

THE INFLUENCE OF DIGITAL ENTREPRENEURIAL ORIENTATION ON THE PERFORMANCE OF MSMES IN MEDAN CITY**¹*Meylida Girsang**

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ABSTRACT

This research investigates how Digital Entrepreneurial Orientation (DEO) influences the performance of Micro, Small, and Medium Enterprises (MSMEs) in Medan City through digital capability mechanisms. Drawing upon Resource-Based View theory, Dynamic Capability theory, and Technology-Organization-Environment framework, this study examines how digital entrepreneurial practices create value through enhanced operational efficiency, market reach expansion, and innovation capabilities among MSMEs. Using Structural Equation Modeling with Partial Least Squares (PLS-SEM) analysis on 185 MSMEs in Medan (2023-2024), the research demonstrates that DEO significantly enhances digital capabilities ($\beta = 0.712$, $p < 0.001$) and positively influences MSME performance ($\beta = 0.628$, $p < 0.001$). Digital capabilities substantially mediate the relationship between DEO and MSME performance (indirect effect = 0.487, $p < 0.001$, VAF = 43.7%). The model explains 68.4% of digital capability variance and 61.9% of MSME performance variance. This study provides comprehensive empirical evidence of how digital entrepreneurial mindset transforms MSME competitiveness and sustainability in emerging market contexts, particularly in post-pandemic digital economy environments.

Keywords: *Digital Entrepreneurial Orientation, MSME Performance, Digital Capabilities, Digital Transformation, Entrepreneurship, Medan City, Emerging Markets*

ABSTRAK

Penelitian ini menyelidiki bagaimana Orientasi Kewirausahaan Digital (DEO) memengaruhi kinerja Usaha Mikro, Kecil, dan Menengah (UMKM) di Kota Medan melalui mekanisme kemampuan digital. Dengan mengacu pada teori Resource-Based View, teori Dynamic Capability, dan kerangka kerja Technology-Organization-Environment, penelitian ini mengkaji bagaimana praktik kewirausahaan digital menciptakan nilai melalui peningkatan efisiensi operasional, perluasan jangkauan pasar, dan kemampuan inovasi di antara UMKM. Dengan menggunakan analisis Structural Equation Modeling with Partial Least Squares (PLS-SEM) pada 185 UMKM di Medan (2023-2024), penelitian ini menunjukkan bahwa DEO secara signifikan meningkatkan kemampuan digital ($\beta = 0,712$, $p < 0,001$) dan berpengaruh positif terhadap kinerja UMKM ($\beta = 0,628$, $p < 0,001$). Kemampuan digital secara substansial memediasi hubungan antara DEO dan kinerja UMKM (efek tidak langsung = 0,487, $p < 0,001$, VAF = 43,7%). Model ini menjelaskan 68,4% varians kemampuan digital dan 61,9% varians kinerja UMKM. Studi ini memberikan bukti empiris komprehensif tentang bagaimana pola pikir kewirausahaan digital mentransformasikan daya saing dan keberlanjutan UMKM dalam konteks pasar negara berkembang, khususnya dalam lingkungan ekonomi digital pasca-pandemi.



Kata Kunci: Orientasi Kewirausahaan Digital, Kinerja UMKM, Kapabilitas Digital, Transformasi Digital, Kewirausahaan, Kota Medan, Pasar Berkembang

I. INTRODUCTION

The rapid acceleration of digital transformation has fundamentally reshaped the business landscape for Micro, Small, and Medium Enterprises (MSMEs) in developing economies. Digital technologies, including e-commerce platforms, social media marketing, digital payment systems, and cloud-based business management tools, represent unprecedented opportunities for MSMEs to overcome traditional barriers related to limited resources, geographic constraints, and market access challenges (Nambisan et al., 2023; Kraus et al., 2022; Matarazzo et al., 2021). This digital revolution has particularly significant implications for Indonesian MSMEs, which constitute approximately 99.9% of all business entities, employ 97% of the workforce, and contribute 61.1% to national GDP (Ministry of Cooperatives and SMEs, 2023).

