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The components of competency standards for technology leadership in school

(Komponen Standard Kepimpinan Teknologi di Sekolah)

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Abstract

Technology leadership is increasingly important in modern education, where technological advancements influence various aspects of learning and school management. This study explores the components of competency standards for technology leadership in schools. The research adopts a qualitative approach using basic interpretative methods to deeply understand school leaders' subjective experiences and perspectives. The study findings reveal that technology leadership competency encompasses various aspects such as leadership, Organizational Policy and Culture, educational technology, collaboration and communication, organization management, and individual competencies. In conclusion, effective technology leadership requires a combination of strategic insight, flexibility, and a profound understanding of educational goals to enhance learning outcomes.

Keywords: Leadership, Educational Technology, School Management, Organization Management

INTRODUCTION

To address the rapid advancements in technology and their impact on various aspects of life, this article explores how technology has become integral in everyday activities such as communication, logistics, business, healthcare, human resource management, and education (Kharchenko et al., 2020). The influence of digital technologies extends beyond individual well-being to encompass societal and economic development. For example, digital technologies have transformed human capital management systems at macro and micro levels, underscoring their profound impact on digital economic development (Kharchenko et al., 2020).

Trust et al. (2016) highlights how technological advancements, including machinery, handheld tools, and management technologies, enhance production flexibility, information access, productivity, quality improvement, and business model transformation, facilitating overall organizational management. The use of technology also facilitates efficient information sharing among employees within organizations (Walker et al., 2021).

Therefore, this study aims to explore the components of Leadership Competency Standards for school leaders. The specific objectives of this study are to investigate the components of Technology Leadership Competency Standards for school leaders. By examining how technology influences leadership in educational settings, this study seeks to identify the key competencies that school leaders must possess to effectively integrate and manage technological advancements. Understanding these competencies will help in developing frameworks and strategies that align with the evolving technological landscape, ensuring that school leaders can harness technology to improve educational outcomes.

LITERATURE REVIEW

Globally, several nations have undertaken efforts to incorporate technology into their educational institutions to improve learning environments and equip students for the digital era. One prominent example is the School Project F@tih in Turkey, which has been pivotal in encouraging technology integration in schools. This project enables school principals to demonstrate successful leadership by utilizing sufficient technical resources and infrastructure in their day-to-day operations (Banoglu et al., 2016). Through the integration of technology into school management, Turkey aims to modernize educational procedures and enhance educational performance.

Furthermore, the Learning Resource Center in Saudi Arabia stands out as a significant effort in using technology in teaching. The primary objective of this centre is to develop learning environments that utilize technology to improve educational experiences. This goal is achieved by implementing novel technological tools and resources (Alenezi, 2016). Additionally, Spain has made notable progress in incorporating technology into education by prioritizing the use of software, offering training in technology development, and encouraging principals and teachers to adopt technology-focused teaching and learning methods (Gil-Flores et al., 2017). These endeavours collectively highlight a worldwide movement towards utilizing technology in education to cultivate improved learning environments and provide students with the necessary skills for the 21st century.

In Malaysia, the Ministry of Education (MOE) has proactively adopted various efforts to incorporate technology into the educational environment, demonstrating a dedication to modernizing and improving the standard of education. The 1BestariNet Program, for instance, aims to provide schools with robust technology infrastructure to enable digital learning environments (Wong & Daud, 2017). This program underscores Malaysia's endeavours to equip schools with the essential tools and resources to facilitate efficient technology integration, ultimately enhancing the delivery of education and boosting student outcomes nationwide.

Moreover, the MOE's Smart School development initiative seeks to revolutionize traditional teaching processes by implementing innovative technological applications. This initiative aims to provide interactive educational settings that actively engage students in their academic pursuits using technology (Wong & Daud, 2017). Additionally, the Frog Virtual Learning Environment (VLE) has emerged as a crucial instrument in Malaysia's educational system. This online network effectively connects millions of students, instructors, and parents nationwide, enabling smooth communication and easy access to educational resources (Majid & Hasim, 2019). The Frog VLE is recognized for its contribution to aligning education with the requirements of the 21st century, enhancing teaching standards, and enriching learning experiences in Malaysian schools (Lukas et al., 2020). These efforts collectively demonstrate Malaysia's proactive attitude in utilizing technology to promote educational excellence and equip students for a digitally driven future. By incorporating these technological advancements into the educational system, Malaysia aims to cultivate a generation with the requisite skills and knowledge to succeed in a highly competitive global environment.

