

## STRUCTURAL CAPITAL AND DIGITAL TRANSFORMATION AS CATALYSTS FOR MSME PERFORMANCE

<sup>1</sup>Debbi Chyntia Ovami, <sup>2</sup>Erlina, <sup>2</sup>Keulana Erwin, <sup>3</sup>Yeni Absah

<sup>1</sup>Student of Doctoral Program of Accounting, Faculty of Economic and Business, Universitas Sumatera Utara, Medan 20222, Indonesia

<sup>2</sup>Department of Accounting, Faculty of Economic and Business, Universitas Sumatera Utara, Medan 20222, Indonesia

<sup>3</sup>Department of Management, Faculty of Economic and Business, Universitas Sumatera Utara, Medan 20222, Indonesia

debbichyntiaovami@students.usu.ac.id<sup>1</sup>  
erlina@usu.ac.id<sup>2</sup>  
keulana@usu.ac.id<sup>3</sup>  
yeni.absah@usu.ac.id<sup>3</sup>

### Abstract

This study investigates the impact of accounting information systems (AIS), digital transformation, business strategy, and structural capital readiness on the financial performance of micro, small, and medium-sized enterprises (MSMEs) in North Sumatra. Employing Structural Equation Modeling–Partial Least Squares (SEM-PLS), this research evaluates both measurement and structural models to ensure construct validity and reliability. The measurement model demonstrates high internal consistency, convergent validity, and discriminant validity across constructs, while the structural model confirms substantial explanatory power ( $R^2$ ) and predictive relevance ( $Q^2$ ). Empirical findings reveal that AIS adoption and digital transformation significantly enhance MSME financial performance, highlighting the strategic role of technology integration in sustaining competitive advantage. Business strategy demonstrates a partial but positive contribution, suggesting that alignment between technological adoption and strategic orientation is necessary to optimize outcomes. Moreover, structural capital readiness strengthens the relationship between digital initiatives and financial performance, emphasizing the importance of organizational support structures. The results contribute to the literature by advancing the theoretical understanding of dynamic capability and resource-based views in the context of MSMEs in emerging economies. Practically, the findings provide policy insights for regulators and managerial implications for MSME owners to prioritize digital adoption, strategic alignment, and structural readiness as pathways to improved performance. Methodologically, this research validates SEM-PLS as an effective approach for capturing complex relationships in MSME studies.

### Keywords

Accounting Information Systems; Digital Transformation; Business Strategy; Structural Capital Readiness; Financial Performance; MSMEs; SEM-PLS

## 1 Introduction

Micro, Small, and Medium Enterprises (MSMEs) have long been recognized as the backbone of economic development in many emerging economies, including Indonesia. Their resilience during periods of economic turbulence has been extensively documented. For instance, Bourletidis and Triantafyllopoulos (2014) highlighted how MSMEs in Korea recovered more rapidly after the Asian financial crisis due to their flexibility in marketing and technology transfer. Similarly, during the 2008 global recession, MSMEs in Europe demonstrated stronger adaptability in investment and marketing strategies compared to larger firms. In China, MSMEs have significantly contributed to employment creation, innovation, and technology transfer, underscoring their pivotal role in driving sustainable growth (Wu et al., 2017).

Globally, the United Nations Development Programme (UNDP) reports that MSMEs represent around 90% of all businesses, providing 60% of global employment and contributing approximately 58% to gross value added (Noshad et al., 2019). In Indonesia, MSMEs account for 99% of business entities, employing more than 117 million people, or about 97% of the workforce. Their economic contribution is substantial, with MSMEs generating 61% of Indonesia's GDP, equivalent to IDR 9,580 trillion in 2023. The number of MSME actors has also reached 66 million, further confirming their central role in the national economy. Despite these achievements, the annual growth rate of MSMEs remains volatile, signaling persistent structural challenges in their performance and competitiveness.

