INTEGRATION OF DIGITAL TECHNOLOGY IN MICRO, SMALL AND MEDIUM ENTERPRISES (MSMES) REALIZATION OF *SMART CITY* (CASE STUDY OF MEDAN DENAI DISTRICT)

Muhammad Naufal Rahadian[1a*], Tengku Irmayani[2b], Nurman Achmad[3c]

[123] Universitas Sumatera Utara, Indonesia

[a]E-mail:rahadian11061998@gmail.com
[b]E-mail:tengku.irmayani@gmail.com
[c]E-maial:nurman@usu.ac.id

(*) Corresponding Author
rahadian11061998@gmail.com

ABSTRACT
This study examines the integration of digital technology among Micro, Small, and Medium Enterprises (MSMEs) in Medan Denai District within the framework of smart city development. The research aims to identify patterns of digital platform adoption, challenges faced by MSME actors, and the implications for local economic transformation. A qualitative descriptive approach was employed using in-depth interviews, field observations, and documentation involving MSME actors, local government officials, and related stakeholders. The data were analyzed thematically to capture MSMEs' experiences and institutional support mechanisms in the digitalization process. The findings indicate that digital technology adoption among MSMEs is predominantly limited to marketing activities through social media and online marketplaces, while the utilization of digital tools for financial management, inventory control, and data-driven decision-making remains minimal. Major constraints include low digital literacy, lack of continuous training, and limited institutional coordination. Although basic digital infrastructure is available, its potential has not been fully leveraged to enhance MSME productivity and competitiveness. The study concludes that smart city initiatives in Medan Denai have not yet effectively empowered MSMEs as key actors in the digital economy. A more inclusive and MSME-centered smart city strategy is therefore required, emphasizing sustained capacity building, integrated digital systems, and cross-sector collaboration to strengthen local economic resilience.

INTRODUCTIONS

Micro, Small, and Medium Enterprises (MSMEs) play a strategic role in national and regional economic development, including in Medan City. MSMEs serve not only as the primary source of employment but also as a pillar of local economic activity and community resilience. At the national level, MSMEs account for more than 99% of business entities, absorb approximately 97% of the workforce, and contribute over 60% to Indonesia's Gross Domestic Product (Tambunan, 2022). In North Sumatra, MSMEs dominate the trade, service, and small industrial

sectors. In Medan City particularly Medan Denai District MSMEs function as key drivers of the grassroots economy despite operating on a relatively small scale.

Alongside this strategic role, MSMEs face growing challenges due to rapid digital transformation. Digitalization has become a critical determinant of business competitiveness, efficiency, and sustainability. Studies in Scopus-indexed journals highlight that digital adoption enables MSMEs to expand markets, reduce operational costs, improve financial management, and integrate into broader value chains (Pratamansyah, 2024) and (Kraus et al., 2019). However, the benefits of digital transformation are highly contingent upon digital literacy, technological access, and institutional support. In Medan City, digital readiness among MSMEs remains uneven. Although data from the Medan Communication and Information Service indicate that approximately 82% of residents possess basic internet literacy, advanced digital competencies such as operational digital skills, cybersecurity awareness, and ethical digital practices are still limited. This condition reflects a broader gap between infrastructure availability and effective utilization, as noted by (OECD et al., 2021) particularly among small business actors (Harahap et al., 2024). To address this issue, the Medan City Government has launched several initiatives, including Digital Literacy Week and MSME capacity-building programs aimed at integrating local businesses into e-catalog systems and digital marketing platforms.

These efforts align with the smart city framework, which positions information and communication technology (ICT) as a key instrument for enhancing urban governance, economic growth, and social inclusion. Within this framework, MSMEs are expected to become integral components of the urban digital ecosystem through the adoption of e-commerce, digital financial management, logistics integration, and cashless payment systems. Nevertheless, empirical evidence suggests that smart city implementation in Medan has not yet fully accommodated the needs of MSMEs. Research by (Kurnia & Alfirdaus, 2022) indicates that MSME digitalization remains fragmented due to uneven training distribution, limited human resources, low motivation among business actors, and constrained institutional capacity. Similar findings are reported by (Sucitra et al., 2024) and (Nambisan et al., 2019) who emphasize that digital transformation initiatives often underperform when policy interventions are not grounded in local contexts and actor-level capabilities.