In guiding school leaders to integrate technology effectively, various technology leadership models have been developed. Flanagan and Jacobsen's (2003) Principal Technology Leadership Model emphasize student engagement, shared vision, equal access, effective professional development, and networking for successful ICT integration. Additionally, Anderson and Dexter's (2005) model highlight the interdependence between school infrastructure, principal technology leadership, and technology outcomes. Furthermore, Davies' (2010) Advanced Principal Technology Leadership Model underscores the importance of understanding the interconnected factors influencing school technology use.

Despite these efforts, Malaysian school leaders face significant challenges in leveraging technology effectively (Kor et al., 2016; Ugur & Koc, 2019). Many principals lack the necessary technological competence, which hinders successful ICT integration (Esplin et al., 2018; Yu & Prince, 2016). Addressing these leadership competency gaps is crucial for fostering effective technology integration and improving educational outcomes across Malaysia's school system. Leadership competency frameworks, such as the Technology Leadership Competency Standards, are essential in guiding educational leaders to promote and use technology effectively in schools (Raman et al., 2019).

In conclusion, integrating technology into education is crucial for adapting to modern learning needs. Malaysian schools must enhance technology leadership skills to navigate challenges, promote innovation, and improve educational outcomes. By adopting effective technology leadership models and addressing competency gaps, educators can effectively integrate technology into teaching and learning processes, ensuring students are well-prepared for the future digital age.

METHODOLOGY

This study adopts a qualitative research approach using basic interpretative methods. Qualitative research, particularly when employing basic interpretative methods, offers a profound understanding of specific phenomena by interpreting experiences and subjective perspectives (Faulks et al., 2021). This approach focuses on meaning-making practices, exploring relationships between conceptual categories and previous research to gather detailed accounts of phenomena and gain new insights (Mastronardo et al., 2022). In the context of technology leadership standards for school leaders, basic interpretative methods provide a comprehensive view of leadership in a technological setting by uncovering underlying meanings and interpretations related to technology leadership competencies (Akib et al., 2022).

Using basic interpretative methods in exploring technology leadership standards allows researchers to delve into individuals' subjective experiences and perspectives, revealing contextual and situational factors influencing technology leadership (Rangavittal, 2023). By employing non-probability sampling, such as purposive sampling, researchers can select credible participants directly involved in leadership and technology, ensuring valuable insights are obtained (Üstgörül, 2023). These participants willingly share their experiences, contributing to a rich understanding of technology leadership standards (Prayag et al., 2023).

The selection of study participants uses purposive sampling. This is a method in qualitative research where researchers intentionally choose participants or content based on specific characteristics related to the study's goals (Mills & Gay, 2016). Purposive sampling is conducted with a specific purpose to obtain perspectives or information that aligns with the research objectives. In purposive sampling, researchers select participants based on essential characteristics to understand the study topic deeply.

According to Mills and Gay (2016), selection criteria involve choosing the sample size for the study based on criteria set by the researcher. The participants meet the sampling criteria established by the researcher, involving experts in leadership and technology. The researcher sets criteria to maintain quality assurance (Creswell, 2013).
This study's primary data collection method involves conducting face-to-face interviews between the researcher and participants. Interviews are valuable for gaining detailed information, allowing researchers to understand the research topic deeply. Interview feedback is recorded using audio recordings (Chua, 2012), with participants allowed to consent to note-taking or typing notes on their laptops instead of audio recording. This procedure is confirmed through consent forms provided to participants before the interviews begin.

Table 1. Profile of participants involved in this study

Participant	Expertise	Expertise Criteria
Participant 1 (JPNJ)	Leadership and Technology	Practice criteria in leadership and experience are verified through exceptional evaluation standards.
Participant 2 (JPNJ)	Technology	Appointed in technology after various evaluations and practices, serving as a role model in technology.
Participant 3 (JPNJ)	Technology	Appointed in technology after various evaluations and practices, serving as a role model in technology.
Participant 4 (PPDBP)	Leadership	Expertise in leadership with a Ph.D. in leadership.
Participant 5 (PPDBP)	Leadership	Expertise in leadership with practice criteria and experience verified through special evaluation standards.
Participant 6 (School A)	Leadership and Technology	School leader practising leadership and technology as a role model for over 8 years.
Participant 7 (School B)	Leadership and Technology	School leader practising leadership and technology as a role model for over 8 years.
Participant 8 (School C)	Leadership and Technology	School leader practising leadership and technology as a role model for over 8 years.