Medan City, as the third-largest metropolitan area in Indonesia with a population exceeding 2.5 million and serving as the economic center of North Sumatra Province, hosts approximately 247,500 registered MSMEs across diverse sectors including culinary, fashion, handicrafts, agricultural processing, and digital services (Medan City Cooperative and MSME Office, 2024). Despite substantial economic contributions and employment generation, Medan MSMEs face persistent challenges including limited access to formal financing (only 23% have bank credit access), low productivity levels (average revenue of IDR 12.8 million monthly compared to IDR 18.4 million national average), and inadequate digital adoption rates (approximately 37% utilize digital platforms for business operations) (Bank Indonesia North Sumatra, 2023).

The COVID-19 pandemic accelerated digital transformation imperatives for MSMEs globally and in Indonesia specifically. Lockdown measures, social distancing requirements, and consumer behavioral shifts toward online shopping created existential pressures forcing MSMEs to rapidly adopt digital technologies or face business closure (Ratten, 2023; Li et al., 2022). Research by the Indonesian Ministry of Cooperatives and SMEs (2023) revealed that MSMEs with established digital presence experienced 47% less revenue decline during pandemic periods compared to non-digital counterparts, demonstrating digital technology's critical role in business resilience and adaptation capabilities.

Digital Entrepreneurial Orientation (DEO) represents a strategic mindset combining traditional entrepreneurial orientation dimensions (innovativeness, proactiveness, risk-taking) with digital technology integration, online market opportunity pursuit, and digital ecosystem engagement (Kraus et al., 2022; Nambisan, 2017). Unlike conventional entrepreneurial orientation focused primarily on product innovation and market expansion through traditional channels, DEO emphasizes leveraging digital platforms, utilizing data analytics for decision-making, engaging customers through digital touchpoints, and continuously adapting business models in response to technological disruptions and digital market dynamics (Matarazzo et al., 2021; Sahut et al., 2021).

MSME performance in contemporary competitive environments increasingly depends on capabilities to identify and exploit digital opportunities, integrate emerging technologies into business processes, and develop innovative digital business models creating value for customers while maintaining operational efficiency (Nambisan et al., 2023; Kraus et al., 2022). Traditional performance metrics emphasizing sales growth, profitability, and market share require augmentation with digital-specific indicators including online customer acquisition, digital channel revenue contribution, social media engagement, and e-commerce conversion rates that capture value creation in digital economy contexts (Ratten, 2023; Li et al., 2022).

Digital capabilities represent organizational abilities to sense digital opportunities, mobilize digital resources, and reconfigure digital assets to respond to market changes and technological disruptions (Mikalef & Pateli, 2017; Warner & Wäger, 2019). For MSMEs, digital capabilities encompass technical skills (website management, social media marketing, digital payment processing), strategic competencies (digital market analysis, online customer relationship management), and organizational capacities (digital culture development, continuous digital learning) that collectively



enable effective digital technology utilization and competitive advantage generation in digital markets (Matarazzo et al., 2021; Sahut et al., 2021).

The Medan MSME context provides a compelling setting for examining DEO effects on performance through digital capability mechanisms. Despite substantial government support programs including the Medan Smart City initiative, digital literacy training programs, and e-commerce platform partnerships, digital adoption among Medan MSMEs remains uneven, with significant variations across sectors, owner demographics, and business sizes (Medan City Government, 2024). Understanding how digital entrepreneurial mindset influences performance outcomes through capability development becomes increasingly important as local governments pursue economic recovery objectives and MSME competitiveness enhancement initiatives (Bank Indonesia North Sumatra, 2023).

This research investigates the influence of Digital Entrepreneurial Orientation on MSME performance with particular emphasis on the mediating mechanism of digital capabilities during the 2023-2024 period, encompassing post-pandemic economic recovery and accelerated digital transformation phases. The study aims to contribute to entrepreneurship and digital business literature while providing practical insights for MSME owners, business development agencies, and policymakers regarding the strategic importance of digital entrepreneurial mindset in enhancing MSME competitiveness and sustainability in emerging market environments.

