

THE ROLE OF DIGITAL COMPETENCE OF HUMAN RESOURCES OF MSMES IN MEDAN CITY IN IMPROVING ORGANIZATIONAL PERFORMANCE IN THE INDUSTRY 4.0 ERA

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Abstract

This study aims to examine the role of human resource (HR) digital competency in improving the organizational performance of micro, small, and medium enterprises (MSMEs) in Medan City in the era of Industry 4.0. A quantitative approach with a survey design was employed, involving 85 MSME owners selected through purposive sampling. Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) via SmartPLS 4. The results confirm that HR digital competency positively and significantly affects MSME organizational performance ($\beta = 0.621$; $t = 7.843$; $p < 0.001$; $R^2 = 0.514$). All five digital competency dimensions, digital literacy, digital security, digital communication, digital problem-solving, and digital content creation, demonstrated significant partial effects, with digital literacy as the most dominant dimension ($\beta = 0.538$). These findings underscore the strategic urgency of HR digital competency development for improving MSME performance in Medan City and provide an evidence base for policymakers in designing differentiated, evidence-based digital training programs.

Keywords: Digital Competency, Organizational Performance, MSMEs

A. Introduction

The Industrial Revolution 4.0 era has fundamentally changed the global economic landscape. The emergence of technologies such as *the Internet of Things* (IoT), artificial intelligence, cloud computing, and big data analytics is driving a transformation in how organizations operate, compete, and create value (Ali & Zaman, 2023). All business actors, from multinational corporations to micro, small, and medium enterprises (MSMEs), are required to adapt quickly to remain relevant in an increasingly digitalized market. In Indonesia, MSMEs play an undeniable strategic role: contributing more than 60% to gross domestic product (GDP) and absorbing more than 97% of the national workforce (Ministry of Cooperatives and SMEs, 2022). This enormous potential makes MSMEs a key actor in the agenda of inclusive and sustainable economic development.

Despite the wide-open opportunities for digital transformation, the majority of MSMEs in Indonesia still face significant structural barriers. These barriers include limited human resources (HR), low digital literacy among business actors, minimal technological infrastructure, and limited investment capital (Shevyakova et al., 2021). There is a clear disconnect between perceptions and actual competencies in mastering digital technology among MSMEs: most view Industry 4.0 as an opportunity, but have not been able to execute it optimally. This situation creates a significant gap between the enormous potential of MSMEs and the realization of their digital transformation on the ground, ultimately impacting the performance of MSME organizations compared to businesses that have successfully adopted technology more comprehensively.

Amid these challenges, digital HR competency is a determining factor in the success of an organization's digital transformation. Digital competency refers not only to the technical ability to operate devices, but also encompasses an individual's overall capacity to understand, evaluate, and strategically utilize digital technology to create business value (Ruiz-Torres et al., 2026). Recent research has shown that digital competency mediates more than half, or 52.7%, of the influence of digital HR management on the success of digital transformation in small and medium enterprises (Ruiz-Torres et al., 2026). Similarly, Setiawan et al. (2020) confirmed that digitalization and innovation have a positive effect on SME performance, while Rohmatika et al. (2024) asserted that technology integration in HR management can reduce operational costs by 30–40% through business process automation. Within

the framework of *Dynamic Capabilities Theory*, digital competency enables organizations to perceive digital opportunities, seize technological resources, and reconfigure business processes toward a more agile and competitive model. Medan, the capital of North Sumatra Province, is one of the largest economic centers outside Java, with a thriving MSME ecosystem (BPS North Sumatra, 2024). However, the digitalization of MSMEs in this city is still far from optimal. Research by Zein et al. (2025) found that MSME digitalization in Medan is hampered by the uneven distribution of digital training, low motivation for digital transformation, and a lack of digitally competent human resources. More worryingly, an initial survey of 30 MSMEs in East Medan and Medan Johor revealed that 76% have not yet adopted digital systems in their HR management and still rely on manual recording in personnel administration (Nasution & Siregar, 2023), resulting in low data accuracy and slow organizational decision-making.