The data collected through interviews, in the form of audio recordings, will be analyzed using thematic analysis (Asrial et al., 2020). Thematic analysis allows researchers to

systematically organize, categorize, and interpret data, enabling an in-depth investigation of the research topic. Individual interviews with each participant provide space for deeper interaction and detailed information exchange, allowing researchers to gain comprehensive insights into participants' experiences, perspectives, and perceptions regarding the study topic (Morgan et al., 2013).
This study uses eight participants from Johor, combining the knowledge of several participants to predict the outcomes (Ab Latif et al., 2016; Robertson et al., 2017). The rationale is that multiple findings can provide better insights than a single participant. Creswell (2007) and Skulmoski et al. (2007) suggest that the panel members' knowledge, experience, and background make the participants valuable in this study. This implies that participants in the field can provide valuable insights into future developments (Keeley et al., 2016).

All participants have worked in their fields of expertise, either in technology or leadership, for over 8 years. For data collection purposes, participants must agree to be interviewed. The following table describes the profiles of the participants involved in this study.

RESULT

LEADERSHIP

The first theme that emerged from the interviews was leadership. Participants highlighted elements such as adaptability, fairness, accountability, motivation, and readiness to face challenges as critical components of effective leadership. Adaptability and flexibility were emphasized as essential traits for leaders in rapidly changing technology. Participants P4 and P5 noted the importance of creating a school culture that encourages adaptability and agility in learning. This indicates that leaders need to be able to adjust to technological changes and provide opportunities for innovation.

"...flexibility, meaning they should be ready to adapt to rapid and comprehensive technological changes... The leader must also ensure the school's readiness for future technology by preparing a culture that encourages flexibility..." (P1; P4)

Fairness and accountability were also highlighted by participants P1, P2, and P3 as essential elements of leadership. They stressed that accountability helps individuals take responsibility for their actions, which is vital for successful technological leadership in schools.

"...and the most important thing is accountability and integrity... Accountability helps them take responsibility for their actions... Accountability means being ready to be held accountable for their decisions and actions..." (P1; P3; P6)

Motivation was another important theme, as noted by participants P1, P3, and P6. They pointed out that enthusiasm and motivation are key factors in advancing technology in schools. In this context, the ability to motivate oneself and others is an important skill for a successful technology leader.

"...Motivation is about enthusiasm... we need to have high spirits to keep learning and developing in technology... the ability to motivate and be motivated is indeed a power combo for being an awesome technology leader... a leader needs to motivate their staff and also be constantly motivated..." (P1; P3; P6)

Finally, resilience and readiness to face challenges were emphasized by Participant P4. This shows that technology leaders must be capable of bringing about positive change and ensuring that the school is prepared for the challenges and opportunities that come with rapid technological development.

ORGANIZATIONAL POLICY AND CULTURE

The second theme involves organizational policy and culture, which includes various elements that play a key role in the effective use of technology in schools. Participants emphasized the importance of understanding the values, norms, and beliefs that shape the organizational culture. This sensitivity to organizational culture forms the foundation for successful technology integration. Leaders need to be able to read and understand the dynamics of organizational culture to implement relevant and accepted technology strategies.

"...awareness of aspects of organizational culture..." (P2) "...includes long-term strategies to integrate technology into the school culture..." (P2; P5)

Strategic planning skills were recognized as important for designing long-term strategies that align technology with the school's culture. Effective management of technological resources, including planning, procurement, and maintenance, was vital for successful technology leadership.

"...strategic planning skills involve management and assessment skills... Technology management refers to the skills of technology leaders in managing technology resources efficiently in schools... This includes planning, procurement, and maintenance..." (P1)

Integrity and ethics were identified as fundamental for building trust in leadership and ensuring moral responsibility in managing technological resources. Leaders must be ready to be held accountable for their decisions and actions related to technology.

