

Digital Transformation and MSME Performance in Medan: The Roles of Digital Marketing, E-Commerce, Fintech, and Digital Literacy

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ABSTRACT

Purpose – This investigation evaluates how digital marketing, e-commerce adoption, fintech usage, and digital literacy—as four distinct dimensions of digital transformation—affect the performance of Micro, Small, and Medium Enterprises (MSMEs) based in Medan, with self-reported MSME performance serving as an operational indicator of short- to medium-term business outcomes.

Design/methodology/approach – A quantitative research design was executed using empirical data collected through a structured quota-purposive sampling procedure from 200 digitally active MSME operators across five major industrial sectors in Medan. Structural Equation Modeling–Partial Least Squares (SEM-PLS) via SmartPLS 4 was used to evaluate measurement validity, structural path relationships, control variable impacts, and out-of-sample predictive performance using PLSpredict.

Finding/Results – The empirical structural evaluation indicates that digital marketing ($\beta = 0.232$, $p < 0.001$), e-commerce adoption ($\beta = 0.185$, $p < 0.001$), fintech usage ($\beta = 0.142$, $p < 0.001$), and digital literacy ($\beta = 0.364$, $p < 0.001$) exhibit positive and statistically significant associations with MSME performance. Inclusion of control variables (firm age, owner education, sector) confirmed the robustness of these baseline relationships. PLSpredict analysis verified the model's out-of-sample predictive capabilities.

Originality/Value – The novelty of this study lies in its comparative empirical assessment of four key digital-transformation dimensions as parallel direct predictors within a unified variance-based structural framework among digitally engaged regional MSMEs. Grounded in entrepreneurship theory, the findings emphasize that while external digital platforms provide necessary market access and transactional tools, internal human capabilities (digital literacy) carry the largest relative association with performance outcomes.

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1. Introduction

Micro, Small, and Medium Enterprises (MSMEs) play a fundamental role in driving regional economic development, generating employment, and fostering entrepreneurial resilience across emerging economies (Tambunan, 2020). In Indonesia, MSMEs constitute the backbone of national economic activity (Rahayu & Day, 2022). However, rapid advancements in digital communication, online transaction infrastructure, and automated financial services have presented both structural challenges and operational opportunities for regional MSME operators (Winasis et al., 2021).

While prior literature underscores the benefits of digital tools, such as expanding customer reach through digital marketing (Bala & Verma, 2021), lowering distribution costs via e-commerce (Oliveira & Martins, 2021), and streamlining payment processing through financial technology (fintech) (Putra & Handayani, 2022), a scholarly consensus remains emerging regarding the combined structural impact of these technologies when implemented alongside human capability factors such as digital literacy (Van Deursen & Van Dijk, 2022).

A substantial portion of existing research examines technological adoption tools in isolation or focuses predominantly on megacity commercial hubs, leaving regional metropolitan corridors such as Medan understudied (Siregar et al., 2022). Medan serves as the main economic and trade hub of North Sumatra, marked by accelerated digital payment adoption (e.g., Quick Response Code Indonesian Standard / QRIS) alongside heterogeneous levels of digital literacy among business owners (Pratama & Nasution, 2023; Susanti & Syahputra, 2023).

To address these empirical gaps, this study examines the direct associations between four core dimensions of digital transformation—digital marketing, e-commerce adoption, fintech usage, and digital literacy—and MSME performance among digitally active enterprises in Medan. Rather than conceptualizing digital transformation as a single higher-order construct, this paper examines these four operational dimensions as parallel direct antecedents within a unified framework.

2. Literature Review & Hypothesis Development

2.1 Entrepreneurship Theory as Literature Foundation

Entrepreneurship theory provides the primary conceptual foundation for this inquiry, emphasizing that value creation and business survival depend on an entrepreneur's capacity to recognize market opportunities, mobilize resources under conditions of uncertainty, and adapt business processes (Klein, 2016). Modern practice-based perspectives in entrepreneurship highlight that technology adoption is not an exogenous force that automatically guarantees success; rather, performance improvements stem from how business owners actively integrate digital tools into daily decision-making routines and operational workflows (Thompson et al., 2016).

