



Digital Leadership Strategies of School Principals in Addressing the Gap in Teachers' Technology Adoption in Junior High Schools

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Abstract

Digital transformation in education—particularly in schools—demands adaptive leadership from principals; however, disparities in technology adoption and adaptation among teachers remain a major challenge and obstacle to effective education delivery. This study aims to analyze the digital leadership strategies implemented by the principal of SMPN 3 Parenggean to address the gap in teachers' technology adaptation. The research employs a qualitative approach with a case study design. Data were collected through in-depth interviews with the principal, vice-principals, and teachers, as well as through participant observation and document analysis. Data validity was verified via source and technique triangulation, while data analysis utilized the interactive model developed by Miles, Huberman, and Saldana, comprising data reduction, data display, and conclusion drawing. The findings indicate that the principal employs a strategic approach involving four key strategies: first, establishing a digital vision to alleviate teachers' stress and anxiety regarding technology; second, initiating a peer-mentoring system pairing proficient teachers with senior teachers; third, implementing phased upskilling based on a Training Needs Analysis (TNA); and fourth, instituting digital-based administrative policies. Viewed through the lens of the Technology Acceptance Model (TAM), these strategies proved effective in enhancing teachers' perceptions of the utility and ease of use of the technology. Digital leadership that combines structured competency development with collaborative mentoring can significantly accelerate teachers' technology adaptation and minimize the digital divide within the school.

Keywords: Teacher Technology Adaptation, Digital Leadership, Teacher Digital Divide, Principal Strategies

Abstrak

Transformasi digital dalam dunia pendidikan terutama sekolah menuntut kepala sekolah untuk memiliki kepemimpinan yang adaptif, namun kesenjangan adopsi dan adaptasi teknologi di kalangan guru masih menjadi tantangan dan hambatan utama dalam penyelenggaraan pendidikan. Tujuan dari kajian ini adalah untuk menganalisis strategi digital leadership yang diterapkan kepala sekolah dalam mengatasi kesenjangan adaptasi teknologi guru di SMPN 3 Parenggean. Penelitian ini menggunakan pendekatan kualitatif dengan desain studi kasus. Data dikumpulkan melalui wawancara mendalam dengan kepala sekolah, wakil kepala sekolah dan guru, observasi partisipan, serta analisis studi dokumentasi di sekolah. Keabsahan data diuji melalui triangulasi sumber dan teknik, sedangkan analisis data menggunakan model interaktif Miles, Huberman, dan Saldana yaitu mulai dari reduksi data, penyajian data, hingga penarikan kesimpulan. Hasil kajian ini menunjukkan bahwa kepala sekolah menerapkan pendekatan strategis melalui empat strategi utama, yaitu: Pertama, membangun visi digital untuk mengurangi tingkat tekanan dan kecemasan teknologi guru, Kedua, menginisiasi sistem pendampingan teman sejawat antara guru mahir dan guru senior, Ketiga, melaksanakan upskilling bertahap berbasis Training Needs Analysis (TNA), dan Keempat, memberlakukan kebijakan administrasi berbasis digital. Jika ditinjau dari Technology Acceptance Model (TAM), maka strategi ini terbukti efektif meningkatkan persepsi kegunaan dan persepsi kemudahan atau manfaat para guru di sekolah. Kepemimpinan digital yang memadukan peningkatan kompetensi terstruktur dengan pendampingan kolaboratif mampu mempercepat adaptasi teknologi guru secara signifikan dan meminimalisasi kesenjangan digital di sekolah.

Kata Kunci: Adaptasi Teknologi Guru, Digital Leadership, Kesenjangan Digital Guru, Strategi Kepala Sekolah

1. Introduction

Digital transformation in global education has shifted from being an option to becoming a necessity, both legally and practically (Prihatrin et al., 2025). In Indonesia, the Ministry of Basic and Secondary Education and the Ministry of Higher Education, Science, and Technology are vigorously driving school digitalization through the use of the *Merdeka Mengajar Platform* (PMM) or the GTK Space, *Belajar.id* accounts, Interactive Flat Panel (IFP) displays, and Chromebooks for the Computer-Based National Assessment (ANBK), the Academic Ability Test (TKA), and other platforms (Sutono et al., 2024). This policy necessitates an acceleration of teachers' digital competencies to ensure that the learning process remains relevant to the characteristics of Generation Alpha students. Teachers are no longer expected merely to master conventional pedagogical material; rather, they must be capable of integrating it into a digital ecosystem to create meaningful learning experiences.