Field observations in Medan Denai District further illustrate these challenges. Despite the presence of 30 active MSMEs across sectors such as convection, footwear, food and beverages, batik, and screen printing, most businesses continue to operate conventionally with minimal use of digital tools (Mujiono et al., 2023). Average monthly revenues remain modest, indicating untapped potential for growth through digital market access and operational efficiency. Comparatively, MSMEs in other districts with better digital infrastructure and continuous mentoring demonstrate higher adaptability and competitiveness. Previous studies discussed the concepts of MSME digitalization, smart cities, and inclusive digital economies (Akbar, 2022) and However, most of these studies focus on macro-level policy analysis or general adoption factors, leaving a significant empirical gap at the micro and sub-district levels (Ika Sari et al., 2024).

Specifically, there is limited field-based research that captures how MSME actors experience, interpret, and negotiate digital transformation within the smart city agenda at the local level. Therefore, the research gap addressed in this study is empirical rather than theoretical. This study aims to examine the real conditions, challenges, and opportunities faced by MSMEs in Medan Denai District in adopting digital technologies. By grounding the analysis in empirical data, this research is expected to provide practical insights for strengthening MSME digital capacity, improving smart city policy implementation, and fostering a more inclusive and sustainable local digital economy.

RESEARCH METHOD

This study employs a qualitative descriptive approach to gain an in-depth understanding of the use of digital technology by MSME actors in Medan Denai District, the ideal types of technology for Smart City–based MSME centers, and the forms of support provided by the Medan City Government. This approach enables researchers to comprehensively describe the perceptions, experiences, challenges, and digitalization strategies of MSMEs and local government stakeholders through interviews, observations, and documentation analysis.

The study is exploratory in nature and adopts a case study design, as it focuses on a specific geographical area to allow for a more contextual and detailed analysis. The research was conducted in Medan Denai District, which was selected due to its high concentration of MSME economic activities alongside a relatively low level of digital technology utilization (Sugiyono, 2022). This setting is therefore relevant for assessing MSME readiness within the Smart City ecosystem. Informants were selected using purposive sampling, comprising MSME actors, officials from the Cooperative Service and the Communication and Information Service, representatives of financial institutions, digital platform managers, and academics.

The selection criteria included active involvement in MSME operations, experience in the use of digital technologies, and roles in MSME digitalization programs (Sugiyono 2018). Data collection techniques consisted of in-depth interviews, field observations, and documentation studies, drawing on government policy documents, BPS data, and reports on MSME digitalization programs. To ensure data validity and reliability, the study applied triangulation of sources, methods, and time (Sugiyono, 2022). Data analysis followed an interactive analysis model, encompassing data reduction, data display, and iterative conclusion drawing to maintain analytical rigor and validity (Zaini et al., 2023).

RESULT AND DISCUSSION
RESULT
Digital Platform used by MSMEs in Medan Denai District

The findings show that the utilization of digital platforms by MSMEs in Medan Denai District has progressed gradually but remains partial, uneven, and largely limited to surface-level adoption. Most MSMEs rely on digital technology primarily for marketing and sales, particularly through social media platforms such as Instagram, Facebook, TikTok, and WhatsApp Business. These platforms function as digital storefronts that enable product promotion, consumer interaction, and market expansion beyond the sub-district through visual content and online engagement. Marketplace platforms including Shopee, Tokopedia, Lazada, and Bukalapak have also been adopted as channels for online transactions, allowing MSMEs to reach regional and national markets without geographical constraints. In addition, the use of digital payment systems such as QRIS, GoPay, OVO, Dana, and mobile banking has increased, contributing to faster and more transparent transactions. From an infrastructure perspective, Medan Denai District is already supported by adequate internet connectivity (fiber optic and 4G/5G networks), indicating that technological access is not the primary barrier to digitalization. However, digital adoption among MSMEs remains functionally narrow. Most business actors have not integrated digital tools into internal management processes such as financial recording, inventory control, or data-driven decision-making. This finding suggests that MSME digitalization in Medan Denai is still concentrated at the transactional and promotional level, rather than at a strategic or organizational level.

