementation of the normal condition of academic activity and academic activities in emergencies.

2 Methodology

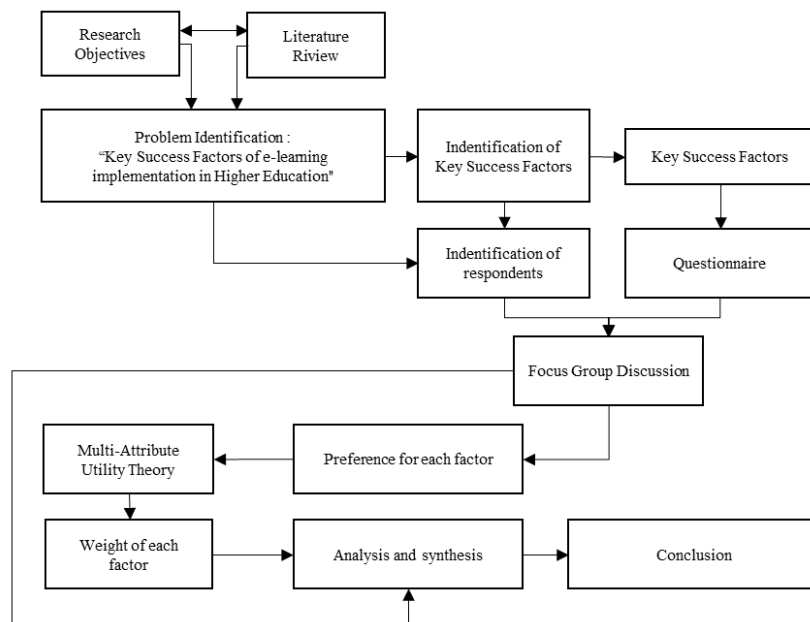


Fig. 1. Research Procedures

The research begins with a literature study, observation, and survey of the implementation of e-learning on the research object, followed by a weighting calculation with weighting that is commonly used in Multi-Attribute Utility Theory (MAUT). The assessment mechanism for each criterion is determined through the preparation of criteria followed by an assessment of each criterion using the preference scale used in the Analytical Hierarchy Process (AHP) developed by Saaty [35–37]. The research procedures or activities are presented in Figure 1. Begin from investigating the re-

search objectives, kinds of literature, and identifying the problem. Then, KSFs will be identified and evaluate by questionnaire and Focus Group Discussion (FGD).

This study uses the AHP questionnaire model that involved by 12 experts, namely education experts, top management of higher education, and information systems experts in Universitas Islam Negeri (UIN) Sunan Gunung Djati Bandung, Indonesia. The experts who filled out the questionnaire also involved two experts from outside UIN Sunan Gunung Djati Bandung, among other experts from the High School of Garut Technology, Indonesia, and Universiti Teknikal Malaysia Melaka, Malaysia. Filling out the questionnaire is a pairwise comparison that is filled based on the AHP scale (1-9), where reference data is the consensus of respondents (expert). Data processing uses the AHP Priority Calculator (online) as provided at <https://bpmsg.com/ahp/ahp-calc.php>. For each factor is weighted using MAUT then the result will be analyzed and synthesized until getting the conclusion. The limitation of the study that conducted in this study about using the definition of e-learning as a learning process by combining digital technology as a service for transferring learning content [38], which is utilized and conducted focus in higher education.

3 Result and Discussion

Based on the results of literature review, observations, and surveys conducted on research objects, KSFs were identified as the main considerations in the success in implementing e-learning, among others:

- 1) Aspects of the organization (culture, and policy/ role)
- 2) Technology aspects (availability, reliability, accessibility, usability, and content)
- 3) Aspects of human resource capacity (knowledge, skills, and attitude). Figure 2 describes the relation of those KSFs aspects

Data processing of the questionnaire result shows that the use of e-Learning is in third place after the Academic Information System and the Employment Information System. This shows that the use of e-learning is quite high in the academic community of higher education, especially for Lecturers and Students as direct users of e-Learning. Of course, e-learning implementation is influenced by several factors. This study uses aspects of the KSFs contained in Figure 2 to evaluate the use of e-learning in higher education.

