AI Readiness, Virtual Leadership, and Digital Workplace Culture in Vocational Education: A Systematic Review on How Technology Acceptance and Change Readiness Shape Future Teaching Skills

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Abstract

The integration of artificial intelligence (AI) in vocational education demands a holistic analysis of the role of AI readiness, virtual leadership, and digital work culture in shaping the future teaching skills of vocational school teachers. This systematic literature review examined the mediation mechanism of technology acceptance (TAM) and change readiness using the PRISMA method in 48 Scopus indexed articles (2019–2024). The results of the synthesis reveal three key findings: (1) AI readiness ($\beta = 0.42$; $p < 0.01$) improves teacher adaptation through technology acceptance, with infrastructure and training as the main predictors; (2) Virtual leadership was positively correlated with digital collaboration ($\beta = 0.35$; $p < 0.05$), but its effectiveness depended on change readiness; (3) Digital work culture encourages pedagogical innovation through decentralization of decisions and agile workflows, especially in schools with non-hierarchical structures. Theoretically, this study expands the TAM model by including the context of organizational readiness and virtual leadership, while challenging the conventional teacher training paradigm. Practical implications include HR policy recommendations such as the establishment of an AI task force, the allocation of digital transformation incentives, and the integration of virtual leadership modules in teacher training curricula. The main limitation lies in the dominance of developed country studies (80% of the sample), so generalization to the Indonesian context requires further studies based on local contexts.

Keywords: *AI Readiness*, *Virtual Leadership*, *Digital Workplace Culture*, *Technology Acceptance, Change Readiness, future teaching skills*, *SMK Teacher*

INTRODUCTION

The era of technological disruption has transformed the global education landscape, with 65% of vocational education institutions in developing countries reportedly lagging behind in integrating artificial intelligence (AI) into the

curriculum (UNESCO, 2023). This phenomenon poses a critical challenge for Vocational High School (SMK) teachers who are required to master technology-based teaching skills, but are hampered by the low readiness of the institution's AI (AI readiness). Based on the Resource-Based View theory (Barney, 1991), AI readiness requires not only infrastructure but also organizational capacity in managing human resources and technology. Unfortunately, 72% of vocational schools in Southeast Asia still lack systematic training and supporting policies, making it difficult for teachers to access AI tools such as learning analytics or virtual simulations (OECD, 2023). A study in Germany shows that vocational schools with structured training programs have experienced a 48% increase in teacher technology adaptation (Müller et al., 2024), but similar practices are still rare in developing countries such as Indonesia, where only 22% of vocational schools have a digital transformation roadmap (Kemdikbud RI, 2023). This situation has a very influential impact on the urgency of adaptation to the world of education, in this case Vocational High Schools as providers of vocational education. Vocational education is expected to be able to make an effective and strategic supplemental contribution, as well as innovative in increasing its role in the Industrial World Business (DUDI) through the effectiveness of human resource management and digital technology.

On the other hand, virtual leadership is a decisive factor in building team collaboration during the digital transition. Transformational Leadership Theory (Bass, 1985) emphasizes the role of leaders in motivating adaptation to change through inspirational communication. However, its implementation in vocational schools is often hampered by the lack of digital competence of school principals. Research in South Korea revealed that digital empathy-based leadership was able to reduce 30% of teachers' resistance to technology (Lee, et al., 2023), while in Indonesia, 53% of vocational school heads have not been trained in asynchronous communication strategies (Rahman et al., 2024). In fact, virtual simulation-based training has been shown to improve these leadership skills by up to 40% (Avolio et al. 2021).

Digital workplace culture is also the key to pedagogical innovation. The Agile Organizational Culture theory (Denyer, & Parry, 2022) states that a decentralized and collaborative work environment accelerates the adoption of technology. In Australia, vocational schools with agile cultures report a 35% increase in AI-based learning experiments (Chen, 2024). However, 68% of vocational schools in Southeast Asia are still stuck in rigid bureaucracy, hindering technology exploration (Gonzalez et al., 2023). A case study in Japan proves that the implementation of agile workflow can cut the time of AI implementation from 12 months to 4 months (Denyer & Parry, 2022), but this model is difficult to adopt in vocational schools with traditional hierarchical structures.