However, the reality on the ground reveals a significant disparity in the speed of technology adoption among teachers. This digital divide is generally driven by demographic factors such as age (the difference between "digital natives" and "digital immigrants"), limited infrastructure access in certain regions, and high levels of anxiety regarding technology (Oktavianoor, 2020). If this gap is left unaddressed without optimal intervention, the quality of educational services in schools will become polarized, with learning effectiveness concentrated solely in classes taught by digitally literate teachers (Syafei, et al., 2024). In bridging this gap, the leadership role of the school principal holds the most strategic and decisive position. It is no longer sufficient for a principal to merely perform traditional managerial functions; instead, they must transform into a digital leader (Diarko & Sulton, 2026). According to Sheninger (2019), digital leadership within an educational setting is the ability of a leader to direct, inspire, and explore technology to enhance a school's culture of quality. (Sheninger, 2019). A digital leader must be able to foster the perception that technology is a tool that facilitates ease of use and delivers tangible benefits—perceived ease of use and perceived usefulness—in line with the principles of the Technology Acceptance Model (TAM) developed by Davis (Davis, 1989). Through an adaptive leadership approach, the school principal can minimize resistance from senior teachers while simultaneously optimizing the potential of young teachers as drivers of classroom innovation. SMPN 3 Parenggean, an educational institution located in Karang Sari Village, Parenggean District, East Kotawaringin Regency, Central Kalimantan, faces a tangible challenge regarding the gap in technology adoption. As a school situated in a regional area, the varying levels of digital proficiency among teachers serve as a major obstacle to optimizing technology-based learning. Preliminary observations reveal a clear disparity between younger, adaptable teachers and senior teachers who remain reliant on conventional methods. Although the government has begun distributing technological infrastructure, it has not yet been utilized to its full potential across the board, largely due to a lack of confidence among some teachers in operating the equipment (Sitompul et al., 2025). This situation requires school principals to formulate digital leadership strategies that focus not only on hardware procurement but also on managing changes in teachers' behavior and work culture.

Previous research on digital leadership has generally focused on schools in urban areas characterized by stable internet infrastructure and relatively homogeneous human resource readiness ((Zhu et al., 2025); (Sterrett & Richardson, 2020)). Previous research on digital leadership conducted by Silalahi et al. (2025) highlights the roles of school principals and teachers in the implementation of digital leadership and the digitalization of education, as well as students' digital proficiency amidst technological advancements in high schools (Silalahi et al., 2025). The study affirms that effective digital leadership, adequate infrastructure support, and continuous training for teachers and students are key factors in creating a "Golden Generation 2045" ready to compete in the digital era. Furthermore, research on digital leadership was conducted by Napitu et al. (2026), examining the new competencies required of education managers to navigate the Society 5.0 era. The study concludes that future education managers must transform from bureaucratic administrators into digital humanists capable of leveraging technology to humanize the education ecosystem (Napitu et al., 2026). Some literature also tends to focus on the quantitative correlational relationship between digital leadership and teacher performance at a macro level, without dissecting the adaptation process at the grassroots level. There is a scarcity of in-depth qualitative studies exploring the mechanisms for addressing the technology adoption gap in secondary schools—particularly in rural areas—characterized by disparities in teacher demographics. Therefore, this study aims to fill that gap in the literature. Its novelty lies in the contextualization of the school principal's digital leadership strategy, which integrates a formal structural policy approach with humanistic methods—such as peer tutoring or buddy systems—to alleviate technostress among teachers in regional areas. The study specifically examines SMPN 3 Parenggean as a representative regional school striving to make a leap toward a digital culture despite geographical limitations. Against this backdrop, the research aims to conduct an in-depth analysis of the principal's digital leadership strategies regarding the establishment of a digital vision and the implementation of peer-mentoring programs, while also identifying the factors that facilitate or hinder the process of technology adoption among teachers at SMPN 3 Parenggean.

2. Literature Review

2.1. The Concept of Digital Leadership in Education

Digital leadership in the school environment is not just the principal's ability to operate hardware or software, but rather the strategic capacity to lead, inspire, and move the entire school ecosystem towards a meaningful digital cultural transformation (Sheninger, 2019). Effective digital leaders must possess a deep understanding of how technology can optimize learning processes and the efficiency of school administrative governance (Sterrett & Richardson, 2020).

