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The Effects of Digital Information Technology, Digital Marketing and Human Resource Capacity on Smes Performance in North Sumatera

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Abstract

This study investigates the effects of digital information technology, digital marketing, and human resource capacity on SME performance in North Sumatera. Although numerous prior studies have examined these variables separately, a significant gap persists regarding their synergistic effects, especially among SMEs in developing regions. To address this gap, the present study developed an integrated model using an explanatory research design. Data were collected through a survey of 232 SMEs that actively adopt digital technology in North Sumatra Province, representing a targeted sample of digitally active small and medium enterprises in a developing region. The data were analyzed using Structural Equation Modelling–Partial Least Squares (SEM-PLS) due to its suitability for examining complex relationships in a predictive, non parametric manner with relatively small sample sizes. The results indicate that all three variables exert positive and significant effects on SME performance, with digital marketing emerging as the strongest predictor. These findings underscore the importance of resource integration in enhancing SME competitiveness in emerging economies.

KEYWORDS

digital information technology, digital marketing, human resource capacity, sme performance.

Introduction

Small and medium-sized enterprises (SMEs) in North Sumatra face significant challenges in enhancing their performance amid rapid digital transformation. Although digital technology offers substantial opportunities to improve competitiveness, many SMEs still struggle to effectively integrate digital information technology, digital marketing, and human resource capacity in a cohesive manner. Business trends increasingly demand that organizations leverage digital technology to transform preexisting business practices (Nudurupati et al., 2021). In this context, digital information technology serves not only as an operational tool but as a strategic resource capable of creating competitive advantage. The growing adoption of various digital platforms further underscores the critical role of information systems in supporting organizational development, particularly for resource-constrained SMEs in developing regions (Oliveira-Dias et al., 2022).

Numerous studies have examined the relationship between digital information technology and organizational performance (C. L. Chen & Lai, 2022). Information technology is no longer viewed merely as a supporting tool but has become a strategic factor that contributes significantly to performance achievement (Odhiambo, 2022). The utilization of digital technology can enhance operational effectiveness and efficiency, thereby enabling organizations to achieve performance targets more optimally. Nevertheless, empirical phenomena indicate that not all SMEs are able to optimize the use of digital technology, despite increasing investment in this area.

Investment in information technology has become an important necessity to drive

digital transformation. Effective management of digital information technology enables SMEs to create synergy between work units, allowing for more integrated technology utilization (Zhang et al., 2023). From the perspective of the Resource Based View (RBV), an organization's competitive advantage is determined by its ability to manage valuable, rare, inimitable, and non substitutable (VRIN) strategic resources, including technology and organizational capabilities (Willie, 2025) (Civelek et al., 2023) (Khan et al., 2024). The growth of the digital economy has also changed businesses' internal and external environments, promoting the merging of the real and virtual economies and creating new business models such as smart manufacturing and online retail (Peng & Wang, 2022).

From an internal perspective, the implementation of digital technology enhances information access, transparency, and reduces uncertainty and information asymmetry within the organization. This results in reduced monitoring costs and increased rationality in managerial decision making (Wang et al., 2024). To further understand the relationship between digital information technology and performance, this research examines several key dimensions, namely digital platforms, management information systems, digital marketing, and human resource capacity.

Although extensive research has explored the relationship between digital information technology, digital marketing, and human resource capacity with organizational performance, most prior studies have examined these variables in isolation or in limited pairwise combinations. This creates a significant theoretical gap because, according to the Resource Based View (RBV), sustainable competitive advantage emerges primarily from the complementarity and synergistic integration of strategic resources, rather than from their isolated effects (Civelek et al., 2023) (Khan et al., 2024). Furthermore, empirical evidence on the simultaneous and synergistic effects of all three variables remains limited, especially in the context of SMEs in developing regions. This study addresses the unresolved theoretical and contextual gap by developing a comprehensive integrated model that examines the combined influence of digital information technology, digital marketing, and human resource capacity on SME performance in North Sumatera. Such integration is theoretically important as it is expected to generate super additive synergies that partial models fail to capture.