Psychological factors such as technology acceptance and change readiness also determine the success of transformation. The Technology Acceptance Model (TAM) (Davis, 1989) explains that perceived usefulness and ease of use are the main drivers of technology adoption. In Malaysia, AI gamification training increased 45% of teachers' technology adoption (Venkatesh et al., 2023), but in

Indonesia, 41% of vocational school teachers still find AI tools complicated, especially in rural areas (Wilson & Lee, 2022). Meanwhile, Lewin's Change Management theory (1947) emphasizes the importance of institutional support in increasing change readiness. A study in Brazil showed that teachers with peer support were 60% more likely to adopt AI (Smith, 2024), but only 18% of vocational schools in Indonesia had change mentoring programs (Ministry of Education and Culture, 2023).

Although many studies have explored these variables, previous research has tended to be fragmented on a focus on technical aspects (TAM) or leadership, without integrating organizational, technological, and psychological factors. In addition, 88% of the literature comes from developed countries (Scopus, 2023), making it less relevant for the context of vocational schools in developing countries with limited resources. This article answers this gap by proposing a *Human-Technology-Organization* (HTO) framework that combines TAM and *Dynamic Capabilities* theory (Teece, 2020), while testing dual mediation for the first time in a vocational school environment. Based on these problems, the purpose of this study is to analyze the influence of Artificial Intelligence Readiness, Virtual Leadership, and Digital Workplace Culture on Future Teaching Skills through Technology Acceptance and Change Readiness in vocational school teachers. Practical implementation in a contributory manner includes policy recommendations such as the establishment of a Digital Transformation Office and the integration of AI literacy assessment, a strategic step to align vocational education with the demands of Industry 4.0. This research is expected to contribute to the development of a more inclusive education policy strategy, in order to increase the readiness of educators to face the challenges of the digital era and meet the needs of the growing industry.

METHOD

This study adopted a systematic literature review (SLR) design guided by Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) to ensure the transparency and validity of the synthesis of findings (Page et al., 2021. The study population includes Scopus and Web of Science indexed empirical articles (2019–2024) that discuss the linkages between AI readiness, virtual leadership, digital workplace culture, technology acceptance, change readiness, and future teaching skills in vocational school teachers. The search strategy used a combination of controlled keywords (Boolean operators) such as ("Artificial Intelligence readiness" OR "AI preparedness") AND ("virtual leadership" OR "e-leadership") AND ("vocational teacher"), with a filter of Q1/Q2 journals and the context of vocational education (Mongeon, P., & Paul-Hus, 2016). The selection process was carried out through four stages of PRISMA: (1) identification of 312 initial articles, (2) screening of 180 articles after the removal of duplicates, (3) feasibility assessment of 85 articles based on inclusion-exclusion criteria, and (4) inclusion of 48 articles that met the requirements of mediation/moderation analysis (PRISMA flow diagram attached).

The research instruments include standardized SLR protocols and coding frameworks based on Technology Acceptance Model (TAM; Davis, 1989) and Change Management Theory (Lewin, 1947) to categorize the findings. The validity of the instrument was tested through peer debriefing with two senior researchers as well as expert validation using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist (Munn et al., 2020). Data analysis was carried out in stages: (1) thematic coding using NVivo 14 (Braun & Clarke, 2006) to identify patterns of relationships between variables, (2) meta-aggregation (Lockwood et al., 2015) to integrate conflicting results, and (3) descriptive statistical analysis (percentage, correlation coefficient) of the secondary data of the selected study. Path coefficients and p-values from the SEM/PLS model in the inclusion study were aggregated to test the strength of the relationship between variables (Borenstein et al., 2009).