"...integrity, where the leader is ready to be held accountable for decisions and actions related to technology... Integrity builds trust in leadership by highlighting honesty... Integrity forms the foundation of trust in relationships with staff, students, and other stakeholders..." (P1; P2; P4; P8)

EDUCATIONAL TECHNOLOGY

The third theme focuses on educational technology, encompassing various skills essential for using and applying technology in education. Participants highlighted the importance of having skills in using technological tools, data analysis, software mastery, networking, application usage, and computer proficiency. These skills are essential for leaders to ensure effective and beneficial use of technology in educational settings.

"...skills in using modern technology to enhance school management... Basic understanding of technology refers to fundamental knowledge of things like computer hardware..." (P2; P7)

COLLABORATION AND COMMUNICATION

The fourth theme underscores the importance of collaborative leadership and effective communication in the context of schools. Influential leaders understand the importance of collaboration with various stakeholders, including school staff, parents, and the community. This collaboration is essential for the successful integration of technology in education.

"...collaboration with stakeholders, parents, and the community... Collaboration with school staff, parents, and the community is important..." (P5)

Practical communication skills are critical for technology leaders to convey technical information understandably to all parties involved. This includes school staff with varying educational backgrounds, technical expertise, and the community.

"...communication skills ensure a clear understanding of technical concepts... Effective communication is an important aspect of the role of a technology leader..." (P8)

ORGANIZATION MANAGEMENT

The findings from the participant interviews show that organizational management plays a very important role in achieving organizational goals. Various components of management, such as security management, financial management, organizational coordination management, equipment monitoring management, evaluation management, maintenance management, organizational planning management, software management, project management, human resource management, management support, and technical support, are recognized as critical elements that are closely related. Leadership in the context of technology not only focuses on the use of technological tools and systems but also involves managing various important aspects to ensure the effectiveness of operations and the development of the school. Technology leadership requires competence in security management, financial management, human resource management, organizational coordination, evaluation, maintenance, project management, organizational planning, management and technical support, decision-making skills, effective communication skills, team management skills, and effectiveness measurement skills.

In the era of technology, data security and technology infrastructure are priorities. Technology leadership needs to ensure the implementation of effective security measures to protect school information and technology involvement. Additionally, skills in financial management are important for planning and executing technology projects without neglecting the school's financial stability. Human resource management involves recruiting and training staff related to technology, ensuring compatibility and efficiency in using technological tools.

"...and financial competence, uhh... is also very important in becoming a technology leader... financial competence. We cannot skip this part. Technology leaders must be good at budgeting, uh... managing financial resources. They must plan technology project budgets wisely, uh... make sure money is not wasted. And uh... they must really understand how technology can impact the school budget... Competent school leaders in technology leadership are expected to have the competence to manage technological aspects, uh... including human resource planning... providing the necessary support for human resource development in the technology aspect..." (P1; P5; P8)

Furthermore, technology leadership needs to conduct organizational coordination management to ensure the compatibility of technology use at all levels and units in the school. This includes aligning technology programs, projects, and initiatives with the school's overall goals and vision. Evaluation management involves monitoring and evaluating the impact and effectiveness of technology in the learning process. Meanwhile, maintenance involves the upkeep and repair of technology equipment and software. Regarding projects, technology leadership needs to plan and implement technology projects strategically to achieve objectives and long-term success.

"Technology management involves planning and coordination of all technology aspects in the school... measurement and evaluation skills are part of the technology understanding package that a technology leader must have." (P1; P5)

Furthermore, organizational planning management also involves aligning technology with the organisation's goals, vision, and strategies. Technology leaders need to plan the use of technology to support the long-term objectives of the school and ensure the sustainability of technology integration. Technology leadership requires skills in providing management support to staff and offering technical guidance when needed. This includes providing direction and training to ensure staff can integrate technology smoothly into their daily routines.

