

THE ROLE OF THE SCHOOL PRINCIPAL IN EXPLORING DIGITAL-BASED TEACHING FACTORY MANAGEMENT PRACTICES: A CASE STUDY OF SMKN 1 TANJUNG

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ABSTRACT

This study aims to explore the role of the school principal in managing digital-based Teaching Factory (TeFa) at SMKN 1 Tanjung. A qualitative descriptive approach with a single case study design was employed. Data were collected through in-depth interviews, observations, and documentation involving the school principal as the key informant, supported by the vice principal for curriculum affairs, three Fashion Design teachers, and five Boutique TeFa students. Data were analyzed using the interactive model of Miles, Huberman, and Saldaña through data reduction, data display, and conclusion drawing, supported by source and method triangulation and member checking. The findings show three interconnected roles. First, as a digital visionary leader, the principal integrates digitalization into TeFa planning by aligning curriculum development with industry needs, establishing digitalization targets, and encouraging digital communication with industry partners. Second, as a digital transformation manager, the principal allocates resources for digital infrastructure, facilitates teachers' digital competency development, and expands industry partnerships through digital platforms. Third, as a data-driven supervisor, the principal uses production records, customer feedback, and management information systems to monitor TeFa performance and inform evaluation meetings and subsequent planning. These practices are implemented amid unstable internet connectivity, teacher resistance, and budget constraints, which require adaptive and participatory leadership strategies. The study contributes a contextually grounded framework for understanding school principal leadership in digital-based TeFa management and offers practical insights for strengthening digital leadership and management capacity in vocational education.

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INTRODUCTION

Vocational High Schools (Sekolah Menengah Kejuruan, SMK) have an important role in preparing graduates whose competencies correspond to the needs of the business and industrial sectors (DUDI). However, the rapid development of automation, artificial intelligence, and digital technologies has increased the need for vocational schools to continuously adapt their curriculum, learning practices, and institutional management. The continuing mismatch between vocational graduates' competencies and changing industry demands indicates that adaptation cannot be limited to instructional practices but also requires changes in school management and leadership (Habibi et al., 2024).

Teaching Factory (TeFa) provides an important mechanism for connecting vocational learning with industrial practices. As a production-based learning model, TeFa brings industry standards and work environments into schools and provides students with authentic opportunities to develop technical and non-technical competencies (Muharam et al., 2025; Setiadi et al., 2025; Sudarsono et al., 2026; Sutionah et al., 2024). Nevertheless, changes in industrial practices require TeFa to incorporate digital technologies into production administration, communication, marketing, monitoring, and industry partnerships. Digitalization therefore extends TeFa management beyond conventional production activities toward a more digitally connected organizational system.

The transition requires leadership capable of translating technological change into organizational practice. School principals are not only responsible for administrative functions but also influence the development of digital vision, organizational change, teacher capacity, and data-informed decision making (Alajmi, 2022; Zahro et al., 2025). Research on digital leadership has shown that principal leadership can support technology integration by establishing strategic direction, providing institutional resources, and creating conditions that enable teachers to adopt technology (Agustina et al., 2020; Schmitz et al., 2023). In vocational education, leadership is also important because digital transformation involves simultaneous changes in infrastructure, teacher competence, production management, and relationships with industry.

Existing studies, however, have generally examined these dimensions separately. Research on TeFa has primarily addressed its management and contribution to students' vocational competencies, including studies focusing on TeFa implementation and quality improvement (Ngusman et al., 2023; Putra et al., 2022). Other studies have examined school principals' digital leadership and technology integration, emphasizing teacher readiness, digital culture, and organizational support (Agustina et al., 2020; Alajmi, 2022; Zahro et al., 2025). These studies establish the importance of both TeFa management and digital leadership, but they provide less explanation of how the principal's leadership roles are enacted across the planning, implementation, and evaluation of a digitally oriented TeFa program. This leaves a contextual gap concerning the integration of strategic vision, resource and transformation management, and data-based supervision within the management of a specific TeFa program.