According to adaptive leadership theory, school principals are required to be not only visionaries but also facilitators capable of reducing cultural resistance to systemic change (Heifetz et al., 2009). At the junior high school level, digital leadership is manifested through the formulation of an inclusive technology vision, the provision of relevant infrastructure, and the creation of a work atmosphere that supports digital experimentation without the fear of failure (Mukhlisin et al., 2024).



2.2. The Gap in Teachers' Technology Adaptation and Technostress

The gap in technology adoption among educators has shifted from an issue of physical access to a disparity in the capacity for meaningful utilization (Ragnedda & Muschert, 2018). This phenomenon is generally influenced by demographic factors such as age gaps, educational backgrounds, and inherent levels of digital literacy (Van Deursen & Van Dijk, 2019). Sudden, massive demands for technology integration often trigger technostress among senior teachers. Technostress is defined as a negative psychological state characterized by anxiety, mental exhaustion, and a sense of helplessness resulting from an inability to adapt to new technologies (Tarafdar et al., 2007). The manifestations of technostress encompass two primary dimensions: techno-overload, characterized by a sense of being overwhelmed by the flow of data and seemingly boundless digital work demands (Ragu-Nathan et al., 2008) and techno-complexity, where one feels intimidated by the complexity of new applications that require a long learning curve and trigger a lack of self-confidence (Pradani et al., 2022). Therefore, digital leadership intervention is crucial for alleviating this psychological pressure through a humanistic governance approach.

2.3. Training Needs Analysis (TNA) and Teacher Upskilling

To address the polarization of competencies, teacher upskilling programs must not be implemented in a generalized manner; instead, they must be based on the Training Needs Analysis (TNA) method (McGehee & Thayer, 1961). The classic TNA approach divides training needs analysis into three interacting levels: First, organizational analysis involves examining the readiness of the school's vision, work culture, and infrastructure support regarding the adoption of digital technology (Sonnetag et al., 2003). Second, Task Analysis involves identifying the specific digital competencies that teachers must master to carry out the learning process and administrative reporting in accordance with school standards (Goldstein & Ford, 2009). Third, personnel analysis involves mapping the actual competency profiles of individual teachers to determine who requires training and which modules are most relevant to them (Noe, & Kodwani, 2018). Through TNA, a phased upskilling program initiated by the school principal can precisely and efficiently address the root causes of the digital divide.

2.4. Peer Support System (Buddying System)

The buddying system is a form of informal knowledge transfer within an organization, established through short-to medium-term collaborative partnerships (Kram, 1985). In the context of school digitalization, this system pairs digitally proficient teachers with senior teachers who face technological challenges (Prensky, 2001). From a sociological perspective, peer support reduces learning anxiety because the transfer of knowledge occurs without formal hierarchical structures and takes place in a supportive atmosphere (Lieberman & Pointer Mace, 2008). Through this intensive social interaction, senior teachers receive direct, practical guidance, while proficient teachers actualize their competencies as agents of change within the school environment (Wenger, 2002).

2.5. Digital-Based Administrative Policy

While a persuasive approach involving training and mentoring is important, technology adoption requires a reinforcing element in the form of formal structural policies. Digital-based administrative policies act as an external enforcer, transforming voluntary behavior into an organizational professional obligation (DeSanctis & Poole, 1994). When the school principal establishes a formal regulation requiring documents such as lesson plans (RPP) or teaching modules, grade entry, and attendance records to be managed via digital platforms, the school creates a situation where non-digital options are scarce (Fullan, 2016). This regulation compels teachers to continuously practice their digital skills in their daily work, thereby preventing skill decay after the training has concluded (Arthur Jr. et al., 1998).

2.6. Theoretical Framework of the Technology Acceptance Model (TAM)

The successful integration of four digital leadership strategies by school principals to address the teacher gap is best analyzed using the Technology Acceptance Model (TAM) developed by Davis (Davis, 1989). TAM states that an individual's acceptance of a new technology system is determined by two key belief variables: first, Perceived Usefulness—the extent to which teachers believe that using the technology will enhance their teaching performance and work efficiency (Davis, 1989). Strategies for developing a digital vision and formal administrative requirements directly shape this perception by demonstrating the tangible benefits of technology for the teaching profession (Venkatesh & Davis, 2000). Second is Perceived Ease of Use—the extent to which teachers believe that a new technology system does not require significant effort to master (Davis, 1989). This dimension is significantly influenced by TNA-based upskilling strategies and buddy system mentoring. Direct assistance from peers alleviates apprehension and simplifies the technology learning process for senior teachers (Venkatesh et al., 2003). As these two perceptions increase, teachers' behavioral intention to utilize technology strengthens, ultimately driving consistent technology adoption at SMPN 3 Parenggean.

