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Technopreneurship and Digital Innovation as Determinants of MSME Competitive Advantage: A Strategic Management Perspective in the Digital Economy Era

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Abstrak. Digital transformation is understood as a systematic process that influences the entire management cycle—from strategy formulation and implementation to organizational performance evaluation. This study aims to analyze the effect of digital innovation, technopreneurial managerial competence, and technology orientation on the competitive advantage of Small and Medium Enterprises (SMEs). A quantitative approach was employed using a survey method involving 150 SME respondents who had adopted digital technologies, and the data were analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS). The results indicate that digital innovation, technopreneurial managerial competence, and technology orientation have a positive and significant impact on SMEs' competitive advantage, explaining 71.7% of the variance. These findings highlight the importance of integrating technopreneurship and digital innovation as an effective managerial strategy to enhance the competitiveness and sustainability of SMEs. The study provides practical implications for SME owners to prioritize managerial competence development, technology adoption, and innovation culture while offering guidance for future research to consider external factors influencing competitive advantage models.

Keywords: Technopreneurship; Digital Innovation; Managerial Competence; Technology Orientation; Competitive Advantage.

INTRODUCTION

Digital transformation is understood as a systematic process that impacts the entire management cycle—from strategy formulation and implementation to organizational performance evaluation (Rahawarin & Wardoyo, 2023). Digitalization not only functions as an operational tool but has become a determining factor in value creation and a source of sustainable competitive advantage (Li, 2025). For Micro, Small, and Medium Enterprises (MSMEs), digital transformation demands a shift in managerial paradigms from conventional approaches to adaptive, agile, and technology-based approaches in order to survive in a dynamic and competitive business environment (Thapaliya & Adhikari, 2025).

Technopreneurship has emerged as a strategic approach within management science that positions technology and digital innovation as core elements of organizational value creation (Yang & Grace, 2024). This approach not only emphasizes the entrepreneurial aspect of business formation but also highlights managerial capabilities in managing, integrating, and leveraging technology as a strategic resource (Bargavi, 2025). Technopreneurship combines entrepreneurial competencies—such as risk-taking and opportunity orientation—with technological capabilities and sustainable digital innovation, forming the foundation of an adaptive and future-oriented business strategy (Uzunbacak et al., 2024).

From a Resource-Based View (RBV) perspective, technopreneurship can be positioned as an organizational capability that is valuable, rare, inimitable, and non-substitutable (VRIN) (Mandung et al., 2025). This capability is difficult for competitors to replicate because it arises from a combination of managerial knowledge, entrepreneurial experience, a culture of innovation, and the ability to utilize technology simultaneously and contextually (Hsiao, 2024). Thus, technopreneurship does not merely represent technology adoption but reflects a complex managerial process of configuring internal resources to respond to the dynamics of the digital business environment (Wang & Chebo, 2021).

For MSMEs, the effective implementation of technopreneurship has significant strategic implications for performance and competitive advantage (Wibisono & Supoyo, 2023). The use of digital technology increases operational efficiency through automation, information system integration, and data-driven decision-making (Tanjung et al., 2023). Furthermore, technopreneurship expands market reach through digital platforms, e-commerce, and social media, reducing both geographic limitations and transaction costs (Santhosh et al., 2024). Digital innovation generated through technopreneurship also fosters product and service differentiation that is more responsive to consumer needs, including personalization, improved service quality, and the development of new digital business models (Candraningrat et al., 2025).

Within the dynamic capabilities framework, technopreneurship acts as an organizational mechanism for sensing, seizing, and reconfiguring technology-based business opportunities (Ba Awain et al., 2025). MSMEs with strong technopreneurship capabilities tend to be more adaptive to technological changes and market dynamics, enabling them to sustain a long-term competitive advantage (Motamedimoghadam et al., 2024). Therefore, technopreneurship can be understood as a strategic managerial capability that bridges digital innovation and competitive advantage for MSMEs in the digital economy ecosystem.