In this framework, the four examined dimensions represent distinct entrepreneurial mechanisms:

- a. Digital Marketing (X1): Acts as an opportunity exploitation mechanism, enabling resource-constrained entrepreneurs to identify and capture target customer segments with high efficiency (Klein, 2016; Bala & Verma, 2021).

- b. E-Commerce Adoption (X2): Represents a market-access capability, enabling firms to bypass physical distribution constraints and operate in broader digital marketplaces (Thompson et al., 2016; Nguyen & Waring, 2020).
- c. Fintech Usage (X3): Represents a financial-resource mobilization tool, streamlining transaction processing, cash-flow monitoring, and working capital management (Frost, 2020; Putra & Handayani, 2022).
- d. Digital Literacy (X4): Reflects entrepreneurial human capital, representing the cognitive and technical skills that empower business actors to evaluate, adopt, and deploy digital tools effectively (Marvel et al., 2016; Van Laar et al., 2020).

2.2 Theoretical Specification of the Parallel Direct-Effects Model

While digital literacy theoretically represents a foundational human capital capability that could enable or moderate the utilization of digital platforms, estimating interactive (moderation) or indirect (mediation) paths requires specific longitudinal or complex structural designs. In this study, to maintain structural parsimony and avoid over-specifying unobserved structural pathways without longitudinal data, we specify a parallel direct-effects structural model. We evaluate the independent baseline associations of all four selected digital transformation dimensions on performance, acknowledging that evaluating interactive dynamic effects remains an avenue for future theoretical testing.

2.3 Research Hypothesis

H1: Digital marketing positively influences MSME performance.

H2: E-commerce adoption positively influences MSME performance.

H3: Fintech usage positively influences MSME performance.

H4: Digital literacy positively influences MSME performance.

3. Methodology

3.1 Sampling Design, Target Population, and Data Collection

The empirical context covers MSMEs operating in Medan, Indonesia. A quota-purposive sampling procedure was utilized. Eligibility criteria required that: (1) the enterprise had been actively operating for at least one year; (2) the firm routinely utilized at least one digital business platform (e.g., social media marketing, e-commerce marketplace, or QRIS payment system); and (3) the questionnaire was completed directly by the primary business owner or managing partner holding strategic authority.

To ensure analytical balance across key urban economic sectors, predetermined sector quotas were established (Food & Beverage: 60; Retail: 50; Services: 40; Fashion: 30; Creative Industry: 20). Field data collection was conducted between January and February 2026 by trained academic enumerators via direct face-to-face visits supported by digital data capture. A total of 245 MSME owners were initially contacted from business association directories. Of these, 45 prospective participants either declined to participate, failed to verify routine digital platform usage, or provided incomplete responses. Enumerators continued data collection until the exact target quota of 200 fully complete, verified questionnaires was achieved ($N = 200$).

3.2 Reproducible Statistical Power Analysis

A formal a priori statistical power analysis was conducted using G*Power software (version 3.1.9.7) for multiple linear regression / structural path modeling. Assuming a medium effect size $f^2 = 0.15$, significance level $\alpha = 0.05$, statistical power $(1 - \beta) = 0.80$, and 4 main structural

predictors, the minimum required sample size was calculated as $N = 85$. When incorporating 4 additional control variable paths (total 8 predictors), the minimum required sample size increased to $N = 109$. Our finalized sample of $N = 200$ significantly exceeds these formal requirements, achieving an empirical statistical power greater than 0.98.

