FORESIGH 2024-2034: THE FUTURE LANDSCAPE OF EDUCATIONAL TECHNOLOGY AND COMMUNICATIONS MANAGEMENT IN THAILAND'S VOCATIONAL INSTITUTIONS

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ABSTRACT

This research aimed to: (1) investigate prospective scenarios of educational technology and communications management in Thai vocational schools for the period 2024-2034, and (2) offer policy recommendations for their advancement utilising the Ethnographic Delphi Futures Research (EDFR) approach. The study had three phases: 1) Conduct a literature research and analysis utilising the AECT (2012) framework, focusing on pertinent theories and documents. The AECT (2012) framework includes five fundamental standards: content knowledge, content pedagogy, learning settings, professional knowledge and skills, and research. 2) employed the EDFR technique with a panel of 22 experts, comprising five senior management officials from the Office of the Vocational Education Commission, three university lecturers specialising in educational technology and communications, two educational supervisors, college administrators, six instructors, and one representative from an educational technology enterprise. There are three rounds in the EDFR method. Semi-structured interviews were done in Round 1. In Round 2, a questionnaire was designed based on the expert interviews and disseminated to the same cohort. In Round 3, experts were provided with statistical feedback, comprising percentage values, median, and interquartile range (IQR), in conjunction with their prior responses. They were thereafter requested to validate or amend their responses. 3) The results identified five developing trends in content knowledge, four in content pedagogy, six in learning environments, eleven in professional knowledge and skills, and four in research. Twelve policy proposals were presented to direct the advancement of educational technology and communications management in Thai vocational schools during the upcoming decade (2024-2034).

I. INTRODUCTION

In contemporary society, technology significantly influences daily life, especially in education, where it plays a pivotal role in enhancing teaching and learning quality. The government, recognizing this, has highlighted the importance of developing educational technology and innovation through the National Education Act of 1999, Section 64, which focuses on equipping personnel with the necessary knowledge and skills for effective use and production of technology in education. Section 64 of Thailand's National Education Act serves as the legal foundation for educational technology development. It mandates: (1) capacity-building programs for educators through practical training workshops; (2) development of quality digital learning resources; and (3) establishment of institutional technology systems. This comprehensive approach enhances digital literacy, bridges classroom technology gaps, and modernizes Thailand's education system for the digital age. The National Education Act (No. 2) B.E. 2545 (2002) serves as Thailand's framework for modernizing education by integrating 21st-century skills into curricula. It promotes educational technology (EdTech) through digital learning platforms, teacher training, and infrastructure development. Technology in education applies various tools to improve the efficiency and effectiveness of learning processes. It also helps bridge educational gaps by ensuring equal access to information. Furthermore, technology underpins human resource development in the country by facilitating distance learning, telecommunications, and modern educational tools, such as internet access, which support global knowledge retrieval

Vocational education management is essential for producing skilled labor, contributing to national, economic, and societal development, and meeting the growing demands of business and industry. The Vocational Education Act (Section 6) aligns vocational education with national development plans to produce skilled workers at various levels. The Office of the Vocational Education Commission aims to create a high-quality workforce using modern technology to meet national strategic goals. Thailand ranks low (56th) in Infrastructure (Education), highlighting the need for improved educational technology to boost competitiveness and sustainability (Research and Innovation Policy Council, 2021, p. 1).

The recent crisis has driven changes in educational technology, significantly impacting vocational education for hundreds of thousands of students in Thailand across social, economic, and learning dimensions with shifting economic conditions, the demand for vocational workers has changed in both quantity and quality (Paweenawat & Liao, 2021, pp. 26-27). Developing skilled labor must align with technological changes and new innovations entering industries. Additionally, a study on factors influencing the success of vocational education management found that educational technology and communications play a crucial role. Vocational education thrives when aligned with real-world industry needs, and educational technology (EdTech) and communications serve as transformative pillars in achieving this alignment. However, challenges such as outdated equipment and insufficient resources hinder effectiveness. Support for modern technology and adequate resources is essential to improve efficiency and reduce operational time.