However, despite the growing urgency of technopreneurship, many MSMEs continue to face limitations in managerial competence—particularly in digital strategic planning, data-driven decision-making, and technological innovation management. These deficiencies in digital literacy and management capacity hinder MSMEs from optimizing technology as a means of value creation and competitive advantage (Candraningrat et al., 2025). This condition reflects a persistent gap between the potential of digital technology and the managerial capacity of MSMEs to strategically manage digital transformation.

This gap highlights the need for managerial studies that empirically position technopreneurship as a key determinant of MSME competitive advantage. The strategic management perspective emphasizes that competitive advantage is not determined solely by technology ownership, but by managerial capabilities in configuring, integrating, and innovatively utilizing technology to respond to environmental changes. Therefore, this study focuses on analyzing the relationship between technopreneurship, digital innovation, and MSME competitive advantage within a strategic management framework, to provide both theoretical and practical contributions to the development of technology-based MSME strategies.

MATERIALS AND METHODS

This study employs a quantitative approach using a survey method, aiming to test causal relationships between variables based on empirical data obtained from respondents. The quantitative approach was chosen because it enables objective and measurable hypothesis testing, particularly in analyzing the influence of technopreneurship and digital innovation on the competitive advantage of Micro, Small, and Medium Enterprises (MSMEs).

The population in this study consists of MSMEs that have adopted digital technology in their business operations—such as the use of e-commerce platforms, social media, digital payment systems, or management information systems. This population selection is based on the consideration that digital technology adoption is a primary prerequisite for the implementation of technopreneurship. The research sample comprised 150 respondents, selected through a purposive sampling technique. This method was chosen because it allows the selection of respondents who meet specific criteria, namely MSME owners or managers who are actively involved in managerial decision-making and the use of digital technology in their businesses. The sample size is considered adequate for analysis using Structural Equation Modeling–Partial Least Squares (SEM-PLS), which is relatively robust to medium sample sizes and non-normal data distributions (Hair et al., 2019).

The research instrument utilized a structured questionnaire with a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire was designed to measure respondents' perceptions of technopreneurship, digital innovation, and the competitive advantage of MSMEs. Before being used in the analysis, the instrument was tested for validity and reliability to ensure measurement accuracy and internal consistency (Hair et al., 2019).

The data analysis technique applied Structural Equation Modeling–Partial Least Squares (SEM-PLS) using SmartPLS software. This method was chosen because it can analyze complex relationships among latent variables simultaneously and is well-suited for exploratory and predictive research in management studies. The SEM-PLS analysis included an evaluation of the measurement model (outer model) to assess convergent validity, discriminant validity, and construct reliability, as well as an evaluation of the structural model (inner model) to test the strength and significance of the causal relationships among research variables (Hair et al., 2019).

RESULTS AND DISCUSSION

Validity Test

Validity testing is conducted to assess the validity of a questionnaire. A questionnaire is considered valid if each question item accurately represents and measures the construct under study. Based on data processing using SmartPLS, all indicators have *outer loading values* above 0.70, and *the Average Variance Extracted* (AVE) value for each construct exceeds 0.50. These findings indicate that all indicators meet convergent validity criteria (Hair et al., 2019).

Table 3. Validity Test

	Average Variance Extracted (AVE)
Digital Innovation	0.760

Competitive Advantage	0.709
Technopreneur Managerial Competence	0.691
Technology Orientation	0.693

Based on the test results, the Digital Innovation construct has an Average Variance Extracted (AVE) value of 0.760, indicating that 76.0% of the indicator variance is explained by the construct. This value reflects an excellent level of convergent validity, demonstrating that the indicators used effectively and consistently represent the concept of digital innovation. The Competitive Advantage construct obtained an AVE value of 0.709, meaning that 70.9% of the indicator variance is explained by the latent construct. These results indicate that the competitive advantage indicators meet the criteria for convergent validity and accurately describe the ability of Micro, Small, and Medium Enterprises (MSMEs) to create superior value compared to competitors.