3.3 Measurement Scale Development and Reflective Specification

All constructs were measured on a 5-point Likert scale ranging from 1 ('Strongly Disagree') to 5 ('Strongly Agree'). The constructs were specified reflectively based on the theoretical understanding that the indicators represent observable manifestations sharing a common underlying conceptual core (Hair et al., 2021). Content validity was established through an academic expert review panel (3 senior professors in entrepreneurship and digital business). A pre-test pilot study was conducted with 30 MSME owners in Medan (not included in the final sample); all construct scales demonstrated high internal consistency (Cronbach's $\alpha > 0.80$). Double translation (English to Indonesian and back-translation) was performed to ensure semantic accuracy.

Table 1. Operational Variable

Construct	Indicator	Source	Scale
Digital Marketig (X1)	Measured the frequency and intensity of social media promotion and online advertising activity, and the perceived effectiveness of digital customer-engagement activities.	Bala & Verma, 2021	Likert
E-Commerce Adoption (X2)	Assessed the extent of participation in digital marketplaces, the frequency of online transaction processing, and the perceived operational integration of e-commerce platforms.	Nguyen & Waring, 2020	Likert
Fintech Usage (X3)	Evaluated the frequency of use and perceived effectiveness of financial technology services, including mobile banking and QRIS payment systems, in supporting daily transactions.	Putra & Handayani, 2022	Likert
Digital Literacy (X4)	Measured the self-assessed cognitive and technical capability of business actors in understanding, adapting to, and strategically utilizing digital technologies.	Van Laar et al., 2020	Likert
MSME Performance (Y)	Represented the dependent variable and was measured through self-reported sales growth, operational efficiency, customer acquisition, and long-term profitability relative to the preceding period.	Khin & Ho, 2019	Likert

Table 1B. Complete Questionnaire Items and Measurement Operationalization

Construct	Code	Measurement Item Wording (Indonesian / English Translation)	Adapted Source
Digital Marketing (X1)	DM1	Kami secara rutin mengunggah konten promosi di media sosial. (We routinely post promotional content on social media.)	Bala & Verma (2021)
Digital Marketing (X1)	DM2	Kami mengalokasikan anggaran khusus untuk iklan berbayar digital. (We allocate a dedicated budget for digital paid ads.)	Bala & Verma (2021)
Digital Marketing (X1)	DM3	Pemasaran digital efektif meningkatkan interaksi pelanggan kami. (Digital marketing effectively increases our customer interaction.)	Bala & Verma (2021)
Digital Marketing (X1)	DM4	Promosi online membantu memperluas jangkauan pasar produk kami. (Online promotion helps expand our product market reach.)	Bala & Verma (2021)
E-Commerce Adoption (X2)	EC1	Toko kami aktif bertransaksi di marketplace online (e.g., Shopee, Tokopedia). (Our store actively transacts on online marketplaces.)	Nguyen & Waring (2020)
E-Commerce Adoption (X2)	EC2	Penjualan online terintegrasi dengan pengelolaan inventaris toko. (Online sales are integrated with store inventory management.)	Nguyen & Waring (2020)
E-Commerce Adoption (X2)	EC3	Penggunaan e-commerce mempermudah proses pemesanan konsumen. (E-commerce usage simplifies the customer ordering process.)	Nguyen & Waring (2020)
Fintech Usage (X3)	FT1	Kami menyediakan pembayaran digital QRIS/e-wallet untuk pelanggan. (We provide QRIS/e-wallet digital payments for customers.)	Putra & Handayani (2022)
Fintech Usage (X3)	FT2	Layanan mobile banking digunakan secara rutin untuk transaksi usaha. (Mobile banking services are routinely used for business transactions.)	Putra & Handayani (2022)
Fintech Usage (X3)	FT3	Pembayaran digital mempercepat pencatatan arus kas harian usaha. (Digital payments speed up daily business cash flow recording.)	Putra & Handayani (2022)