SMKN 1 Tanjung provides a relevant context for examining this issue because its Fashion Design program implements Boutique TeFa and has incorporated digital elements into its management practices. The case makes it possible to examine how the school principal responds to technological demands while managing infrastructure, teacher capacity, industry partnerships, and program evaluation within the actual conditions of a vocational school. This study therefore aims to explore the role of the school principal in managing digital-based TeFa at SMKN 1 Tanjung. It focuses on three interconnected dimensions: digital visionary leadership in TeFa planning, digital transformation management in implementation, and data-driven supervision in evaluation and development. The study contributes a contextually grounded understanding of how these roles are enacted simultaneously in vocational school management and provides practical implications for strengthening digital leadership in TeFa.

METHOD

This study employed a qualitative descriptive approach with a single case study design to explore the role of the school principal in digital-based TeFa management within its natural setting. The case study was conducted at SMKN 1 Tanjung, Tabalong Regency, South Kalimantan, specifically in the Fashion Design program that implements Boutique TeFa. The site was selected because the program has incorporated digital elements into TeFa management and the school principal is actively involved in its digital transformation. Data collection and analysis were conducted over four months, covering

preparation, field data collection, analysis, and report writing. The principal served as the key informant because of the strategic position in school decision making and TeFa digital transformation. Supporting informants comprised one vice principal for curriculum affairs, three Fashion Design teachers, and five active Boutique TeFa students. The informants were selected purposively based on their direct involvement in TeFa activities and their knowledge of its management and digitalization. The distribution of informants was intended to represent different roles within the TeFa ecosystem and provide complementary perspectives.

Data were collected through semi-structured in-depth interviews, participatory observation, and document analysis. Interviews focused on the principal's digital visionary leadership, transformation management, and data-driven supervision and were recorded and transcribed verbatim. Observations covered TeFa planning meetings, production activities, the use of digital management tools, and interactions between the principal, teachers, and industry partners. Documents included digital policy documents, TeFa work plans, digitally based standard operating procedures, industry partnership records, and evaluation reports generated through the school management information system. Data analysis followed the interactive model of Miles, Huberman, and Saldaña (2014), consisting of data reduction, data display, and conclusion drawing and verification. Interview transcripts and field notes were coded and categorized to identify patterns related to the three dimensions of the principal's role. The resulting categories were organized into thematic matrices and descriptive narratives and then interpreted in relation to the research focus and relevant literature. Data credibility was strengthened through source triangulation, method triangulation, and member checking. Transcripts and summaries of findings were returned to the informants for verification of the accuracy and consistency of the interpretations.

RESULT AND DISCUSSION

The Principal as a Digital Visionary Leader in TeFa Planning

The first role identified is the principal as a digital visionary leader who establishes the strategic direction of digital-based TeFa. Interview, observation, and document data indicate that digitalization was incorporated into TeFa planning through curriculum development, industry partnerships, production administration, and measurable digitalization targets. The principal communicated this direction through formal meetings, supervision activities, and discussions with teachers. In curriculum planning, the principal also engaged industry partners to identify technological developments relevant to the Fashion Design program. The annual TeFa work plan subsequently incorporated targets related to digital platforms, teacher competence in fashion design software, and digitally connected industry partners. This practice shows that the principal's digital leadership was expressed not simply through the adoption of technology but through the translation of technological demands into organizational planning. The principal's statement that TeFa should reflect industry's use of design software, digital order management, and online marketing illustrates how industry requirements were used as a reference for program development. The finding is consistent with AlAjmi (2022), who emphasizes the importance of principal digital leadership in supporting technology integration, and with Karakose et al. (2024), who characterize effective digital leadership as proactive and future-oriented.

The distinctive feature of the case is the connection between digital vision and TeFa planning. Digitalization was not treated as an isolated technological program but was linked to curriculum relevance, industry communication, and production management. This finding also complements research on transformational leadership in vocational schools, which indicates that leadership and knowledge management contribute to organizational performance in the digital era (Firmansyah et al., 2022; Hadi et al., 2024; Nasution et al., 2026; Prasetyo et al., 2027). In the context of SMKN 1 Tanjung, the principal's role is therefore better understood as translating external technological and industrial changes into concrete planning priorities. The principal's digital vision was also reflected in the gradual digitalization of industry partnerships. Several partners communicated orders and feedback through digital channels, replacing some face-to-face interactions. The vice principal reported that the principal encouraged the use of technology in communication with partners, which made the process more efficient. Rather than demonstrating a causal improvement in industry satisfaction, this finding indicates that digital communication became an organizational mechanism for maintaining and documenting interactions with external partners. This practice extends the conventional conception of TeFa partnerships by incorporating digital communication into the relationship between school and industry.