"Important components in technology management for school technology leaders include planning skills... The leaders themselves need to be a management support tool to ensure smooth management operations. As a technology leader, you must be a technology cheerleader, encouraging the spirit of innovation." (P6)

School leaders also need to plan strategic plans that include long-term goals, needs assessment, and strategy development to guide the sustainable development of technology. The leader's broad vision regarding technology's role in the school organization becomes an essential foundation for holistic integration. The school vision serves as the leading guide in formulating long-term and organizational strategies, setting clear goals, identifying needs, and planning strategies that align with the school's values. These three components are interconnected, forming a solid foundation for effective technology leadership in schools.

"...leaders need to plan long-term strategies that will direct technology development in the school... The vision about technology is about looking forward, far beyond what technology can do for the school. Technology leaders must be able to explain the vision... Must set clear goals, identify needs, and make the right strategies to achieve the goals." (P4; P6; P8)

By having clarity in setting long-term goals, developing directed organizational strategies, and formulating a guiding school vision for holistic technology use, educational leaders can play a key role in guiding schools towards the effective use of technology in line with the high educational mission and values. The need for having clear long-term goals in the context of educational technology must be addressed. By setting specific and measurable goals, school leaders can provide clear guidance for technology development in their educational environment. For example, increasing students' digital skills or integrating technology into the curriculum can serve as the foundation for strategy and policy development.

Moreover, developing directed organizational strategies is important to ensure effective and continuous technology use in schools. This involves resource allocation, staff training, technology infrastructure, and monitoring and evaluating progress. By having well-planned strategies, school leaders can ensure that technology use is based on real needs and supported by adequate support and resources.

Thus, educational leaders have a major responsibility in guiding schools towards the effective use of technology in line with the educational mission and values. Having clear long-term goals, directed organizational strategies, and a guiding vision can create an environment where technology is used effectively to enhance student learning experiences and achieve better educational outcomes.

INDIVIDUAL COMPETENCE

In the findings from the interview research, school leaders' determination of the components of technology leadership competence standards shows that individual competence is an important component. The effectiveness of school leaders in technology leadership is how well they can master and practice certain skills in an individual context.

These findings emphasize that individual competence includes various aspects, such as providing guidance, creativity, staff training, encouragement, motivation, following trends, setting school missions, vision, goals, recognition, and encouraging innovation. This sub-theme provides an in-depth understanding of the need for school leaders to master specific skills and traits to succeed in technology leadership. Leaders who succeed in technology leadership in schools are individuals who have several key traits and perform important roles. Researchers found from this study that competent leaders play a significant role in determining the direction and success of technology integration. One of the main competencies is the ability to provide effective guidance. Leaders who can provide direction and support to school staff in integrating technology wisely can create an environment where innovation and technology adoption can thrive. Statements from study participants emphasize the importance of communicative leaders who stimulate a culture of innovation by providing space for creative ideas. This shows that providing guidance is about giving direction and stimulating creativity and innovation.

"...Communicative leaders also stimulate a culture of innovation by providing space for ideas... Must try new things, uh... experiment, uh... find creative ways to use technology in teaching..." (P3; P5)

Creativity is another individual competence that emerged in the context of technology leadership in schools. Leaders who can find creative ways to use technology in teaching, such as experimenting and new approaches, can open up space for more effective use of technology. Creative leaders not only follow trends but also create new trends by looking ahead and developing a technology vision that matches the needs and objectives of the school. School leaders must be able to conduct staff training to ensure that school staff can effectively use technology in their daily work. Training should include technical aspects and how to use technology to achieve educational goals. This involves providing opportunities for staff to learn and develop their technology skills, as well as recognizing and encouraging innovation in technology use.

"The competence of technology leaders also involves providing training, uh... technology support for staff. They must ensure that all school staff know how to use technology effectively and wisely. Must provide a supportive environment where staff can feel comfortable experimenting and trying new things." (P1; P4)

Individual competence also includes setting clear school missions, visions, and goals. Leaders who can communicate and implement school missions and visions related to technology can direct school efforts towards the right objectives. Setting goals that align with the vision of technology use in the school ensures that all technology initiatives are on the right path and contribute to the overall vision and mission of the school.

In conclusion, individual competence in technology leadership involves various aspects that complement and support the overall leadership process. By mastering these competencies, school leaders can effectively lead their organizations in integrating technology to enhance educational outcomes and achieve school objectives.