Furthermore, the Technopreneur Managerial Competence construct shows an AVE value of 0.691, indicating that 69.1% of the indicator variance is explained by the construct. This value demonstrates that technopreneurial managerial competence has been well measured through the indicators used and reflects relevant managerial capabilities in the context of technology and innovation management. The Technology Orientation construct produced an AVE value of 0.693, meaning that 69.3% of the indicator variance is explained by the latent construct. This result also exceeds the recommended minimum threshold, indicating that the Technology Orientation construct possesses adequate convergent validity.

Overall, all constructs in this study obtained AVE values above 0.50, confirming that the measurement model meets the criteria for convergent validity. Therefore, it can be concluded that all constructs in this research model have achieved satisfactory convergent validity, and the indicators used are valid representations of their respective latent constructs.

Reliability Test

The construct reliability in this study was evaluated using two main indicators, namely Cronbach's Alpha and *Composite Reliability* (CR). Cronbach's Alpha is used to measure the level of internal consistency between indicators within a construct, while *Composite Reliability* assesses the overall reliability of the construct by considering the contribution or weight of each indicator. Reliability testing is conducted to assess the level of internal consistency of the research instrument in measuring the latent construct. A construct is declared to have good reliability if the Cronbach's Alpha and Composite Reliability values are each greater than 0.70, indicating that the indicators in the construct have an adequate level of consistency (Hair et al., 2019).

Table 2. Reliability Test Results

Variables	*Cronbach's Alpha*	*Composite Reliability*
Digital Innovation	**0.921**	**0.941**
Competitive Advantage	**0.897**	**0.924**
Technopreneur Managerial Competence	**0.888**	**0.918**
Technology Orientation	**0.889**	**0.918**

Based on the test results, the Digital Innovation construct has a Cronbach's Alpha value of 0.921 and a Composite Reliability of 0.941. These values indicate a very high level of internal consistency, so it can be concluded that the digital innovation indicators are able to

measure the construct reliably and stably. The Competitive Advantage construct shows a Cronbach's Alpha value of 0.897 and a Composite Reliability of 0.924. These results indicate that the instrument used to measure competitive advantage has excellent reliability and is consistent in representing the ability of MSMEs to create superior value compared to competitors.

Furthermore, the Technopreneur Managerial Competence construct has a Cronbach's Alpha value of 0.888 and a Composite Reliability of 0.918. These values indicate that the indicators used have strong internal consistency and are able to describe the technopreneur managerial competence reliably. The Technology Orientation construct obtained a Cronbach's Alpha value of 0.889 and a Composite Reliability of 0.918. These results indicate that the technology orientation construct has a good level of reliability, so that its indicators can be used consistently to measure the orientation of MSMEs towards the use of technology in business strategies.

Overall, all constructs in this study had Cronbach's Alpha and Composite Reliability values above the threshold of 0.70. Thus, it can be concluded that the research instrument has met the criteria for good reliability and is suitable for further analysis on the structural model (inner model).

***Square* Test (R^2)**

The magnitude of the influence of independent variables on the dependent variable can be determined through the *coefficient of determination* (R-square). R-square values range from 0 to 1, with higher values indicating a better predictive ability of the model. In the context of SEM-PLS-based quantitative research, an R-square value of 0.25 is considered weak, 0.50 moderate, and 0.75 strong (Hair et al., 2019).

Table 3. Results of the R- Square Test (R^2)

Variables	R- *Square*	Information
Competitive Advantage	0.717	Strong

Based on the test results, the Competitive Advantage variable has an R-square value of 0.717, indicating that 71.7% can be explained by the independent variables, namely Digital Innovation, Technopreneurial Managerial Competence, and Technology Orientation. This value is categorized as strong, so the research model has good predictive ability in explaining the factors influencing the competitive advantage of MSMEs.

With a high R-square, it can be concluded that the combination of independent variables used in this study effectively describes variations in MSME competitive advantage. The remaining 28.3% is likely influenced by other factors not included in the research model, such as market conditions, government policies, or other external factors.

Hypothesis Testing

Hypothesis testing in this study was conducted using the PLS-SEM method through *bootstrapping techniques* to determine the effect of independent variables on the dependent variable. The test results were analyzed based on *the direct effect* (*path coefficient*) and *indirect effect* (*specific indirect effect)* values obtained from data processing using SmartPLS 3. Figure 2 presents a model for testing the relationship between variables in this study.

