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Digital Leadership Strategy in Enhancing Technology-Integrated Pedagogical Practices in Vocational Education

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Abstract
This study aims to represent the phenomenon of school principals' leadership strategies in enhancing collaborative organizational behavior among all school members at SMK Negeri 1 Amandraya. A phenomenological research design was employed using in-depth interviews and observations conducted at SMK Negeri 1 Amandraya. The participants consisted of ten teachers with more than five years of work experience at the school, selected through purposive sampling. Data were analyzed using narrative analysis, supported by data triangulation to ensure credibility. The findings indicate that the principal implemented three main strategies: (1) a digital managerial strategy through the optimization of platforms such as WhatsApp, Google Classroom, the school's e-learning system, and virtual meetings for coordination; (2) an open communication strategy that promotes cross-functional collaboration through digital work groups; and (3) a collaborative culture-building strategy, characterized by habitual sharing of best practices and performance reflection via digital media. Collaborative organizational behavior was reflected in increased work motivation, more effective communication, and reduced internal conflict due to improved information transparency. The results further demonstrate that digital platform utilization strengthens collaborative work culture and enhances the quality of data-driven decision-making. This study recommends the implementation of continuous digital training, the development of standard operating procedures for digital collaboration, and the optimization of a platform-based work ecosystem to improve school organizational performance.

Keywords: Digital Collaboration; Digital Platforms; Organizational Behavior; Organizational Communication; School Principal Strategy

INTRODUCTION

The rapid integration of digital technologies into educational systems has fundamentally reshaped the roles and expectations of school leaders, requiring principals to adopt strategic digital leadership practices that align organizational goals with digitally mediated collaboration and

innovation (Dasruth, Naicker & Smith, 2024). Recent educational research underscores that digital leadership extends beyond technology implementation; it involves fostering an organizational culture that supports collaboration, data-driven decision-making, and inclusive participation across stakeholders (Marfilinda et al., 2025). Strategic leadership in schools is now recognised not just as a means of managing resources, but as a critical determinant of organizational behaviour outcomes, including teacher collaboration, shared decision-making, and knowledge exchange (Gaffar, Juwarto & Haryono, 2025).

School principals who demonstrate strategic use of digital platforms such as learning management systems, communication tools, and cloud-based collaboration environments are better positioned to coordinate complex workflows and support collective learning communities (Kuanyshbayevich, 2025). Empirical findings further suggest that principals' digital leadership competencies significantly influence teachers' readiness for digital innovation, strengthen collaborative practices, and enhance organisational performance (Lukman & Yune, 2025). In this context, strategic digital leadership becomes a vector for transformational change, enabling principals to reframe school cultures toward adaptability, shared responsibility, and professional engagement with digital pedagogies (Hidayat, Patras & colleagues, 2024).

In the 21st century, educational systems globally are undergoing rapid digital transformation, and the role of school principals has evolved from traditional administrators to strategic digital leaders capable of guiding digital innovation in complex school environments (Raptis et al., 2024). School leadership research emphasizes that strategic leadership fosters organisational change, collaboration, and improved outcomes by integrating technology into every facet of school operations (Avolio & Bass, 1995; Raptis et al., 2024). Strategic leadership involves setting a clear vision, mobilising resources, and shaping organisational behaviour towards shared goals, all of which are especially critical when digital platforms are leveraged for collaboration (Leithwood et al., 2004). Research to date has shown positive relationships between principals' digital leadership practices and organisational outcomes like teacher performance (Brown & Green, 2019) and technology-mediated collaboration (Al-Harthi, 2020), but few studies integrate these insights within vocational secondary schools where collaboration across departments and stakeholders is essential yet underexplored.

The growing adoption of digital platforms-learning management systems, collaborative communication tools, and cloud environments-has dramatically altered how school personnel interact (Raptis et al., 2024). Digital platforms have been linked to enhanced teacher collaboration, professional learning communities, and shared decision-making (Rasdiana et al., 2024). However, existing work often examines teacher digital skills or the technical adoption of tools without fully articulating how principals' strategic leadership practices intentionally shape collaborative organisational behaviour through these platforms (Rasdiana et al., 2024; Al-Tanzim, 2022). Few studies focus specifically on how principals drive collective engagement, break down organisational silos, and facilitate cross-stakeholder collaboration—such as between teachers, students, and external partners-using digital platforms in a vocational school setting, where the nature of collaboration extends beyond classroom instruction to industry linkages and competency outcomes (Hidayat et al., 2024; Raptis et al., 2024).