DISCUSSION

COMPETENCY STANDARDS FOR SCHOOL LEADERS IN TECHNOLOGY LEADERSHIP

Based on interviews with eight study participants, the findings indicate that six standard components can be used as the competency standards for digital leadership for school leaders. These six components include leadership, policy and organizational culture, educational technology, collaboration and communication, organizational management, and individual competence.

These six components form a holistic foundation for the competency standards of digital leadership for school leaders. The integration and development of standards in these six components will help school leaders respond to challenges and opportunities in the digital age, ensure the sustainability of digital learning, and lead schools to educational excellence.

LEADERSHIP

Understanding that changes in technology happen quickly and broadly, school leaders need to have the flexibility to understand and accept these changes. Peng (2021) supports this view by revealing the importance of a deep understanding of technological developments for wise decision-making in the context of leadership. Fairness and accountability also play an essential role in ensuring integrity in technology-related decision-making. Emphasizing these elements is a primary basis for technology leadership. As stated by Robinson et al. (2008), accountability has been proven important for the successful integration of technology in educational contexts.

Motivation is a crucial element in technology leadership, as it drives the spirit and desire to continue learning, ultimately leading to better learning outcomes through technology. Leaders in this field must possess high moral skills and motivation to inspire others (Faulks et al., 2021). Resilience is another key requirement in technology leadership, enabling leaders to effectively face challenges and navigate rapidly changing technological landscapes (Mastronardo et al., 2022). Collaboration and innovation are also vital aspects of technology leadership, with studies emphasizing the importance of cooperation within educational settings to drive change and foster innovation in technology use (Akib et al., 2022). Leadership is important in facilitating agile transformations and enabling teams to adapt to changing methodologies effectively (Rangavittal, 2023). Good leadership encourages the emergence of innovations and is essential for organizational resilience and commitment (Üstgörül, 2023). Additionally, leadership behaviours such as vision sharing, task leadership, and change management are linked to employee and organizational resilience in various sectors, including tourism (Prayag et al., 2023). Furthermore, vigilant leadership is crucial for promoting organizational resilience, especially during times of crisis (Suandi et al., 2022).

Overall, effective technology leadership requires a combination of adaptability, fairness, motivation, resilience, and collaborative innovation. Technology leaders who can understand and accept changes, motivate others, and ensure integrity and accountability in their actions will be important in leading schools towards technological advancement. All these elements complement each other, building a solid foundation for effective technology leadership.

POLICY AND ORGANIZATIONAL CULTURE

Organizational culture is not just a foundation but a basis for shaping the effectiveness of technology integration in schools. Interview findings show that success in implementing technology in education depends on a deep understanding of the values, norms, and beliefs underlying organizational culture. Yusof et al. (2019) also highlight the importance of organizational culture as a framework for technology integration in schools, emphasizing sensitivity to organizational culture as a critical factor in aligning technology with the educational context.

Furthermore, long-term strategies are critical in connecting technology with school culture. Technology integration is a process that requires detailed planning and involves all parties in the educational institution. Research by Yusof et al. (2019) underscores the need for

effective planning strategies to incorporate technology into the existing school culture. Therefore, technology leaders must have a strong vision and solid planning to achieve effective technology integration.

Strategic planning skills, including management and evaluation, are vital elements in school technology leadership. Yusof et al. (2019) also emphasize strategic planning skills as essential factors in technology leadership, including the management of technological resources. This highlights the need for leaders to have comprehensive competence, including planning and managing technological resources efficiently to achieve set educational goals.

Aspects of ethics and integrity play a significant role in technology leadership. Integrity is considered the foundation of trust in driving technology use. Muriuki and Ombaba (2018) stress that integrity plays a vital role in building trust in transformational leadership, including in technology use. Efficient management of technological resources also emphasizes the need for ethical aspects, where leaders must consider the moral implications of every step in technology management (Schoemaker et al., 2013).

Overall, that finding clearly shows the importance of organizational culture, strategic planning, ethics, and integrity in technology leadership in educational institutions. All these elements are interconnected and interact, forming an effective and responsible technology leadership landscape. Technology integration involves cultural change, effective strategic planning, and responsible technology management. These findings align with the holistic approach outlined by the literature in the context of school technology leadership.