Analytically, this condition reflects limitations in digital literacy and capability development, particularly in creative content production, data analytics, and the effective use of digital platforms to enhance business efficiency. Government support programs—such as KUR financing, OSS licensing, digital marketing training, and QRIS facilitation—have been implemented, but their impact is perceived as limited due to one-off training models, lack of continuous mentoring, and weak inter-institutional coordination. As a result, improvements in MSME digital competence tend to be short-term and unsustainable. The case of Instagram illustrates this pattern clearly. Instagram is the most widely used platform and plays a significant role in branding, customer interaction, and market visibility. Nevertheless, inconsistent content management, limited creative skills, and advertising costs constrain its optimal use. These findings indicate early progress toward the Smart City pillars Smart People, Smart Economy, and Smart Governance but also reveal structural gaps. MSME actors demonstrate initial digital awareness (*Smart People*), digital payments and e-commerce support economic efficiency (*Smart Economy*), and government facilitation programs reflect emerging digital governance (*Smart Governance*). Yet, these elements have not been fully integrated into a coherent and sustainable digital ecosystem.
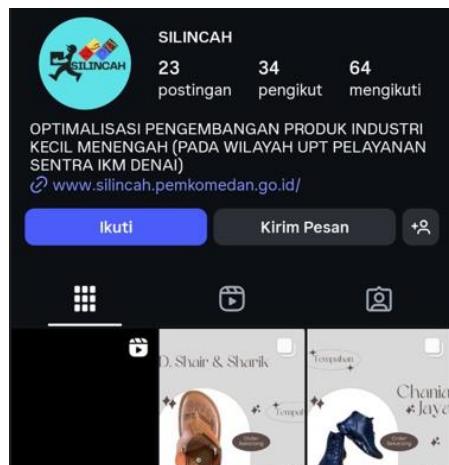
Figure 1 Digital Infrastructure of MSMEs Medan Denai (Instagram)

Interviews with MSME actors Mrs. Citra (*bag seller*), Ms. Novi (*tailor*), and Mr. Chaniago (*leather shoe seller*) further confirm that digital platform usage is still at an early stage. Only one informant uses Instagram and TikTok sporadically, while others rely mainly on offline transactions and WhatsApp. This aligns with the Technology Acceptance Model (TAM), which explains that although MSME actors recognize the benefits of digital platforms, low perceived ease of use due to limited skills and assistance hinders full adoption (Happyana & Istiqomah, 2025) From the Resource-Based View (RBV) perspective, MSMEs possess strong production capabilities but lack digital distribution and managerial resources, restricting market expansion (Krauter, 2025). Overall, the findings reveal a persistent gap between policy intent and practical implementation, supporting (Tambunan, 2022) argument that MSME empowerment requires not only socialization but also hands-on assistance, accessible capital, and effective marketing facilitation. Therefore, accelerating MSME digitalization in Medan Denai District requires an integrated Smart City based MSME center supported by a local e-marketplace, a government-managed MSME data system, and continuous digital capacity-building programs. Strengthening infrastructure must be accompanied by systematic mentoring, cross-sector collaboration with universities and the private sector, and sustainable policy execution to enhance MSME competitiveness within Medan City's smart economy framework.

Form of Support of the Medan City Government in developing MSMEs

The findings indicate that the Medan City Government plays a strategic role in shaping a supportive ecosystem for MSME development through three interrelated dimensions: regulation, facilitation, and collaboration. This support goes beyond administrative functions and extends to funding access, capacity building, and digital integration aligned with the Smart City framework. From a regulatory perspective, the simplification of business legality through the OSS (*Online Single Submission*) system represents a significant step toward reducing bureaucratic barriers. This policy enables MSMEs to obtain legal status more efficiently, thereby improving access to government programs, financial institutions, and public procurement opportunities. Complementary measures, such as tax incentives and reduced levies, further ease operational burdens and encourage formalization. These efforts reflect the principles of Smart Governance, particularly governance as a market enabler. In terms of facilitation, the Medan City Government has implemented concrete policies to strengthen MSME market access and production capacity. One notable initiative is positioning the local government as a market creator by mandating the use of MSME products such as official shoes produced by MSMEs in Medan Denai within government institutions (OPDs). This policy not only guarantees demand but also incentivizes MSMEs to upgrade product quality and standardization. The establishment of MSME

cooperatives and the integration of digital tools in business management further demonstrate institutional strengthening aimed at building a modern and competitive MSME ecosystem.