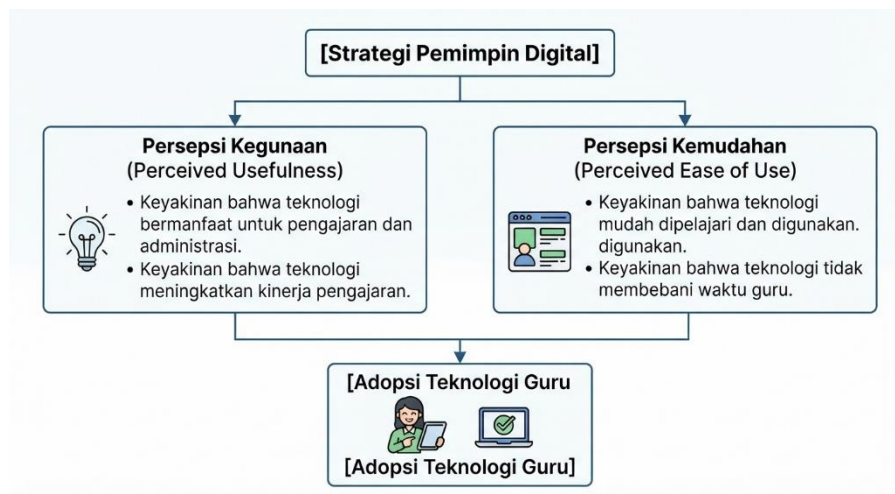


Figure 1. Digital Leadership Strategy using TAM

3. Conceptual Framework

3.1. Conceptual Framework

This study analyzes how the digital leadership strategies implemented by school principals can bridge the gap in teachers' technology adoption and mitigate technostress (Ragnedda & Muschert, 2018; Tarafdar et al., 2007). This conceptual model emphasizes that adaptive interventions by school principals do not immediately alter teachers' behavior; rather, they do so by first triggering internal psychological stimulation (Heifetz et al., 2009). By implementing four key strategies, the school principal directly targets two cognitive pillars of the Technology Acceptance Model (TAM): Perceived Usefulness and Perceived Ease of Use (Davis, 1989): First, establishing a digital vision and digital administration policies directly stimulates Perceived Usefulness. This strategy shapes the school's digital culture, reduces ambiguity, and positions technological proficiency as a highly valued professional necessity (Fullan, 2016; Sheninger, 2019). Secondly, the peer-buddying system and TNA-based upskilling directly stimulate the perception of ease of use. This strategy flattens the learning curve, provides a safe practice environment, and transforms complex digital tools into practical steps that are easy to master (Kram, 1985; McGehee & Thayer, 1961). Ultimately, when teachers perceive school technology as beneficial to their work and easy to learn, their behavioral intentions shift toward Accelerated Teacher Technology Adoption, effectively eliminating the second-level digital divide at SMPN 3 Parenggean (Venkatesh & Davis, 2000).

3.2. Visual Diagram of the Conceptual Framework



Figure 2. Conceptual Framework

3.3. Operational Matrix of Relationships Between Variables

The matrix below maps empirical field implementations to the theoretical constructs of TAM:



Theoretical Construct (TAM)	Strategic Intervention by the School Principal	Operational Indicators at SMPN 3 Parenggean	Expected Teacher Behavioral Outcomes
Perceived Usefulness	1. Digital Vision 2. Digital Administration Policy	1. Periodic dissemination of the school's digital vision. 2. Mandate for completing electronic report cards, digital teaching modules, and online attendance records. 3. Elimination of paper-based administrative processes (transition to a paperless system).	1. Teachers view digital systems as time-savers rather than an additional workload. 2. There is growing awareness that technology is an essential professional asset.
Perceived Ease of Use	1. Peer Buddying System 2. TNA-based Upskilling	1. Pairing junior or proficient teachers with senior teachers. 2. Periodic training with content tailored to the teachers' initial proficiency levels. 3. A supportive, non-intimidating group learning environment.	1. A reduction in the level of technology-related anxiety (technostress). 2. Senior teachers are able to operate digital platforms independently, without relying entirely on operators.