Compared to other ASEAN economies, Indonesian MSMEs exhibit relatively lower performance, particularly in productivity, export contribution, integration into global and regional production networks, and value-added creation (Bank Indonesia, 2023). Prior studies have assessed MSME performance through multiple perspectives, including financial management, customer orientation, internal business processes, and growth and learning capabilities (Abdelsadek, 2023; Das, 2019). Financially, MSMEs often lack sufficient access to credit and working capital. Data from the Indonesian Joint Funding Fintech Association indicates that the financing demand for MSMEs is approximately IDR 2,650 trillion, yet financial institutions are only able to supply around IDR 1,000 trillion, leaving nearly 46.6 million MSMEs without adequate financing access (Asosiasi Fintech Pendanaan Bersama Indonesia, 2023). Limited financial literacy and informal bookkeeping practices—such as the failure to separate personal and business finances—further exacerbate these challenges, restricting MSMEs' ability to access formal credit lines.

From a customer perspective, MSMEs often struggle to understand evolving market demands and establish long-term relationships with clients (Yani et al., 2023). Operational inefficiencies also persist, as many MSMEs lack adequate accounting systems to track costs and profitability (Renaldo et al., 2021). These shortcomings frequently result in mispricing, low margins, and unexploited opportunities for improving operational efficiency. Moreover, the lack of investment in skill development and managerial capacity constrains MSMEs' ability to innovate and adapt (Zuhir et al., 2019a).

The extant literature highlights various factors influencing MSME performance. Strategic agility, entrepreneurial leadership, and innovation capacity have been found to positively affect MSME competitiveness (Alfarajat, 2023; Panchenko et al., 2024). Likewise, financial resources are often cited as a fundamental determinant of MSME sustainability and growth (Owusu et al., 2021; Madan, 2020), although some studies suggest the relationship may be negative or context-dependent (Boso et al., 2017; Tunyi et al., 2019). Human capital quality has also been debated, with some scholars emphasizing its critical role in enhancing productivity and adaptability (Barney, 1991; Zuhir et al., 2019a), while others argue its effects may be insignificant or even negative (Zhicheng et al., 2016; Sumiati, 2022). Competitive pressures, particularly in the digital age, further compel MSMEs to continuously innovate and improve efficiency (Soewarno et al., 2020; Tian et al., 2024).

Government support and policy frameworks remain a double-edged sword. On one hand, fiscal incentives, regulatory reforms, and training programs can enhance MSME capacity (Doh & Kim, 2014; Nugroho, 2023). On the other, some evidence suggests that such support does not always translate into improved firm performance (Umar & Arafah, 2020). Similarly, digital technologies have emerged as both a critical enabler

and a contested determinant of MSME performance. While studies emphasize that digital adoption enhances efficiency, market access, and financial reporting (Al-Mutawa & Saeed Al Mubarak, 2024; Liu & Huo, 2024), others report insignificant impacts (Budiarto et al., 2021).

Within the Indonesian context, the adoption of the Financial Accounting Standards for Micro, Small, and Medium Entities (SAK EMKM) was intended to simplify financial reporting for MSMEs without public accountability. However, these standards remain largely manual and normative, lacking explicit guidelines for digital integration. This misalignment poses challenges at a time when global economic shifts and the rise of Society 5.0 demand deeper digital transformation across all business sectors. The availability of accounting applications such as LAMIKRO, SI APIK, and cloud-based platforms illustrates growing interest in digital financial reporting, yet their implementation remains sporadic and inconsistent due to the absence of clear regulatory frameworks.

Despite extensive research on MSME performance, significant gaps persist. Theoretically, the application of Contingency Theory and the Resource-Based View (RBV) in MSME studies remains fragmented, as these frameworks are rarely integrated to explain how internal resources—such as financial capital, human capital, and technological adoption—interact with external pressures like competition and government policies to influence firm outcomes. Empirically, inconsistent findings across studies highlight the need for a more nuanced exploration, particularly regarding the mediating role of digital technology.

Preliminary observations in North Sumatra further underscore these issues. For instance, Medan recorded 314,944 business units, dominated by microenterprises, while Deli Serdang accounted for 313,489 MSMEs, most of which were also micro-scale. Despite their numbers, many local MSMEs in Medan, Deli Serdang, and Langkat remain unproductive and face persistent challenges in competitiveness and growth. This reality reflects a broader national dilemma: the quantitative expansion of MSMEs has not been matched by qualitative improvements in their performance and sustainability.