Source: Prokopim Pemko Medan.go. id
Figure 2 Mr. Bobby Nasution when he served as Mayor of Medan Empowering MSMEs Shoes

At the provincial and city levels, MSME development is closely linked to broader economic growth targets. Government narratives emphasize MSMEs as key drivers of regional and national economic performance, reinforcing policy alignment between the Medan City Government, the North Sumatra Provincial Government, and central ministries. Programs supporting MSMEs include OSS-based licensing, access to digital financing, integration into e-catalog systems, and digital literacy training. However, empirical findings suggest that while these programs are well-designed, their implementation remains uneven due to limited continuity, coordination, and monitoring.

Source : https://diskominfo.sumutprov.go.id
Figure 3 The Provincial Government Continues to Support MSME Actors in North Sumatra

The collaborative dimension involves partnerships with universities, financial institutions, business communities, and technology companies. These collaborations focus on strengthening the four main pillars of MSME development capital, production, marketing, and human resources. Access to capital is expanded through financial partnerships; production quality is enhanced through standardization and halal certification; marketing is supported through digital platforms and e-commerce; and human resource capacity is developed through entrepreneurship and digital literacy training. This integrated approach aligns with the Smart Economy and Smart People dimensions by promoting efficiency, innovation, and digital competence.

Source: Medan City Communication and Informatics Office
Figure 4 Support of Various Medan MSME Stakeholders to Upgrade and Go National

Nevertheless, the findings also reveal persistent structural challenges. Data indicating low levels of MSME access to financing, technology adoption, digital ecosystem participation, and youth entrepreneurship highlight a significant gap between policy intentions and actual outcomes. From a Technology Acceptance Model (TAM) perspective, MSME actors generally recognize the benefits of digital tools but face low perceived ease of use due to limited skills and insufficient hands-on assistance. Meanwhile, the Resource-Based View (RBV) analysis shows that although MSMEs possess strong production capabilities, weaknesses in digital distribution, branding, and managerial resources constrain competitiveness.

Source : https://news.detik.com/berita/d-5831266 Figure 5 Supporting MSMEs to Rise, Medan City Government Encourages Construction & Technology Adoption

Overall, the support provided by the Medan City Government demonstrates alignment with the three pillars of Smart City development. Smart Governance is reflected in the implementation of OSS-based licensing and local product procurement policies that position the government as a market enabler for MSMEs. Smart Economy is realized through the promotion of digital payments, marketplace integration, cooperative development, and improved access to financing, which collectively enhance business efficiency and market reach. Meanwhile, Smart People is supported

through training programs and business mentoring initiatives aimed at strengthening the digital and entrepreneurial capacities of MSME actors.

Source : https://diskominfo.sumutprov.go.id Figure 6 Mr. Bobby Nasution Says Hard Work Still Needs to Improve the Level of North Sumatra MSMEs

However, to ensure that these interventions generate sustainable and long-term impacts, they must be complemented by continuous mentoring mechanisms, integrated MSME data and information systems, and systematic monitoring and evaluation. Strengthening cross-sector collaboration involving local government, universities, financial institutions, and the private sector is also crucial. Grounding policy implementation in the real conditions and capacities of MSMEs is essential for transforming Medan Denai District into a viable pilot area for inclusive and sustainable Smart City based MSME development.

DISCUSSION

Integration of Digital Technology in Micro, Small and Medium Enterprises (MSMEs) Realization of *Smart City* (Case Study of Medan Denai District)

The findings of this study indicate that the adoption of digital platforms by MSMEs in Medan Denai District is predominantly concentrated on marketing activities through social media and online marketplaces, while deeper integration into business management systems remains limited. This pattern aligns with Scopus-indexed studies showing that MSMEs in developing urban contexts tend to adopt digital technologies gradually, beginning with low-cost and user-friendly platforms such as social media (OECD et al., 2021) and (UN report, 2021).

Social media platforms including Instagram, Facebook, and TikTok are widely utilized because they facilitate direct interaction with consumers and support visual-based promotion, which has been shown to be particularly effective for MSMEs in creative, culinary, and fashion sectors (Dwivedi et al., 2021; Tiago & Veríssimo, 2014). (Tiago & Veríssimo, 2014). Nevertheless, consistent with the findings of (Kraus et al., 2019) and (Ackerman, 2010) this study reveals that digital marketing strategies among MSMEs remain largely product-oriented rather than data-driven. The limited application of analytics tools, audience segmentation, and paid digital advertising indicates a low level of digital marketing maturity, which constrains promotional effectiveness and business scalability. This supports the argument by (Nosratabadi et al., 2020) Kaplan and (Hasan et al., 2021) that social media adoption without analytical and strategic integration diminishes its long-term value for firm performance. Furthermore, the weak integration between social media platforms and online marketplaces observed among MSMEs in Medan Denai reflects findings by (Watanabe & Naveed, 2019) who identify limited digital capabilities and technical skills as major barriers to effective social commerce adoption in MSMEs.