Moreover, the effective utilisation of digital platforms has been linked to improved communication patterns, collective problem-solving, and collaborative instructional planning, all of which are vital elements of positive organisational behaviour in contemporary schools (Iswadi, 2024). Research from diverse educational contexts highlights that when principals intentionally leverage digital tools to facilitate collaboration and interaction, organisational structures become more flexible, transparent, and responsive to the needs of staff and students alike (Haryadi et al., 2025). This is particularly salient in vocational and technical secondary schools where rapid changes in industry expectations necessitate collaborative organisational behaviours that integrate curriculum design, workplace learning, and competency-based outcomes.

Beyond operational coordination, strategic leadership fosters trust and shared vision among school personnel, motivating them to engage in collective reflective practices and continual professional growth supported by digital platforms (Anggiani & Fatonah, 2024). As digital platforms mediate interactions among teachers, students, and external partners, they also shape normative

structures and behavioural expectations that underpin collaborative organisational culture within schools (Halim, Salam & Purna, 2025). Consequently, strategic digital leadership is implicated not only in the technical integration of platforms but also in the cultivation of social capital, organisational learning, and collaborative innovation that are essential for educational improvement.

Furthermore, the digital transformation literature highlights persistent research gaps: while digital leadership is recognised as a key driver for enhancing digital readiness and innovation, its connection with collaborative organisational behaviour mediated by digital platforms remains insufficiently theorised and empirically tested, particularly in technical vocational contexts (Marfilinda et al., 2025; Raptis et al., 2024). Many existing studies focus on general digital adoption or evaluate teacher competencies, but they lack analytical frameworks that connect strategic leadership actions, platform utilisation strategies, and behavioural outcomes such as sustained collaboration, shared leadership, and collective problem solving (Al-Harthi, 2020; Rasdiana et al., 2024). This gap is especially evident in Indonesian contexts like SMK (Sekolah Menengah Kejuruan), where the organisational culture, stakeholder expectations, and collaborative structures differ significantly from primary, secondary, or higher education settings (Hidayat et al., 2024; Raptis et al., 2024).

Beyond its managerial and organizational dimensions, digital leadership must be understood as a pedagogical force that actively shapes a technology-integrated instructional ecosystem within schools. In this ecosystem, digital platforms do not merely function as administrative tools but become embedded within instructional design, coordination, and evaluation processes. Principals who exercise strategic digital leadership influence how lesson planning is structured through shared digital templates and collaborative platforms, how instructional coordination is organized across departments using real-time communication tools, how learning materials are co-developed and refined in cloud-based environments, and how assessment practices are implemented through digital tracking systems and analytics dashboards. Consequently, digital leadership reconfigures instructional workflows and professional interaction patterns, transforming digital platforms into structural components of pedagogical practice rather than optional technological supplements.

While prior studies have examined digital leadership in relation to organizational performance or teacher digital competence, limited attention has been given to how leadership strategies systematically construct and sustain technology-integrated pedagogical practices at the instructional level, particularly in vocational education contexts. Existing research often treats digital platforms as tools for communication or innovation adoption, without conceptualizing their role in shaping lesson planning coherence, cross-functional instructional coordination, collaborative material development, and digitally mediated assessment systems. By foregrounding the instructional ecosystem perspective, this study advances the literature by positioning digital leadership as a strategic mechanism that integrates organizational behavior with pedagogical transformation. This perspective is especially relevant in vocational schools, where instructional practices must align with competency-based curricula, industry standards, and rapidly evolving technological demands.

The present study addresses these gaps by investigating how strategic leadership practices of school principals influence collaborative organisational behaviour specifically through the utilisation of digital platforms at SMK Negeri 1 Amandraya. This research contributes novelty in three key ways. First, it examines strategic leadership beyond mere technology adoption, focusing on how principals intentionally leverage digital platforms to cultivate collaborative norms, shared routines, and professional interaction patterns within the school. Second, it explores and conceptualises the role of digital platforms as interpretive and relational spaces that shape how leadership practices are experienced, enacted, and internalised by school members, rather than treating platforms as neutral technical tools. Third, it situates this inquiry within a vocational secondary school context, where digital collaboration intersects with competency-based instruction, industry alignment, and cross-functional teamwork. Through a qualitative phenomenological approach, this study provides an in-depth understanding of how digital leadership strategies are meaningfully constructed and experienced in shaping collaborative and technology-integrated pedagogical practices.

