Using the Delphi methodology to develop technology criteria to assess e-learning readiness in Higher education Institutions

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Abstract

Many higher education institutions in Viet Nam are adopting e-learning to explore new education opportunities. However, the successful implementation of e-learning depends on various aspects of the organization's readiness, particularly technology readiness. This research aims to identify and develop a scale that measures the required technology factors for evaluating the readiness of higher education institutions in Viet Nam to deploy e-learning. To achieve this, the authors presented the concept and scales of eight technology factors: hardware, software, connectivity, security, flexibility, skills and support, and data centers. These factors were identified through two rounds of Delphi interviews with 17 experts. This research provides a framework for higher education institutions to assess their readiness to implement e-learning projects based on technological criteria

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e-learning, e-learning readiness, higher education, technological factor, Delphi technique

1 Introduction

1.1 Research Problem

In 1990s, the use of information technology in education, especially e-learning, was limited in Vietnamese universities. There were no incentives for schools to adopt information technology in education, and the State did not have policies to encourage and support universities in deploying information technology applications. Although online training had emerged in many parts of the world, and its benefits have been recognized by some Vietnamese trainers , the application of e-learning still needed to be improved in scales and forms. However, due to the impact of the COVID-19 pandemic, most higher education institutions in Vietnam have switched from traditional face-to-face to online teaching and learning. Moreover, several reports have suggested that Vietnam has the potential to become one of the world-leading countries in developing e-learning [1].

Vietnam's online education is still in the early stages of development compared to developed countries. Thus, several issues need to be studied and resolved [2]. Some key issues that require attention include digitization of learning materials and improving the quality of human resources such as leaders, academic staff, students, and support staff. These factors are crucial for ensuring success while implementing online training in higher education institutions and should be assessed beforehand. Readiness for e-learning refers to how well an organization is prepared to adopt the technology and must be taken into consideration before implementing an online learning program [2]

Technology plays a crucial role in assessing readiness for online learning and directly impacts the educational institutions' effectiveness. Online learning can only be conducted if the technological aspect is fully prepared [3]. Additionally, Kituyi and Tusubira argued that educational institutions can only maximize the benefits

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from online training if they are well-prepared in terms of technology, including both hardware and software [4]. This view is supported by the previous study, which compared 11 studies related to the success factors of e-learning and found that technology was always identified as the most critical [5].

It is crucial to evaluate the technological readiness to determine the success of implementing e-learning in higher education institutions. However, most studies only focus on measuring the preparation of individual participants, such as learners or teachers, rather than assessing the readiness at an organizational level. Technology, policies, and stakeholder coordination mechanisms can only be fully invested in and built with organizational readiness. Therefore, this study aims to identify crucial technological readiness factors and establish the scales to quantify the readiness at educational and training institutions. Ultimately, the goal is to develop a standard set of criteria to measure readiness factors for implementing online training in higher education institutions in Viet Nam.

1.2 Concepts

1.2.1 E-learning

Watkins et al. define e-learning as using electronic media and technology in education, such as images, text, animation, audio, and video streaming [6]. Other studies also share a similar definition, emphasizing the role of Information and Communication Technology (ICT) in education [7], [8]

E-learning is seen as an innovative approach to design and equip better educational facilities from the perspective of innovative methods [9]. The goal is to create interactive and learner-friendly learning environments anywhere and anytime, using digital resources and cutting-edge educational methods.

Alharthi et al. propose an overall definition of e-learning as "an educational solution to provide knowledge, facilitate learning, and improve performance by creating, using, and managing technological processes and resources appropriately." [10]

Overall, e-learning is considered an important innovation in education, with the ability to overcome time and space barriers to provide a flexible and positive learning model for the twenty-first century.

1.2.2 E-readiness

E-readiness is an important concept that has gained significant interest from researchers and policy-makers worldwide. It is closely associated with the development of Information and Communication Technology. Since the late 1990s, organizations have developed several frameworks to assess e-readiness across various sectors. A total of 1506 surveys have been conducted in 68 countries to evaluate the e-readiness indicators. These indicators provide data and serve as an international policy issue to address the digital divide.