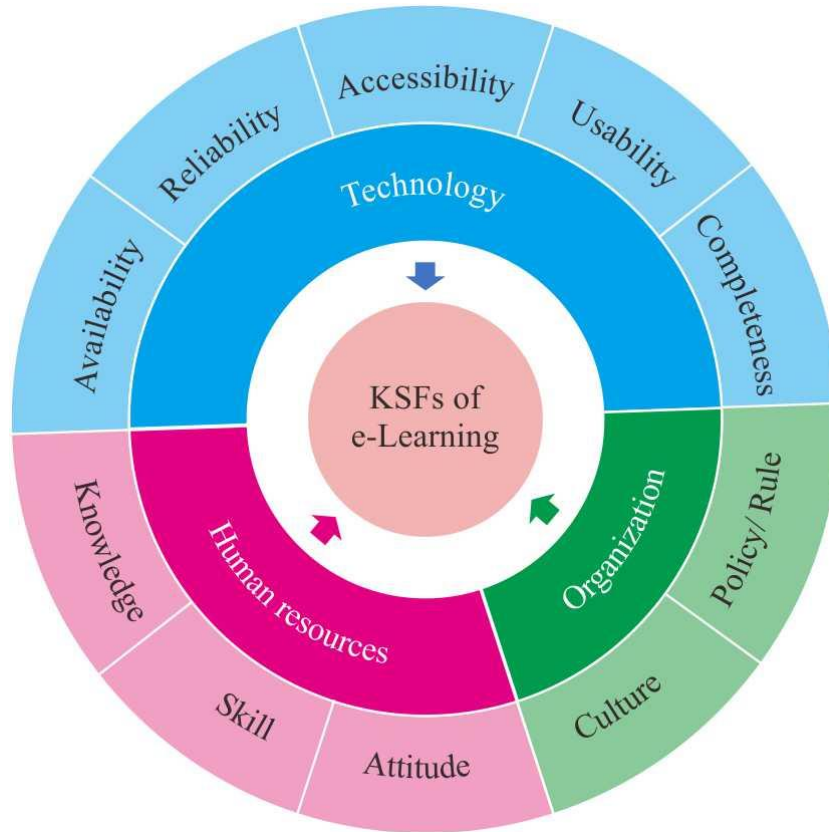


Fig. 2. Key Success Factors of e-Learning Implementation

Based on the results of the assessment conducted through the FGD, which is processed using the AHP calculation model, the weight of each factor is obtained, as presented in Table 1. In Table 1, the value in the weight column shows the importance relative to other criteria in e-learning implementation. The greater value indicates greater significance towards the implementation of e-learning. The weight value, which is calculated using AHP showed that organization has the highest value (0.5499), which means organization the most influence KSFs for e-learning implementation in higher education. Then, followed by technology (0.2402) and human resources (0.2098). Technology and human resources have a weight that is not a too significant difference. This is because the technology needs to be supported by human resources and vice versa.

Table 1. Weighting of determinant factors in e-learning implementation

Key Success Factors	Weight	Dimension	Weight
Organization	0.550	Culture	0.367
		Policy	0.183
Technology	0.240	Availability	0.019
		Reliability	0.086
		Accessibility	0.061
		Usability	0.037
		Completeness	0.037
Human Resources	0.210	Knowledge	0.050
		Skill	0.029
		Attitude	0.131

2.1 Organization

E-learning is an effort to build learning that makes it easy for students to improve their knowledge and skills-based online system. The use of e-learning depends on the user's perspective. Generally, technology will be used if the technology is a necessity, and there is a policy of the organization [39].

The needs and policies of the organization will construct an organizational commitment. Organizational commitment is the extent to which an individual knows and is bound to his organization. An individual who is highly committed will see himself as a true member of the organization [40]. Organizational commitment will be constructed through the creation of organizational culture and policies that bind the academic community.

Culture: Organizational culture is a set of values systems, beliefs, assumptions, or norms that are applicable, agreed upon, and followed by members of an organization as guidelines for behavior and solving the problems that occur in the organization [41]. In this research, organizational culture is limited to digital culture, which is a set of norms that regulate and familiarize the academic community using digital devices as part of the working system of the academic community.

Cultural weight is the highest value in ensuring the implementation of e-learning. Some research states that culture has a positive and significant effect on the implementation of e-learning [42][43]. To improve digital culture, it can be implemented through primary and secondary mechanisms [44]. In the primary mechanism, organizations diffuse culture in their members through (1) their primary concern in measuring, monitoring and setting rules; (2) how leaders react when organizations face critical and critical situations; (3) allocating resources; (4) behavior that is intentionally shown, taught and directed; (5) giving awards and positions; and (6) how to recruit, select, promote and fire members. In the secondary mechanism that is strengthening, subordinates can capture the prevailing organizational culture through: (1) organizational design and structure; (2) organizational systems and procedures; (3) organizational ceremonies; (4) spatial design, physical arrangement and institutional building; (5) a history of events and important people from the organization; and (6) official organizational slogans, philosophies, beliefs and charter of the institution.