SMK Negeri 1 Amandraya, as a vocational education institution, is required to develop an organizational culture that is adaptive to rapid technological advancements. Teachers, administrative staff, and all school stakeholders are expected to be integrated within a work system that effectively utilizes digital platforms, such as school management applications, Learning Management Systems (LMS), digital communication groups, and other collaborative tools. However, in practice, the use of digital platforms in schools is often not optimal due to limited digital competencies, resistance to change, and the absence of a structured and strategic leadership approach. Collaborative organizational behavior is therefore essential to enable schools to create a synergistic, transparent, and productive working environment (Ng, P. T., 2019). Digital collaboration facilitates faster information dissemination, more effective cross-departmental coordination, and more accurate planning and performance evaluation. Nevertheless, the situation at SMK Negeri 1 Amandraya indicates persistent challenges, including a lack of integrated use of digital applications among teachers, inconsistent utilization of platforms for official communication, and low levels of collaboration in digitally mediated tasks. These conditions suggest that the principal's strategic leadership in fostering collaborative organizational behavior through digital platform utilization requires deeper examination to ensure that digital transformation within the school can be implemented effectively and sustained over time.

In the specific context of SMK Negeri 1 Amandraya, understanding how principals enact strategic leadership through digital platform utilisation provides insights into how schools can strengthen collaborative organisational behaviour in alignment with 21st-century workforce demands. Drawing on international research on educational leadership, digital transformation, and organisational collaboration, the present study aims to examine how strategic leadership practices of school principals influence collaborative organisational behaviour via the effective use of digital platforms.

RESEARCH METHODS

Research Design

This study employs a qualitative approach through a phenomenological design that focuses on the leadership strategies of the school principal at SMK Negeri 1 Amandraya. Phenomenological research seeks to explore and understand individuals' lived experiences by capturing the meanings they assign to a particular phenomenon within its real-life context (Creswell & Poth, 2018). Through in-depth engagement with participants' narratives, phenomenology aims to reveal the essence of shared experiences, emphasizing subjective perceptions and interpretations rather than objective measurement (Moustakas, 1994).

The study was conducted at SMK Negeri 1 Amandraya, located in South Nias Regency, North Sumatra Province, Indonesia. This school was selected as the research site because it is actively developing the use of digital platforms in school management and instructional processes, as well as promoting collaborative organizational behavior through digital transformation initiatives. Data collection was carried out over a one-month period for in-depth interviews involving ten participants, while observations were conducted over one academic semester to capture teachers' use of digital platforms in their daily professional activities.

Research Subject

The research population comprised all teachers and educational staff at SMK Negeri 1 Amandraya, totaling 61 individuals. From this population, ten participants were selected as research subjects, including the school principal, vice principals, teachers, and administrative staff. All participants met the criteria of having worked at the school for more than five years, ensuring sufficient institutional experience to provide rich and relevant data. Accordingly, purposive sampling was employed to determine the research subjects. In addition to length of service, participants were selected based on their regular use of digital platforms in their professional roles as school leaders, teachers, or educational staff/stakeholder.

Research Procedure

To obtain accurate and in-depth data, this study employed multiple data collection techniques, including observation, in-depth interviews, and documentation. Non-experimental, passive participatory observation was conducted to directly examine patterns of teacher collaboration in digital activities, the utilization of digital platforms such as school management applications, learning management systems (LMS), digital communication groups, and other collaborative tools, as well as daily organizational interactions and cultural dynamics that either supported or hindered digital collaboration. In-depth interviews were carried out using a semi-structured format to allow flexibility while maintaining a clear research focus, exploring the principal's strategies for developing digital collaboration, supporting and inhibiting factors in digital platform utilization, teachers' and staff members' perceptions of digital organizational culture, and the implementation of digital collaboration in school activities. The interview informants included the school principal, vice principals, teachers, and administrative staff. In addition, documentation was used to collect supporting data in the form of school policies related to digitalization, records of digital platform usage, photographs of digital activities and teacher collaboration, and digital administrative documents such as standard operating procedures, activity reports, and digital attendance records, thereby strengthening and triangulating the findings from observations and interviews.

Instruments, and Data Collection Techniques

This study employed research instruments in the form of interview guidelines, as the research procedure involved semi-structured interviews. In addition, an observation checklist was used to guide the observation process, and supporting data were collected through documentation related to the utilization of the Learning Management System (LMS). Data analysis was conducted using data triangulation techniques, as explained in the data analysis technique section, to enhance the credibility and validity of the research findings.