From an organizational perspective, e-readiness is the capacity to use information technology in specific contexts and opportunities [11,12]. This is often used to assess readiness to engage in e-activities such as e-commerce and e-government.

In the field of higher education, e-readiness is defined by various authors as an organization's mental and physical readiness for learning experiences [9, 13-15]. It is considered an ongoing process that needs to be evaluated to ensure the effectiveness of e-learning implementation. Abdelrahim et al. emphasize the role of e-readiness in supporting educational institutions to integrate appropriate and effective e-learning initiatives [16].

Due to the diversity of educational institutions and different infrastructures, self-assessment of readiness factors is necessary before implementing e-learning. This enables institutions to design e-learning strategies and experiences to meet their specific conditions and needs. In other words, adopting e-learning without proper planning can lead to increased costs and failure.

1.2.3 Technological readiness

E-learning technology refers to using different types of technology to support and enhance the teaching and learning process. These technologies include computers, the Internet, mobile phones, audio and video systems, CDs, DVDs, video conferencing, email, and discussion forums. Before implementing e-learning, it is crucial to prepare several factors such as the availability of computers and Internet which are necessary for technological readiness. In other words, the effectiveness of online learning implementation depends on the readiness of the ICT infrastructure.

Researchers have found that technology readiness is a significant factor that influences online learning outcomes. Therefore, it is necessary to assess

technology readiness before implementing an online learning system to enhance the benefits and mitigate the challenges. A review study identified six technological factors that can affect readiness for e-learning, including hardware, software, connectivity, security, system flexibility, and technical and support personnel [9].

2 Research Methodology

Dalkey N. from the RAND Corporation played a significant role in developing the Delphi method, which is widely used today for the future forecast in various fields like healthcare and social research [17]. This method allows participants to form independent opinions, leading to reliable conclusions. The Delphi method has been used for over 50 years and has a rich history, starting from its use in North America in commerce and government. This study used the Delphi method to review and comment on the technological readiness factors for online learning, thereby making the survey more efficient and effective.

2.1 Expert panel

Identifying an 'expert panel' is a crucial element of this type of research. The Delphi method determines the best policy consensus through selected experts who provide accessible and quick opinion-based information [18]. Professionals based on their position in an organization, public recognition, or other study participants' recommendations [19]. Standard criteria for defining experts include knowledge, experience, and the ability to influence policies [20-23].

This study proposes the following criteria for selecting experts in the Delphi method and the development of e-learning in Viet Nam [24]:

- At least three years of experience and knowledge in e-learning.
- Expertise in technological aspects and higher education management
- Holds a master or doctoral degree
- More than five years of experience in teaching, training, or management related to higher education.

Linstone et al. recommend an expert panel size of 10 - 50, while Fowles suggests a minimum of seven members [25]. Ziglio notes that even small groups of (10-15) specialists can yield good results [26]. Therefore, the Delphi study for this research will include (10-15) experts in the field of e-learning.

2.2 Research process

The Delphi method involves a series of group discussions to achieve a consensus or gain a deep understanding of complex issues [27]. Experts do not need to communicate with each other directly but can discuss the research topic through the coordination with a research team [28]. The Delphi interview process begins with inviting experts and collecting their feedback. In this particular case, 20 experts with expertise and experience in online university training were selected to provide input to the research team. After the first round of feedback in December 2023, the team received 17 out of 20 expert feedbacks. To ensure objectivity, the team keeps the experts' personal information confidential. Each expert was asked to select a nickname and encode into characters (e.g., E1 = expert 01; E2 = expert 02....; E17 = expert 17).