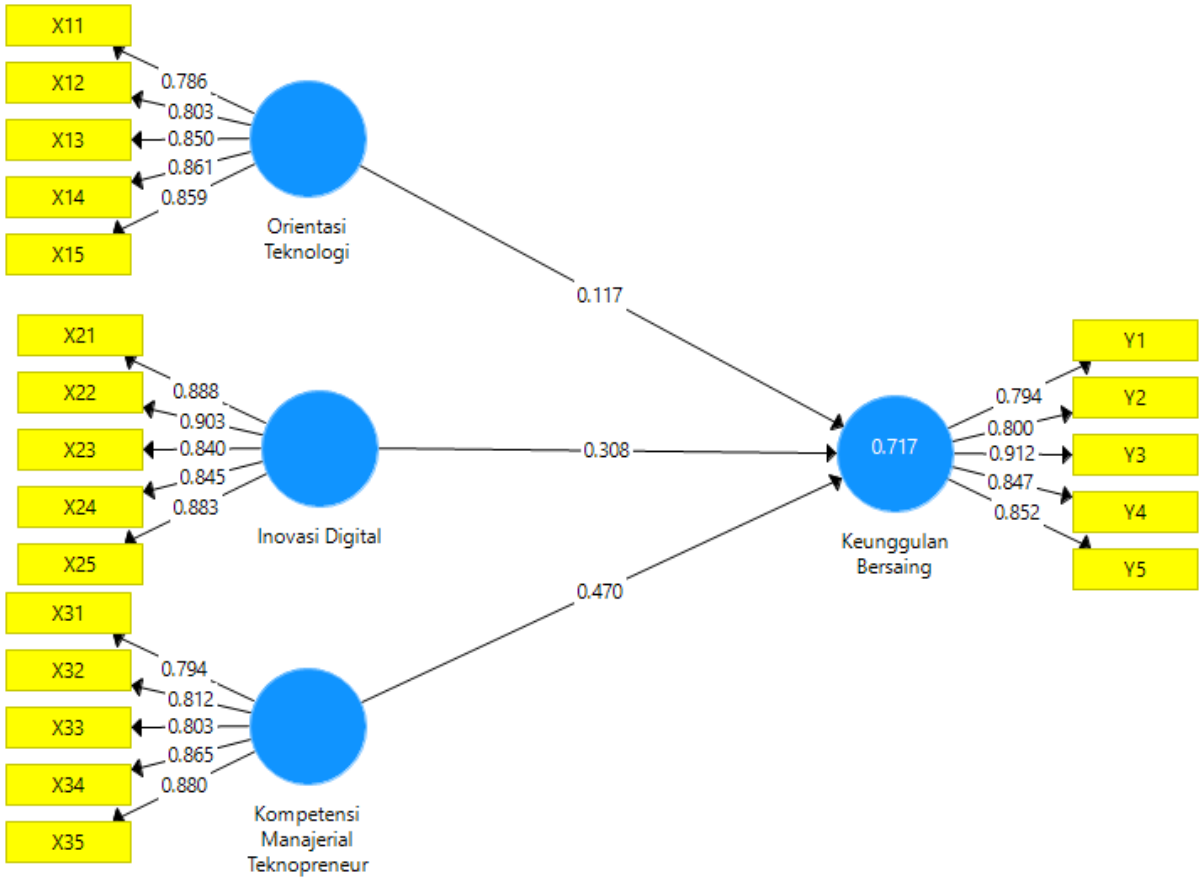

Figure 2. Path Diagram of Modeling Results

Hypothesis Testing

Effect hypothesis test refers to the direct influence between exogenous latent constructs on endogenous latent constructs. The direct effect test was conducted using *bootstrapping techniques* so that the significance of the relationship between variables can be analyzed through *the path coefficient value* generated by SmartPLS. A relationship is declared significant if the *T-Statistic value* is > 1.96 and *the P-Value is < 0.05. Conversely, if the T-Statistic* value is < 1.96 and *the P-Value is* > 0.05, then the relationship between variables is declared insignificant. The results of the *direct effect* test (*path coefficient*) in this study are presented in Table 4.