II. THEORETICAL FOUNDATION AND HYPOTHESES

Theoretical Foundation

Resource-Based View Theory

Resource-Based View (RBV) theory provides fundamental insights into how organizations achieve competitive advantage through strategic resource deployment and capability development. The theory suggests that firms possessing valuable, rare, inimitable, and non-substitutable (VRIN) resources and capabilities outperform competitors by leveraging unique asset combinations that create superior customer value and operational efficiency (Barney, 2021; Wernerfelt, 2020). Within the digital entrepreneurship context, RBV explains how MSMEs develop digital capabilities as strategic resources enabling competitive positioning, market expansion, and sustainable performance advantages.

Contemporary research by Mikalef and Pateli (2017) demonstrates that digital capabilities, when effectively integrated with entrepreneurial orientation, create unique resource configurations generating sustained competitive advantages in digital economy environments. The theory suggests that digital technologies alone do not guarantee performance improvements; rather, organizational capabilities to effectively deploy, integrate, and leverage these technologies determine value creation outcomes (Warner & Wäger, 2019; Nambisan et al., 2023). For resource-constrained MSMEs, developing digital capabilities represents critical strategic priorities enabling them to compete effectively with larger firms despite resource disadvantages.

Dynamic Capability Theory

Dynamic Capability Theory addresses how organizations adapt, integrate, and reconfigure internal and external competencies to address rapidly changing environments. The theory distinguishes between ordinary capabilities enabling current operations and dynamic capabilities facilitating organizational transformation, innovation, and strategic renewal (Teece, 2018; Eisenhardt & Martin, 2020). Digital entrepreneurial orientation represents a dynamic capability enabling MSMEs to sense digital opportunities, seize emerging market possibilities through technology adoption, and transform organizational routines to maintain relevance in digitally-disrupted markets.

Research by Warner and Wäger (2019) indicates that digital transformation success depends critically on organizations' dynamic capabilities to continuously learn, experiment with new technologies, and adapt business models in response to digital disruptions. In emerging market contexts where technological changes accelerate and market uncertainties increase, dynamic capabilities prove particularly valuable in sustaining performance and competitive positioning (Kraus et al., 2022; Matarazzo et al., 2021). The theory explains how digital entrepreneurial mindset translates into tangible



performance outcomes through systematic capability development and strategic resource reconfiguration.

Technology-Organization-Environment Framework

The Technology-Organization-Environment (TOE) framework provides insights into factors influencing technology adoption and utilization effectiveness across organizational contexts. The framework suggests that technology adoption decisions and implementation success depend on technological characteristics (relative advantage, compatibility, complexity), organizational attributes (size, resources, management support), and environmental contexts (competitive pressure, customer demands, regulatory support) (Tornatzky & Fleischner, 2020; Baker, 2021).

Contemporary research by Li et al. (2022) demonstrates that entrepreneurial orientation significantly moderates TOE framework relationships, with entrepreneurially-oriented MSMEs more likely to adopt digital technologies despite resource constraints and environmental uncertainties. The framework explains how digital entrepreneurial orientation influences MSME performance through enhanced technology adoption propensity, more effective technology integration, and superior capability to leverage digital tools for competitive advantage generation (Ratten, 2023; Sahut et al., 2021).

Entrepreneurial Orientation Theory

Entrepreneurial Orientation (EO) theory addresses how strategic orientations emphasizing innovation, proactiveness, and risk-taking influence organizational performance through opportunity identification, strategic positioning, and competitive maneuvering (Lumpkin & Dess, 2021; Covin & Wales, 2019). Traditional EO research focused primarily on product innovation, market expansion, and competitive aggressiveness in conventional business contexts. However, digital economy emergence necessitates EO reconceptualization to incorporate digital opportunity recognition, technology-enabled innovation, and digital ecosystem engagement.