The Principal as a Digital Transformation Manager in TeFa Implementation

The second role concerns the operational management required to translate digital vision into TeFa practice. Three interconnected practices emerged: management of digital infrastructure, development of teachers' digital competencies, and expansion of industry partnerships through digital platforms. The principal allocated budget for digital TeFa needs, including order-management applications, fashion design software, and communication platforms. The vice principal confirmed that technological requirements were incorporated into budget priorities. At the same time, infrastructure remained constrained by unstable internet connectivity. The principal responded by using cellular networks as a backup and modifying workflows so that some activities could continue offline. This finding demonstrates that digital transformation at the school was implemented incrementally rather than under ideal technological conditions.

The finding supports Habibi et al. (2024), who identify leadership support as an important condition for access to digital technology in vocational schools. However, the case of SMKN 1 Tanjung also illustrates that leadership support does not eliminate infrastructural constraints. Instead, the principal's managerial role involves prioritizing resources and developing temporary solutions while pursuing broader infrastructure support. This contextual characteristic is important because digital transformation in vocational schools occurs within uneven resource conditions. Teacher capacity development constituted another major component of the transformation process. The principal facilitated training in fashion design software, e-commerce platforms, and data-based production administration, including training involving industry practitioners. Teachers described the principal as providing time and opportunities to learn new technologies. This supportive approach is consistent with findings that teacher readiness and principal digital leadership are closely related to successful technology (Nursalimah et al., 2026). It also corresponds with Schmitz et al. (2023), who argue that leadership support can empower teachers to use technology beyond basic administrative purposes.

The case further shows that teacher resistance was managed through support rather than directive implementation. Some teachers initially experienced difficulties with new technologies, but continued assistance enabled gradual adaptation. This finding is consistent with research emphasizing trust, self-efficacy, and work engagement in the relationship between digital leadership and teacher practice (Agustina et al., 2020). The principal's approach suggests that human resource development is an integral part of TeFa digitalization because technological infrastructure alone cannot ensure organizational adoption. Digital technology was also used to expand industry partnerships beyond the immediate local environment. The principal used digital communication to establish connections with partners in larger cities, including actors in digital fashion and e-commerce. This practice is relevant to Firmansyah et al. (2022), who highlight the importance of technology-based networks in vocational education. In this case, digital connectivity broadened the potential industrial environment available to the TeFa program while reducing dependence on face-to-face interaction. These practices indicate that the principal's transformation-management role operates across technological, human, and relational dimensions. The role is not limited to procuring devices but involves aligning resources, teacher capacity, work processes, and industry relationships. At the same time, budget limitations required the principal to prioritize investments and seek alternative funding through government assistance, industry grants, and TeFa revenue. The strategies demonstrate adaptive management, although the single-case design does not allow these strategies to be generalized to all vocational schools.

The Principal as a Data-Driven Supervisor in TeFa Evaluation

The third role is the principal as a data-driven supervisor who uses digitally generated information to support monitoring and evaluation. The study found that production data, customer feedback, student competency information, and quality indicators were incorporated into the evaluation process. Data were made available through a management information system, while customer assessments were collected through digital forms and summarized through a management dashboard. The principal used these data to identify trends, determine areas requiring improvement, and inform subsequent TeFa planning. Semester evaluation meetings were also structured around production trends, student competency achievements, and customer feedback rather than relying solely on narrative reports. The vice principal indicated that the use of clear data made evaluation discussions more focused on identifying areas for improvement and determining subsequent actions.

This finding supports Zahro et al. (2025), who identify supervision and assessment as important dimensions of digital leadership. It also corresponds with Agustina et al. (2020), who emphasize the role of digital data in supporting

responsive decision making. In the SMKN 1 Tanjung case, the important contribution lies in the connection between evaluation and subsequent planning. Data were not used only to document past performance but also to inform decisions for the next period. The practice can be interpreted as a movement toward evidence-informed TeFa management. Suhaedin et al. (2024) emphasize the importance of integrating managerial and supervisory functions in vocational education. At SMKN 1 Tanjung, the principal's use of production and customer data provides a mechanism connecting planning, implementation, evaluation, and subsequent adjustment. This resembles a Plan-Do-Check-Act cycle, although the present study does not empirically test the effectiveness of that cycle.