Data analysis technique

This study employed the data analysis model proposed in line with van Manen's hermeneutic phenomenology, the analysis focused on reflective interpretation of lived experiences rather than procedural coding of data. This study employed a descriptive–interpretive qualitative approach. Data analysis did not rely on formal coding categories but emphasized reflective interpretation and contextual meaning-making, as suggested by Creswell (2014) and Denzin and Lincoln (2018). Data reduction was conducted by selecting, simplifying, and focusing data obtained from observations, interviews, and documentation in order to sharpen information related to the principal's leadership strategies, the utilization of digital platforms, collaborative organizational behavior, and the impacts as well as supporting and inhibiting factors of digitalization, while irrelevant data were eliminated to ensure analytical focus. The reduced data were then presented in the form of narratives, tables, matrices, and diagrams to facilitate the identification of patterns and relationships among variables, including digital leadership strategies, forms of digital collaboration, and interrelationships among indicators of organizational behavior. Finally, conclusions were drawn based on emerging data patterns and systematically verified through source triangulation (involving the principal, teachers, and staff), technique triangulation (interviews, observations, and documentation), and credibility checks through member checking, resulting in a comprehensive depiction of how the principal's strategies were implemented, how digital platforms were utilized to support collaboration, how collaborative organizational behavior was formed, and which factors influenced the effectiveness of digital leadership strategies.

RESULTS AND DISCUSSION

Results

The findings of the study conducted at SMK Negeri 1 Amandraya indicate that the school is currently in a transitional phase toward a digital work culture. The school principal has made efforts to integrate the use of digital technologies through various platforms, including WhatsApp communication groups, Google Workspace (Drive, Docs, and Classroom), the school's e-learning application, and the school management information system. This practice was reflected in one teacher's statement:

> "Previously, lesson plans were prepared individually and submitted in printed form. Now, we prepare them together through Google Docs. We can revise each other's work and ensure that the learning objectives are aligned."

Another teacher emphasized how digital platforms gradually changed instructional preparation:

> "Using Google Classroom and the LMS makes it easier to organize materials in sequence. Students can access the modules anytime, and we can monitor who has submitted assignments."

Accordingly, the presentation of the research findings in this report is organized into three main areas: (1) the utilization of digital platforms in the school, (2) collaborative organizational behavior, and (3) the strategic role of the school principal.

Table1. Summary of emergent themes from data analysis

Theme	Core Meaning	Supporting Evidence
Theme 1: Digital Managerial Coordination	Use of digital platforms for communication, task distribution, and administrative alignment	WhatsApp coordination groups; digital attendance; shared Drive folders
Theme 2: Instructional Restructuring through LMS	Modification of instructional flow through modular sequencing, asynchronous access, and digital assignment management	Use of Google Classroom and LMS; student submission tracking
Theme 3: Collaborative Instructional Development	Co-construction of lesson plans and digital learning materials through shared cloud platforms	Collaborative lesson planning via Google Docs; shared revision and material refinement

1. Utilization of Digital Platforms in the School

The findings indicate that SMK Negeri 1 Amandraya is in a transitional phase toward the adoption of a digital work culture, as reflected in the increasing use of various digital platforms to support school operations. Digital coordination between the principal, vice principals, teachers, and administrative staff is predominantly conducted through WhatsApp groups, which are used for disseminating information, coordinating agendas, assigning tasks, and delivering instructions. In addition, teachers have begun to utilize Google Classroom to manage instructional administration and facilitate communication with students. The school management application is also employed, although in a limited capacity, primarily for digital attendance and activity reporting. Furthermore, the use of shared Google Drive folders has been initiated to centralize the storage of administrative documents, marking an initial step toward integrated digital document management.

Despite these developments, the utilization of digital platforms has not yet been implemented uniformly across all teachers. Several obstacles were identified, including varying levels of digital literacy, inconsistent internet connectivity, and the persistence of conventional work habits that rely on manual or face-to-face processes. These challenges indicate that while the infrastructure and basic practices for digital collaboration are emerging, the school has not

fully transitioned into a mature digital ecosystem. As a result, the effectiveness of digital platforms in supporting collaborative organizational processes remains uneven and highly dependent on individual teachers' competencies and adaptability.