The literature on digital platforms shows rapid development in various business disciplines, especially in relation to improving organizational performance. Based on the Technology Acceptance Model (TAM), digital platforms serve as mechanisms of incentives and control that influence user behavior and system effectiveness (L. Chen et al., 2022). Additionally, management information systems have become an important component in supporting effective decision making by providing fast, accurate, and relevant information. This system is a combination of human resources and computer based technology that supports operational efficiency and business planning (Santoso et al., 2022).

Digital marketing has become an important strategic capability for SMEs in facing market competition (Asikin et al., 2024). Based on the RBV perspective, the ability to utilize digital media such as social media, marketplaces, and websites is a strategic resource that can enhance visibility, customer loyalty, and marketing effectiveness. Previous research shows that the systematic implementation of digital marketing positively impacts business growth and SME performance (Satriyo & Khoiruman, 2024).

In addition, human resource capacity is also a key factor in determining the success of an organization. Competent, innovative, and adaptive human resources to technological changes are strategic assets that can enhance operational efficiency, innovation, and marketing performance (Chazhaev et al., 2025) (Aji & Mala, 2024). Investment in skill development and HR training has proven to significantly contribute to the improvement of performance and competitive advantage of SMEs.

Despite the growing body of research on the individual contributions of digital information technology, digital marketing, and human resource capacity, the synergistic effects of integrating these three variables on SME performance remain underexplored, creating a notable theoretical and empirical gap. This study seeks to address this gap by examining their combined influence. The main issue addressed in this research is the absence of a comprehensive understanding regarding how these strategic resources interact to produce superior performance outcomes, particularly among SMEs in developing regions. Therefore, this study poses the following research question : Do digital information technology, digital marketing, and human resource capacity significantly affect the performance of SMEs in North Sumatera Province ? This question is significant not only for advancing theoretical integration within the Resource Based View framework but also for providing practical insights in the context of regional economic development and digital competitiveness..

This research aims to analyze and prove the influence of digital information technology, digital marketing, and human resource capacity on the performance of SMEs. By using an explanatory research approach and Structural Equation Modelling Partial Least Squares (SEM-PLS) analysis, this study is expected to contribute theoretically and empirically to the literature by providing new evidence on the integrated effects of these variables and to serve as a basis for policy making for SME actors in optimizing the use of digital technology.

Methods

This study employs a quantitative explanatory research design to analyze the causal relationships between digital information technology, digital marketing, human resource capacity, and SME performance. The research aims to test the hypothesized relationships within an integrated model grounded in the Resource Based View (RBV) theory.

The population of this study consists of digital based SMEs in North Sumatera Province. Digital based SMEs are defined as enterprises that actively utilize digital technology in their business operations, such as using digital platforms for marketing, management information systems, or digital payment systems. A census sampling technique was applied, whereby questionnaires were distributed to the entire population through postal delivery and direct distribution. A total of 242 SMEs participated in this study.

The research instrument was developed through a multi step process. First, the indicators for each variable were adapted from established literature and adjusted to the research context. The questionnaire was then translated into Indonesian and subjected to expert validation (content validity) by two academics in the field of digital business and entrepreneurship.

Here are the measurements of each variable used as research instruments in this study, where the information technology digital variable is measured using four indicators: the strategic value of IT use in operations, the uniqueness of IT systems compared to competitors, the level of difficulty in imitating the technology, and the integration of IT in business processes (resource complementarity) (Omrani et al., 2022); The digital marketing variable is measured using four indicators: the effectiveness of using digital media for marketing, the uniqueness of digital marketing strategies, the consistency and intensity of digital activities, and the ability to build customer relationships (customer engagement)

(Mohammed, 2024) (Apriyanto, 2025); The human resource capacity variable is measured using four indicators: digital competence and technical skills, the ability for innovation and creativity, adaptability to technological changes, and the ability to integrate resources (resource orchestration) (Ryketeng et al., 2023) (Febriani et al., 2025); and The SMEs performance variable is measured using four indicators: sales growth, increased profitability, sustainable competitive advantage, and customer satisfaction and loyalty (Fadillah, 2025) (Zhu, 2024). All variables were measured using a five point Likert scale (1 = strongly disagree to 5 = strongly agree).