The office of the Vocational Education Commission emphasizes enhancing vocational education management through Digital Transformation, focusing on developing high-competency workers who continuously adapt to future development goals, driven by technology across all learning processes (Butrasenlee, 2022, pp. A-L). Due to changes in educational technology and communications, as well as the evolving demand for vocational education personnel, this research aims to explore the scenario of educational technology and communications management in vocational schools in Thailand for the period 2024-2034. The study follows AECT, 2012 standards: (1) content knowledge, (2) content pedagogy, (3) learning environments, (4) professional knowledge and skills, and (5) research. Additionally, the research will provide

policy recommendations for the development of vocational education colleges. The findings will provide valuable insights for educational leaders and stakeholders to guide effective planning and decision-making in developing educational technology and communications strategies in vocational education, ensuring alignment with the country's context

II. LITERATURE REVIEW

Educational technology and communications, Andrew et al. (2008, p. 294) define educational technology, according to AECT, as a systematic approach to developing solutions for educational challenges, utilizing available resources such as personnel, management, and learning environments. Malitong (2015, p. 17) states that educational technology is a combination of resources and processes that support learning, enabling teachers to use technology and innovations to enhance teaching. Learning is not limited to the classroom and can occur anywhere, depending on the situation. In summary, educational technology involves applying techniques, tools, and knowledge to improve teaching and foster effective learning outcomes.

The role of educational technology and communications, Phromwong (2013, p. 14) explains four roles of educational technology and communications: as knowledge: refers to curricula designed to equip students with skills in educational technology, such as instructional design, media, and telecommunications, as an administrative tool: Involves roles in system management, clerical tasks, personnel and academic management, communication, and staff development, as an academic tool: includes teacher-centered and object-centered learning approaches, such as distance learning using various media, for academic service: helps in disseminating knowledge through media, offering continuous education, and providing research services. Diteeyont and Yoosamran (2021, p. 333) highlight the roles of educational technology in preparing the education system, promoting equality, and fostering global learning opportunities. In summary, educational technology has been and will continue to be crucial for educational management, offering innovation, expanding opportunities, and ensuring accessible learning for all members of society. Scope of educational technology and communications, Association for Educational Communications and Technology [AECT] (2012, Online) consists of five components as follows: 1) content knowledge, to demonstrate the necessary knowledge for creating, using, evaluating, and managing the application of educational technology and processes, both theoretically and practically, 2) content pedagogy, to develop as practitioners who can effectively apply educational technology and processes, considering contemporary content and teaching methods, 3) learning environments, to facilitate learning by creating, using, evaluating, and managing effective learning environments, 4) professional knowledge & skill, to design, develop, apply, and evaluate learning environments enriched with educational technology within a community of practice, and 5) research, to explore, assess, synthesize, and utilize inquiry methods to enhance and improve learning outcomes. Each component integrates ethics, ensuring the responsible application of educational technology and communication processes, upholding ethical standards in theory and practice.

III. RESEARCH METHODOLOGY

This study investigates the scenario of educational technology and communications management of vocational schools in Thailand in the next decade (D.C. 2024-2034). The Ethnographic Delphi Futures Research (EDFR) is employed and is structured in the following steps: "Step 1: literature review and analysis, this phase involves studying relevant documents, theoretical concepts, and literature, followed by the analysis and synthesis of the current situation, issues, and needs regarding the management of educational technology and communication in vocational education schools in Thailand. The study is framed according to the guidelines of the AECT (2012, Online) encompassing five core standards: content knowledge, content pedagogy, learning environments, professional knowledge & skills, and research. Step 2: EFDR research technique, the target group for this research comprises 22 purposively selected experts, including: 5 senior management positions within the Office of the Vocational Education Commission, 3 university lecturers in Educational Technology and Communication, 2 educational supervisors, 5 college administrators, 6 instructors, 1 educational technology enterprises. The EDFR interview technique is employed, structured in the following steps: round 1: Interviews conducted using a semi-structured interview format, round 2: A questionnaire is drafted to encompass the conceptual framework and definitions derived from the expert interviews. Data collection is conducted using the same group of experts through the questionnaire, round 3: The questionnaire is re-administered to the same group of experts. In this round, each expert will be provided with statistical feedback reflecting the group's overall responses, including percentages, the median, and the interquartile range, along with their individual previous responses. Experts are requested to reconsider their answers and either affirm or modify them accordingly. Step 3: Report the research findings.

Figure 1: Research methodology

IV. RESULTS

The results of the analysis of the scenario of educational technology and communications management of vocational schools in Thailand in the next decade (D.C. 2024-2034) based on expert questionnaires using the EDFR Delphi technique were analyzed using SPSS. The results indicated that all items met the established evaluation criteria: 100% had a median score of at least 3.50, a difference between the median and mode not exceeding 1.00, and an interquartile range (IQR) not greater than 1.50.