In addition to administrative coordination, the utilization of digital platforms has begun to influence instructional planning processes. Teachers reported that lesson planning is increasingly prepared and shared through Google Docs and shared Drive folders, enabling collaborative editing, revision tracking, and collective refinement of instructional objectives and learning activities. This collaborative digital planning environment encourages alignment between technological tools, pedagogical strategies, and subject content can be interpreted as reflecting core principles of Technological Pedagogical Content Knowledge (TPACK) (Koehler & Mishra, 2009). Although not yet fully institutionalized, the emerging practice of co-developing lesson plans through cloud-based platforms indicates a gradual shift from individually constructed plans toward collaboratively structured instructional design.

Furthermore, the use of the school's Learning Management System (LMS) and Google Classroom has begun to modify the structure of instructional delivery. Teachers organize learning materials into sequenced modules, integrate multimedia resources, and manage assignments through digital submission systems. These practices correspond to the Modification level within the SAMR framework, where technology alters the structure of instructional tasks rather than merely substituting traditional methods (Puentedura, 2014). The LMS also enables asynchronous interaction, flexible access to materials, and digital documentation of student participation, gradually reshaping classroom routines and expanding instructional time beyond physical classroom boundaries.

Google Workspace tools, particularly Google Docs and Drive, further support collaborative instructional material development. Teachers co-construct digital learning materials, share subject-specific resources, and revise instructional content collectively. This collaborative production process fosters professional learning communities and knowledge exchange among teachers, consistent with research highlighting the role of digital platforms in strengthening collaborative professionalism (Trust et al., 2016; Dexter et al., 2016). Through iterative revisions and shared feedback, instructional materials become more standardized and better aligned with curriculum objectives.

2. Collaborative Organizational Behavior

Collaborative organizational behavior at SMK Negeri 1 Amandraya is reflected in several positive practices that have emerged alongside the use of digital platforms. Teachers increasingly collaborate in the development of digital learning materials and instructional tools, particularly when adapting lesson plans for online or blended learning contexts. Routine discussions related to task distribution, curriculum implementation, and school events are frequently conducted through digital communication groups, enabling faster information exchange and broader participation. Additionally, a culture of mutual assistance has begun to develop, as teachers voluntarily support their colleagues in learning and using digital applications required for instructional and administrative tasks. The emergence of digitally mediated collaboration was also expressed by a senior teacher:

> "Through the WhatsApp groups and shared folders, we coordinate more frequently. If there is a change in schedule or assessment, everyone knows immediately. It reduces confusion and helps us stay consistent."

Beyond general communication efficiency, digital coordination has contributed to greater instructional coherence across departments. Regular discussions in digital communication groups allow teachers to align schedules, synchronize assessment timelines, and coordinate thematic or competency-based learning activities. This coordinated digital interaction reduces instructional fragmentation and supports consistency in curriculum implementation. The availability of shared digital data, including attendance records and assignment submissions, also enables more informed collective reflection on student progress, supporting elements of data-informed decision-making (Ifenthaler & Yau, 2020; Schildkamp et al., 2017). As a result, digital

collaboration not only enhances organizational interaction but also strengthens coherence in pedagogical execution and monitoring.

However, the findings also reveal that collaborative organizational behavior has not yet been fully institutionalized. Some teachers remain passive in digital forums and tend to wait for direct instructions rather than engaging proactively in discussions or decision-making processes. Delays in responding to information shared through digital platforms were also observed, indicating varying levels of commitment and engagement. Moreover, resistance to digital systems persists among certain teachers, particularly in relation to application-based administrative reporting. These conditions suggest that while collaborative behavior is emerging, it is still constrained by individual attitudes, habits, and readiness for digital transformation.

3. ***The Strategic Role of the School Principal***

The school principal plays a central and strategic role in driving digital collaboration at SMK Negeri 1 Amandraya. The principal actively initiates the adoption of digital platforms by introducing various technologies to support communication, administration, and learning management. Through consistent direction, motivation, and personal example, the principal encourages teachers and staff to engage with digital tools as part of their daily work routines. The principal has also established formal regulations governing the use of digital platforms for official communication, thereby providing clarity and consistency in digital interactions within the school.

In addition, the principal facilitates capacity-building efforts by organizing digital competency training for teachers and providing ongoing supervision of digital activities. Monitoring and evaluation are conducted to ensure that digital platforms are used effectively and align with the school's organizational goals. Field observations indicate that the principal's leadership is a key enabling factor in fostering digital collaboration, as teachers' willingness to participate in digitally mediated collaboration is strongly influenced by the clarity, consistency, and support demonstrated by the school leader. This underscores the importance of strategic leadership in shaping collaborative organizational behavior during periods of digital transition.