The research procedure was designed to be replicated: (1) searches using the same keyword string in Scopus/WoS (Martín-Martín et al., 2021), (2) inclusion criteria (empirical articles, period 2019–2024, SMK context), and (3) exclusion of studies without mediation/moderation analysis or full-text was not available. Potential limitations include publication bias (dominance of developed country studies) and variability in the operationalization of variables between researchers. To minimize this, an article quality assessment using a JBI score (M = 8.2/10) and sensitivity analysis by eliminating outliers was performed (Higgins et al., 2019). All data and analysis protocols are available in an open repository (Open Science Framework) to ensure transparency (Wilkinson et al., 2016)

RESULTS AND DISCUSSION

Result

Literature Selection Process (PRISMA)

In this study, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method was used to ensure that the literature selection was carried out in a systematic, transparent, and structured manner. This process aims to screen and select the articles that are most relevant to the focus of the research. Of the initial 312 articles obtained through two main databases, namely Scopus (240 articles) and Web of Science (72 articles), several stages of selection were carried out before finally obtaining 48 articles that met the criteria. Here are the stages of selection in detail:

Identification

The first step in this process is to gather relevant literature based on predetermined keywords. The initial search results yielded 312 articles from two main sources, namely Scopus and Web of Science. These articles cover a wide range of research that discusses Artificial Intelligence Readiness, Virtual Leadership, Digital Workplace Culture, Technology Acceptance, Change Readiness, and Future Teaching Skills, particularly in the context of vocational education.

Screening

Of the total 312 articles collected, an initial screening was carried out to eliminate duplication, i.e. articles that appear more than once because they come

from the same or different sources. After this process, a total of 132 articles were deleted, leaving 180 unique articles that were then analyzed further.

Eligibility Assessment

The remaining articles are then evaluated based on their abstracts to assess whether the content is truly relevant to the research topic. At this stage, a total of 85 articles were selected for further examination. However, after further analysis, 37 articles had to be eliminated because they did not address the aspects of mediation or moderation analysis, which were an important part of the study.

Inclusion (Final Selection)

After going through a series of rigorous screening, finally 48 articles were declared to meet the criteria for further analysis in this study. These articles have been quality tested using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist, which resulted in an average score of 8.2 out of 10. This shows that the selected article has a valid methodology and high relevance to this research.

Study Distribution by Region and Topic

Based on the analysis of the distribution of research used in this study, there is considerable variation in terms of the number of studies, dominant topics, and research methods used in different regions. Of the total articles studied, most came from Europe (45.8%), followed by Asia (29.2%), America (14.6%), and other regions (10.4%) as shown in table 1 below.

Table 1. Study Distribution by Region and Topic

Region	Number of Studies	Dominant Topics	Research Methods
Europe	22 (45.8%)	AI Readiness (50%)	Quantitative (65%)
Asia	14 (29.2%)	Virtual Leadership (45%)	Qualitative (55%)
America	7 (14.6%)	Digital Culture (30%)	Mix (15%)
Other	5 (10.4%)	Technology Acceptance (20%)	Quantitative (70%)

Table 1 above shows that studies from European and American countries dominated the overall sample, with a proportion of 75% of the total studies, while studies conducted in Asia and other regions accounted for only 25%. This shows that developed countries contribute more to research related to AI Readiness, Virtual Leadership, Digital Workplace Culture, and Technology Acceptance, than developing countries. Each region has different research topic tendencies. AI Readiness is the most researched topic in Europe, with 50% of studies in the region addressing the readiness to apply artificial intelligence in education and work environments. Meanwhile, Asia is researching Virtual Leadership more, with 45% of studies in the region focusing on the effectiveness of remote and digital leadership in organizations. In the Americas, the research focus is more directed at Digital Culture, which accounts for 30% of the total studies in the region. The research in this category explores how digital culture affects the work and education ecosystem. On the other hand, other regions, which include developing countries outside the Americas, Europe, and Asia, highlighted Technology Acceptance more, with 20% of studies in these regions addressing the acceptance and adaptation of technology in educational and organizational settings.

The research methods used also vary in each region. Studies in Europe and other regions were more likely to use a quantitative approach, by 65% and 70%, respectively. On the other hand, research in Asia uses more qualitative methods, accounting for 55% of the total studies in the region. Meanwhile, studies in the United States have adopted a more mixed-methods approach, but with a smaller percentage, at 15% of the total studies in the region.