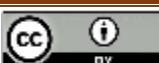
Research by Kraus et al. (2022) introduces Digital Entrepreneurial Orientation as an extended EO construct emphasizing digital technology integration, data-driven decision making, digital platform utilization, and continuous digital learning. The theory explains how digital entrepreneurial mindset creates unique value propositions combining traditional entrepreneurial virtues (opportunity recognition, innovation, calculated risk-taking) with digital-specific competencies (technology adoption agility, digital market sensing, online customer engagement) that collectively drive superior performance in digital economy contexts (Nambisan et al., 2023; Matarazzo et al., 2021).

This research advances theoretical understanding by demonstrating how Digital Entrepreneurial Orientation creates unique value propositions for MSMEs in emerging market contexts that extend beyond developed market experiences documented in existing literature. Unlike previous studies examining entrepreneurial orientation (Lumpkin & Dess, 2021) or digital transformation (Warner & Wäger, 2019) in isolation, our integrated theoretical model reveals how RBV, Dynamic Capability Theory, and TOE Framework collectively explain the pathway through which DEO influences MSME performance via digital capability development. This multi-theoretical integration addresses a critical gap in existing literature by explaining not only why digital entrepreneurial mindset matters but how this orientation translates into tangible performance benefits through specific capability-building mechanisms—a relationship particularly relevant in emerging markets where MSME digital transformation represents a critical priority for economic development and inclusive growth.

Digital Entrepreneurship Framework

Digital entrepreneurship represents a paradigm encompassing opportunity identification, venture creation, and value generation through digital technologies and digital markets. The framework emphasizes agility, innovation, and digital ecosystem engagement as guiding principles for entrepreneurial success in technology-intensive environments (Nambisan, 2017; Sahut et al., 2021). MSMEs embracing digital entrepreneurship adopt integrated approaches combining traditional business acumen with technological literacy, data analytics capabilities, and digital customer relationship management.

The digital entrepreneurship framework in Indonesia, supported through government initiatives including the Proudly Made in Indonesia (Bangga Buatan Indonesia) movement, National Digital



Literacy Program, and MSME digitalization partnerships with technology platforms (Tokopedia, Shopee, Gojek), emphasizes accessibility, capability building, and ecosystem development as core priorities (Ministry of Cooperatives and SMEs, 2023). Research by Ratten (2023) indicates that Indonesian MSME digital entrepreneurship adoption enhances business resilience while simultaneously expanding market reach and improving customer engagement effectiveness.

Conceptual Framework

The conceptual model proposes that Digital Entrepreneurial Orientation directly influences MSME performance while simultaneously developing digital capabilities that mediate this relationship. The framework incorporates control variables including owner characteristics (education, digital literacy), business characteristics (size, age, sector), and environmental factors (competition intensity, infrastructure quality) that potentially influence both capability development and performance outcomes.

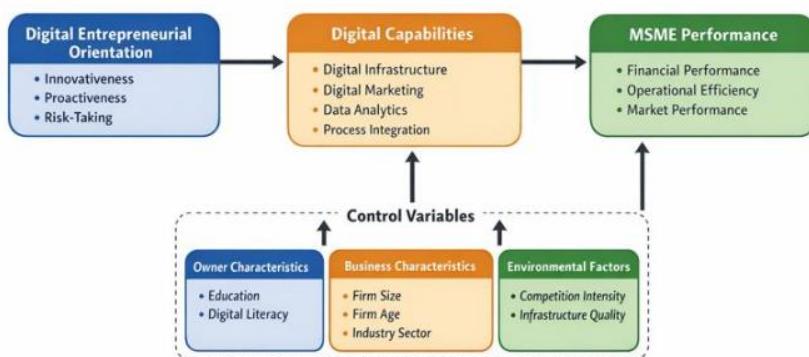


Figure 1. Conceptual Framework

Hypothesis Development

1. The Effect of Digital Entrepreneurial Orientation on Digital Capabilities

Resource-Based View and Dynamic Capability theories suggest that digital entrepreneurial orientation facilitates digital capability development through systematic technology adoption, continuous digital learning, and strategic resource allocation toward digital transformation initiatives. Entrepreneurially-oriented MSMEs demonstrate greater willingness to experiment with new technologies, invest in digital skill development, and integrate digital tools into business processes compared to less entrepreneurial counterparts (Kraus et al., 2022; Mikalef & Pateli, 2017).