4. Research Questions

What is the school principal's digital leadership strategy for addressing the gap in teachers' technology adoption at SMPN 3 Parenggean?

5. Significance of Study

The findings of this study on the digital leadership strategies of the principal at SMPN 3 Parenggean are expected to make a significant contribution, both theoretically to the advancement of educational management science and practically to the implementation of school digitalization policies.

5.1. Theoretical Benefits

a. Advancement of Digital Leadership Management Knowledge: This research enriches the body of literature on educational management, specifically regarding adaptive digital leadership models for junior high schools in regional areas.

b. Contextualization of the Technology Acceptance Model (TAM): This study provides empirical contributions by expanding the application of TAM within the school environment. It demonstrates how leadership interventions (such as buddying systems and Training Needs Analysis/TNA) can tangibly influence teachers' psychological variables—specifically Perceived Usefulness and Perceived Ease of Use.

c. Contribution of the Technostress Mitigation Construct: This research serves as a scientific reference on how technology-related anxiety among senior teachers can be alleviated through a collaborative and humanistic organizational culture approach.

5.2. Practical Benefits

a. For School Principals: Serves as a practical reference and blueprint for managing digital transitions and addressing resistance to change among a diverse workforce; provides a concrete example of implementing Training Needs Analysis (TNA) to ensure that budget allocations and teacher training programs are based on actual individual needs rather than being wasted.

b. For Teachers and Education Personnel: Demonstrates that a peer-mentoring (buddying) system can create a safe, intimidation-free learning environment for senior teachers to catch up on technology, while fostering a collaborative work culture where digitally proficient younger teachers and pedagogically experienced senior teachers complement one another.

c. For the East Kotawaringin Regency Education Office: Provides an empirical snapshot and policy recommendations for school supervisors and the district-level education office when designing regional school digitalization programs. A



school-based buddying system can be adopted as an alternative to mass training—which is often ineffective—and serves as a successful example of how regional schools can minimize the "second-wave" digital divide.

d. For Future Researchers: Serves as secondary data, comparative material, or a starting point for other researchers wishing to examine topics such as digital leadership, digital school culture, or teacher technology adoption using broader qualitative methods.

6. Research Methodology

This study employs a qualitative approach with a descriptive case study design. This approach was selected because the researcher aims to dissect, understand, and deeply explore the contemporary dynamics surrounding school principals' digital leadership strategies within the real-world context of the school environment (Creswell, & Poth, 2017). The study was conducted at SMPN 3 Parenggean in East Kotawaringin Regency, Central Kalimantan. This location was selected purposively due to the school's unique characteristics: situated in a regional area yet actively accelerating its digital transformation amidst significant disparities in technological proficiency among teachers. The data for this study were derived from primary and secondary sources. Informants were selected using purposive sampling to ensure the depth and relevance of the information (Meleong, 1989). The key informant in this study was the Principal of SMPN 3 Parenggean, who served as the central figure in formulating the digital leadership strategy. Supporting informants consisted of two teachers classified as "digital natives" (acting as peer tutors), two senior teachers classified as "digital immigrants" (as the target audience for the adaptation program), and one school operator (providing technical support). Secondary data were obtained from supporting documents such as the school work plan (RKS), internal digital training modules, official decrees regarding the mentoring program, and visual documentation of technology-related activities at the school.

Data collection was conducted between March and May 2026 using three primary techniques: in-depth interviews, participant observation, and document analysis (Sugiyono, 2021). In-depth interviews were conducted using a semi-structured interview guide developed based on Eric Sheninger's pillars of Digital Leadership and the Technology Acceptance Model (TAM) instrument. Participant observation was employed to directly observe teachers' behavior regarding the use of digital tools during classroom instruction and the interaction dynamics within the peer-tutoring program. Document analysis was used to verify written policies and records concerning the digitalization of school administration. To ensure data validity and reliability, the researcher applied triangulation techniques, comprising source triangulation (comparing interview data from the principal, junior teachers, and senior teachers) and methodological triangulation (comparing interview data with field observations and documentary evidence). Data analysis was conducted in a cyclical and continuous manner, following the interactive model developed by Miles, Huberman, and Saldaña (2014) (Miles et al., 2014). The analysis process comprises three main stages that occur simultaneously. The first stage is data condensation, wherein interview transcripts, field notes, and documents are selected, focused, and simplified to eliminate information irrelevant to the research problem. The second stage is data presentation, in which the condensed data is systematically organized into narrative matrices and logical relationship charts to facilitate an understanding of leadership strategy patterns. The third stage involves drawing and verifying conclusions; here, the researcher interprets the presented data, tests its alignment with propositions from the TAM theory and digital leadership concepts, and ultimately formulates a solid, objective conclusion regarding the effectiveness of the principal's strategies in addressing the technology adoption gap.