The data were analyzed using SEM-PLS approach through SmartPLS software. SEM-PLS was chosen because it is particularly suitable for this study as it can handle complex models with multiple variables and indicators, works well with relatively smaller sample sizes, does not require strict assumptions of data normality, and is effective for predictive and exploratory research purposes.

The analysis was conducted in two main stages: (1) evaluation of the measurement model (outer model), which includes convergent validity, discriminant validity, and composite reliability; and (2) evaluation of the structural model (inner model), which includes R-square and path coefficient analysis. Hypothesis testing was performed using the bootstrapping procedure with 5,000 resamples to determine the significance of direct effects. Hypothesis testing is conducted thru direct effect testing using the bootstrapping test.

Result and Discussion

Respondent Profile

A total of 242 questionnaires were distributed online via Google Form to SMEs actively utilizing digital technology in North Sumatera. Of these, 232 questionnaires were returned, resulting in a response rate of 95.87%. All returned questionnaires were valid and complete, and thus 232 responses were used for further analysis in this study.

Based on 232 SMEs that responded, the majority of the owners or managers are women (56%) compared to men (44%). The education levels of the respondents varied, with the majority being high school/vocational school graduates (42.2%), followed by bachelor's degree holders (32.8%), diploma holders (19.8%), and postgraduate degree holders (5.2%). Based on the scale of the business, nearly half of the respondents were classified as micro enterprises (47.4%), followed by small enterprises (35.3%) and medium enterprises (17.3%). From the perspective of annual revenue, 44.8% have a revenue below Rp 300 million, 33.6% in the range of Rp 300 million – Rp2.5 billion and 21.6% have a revenue of Rp 2.5 billion – Rp 50 billion. In the utilization of digital platforms, the majority of SMEs use social media for marketing (39.7%), followed by marketplaces (31.9%), their own websites (12.1%), and a combination of more than one digital platform (16.3%). This indicates that most SMEs have adopted digital technology, especially for online marketing and sales, although the level of utilization varies (see Table 1).

Measurement Model Evaluation

The measurement model was assessed through convergent validity, discriminant validity, and reliability tests. As shown in Figure 1, all indicators exhibited outer loading values greater than 0.70, indicating good convergent validity.

The measurement model was evaluated through several validity and reliability criteria (see Table 2). All indicators showed outer loadings above the recommended threshold of 0.70, confirming indicator reliability. The Average Variance Extracted (AVE) values for all constructs exceeded 0.50, establishing convergent validity. Internal consistency reliability was confirmed as both Cronbach's Alpha and Composite Reliability (CR) values for all constructs surpassed the recommended threshold of 0.70. Discriminant validity was also achieved, as the square root of AVE for each construct was higher than its correlations with other constructs (Fornell Larcker criterion), and the Heterotrait Monotrait (HTMT) ratio values were below 0.85.

These results indicate that the measurement model is valid and reliable. The structural model evaluation (presented in a separate table) further showed acceptable R-Square values, suggesting that the model has moderate explanatory power.

Structural Model Evaluation

The structural model was evaluated using the coefficient of determination (R-Square) and path coefficient analysis. The R-Square value for SME Performance was 0.661, indicating that digital information technology, digital marketing, and human resource capacity together explain 66.1% of the variance in SME performance. This value suggests a moderate to strong explanatory power in the context of social science research, particularly for studies involving SME performance.

Hypothesis testing was conducted using the bootstrapping procedure. The results are presented in Table 3 and Figure 2.

The results of the hypothesis testing, as presented in Table 3, demonstrate that digital information technology, digital marketing, and human resource capacity have positive and significant effects on SME performance (t-statistics > 1.96 and p-values < 0.05). Therefore, all three proposed hypotheses (H1, H2, and H3) are supported.

The results of this study support all three hypotheses, confirming that digital information technology, digital marketing, and human resource capacity have positive and significant effects on SME performance in North Sumatera. Digital information technology exerts a positive and significant influence on SME performance, consistent with previous studies (Omrani et al., 2022) (L. Chen et al., 2022) (Zairis, 2020). More importantly, the findings extend the Resource Based View (RBV) by demonstrating that in the SME digitalization context, the true value of digital information technology lies not merely in possessing VRIN resources, but in the orchestration and integration of its dimensions (infrastructure, systems, security, and processes). This study refines RBV by showing that in resource-constrained environments, such integration generates super additive effects that are particularly difficult to imitate, thereby strengthening the theory's applicability to SMEs in developing regions (Melville et al., 2004) (Bharadwaj, 2000).