Synthesis of Quantitative Findings (n=29 Studies)

The aggregation results from 29 quantitative studies analyzed through path analysis showed a significant relationship between several main variables in this study. AI Readiness, Virtual Leadership, and Digital Culture have been shown to have a diverse impact on Technology Acceptance, Change Readiness, and Pedagogical Innovation, with variations in the power of effects and relationship mechanisms.

The Effect of AI Readiness on Technology Acceptance

This study shows that AI Readiness has a strong impact on Technology Acceptance, with an average path coefficient (β) of 0.42 and a significance level of $p < 0.01$. This relationship has a high variance contribution to changes in technology acceptance ($\Delta R^2 = 0.58$), which suggests that readiness for artificial intelligence greatly determines the extent to which teachers are able to accept and adopt technology in the learning process. Further analysis indicates that Technology Acceptance fully mediates the influence of AI Readiness on Future Teaching Skills, confirming that without adequate technology acceptance, AI readiness does not directly improve future teaching skills.

The Influence of Virtual Leadership on Change Readiness

In the context of virtual leadership, it was found that Virtual Leadership had a moderate relationship with Change Readiness, with a β value of 0.35 and a significance level of $p < 0.05$. This effect resulted in $\Delta R^2 = 0.47$, which suggests that virtual leadership has a considerable influence on an individual's readiness to deal with change. In addition, the results of the analysis show that Change Readiness plays a significant role as a moderator, strengthening the impact of Virtual Leadership on organizational readiness to face digital change.

The Influence of Digital Culture on Pedagogical Innovation

The study also found that Digital Culture contributes to Pedagogical Innovation, albeit with a lower effect power than the previous two relationships. With a β of 0.28 and $p < 0.05$, these influences are categorized in the weak to moderate range. Further analysis using odds ratio (OR = 2.5) shows that an agile digital culture environment can increase the opportunity for pedagogical innovation by 2.5 times compared to an environment with a less developed digital culture as shown in table 2 below.

Table 2. Path Analysis Aggregation Results

Variable Relationships	B (Average)	p-value	Power of Effect	Interpretation
AI Readiness → Technology Acceptance	0.42	<0.01	Strong (ΔR^2 = 0.58)	Full mediation on Future

Variable Relationships	B (Average)	p-value	Power of Effect	Interpretation
				Teaching Skills
Virtual Leadership → Change Readiness	0.35	<0.05	Medium (ΔR^2 = 0.47)	Significant moderation
Digital Workplace Culture → Pedagogical Innovation	0.28	<0.05	Lemah-Moderat (OR = 2.5)	Agile culture boosts innovation

The results of the study as shown in table 2 above show that AI Readiness, Virtual Leadership, and Digital Culture have a significant impact on various aspects of technology acceptance, change readiness, and pedagogical innovation in the world of vocational education. AI Readiness as a Key Factor in Technology Acceptance. Readiness for artificial intelligence (AI Readiness) has the strongest influence on technology acceptance, with a path coefficient (β) of 0.42. A study conducted in Germany by (Müller et al., 2024) found that every one-point increase in the AI Readiness scale can increase the adoption of the technology by up to 42%. This confirms that the higher the readiness of an individual or institution for AI, the more likely they are to adopt and integrate technology in the learning process.

The Role of Virtual Leadership in Increasing Change Readiness and Digital Collaboration. Virtual leadership has been shown to play a significant moderator factor in the relationship between Change Readiness and digital collaboration capabilities. With a β of 0.35, digital empathy-based leadership helps reduce resistance to change, particularly in the educational environment. A study at South Korean Vocational High Schools (SMK) conducted by (Lee et al., 2022) showed that the application of digital empathy in virtual leadership was able to reduce teachers' resistance to change by up to 30%. This emphasizes the importance of the role of leaders in creating a work environment that supports technological adaptation.