Table 4. Results of the Direct Effect Test (Path Coefficient)

Relationship between Variables	**T- *Statistic***	**P- *Value***	**Information**
Digital Innovation -> Competitive Advantage	2,885	**0.004**	H1: Accepted
Technopreneur Managerial Competence -> Competitive Advantage	4,184	**0,000**	H2: Accepted
Technology Orientation -> Competitive Advantage	3,210	**0.003**	H3: Accepted

Based on the SEM-PLS analysis, the influence of independent variables on MSME Competitive Advantage was tested using the path coefficient, t-statistic, and p-value. The test results can be interpreted as follows:

1. The effect of digital innovation on competitive advantage shows a t-statistic of 2.885 with a p-value of 0.004. This result is below the 0.05 significance level, thus accepting hypothesis 1. This indicates that increasing digital innovation, whether through the development of technology-based products, services, or business processes, contributes positively and significantly to increasing the competitive advantage of MSMEs.
2. The influence of technopreneur managerial competence on competitive advantage has a t-statistic of 4.184 and a p-value of 0.000. This value indicates a highly significant influence, so hypothesis 2 is accepted. In other words, technopreneur managerial ability in planning, managing, and utilizing digital technology strategically is a strong determinant in shaping the competitive advantage of MSMEs.
3. The effect of technological orientation on competitive advantage yielded a t-statistic of 3.210 with a p-value of 0.003. This result was also significant at the 0.05 level, thus accepting hypothesis 3. This indicates that technological orientation, namely the organization's ability to adopt, integrate, and adapt technology to business strategy, plays a positive role in strengthening the competitive advantage of MSMEs.

Overall, the three independent variables—Digital Innovation, Technopreneurial Managerial Competence, and Technology Orientation—have a positive and significant influence on MSME Competitive Advantage. This finding confirms that the integration of technopreneurship and digital innovation is an effective managerial strategy for enhancing MSME competitiveness in facing a dynamic and competitive business environment.

CONCLUSIONS

Based on the results of the SEM-PLS analysis, this study found that Digital Innovation, Technopreneurial Managerial Competence, and Technology Orientation have a positive and significant influence on MSME competitive advantage. This finding aligns with the theoretical framework of strategic management, particularly the Resource-Based View (RBV) and dynamic capabilities, and is consistent with previous research.

The Impact of Digital Innovation on Competitive Advantage

The findings show that digital innovation has a positive and significant impact on the competitive advantage of MSMEs. This result supports the RBV perspective, which emphasizes that competitive advantage arises from strategic capabilities and resources that are valuable, rare, difficult to imitate, and non-substitutable—including technology-based innovation capabilities (Barney, 1991; Sun et al., 2024). Digital innovation enables MSMEs to optimize business processes, improve product and service quality, and create sustainable, value-based differentiation. Research by Ahn et al. (2022) demonstrates that technological and innovation capabilities are key determinants of competitive advantage in technology-driven enterprises, while Candraningrat et al. (2025) emphasize that digital capabilities play a crucial role in improving organizational performance and competitiveness. Similarly, Mandung et al. (2025) argue that the strategic use of technological innovation can create sustainable competitive advantage, particularly among small and medium-sized enterprises.

The results of this study are consistent with Hermawan et al. (2021), who noted that unique technology-based innovation serves as a mediating mechanism between information technology utilization and organizational performance. In the MSME context, digital

innovation functions not only as an operational tool but also as a strategic capability supporting digital transformation and long-term value creation (Hsiao, 2024; Motamedimoghadam et al., 2024). Thus, digital innovation can be positioned as a dynamic source of competitive advantage, especially when integrated with managerial competence and technology orientation.

The Influence of Technopreneurial Managerial Competence on Competitive Advantage

Technopreneurial managerial competence has also been shown to significantly influence the competitive advantage of MSMEs. These findings indicate that technopreneurs' ability to strategically plan, organize, and control the use of technology is a critical determinant of competitive advantage. From a dynamic capabilities perspective, managerial competence reflects an organization's ability to identify opportunities (sensing), mobilize technological resources (seizing), and continuously adjust and transform business strategies (reconfiguring). This enables MSMEs to respond more effectively to business and technological changes.