The data-driven approach nevertheless remains at an early stage. The study indicates that the principal continues to require stronger data literacy and structured capacity development. This qualification is important because access to digital information does not automatically establish sophisticated data-driven leadership. The organizational value of the system depends on the capacity of school leaders and TeFa teams to interpret and use the available information appropriately.

An Integrated Model of Principal Leadership in Digital-Based TeFa

The three roles identified in this study should not be interpreted as a causal sequence. Instead, they constitute interconnected dimensions of leadership across the TeFa management cycle. The digital visionary role provides strategic direction; the transformation-manager role translates that direction into resources, teacher development, work processes, and industry partnerships; and the data-driven supervisory role uses information generated through implementation to support evaluation and subsequent planning.

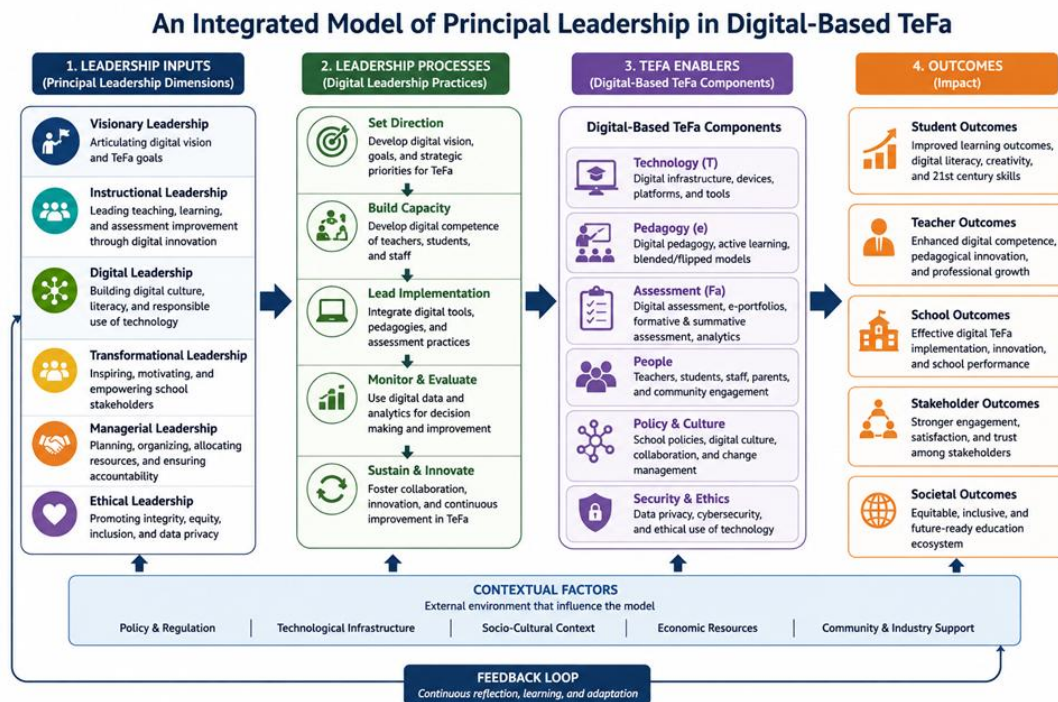


Figure 1. An Integrated Model of Principal Leadership in Digital-Based Teaching Factory (TeFa) Management

Source: Developed by the researchers based on the study findings.

The arrows in this model represent a conceptual flow of management practices rather than statistically tested causal relationships. The model synthesizes the empirical findings of the case and illustrates how the three roles operate in a mutually connected management process. Its contribution lies in bringing together dimensions that are frequently discussed separately in research on digital leadership and TeFa management.

Contextual Challenges and Adaptive Leadership

The implementation of the three roles occurred under three principal constraints: unstable internet connectivity, teacher resistance, and limited budgets. These constraints are important because they demonstrate that digital transformation was not a linear process. Unstable connectivity affected digital communication and cloud-based activities. Teacher resistance emerged from concerns about the complexity of new technologies and the possibility of making mistakes. Budget limitations restricted the simultaneous fulfillment of all technological requirements. The principal responded through backup connectivity, gradual adaptation, teacher support and training, prioritization of technological investments, and alternative funding proposals.