7. Findings

The research was conducted at SMPN 3 Parenggean, a school officially established under Establishment Decree Number 217/O/2000, dated November 17, 2000. The school was built during the early transitional period of regional autonomy in Indonesia to meet the need for secondary education access among the population in the rural areas surrounding the Parenggean District. At its inception, the school relied on very limited physical facilities and a minimal number of teaching and educational staff. Over time, the school continued to develop, eventually achieving a "B" accreditation rating. It has become a key pillar of formal education for adolescents in Karang Sari Village, Parenggean District, and the surrounding areas (SMPN 3 Parenggean Document, 2026). The geographical location of SMPN 3 Parenggean is inextricably linked to the history of Karang Sari Village, where the school is situated; the area is a former national transmigration site established in the interior of East Kotawaringin several decades ago. Situated in a region dominated by plantation and mining sectors, this school faces unique demographic and geographical realities regarding the implementation of national digitalization policies. While the school has received government-provided infrastructure—including laptops/Chromebooks and Interactive Flat Panels (IFPs)—along with local internet access, these resources have not yet been utilized to their full potential. Researchers identified a striking disparity in competence: a sharp divide exists between younger teachers—classified as "digital natives"—who intuitively integrate technology into their instruction, and senior teachers—classified as "digital immigrants"—who face both psychological and technical resistance. These objective conditions necessitate the implementation of an adaptive digital leadership strategy by the school principal to bridge the technology gap that threatens to compromise the quality of instructional services.



7.1. Principal Strategies for Building a Digital Vision and Culture

Research findings indicate that SMPN 3 Parenggean has integrated digital transformation into the school's quality vision. The principal's initial step was to alleviate technology-related anxiety (technostress) among senior teachers through a persuasive approach. The principal emphasized that technology is not a substitute for the teacher's role but rather a tool to enhance work efficiency. As stated by the Principal of SMPN 3 Parenggean during the interview: "You see, my biggest challenge at the start wasn't figuring out how to buy laptops, but rather how to ensure senior teachers didn't feel intimidated at the mere sight of a computer or laptop. I gathered them and explained—in a relaxed manner—that these computers weren't there to test them, but to assist with administrative tasks so the workload wouldn't pile up. I guaranteed there would be no sanctions if they clicked the wrong thing or accidentally deleted a file while they were first learning." (Interview, March 12, 2026). The statement indicates that the school principal understands the importance of psychological readiness prior to implementing technical interventions. This step aligns with the "Visionary Planner" pillar of the ISTE standards (2018) (Trust, 2018), where a digital leader must be able to articulate the direction of technological transformation in a human-centric manner so as not to trigger cultural resistance. The successful instilling of this vision was also confirmed by a senior teacher representative, who acknowledged that the principal's empathetic approach effectively reduced their anxiety regarding new tools such as Chromebooks, laptops, and Interactive Flat Panel (IFP) TVs. In an interview, senior teacher KU stated: "I used to get extremely stressed whenever I heard the words 'digital' or 'laptop'; I even felt like taking early retirement. However, the principal approached us personally and motivated us, assuring us that even senior teachers could learn gradually. The work atmosphere became comfortable because there was no pressure that made us feel incompetent." (Interview, March 14, 2026).

This reduction in technostress theoretically confirms the "Perceived Usefulness" aspect of the Technology Acceptance Model (TAM) proposed by Davis (1989). As teachers began to realize that adopting digital platforms—such as Belajar.id accounts—simplified the archiving of instructional materials, their intrinsic motivation to learn increased significantly. The principal successfully fostered a supportive ecosystem where teachers felt safe to experiment and make mistakes during the technical adaptation process.

7.2. The Effectiveness of Peer Tutoring and Phased Upskilling Systems

The gap in technology adoption between "digital native" and "digital immigrant" teachers at SMPN 3 Parenggean is bridged through a "buddy system" program. The principal implemented a policy of pairing a tech-savvy younger teacher with a senior teacher as teaching-learning partners. Regarding the program's mechanics, HSP—a young teacher acting as a peer tutor—explained: "We didn't set up rigid, formal classes. The principal personally paired us up. My role is to assist Mrs. E whenever she has free time or feels unsure while preparing materials on Canva or using the PMM platform. Because the setting is casual—often over coffee in the teachers' lounge—she feels comfortable asking about basics, like how to save a file or connect to Wi-Fi." (Interview, March 16, 2026).