Digital marketing emerged as the strongest predictor among the three variables. This finding suggests a capability hierarchy in SMEs operating in developing regions, where digital marketing acts as a market-facing capability that directly translates digital investments into visible performance outcomes. In the North Sumatra context, limited physical infrastructure and geographical challenges make digital marketing a critical bridge to wider markets. This implies that SMEs should prioritize digital marketing capability development as a primary strategic lever, as it amplifies the effectiveness of both digital technology infrastructure and human resources. By highlighting this hierarchy, the present study extends RBV by illustrating how certain digital capabilities may serve as keystone resources that unlock greater value from other complementary assets in emerging economy settings (Hagen et al., 2022) (Ajiva et al., 2024) (Bruce et al., 2023) (Jadhav et al., 2023) and (Saura et al., 2023).

Human resource capacity also demonstrates a significant positive effect on SME performance. Beyond its role as an independent predictor, this study positions human resource capacity as a dynamic capability (Kandukuri, 2023) (L'Écuyer & Raymond, 2023) and (Elbendary & Mohamed Shehata, 2024)

Table 1. Respondent Identity

Characteristic	Category	Frequency	Percentage (%)
Gender	Male	102	44,0
	Female	130	56,0
Last Education	SMA/SMK	98	42,2
	Diploma (D3)	46	19,8
	Bachelor's Degree (S1)	76	32,8
	Postgraduate (S2)	12	5,2
Business Scale	Micro	110	47,4
	Small	82	35,3
	Intermediate	40	17,3
Annual Revenue	< Rp300 Million	104	44,8
	Rp 300 Million – Rp2,5 Billion	78	33,6
	Rp 2,5 Billion – Rp50 Billion	50	21,6
Use of Digital Platforms	Media Sosial (Instagram, Facebook, etc)	92	39,7
	Marketplace (Shopee, Tokopedia, etc)	74	31,9
	Own Website	28	12,1
	Combination (More Than One Platform)	38	16,3