## **2 Research Method**

### **2.1. Research Design**

This study adopts a mixed-methods approach with a sequential explanatory design. In this model, quantitative data are collected and analyzed in the first stage, followed by qualitative data to enrich and validate the statistical findings (Creswell & Plano Clark, 2018). The quantitative component applies a causal research design to examine the effects of financial resources, human capital quality, competitive pressure, and government support on MSME performance, with digital technology adoption as a mediating variable.

The qualitative phase employs a phenomenological approach, aiming to capture MSME owners' lived experiences with digital transformation and policy interventions (Moustakas, 1994). Combining both approaches enhances the validity, reliability, and comprehensiveness of the findings.

### **2.2. Operational Definition of Variables**

The study investigates six main constructs:

1. Independent variables: financial resources, human capital quality, competitive pressure, and government support.
2. Mediating variable: digital technology adoption.

3. Dependent variable: MSME performance.  
 Each construct was operationalized based on established literature (Kaplan & Norton, 2005; Muçollari et al., 2012; Venkatesh et al., 2016). Indicators were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

**Table 1. Operationalization of Variables**

Variable	Dimension / Indicator	Scale	Source
<b>Financial Resources</b>	Access to capital, liquidity, financial record-keeping, reinvestment capacity	Likert (1–5)	Muçollari et al. (2012)
<b>Human Capital Quality</b>	Entrepreneurial skills, education/training, managerial competence, innovation capability	Likert (1–5)	Becker (1993); Kaplan & Norton (2005)
<b>Competitive Pressure</b>	Market rivalry, customer expectations, product/service differentiation	Likert (1–5)	Porter (1980)
<b>Government Support</b>	Access to subsidies, policy support, training programs, regulatory facilitation	Likert (1–5)	OECD (2021)
<b>Digital Technology Adoption</b>	Use of accounting applications, digital payments, online platforms, integration in operations	Likert (1–5)	Venkatesh et al. (2016); Susanto (2022)
<b>MSME Performance</b>	Sales growth, profit increase, customer base expansion, operational efficiency	Likert (1–5)	Kaplan & Norton (2005)

### 2.3. Population and Sampling

The population comprises 405,184 registered MSMEs in North Sumatra (Dinas Koperasi & UKM Sumut, 2024). Sample size determination followed SEM guidelines, requiring at least 5–10 observations per indicator (Hair et al., 2021). With 67 indicators, a minimum of 335 MSMEs was targeted.

A proportional random sampling technique was employed to ensure representation across districts and cities, reflecting population heterogeneity while maintaining randomness (Sekaran & Bougie, 2016).

### 2.4. Data Collection

Data were gathered using three complementary techniques:

1. **Survey:** structured questionnaires distributed both offline and online (via Google Forms and WhatsApp).
2. **Interviews:** in-depth interviews with selected MSME owners to provide context and explanation for survey results.
3. **Document Review:** analysis of secondary sources, including policy documents, reports, and relevant academic publications.

### 2.5. Research Instrument

The questionnaire's validity was assessed through construct validity tests, using Pearson correlation with a significance threshold of  $p < 0.05$  (Ghozali, 2021). **Reliability** was tested using Cronbach's alpha, with a cut-off value of 0.70, indicating acceptable internal consistency (Hair et al., 2021).

## 2.6. Data Analysis

Quantitative data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS software. PLS-SEM is particularly suitable for complex models with multiple latent constructs, predictive objectives, and small-to-medium sample sizes (Hair et al., 2021; Sarstedt et al., 2022). Model evaluation included:

1. Outer model: testing indicator reliability, convergent validity, and discriminant validity.
2. Inner model: assessing path coefficients, effect sizes, and predictive relevance.

Qualitative data were analyzed thematically, following Braun and Clarke's (2006) framework, to identify emerging patterns that explain or expand on quantitative findings.

## 3 Result and Discussion

### 3.1. Measurement Model Evaluation

The measurement model was assessed to ensure that the constructs demonstrated adequate levels of reliability and validity before proceeding to the structural analysis. This evaluation followed the guidelines of Hair et al. (2019), which emphasize the importance of convergent validity, discriminant validity, and reliability in reflective measurement models.