Digital Workplace Culture and Its Implications for Pedagogical Innovation Digital Culture or Future Teacher Skills plays an important role in driving pedagogical innovation, although its influence is relatively lower than other variables. With an odds ratio (OR) of 2.5, studies show that the existence of an agile digital culture can increase the chances of pedagogical innovation up to 2.5 times. However, the data also reveals that only 23% of vocational schools in Southeast Asia have met agile workflow standards, as reported in the Chen study (Chen, 2024). This indicates that despite the high potential for pedagogical innovation, limitations in the implementation of a flexible digital work culture are still a major challenge in some regions.

Synthesis of Qualitative Findings (n=19 Studies)

An analysis of 19 qualitative studies conducted with NVivo 14 revealed three main themes related to AI Readiness, virtual leadership, and digital culture. Each theme has a specific sub-theme that shows the main patterns in the study.

AI Readiness and the Importance of Structured Training

As many as 32% of studies emphasized that structured training is a key factor in increasing teachers' readiness for AI. This approach is more effective than one-time workshops, as it allows teachers to gradually build their technological skills in the context of learning. A study conducted by Mohammad, 2023 shows that monthly training using ChatGPT is able to increase teachers' confidence in designing interactive simulations. This indicates that sustainability in AI training is critical to ensuring effective adoption in the classroom.

Virtual Leadership and Asynchronous Communication

As many as 28% of studies underscore the importance of asynchronous communication in supporting the effectiveness of virtual leadership. Technology-based leadership allows for more flexible communication, especially in dynamic work environments. A study conducted by (Rahman et al., 2024) found that principals who use platforms like Slack to provide daily feedback to teachers can improve communication effectiveness without having to rely on face-to-face meetings. In addition, the concept of digital empathy is an important part of virtual leadership, where leaders must understand the psychological barriers teachers face during the transition to a digital environment.

Digital Workplace Culture and Risky Experiments

As many as 25% of studies show that schools that have a strong digital workplace culture tend to provide space for experimentation, including the courage to face failure. A study conducted by Denyer, D. & Parry, (2022) found that schools that incentivized teachers who failed to test AI tools showed higher levels of pedagogical innovation. This approach emphasizes that mistakes are not barriers, but rather part of the learning and innovation process. This is as presented by tabulation data in table 3 below.

Table 3. Thematic Analysis with NVivo 14

Main Themes	Sub-Theme	Frequency	Sample Quotes
AI Readiness	Structured Training	32%	*"ChatGPT monthly training increases teachers' confidence in designing interactive simulations"* (Alenezi, 2023).
Virtual Leadership	Asynchronous Communication	28%	*"Principals use the Slack platform to provide daily feedback to teachers"* (Rahman et al., 2024).
Digital Workplace Culture	Risky Experiments	25%	*"Schools provide incentives for teachers who fail to test AI tools"* (Denyer & Parry, 2022).

Table 3 above interprets that in addition to the three main themes that have been identified, there are two significant thematic patterns in this study that provide a deeper insight into the factors that support technological readiness in the world of education:

The Importance of Continuous Training as the Foundation of AI Readiness (32%)

The results of the analysis show that the adoption of artificial intelligence (AI) in education cannot be achieved through only short training or one-time workshops. In contrast, continuous training modules are considered a more effective approach in building teachers' readiness for technology. With progressive and structured training, teachers can gradually develop their digital skills as well as understand how AI technology can be optimally integrated into the learning process. The study confirms that an iterative and practice-based approach is more successful in increasing confidence and AI-based pedagogical skills than training that is only theoretical or temporary (Kar et al., 2021).

Digital Empathy as a Key Factor in Virtual Leadership (28%)

In addition to the technical aspects of digital leadership, this study underscores the importance of digital empathy, which is the ability of leaders to understand and deal with the psychological obstacles experienced by teachers during the transition process to a digital environment. Virtual leadership that focuses only on the effectiveness of communication and technology implementation often ignores the emotional challenges educators face, such as anxiety about change, uncertainty in the use of new technologies, and resistance due to a lack of confidence in the digital realm. Therefore, education leaders who implement digital empathy can help reduce psychological barriers, create a more inclusive work environment, and encourage more organic and sustainable technology adoption among teachers (Ospina, S., & Foldy, 2021).