Table 1: The number of future statements that meet the evaluation criteria

The scenario of educational technology and communications, Management of Vocational Schools in Thailand in the next decade (D.C. 2024-2034)	Total number of future trend questions						
	Total number of future trend questions	Level of feasibility			**Consensus of opinions**		Number of selected future trend statements
		Highest	**High**	**Moderate**	**Consistent**	**Inconsistent**	
1. Content knowledge	11	11	0	0	11	0	11
2. Content pedagogy	11	11	0	0	11	0	11
3. Learning environments	12	12	0	0	12	0	12
4. Professional knowledge and skills	21	20	1	0	21	0	21
5. Research	7	6	1	0	7	0	7
Total	**62**	**60**	**2**	**0**	**62**	**0**	**62**

Table 1 shows the number of future statements that meet the evaluation criteria which has been summarized by category as follows: 11 content knowledge, 11 content pedagogy, 12 learning environments, 21 professional knowledge and skills, and 7 research, totalling 62 statements that satisfied the statistical requirements.

Table 2: The future trends with the highest feasibility and strong consensus among experts

Question	Results							
	Mode	Median	Median-Mode	Q1	Q3	IQR	Feasibility	Consensus
Content knowledge								
1) Training in the use of basic technology tools, such as Canva or other suitable tools for creating instructional media	5	5	0	5	5	0	Highest	Strong
2) The development of knowledge on the use of technology-based media to help teachers create effective teaching materials tailored to learners	5	5	0	5	5	0	Highest	Strong
3) The development and application of technology in teaching, enabling teachers to effectively integrate technology into various subject areas	5	5	0	5	5	0	Highest	Strong
4) The development of teachers' knowledge of technology, which aids in the improvement of the teaching and learning process in the classroom and	5	5	0	5	5	0	Highest	Strong
5) Supporting teachers' access to modern teaching resources or tools that enhance the effectiveness of technology usage in education	5	5	0	5	5	0	Highest	Strong

Table 2: (continued) The future trends with the highest feasibility and strong consensus among experts

Question	Mode	Median	Median-Mode	Q1	Q3	IQR	Feasibility	Consensus
Content pedagogy								
1) The use of technology in designing teaching activities to enhance teaching effectiveness	5	5	0	5	5	0	Highest	Strong
2) The use of appropriate technological tools for teaching specific subjects to improve teaching effectiveness	5	5	0	5	5	0	Highest	Strong
3) The creation of teaching innovations that utilize technology to enhance learning outcomes	5	5	0	5	5	0	Highest	Strong
4) The use of technology in measuring and evaluating students' learning to improve teaching and learning processes	5	5	0	5	5	0	Highest	Strong
5) The use of digital tools in creating learning activities that stimulate students' creativity	5	5	0	5	5	0	Highest	Strong
6) The selection of modern teaching media that enhance understanding and improve learning utcomes	5	5	0	5	5	0	Highest	Strong
Learning environments								
1) Teaching and learning that supports the exchange of opinions between teachers and students, contributing to the development of the teaching and learning process	5	5	0	5	5	0	Highest	Strong
2) The application of technology to create a digital environment conducive to learning	5	5	0	5	5	0	Highest	Strong
3) The use of technology to analyze student data and adjust learning activities accordingly	5	5	0	5	5	0	Highest	Strong

Table 2: (continued) The future trends with the highest feasibility and strong consensus among experts

Question	Results							
	Mode	Median	Median-Mode	Q1	Q3	IQR	Feasibility	Consensus
4) The use of technology in managing learning resources in professional subjects	5	5	0	5	5	0	Highest	Strong
5) Supporting effective learning through the use of digital technology in teaching environments	5	5	0	5	5	0	Highest	Strong
6) The development of policies and strategies for using technology in education to support learning in all aspects	5	5	0	5	5	0	Highest	Strong
Professional knowledge and skill								
1) Development and skills in using tools or software to design effective teaching and learning	5	5	0	5	5	0	Highest	Strong
2) The use of digital platforms for managing teaching, learning, and communication with students	5	5	0	5	5	0	Highest	Strong
3) Understanding the use of technology for assessment and tracking student development	5	5	0	5	5	0	Highest	Strong
4) The use of technology to create effective teaching materials	5	5	0	5	5	0	Highest	Strong
5) Understanding the application of technology in the context of teaching various professional subjects	5	5	0	5	5	0	Highest	Strong
6) The ability to design learning that is connected to real-world industry practices	5	5	0	5	5	0	Highest	Strong
7) Skills in using technology to support learning in dynamic environments	5	5	0	5	5	0	Highest	Strong