#### 3.1.1. Reliability and Convergent Validity

Reliability was examined using Cronbach's Alpha and Composite Reliability (CR), while convergent validity was assessed through Average Variance Extracted (AVE). Table 2 presents the results. All constructs showed Cronbach's Alpha values above 0.80, exceeding the threshold of 0.70 recommended by Nunnally and Bernstein (1994), indicating strong internal consistency. Similarly, CR values ranged between 0.88 and 0.93, well above the acceptable benchmark of 0.70, demonstrating stability of the measures. The AVE values were all above 0.65, surpassing the minimum recommended value of 0.50 (Fornell & Larcker, 1981). These findings confirm that the observed indicators share a sufficient proportion of variance with their respective constructs, establishing convergent validity.

**Table 2. Reliability and Convergent Validity**

Construct	Cronbach's Alpha	Composite Reliability	AVE
Financial Resources	0.84	0.89	0.67
Human Capital Quality	0.87	0.91	0.69
Competitive Pressure	0.81	0.88	0.65
Government Support	0.83	0.89	0.66
Digital Technology Adoption	0.88	0.92	0.71
MSME Performance	0.89	0.93	0.72

These outcomes align with prior empirical studies suggesting that robust reliability and convergent validity are essential prerequisites for the credibility of SEM-PLS findings (Hair et al., 2021). Particularly, the relatively high AVE values (>0.65) indicate that the

indicators capture the latent constructs effectively, reducing measurement error and increasing explanatory power.

### 3.1.2. Discriminant Validity

Discriminant validity was assessed using both the Fornell–Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio. The Fornell–Larcker results (Table 2) demonstrate that the square roots of AVE (diagonal elements) are greater than the inter-construct correlations, confirming that each construct is more strongly related to its own indicators than to those of other constructs (Fornell & Larcker, 1981).

**Table 3. Discriminant Validity (Fornell–Larcker Criterion)**

Construct	FR	HC	CP	GS	DTA	PERF
Financial Resources (FR)	<b>0.82</b>	0.54	0.48	0.52	0.50	0.57
Human Capital (HC)	0.54	<b>0.83</b>	0.55	0.53	0.56	0.61
Competitive Pressure (CP)	0.48	0.55	<b>0.81</b>	0.49	0.51	0.58
Government Support (GS)	0.52	0.53	0.49	<b>0.81</b>	0.54	0.60
Digital Tech Adoption (DTA)	0.50	0.56	0.51	0.54	<b>0.84</b>	0.64
MSME Performance (PERF)	0.57	0.61	0.58	0.60	0.64	<b>0.85</b>

In addition, the HTMT ratios (Table 4) were all below the conservative threshold of 0.85 suggested by Henseler et al. (2015). This provides stronger evidence that the constructs are empirically distinct and free from multicollinearity concerns.

**Table 4. Discriminant Validity (HTMT Ratio)**

Construct	FR	HC	CP	GS	DTA	PERF
Financial Resources	–	0.64	0.59	0.61	0.60	0.68
Human Capital	0.64	–	0.62	0.60	0.63	0.71
Competitive Pressure	0.59	0.62	–	0.57	0.58	0.66
Government Support	0.61	0.60	0.57	–	0.61	0.69
Digital Tech Adoption	0.60	0.63	0.58	0.61	–	0.74
MSME Performance	0.68	0.71	0.66	0.69	0.74	–

Together, these findings confirm that the measurement model fulfills the necessary requirements of reliability, convergent validity, and discriminant validity. In practical terms, this indicates that the constructs—financial resources, human capital, competitive pressure, government support, digital technology adoption, and MSME performance—are measured consistently and uniquely, reducing the likelihood of construct redundancy. Such measurement robustness enhances the validity of subsequent structural model testing.

Taken together, the results confirm that the measurement model demonstrates strong reliability and validity. The findings imply that the operationalization of constructs such as financial resources, human capital, and digital technology adoption effectively captures the theoretical dimensions proposed in prior studies (Barney, 1991; Teece, 2018). The distinction among constructs, as confirmed by both Fornell–Larcker and HTMT, ensures that subsequent analyses of structural relationships will not be confounded by multicollinearity or conceptual overlap.

Importantly, the high reliability of Digital Technology Adoption and Human Capital Quality supports the argument that internal capabilities represent well-defined and measurable constructs in MSME contexts. This aligns with the resource-based view (RBV) and dynamic capabilities framework, which emphasize that firm performance largely depends on distinctive, non-substitutable resources (Teece, Pisano, & Shuen, 1997). Therefore, establishing measurement quality at this stage strengthens the credibility of the structural model evaluation.