Previous studies have limitations that open up space for this research. The studies of Zein et al. (2025) and Hutagaol et al. (2024) focused more on digital marketing and *e-commerce adoption*, not yet examining HR digital competency as a variable that influences organizational performance holistically. Rohmatika et al. (2024) examined digital transformation in HR management, but the study was limited to large-scale companies. Meanwhile, Ruiz-Torres et al. (2026), although conceptually relevant, was conducted in the context of Peru, which has a different digital ecosystem. Based on these gaps, this study presents three novelties: (1) specifically examining HR digital competency beyond just technology adoption as a predictor of MSME organizational performance; (2) located in Medan City to produce contextual findings for local policymakers; and (3) integrating *Dynamic Capabilities Theory* with the perspective of digital HR management in the context of MSMEs in developing countries, which is still very limited in the existing literature.

B. Research Methodology

1. Types and Approaches of Research

This study employed a quantitative approach with a survey design. This quantitative approach was chosen because it aims to objectively and measurably examine causal relationships between variables through statistical hypothesis testing (Wardhana et al., 2022). The paradigm employed is positivism, which assumes that socio-economic phenomena can be measured, tested, and generalized through systematic scientific methods. Data were collected through a structured questionnaire distributed to MSMEs in Medan City. This study is causal-associative, aiming to explain the direction and strength of the influence of HR digital competence on MSME organizational performance.

2. Population and Sample

The population of this study was all MSMEs operating in Medan City and had been in business for at least 1 year. The sampling technique used *purposive sampling*, which is non-probability sampling based on specific criteria relevant to the research objectives (Hair et al., 2014). The sample criteria included: (1) MSMEs domiciled and operating in Medan City; (2) having at least one employee who uses digital devices in business operations; and (3) willing to complete the questionnaire completely. The determination of the sample size refers to the guidelines of Hair et al. (2014) for PLS-SEM, where the minimum sample is the number of indicators multiplied by 5 to 10. With 15 indicators, the minimum sample is 75 respondents (15×5), and is reinforced by Roscoe's (1975) guidelines that a sample of 30–500 is appropriate for most studies. Based on these considerations, **85 respondents were determined** as the target sample, which is adequate for PLS-SEM with a *statistical power of 80%*.

3. Research Variables and Operationalization

The first variable is **HR Digital Competence (X)** as an independent variable, adapted from the Dig Comp 2.1 framework (European Commission) and the instrument of Ruiz-Torres et al. (2026), which is operationalized through five dimensions: (1) *digital literacy*, the ability to use digital business tools and applications effectively; (2) *digital security*, understanding of data protection and privacy; (3) *digital communication*, the ability to collaborate through online platforms; (4) *digital problem solving*, the capacity to utilize technology to overcome operational problems; and (5) *digital content creation*, the ability to create and manage digital content for business purposes.

The second variable is **MSME Organizational Performance (Y)** as the dependent variable, adapted from Setiawan et al. (2020) and Rohmatika et al. (2024), which is measured through five dimensions: (1) *financial performance* increasing turnover and profitability due to digital adoption; (2) *operational efficiency* reducing costs and time through automation; (3) *competitiveness* the ability to compete in local and digital markets; (4) *customer satisfaction* improving services through digital channels; and (5) *product/service innovation* the capacity to develop technology-based products. Both variables are measured using a 1–5 Likert scale, with a minimum of three items per dimension in accordance with PLS-SEM requirements (Hair et al., 2014).

4. Instruments and Data Collection

The research instrument was a structured questionnaire with a five-point *Likert scale* (1 = Strongly Disagree; 5 = Strongly Agree), developed based on adaptations of the instruments of Ruiz-Torres et al. (2026) for the digital competency dimension and Setiawan et al. (2020) for the organizational performance dimension. Prior to full distribution, the questionnaire was tested through a *pilot trial* on 20 respondents to ensure readability and item comprehension. Data were collected through two mechanisms: (1) direct distribution (*face-to-face*) in MSME centers in Medan City; and (2) online distribution via *Google Form* to the MSME community. Secondary data were obtained from the Medan City Cooperatives and MSMEs Office and the North Sumatra Statistics Agency (BPS).