Table 2: (continued) The future trends with the highest feasibility and strong consensus among experts

Question	Results							
	Mode	Median	Median-Mode	Q1	Q3	IQR	Feasibility	Consensus
Professional knowledge and skill								
8) The creation and use of new teaching materials to develop students' professional skills	5	5	0	5	5	0	Highest	Strong
9) The development of skills in using technology for training and developing students to meet established standards	5	5	0	5	5	0	Highest	Strong
10) The ability to develop skills in using modern digital tools and technologies for teaching	5	5	0	5	5	0	Highest	Strong
11) Practical training in the use of technology in workplaces related to the profession	5	5	0	5	5	0	Highest	Strong
12) Applying technological experience from workplaces to teaching and student development	5	5	0	5	5	0	Highest	Strong
13) Learning how to use technology in real industries and conveying that knowledge to students	5	5	0	5	5	0	Highest	Strong
14) Skills in managing and adapting to the tools and technologies used in workplaces	5	5	0	5	5	0	Highest	Strong

Table 2: (continued) The future trends with the highest feasibility and strong consensus among experts

Question	Results							
	Mode	Median	Median-Mode	Q1	Q3	IQR	Feasibility	Consensus
Research								
1) Action research promoting the development of essential skills for the labor market	5	5	0	5	5	0	Highest	Strong
2) Collaboration between digital researchers, educators, and subject matter experts is crucial for developing educational technologies	5	5	0	5	5	0	Highest	Strong
3) Flexible research and development that can beimproved based on real-world usage results promotes sustainable development	5	5	0	5	5	0	Highest	Strong

Table 2 shows the data which has been summarized by category as follows: experts identified the future trends with the highest feasibility and strong consensus among experts as follows: content knowledge, 1) training in the use of basic technology tools, such as Canva or other suitable tools for creating instructional media 2) development of knowledge on the use of technology-based media to help teachers create effective teaching materials tailored to learners 3) the development and application of technology in teaching, enabling teachers to effectively integrate technology into various subject areas 4) the development of teachers' knowledge of technology, which aids in the improvement of the teaching and learning process in the classroom and 5) supporting teachers' access to modern teaching resources or tools that enhance the effectiveness of technology usage in education, content pedagogy 1) the use of technology in designing teaching activities to enhance teaching effectiveness 2) the use of appropriate technological tools for teaching specific subjects to improve teaching effectiveness 3) the creation of teaching innovations that utilize technology to enhance learning outcomes 4) the use of technology in measuring and evaluating students' learning to improve teaching and learning processes 5) the use of digital tools in creating learning activities that stimulate students' creativity and 6) the selection of modern teaching media that enhance understanding and improve learning outcomes, learning environments 1) teaching and learning that supports the exchange of opinions between teachers and students, contributing to the development of the teaching and learning process 2) the application of technology to create a digital environment conducive to learning 3) the use of technology to analyze student data and adjust learning activities accordingly 4) the use of technology in managing learning resources in professional subjects 5) supporting effective learning through the use of digital technology in teaching environments 6) the development of policies and

strategies for using technology in education to support learning in all aspects, professional knowledge and skills 1) development and skills in using tools or software to design effective teaching and learning 2) the use of digital platforms for managing teaching, learning, and communication with students 3) understanding the use of technology for assessment and tracking student development 4) the use of technology to create effective teaching materials 5) understanding the application of technology in the context of teaching various professional subjects 6) the ability to design learning that is connected to real-world industry practices | 7) skills in using technology to support learning in dynamic environments 8) the creation and use of new teaching materials to develop students' professional skills 9) the development of skills in using technology for training and developing students to meet established standards 10) the ability to develop skills in using modern digital tools and technologies for teaching 11) practical training in the use of technology in workplaces related to the profession 12) applying technological experience from workplaces to teaching and student development 13) learning how to use technology in real industries and conveying that knowledge to students 14) skills in managing and adapting to the tools and technologies used in workplaces, research 1) action research promoting the development of essential skills for the labor market 2) collaboration between digital researchers, educators, and subject matter experts is crucial for developing educational technologies 3) flexible research and development that can be improved based on real-world usage results promotes sustainable development.