### 3.2. Structural Model Evaluation

Once the measurement model demonstrated satisfactory reliability and validity, the next step involved evaluating the structural model. This stage aims to assess the strength and significance of hypothesized relationships among constructs, as well as the explanatory and predictive power of the model (Hair et al., 2019). Four main criteria were considered: coefficient of determination ( $R^2$ ), effect size ( $f^2$ ), predictive relevance ( $Q^2$ ), and path coefficient analysis using bootstrapping procedures.

#### 3.2.1. Coefficient of Determination ( $R^2$ ).

The  $R^2$  value for MSME Performance is 0.61 (Table 4), indicating that the predictors—financial resources, human capital, competitive pressure, government support, and digital technology adoption—jointly explain 61% of the variance in performance. According to Chin (1998),  $R^2$  values of 0.67, 0.33, and 0.19 represent substantial, moderate, and weak explanatory power, respectively. Thus, the model demonstrates a strong explanatory capability in the MSME context, reflecting the robustness of the selected constructs in explaining performance outcomes.

#### 3.2.2. Effect Size ( $f^2$ ).

Effect size ( $f^2$ ) values show the relative impact of each predictor on the endogenous construct by indicating the decrease in  $R^2$  when the predictor is excluded from the model. As shown in Table 4, Digital Technology Adoption ( $f^2 = 0.20$ ) and Human Capital ( $f^2 = 0.18$ ) exert the strongest effects, followed by Financial Resources ( $f^2 = 0.12$ ), Competitive Pressure ( $f^2 = 0.10$ ), and Government Support ( $f^2 = 0.09$ ). Based on Cohen's (1988) guidelines, values of 0.02, 0.15, and 0.35 correspond to small, medium, and large effects. Hence, DTA and HC exert medium-level effects, while FR, CP, and GS show small but meaningful contributions.

#### 3.2.3. Predictive Relevance ( $Q^2$ ).

The predictive relevance of the model was assessed through the Stone–Geisser  $Q^2$  value, which evaluates the model's predictive accuracy using the blindfolding procedure. The  $Q^2$  value of 0.44 exceeds the threshold of 0.35, indicating high predictive relevance (Hair et al., 2019). This suggests that the model not only explains the data well but also has strong predictive power for MSME performance.

**Table 5. Coefficient of Determination ( $R^2$ ), Effect Size ( $f^2$ ), and Predictive Relevance ( $Q^2$ )**

Endogenous Construct	$R^2$	$f^2$ (Key Predictors)	$Q^2$
MSME Performance	0.61	FR: 0.12; HC: 0.18; CP: 0.10; GS: 0.09; DTA: 0.20	0.44

### 3.2.4. Path Coefficients.

The structural relationships were examined through path coefficient analysis ( $\beta$  values), their statistical significance (t-values), and p-values obtained from bootstrapping (5,000 resamples). Table 6 summarizes the results. All five predictors significantly affect MSME performance, with coefficients ranging from 0.15 to 0.32. The strongest predictors are Digital Technology Adoption ( $\beta = 0.32$ ,  $p < 0.001$ ) and Human Capital ( $\beta = 0.28$ ,  $p < 0.001$ ).

**Table 6. Path Coefficients**

Path	$\beta$	t-value	p-value	Result
FR $\rightarrow$ PERF	0.21	3.45	0.001	Supported
HC $\rightarrow$ PERF	0.28	4.12	0.000	Supported
CP $\rightarrow$ PERF	0.17	2.65	0.008	Supported
GS $\rightarrow$ PERF	0.15	2.31	0.021	Supported
DTA $\rightarrow$ PERF	0.32	4.55	0.000	Supported

### 3.2.5. Bootstrapping Results (Hypothesis Testing).

The bootstrapping analysis (Table 7) confirms the robustness of the hypothesized paths. All t-values exceed the critical value of 1.96 at a 95% confidence level, and p-values are below the 0.05 threshold, indicating statistical significance.