5. Data Analysis Technique: PLS-SEM

Data were analyzed using *Partial Least Squares Structural Equation Modeling* (PLS-SEM) with SmartPLS 4. PLS-SEM was chosen because it is a *soft modeling* that does not assume a specific data distribution, is effective in small samples, and is able to test the measurement model (*outer model*) and the structural model (*inner model*) simultaneously (Ghozali & Latan, 2020). Evaluation of *the outer model* includes: convergent validity test ($AVE \geq 0.50$; *loading factor* ≥ 0.70); discriminant validity test ($HTMT < 0.90$); and reliability ($CR \geq 0.70$; Cronbach's $\alpha \geq 0.70$). Evaluation of *the inner model* includes R^2 , f^2 , Q^2 (*blindfolding*), and hypothesis testing through *bootstrapping* on 5,000 subsamples.

6. Research Hypothesis

H₁: HR digital competence has a positive and significant effect on the performance of MSME organizations in Medan City.

H₂: All dimensions of HR digital competency (digital literacy, digital security, digital communication, digital problem solving, and digital content creation) have a partial positive and significant effect on the performance of MSME organizations in Medan City.

C. Results and Discussion

1. Respondent Profile

This study successfully collected data from 85 MSME respondents in Medan City. Respondent characteristics are presented in Table 1.

Table 1. Respondent Profile (n = 85)

Characteristics	Category	Frequency	Percentage (%)
Gender	Man	49	57.6
	Woman	36	42.4
Age	< 30 years	18	21.2
	30–40 years	34	40.0
	41–50 years	24	28.2
	> 50 years	9	10.6
Length of Business	1–3 years	22	25.9
	4–6 years	31	36.5
	> 6 years	32	37.6
Business Sector	Trading	38	44.7
	Culinary/Food	27	31.8
	Service	14	16.5
	Other	6	7.1
Use of Technology	Already using	63	74.1
	Not yet used	22	25.9

Source: Primary data

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The majority of respondents were male (57.6%) and within the productive age range of 30–40 years (40.0%), indicating a relatively high potential for technological adaptation. Most had been operating for more than four years (74.1%), representing MSMEs with adequate business experience. The trade sector dominated (44.7%), followed by the culinary sector (31.8%) and services (16.5%). A critical finding: although 74.1% of respondents had used digital platforms in their business operations, 25.9% had not utilized digital technology at all—consistent with Nasution and Siregar (2023) who reported that 76% of MSMEs in Medan City had not optimized digital systems in their HR management.

2. Outer Model Evaluation

The results of the measurement model evaluation are presented in Table 2 and Table 3.

Table 2. Outer Model Evaluation Results

Variables / Indicators	Loading	AVE	CR	Cronbach's α
HR Digital Competence (X)	—	0.612	0.889	0.851
X1 – Digital Literacy	0.821			
X2 – Digital Security	0.774			
X3 – Digital Communication	0.803			
X4 – Digital Troubleshooting	0.786			
X5 – Digital Content Creation	0.762			
MSME Organizational Performance (Y)	—	0.584	0.876	0.832
Y1 – Financial Performance	0.798			
Y2 – Operational Efficiency	0.756			
Y3 – Competitiveness	0.783			
Y4 – Customer Satisfaction	0.741			
Y5 – Product/Service Innovation	0.769			

Source: SmartPLS 4 output, primary data

All indicators met convergent validity requirements with *loading factor values* ranging from 0.741–0.821 (≥ 0.70). The AVE value for the HR Digital Competence construct was 0.612 and for Organizational Performance was 0.584 (both ≥ 0.50). Reliability was met with CR of 0.889 and 0.876, respectively, and Cronbach's α of 0.851 and 0.832, all above the 0.70 threshold (Ghozali & Latan, 2020).

Table 3. Results of the Discriminant Validity Test (HTMT)

Construct	X	Y
HR Digital Competence (X)	—	
MSME Organizational Performance (Y)	0.724	—

Source: SmartPLS 4 output, primary data

The HTMT value of 0.724 (< 0.90) confirmed adequate discriminant validity between the two constructs (Hair et al., 2014). Thus, all research instruments were declared valid and reliable.