With regard to financial management, the findings corroborate Scopus-indexed research demonstrating that MSMEs in emerging economies predominantly rely on manual bookkeeping and have not fully adopted digital

financial management systems (Tiago & Veríssimo, 2014) digital accounting applications provide advanced features such as cash flow monitoring, inventory control, and automated financial reporting, MSME actors often utilize these tools only for basic transaction recording. This observation supports (Abubakar & Handayani, 2019) who emphasize that digital financial technologies do not automatically enhance financial governance without structured training and continuous mentoring. Moreover, the persistent practice of mixing personal and business finances among MSMEs in Medan Denai reinforces the findings of (OECD et al., 2021) which identify weak financial discipline as a key obstacle to MSME access to formal financing and credit institutions.

The use of national marketplaces such as Shopee, Tokopedia, and Lazada reflects a broader national and regional trend identified in Scopus-indexed reports by (OECD et al., 2021) which recognize e-commerce platforms as critical entry points for MSMEs into the digital economy. However, the limited understanding of marketplace optimization strategies such as keyword management, customer review handling, pricing algorithms, and paid advertising confirms findings by (Tahar et al., 2022) and (Estrada et al., 2016) who note that many MSMEs remain passive platform users rather than strategic digital sellers. Furthermore, MSME participation in international digital markets remains minimal, consistent with (OECD et al., 2021) findings that export-oriented digitalization requires higher digital literacy, language competence, and institutional support mechanisms. From a smart city perspective, these findings reinforce the argument that digital infrastructure alone is insufficient to ensure inclusive and sustainable digital economic transformation. Scopus-indexed scholars such as (Anthopoulos, 2017) emphasize that smart city development must integrate technological infrastructure with human capital development, institutional coordination, and digital capability building.

The limited effectiveness of government digitalization programs in Medan Denai often characterized by short-term training without continuous mentoring echoes critiques by (UN report, 2021) who argue that many smart city initiatives prioritize technological deployment over social readiness and community empowerment. Therefore, the digitalization challenges faced by MSMEs in Medan Denai underscore the need for a more participatory, MSME-centered smart city approach that combines technology adoption with sustained capacity building, policy coherence, and cross-sector collaboration.

CONCLUSION

This study concludes that the utilization of digital platforms by MSMEs in Medan City remains limited to basic functions, primarily product promotion through social media and participation in online marketplaces. Constraints in digital literacy and technical capacity hinder MSMEs from adopting more advanced digital strategies, such as data-driven marketing, application-based financial management, and structured online market expansion. These findings confirm that the availability of digital infrastructure alone is insufficient without sustained capacity building and institutional support. Within the smart city framework, MSMEs have not yet been fully integrated into a cohesive urban digital ecosystem. Although the Medan City Government has introduced programs related to digital financing, online licensing, and MSME training, their implementation remains uneven and weakly coordinated. Therefore, the development of Smart City–based MSME centers should prioritize integrated digital functions, continuous sub-district–level training, and expanded access to digital financing through collaboration with banking and fintech institutions. Strengthening cross-sector collaboration among government, universities, financial institutions, business communities, and technology providers is essential to establishing a sustainable and inclusive Smart MSME ecosystem.

REFERENCES

Abubakar, L., & Handayani, T. (2019). Strengthening financial technology regulation to empower financial inclusion. *Diponegoro Law Review*, *4*(2), 1–15. https://doi.org/10.14710/dilrev.4.2.2019.1-15

Ackerman, G. (2010). Brief review of *21st century skills: Learning for life in our times*. *Journal of Educational*

Change, *11*(4), 423–425. https://doi.org/10.1007/s10833-010-9145-6

Akbar, M. R. (2022). Ketentuan pidana undang-undang Republik Indonesia. *Haura Utama*, *3*(1), 45–60.