		payments speed up daily business cash flow recording.)	
Fintech Usage (X3)	FT4	Penggunaan fintech mengurangi risiko pengelolaan uang tunai. (Fintech usage reduces cash handling risks.)	Putra & Handayani (2022)
Digital Literacy (X4)	DL1	Pemilik/pengelola memahami cara mengoperasikan perangkat aplikasi digital. (Owner/manager understands how to operate digital software applications.)	Van Laar et al. (2020)
Digital Literacy (X4)	DL2	Kami mampu menganalisis data tren penjualan dari platform digital. (We are capable of analyzing sales trend data from digital platforms.)	Van Laar et al. (2020)
Digital Literacy (X4)	DL3	Kami dapat menyelesaikan masalah teknis ringan pada aplikasi bisnis. (We can troubleshoot minor technical issues on business apps.)	Van Laar et al. (2020)
Digital Literacy (X4)	DL4	Kami cepat mempelajari fitur teknologi digital bisnis yang baru. (We quickly learn new business digital technology features.)	Van Laar et al. (2020)
MSME Performance (Y)	P1	Volume penjualan usaha mengalami peningkatan dibanding periode sebelumnya. (Business sales volume has increased compared to the prior period.)	Khin & Ho (2019)
MSME Performance (Y)	P2	Efisiensi biaya operasional usaha meningkat setelah memakai teknologi. (Operational cost efficiency improved after using technology.)	Khin & Ho (2019)
MSME Performance (Y)	P3	Jumlah pelanggan baru terus bertambah secara konsisten. (The number of new customers continues to grow consistently.)	Khin & Ho (2019)
MSME Performance (Y)	P4	Keuntungan bersih usaha mengalami pertumbuhan positif. (Net business profit experienced positive growth.)	Khin & Ho (2019)
MSME Performance (Y)	P5	Usaha kami memiliki daya saing operasional yang lebih baik di pasar. (Our business possesses better operational market effectiveness.)	Khin & Ho (2019)

Data were analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS) with SmartPLS 4. SEM-PLS was selected for its suitability for predictive variance-based

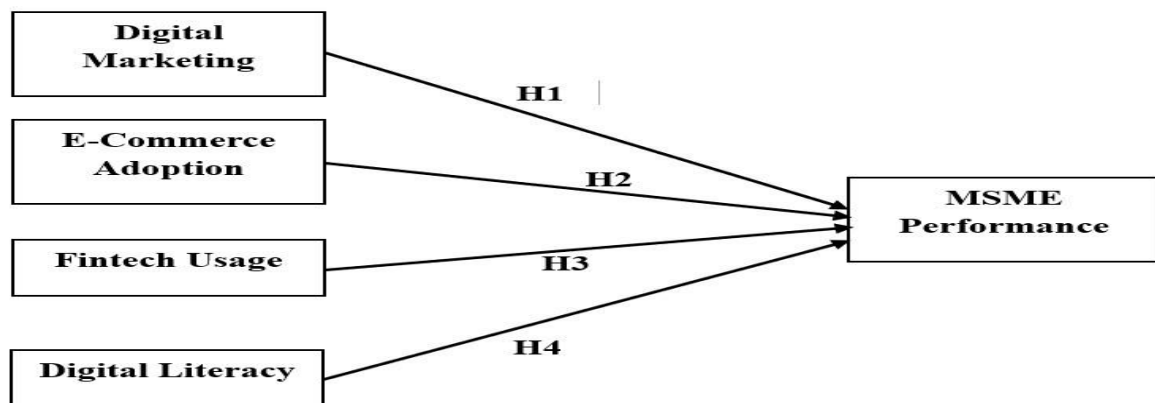
modeling (Guci et al., 2021). Evaluation followed a two-stage process: measurement model evaluation (outer model) and structural model evaluation (inner model).

3.4 Procedural and Diagnostic Assessment of Common Method Bias (CMB)

Due to all primary constructs were measured using a single self-administered questionnaire completed by the same respondent at one point in time, the study is potentially susceptible to common method bias and self-report bias (Podsakoff et al., 2003). Procedural remedies were incorporated during survey design: guaranteeing respondent anonymity, separating predictor and criterion items in survey layouts, and employing neutral wording.