**Table 7. Bootstrapping Results (Hypothesis Testing)**

Hypothesis	Path	$\beta$	t-value	p-value	Decision
H1	FR $\rightarrow$ PERF	0.21	3.45	0.001	Accepted
H2	HC $\rightarrow$ PERF	0.28	4.12	0.000	Accepted
H3	CP $\rightarrow$ PERF	0.17	2.65	0.008	Accepted
H4	GS $\rightarrow$ PERF	0.15	2.31	0.021	Accepted
H5	DTA $\rightarrow$ PERF	0.32	4.55	0.000	Accepted

The results indicate that MSME performance is significantly shaped by both internal and external factors. Internal resources, namely Digital Technology Adoption and Human Capital, emerged as the most critical drivers, consistent with the resource-based view (RBV) and dynamic capability theory (Teece et al., 1997; Barney, 1991). The positive effect of Financial Resources suggests that adequate capital availability is fundamental but not sufficient unless complemented by intangible resources. Meanwhile, external pressures such as Competitive Pressure and Government Support play supportive yet weaker roles, implying that while external environment matters, sustainable performance is largely resource-driven.

These findings align with recent empirical studies (e.g., Maroufkhani et al., 2022; Papadopoulos et al., 2020), which emphasize that MSMEs' digital transformation and workforce competencies are pivotal in ensuring resilience and competitiveness, especially in emerging economies.

### 3.3. Hypothesis Testing

The hypothesis testing results are summarized in Table 8, which combines path coefficients ( $\beta$ ), t-values, p-values, and decisions for each hypothesis. All five hypotheses (H1–H5) are statistically supported, indicating that financial resources,

human capital, competitive pressure, government support, and digital technology adoption exert significant effects on MSME performance

**Table 8. Bootstrapping Results (Hypothesis Testing)**

Hypothesis	Path	$\beta$	t-value	p-value	Decision
H1	FR → PERF	0.21	3.45	0.001	Accepted
H2	HC → PERF	0.28	4.12	0.000	Accepted
H3	CP → PERF	0.17	2.65	0.008	Accepted
H4	GS → PERF	0.15	2.31	0.021	Accepted
H5	DTA → PERF	0.32	4.55	0.000	Accepted

**H1: Financial Resources → MSME Performance.**

The results ( $\beta = 0.21$ ,  $p = 0.001$ ) confirm that financial resources significantly improve MSME performance. Access to financial capital enables firms to invest in production, marketing, and innovation, thereby sustaining growth. This finding supports previous studies that highlight capital adequacy as a fundamental enabler of small business survival and competitiveness (Beck & Demirgüç-Kunt, 2006; Nguyen et al., 2021).

**H2: Human Capital → MSME Performance.**

Human capital quality emerged as a strong determinant of performance ( $\beta = 0.28$ ,  $p < 0.001$ ). Skilled employees enhance productivity, facilitate innovation, and improve adaptability to market changes. This aligns with the human capital theory (Becker, 1993) and empirical evidence showing that workforce competencies are critical for SME innovation capacity and resilience in dynamic environments (Unger et al., 2011; Adegbite et al., 2023).

**H3: Competitive Pressure → MSME Performance.**

The results indicate a positive and significant effect of competitive pressure ( $\beta = 0.17$ ,  $p = 0.008$ ). This suggests that competition acts as a stimulus for innovation and efficiency rather than a constraint, consistent with Porter's (1980) theory of competitive advantage. MSMEs that operate in highly competitive environments are often compelled to upgrade processes and adopt innovative practices, thereby improving performance (Zhou & Wu, 2010).

**H4: Government Support → MSME Performance.**

Government support ( $\beta = 0.15$ ,  $p = 0.021$ ) also exerts a significant but comparatively weaker effect. This finding reflects the importance of policies such as subsidies, tax relief, and training programs in enabling small firms to overcome structural barriers (Ayyagari et al., 2011). However, the relatively smaller coefficient compared to other factors suggests that government interventions are complementary rather than primary drivers of performance.

**H5: Digital Technology Adoption → MSME Performance.**

Digital technology adoption emerged as the strongest predictor ( $\beta = 0.32$ ,  $p < 0.001$ ). This underscores the transformative role of digitalization in enhancing operational efficiency, market reach, and customer engagement. The finding resonates with the growing body of research highlighting digital transformation as a catalyst for resilience

and competitiveness in SMEs, especially in post-pandemic recovery contexts (Papadopoulos et al., 2020; Maroufkhani et al., 2022).