The panel of specialists comprises 17 members, with nine men and eight women, three of them hold the position of Associate Ph.D., eight of them hold doctoral degrees, and the other experts have master's degrees. Furthermore, 14 professionals have more than ten years of experience in higher education, and all experts have more than three years of experience in e-learning. Detailed information about the panel of experts is shown in Table 1.

Table 1 General information about the "expert panel"

Expert background		**Percentage (%)**
Gender	Male	52.9
	Female	47.1
Age	30 to 40	23.5
	40 to 50	41.2
	50 to 60	29.4
	> 60	5.9
Academic Title	Master	35.3
	Ph.D.	47.1
	Asscociate. Prof., Ph.D.	17.6
Experience in the field of education	(3 to 10) years	17.6
	> 10 years	82.4
Experience in the field of e-learning	(3 to 5) years	47.1
	(5-10) years	35.3
	> 10 years	17.6
Position	Lecturer	35.3
	Education Manager	5.9
	Dean of Faculty	11.8

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	Vice President	17.7
	Program Director/ Chief Representative	23.6

2.3 Questionnaire design

To build a set of criteria in the field of technology to assess the readiness for online training, the authors have designed a survey through 02 rounds as follows:

- Round 1 of the questionnaire has three parts: A, B, and C. Part A explains the general concept, part B proposes scales for technological aspects, and part C collects personal information from experts. Experts rate the questionnaire on a 5-point Likert scale, with one being "Completely inappropriate" and five being "Completely appropriate." Open-ended questions are also included at the end of each scale, allowing experts to suggest new elements or adjust the existing ones. If experts have more suggestions, a Delphi interview will be conducted in round 2.
- Round 2 has the same content and format as round 1, but the concepts and scales have been updated and adjusted based on expert opinions from round 1. To reach an absolute consensus, experts are asked to rate the questionnaire the second time on a 5-point Likert scale. Open-ended questions are still included at the end of each scale, allowing experts to suggest new elements or adjust updated ones. If necessary, Delphi interviews will continue until an absolute consensus is reached among the experts.

2.4 Data collection and analysis

The authors of a survey will analyze the data into two categories: closed and open-ended questions. For the closed questions, the authors will assess the level of agreement among participants based on the average score and standard deviation of the data [29-30]. Consensus is considered appropriate if the average score is between 3.4 and 4.19 and highly appropriate between 4.20 and 5.0. However, if the score is below 3.4, inconsistencies must be addressed and corrected. The standard deviation is also used to determine consensus, with a value below 1.0, indicating a high degree of agreement among specialists. Conversely, a standard deviation above 1.0, despite the relevance of the results, implies disagreement among the surveyed experts.

On the other hand, open-ended questions gather expert opinions and knowledge on essential issues such as adding new elements, re-naming existing ones, or modifying element descriptions. Expert answers to open-ended questions usually contain more descriptive text than quantitative data. Therefore, before accepting the feedback, the team needs to read and understand all expert opinions to determine if it is relevant to the study's objectives. The study follows basic rules for analyzing expert feedback [31].

- If there are many disagreements among experts regarding the concept or scale of a technological factor, the majority viewpoint will be respected.
- If more than one expert propose a change or addition to the wording of the list of technological elements, the proposal will be considered.
- Suppose only one expert proposes a change or addition to the concept or scale of a technological factor. In that case, the change will be considered as long as it is not due to a misunderstanding or mistake on the expert's part.
- However, suppose only one expert proposes a change or addition to the name of the scales of technological factors, and other experts still need to propose this change. In that case, this opinion will not be accepted.