These responses suggest that leadership in digital-based TeFa requires both strategic direction and contextual adaptation. The finding is compatible with the argument that transformational leadership can support organizational change when accompanied by teacher involvement and commitment (Aziziyah & Rahmawati, 2024; Firmansyah et al., 2022; Subramani, 2025; Suryaman et al., 2024). However, the contribution of this study is not the claim that these strategies universally overcome digitalization barriers. Rather, the case demonstrates how a principal navigates specific constraints while maintaining the direction of TeFa digitalization. Taken together, the findings indicate that digital-based TeFa management at SMKN 1 Tanjung is shaped by the interaction between strategic vision, operational management, evidence-informed supervision, and adaptive responses to contextual constraints. The principal's leadership is therefore enacted across the entire management process rather than being confined to technology adoption.

CONCLUSION

This study reveals that the school principal plays an extraordinarily central, complex, and multidimensional role within the digital-based TeFa ecosystem at SMKN 1 Tanjung. The three primary roles identified as digital visionary leader, transformation manager, and data-driven supervisor are dimensions that are mutually interconnected and mutually reinforcing in shaping the overall effectiveness of TeFa digitalization. These roles are neither hierarchical nor sequential; rather, they operate simultaneously and synergistically in the day-to-day leadership of the school principal. This finding expands the understanding of vocational school principal leadership, which can no longer be confined to conventional administrative functions but must encompass a strong digital capacity and a sustained transformative orientation. Together, these three role dimensions form a comprehensive and contextually grounded model of digital leadership that can serve as a reference for developing the competencies of vocational school principals in Indonesia as they face the challenges of Industry 4.0 and the digital transformation of vocational education.

This study offers several important implications for various parties with a stake in the development of vocational education in Indonesia. For vocational school principals, these findings affirm the importance of developing digital leadership competencies as an urgent professional necessity, rather than a merely optional supplement. For government agencies and policymakers, this study highlights the need to incorporate digital leadership competency for school principals as a core component in the selection, training, and evaluation programs for vocational school principals. For other vocational education institutions, the three-dimensional conceptual framework of the school principal's role produced by this study can serve as a guide for designing more systematic and purposeful digital-based TeFa development programs. More broadly, this study also calls for the professional development of vocational school principals to be designed not generically but in ways that specifically respond to the contextual challenges of digital transformation confronted by vocational education institutions within an industrial ecosystem that is continuously and rapidly changing.

This study is subject to the limitation of focusing on a single school, so its findings should be interpreted within the specific context of SMKN 1 Tanjung and cannot be directly generalized to all vocational schools. Comparative multi-school research incorporating variations in the degree of TeFa digitalization would enrich and validate the conceptual framework produced by this study. Future research could also examine the relationship between the quality of school principal digital leadership and the learning outcomes of TeFa students and the rate at which graduates are absorbed into the digital industry, in order to provide stronger empirical evidence for the genuine impact of digital school principal leadership on the overall quality of vocational education. In so doing, this study is intended to serve as a starting point for a broader and deeper series of investigations into digital leadership in the context of Indonesian vocational education, which will ultimately contribute

meaningfully to strengthening the scientific foundation for policies and practices in vocational education that are responsive to the needs of industry in the digital transformation era.