Both of these mechanisms show that organizational culture can be embedded in the awareness of the academic community through daily activities in tertiary institutions in completing teaching tasks that are directed for the implementation of e-learning, not just in the form of planned programs.

Policy: The policy is a series of program plans, activities, actions, decisions, attitudes, to act or not act carried out by the parties (actors), as a stage for solving the problem. Policy determination is an important factor for an organization to achieve its objectives [45].

The organizational policy basically regulates something that should and should not be done by its members. University policy is a binder for the academic community to run e-learning, which can be through punished and reward. Implementation of the use of digital devices needs to be governed by policies/regulations decided by the university as an obligation inherent in the main tasks and functions of the academic community. To maintain the effectiveness of the implementation of this policy, the university allocates sufficient resources to increase the capacity of the academic community's resources so that e-learning implementation can run effectively and efficiently.

2.2 Technology

Technology is applied-practical and systematic knowledge that is useful in meeting human needs [46]. Technology contains all processes that carried out in an effort to realize something rationally [47]. Consideration of technological aspects in the context of implementing e-learning based on observations and surveys are availability, reliability, accessibility, usability, and completeness of the content.

Availability: E-learning is one of the educational services that facilitate students to carry out the learning process both in the classroom and outside the classroom without the separation between space and time. E-learning is generally implemented by utilizing web-based technology [48]. The availability of e-learning facilities at higher education is an important aspect as a key factor in the success of e-learning implementation. The availability of e-learning facilities is based on the balance that through e-learning can help the learning process quickly and easily. Completeness of e-learning facilities can encourage students to have the strength or ability to be able to explore or search, deepen, and expand the course material they learn through various learning resources online. On the other hand, the availability of e-learning tools facilitates the formation of a learning culture, also encourages expression in student interest to learn and to explore their own knowledge and information actively and independently.

Reliability: The reliability aspect of the e-learning application system is one of the key factors in the successful implementation of e-learning. Some parameters of the reliability of e-learning application systems include time savings, cost savings, increased effectiveness, technology development, and staff development [49].

Accessibility: E-learning is a learning process where the delivery of material, discussions, and other lecture activities is carried out through electronic media. E-learning is a learning system that allows the delivery of teaching materials to students using internet media, intranets, or other computer network media [50]. The e-learning

functionality depends on the accessibility of the academic community to computer/internet networks.

For universities that are the object of research, network accessibility is not a major obstacle in implementing e-learning. The support of computer network infrastructure has supported the implementation of e-learning. Different things for students, the internet network accessed by students in positions outside of campus still has problems. Limited internet access is one of the obstacles to implementing e-learning for students.

Usability: The reaction and perception of the user of the technology will affect the attitude in acceptance of the technology. The aspect that can influence user acceptance for technology is whether the technology easy for use (usability) [51]. The usability aspect of e-learning is the reason for technology users to implement a technological device. The ease of use of e-learning is a considering aspect as a benchmark in the acceptance of a technology, which in turn will make the basis for the formation of the person's actions/behavior towards the implementation of e-learning as a learning medium.

There are six indicators to measure the construct of e-learning usability, namely: ease of learning system (easy of learn), ease of system to be controlled (controllable), interaction with systems that are easily understood and clear (clear and understandable), the flexibility of interaction (flexibility), easy to skilled at using the system (easy to become skilled), and easy to use [52]. The e-learning tool is designed so that it can be used as a medium for discussion with selected themes. Discussion is one of the effective education patterns in stimulating students' critical abilities [53].

Digital devices that are designed must be simple, uncomplicated, and easily run by the academic community, given the capability of digital knowledge from the academic community, which is not always high. The easier the practice of digital applications, the higher the use of e-learning by the academic community. The complexity of digital applications has a great influence on the implementation of e-learning. The aspect of ease of use of e-learning will encourage the attitude of use towards the use of e-learning.