Table 2 Average values [29, 30]

Factor	Mean
1.00 to 1.79	Completely inappropriate
1.80 to 2.59	Inappropriate
2.60 to 3.39	Neutral
3.40 to 4.19	Appropriate
4.20 to 5.00	Completely appropriate

3 Results and Discussion

3.1 Delphi interview round 1

Table 3 displays the expert agreement on the factors that affect the technological preparedness of online learning, along with their scale. The findings indicate that the highest mean was 4.88 (SD = 0.33) and the lowest GPA was 4.65 (SD = 0.49), both of which are within the "Completely appropriate" range, as shown in Table 2. The "Security" and "Skills and support" factors scored the highest mean of 4=0.88/5.0 (SD = 0.33), while the general concept of technical factors received the lowest mean of 4.65/5.0 (SD = 0.49). Therefore, it is clear that the participants reached a strong consensus on both the overall concept and the scale of technological preparedness. Additionally, the results show that the standard deviation (SD) for all factors is less than 1.00, indicating a high level of

agreement among the experts on the concept and scales of technological preparedness.

Table 3 Descriptive statistics of Round 1 survey results

No	Factors	Mean	SD
1	Technology concept	4.65	0.49
2	Hardware	4.82	0.39
3	Software	4.76	0.44
4	Connectivity, x, flexibility, skills and support, and data centers	4.82	0.39
5	Security	4.88	0.33
6	Flexibility	4.76	0.44
7	Skills and support	4.88	0.33
8	Data centers	4.71	0.59

In round 1 part B, experts were asked to suggest new elements or edits to concepts or scales. Table 4 presents expert and research team responses.

Table 4 Data analysis of open questions

No	Factors	Scale description	Expert opinion	Response from the researchers
1	Technology concept	The technical element of teaching and learning involves the use of various types of technology to facilitate and enhance the process. Before deploying an e-learning unit, it is essential to complete technical requirements such as ensuring the availability of computers, necessary conditions, and internet-connected equipment.	Agree	Not change
2	Hardware	Before applying e-learning, hardware devices such as computers, servers, and **communication networks** must be available	E15: Use "Internet" instead of "Communication Network" to avoid confusion with communication in marketing	Agree and adjust as expert opinion E15
3	Software	Before applying e-learning, it is necessary to have access to programs and applications that enable e-learning systems to operate, including digital libraries and digital data such as online documents and multimedia documents.	Agree	Not change
4	Connectivity	The ability to easily connect and communicate	Agree	Not change

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		with electronic devices, computer systems, software or the Internet should be regularly updated and convenient.		
5	Security	Universities require professional software to safeguard computer systems from unauthorized access, data loss, interception, corruption, and destruction.	Agree	Not change
6	Flexibility	The universties has formulated plans to respond to any changes in regulations or teaching conditions that may arise in the future.	Agree	Not change
7	Skills and support	Technical staff must possess the knowledge and skills to maintain and upgrade information technology systems and provide technical support to lecturers and students.	E 15: The attitude of technical staff is also an important factor besides knowledge and skills	Agree and adjust as expert opinion E15
8	Data centers	The university has its own data center, which may be self-invested or outsourced, for storing, processing, or controlling training data.	Agree	Not change
9	New scale addition		E15: adding the scale "Easy to use on many platforms and devices (laptop, ipad, smartphone, ...)"	This content has been integrated in the scale of "connectivity".

Based on the results from the first Delphi interview round, there was a high consensus among experts regarding the concept and scale of factors. However, after receiving suggestions from part B, the authors made minor adjustments to the "hardware" and "Skills and Support" scales. After these adjustments, the questionnaire was sent to the experts and reviewed in round 2.

3.2 Delphi interview round 2

In the second round of assessment, experts were assigned to reviewing and revising previously and proposed scales of technological readiness. They were asked to provide their input on a 5-point Likert scale, ranging from "1= Completely inappropriate" to "5 = Completely appropriate". The communication network scale was adjusted to "internet" under the "hardware" scale, and "attitude" was added to "knowledge and skills" under the "Skills and Support" scale. The results

of expert consensus on the revised scales are presented in Table 5.

Table 5 Descriptive statistics of Round 2 survey results

No	Factors	Mean	SD
1	Hardware	4.51	0.51
2	Skills and supports	4,.50	0.50

Based on Table 5, both adjusted scales received an average score of 4.50 to 4.52 out of 5, with standard deviations of 0.51 and 0.52. This indicates that both adjustment scales have achieved a high consensus among experts. In part B of the round 2 questionnaire, the experts did not suggest any adjustments or additions to the general concept and current factors.