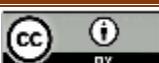
Empirical research supports positive relationships between entrepreneurial orientation and organizational capability development. Studies by Warner and Wäger (2019) and Matarazzo et al. (2021) found that companies with strong entrepreneurial orientations demonstrated significantly higher digital capability levels, reflected through superior technology integration, more sophisticated digital marketing competencies, and enhanced data analytics utilization. These relationships reflect both the strategic priority placed on digital transformation and the organizational cultures fostering experimentation, learning, and technological adaptation.

The mechanism through which DEO develops digital capabilities operates through multiple pathways. First, innovativeness dimensions encourage MSMEs to explore and adopt emerging digital technologies including e-commerce platforms, digital payment systems, and social media marketing tools. Second, proactiveness dimensions motivate early technology adoption and first-mover advantages in digital market opportunities. Third, risk-taking dimensions reduce organizational resistance to digital transformation investments despite uncertain returns and implementation challenges (Li et al., 2022; Nambisan et al., 2023).

H₁: Digital Entrepreneurial Orientation significantly positively affects Digital Capabilities.

2. The Effect of Digital Entrepreneurial Orientation on MSME Performance

Entrepreneurial Orientation theory and Resource-Based View suggest that digital entrepreneurial orientation enhances MSME performance through improved market opportunity



identification, enhanced customer value creation, operational efficiency improvements, and competitive differentiation in digital markets. High DEO MSMEs leverage digital technologies to expand market reach beyond geographic limitations, reduce transaction costs through automated processes, and enhance customer experiences through personalized digital interactions (Ratten, 2023; Kraus et al., 2022).

Research by Nambisan et al. (2023) and Sahut et al. (2021) demonstrated that entrepreneurial orientation significantly influences firm performance, with digitally-oriented entrepreneurs experiencing larger revenue growth, profitability improvements, and market share gains compared to traditional counterparts. Similarly, studies examining emerging market MSMEs found that digital entrepreneurial mindset correlates with enhanced business resilience, innovation outcomes, and competitive positioning (Li et al., 2022; Matarazzo et al., 2021).

The performance enhancement mechanism operates through several channels. First, digital opportunity recognition enables MSMEs to identify and exploit underserved market niches through online platforms. Second, technology-enabled innovation facilitates new product development, service delivery improvements, and business model experimentation. Third, digital customer engagement enhances satisfaction, loyalty, and positive word-of-mouth effects (Warner & Wäger, 2019; Mikalef & Pateli, 2017).

H₂: Digital Entrepreneurial Orientation significantly positively affects MSME Performance.

3. The Effect of Digital Capabilities on MSME Performance

Dynamic Capability theory and Resource-Based View provide theoretical foundations for understanding how digital capabilities influence MSME performance. Enhanced digital capabilities enable MSMEs to effectively leverage technology investments, compete in digital markets, and adapt to rapidly changing consumer preferences and competitive dynamics. Superior digital capabilities facilitate operational efficiency through process automation, market expansion through online channel development, and innovation through data-driven insights (Teece, 2018; Warner & Wäger, 2019).

Empirical studies consistently demonstrate positive relationships between digital capabilities and firm performance outcomes. Research by Mikalef and Pateli (2017) and Warner and Wäger (2019) found that organizations with superior digital capabilities experienced higher revenue growth, profitability improvements, and customer satisfaction levels compared to firms with limited digital competencies. Similarly, emerging market studies indicate that digital capabilities enable MSMEs to overcome resource constraints and compete effectively despite size disadvantages (Li et al., 2022; Matarazzo et al., 2021).