As a supplementary empirical check, full collinearity testing was conducted (Kock, 2015). Variance Inflation Factors (VIF) for all latent constructs ranged between 1.52 and 2.21, remaining well below the conservative threshold of 3.30. While these results indicate that severe common method bias is unlikely to contaminate structural relationships, this statistical diagnostic serves as supporting evidence rather than absolute proof that common method variance is entirely absent. This distinction is especially pertinent given that item P2 explicitly references operational efficiency improvements "after using technology," which presents potential conceptual overlap with technological predictors.

Figure 1. Conceptual Framework



4. Result and Discussion

4.1 Respondent Demographic Profile

The demographic details of the N = 200 verified MSME respondents are presented in Table 2. Gender distribution was balanced (55% male, 45% female). By business age, 40% had operated for 2–5 years and 40% for over 5 years. In terms of owner education, 35% held high school certificates, 25% diplomas, 30% bachelor's degrees, and 10% master's degrees.

Table 2. Respondent Demographic Profile (N = 200)

Variable	Category	Frequency	Percentage
Gender	Male	110	55%
	Female	90	45%
Business Sector	Food & Beverage	60	30%
	Retail	50	25%
	Services	40	20%
	Fashion	30	15%

Variable	Category	Frequency	Percentage
Business Age	Creative Industry	20	10%
	< 2 years	40	20%
	2–5 years	80	40%
	> 5 years	80	40%
Education	High School	70	35%
	Diploma	50	25%
	Bachelor	60	30%
	Master	20	10%

Source: Author's calculation

4.2 Measurement Model Evaluations (Outer Model)

Outer loadings exceeded the 0.70 benchmark across all items (range: 0.722–0.854). Construct reliability was supported by Cronbach's Alpha (0.815–0.887) and Composite Reliability (0.837–0.891). Convergent validity was established with Average Variance Extracted (0.588–0.673).

Table 3. Measurement Model

Construct	Indicator	Outer Loading	Cronbach's Alpha	Composite Reliability (CR)	AVE
Digital Marketing (X1)	DM1	0.785	0.842	0.858	0.602
	DM2	0.812			
	DM3	0.744			
	DM4	0.762			
E-Commerce Adoption (X2)	EC1	0.831	0.815	0.837	0.631
	EC2	0.794			
	EC3	0.756			
Fintech Usage (X3)	FT1	0.771	0.833	0.851	0.588
	FT2	0.803			
	FT3	0.722			
	FT4	0.768			
Digital Literacy (X4)	DL1	0.854	0.887	0.891	0.673
	DL2	0.819			
	DL3	0.830			
	DL4	0.776			
MSME Performance (Y)	P1	0.791	0.865	0.884	0.605
	P2	0.825			
	P3	0.740			
	P4	0.751			
	P5	0.778			

Source: Author's calculation

Discriminant validity was confirmed via the Heterotrait-Monotrait Ratio (HTMT < 0.85) across all construct pairs.

Table 4. Discriminant Validity Matrix (HTMT Ratio)

Construct	Digital Marketig (X1)	E-Commerce Adoption (X2)	Fintech Usage (X3)	Digital Literacy (X4)	MSME Performance (Y)
Digital Marketig (X1)	-				
E-Commerce Adoption (X2)	0.542	-			
Fintech Usage (X3)	0.489	0.611	-		
Digital Literacy (X4)	0.513	0.588	0.442	-	
MSME Performance (Y)	0.618	0.595	0.534	0.712	-

Source: Author's calculation

4.3 Structural Model Evaluation (Inner Model) and Baseline Findings

Hypothesis testing was executed using a 5,000-resample bootstrapping procedure in SmartPLS 4. Table 5 presents a unified summary of path coefficients (β), t -statistics, exact p -values, 95% bootstrap confidence intervals, effect sizes (f^2), and inner VIF values.