Therefore, it can be concluded that round 2 is the final round of the Delphi study because the expert panel needed to make adjustments/additions to the scale concept or propose new elements in round 2. Therefore, the authors decided that the second round was the final round of this study. The final result of the concept and scale of technical readiness is shown in Table 6.

Table 6 The final result of the concept and scale of technical readiness

No	Factors	Scale description
1	Technology concept	The technical element of teaching and learning involves the use of various types of technology to facilitate and enhance the process. Before deploying an e-learning unit, it is essential to complete technical requirements such as ensuring the availability of computers, necessary conditions, and internet-connected equipment.
2	Hardware	Before applying e-learning, hardware devices such as computers, servers, and **internet** must be available
3	Software	Before applying e-learning, it is necessary to have access to programs and applications that enable e-learning systems to operate, including digital libraries and digital data such as online documents and multimedia documents.
4	Connectivity	The ability to easily connect and communicate with electronic devices, computer systems, software or the Internet should be regularly updated and convenient.
5	Security	Universities require professional software to safeguard computer systems from unauthorized access, data loss, interception, corruption, and destruction.
6	Flexibility	The universties has formulated plans to respond to any changes in regulations or teaching conditions that may arise in the future.
7	Skills and support	Technical staff must possess the knowledge and skills **and attitude** to maintain and upgrade information technology systems and provide technical support to lecturers and students.
8	Data centers	The university has its own data center, which may be self-invested or outsourced, for storing, processing, or controlling training data.

The results of the study on technological readiness in universities in the Middle East are consistent with eight factors, which include hardware, software, connectivity, security, system flexibility, skills and technical support, data center, and cloud computing [10]. These results are similar to previous studies which emphasized the need for hardware and software integration to benefit from online training [32, 33]. Moreover, other research highlighted that online training is most effective when students and lecturers have complete access to technology sources such as the internet, along with supporting hardware and software [34]. Additionally, studies have shown that challenges or failures during the implementation of online training are related to technological aspects like technology infrastructure, poor software and hardware, lack of resources, and security [35].

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4 Conclusions

To effectively implement an online learning program, higher education institutions must assess their readiness for e-learning. Technological readiness is a crucial factor that shapes and influences the success of implementing this training method. Therefore, it is essential to assess the technology readiness before implementing an e-learning system to promote its benefits and minimize challenges.

The research team used the Delphi method to conduct two interviews with questionnaires sent to 17 experts. The final results showed that seven aspects of technology need to be carefully considered and evaluated before implementing online training, including hardware, software, connectivity, security, flexibility, skills and support, and data center.

Based on these results, the authors proposed a set of criteria to measure technical readiness which can help higher education institutions to determine the necessary considerations before launching online training. Furthermore, this model can be used by designers and developers as a guide to assess the technological requirements for e-learning implementations. However, besides technology, other factors such as "human resources" or "finance" need to be thoroughly evaluated before implementing online training. Therefore, further studies should continue to add other factors to comprehensively assess readiness before applying this training method.

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References

1. Ken Research. (2019). Vietnam E-Learning Market Outlook to 2023 – Driven by Rising Adoption of Smartclasses, E-books in Schools and MOOCs and Smart Authoring Tools in Corporate Training and Test Preparation Segment. https://www.kenresearch.com/education-and-recruitment/education/vietnam-e-learning-market-outlook/248568-99.html

2. Ao, S. I., & International Association of Engineers. (2013). International MultiConference of Engineers and Computer Scientists : IMECS 2013 : 13-15 March, 2013, the Royal Garden Hotel, Kowloon, Hong Kong. Newswood Ltd.

3. Saginova, O., & Belyansky, V. (2008). Facilitating innovations in higher education in transition economies. *International Journal of Educational Management*, *22*(4), 341-351.