Source: Data Analysis Results, 2026

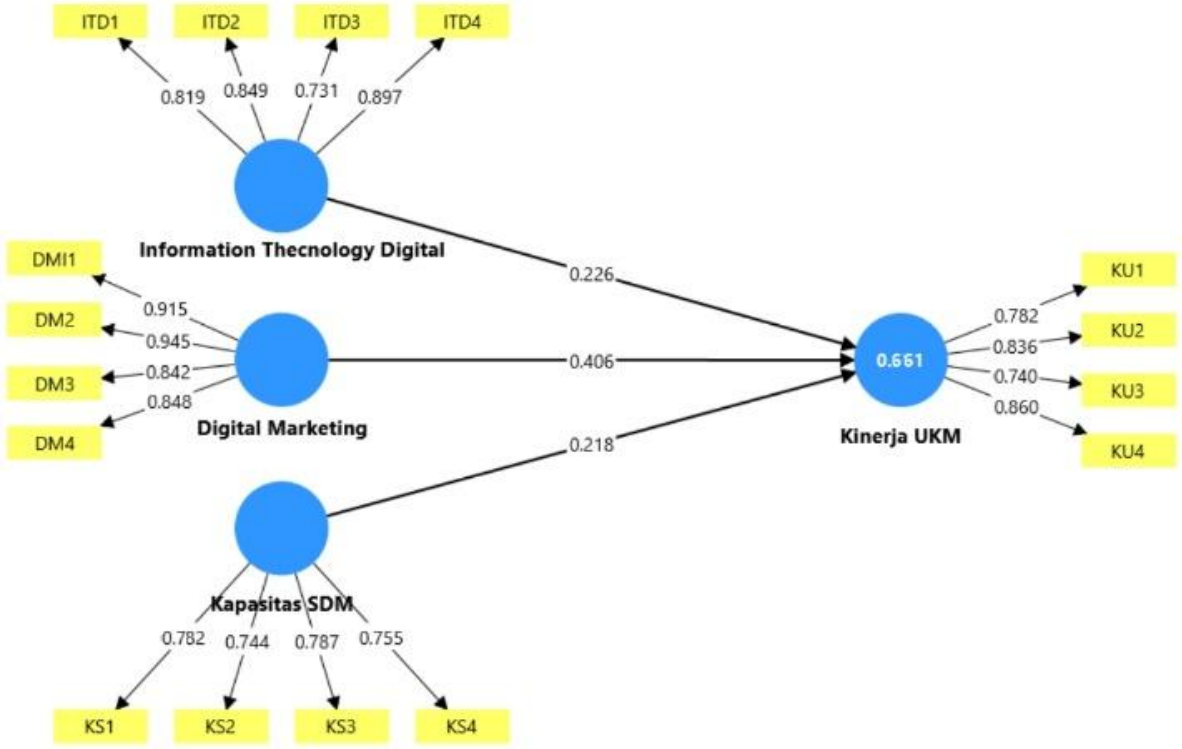

Figure 1. Outer Loading
Source: Research Findings, 2026

Table 2. Validity and Reliability Test

Variable	Explanation	Value	R-Square
Information Tehnology Digital	AVE	0.795	0.661
	Cronbach's Alpha	0.802	
Digital Marketing	AVE	0.748	
	Cronbach's Alpha	0.721	
Human Resource Capacity	AVE	0.833	
	Cronbach's Alpha	0.755	
Performance of SMEs	AVE	0.810	
	Cronbach's Alpha	0.891	

Source: Research Findings, 2026

that enables the effective deployment and integration of digital technology and digital marketing. In the context of North Sumatera's SMEs many of which are micro enterprises with owner managers. HR capacity functions as a mediating mechanism that bridges the gap between technology availability and actual performance realization. This finding enriches the theoretical narrative by showing that human capital is not only a complementary resource but also an orchestrating capability that activates and maximizes the potential of digital resources, particularly in environments with lower digital maturity.

Overall, the integrated model tested in this study contributes to theory by moving beyond the examination of isolated effects toward a more nuanced understanding of resource complementarity and capability hierarchy in SME digital transformation within developing regions.

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Table 3. Hypothesis Testing

Hypothesis	β	T-Count	Sig	Conclusion
Information Tehnology Digital → Performance of SMEs	0.412	2.753	0.003	Accepted
Digital Marketing → Performance of SMEs	0.501	3.432	0.001	Accepted
Human Resource Capacity → Performance of SMEs	0.327	2.843	0.031	Accepted