Completeness of content: Innovative and creative learning models manage and develop learning components in a planned design. E-learning design needs to pay attention to the actual conditions of the supporting elements in the implementation of learning to be carried out. Information content on e-learning that is suitable for the learning needs of students both in terms of accuracy, relevance, completeness, timeliness, and attractive format will give satisfaction to the information received.

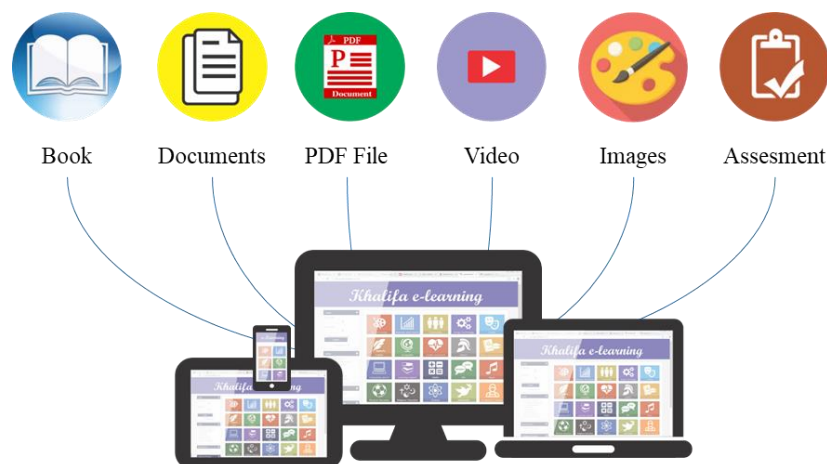


Fig. 3. Content multimedia on e-learning system[17]

Information quality and completeness can help to optimize the use of e-learning to support learning activities [54]. Digital devices that implemented at universities must be felt like a necessity by the general academic community so that the academic community is comfortable in running the application. The use of digital applications will be the needs of the academic community if the application can help the work done by the academic community. The digital application that used as content multimedia on e-learning (available in Figure 3), such as an e-book, digital documents, video, images, digital assessment, can enrich, complement, and complete the information in e-learning.

To explain a learning material well, the multimedia component of e-learning is expected to explain visually and conceptually of the learning material. The availability of learning modules in various formats can create an effective learning process [55]. E-learning is also expected to accommodate the learning evaluation process conducted by lecturers and students.

2.3 Human Resources

Knowledge: One of the KSFs for e-learning implementation is ownership of adequate knowledge about e-learning systems. Knowledge is a combination of framed experience, values, contextual information, expert insight and grounded intuition that provides an environment and framework for evaluating and incorporating new experiences and information [56]. Knowledge is the result of one's reflection or experience. Knowledge is attached to language, rules and procedures, and concepts [57]. The knowledge factor is an important factor in the development and implementation of information systems [58][59].

Based on observations at the research object university, it was found that the fact of the lack of knowledge of the academic community about the practice of implementing e-learning. The university's efforts include publishing a manual book on the imple-

mentation of e-learning. As an important note, the capacity of human resources owned by the university is good, making it possible for increased knowledge to be able to understand the e-learning application system.

Skill: Skills are the ability to use reason, thoughts, ideas and creativity in doing, changing, or making things more meaningful so as to produce a value from the results of the work. Personal skills of information system users play an important role in the implementation of information systems [60]. Skills are aspects of the expertise of the academic community in carrying out e-learning that can be formed through the habituation of the use of e-learning systems in the learning process.

Attitude: Human behavior/ attitude is essentially a human activity, which has a very broad range, including walking, talking, acting, thinking, perception, and emotions. Behavior can also be interpreted as an organism's activity, both of which can be observed directly or indirectly [61]. Behavioral aspects (attitude) affect the success or failure of information systems [39]. Often the information system fails because when it is used the system is not accepted by its users. In order for an information system to be well received by its users, the rejection behavior needs to be changed and/ or the system needs to be prepared so that the recipient's behavior will accept the system. In addition, user behavior influences the ethical use of e-learning.

4 Conclusion

Optimization of e-learning can occur if KSFs are fulfilled in e-learning implementation. The KSFs identified for the effectiveness of e-learning include aspects of the organization (culture and policy/ role), technology (availability, reliability, accessibility, usability, and content), and human resource capacity (knowledge, skills, and attitude). Where every aspect influences one another, but the finding shows that the organization aspect is the most influenced the e-learning implementation, then followed by technology and attitude. For further works, this KSFs model can be applied and evaluate more broadly in higher educations.

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