Figure 2: Foresight 2024–2034: The Future Landscape of Educational Technology and Communication Management in Thailand's Vocational Institutions

V. CONCLUSION AND DISCUSSION

The scenario of educational technology and communications management of vocational schools in Thailand in the next decade (D.C. 2024-2034) based on the analysis from the expert survey using the Delphi technique (EDFR), is summarized in the following aspects: 1) content Knowledge: experts envision the most likely future scenario, with a high level of agreement, including training on basic technology tools (e.g., Canva) to create effective teaching materials,

developing knowledge in using educational technology enables teachers to create teaching materials tailored to learners' needs, teachers' ability to apply technology in teaching across various subjects effectively improves classroom processes, and supporting teachers in accessing modern teaching resources enhances the use of technology, 2) content pedagogy: experts foresee the use of technology to design learning activities, improving teaching effectiveness, proper use of technological tools for specific subjects increases teaching quality, innovation in teaching methods, leveraging technology, enhances learning, while using technology for assessment fosters better learning outcomes, digital tools also stimulate students' creativity and help enhance understanding through modern instructional media, 3) learning environments: experts highlight the future use of technology to foster teacher-learner interaction, enhancing learning, technology helps create digital learning environments, analyze learners' data to adapt learning activities, manage learning resources effectively, and support learning through digital tools. Developing policies to incorporate technology into education ensures comprehensive learning, 4) professional knowledge and skills: experts emphasize the need for developing skills in using tools or software for effective lesson planning and teaching, digital platforms for managing teaching and communication with learners are key, understanding technology for assessment and tracking learner progress is crucial. Skills in creating effective learning materials and applying technology in specific vocational contexts improve teaching, teachers must be able to design learning experiences linked to real-world industries and continuously adapt to new technologies for supporting learners' evolving needs, 5) research: experts agree that action research should focus on developing necessary skills for the labor market, developing software for vocational skills training to meet market demands is essential, collaborations between digital researchers, educators, and content experts are crucial for creating sustainable educational technology, flexibility in education technology allows for continuous improvement, fostering sustainable development in vocational education.
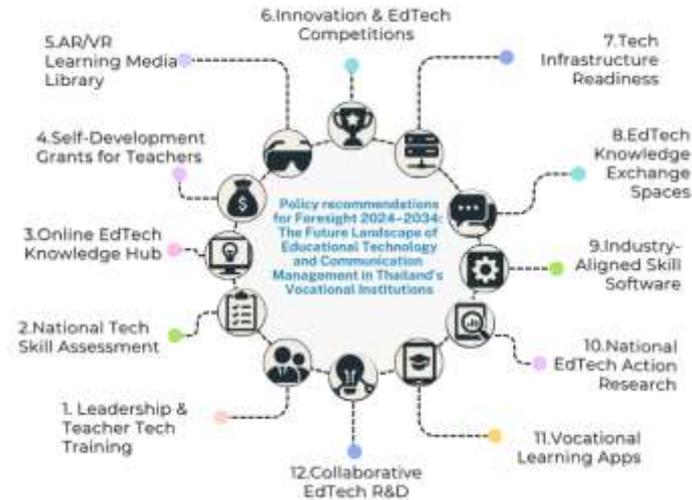
Policy recommendations for driving the future scenario of educational technology and communications management of vocational schools in Thailand in the next decade (D.C. 2024-2034) consist of: 1) relevant agencies should enhance the potential of administrators and teachers in educational technology, including both theory and practice, with ongoing evaluation 2) national standards for technology and communication skills should be tested and used for school evaluations 3). develop an online knowledge repository on educational technology, innovations, and assessment tools accessible anytime 4) allocate budgets for teachers' self-development in educational technology, collaborating with the private sector, with evaluations to improve student outcomes 5) create a media repository with AR/VR-based learning tools across subjects for teaching preparation and real-world simulations 6) organize national and international competitions on the use of educational technology in school management and teaching 7) ensure sufficient technology infrastructure and tools for both teachers and learners 8) provide platforms for knowledge exchange on educational technology among experts, educators, and stakeholders 9) develop vocational training software aligned with industry standards to meet labor market needs 10) conduct national research to improve the use of technology in vocational education 11) develop educational apps to enhance vocational education quality and12) foster collaboration between tech researchers, educators, and content experts to create sustainable educational technologies for vocational education.