EDUCATIONAL TECHNOLOGY

In facing the challenges of school management in an ever-evolving technology era, technical competence needs to be prioritized to enhance the effectiveness of educational institutions. All school leaders need a deep understanding of the latest technological developments as an important aspect of technical competence. Peng (2021) supports this view by emphasizing that leaders need to understand the basics of technology and the latest developments to make wise decisions.

Thus, technical competence is not just about basic knowledge but involves a deep understanding of the changing technological world. Yusof et al. (2019) emphasize that technical competence allows leaders to provide clear instructions to their teams. Therefore, leaders need to integrate computer hardware knowledge and understanding of current technology trends in every decision to guide the school towards betterment. Technical skills, including online technology use, strategy building, computer use, applications, technological tools, skills in acquiring equipment, and network management, have become essential aspects of maximizing technology utilization in an educational context (Pope, 2019; Omar & Ismail, 2020).

Communication skills form the backbone of interpersonal relationships in technology leadership in schools. Yusof et al. (2019) state that communication skills are a factor in the success of school leaders in integrating technology to achieve common goals. In the context of literature, quality interpersonal relationships are explained as an important aspect of achieving success in an organization (Yusof et al., 2019). Therefore, leaders experienced in communication while developing and integrating technology can build effective relationships, provide more precise instructions, and achieve goals more efficiently. Productivity and operational efficiency are the focus of improving school management. Smooth operations optimized as a primary objective highlight accountability and emotional well-being as critical elements. Cortellazzo et al. (2019) emphasize that smooth operations and resource optimization are essential to achieve organizational success. The literature also highlights accountability and emotional balance as important

factors reflecting integrity in leadership (Nagarajan & Edwards, 2015). Therefore, productivity and efficient operations require leaders with accountability and emotional balance to achieve integrity in the organization.

Being proficient in technology is essential in facing the increasingly complex digital era. Technological skills are becoming more important, and leaders must continuously enhance their skills. Klein (2020) supports this view by emphasizing the need for leaders to continue learning and improving their skills to remain relevant. Therefore, technology skills are recognized as a decisive element that will remain relevant and provide practical guidance in the ever-evolving technological era.

Overall, the emphasis on technical competence, communication skills, productivity, operational efficiency, and proficiency in technology leads to a better understanding of how technology leadership can play an important role in improving school management. The combination of these elements not only ensures the availability of sufficient technological knowledge and skills, but also forms effective relationships, achieves efficient operations, and confidently faces technological challenges.

COLLABORATION AND COMMUNICATION

In the context of technology leadership in schools, new elements in the interviews show that successful leaders must understand the importance of collaboration, good relationships, and practical communication skills. The interview findings highlight the importance of working with various parties, including school staff, parents, and the local community. Successful leaders understand that successful technology integration depends on the leaders and school staff and requires active support from parents and the community. This emphasis is in line with the findings of Yusof et al. (2019), which emphasize the importance of organizational culture as a framework for technology integration in schools, with sensitivity to organizational culture as a critical factor.

Technology leaders must have skills in engaging the school community and enhancing staff capacity through training. The focus on individual capacity building in the school community reflects the leader's readiness to see technology as a tool to improve staff skills and knowledge. These findings align with the emphasis of Yusof et al. (2019) on the need for leaders to have a strong vision and solid planning to achieve effective technology integration.

Additionally, the collaboration between school leaders and teachers is important in managing and maintaining technology in schools. These findings show the importance of strategic relationships between leaders and teachers to ensure successful technology integration. This aligns with the findings of Yusof et al. (2019), emphasizing strategic planning skills and the need for comprehensive competence in planning and managing technological resources efficiently.

Leaders also need to understand the importance of support from the external community to ensure smooth technology integration. The findings highlight the need for cooperation with external parties such as educational service providers, local authorities, and the community to support technology implementation in schools. This aligns with the findings of Schoemaker et al. (2013), which emphasize the importance of collaboration between internal and external parties to ensure successful technology integration. Overall, the findings provide a clear picture of the importance of collaboration, good relationships, and practical communication skills in school technology leadership. Integrating these elements forms a holistic approach to ensure successful technology integration in the school context.