REFERENCES

- Agustina, R., Kamdi, W., Hadi, S., & Nurhadi, D. (2020). Influence of the principal's digital leadership on the reflective practices of vocational teachers mediated by trust, self efficacy, and work engagement. *International Journal of Learning, Teaching and Educational Research*, 19(11), 24–40.
- Alajmi, M. K. (2022). The impact of digital leadership on teachers' technology integration during the COVID-19 pandemic in Kuwait. *International Journal of Educational Research*, 112, 101928.
- Aziziyah, A., & Rahmawati, D. (2024). The Role of Transformational Leadership in Building Teacher Commitment in Secondary Education. *Tarbawi: Jurnal Keilmuan Manajemen Pendidikan*, 10(02), 185–198.
- Firmansyah, A., Chen, M.-H., Junaedi, I. W. R., Arwani, M., & Kistyanto, A. (2022). The role of transformational leadership and knowledge management and learning organization on vocational schools performance during digital era. *Frontiers in Psychology*, 13, 895341.
- Habibi, A., Mukminin, A., & Sofyan, S. (2024). Access to the digital technology of urban and suburban vocational schools. *Education and Information Technologies*, 29(4), 4197–4222.
- Hadi, S., Imron, A., Pristian, R., Ranu, M. E., & Jamil, A. S. (2024). Adapted Integrated Transformational-Instructional Leadership Behaviors: Construct Validity and Perceptions among Teachers and Principals in Indonesian Vocational Schools. *Eurasian Journal of Educational Research (EJER)*, (109), 214.
- Karakose, T., Polat, H., Tülübaş, T., & Demirkol, M. (2024). A review of the conceptual structure and evolution of digital leadership research in education. *Education Sciences*, 14(11), 1166.
- Miles, M. B., Huberman, A. M., & Saldana, J. (2014). *Qualitative data analysis*. sage.
- Muharam, R. S., Afrilia, U. A., & Sudarma, S. (2025). Integrating vocational education and industry through public policy: Towards excellent and competitive human capital. *International Journal of Multidisciplinary Sciences and Arts*, 4(2), 642213.
- Nasution, R. H., Mesiono, M., & Siti, M. (2026). Building Vocational High School Teacher Performance through the Synergy of Transformational Leadership, Organizational Culture, and Work Motivation in the Era of Vocational Education. *Journal La Edusci*, 7(5), 2032–2046.
- Ngusman, N., Egar, N., & Wuryandini, E. (2023). Manajemen Teaching Factory Dalam Peningkatan Mutu Konsentrasi Keahlian Teknik Audio Video. *Jurnal Manajemen Pendidikan (JMP)*, 12(3).
- Nursalimah, N., Putri, R. M., Dismawati, D., Mardalena, M., & Sarinah, S. (2026). The Influence of Principals' Digital Leadership on Teacher Readiness in the Digital Transformation of Education. *Education and Sociedad Journal*, 4(1), 233–241.
- Prasetyo, Y. E. P., Riyanto, Y., & Hariyati, N. (2027). A Transformational Leadership Model for School Principals in Accelerating the Digital Transformation of Vocational High School Management Toward SDG 4. *Journal of Current Studies in SDGs*, 3(1), 238.
- Putra, D. A., Vratwi, S., Hidayatullah, R. R., & Hasan, T. A. (2022). Manajemen pembelajaran teaching factory dalam meningkatkan kompetensi keahlian siswa di sekolah menengah kejuruan (smk). *Vol*, 7, 101–111.
- Schmitz, M.-L., Antonietti, C., Consoli, T., Cattaneo, A., Gonon, P., & Petko, D. (2023). Transformational leadership for technology integration in schools: Empowering teachers to use technology in a more demanding way. *Computers & Education*, 204, 104880.
- Setiadi, A., Rochayati, U., Hartopo, I., & Handito, T. (2025). Production-based teaching factory learning model: Enhancing soft skills and simulating the industrial environment. *Indonesian Journal of Educational Development (IJED)*, 6(2), 278–292.
- Subramani, N. S. R. (2025). Transformational leadership and its impact on organizational commitment during change management. *International Journal of Health Technology and Innovation*, 4(01), 90–101.

- Sudarsono, B., Ghozali, F. A., & Saputra, W. N. E. (2026). Bridging the education-industry gap: A rolling-cycle teaching factory model to occupational competence development in vocational schools. *Higher Education, Skills and Work-Based Learning*, 1–15.
- Suhaedin, E., Giatman, M., & Maksum, H. (2024). Manajemen kepemimpinan dalam meningkatkan kualitas pendidikan sekolah menengah kejuruan (SMK). *Journal of Education Research*, 5(1).
- Suryaman, S., Adha, M. A., Suharyanto, S., & Ariyanti, N. S. (2024). Principal change leadership and e-learning effectiveness: The mediating role of teachers work commitment and attitudes toward change. *Jurnal Cakrawala Pendidikan*, 43(1), 88–101.
- Sutianah, C., Sobandi, B., Yamin, A. A., & Trang, P. D. K. (2024). Increasing creativity, production innovation and commercialization through the new teaching factory model based on life skills. *Jurnal Pendidikan Vokasi*, 14(2), 133–146.
- Zahro, K., Andriani, D. E., & Raihan, P. D. (2025). Exploring vocational school principals' digital leadership in cultivating school digital culture. *JDMP (Jurnal Dinamika Manajemen Pendidikan)*, 10(1), 15–28.