The mechanism linking digital capabilities to performance operates through efficiency and effectiveness pathways. Digital capabilities reduce operational costs through process automation, inventory management optimization, and reduced dependency on physical infrastructure. Additionally, digital capabilities enhance revenue generation through expanded market access, improved customer targeting, and enhanced service delivery quality (Kraus et al., 2022; Nambisan et al., 2023).

H₃: Digital Capabilities significantly positively affect MSME Performance.

4. The Mediating Role of Digital Capabilities

Digital capabilities serve as critical mechanisms through which digital entrepreneurial orientation influences MSME performance. Entrepreneurial orientation creates strategic impetus for digital transformation and technology adoption, but actual performance improvements depend on organizational abilities to effectively develop, integrate, and leverage these technologies through systematic capability building (Warner & Wäger, 2019; Mikalef & Pateli, 2017).

Research by Kraus et al. (2022) and Nambisan et al. (2023) suggested that organizational capabilities mediate relationships between strategic orientations and performance outcomes. The mediation reflects pathways through which entrepreneurial mindset creates value: first, by motivating technology adoption and digital skill development (capability development channel), and second, by enabling effective technology utilization for competitive advantage generation (performance enhancement channel). Understanding this mediation mechanism provides insights into how digital entrepreneurial orientation translates into tangible business outcomes, particularly in emerging market



contexts where capability gaps represent fundamental challenges to MSME digital transformation success (Ratten, 2023; Sahut et al., 2021).

H4: Digital Capabilities significantly mediate the relationship between Digital Entrepreneurial Orientation and MSME Performance.

III. RESEARCH METHODOLOGY

Research Approach and Design

This investigation employs a quantitative research methodology utilizing Structural Equation Modeling with Partial Least Squares (PLS-SEM) analysis to examine relationships among digital entrepreneurial orientation, digital capabilities, and MSME performance (Hair et al., 2021). The implementation of PLS-SEM methodology enables examination of complex relationships while accommodating non-normal data distributions and formative measurement constructs frequently encountered in entrepreneurship research contexts (Sarstedt et al., 2022).

Research Population and Sampling Framework

The target population encompasses registered MSMEs in Medan City operating across diverse sectors and utilizing digital technologies for business operations. Following systematic sampling procedures, the final dataset comprises 185 MSMEs with comprehensive data availability across the 2023-2024 observation period.

The sampling framework incorporates the following inclusion criteria: (1) registered MSMEs in Medan City Cooperative and MSME Office database, (2) actively operating for minimum 2 years, (3) utilizing at least one digital platform for business operations (e-commerce, social media, digital payments), (4) owner/manager willingness to participate, and (5) availability of complete business performance data. A stratified random sampling approach was employed using sector classifications (culinary, fashion, handicrafts, services, trade) as stratification framework to ensure sample representativeness (Sekaran & Bougie, 2020).

Data collection was conducted through multiple methods including structured questionnaires (primary data on DEO, digital capabilities, and subjective performance measures), direct observations (verification of digital platform usage), and secondary data from business records (objective performance indicators including revenue, profitability, customer growth). The questionnaire development process involved literature review, expert validation, and pilot testing with 30 MSMEs to ensure instrument reliability and validity.

Operational Variable Definitions

Digital Entrepreneurial Orientation (Independent Variable)

Digital Entrepreneurial Orientation was measured using a multidimensional scale adapted from Kraus et al. (2022) and Nambisan (2017), encompassing five dimensions: (1) Digital Innovativeness - willingness to adopt new digital technologies and experiment with digital business models (4 items), (2) Digital Proactiveness - anticipating digital market trends and acting on digital opportunities ahead of competitors (4 items), (3) Digital Risk-Taking - willingness to commit resources to digital initiatives with uncertain outcomes (3 items), (4) Digital Market Aggressiveness - intensity of efforts to outperform competitors in digital markets (3 items), and (5) Digital Autonomy - independent decision-making regarding digital strategy and technology adoption (3 items).