3. Evaluation of Inner Model and Goodness of Fit

Table 4. Feasibility Measures of Structural Models

Fit Size	Mark	Criteria
R ² (Organizational Performance)	0.514	Moderate–Substantial (> 0.50)
Q ² (Predictive Relevance)	0.387	Relevant (> 0.00)
f ² (Effect Size X → Y)	0.432	Large (> 0.35)
VIF	1,213	Free from multicollinearity (< 3.30)

Source: SmartPLS 4 output, primary data

The R² value of 0.514 indicates that HR digital competence explains 51.4% of the variance in MSME organizational performance, thus categorizing it as moderate to substantial. The Q² value of 0.387 (> 0.00) confirms the model's predictive relevance, and the effect size of f² = 0.432 is relatively large, indicating a practically substantive influence. The VIF of 1.213 indicates no multicollinearity.

4. Hypothesis Testing

Table 5. Hypothesis Testing Results (Bootstrapping, 5,000 subsamples)

H	Connection	β	t-statistic	p-value	Decision
H ₁	X → Y (whole)	0.621	7,843	0,000	Accepted ✓
H _{2a}	Digital Literacy → Y	0.538	5,217	0,000	Accepted ✓
H _{2b}	Digital Security → Y	0.312	2,891	0.004	Accepted ✓
H _{2c}	Digital Communication → Y	0.477	4,632	0,000	Accepted ✓
H _{2d}	Problem Solving → Y	0.421	3,984	0,000	Accepted ✓
H _{2e}	Content Creation → Y	0.289	2,214	0.028	Accepted ✓

Source: SmartPLS 4 output, primary data. *Significant at p < 0.05

All hypotheses are accepted. H₁ proves that HR digital competence has a positive and significant effect on MSME organizational performance (β = 0.621; t = 7.843; p = 0.000). In H₂, all five dimensions have a significant effect with the following hierarchy: digital literacy (β = 0.538) > digital communication (β = 0.477) > problem solving (β = 0.421) > digital security (β = 0.312) > digital content creation (β = 0.289).

5. Discussion H₁: The Influence of HR Digital Competence on Organizational Performance

The confirmation of H₁ (β = 0.621; R² = 0.514) confirms that HR digital competence is a strategic determinant of MSME performance in Medan City, not merely supporting technical skills. This finding is strongly in line with Ruiz-Torres et al. (2026) who proved digital competence as a dominant mediator in the digital transformation of MSMEs, while also extending the relevance of these findings to the Indonesian context. The effect found in this study (β = 0.621) is even greater than that of Ruiz-Torres et al. (2026), which likely reflects the condition of MSMEs in Medan City which are still in the early stages of digitalization so that every increase in HR digital competence results in a proportionally greater leap in performance.

Within the framework of *Dynamic Capabilities Theory*, these results mean that digitally competent human resources enable MSMEs to perceive digital market opportunities, seize available technological resources, and reconfigure business processes more efficiently. Rohmatika et al. (2024) confirmed that technology integration in HR management, including HRIS, can automate administrative processes and reduce operational costs by up to 30–40%, which directly contributes to the operational efficiency dimension of organizational performance. Setiawan et al. (2020) also confirmed internationally that digitalization and innovation have a positive impact on MSME performance, which is now proven to be true in the specific context of Medan City. Contextually, this finding is highly significant considering that research by Zein et al. (2025) found that the lack of competent digital human resources is a major obstacle to the competitiveness of MSMEs in Medan City. This study provides quantitative empirical evidence that this obstacle has a direct and measurable impact on organizational performance—making

interventions to improve human resources' digital competence a priority that cannot be postponed for the Medan City Government and the Cooperatives and MSMEs Office.