4. Kituyi, G., & Tusubira, I. (2013). A framework for the integration of e-learning in higher education institutions in developing countries. *International Journal of Education and Development Using ICT*, *9*(2).

5. Parsazadeh, N., Zainuddin, N. M. M., Ali, R., & Hematian, A. (2013). A review on the success factors of e-learning. In *The Second International Conference on e-Technologies and Networks for Development* (pp. 42-49).

6. Watkins, R., Leigh, D., & Triner, D. (2004). Assessing readiness for e-learning. *Performance Improvement Quarterly*, *17*(4), 66-79.

7. Ong, C. S., Lai, J. Y., & Wang, Y. S. (2004). Factors affecting engineers' acceptance of asynchronous e-learning systems in high-tech companies. *Information & Management*, *41*(6), 795-804.

8. Eze, S. C., Chinedu-Eze, V. C., & Bello, A. O. (2018). The utilisation of e-learning facilities in the educational delivery system of Nigeria: a study of M-University. *International Journal of Educational Technology in Higher Education*, *15*(1), 1-20.

9. Mosa, A. A., Mohd. Naz'ri bin Mahrin, & Ibrrahim, R. (2016). Technological Aspects of E-Learning Readiness in Higher Education: A Review of the Literature. *Computer and Information Science, 9*(1), 113-127.
10. Alharthi, A. D., Spichkova, M., & Hamilton, M. (2019). Sustainability requirements for e-learning systems: a systematic literature review and analysis. *Requirements Engineering*, *24*, 523-543.
11. Darab, B., & Montazer, G. A. (2011). An eclectic model for assessing e-learning readiness in the Iranian universities. *Computers and Education*, *56*(3), 900-910.
12. Đurek, V., & Ređep, N. B. (2016). Review on e-readiness assessment tools. *Central European Conference on Information and Intelligent Systems* , 161-250.
13. Adiyarta, K., Napitupulu, D., Rahim, R., Abdullah, D., & Setiawan, M. I. (2018). Analysis of e-learning implementation readiness based on integrated elr model. *Journal of Physics: Conference Series*, *1007*(1).
14. Akaslan, D., & L-C Law, E. (2011). LNCS 7048 – Measuring Student E-Learning Readiness: A Case about the Subject of Electricity in Higher Education Institutions in Turkey. In *LNCS* (Vol. 7048).
15. Nwagwu, W. E. (2020). E-learning readiness of universities in Nigeria- what are the opinions of the academic staff of Nigeria's premier university? *Education and Information Technologies*, *25*(2), 1343-1370.
16. Abdelrahim, A., Samar, Z., Cai, Z., & Yan, Z. (2021). Assessing the E-learning Readiness of Universities in Developing Countries and Expected Obstacles. *Makara Journal of Technology*, *25*(3).
17. Dalkey N, H. D. (1963). *An experimental application of the Delphi method to the use of experts*. *9*, 458-467.
18. Beech B. (2001). The Delphi approach: recent applications in health care. *Nurse Researcher*, *8*(4), 38-48.
19. Mead, D., & Mosely, L. (2001). The use of the Delphi as a research approach. *Nurse researcher*, *8*(4), 4-23.
20. Cantrill, J. A., Sibbald, B., & Buetow, S. (1996). The Delphi and nominal group techniques in health services research. *International Journal of Pharmacy Practice*, *4*(2), 67-74.
21. Keeney, S., Hasson, F., & McKenna, H. P. (2001). A critical review of the Delphi technique as a research methodology for nursing. *International Journal of Nursing Studies*, *38*(2), 195–200.
22. Kennedy, H. P. (2004). Enhancing Delphi research: methods and results. *Journal of Advanced Nursing*, *45*(5), 504–511.
23. Baker, J., Lovell, K., & Harris, N. (2006). How expert are the experts? An exploration of the concept of 'expert' within Delphi panel techniques. *Nurse Researcher*, *14*(1), 59–70.
2.4. Al-araibi, A. A. M., Mahrin, M. N. bin, & Yusoff, R. C. M. (2019). Technological aspect factors of E-learning readiness in higher education institutions: Delphi technique. *Education and Information Technologies*, *24*(1), 567–590.
25. Linstone, H. A., Turoff, M., & Helmer, O. (1975). *The Delphi Method Techniques and Applications Edited by*. Wesley Publishing.
26. Adams, M. K. (2004). Defining creative scholarship and identifying criteria for evaluating creative scholarship using a modified Delphi technique. University of Wyoming.
27. Skulmoski, G. J., Hartman, F. T., & Krahn, J. (2007). The Delphi Method for Graduate Research The Delphi Method for Graduate Research 2. In *Journal of Information Technology Education* (Vol. 6).
28. Rowe, G., & Wright, G. (1999). The Delphi technique as a forecasting tool: issues and analysis. *International Journal of Forecasting*, *15*(4), 353-375.
29. Özad, B. (2012). Tertiary students' attitudes towards using SNS. In *International Conference on Communication, Media, Technology and Design. Paper presented at the International Conference on Communication, Media, Technology and Design, Istanbul, Turkey* (pp. 9-11).
30. Butucha, K. G. (2013). School type and school setting differences in teachers perceptions of school culture. *International Journal of Education and Research*, *1*(12), 1-12.
31. Vegas, S., Juristo, N., & Basili, V. R. (2003). *Identifying relevant information for testing technique selection: An Instantiated Characterization Schema* (Vol. 8). Springer Science & Business Media.
32. AbuSneineh, W., & Zairi, M. (2010). An evaluation framework for E-learning effectiveness in the Arab World.
33. Odunaike, S., Olugbara, O., & Ojo, S. (2013). E-learning implementation critical success factors. *Innovation*, *3*(4).