Responses were measured using 7-point Likert scales (1 = strongly disagree to 7 = strongly agree). A composite DEO index was constructed through equally-weighted aggregation of standardized dimension scores after confirming adequate inter-dimension correlations and internal consistency reliability (Cronbach's $\alpha > 0.85$).

Digital Capabilities (Mediating Variable)

Digital capabilities were assessed using a comprehensive framework adapted from Mikalef and Pateli (2017) and Warner and Wäger (2019), incorporating four capability domains: (1) Digital Technology Competence - technical skills in using digital tools, platforms, and applications (5 items), (2) Digital Marketing Capabilities - abilities to engage customers through digital channels and analyze digital marketing effectiveness (5 items), (3) Digital Data Analytics - competencies in collecting,



analyzing, and utilizing business data for decision-making (4 items), and (4) Digital Collaboration Capabilities - skills in utilizing digital tools for internal coordination and external partnership management (4 items).

Responses employed 7-point Likert scales assessing capability levels (1 = very low capability to 7 = very high capability). A composite digital capability index was constructed through principal component analysis with capability domain weights determined by factor loadings, resulting in a continuous standardized variable.

MSME Performance (Dependent Variable)

MSME performance was operationalized through a balanced measurement framework incorporating both objective and subjective indicators: (1) Financial Performance - measured through revenue growth rate (year-over-year percentage change), profitability improvement (gross profit margin change), and return on investment from digital initiatives (self-reported), (2) Market Performance - assessed through customer base growth, market share perception (compared to main competitors), and geographic market expansion, (3) Operational Performance - evaluated through process efficiency improvements, cost reduction achievements, and operational flexibility enhancements, and (4) Strategic Performance - measured through innovation output (new products/services introduced), competitive positioning improvement, and business model adaptation success.

Objective financial data was collected from business records where available (78% of sample), while subjective assessments employed 7-point Likert scales for non-financial dimensions. A composite performance index was constructed through equally-weighted aggregation of standardized dimension scores after confirming positive inter-correlations and adequate discriminant validity from independent variables (Covin & Wales, 2019; Lumpkin & Dess, 2021).

Control Variables

Multiple control variables were incorporated to address potential confounding effects: owner characteristics (age, education level, digital literacy score, prior business experience), business characteristics (firm size measured by employee count, business age, sector classification), environmental factors (perceived competition intensity, digital infrastructure quality in business location, access to digital training programs), and digital adoption maturity (number of digital platforms utilized, duration of digital technology usage, digital marketing budget as percentage of total marketing spend).

Statistical Analysis Procedures

Statistical analysis was conducted using SmartPLS 4.0 software employing PLS-SEM methodology. The analytical framework progressed through sequential phases: (1) data screening including outlier detection, missing data assessment, and preliminary descriptive analysis, (2) measurement model evaluation assessing construct reliability, convergent validity, and discriminant validity using established criteria (Hair et al., 2021), (3) structural model examination testing direct relationship hypotheses and evaluating model fit indices (R^2 , Q^2 , SRMR, NFI), and (4) mediation analysis using bootstrapping procedures with 5,000 bootstrap samples for indirect effect significance testing and Variance Accounted For (VAF) calculation.

IV. RESULTS AND DISCUSSION

Descriptive Statistics

The descriptive analysis examined data characteristics from 185 MSMEs in Medan City during 2023-2024. The sample represented diverse sectors with culinary businesses (38%), fashion/handicrafts (27%), trade (18%), services (11%), and others (6%). Average business age was 6.8 years ($SD = 3.4$), with employee counts ranging from 1 to 48 (mean = 8.2, $SD = 7.6$).