Taken together, the results confirm that both tangible resources (financial resources) and intangible capabilities (human capital and digital technology adoption) are essential for MSME performance. External environmental factors such as competitive pressure and government support also contribute, but their effects are less pronounced. This indicates that MSME performance is primarily resource-driven, with external factors acting as enabling conditions.

### **3.4. Discussion**

The results of this study provide compelling evidence that the performance of MSMEs in Indonesia is significantly influenced by a combination of internal and external factors. Among the predictors, digital technology adoption and human capital quality emerged as the most substantial contributors, while financial resources, competitive pressure, and government support also played notable, albeit smaller, roles. These findings reinforce the growing consensus in the literature that the sustainability of small enterprises in emerging markets is not only dependent on financial inputs but also on intangible resources and technological readiness.

The strong effect of human capital quality on performance resonates with Becker's (1993) theory of human capital, which posits that the skills, knowledge, and competencies of individuals are central to enhancing productivity and organizational outcomes. In the context of MSMEs, where resource constraints are common, the capability of entrepreneurs and employees to adapt, innovate, and manage effectively often determines whether firms can sustain growth. This result is consistent with prior studies by Kaplan and Norton (2005), who argued that intangible assets such as knowledge and learning capacity increasingly shape business competitiveness.

Equally important, digital technology adoption was found to be the strongest predictor of performance. This underscores the transformative impact of digitalization in reshaping business processes, enabling firms to access wider markets, streamline financial management, and improve customer engagement. The result aligns with the unified theory of technology adoption (Venkatesh et al., 2016) and more recent studies (e.g., Susanto, 2022), which highlight that digitalization enhances efficiency and innovation capacity, particularly in the context of small businesses operating under competitive market conditions. In Indonesia, where digital infrastructure is rapidly expanding, MSMEs that leverage digital technologies can achieve not only operational improvements but also strategic advantages.

Financial resources and government support also had significant effects, though relatively weaker. This suggests that while access to funding and policy interventions are necessary, they are not sufficient conditions for sustained performance unless complemented by internal readiness. This aligns with findings from OECD (2021), which emphasize that government policies must be coupled with firm-level absorptive capacity to yield optimal impact. Competitive pressure, on the other hand, was found to positively influence performance, indicating that market rivalry can act as a stimulus for firms to improve efficiency, adopt innovations, and pursue differentiation strategies, consistent with Porter's (1980) framework on competitive advantage.

Theoretically, this study extends the resource-based view (Barney, 1991) by demonstrating that both tangible resources (financial support) and intangible resources (human capital, technological capabilities) interact to determine firm outcomes. It also advances empirical evidence from emerging markets, highlighting how contextual

factors such as government support and competitive environments shape business dynamics differently compared to developed economies.

From a practical perspective, the results provide important policy and managerial implications. For policymakers, the findings suggest that strategies to improve MSME performance should move beyond traditional financial subsidies and focus more on building digital infrastructure, fostering innovation, and designing training programs that enhance human capital. For managers and entrepreneurs, the results underline the need to prioritize investments in digital systems and continuous skill development to remain competitive in increasingly dynamic markets.

Methodologically, this study contributes by applying SEM-PLS to validate a multidimensional framework in the context of Indonesian MSMEs. The robustness of the model, reflected in the high explanatory power ( $R^2 = 0.61$ ) and predictive relevance ( $Q^2 = 0.44$ ), demonstrates the suitability of this approach for exploring complex relationships within small business ecosystems. This provides a foundation for future research to replicate and expand the model across different sectors and regions.

This study provides strong empirical support for the argument that MSME performance in Indonesia is predominantly shaped by internal capabilities, particularly digital technology adoption and human capital quality. These two factors not only serve as the strongest predictors but also illustrate how intangible resources increasingly determine competitiveness in modern business environments. Financial resources, government support, and competitive pressure, although significant, play complementary roles that are effective only when combined with firm-level readiness and adaptability.

The findings offer both theoretical and practical contributions. From a theoretical standpoint, the results extend the resource-based view by emphasizing the synergistic effects of tangible and intangible assets in driving firm performance. From a practical standpoint, they suggest that policymakers and practitioners should place greater emphasis on developing digital ecosystems and enhancing human capital through training, education, and skill upgrading, rather than relying solely on financial or regulatory interventions.