Digital transformation in vocational education does not only depend on the availability of technology, but also on the readiness of teachers to adopt the technology. Continuous training and leadership based on digital empathy are two key factors that can accelerate the adoption of technology in the educational environment and create a stronger culture of innovation.

Digital Workplace Culture and Risky Experiments in Education (25%)

In a technology-based education ecosystem, an adaptive digital culture is a key factor in encouraging innovation. One of the key characteristics of an advanced digital culture is the willingness of institutions to accept failure as part of the learning process.

Research conducted by Denyer & Parry (2022) shows that schools that incentivize teachers who fail to test AI tools have a higher level of pedagogical innovation or Future Teacher Skills than schools that implement zero-risk-based learning policies. As many as 25% of the studies in this analysis highlight that risky experiments, i.e. trying new technologies with the possibility of failure, can increase teachers' confidence in adopting technology-based learning methods.

This approach emphasizes that failure is not an obstacle, but rather an essential step in developing more advanced digital and pedagogical skills. By creating an environment that supports innovation without fear of sanctions, schools can accelerate the digital transformation process in the world of education.

Discussion

Technology Acceptance Mediation Mechanism

The results of this study support and expand the Technology Acceptance Model (TAM) theory developed by Davis (1989). In particular, this study confirms that the perceived usefulness of technology is not only influenced by individual factors, but also highly dependent on institutional support, especially in the context of vocational education.

The Role of Institutional Support in Technology Acceptance

Various studies show that the success of AI adoption in an educational environment is greatly influenced by institutional support. A study conducted by Osman et al. (2024) found that institutions that provide training and a good supporting ecosystem tend to have higher rates of technology acceptance. In this context, a comparative study between vocational schools in Germany and Indonesia confirms the following findings: In Germany, vocational schools that implement structured AI training show a technology acceptance score of 4.1/5. This shows that teachers are more confident and open to the use of technology after receiving continuous training. In contrast, in Indonesia, vocational schools that do not provide AI training have a much lower technology acceptance score, which is only 2.3/5 (Kemdikbud RI, 2023). This low score indicates that without adequate training and support, teachers have difficulty accepting and adopting new technologies.

These results are also in line with research conducted by Hazzan-Bishara et al. (2025), which found that institutional support has direct and indirect effects on technology acceptance in the classroom. This support can be in the form of intensive training, policies that support AI adoption, and evaluation systems that encourage active use of technology.

Policy Implications: AI Training Roadmap for Vocational Teachers

Based on these findings, vocational education institutions need to develop an AI Training Roadmap that includes more systematic stages in supporting technology adoption. This approach can be applied in three main phases:

Basic Training – Teachers are provided with a fundamental understanding of AI concepts and their application in education, including the use of tools such as ChatGPT, machine learning in assessments, and learning analytics.

Guided Trials – Teachers are encouraged to apply technology in real-world scenarios, for example using AI in student evaluations or developing AI-based materials, with guidance from mentors or technology experts.

Gamified Assessment-Based Evaluation – Institutions providing vocational education and learning in vocational schools adopt a gamification-based evaluation system, where teachers can test their skills in implementing AI and get iterative feedback.

This roadmap-based approach not only increases teachers' readiness to adopt AI, but also creates an educational ecosystem that is more open to digital innovation.

The Role of Virtual Leadership Catalysts

In the era of digital transformation, virtual leadership not only serves as a coordination tool, but also becomes a major catalyst in building digital trust in the

educational environment. Digital trust is an important element in ensuring the effectiveness of communication and collaboration, especially in the vocational education sector which is increasingly adopting AI-based technologies and distance learning systems (Jaboob et al., 2025).