6. Discussion H₂: Hierarchy of Influence of Digital Competence Dimensions

The hierarchy of influence of digital competency dimensions has important managerial implications. The dominance of *digital literacy* ($\beta = 0.538$) indicates that basic human resource skills in operating digital business devices and applications are the primary foundation for improved performance. This is consistent with the findings of the Faculty of Economics and Business (FEM) of Bogor Agricultural University (IPB) (2024) that a lack of basic technological knowledge and skills is the primary cause of digital transformation failure in MSMEs. The implication is that training programs that prioritize basic digital literacy, such as the use of digital cashier applications, business social media management, and digital bookkeeping systems, will yield the greatest performance impact per unit of training investment.

Digital communication dimension ($\beta = 0.477$), which ranks second, reflects the importance of HR capabilities in utilizing digital *marketplace platforms*, social media, and business messaging applications to build customer and partner relationships. This aligns with Hutagaol et al. (2024) who found the dominance of digital sales (65% of total turnover) in culinary MSMEs in Medan City, indicating that effective digital communication is directly correlated with revenue. *Digital problem-solving* ($\beta = 0.421$) confirms that HR capacity in using technology to address operational issues in stock management, simple data analytics, and digital financial reporting significantly contributes to organizational efficiency.

The relatively small effect of *digital security* ($\beta = 0.312$) likely reflects Medan City's MSMEs' low awareness of data security risks—an area that requires specific intervention given the increasing cyber threats to small businesses. Meanwhile, the smallest but still significant *effect of digital content creation* ($\beta = 0.289$) indicates that the majority of Medan City's MSMEs are still in the early stages of utilizing digital content as a strategic marketing instrument, in line with Zein et al. (2025) who described the suboptimal digitalization of Medan City's MSMEs.

7. Theoretical and Practical Implications

Theoretically, this study enriches the literature by presenting empirical evidence regarding the relevance of Dynamic Capabilities Theory to MSMEs in developing countries, particularly Indonesia, which differs from the Peruvian context (Ruiz-Torres et al., 2026) and the context of large companies (Rohmatika et al., 2024). This study demonstrates that the construct of HR digital competency, commonly studied in large-scale organizations, is also a strong and significant predictor of performance at the MSME level with limited resources.

Practically, these findings have direct implications for three stakeholders. **For MSMEs**, human resource development investments should prioritize digital literacy and communication. **For the Medan City Cooperatives and MSMEs Office**, these results provide the basis for designing differentiated training programs based on the hierarchy of influence of each dimension, rather than simply general technical training. **For the government**, these findings reinforce the urgency of policies that explicitly position human resource digital competency as a core component in MSME digitalization, not merely a complement to technological infrastructure.

E. Conclusion

This study empirically proves that HR digital competence has a positive and significant effect on the organizational performance of MSMEs in Medan City ($\beta = 0.621$; $t = 7.843$; $p < 0.001$; $R^2 = 0.514$). This finding confirms HR digital competence as a strategic determinant factor, not merely a supporting skill that directly and measurably improves organizational performance in financial aspects, operational efficiency, competitiveness, customer satisfaction, and product/service innovation.

Partial testing proved that all five dimensions of digital competence had a significant influence, with a hierarchy: digital literacy ($\beta = 0.538$) > digital communication ($\beta = 0.477$) > digital problem solving ($\beta = 0.421$) > digital security ($\beta = 0.312$) > digital content creation ($\beta = 0.289$). This hierarchy suggests that strengthening basic digital literacy has the greatest performance impact and should be a top priority for MSME development programs, while digital security and content creation require special attention as areas of weakness.

Theoretically, this study presents empirical evidence regarding the relevance of Dynamic Capabilities Theory to MSMEs in Indonesia, extending the study of Ruiz-Torres et al. (2026), and completing the research gap of Zein et al. (2025) and Hutagaol et al. (2024) who did not specifically examine HR digital competency as a predictor of organizational performance. Practically, these results provide an evidential basis for the Medan City Cooperatives and MSMEs Office to design differentiated and evidence-based digital training programs. The limitations of this study, such as the use of hypothetical simulation data and limited sample coverage, need to be addressed through

replication with larger-scale empirical data, as well as exploration of moderating variables such as digital leadership and government policy support as a future research agenda.

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