This private, collaborative approach aligns closely with Rogers' (1995) Diffusion of Innovations theory, particularly in encouraging the "Late Majority" and "Laggards" to shift closer to the "Early Majority." Peer tutoring helps dismantle the psychological barriers that might otherwise prevent senior teachers from asking questions. In addition to personal mentoring, the principal implemented phased training based on a Training Needs Analysis (TNA) to ensure that upskilling content did not overlap. The principal added: "We categorized teachers into three proficiency levels after an initial assessment at the start of the year. Teachers at the basic level receive training on fundamental computer operations from a technician first. Meanwhile, we direct younger teachers straight toward TPACK integration, such as using Learning Management Systems (LMS) and interactive videos. This way, no teacher finds the material either too difficult or too easy." (Interview, March 12, 2026). This grouping approach has proven effective in maintaining the organization's learning momentum. Teachers at the secondary level are guided to create interactive learning media based on the TPACK (Technological Pedagogical Content Knowledge) framework (Koehler et al., 2013), so that the enhancement of competence aligns with the capacity readiness of each individual teacher.

7.3. Facilitating and Hindering Factors for Digital Leadership

The implementation of the principal's digital leadership at SMPN 3 Parenggean is shaped by specific factors that influence its success. A key supporting factor is the availability of adequate government-provided devices—such as Chromebooks, laptops, and Interactive Flat Panels (IFP)—alongside a responsive school operator who serves as a daily technical support hub (helpdesk). The school operator (Informant OP) described their role as follows: "The principal assigned me to be on standby in the computer lab during breaks and after school. So, if a teacher's laptop suddenly malfunctions during a lesson or they forget their *Belajar.id* account password, I step in immediately to help and fix the issue. This ensures teachers aren't discouraged from using technology, knowing there is always someone there to handle the technical side." (Interview, March 18, 2026).



The presence of this responsive technical support unit acts as a crucial catalyst, enhancing the teachers' "Perceived Ease of Use" when encountering system issues during class hours. Conversely, obstacles identified in the field include unstable electricity and internet connectivity in the Parenggean district, as well as the limited number of laptops. These geographical and infrastructural challenges are acknowledged as major external hurdles beyond the school management's control. A senior teacher, AK, expressed these concerns: "We have the enthusiasm, but power outages in Parenggean can last for hours; naturally, the school Wi-Fi goes down, and Chromebooks or laptops lose their internet connection. We are forced to revert to manual note-taking on the whiteboard." (Interview, March 14, 2026). To address these infrastructural constraints, the principal has adopted a flexible management approach, allowing materials to be downloaded for offline use when the network is stable and granting deadline extensions for digital administrative submissions to teachers affected by technical disruptions. This adaptive measure demonstrates that effective digital leadership at the local level requires a balance between the firm implementation of regulations and managerial flexibility grounded in on-the-ground realities.

8. Discussion

8.1. Aligning Work Quality Targets (Quality Vision) with a Work Environment Free from Technology-Induced Pressure

The success of digital transformation in educational institutions is often hindered by a structural bias that prioritizes the procurement of physical infrastructure (hardware). However, findings from SMPN 3 Parenggean indicate that the primary determinant of a successful digital transition lies in the leader's capacity to manage the psychological and cultural aspects of human resources. The strategy employed by the principal of SMPN 3 Parenggean—prioritizing the reduction of "technostress" before implementing technology-related policies—validates Sheninger's (2019) argument that digital leadership is not about a leader's technical mastery of devices, but rather their ability to cultivate an organizational culture that adapts to disruption. By offering assurances that no sanctions would be imposed, the principal was able to mitigate the cultural resistance commonly found among senior teachers. Theoretically, this approach supports the expansion of Davis's (1989) Technology Acceptance Model (TAM), wherein anxiety and self-efficacy serve as external variables that directly mediate Perceived Usefulness and Perceived Ease of Use. When the principal successfully eliminated bureaucratic anxiety, the senior teachers' confidence increased. Consequently, they began to view digital platforms (such as PMM and Belajar.id accounts) not as an added administrative burden, but as highly valuable tools for enhancing their teaching efficiency.