Figure 3: Policy recommendations for driving the scenario of educational technology and communications management of vocational schools in Thailand in the next decade (D.C. 2024-2034)

From the analysis of educational technology and communications management of vocational schools in Thailand in the next decade (D.C. 2024-2034), the results can be discussed through the following aspects:

1) Content knowledge: Training teachers in basic technology tools, such as Canva, to create effective teaching media is essential. This approach allows teachers to apply technology across subjects, enhancing the quality of classroom instruction. Supporting teachers' access to modern resources further improves technology usage. This aligns with the findings of Kosit (2017, p. 112) who found that teacher training and recognition of their technology skills enhance teaching practices. Similarly, Parmwong et al. (2016, p. 67) and Saengthong (2017, p. 118) emphasize the importance of ongoing training and development in educational technology for vocational educators. 2) Content pedagogy: The use of technology in designing teaching activities improves instructional effectiveness. Tools like AR and VR enhance learning experiences and foster creativity. Aliazas (2023, p. 10) indicates that educational technology positively impacts students' skills in science and technology. Similarly, Harris et al. (2016, p. 379) found that technology boosts student success and motivation by enhancing teaching methods. Experts agree that integrating technology into teaching increases efficiency and provides personalized learning. Egunjobi and Adeyeye (2024, p. 1167) highlight the role of AR and AI in transforming education, making learning environments more dynamic and accessible. Silva et al. (2023, p. 7) confirm that AR improves student performance and motivation in chemistry. 3) Learning environments: The integration of technology in teaching supports the exchange of ideas between teachers and students, enhancing learning. It creates a digital environment conducive to learning, where data analysis helps tailor learning activities, and technology aids in managing educational resources. This supports efficient learning in digital environments, aligning with Al-Abdullatif and Gameil (2021, p. 207), who found that integrating digital technology in project-based learning (PBL) improves student outcomes in higher education. Xue (2024, p. 31), further confirms that digital learning environments increase student engagement, independent learning, and learning efficiency, though excessive information and technical challenges may hinder some students' performance. 4) Professional knowledge and skills: The development of skills in using tools or software for effective lesson design, utilizing

digital platforms for teaching and communication, and understanding technology in assessing and tracking student progress are essential for enhancing teaching effectiveness. Additionally, the ability to apply technology in various professional contexts and design learning experiences linked to real-world industry work is critical. However, Wilujeng and Setiyawan (2023, p. 331) found that while digital knowledge positively affects creativity and professionalism, there is insufficient evidence to suggest that digital knowledge directly influences teaching effectiveness. In contrast, Althubyani (2024, pp. 1-24) highlighted the moderate digital competence of teachers in Saudi Arabia, with positive perceptions of digital technology use. While digital technology increases student motivation, learning experience evaluation, and communication, challenges remain regarding technology acceptance, teachers' skills, and access to digital tools. 5) Research: Study on developing essential skills for the labor market, vocational training software, and flexible educational technologies emphasizes collaboration between digital researchers, educators, and content experts. This aligns with Oarun (2021, p. 102), who found that the main challenges in technology integration in schools were collaboration and management. Key strategies for improvement included appointing responsible personnel, professional development, and building partnerships with external organizations. Similarly, Villavicencio et al. (2016, Online) highlighted the importance of user-centered design in educational technologies, successfully implemented in New York schools. Ramiel (2019, p. 492) demonstrated the significance of industry-education collaboration in developing educational technology. In addition, according to the OECD Reviews of Vocational Education and Training: Vocational Education and Training in Thailand (OECD, 2021), the development of Thailand's VET system can be significantly enhanced through the integration of educational technology and communication across five key domains: content knowledge, pedagogy, learning environments, professional knowledge and skills, and research. Educational technology contributes by improving curriculum relevance, enabling flexible instruction, supporting inclusive and interactive learning environments, strengthening teacher competencies, and facilitating data-driven research to inform policy and practice. Such integration can advance the overall quality, equity, and responsiveness of the Thai VET system.

SUGGESTION

Relevant agencies should organize training programs to build the capacity of administrators, teachers, and stakeholders in utilizing educational technology, communication tools, and AI innovations for institutional management and instructional delivery. The establishment of a centralized digital repository is recommended to support the dissemination and exchange of modern educational technology resources and innovations. This platform should enable easy access, sharing, and downloading of instructional materials. Furthermore, the appointment of technology integration specialists is essential to provide hands-on support, expert guidance, and troubleshooting in the use of educational media, digital content, and technological equipment.

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