Anthopoulos, L. (2017). *Understanding smart cities: A tool for smart government or an industrial trick?* Springer. https://doi.org/10.1007/978-3-319-57015-0

Dwivedi, Y. K., Ismagilova, E., Hughes, D. L., Carlson, J., Filieri, R., Jacobson, J., Jain, V., Karjaluoto, H., Kefi, H., Krishen, A. S., Kumar, V., Rahman, M. M., Raman, R., Rauschnabel, P. A., Rowley, J., Salo, J., Tran, G. A., & Wang, Y. (2021). Setting the future of digital and social media marketing research. *International Journal of Information Management*, *59*, 102168. https://doi.org/10.1016/j.ijinfomgt.2020.102168

Estrada, S., Cuevas-Vargas, H., & Larios-Gómez, E. (2016). The effects of ICTs as innovation facilitators for greater business performance. *Procedia Computer Science*, *91*, 47–56. https://doi.org/10.1016/j.procs.2016.07.040

Happyana, L., & Istiqomah, F. Z. (2025). Integration of tradition and technology: Digitalization strategies in Islamic education at pesantren in Banyuwangi, Indonesia. *Journal of Islamic Education Studies*, *6*(1), 1–18.

Harahap, A. P. A. W., Irmayani, T., & Ridho, H. (2024). The effect of organizational effectiveness on employee performance. *Perspektif*, *13*(3), 864–872. https://doi.org/10.31289/perspektif.v13i3.11986

Hasan, M., Le, T., & Hoque, A. (2021). How does financial literacy impact inclusive finance? *Financial Innovation*, *7*(1), 1–23. https://doi.org/10.1186/s40854-021-00259-9

Ika Sari, G., Winasis, S., Pratiwi, I., Nuryanto, U. W., & Basrowi. (2024). Strengthening digital literacy in Indonesia. *Social Sciences & Humanities Open*, *10*, 101100. https://doi.org/10.1016/j.ssaho.2024.101100

Kraus, S., Palmer, C., Kailer, N., Kallinger, F., & Spitzer, J. (2019). Digital entrepreneurship. *International Journal of Entrepreneurial Behaviour & Research*, *25*(2), 353–375. https://doi.org/10.1108/IJEBR-06-2018-0425

Krauter, J. (2025). Re-envisioning leadership practice for an uncertain future. *Open Journal of Leadership*, *14*(1), 1–54. https://doi.org/10.4236/ojl.2025.141001

Mujiono, R., Tobing, L., Bengkel, B., & Irmayani, T. (2023). The impact of online single submission toward ease of business licensing. *Dinasti International Journal of Economics, Finance & Accounting*, *3*(6), 627–638.

Nambisan, S., Wright, M., & Feldman, M. (2019). The digital transformation of innovation and entrepreneurship. *Research Policy*, *48*(8), 103773. https://doi.org/10.1016/j.respol.2019.03.018

Nosratabadi, S., Bahrami, P., Palouzian, K., & Mosavi, A. (2020). Leader cultural intelligence and organizational performance. *Cogent Business & Management*, *7*(1), 1809310. https://doi.org/10.1080/23311975.2020.1809310

OECD. (2021). *The digital transformation of SMEs*. OECD Publishing. https://doi.org/10.1787/bdb9256a-en

Pratamansyah, S. (2024). Transformasi digital dan pertumbuhan UMKM. *Jurnal Akuntansi, Manajemen, dan Perencanaan Kebijakan*, *2*(2), 17–30. https://doi.org/10.47134/jampk.v2i2.475

Sugiyono. (2022). *Metode penelitian kualitatif*. Alfabeta.

Tahar, A., Setiadi, P. B., & Rahayu, S. (2022). Strategi pengembangan sumber daya manusia menuju society 5.0. *Jurnal Pendidikan Tambusai*, *6*(2), 13456–13465.

Tambunan, T. T. H. (2022). Recent development of micro, small and medium enterprises in Indonesia. *International Journal of Social Sciences and Management Review*, *6*(1), 193–214. https://doi.org/10.37602/ijssmr.2022.6112

Tiago, M. T. P. M. B., & Veríssimo, J. M. C. (2014). Digital marketing and social media. *Business Horizons*, *57*(6), 703–708. https://doi.org/10.1016/j.bushor.2014.07.002

UNCTAD. (2021). *Digital economy report 2021*. United Nations.

Zaini, P., Saputra, N., Lawang, K. A., & Susilo, A. (2023). *Metodologi penelitian kualitatif*. RajaGrafindo Persada.