34. Kituyi, G., & Tusubira, I. (2013). A framework for the integration of e-learning in higher education institutions in developing countries. *International Journal of Education and Development Using ICT*, *9*(2).
35. Saginova, O., & Belyansky, V. (2008). Facilitating innovations in higher education in transition economies. *International Journal of Educational Management*, *22*(4), 341-351.

Sử dụng phương pháp Delphi nhằm xây dựng các tiêu chí công nghệ để đánh giá sự sẵn sàng đào tạo trực tuyến

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Tóm tắt - Ngày càng nhiều cơ sở giáo dục đại học tại Việt Nam đã áp dụng e-learning để tận dụng các cơ hội mà phương thức này mang lại. Tuy nhiên, việc triển khai e-learning phụ thuộc vào sự sẵn sàng của nhiều bộ phận trong tổ chức đó, đặc biệt là các yếu tố liên quan lĩnh vực công nghệ. Mục tiêu của bài báo này là chỉ ra khái niệm tổng quát và xây dựng thang đo liên quan tới yếu tố công nghệ nhằm đánh giá sự sẵn sàng triển khai đào tạo trực tuyến tại các cơ sở giáo dục đại học ở Việt Nam. Thông qua hai vòng phỏng vấn Delphi với 17 chuyên gia, nhóm tác giả đã đưa ra khái niệm và các thang đo của tám nội dung thuộc yếu tố công nghệ bao gồm: phần cứng, phần mềm, tính kết nối, tính bảo mật, tính linh hoạt, kỹ năng và sự hỗ trợ và trung tâm dữ liệu. Kết quả nghiên cứu là căn cứ để các cơ sở giáo dục đại học xác định sự sẵn sàng triển khai dự án e-learning trong phạm vi các tiêu chí thuộc yếu tố công nghệ.

Từ khóa đào tạo trực tuyến, sự sẵn sàng đào tạo trực tuyến, giáo dục đại học, tiêu chí công nghệ, phương pháp Delphi

MỤC LỤC