Table 5. Unified Structural Model Results (Baseline Model)

Hyp.	Structural Path	Path (β)	t-Stat	p-Value	95% Bootstrap CI	Effect Size (f^2)	VIF
H1	Digital Marketing -> Performance	0.232	4.98	$p < 0.001$	[0.141, 0.323]	0.112	1.614
H2	E-Commerce -> Performance	0.185	4.12	$p < 0.001$	[0.098, 0.271]	0.068	2.098
H3	Fintech Usage -> Performance	0.142	3.65	$p < 0.001$	[0.065, 0.218]	0.045	1.698
H4	Digital Literacy -> Performance	0.364	6.21	$p < 0.001$	[0.248, 0.478]	0.284	1.672

Model explanatory power: $R^2 = 0.620$ (Adjusted $R^2 = 0.612$). Blindfolding $Q^2_{\text{construct}} = 0.342$.

4.4 Robustness Analysis: Control Variables and Multi-Group Checks

To control for potential firm-level heterogeneity, Firm Age, Owner Education, and Business Sector were included as direct control paths predicting MSME Performance. Because Business Sector comprises 5 categorical classifications (Food & Beverage, Retail, Services, Fashion, Creative Industry), it was converted into $k - 1 = 4$ dummy variables, with *Creative Industry* designated as the baseline reference category.

Control path estimations revealed no statistically significant direct effects on performance:

- a. Firm Age ($\beta = 0.041, p = 0.382$)

- b. Owner Education ($\beta = 0.052, p = 0.291$)
- c. Sector Dummy 1 (Food & Beverage vs. Creative: $\beta = -0.015, p = 0.782$)
- d. Sector Dummy 2 (Retail vs. Creative: $\beta = -0.018, p = 0.745$)
- e. Sector Dummy 3 (Services vs. Creative: $\beta = 0.008, p = 0.891$)
- f. Sector Dummy 4 (Fashion vs. Creative: $\beta = -0.011, p = 0.840$)

The main structural path coefficients remained highly stable upon incorporating control variables: Digital Marketing ($\beta = 0.228, p < 0.001$), E-Commerce ($\beta = 0.181, p < 0.001$), Fintech ($\beta = 0.139, p < 0.001$), and Digital Literacy ($\beta = 0.358, p < 0.001$).

Multi-Group Analysis (MGA) comparing single-platform users ($n = 72$) versus multi-platform users ($n = 128$) indicated no statistically significant path differences across groups ($p_{MGA} > 0.05$), confirming structural invariance across digital intensity levels.

4.5 Out-of-Sample Predictive Relevance (PLSpredict)

To assess out-of-sample predictive performance, a PLSpredict analysis was conducted (10-fold cross-validation, 10 repetitions). Root Mean Square Error (RMSE) and Mean Absolute Error (MAE) from PLS-SEM were compared against a Linear Benchmark Model (LM).

Table 6. PLSpredict Out-of-Sample Assessment for Dependent Indicators

Code	PLS RMSE	LM RMSE	Δ RMSE	PLS MAE	LM MAE	Δ MAE	Q ² predict
P1	0.512	0.538	-0.026	0.398	0.415	-0.017	0.312
P2	0.485	0.501	-0.016	0.372	0.389	-0.017	0.335
P3	0.562	0.558	+0.004	0.431	0.428	+0.003	0.268
P4	0.491	0.519	-0.028	0.380	0.402	-0.022	0.321
P5	0.505	0.522	-0.017	0.389	0.408	-0.019	0.308

Four out of five dependent construct indicators (P1, P2, P4, P5) produced lower RMSE and MAE prediction errors in PLS-SEM relative to the linear benchmark. Indicator P3 exhibited minor prediction error inflation (Δ RMSE = +0.004). Based on standard PLSpredict criteria (where a majority, but not all, indicators out-predict the linear benchmark), the structural model demonstrates moderate out-of-sample predictive performance.