Source: Research Findings, 2026

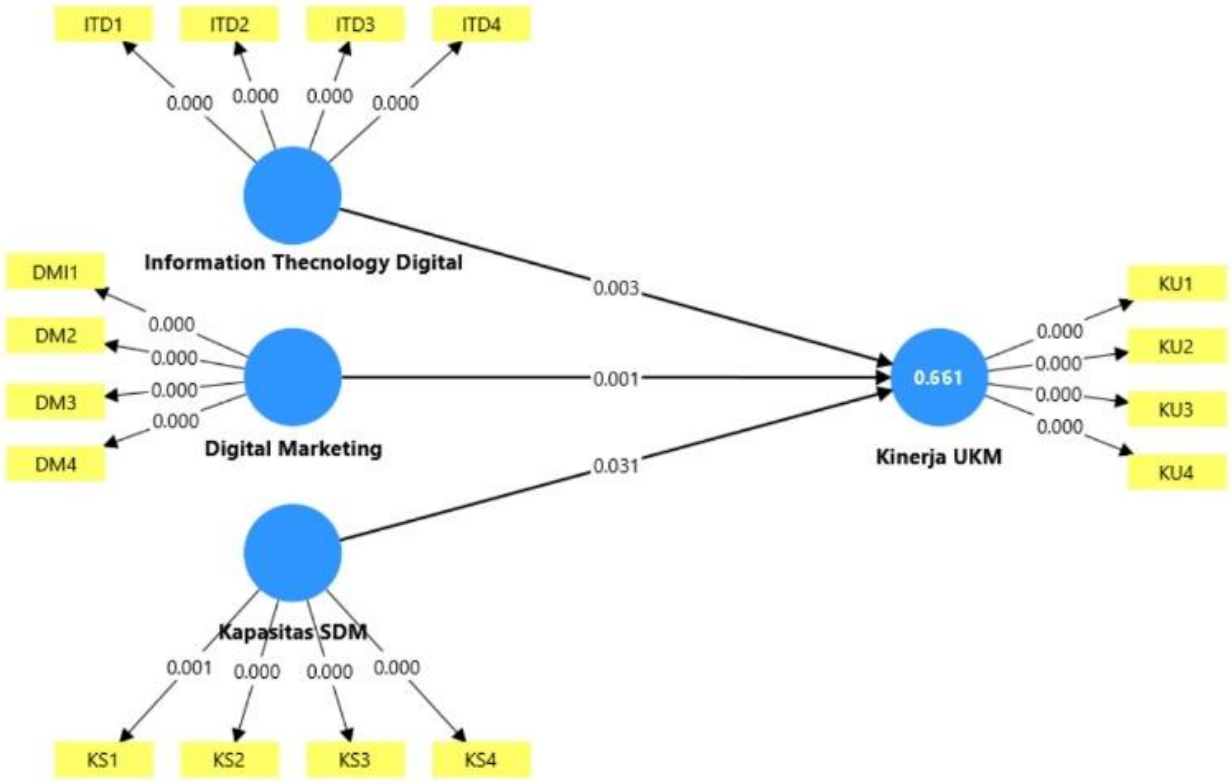

Figure 2. Direct Hypothesis Test
Source: Research Findings, 2026

Theoretical Contribution

Despite its contributions, this study has several limitations First, the cross sectional design limits causal inference. Although the results show significant relationships between digital information technology, digital marketing, human resource capacity, and SME performance, the data collected at a single point in time cannot confirm the direction of causality or long term sustainability of these effects. Second, the reliance on self reported questionnaires from SME owners or managers raises the potential for common method bias and self report inflation. Although procedural remedies such as anonymity assurance and item randomization were applied, these biases may still inflate the observed relationships. Third, the sample was limited to 232 SMEs in North Sumatra Province that actively use digital technology, which restricts the generalizability of the findings to SMEs in other regions, non digital adopters, or different business contexts.

These limitations suggest caution in interpreting the results. Future research could address these issues by adopting longitudinal designs to establish causality, incorporating objective performance measures (e.g., financial reports or sales data) to reduce common method bias, and expanding the sample across multiple provinces or countries to examine the boundary conditions of the proposed model more comprehensively.

Practical Implications

For SME owners and managers in North Sumatra, these results suggest the need to prioritize digital marketing capabilities while simultaneously strengthening digital information technology infrastructure and human resource capacity. Policymakers and business support organizations should design programs that integrate digital skills training with practical digital marketing strategies rather than focusing on technology adoption alone. Such integrated interventions are expected to generate more significant performance improvements for SMEs in similar regional contexts.

Conclusion

This study confirms that digital information technology, digital marketing, and human resource capacity have positive and significant effects on SME performance in North Sumatera. Statistically, all three hypotheses are supported, indicating that these variables are important predictors of SME performance in the sampled population.

Theoretically, this research contributes to the Resource Based View (RBV) literature by providing empirical evidence on the synergistic effects of integrating digital information technology, digital marketing, and human resource capacity within a comprehensive model. The findings highlight the importance of resource complementarity in improving SME performance, particularly in the context of developing regions.

From a managerial perspective, SME owners and policymakers in North Sumatra are encouraged to prioritize the integrated development of digital information technology, digital marketing, and human resource capacity rather than implementing them in isolation. Such integration is expected to

enhance operational efficiency and market reach.

Despite these contributions, this study has several limitations. The cross sectional design and the sample restricted to SMEs in North Sumatera Province limit the generalizability of the findings. Future research could employ longitudinal designs, broader geographical coverage, and objective performance measures to further validate the relationships among these variables.

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