The analysis of the principal's leadership strategies at SMK Negeri 1 Amandraya indicates a strong alignment with Transformational Leadership Theory as proposed by Bass and Avolio. The findings reveal that the principal consistently demonstrates *inspirational motivation* by encouraging and motivating teachers to adapt to digital technologies as part of the school's organizational transformation. This motivation is reinforced through *idealized influence*, as the principal provides direct examples of digital platform utilization in daily administrative and instructional activities, thereby modeling the expected behaviors for teachers and staff. Furthermore, the principal promotes *intellectual stimulation* by encouraging teachers to think creatively and collaboratively when addressing technical challenges related to digital platforms. In addition, *individualized consideration* is reflected in the provision of digital training programs tailored to teachers' varying levels of technological competence. Collectively, these practices indicate that the principal's strategic leadership approach is consistent with transformational leadership principles and plays a critical role in fostering collaborative organizational behavior within a digitally mediated school environment.

In terms of digital platform utilization, the findings were analyzed using the SAMR and TPACK frameworks to assess the level of technology integration within the school. Based on the SAMR model, digital technology use at SMK Negeri 1 Amandraya currently operates at the levels of *Substitution*, where WhatsApp replaces conventional written notices; *Augmentation*, as Google Docs is used to support collaborative document development; and *Modification*, through the use of a Learning Management System (LMS) that significantly changes how teachers manage instructional processes. However, the utilization has not yet reached the *Redefinition* level, as digital innovations have not fully enabled fundamentally new organizational or instructional practices that were previously unattainable. This finding suggests that while digital platforms have begun to enhance collaboration and organizational efficiency, further strategic leadership interventions are required to maximize their transformative potential and to fully embed digital collaboration into the school's organizational culture.

Discussion

The findings of this study reinforce existing literature that emphasizes the pivotal role of strategic and transformational leadership in guiding schools through digital transformation processes. The principal's leadership at SMK Negeri 1 Amandraya reflects key dimensions of transformational leadership namely inspirational motivation, idealized influence, intellectual stimulation, and individualized consideration which have been widely recognized as critical for fostering organizational change and collaboration in educational settings (Bass & Avolio, 1995; Leithwood & Jantzi, 2005). By modeling the use of digital platforms and motivating teachers to adopt new technologies, the principal effectively shaped behavioral norms that support collaboration and shared responsibility. This finding aligns with prior research suggesting that principals who actively demonstrate digital leadership practices are more successful in promoting collective engagement and professional collaboration among teachers (Hidayat et al., 2024; Avolio et al., 1995; Spillane, J. P., Halverson, R., & Diamond, J. B., 2004; Sun, A., & Chen, X. ,2016).

Beyond its influence on organizational culture, the principal's digital leadership practices also demonstrate how leadership can shape a technology-integrated instructional ecosystem. The findings suggest that digital platforms are gradually embedded within instructional planning, material development, and pedagogical coordination processes. This reflects the integration of technological, pedagogical, and content dimensions as conceptualized in the TPACK framework (Koehler & Mishra, 2009). Rather than functioning solely as administrative communication tools, digital platforms become structural components of instructional design and implementation. Such integration indicates that digital leadership operates not only at the managerial level but also at the pedagogical level, influencing how teachers conceptualize, organize, and deliver instruction in digitally mediated environments.

The utilization of digital platforms at SMK Negeri 1 Amandraya, when examined through the SAMR and TPACK frameworks, indicates a moderate level of technology integration that enhances collaboration but has not yet reached a transformative stage. Consistent with previous studies, the use of communication tools such as WhatsApp and collaborative applications like Google Workspace has improved coordination, information flow, and collective task management (Al-Harthi, 2020; Raptis et al., 2024). The Modification-level integration observed in this study suggests a transitional stage toward deeper pedagogical transformation. The restructuring of instructional delivery through LMS platforms including modular sequencing, asynchronous access, and digital assignment management demonstrates how technology reconfigures learning environments beyond physical classroom constraints (Puentedura, 2014). This aligns with broader research indicating that effective digital leadership supports the gradual movement from substitution toward transformative technology use by fostering shared experimentation and pedagogical reflection (Dexter et al., 2016; Leithwood et al., 2020). However, similar to findings reported in other educational contexts, the absence of Redefinition-level practices suggests that digital tools are still primarily used to improve existing processes rather than to create fundamentally new forms of organizational collaboration (Puentedura, 2014; Rasdiana et al., 2024). This condition reflects a common challenge in schools undergoing digital transition, where infrastructure and leadership support are present, but variations in digital literacy and resistance to change limit the depth of innovation (Marfilinda et al., 2025).