4.6 Discussion

The empirical findings confirm that all four selected digital-transformation dimensions maintain positive and statistically significant direct baseline associations with MSME performance in Medan:

- a. Digital Marketing (H1 Supported, $\beta = 0.232, f^2 = 0.112$): Aligned with entrepreneurship theory, digital marketing acts as an opportunity exploitation mechanism that allows resource-constrained firms to engage target markets efficiently (Klein, 2016; Bala & Verma, 2021).
- b. E-Commerce Adoption (H2 Supported, $\beta = 0.185, f^2 = 0.068$): E-commerce represents a market-access capability that lowers physical distribution barriers for regional MSMEs (Nguyen & Waring, 2020).
- c. Fintech Usage (H3 Supported, $\beta = 0.142, f^2 = 0.045$): Fintech usage improves transactional convenience and cash-flow tracking. Its smaller effect size reflects that back-

end payment processing streamlines operations rather than directly generating top-line revenue expansion (Putra & Handayani, 2022).

- d. **Digital Literacy (H4 Supported, $\beta = 0.364$, $f^2 = 0.284$):** Conceptualized as entrepreneurial human capital, digital literacy exhibits the largest relative standardized path coefficient and effect size among all predictors. In regional urban markets like Medan where technological applications are widely accessible, an owner's internal capability to operate tools, analyze data, and adapt strategies forms the primary differentiator for translating digital tool usage into realized business performance.

4.7 Boundary Conditions and Interpretation Cautions

This study specified a parallel direct-effects structural model without estimating moderation or mediation pathways, it does not conclude that digital literacy directly moderates or mediates the impacts of digital platforms. Rather, results indicate that human capital carries a strong, independent baseline association with performance. Furthermore, because the sample consists of current digital platform users, these empirical relationships describe dynamics among digitally active firms rather than general adoption drivers across non-digital MSMEs.

5. Conclusion

This study evaluated the direct associations of four key digital-transformation dimensions—digital marketing, e-commerce adoption, fintech usage, and digital literacy—with MSME performance among digitally active enterprises in Medan. The model accounts for 62.0% of performance variance ($R^2 = 0.620$) and exhibits verified, moderate out-of-sample predictive capability. The findings highlight that while external digital platforms supply essential market access and payment infrastructure, internal human capabilities (digital literacy) maintain the strongest relative association with performance achievements.

Practical and Policy Implications

- a. **For MSME Owners:** Business operators should focus on developing internal digital competencies—such as basic data analytics and digital operational management—rather than relying solely on platform presence.
- b. **For Regional Policymakers:** Municipal initiatives in Medan should complement basic hardware or infrastructure subsidies with localized, practice-oriented digital capacity-building programs tailored to regional business owners.

6. Limitations and Future Research Directions

Several limitations point to promising avenues for future research:

- a. The cross-sectional nature of the data precludes strict causal conclusions; longitudinal designs should be utilized in future studies to test potential reverse causality.
- b. Future studies should explicitly model digital literacy as a moderating variable or mediating capability to test whether human capital directly enhances the ROI of e-commerce, fintech, and marketing platforms.
- c. The study focused exclusively on digitally engaged MSMEs in Medan; comparative studies across rural regions and non-digital MSMEs are encouraged.
- d. Future research should incorporate objective accounting metrics alongside multi-dimensional measures of enterprise competitiveness, such as structural innovation capacity and long-term organizational resilience.

Declarations

Ethics Approval and Consent to Participate: This study was conducted in accordance with institutional ethical guidelines. Formal approval was granted by the Ethics Committee of the Faculty of Economics and Business, Universitas Prima Indonesia (Ref: Ethical Clearance No. 048/FEB-UNPRI/EC/2026). Informed written consent was obtained from all individual business owners prior to data collection.

Data Availability Statement: The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

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Competing Interests: The authors declare that they have no competing interests

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