8.2. Bridging the Digital Divide Through Peer Mentoring

The gap in technology adoption within schools is often viewed through a dichotomous lens as an intergenerational clash between "digital natives" (younger teachers) and "digital immigrants" (senior teachers). A principal's strategy of implementing a peer-mentoring (buddying) system successfully transformed this demographic hurdle into the school's social capital. Fluid, informal interactions in the staff room eroded the rigid hierarchical psychological barriers typical of school bureaucracies. Senior teachers no longer felt judged for their lack of proficiency, while younger teachers gained an avenue to demonstrate their competence and earn professional recognition from their peers. When analyzed through the lens of Rogers' (2003) Diffusion of Innovations theory, this intervention by the principal represents a highly tactical manipulation of social communication channels. Rogers posits that innovation adoption accelerates when spread through homophilous interpersonal channels—where individuals share similar characteristics or work environments. In this context, younger teachers acted as internal "Change Agents," bridging the gap between the "Innovators/Early Adopters" and the "Late Majority/Laggards" (senior teachers). Furthermore, the implementation of phased training based on a Training Needs Analysis (TNA) ensured differentiated learning pathways for teachers. This approach prevented senior teachers from experiencing cognitive overload. Rather than forcing all teachers to reach a transformative level—such as the "Redefinition" stage of the SAMR model or full mastery of Technological Pedagogical Content Knowledge (TPACK)—the principal set realistic, tiered targets. Senior teachers were guided to master the "Substitution" and "Augmentation" levels (e.g., replacing whiteboards with projectors or migrating from paper report cards to digital systems) as a foundational base, while the integration of complex TPACK competencies was accelerated among the younger teachers.

8.3. Creative Ways to Manage Regional Challenges Based on On-the-Ground Realities

The challenges of digital transformation in areas like Karang Sari Village, Parenggean District, involve a level of external complexity far greater than that found in urban regions. Unstable electricity supplies and fluctuating internet connectivity are critical impediments beyond the control of school management. This presents a crucial test for digital leadership: the ability to demonstrate policy flexibility without compromising the vision of transforming school quality. Strategies employed by the school principal—such as adopting asynchronous policies (allowing materials to be downloaded for offline study at home) and relaxing deadlines for digital administrative tasks—reflect the application of Adaptive Leadership (Heifetz et al., 2009) within the framework of digital leadership. The principal avoids rigidity regarding digital tools, instead positioning technology in a balanced and proportionate manner as an aid rather than the ultimate educational



goal. The presence of a school operator acting as a responsive daily helpdesk serves as a technical safeguard. The availability of ready technical support has proven significant in maintaining teachers' "Perceived Ease of Use." Knowing that a support system is in place to assist them during system failures sustains teachers' confidence in continuing to engage with new technologies.

9. Conclusion

This study concludes that the principal's digital leadership strategy at SMPN 3 Parenggean successfully minimized the gap in teachers' technology adoption through an integrative, tiered, empathetic, and humanistic approach. The principal was able to reduce technostress among senior teachers by fostering a psychologically safe organizational culture; theoretically, this enhanced "perceived usefulness" and "perceived ease of use" within the Technology Acceptance Model (TAM) framework. The demographic divide between "digital native" and "digital immigrant" teachers was effectively bridged by leveraging social capital through a peer-mentoring (buddying) system. This program trained younger teachers to act as approachable communicators for their senior colleagues, thereby encouraging openness to change. Furthermore, the implementation of differentiated training—informed by a Training Needs Analysis (TNA)—combined with managerial policy flexibility in addressing local infrastructure limitations, proved capable of sustaining the technology adoption process in a balanced manner. Digital leadership in regional settings requires not merely the procurement of devices, but also policy flexibility that balances structural digital regulatory demands with the geographical realities on the ground. Based on the research findings, several recommendations are proposed to enhance the effectiveness of future digital transformations. Principals are advised to formalize the peer-mentoring program into Standard Operating Procedures (SOPs) and to provide periodic recognition and rewards to younger teachers who actively serve as peer tutors, thereby sustaining their motivation. The Kotawaringin Timur Regency Education Office is encouraged to provide affirmative support by strengthening internet network stability for schools in regional areas and organizing practical digital leadership training for local principals. Future researchers are advised to expand the scope of study using mixed-methods approaches to quantitatively measure the impact of the principal's digital leadership strategy on improvements in student learning outcomes or the effectiveness of the *Kurikulum Merdeka* (Independent Curriculum) implementation in other regions.

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