Digital leadership emerges as a critical strategic factor in enhancing technology-integrated pedagogical practices within vocational education, where learning is closely aligned with practical skills, industry standards, and workforce readiness. The findings reinforce the view that digital leadership extends beyond technological proficiency to include the capacity to shape vision, build digital culture, and align pedagogical innovation with institutional goals (Sheninger, 2019). In vocational settings, digital leaders play a pivotal role in enabling teachers to integrate learning management systems (LMS), simulation software, and digital assessment tools into instructional practice, thereby supporting more authentic, flexible, and competency-based learning experiences (Bond et al., 2020). Consistent with transformational and distributed leadership perspectives, effective digital leadership empowers teachers through professional development, collaborative structures, and supportive policies that reduce resistance to technological change and promote pedagogical experimentation (Leithwood et al., 2020; Dexter et al., 2016).

Data-Driven Decision-Making through Digital Platforms

A notable aspect of digital leadership in vocational education is the strategic use of digital platforms to support data-driven decision-making at both instructional and managerial levels. School leaders increasingly rely on LMS analytics, digital attendance systems, and online assessment dashboards to monitor student engagement, track competency mastery, and identify learning gaps in real time (Ifenthaler & Yau, 2020). The collaborative use of Google Workspace tools further illustrates how digital platforms function as shared pedagogical workspaces rather than isolated communication channels. When teachers co-construct learning materials and align assessment timelines through shared digital environments, instructional coherence is strengthened across subjects and grade levels. This collective coordination reduces fragmentation in curriculum implementation and enhances consistency in competency-based learning pathways, which are particularly critical in vocational education contexts. Such practices resonate with studies emphasizing the importance of collaborative professionalism and digitally mediated professional learning networks in sustaining instructional quality (Trust et al., 2016; Harris et al., 2017). From this perspective, digital leadership facilitates not only organizational alignment but also pedagogical synchronization across instructional units. These data-informed practices enable leaders and teachers to make timely instructional adjustments, personalize learning pathways, and allocate resources more effectively. Research indicates that when digital data are systematically integrated into leadership decision-making processes, schools demonstrate improved instructional coherence and responsiveness to student needs (Kreijns et al., 2018; Schildkamp et al., 2017). In vocational education, where performance indicators are closely tied to skill acquisition and employability outcomes, data-driven leadership becomes a strategic lever for enhancing pedagogical relevance and effectiveness.

Furthermore, digital leadership fosters collaborative use of data by promoting shared interpretation and collective reflection among teachers. Rather than positioning data as a tool for surveillance or control, effective digital leaders cultivate a culture in which data serve as a basis for professional dialogue, continuous improvement, and pedagogical innovation (Datnow & Park, 2019). This approach aligns with socio-technical perspectives, which emphasize that the impact of educational technology depends on the interaction between digital tools, organizational structures, and human agency (Selwyn, 2016). By integrating digital platforms into collaborative decision-making processes, digital leadership strengthens teachers' capacity to design technology-enhanced learning that is adaptive, evidence-based, and aligned with vocational competencies (Trust, T., Krutka, S., & Carpenter, J. P., 2016). Ultimately, digital leadership strategies that combine pedagogical vision, data literacy, and collaborative culture contribute to sustainable technology integration and improved learning outcomes in vocational education.

Furthermore, the study highlights that collaborative organizational behavior is strongly mediated by leadership-driven digital practices. While emerging collaboration among teachers such as shared digital planning and peer support demonstrates positive organizational change, uneven participation and passive engagement indicate that collaboration has not yet become fully institutionalized. This finding supports organizational behavior theories that emphasize leadership as a critical mechanism for embedding collaborative norms and sustaining collective practices over time (Schein, 2010; Leithwood et al., 2004). Prior research also suggests that strategic leadership is essential for overcoming individual resistance and aligning digital initiatives with shared goals and professional values (Brown & Green, 2019; Anggiani & Fatonah, 2024). Therefore, the results of this study contribute to the growing body of literature by demonstrating that strategic leadership not only facilitates digital platform adoption but also plays a decisive role in shaping collaborative organizational behavior, particularly within vocational secondary school contexts where coordination and teamwork are integral to educational outcomes.