The Influence of Virtual Leadership on Teacher Participation

The results of the study show that proactive and digital communication-based virtual leadership has a significant impact on teacher engagement in AI-based projects. For example, a study conducted by Lee et al. (2022) at South Korean Vocational High Schools (SMK) found that principals who actively provided feedback through virtual platforms successfully increased teacher participation in AI projects by up to 32%. This shows that structured, directed, and digital-based communication can increase teachers' involvement and readiness in applying technology in the classroom. However, a different situation is found in Indonesia. A study by Rahman et al. (2024) revealed that 53% of vocational school principals in Indonesia still rely on face-to-face meetings as the main method of decision-making. This conventional approach is considered less flexible in supporting the adoption of technology, especially in working conditions that are increasingly shifting towards digital. These limitations have an impact on the lack of accessibility to technology-based discussions, slow decision-making, and low teacher participation in digital innovation projects (Yanto et al., 2023).

Theoretical Implications: Transformal Leadership's Expansion into the Digital Age

These findings reinforce the Transformational Leadership theory introduced by Bass (1985), but suggest that this leadership model needs to be adapted to the digital dimension to increase its effectiveness in an increasingly digitized environment. Some aspects that need to be included in a digital transformational leadership model include:

Asynchronous Communication – Leaders should adopt asynchronous communication methods, such as digital collaboration platforms (Slack, Microsoft Teams, or Google Classroom), that allow teachers to interact and share ideas without time and space limitations. A study by Yang et al. (2024) confirms that leadership based on digital communication increases team engagement by 28% compared to traditional methods.

Virtual Mentoring – In addition to asynchronous communication, leaders also need to act as digital mentors, who not only provide direction but also guide teachers in understanding new technologies. Kafa & Eteokleous (2024) states that schools that regularly implement virtual mentoring experience an increase in technology adoption of up to 35% compared to schools that rely only on conventional training.

Policy Implications: Building a Digital Leadership Ecosystem

Based on these findings, vocational education institutions are expected to: Encourage the use of digital communication platforms to increase teachers' flexibility and involvement in academic discussions; Integrate a digital empathy-based leadership model, in which the principal not only acts as an administrative leader, but also as a technology facilitator capable of guiding teachers in facing digital challenges; and

Developing a digital mentoring program, where principals and senior teachers can provide guidance to other teachers in adapting AI-based learning technologies (Zhou & Armenakis, 2023).

Digital Workplace Culture as the Foundation of Innovation

In the digital era, the success of technology adoption in the world of education depends not only on technological infrastructure, but also on organizational culture that drives innovation. An Digital Workplace Culture allows teachers to experiment with AI tools without fear of sanctions or failure, creating a more innovative and sustainable learning ecosystem.

The Role of Work Culture in Driving AI Innovation

Several studies have shown that institutions with flexible and innovation-based work cultures are more successful in adopting AI in learning compared to institutions that still maintain rigid hierarchical structures. In Australia, a study conducted by Chen (2024) found that "fail-forward" policies in Australian vocational schools encourage teachers to experiment with AI tools, resulting in 120 AI-based pedagogical innovations per year. This approach allows teachers to test new ideas without fear of negative consequences in the event of failure, thus accelerating the innovation cycle. On the other hand, in Indonesia, a study by the Ministry of Education and Culture (Kemdikbud RI, 2023) shows that vocational schools with rigid hierarchical cultures only produce 15 innovations per year. These limitations are due to complex bureaucracy, lack of support for experimentation, and a tendency to avoid risk in the development of technology-based learning methods.

These results are also in line with a study conducted by Jain et al. (2023), which showed that companies and institutions with an agile mindset approach in AI experiments are faster in developing innovations than institutions that still maintain traditional work models.

Practical Implications: Strategies for Building Digital Workplace Culture in Vocational Schools

In order for AI-based innovation to thrive optimally in the vocational education environment, policy changes are needed that support a more flexible and collaborative digital culture ecosystem (Yusuf & Prasetyo, 2024). Some of the strategic steps that educational institutions can implement are: School Policy: Allocation of Funds for AI Experiments; Institutions need to allocate 5% of the education budget to an AI experimentation fund, which can be used by teachers to conduct trials of new technologies; These funds can be used for the procurement of AI tools, the organization of educational hackathons, as well as incentive programs for teachers who succeed in developing technology-based innovations; Teacher Training: Integration of Design Thinking in the Curriculum; and Institutions need to implement a design thinking approach in teacher training, which allows teachers to develop innovative AI-based solutions through iterative and user experience-based processes (Xu & Li, 2023). Studies show that teachers

who receive design-based training are more likely to create innovations that have a direct impact on learning (Jain et al., 2023).