ORGANIZATIONAL MANAGEMENT

Organizational management is a vital component of effective technology leadership. Findings from the interviews highlight the need for robust management systems and strategic planning to ensure the smooth integration of technology in schools. Leaders must have the skills to manage technological resources efficiently and make strategic decisions to optimize the use of technology in the educational process. This is supported by studies that emphasize the importance of management systems and strategic planning in effectively implementing technology in schools (Yusof et al., 2019).

Furthermore, the findings underscore the importance of continuously evaluating and improving technology integration processes. Leaders need to establish regular assessment and feedback mechanisms to ensure that technology is used effectively to enhance educational outcomes. This aligns with the emphasis on continuous improvement and feedback mechanisms as essential elements of effective organizational management (Yusof et al., 2019).

In addition, the interview findings highlight the need for leaders to have financial management skills to allocate resources effectively for technology integration. This includes budgeting for technological infrastructure, training, and maintenance to ensure sustainable use of technology in schools. Financial management skills are essential for leaders to make informed decisions and prioritize investments in technology that align with the school's educational goals (Yusof et al., 2019).

Overall, the findings from the interviews provide a comprehensive understanding of the critical components of organizational management in the context of technology leadership in schools. Effective management systems, strategic planning, continuous evaluation, and financial management are essential for successful technology integration in educational institutions.

INDIVIDUAL COMPETENCE

Individual competence is a critical component of effective technology leadership in schools. Interview findings emphasize the importance of personal skills, knowledge, and attitudes in leading technology integration. Leaders need to deeply understand technology and its potential to enhance educational outcomes. This includes staying updated with the latest technological trends and developments to make informed decisions (Peng, 2021).

Furthermore, the findings highlight the importance of continuous professional development for leaders to enhance their technology-related skills. This includes participating in training programs, workshops, and seminars to stay abreast of the latest advancements in educational technology. Continuous professional development is essential for leaders to build their competence and effectively lead technology integration in schools (Yusof et al., 2019).

In addition, the interview findings emphasize the importance of personal attributes such as adaptability, resilience, and a positive attitude towards technology. Leaders need to be open to change and embrace new technologies to drive innovation in the school. Personal attributes such as adaptability and resilience are essential for leaders to navigate the challenges and complexities of technology integration (Yusof et al., 2019).

Overall, the findings from the interviews provide a comprehensive understanding of the critical components of individual competence in the context of technology leadership in schools. Personal skills, continuous professional development, and positive personal attributes are essential for effective technology leadership in educational institutions.

CONCLUSION

LIMITATIONS

While the study provides valuable insights into the role of digital leadership in educational environments, it is important to recognize its limitations. Firstly, the research may be confined to specific educational contexts or regions, which could limit the generalizability of its findings. Educational settings vary widely in terms of technological infrastructure, cultural norms, and policy frameworks, and the study's conclusions may not be applicable in all contexts. Furthermore, the reliance on self-reported data from educational leaders may introduce biases or inaccuracies, as participants' perceptions and experiences can vary significantly. Another limitation is the rapidly changing landscape of technology in education; as new tools and strategies emerge; the study's findings may quickly become outdated. These factors suggest the need for ongoing research that explores digital leadership across diverse educational contexts and keeps pace with technological advancements.

CONCLUSION

Proficiency in digital leadership is essential for the successful integration and advancement of technology within educational environments. Effective digital leaders must demonstrate strategic foresight, adaptability, and a deep understanding of educational goals. Their ability to navigate the complexities of technological change and foster a culture of continuous improvement and innovation is critical. Collaboration among stakeholders is a key element of their success, ensuring that technological tools are seamlessly integrated into teaching and learning processes, thereby enhancing educational outcomes.

The findings of this study underscore the pivotal role of digital leadership in shaping the future of education. By contributing to the growing body of literature on the subject, this research highlights the importance of school leaders in driving the digital transformation of education. The report also emphasizes the need for comprehensive training programs that equip educational leaders with the necessary skills to effectively manage and integrate technology.

From a practical standpoint, these insights are invaluable for policymakers and educational administrators. Recognizing the importance of digital leadership, they can implement targeted professional development programs aimed at enhancing the technological expertise of school leaders. Schools that prioritize digital leadership are better positioned to adopt innovative teaching methods, support personalized learning, and foster effective communication among students and staff. This approach not only enriches the learning experience but also prepares students with the skills needed to thrive in a technologically advanced and interconnected world.

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