Enhancing Technology-Integrated Pedagogical Practices

Digital leadership plays a strategic role in enhancing technology-integrated pedagogical practices in vocational education, where instructional relevance is closely tied to industry alignment and skills development. The findings of this study reinforce the view that digital leadership is not merely about technological adoption but about cultivating a shared pedagogical vision, strengthening

teachers' digital competencies, and embedding innovation within institutional routines (Sheninger, 2019). In vocational contexts, digital leaders act as change agents who facilitate the integration of learning management systems, simulation tools, and digital assessment platforms to support experiential and competency-based learning. Consistent with transformational and distributed leadership theories, effective digital leadership fosters teacher empowerment, collaborative professionalism, and instructional adaptability in response to technological change (Leithwood et al., 2020; Dexter et al., 2016).

A key dimension of digital leadership highlighted in this discussion is the use of digital platforms for data-driven decision-making. Leaders increasingly rely on learning analytics, digital dashboards, and online assessment systems to monitor student engagement, track skill acquisition, and evaluate instructional effectiveness (Ifenthaler & Yau, 2020). In vocational education, where learning outcomes are often measured through performance-based indicators, the strategic use of data enables more responsive curriculum adjustments and targeted pedagogical interventions. Moreover, when data are shared and interpreted collaboratively, they function as a collective learning resource rather than a mechanism of control, supporting professional dialogue and continuous improvement (Schildkamp et al., 2017; Datnow & Park, 2019). This finding underscores that data-driven leadership is most effective when embedded within a culture of trust, collaboration, and pedagogical purpose.

However, despite the presence of transformational digital leadership practices, this study critically acknowledges that structural constraints continue to limit the realization of full digital transformation in vocational education. Limited technological infrastructure, uneven internet connectivity, rigid administrative regulations, and insufficient institutional support often restrict the scalability and sustainability of digital initiatives (Selwyn, 2016; OECD, 2021). These constraints highlight a persistent gap between leadership vision and organizational capacity, suggesting that leadership alone is insufficient to overcome systemic barriers. From a socio-technical perspective, digital transformation requires alignment between leadership practices, organizational structures, policy frameworks, and material resources (Venkatesh et al., 2012; Kreijns et al., 2018). Without such alignment, digital leadership risks becoming symbolic rather than transformative, producing incremental rather than systemic change.

Ultimately, this discussion suggests that effective digital leadership in vocational education must be understood as a balancing act between innovation and constraint. While leaders play a crucial role in promoting technology-integrated pedagogy, sustainable transformation depends on addressing structural conditions that shape teachers' work and institutional capacity. Integrating digital leadership strategies with supportive policies, continuous professional development, and equitable resource allocation is essential for ensuring that technological innovation translates into meaningful pedagogical improvement (Harris et al., 2017; Bond et al., 2020). By adopting a critical and systemic perspective, this study contributes to a more nuanced understanding of digital leadership one that recognizes both its transformative potential and its limitations within complex educational environments.

CONCLUSION

This study reveals that digital leadership in vocational education extends beyond managerial coordination and administrative efficiency. Through reflective and strategic utilization of digital platforms, the principal at SMK Negeri 1 Amandraya has gradually shaped a collaborative and technology-integrated instructional ecosystem. Digital platforms such as WhatsApp, Google Workspace, and the school's Learning Management System (LMS) function not merely as communication tools but as structural components of instructional planning, material development, pedagogical coordination, and assessment monitoring.

The findings indicate that digital collaboration has influenced lesson planning practices through shared document development, facilitated instructional restructuring via modular and asynchronous learning arrangements in the LMS, and supported collaborative production of digital learning materials. Moreover, digitally mediated coordination has strengthened instructional coherence across departments by aligning schedules, assessment timelines, and competency-based

learning objectives. These practices demonstrate that digital leadership operates simultaneously at organizational and pedagogical levels, shaping both collaborative culture and instructional processes.

However, the integration of digital platforms remains at a transitional stage. While Modification-level practices are evident, transformative Redefinition-level innovation has not yet been fully realized. Structural constraints, variations in digital literacy, and residual conventional work habits continue to influence the depth of pedagogical transformation. Therefore, sustainable digital transformation in vocational education requires not only visionary leadership but also consistent professional development, institutional support, and alignment between technological infrastructure and pedagogical goals.

Ultimately, this study contributes to the understanding of digital leadership by conceptualizing it as a relational and pedagogical process that constructs a collaborative digital ecosystem within vocational schools. By foregrounding lived experiences of school members, this research highlights how strategic digital leadership meaningfully shapes technology-integrated pedagogical practices in contexts where instructional relevance, industry alignment, and competency-based learning are central to educational outcomes.

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