Convergence of Quantitative-Qualitative Findings

The integration of quantitative and qualitative analysis results in this study reveals a strong relationship between technology readiness, virtual leadership, and digital culture change in the world of vocational education. While there was consistency in some of the key findings, the analysis also identified certain discrepancies, which showed differences in patterns of effects between the research methods (Dreher, 1994).

Consistency of Findings between Quantitative and Qualitative Data

The Relationship Between AI Readiness and Technology Acceptance

The results of the quantitative study showed that AI Readiness had a strong effect on Technology Acceptance with a path coefficient (β) of 0.42. These findings are in line with qualitative data, where 32% of studies highlight the importance of structured AI training as a key factor in improving teachers' technology readiness. This means that the more structured the AI training program in schools, the higher the level of teacher acceptance of new technologies.

The relationship between Change Readiness and Teacher Resistance

A quantitative study found that resistance to change in Indonesia is quite high (55% of teachers experience resistance), which correlates with low Change Readiness scores (β = 0.35). Qualitative data confirm that the low readiness for change is rooted in a lack of ongoing training and leadership support, which causes teachers to have difficulty adopting new technologies.

Discrepancy of Findings between Quantitative and Qualitative Data

The Impact of Virtual Leadership: Qualitative Studies vs. Quantitative

Qualitative studies found that 40% of studies reported virtual leadership as a highly influential factor in improving teachers' technology adaptation. However, in quantitative studies, the effect of Virtual Leadership on Change Readiness had only a pathway coefficient (β) of 0.35, which suggests a moderate effect. This difference indicates a reporting bias in qualitative research, where researchers may be more likely to highlight the positive impact of virtual leadership compared to quantitative studies that are based on objective data.

The data convergence shows that AI Readiness and structured training have a clear impact on technology acceptance, while teacher resistance in Indonesia is correlated with low Change Readiness. However, the significant differences in the impact of Virtual Leadership between quantitative and qualitative studies highlight the importance of a data triangulation approach in evaluating the effectiveness of digital education policies.

CONCLUSION

This study reveals that AI *readiness*, *virtual leadership*, and *digital workplace culture* significantly affect the development of future *teaching skills of* vocational school teachers through the mediation mechanism of technology *acceptance* and change *readiness*). Key findings suggest that AI readiness, including infrastructure, training, and policies, is a key prerequisite for improving

teachers' technological adaptability (β = 0.42, $p < 0.01$), but its effectiveness depends on the ability of institutions to build technology acceptance through structured training. Virtual leadership, particularly asynchronous communication and digital empathy, acts as a catalyst that reduces teacher resistance by 30% and strengthens collaboration during the digital transition (β = 0.35, $p < 0.05$). Meanwhile, an agile digital work culture increases the chances of AI-based pedagogical innovation by up to 2.5× (*odds ratio* = 2.5), although its implementation in developing countries is still hampered by rigid bureaucratic structures.

Theoretically, this research contributes to the development of an *integrative model of Human-Technology-Organization (HTO)* that combines Technology *Acceptance Model (TAM) theory with* a Resource-Based View (RBV) *approach*, emphasizing the importance of synergy between individual capabilities and organizational support. The practical implications include policy recommendations such as the establishment of *a Digital Transformation Office* at the vocational school level to coordinate AI training, the allocation of special budgets for technology experimentation, and the integration *of virtual leadership modules* in the teacher training curriculum.

The main limitation of this study lies in the dominance of studies from developed countries (75%) and the variability of operationalization of future *teaching skills* variables. To this end, follow-up research recommendations include: (1) longitudinal studies in developing countries to measure the long-term impact of digital culture on teacher retention; (2) comparative analysis of virtual leadership models in public vs. private vocational schools; and (3) the development *of a contextual AI Readiness Index* for vocational education. By addressing these limitations, future research can produce a more inclusive and adaptive policy framework to the dynamics of the industrial revolution 4.0.

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