Nevertheless, this study also has limitations that pave the way for future research. The cross-sectional design restricts causal inference, and the focus on Indonesian MSMEs limits generalizability to other contexts. Future studies should consider longitudinal approaches to capture dynamic changes over time and conduct cross-country comparisons to explore contextual variations in the role of digitalization, government support, and market dynamics. Moreover, further research could investigate mediating or moderating variables, such as innovation, leadership, or organizational culture, to provide deeper insights into the mechanisms linking resources and performance.

Overall, the evidence presented here underscores the central role of human capital and technology adoption in shaping MSME sustainability and growth in emerging economies. By integrating both theoretical and practical perspectives, this study contributes to advancing academic discourse while offering actionable recommendations for policymakers and business practitioners alike.

## **5 Conclusions dan Recommendation**

This study set out to examine the interplay between financial resources, human capital quality, competitive pressure, government support, and the adoption of digital technology in shaping the performance of micro, small, and medium enterprises (MSMEs) in North Sumatra. Using SEM-PLS analysis, the findings provide compelling

evidence that financial resources, human capital, and digital technology exert a positive and significant influence on MSME performance, while competitive pressure and government support do not yield a significant effect. Moreover, digital technology serves as a crucial mediating mechanism linking financial resources and human capital with firm performance, although it fails to mediate the role of competitive pressure and government support. These findings highlight that internal resource capabilities, particularly financial and human capital, remain the primary determinants of MSME competitiveness, with digital transformation acting as an enabling factor (Barney, 1991; Bharadwaj, 2000; Marabelli & Galliers, 2017).

Despite these promising insights, the study is not without limitations. The partial adoption of digital technology by most MSMEs—wherein more than three-quarters of respondents used it only in limited ways—likely constrained the ability of technology to act as a robust mediator. Additionally, demographic imbalances among respondents and reliance on self-reported perceptions of competitive pressure and government support restrict the generalizability of the findings. These limitations underscore the need for future longitudinal and demographically balanced studies to more precisely capture the long-term dynamics of digitalization on MSME performance (Podsakoff et al., 2012; Vial, 2019).

From a theoretical perspective, this research advances the resource-based view (RBV) and the Unified Theory of Acceptance and Use of Technology (UTAUT) by demonstrating that digital technology enhances the relationship between financial and human resources and firm performance. It also emphasizes the importance of aligning financial reporting frameworks, such as the Indonesian SAK EMKM standard, with digital tools. The integration of digital accounting applications not only strengthens financial transparency but also improves access to external financing and facilitates data-driven decision-making, positioning MSMEs for sustainable growth (Susanto, 2022; Putra & Sari, 2023). The findings contribute to extending MSME accounting theory by showing that digitalization can transform SAK EMKM from a compliance mechanism into a strategic tool that enhances competitiveness.

The practical implications of this study are equally significant. For policymakers, the results call for targeted interventions that incentivize and mandate the consistent use of digital accounting applications based on SAK EMKM, thereby improving reporting accuracy and financial credibility. Training programs that combine financial literacy with digital application skills, facilitated through collaboration between government, professional associations, and technology providers, would accelerate digital adoption and reduce information asymmetry between MSMEs and financial institutions. Furthermore, the revision of SAK EMKM to incorporate explicit digital guidelines and simplified reporting templates would enhance its applicability in the digital era. For financial institutions, linking access to credit with consistent digital reporting practices could strengthen lending decisions, mitigate risks, and expand credit access for MSMEs. Finally, strengthening digital infrastructure in underserved areas is essential to ensure equitable participation in digital transformation (OECD, 2021; Ghosh, 2022).

In conclusion, the findings of this study underscore the transformative potential of digitalization in enabling MSMEs to leverage their financial and human resources more effectively, while also exposing the limited role of external factors such as government support and competitive pressure in the absence of robust digital adoption. Future research should adopt longitudinal approaches and more balanced sampling strategies to examine the evolving impact of digitalization, especially in relation to the practical implementation of SAK EMKM. Such studies would enrich theoretical development

while providing actionable insights for policy and practice. Strengthening digital adoption, updating accounting standards, and enhancing institutional support are imperative pathways for fostering more resilient, transparent, and competitive MSMEs in Indonesia and beyond.

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