These results align with Ahn et al. (2022), who assert that technology-based entrepreneurial capabilities and managerial competencies are strategic, hard-to-imitate resources that directly contribute to competitive advantage. Gudi et al. (2024) further demonstrate that digital entrepreneurial capabilities play a decisive role in determining business success and competitiveness. Similarly, Effendy and Veri (2024) confirm that technopreneurs' involvement in strategic decision-making and effective technology management positively affects MSME development and competitiveness. Therefore, technopreneurial managerial competence can be regarded as a dynamic capability that strengthens competitive advantage in the digital transformation era.

The Influence of Technology Orientation on Competitive Advantage

Technology Orientation has also been found to positively affect the competitive advantage of MSMEs. This finding highlights that an organization's ability to adopt, integrate, and align technology with business strategy plays a vital role in enhancing adaptability and responsiveness to environmental change. Within the dynamic capabilities framework, technology orientation functions as a strategic mechanism that allows MSMEs to maintain flexibility, accelerate innovation, and optimize the sustainable use of digital resources. This aligns with Sun et al. (2024), who assert that integrating the RBV and dynamic capabilities perspectives establishes technology orientation as a core foundation for developing competitive advantage in dynamic markets.

These findings are further supported by Candraningrat et al. (2025), who reported that digital capabilities and technology orientation directly enhance organizational competitiveness and performance. Hsiao (2024) also emphasized that the ability to integrate technological resources through internal competencies contributes substantially to performance and competitive advantage. Similarly, Mandung et al. (2025) found that strong technology orientation enables organizations to strategically leverage technological innovation to create sustainable differentiation and added value. Thus, technology orientation can be classified as a strategic capability that reinforces competitive advantage within the digital transformation landscape.

Integration of Findings with the Theoretical Framework

Overall, these three independent variables can be understood as complementary

strategic capabilities that collectively drive the competitive advantage of MSMEs. Digital Innovation provides valuable resources; Technopreneurial Managerial Competence ensures optimal resource utilization; and Technology Orientation maintains organizational adaptability to external changes. This integration aligns with RBV theory, which highlights the importance of unique, inimitable resources, and with dynamic capabilities theory, which emphasizes an organization's ability to adapt and transform internal competencies in response to environmental demands.

The results confirm that strengthening technopreneurship and digital innovation not only enhances operational efficiency but also serves as a strategic imperative for maintaining competitive advantage in the digital era. These findings have practical implications for MSME owners and policymakers, emphasizing the need to develop managerial competencies, adopt technology, and foster an innovation-oriented culture as key strategies to enhance competitiveness and long-term sustainability.

CONCLUSION

Based on the research results and data analysis, it can be concluded that digital innovation, technopreneurial managerial competence, and technology orientation have a positive and significant influence on the competitive advantage of Micro, Small, and Medium Enterprises (MSMEs). Digital innovation enables MSMEs to improve operational efficiency, product differentiation, and service quality, thereby strengthening overall competitiveness. Technopreneurial managerial competence serves as a key factor in strategically managing and utilizing technology in accordance with the principles of dynamic capabilities, while technology orientation enhances MSMEs' adaptability to market changes and consumer needs. Overall, these three variables explain 71.7% of the variance in competitive advantage, indicating that technopreneurship and digital innovation are effective management strategies for shaping the competitiveness and sustainability of MSMEs in the digital era.

Based on these findings, it is recommended that MSME owners and managers focus on developing technopreneurial managerial competencies, increasing the adoption and integration of digital technologies, and fostering a culture of innovation within their organizations. This strategy can be implemented through technology-based managerial training, the use of digital platforms for marketing and operations, and the continuous development of innovative products and services that meet market needs. Furthermore, future researchers are encouraged to expand the research model by incorporating external variables—such as government policies, business ecosystem support, or macro-environmental factors—to achieve a more comprehensive understanding of MSME competitive advantage.

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