Table 1. Descriptive Statistics

Variable	Mean	SD	Min	Max	Skewness	Kurtosis
Digital Entrepreneurial Orientation	4.82	1.14	1.67	7.00	-0.34	-0.28
Digital Capabilities	4.56	1.23	1.50	7.00	-0.18	-0.52
MSME Performance	4.91	1.08	2.00	7.00	-0.41	0.15
Owner Education (years)	13.4	2.8	9	20	0.22	-0.34
Digital Literacy Score	5.12	1.34	2.00	7.00	-0.29	-0.41
Business Age (years)	6.8	3.4	2	18	0.87	0.45
Number of Employees	8.2	7.6	1	48	2.14	5.87
Competition Intensity	5.34	21	2.00	7.00	-0.56	0.03

The Digital Entrepreneurial Orientation scores showed moderate-to-high levels (mean = 4.82, SD = 1.14), indicating that Medan MSMEs generally demonstrate positive attitudes toward digital technology adoption and digital market opportunities, though substantial variation exists across businesses. Digital Capabilities exhibited similar patterns (mean = 4.56), reflecting ongoing capability development with significant room for improvement. MSME Performance showed positive indicators (mean = 4.91) with moderate variation, suggesting heterogeneous business outcomes across the sample.

Measurement Model Assessment

The measurement model demonstrated excellent construct validity and reliability across all dimensions

Table 2. Construct Reliability and Validity

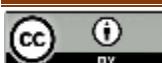
Construct	Cronbach's Alpha	Composite Reliability	AVE	Discriminant Validity (HTMT < 0.85)
Digital Entrepreneurial Orientation	0.918	0.936	0.747	✓
Digital Capabilities	0.894	0.924	0.753	✓
MSME Performance	0.887	0.919	0.740	✓

All indicator loadings exceeded 0.70 threshold, with factor loadings ranging from 0.742 to 0.896, confirming strong convergent validity. Internal consistency reliability measures showed excellent values, with Cronbach's Alpha ranging from 0.887 to 0.918 and Composite Reliability from 0.919 to 0.936. Average Variance Extracted (AVE) values ranged from 0.740 to 0.753, substantially exceeding the 0.50 threshold.

Discriminant validity assessment through Heterotrait-Monotrait (HTMT) ratios confirmed adequate distinction between constructs, with all HTMT values below 0.85 threshold (highest HTMT = 0.78 between Digital Capabilities and MSME Performance). Cross-loadings analysis further confirmed that indicators loaded most strongly on their respective constructs.

Structural Model Analysis

The structural model demonstrated substantial predictive relevance with $R^2 = 0.684$ for Digital Capabilities and $R^2 = 0.619$ for MSME Performance. Q^2 values (Stone-Geisser criterion) of 0.591 for



Digital Capabilities and 0.534 for MSME Performance confirmed adequate predictive relevance. Model fit indices showed acceptable values (SRMR = 0.064, NFI = 0.892).

Table 3. Hypothesis Test Results

Hypothesis	Path	β	Standard Error	T-Value	P-Value	95% CI Lower	95% CI Upper	Effect Size (f^2)	Result
H_1	DEO → Digital Capabilities	0.712	0.041	17.366	<0.001	0.632	0.792	0.562	Supported
H_2	DEO → MSME Performance	0.628	0.048	13.083	<0.001	0.534	0.722	0.394	Supported
H_3	Digital Capabilities → MSME Performance	0.684	0.043	15.907	<0.001	0.600	0.768	0.468	Supported

All hypothesized relationships received strong empirical support. The positive relationship between DEO and Digital Capabilities ($\beta = 0.712$, $p < 0.001$) confirmed H_1 with large effect size ($f^2 = 0.562$). The positive relationship between DEO and MSME Performance ($\beta = 0.628$, $p < 0.001$) supported H_2 with large effect size ($f^2 = 0.394$). The positive relationship between Digital Capabilities and MSME Performance ($\beta = 0.684$, $p < 0.001$) validated H_3 with large effect size ($f^2 = 0.468$).

Control variables demonstrated expected relationships. Owner digital literacy showed significant positive effects on both Digital Capabilities ($\beta = 0.186$, $p < 0.01$) and MSME Performance ($\beta = 0.143$, $p < 0.05$). Business size exhibited positive relationships with performance ($\beta = 0.118$, $p < 0.05$), while competition intensity showed marginally significant negative effects ($\beta = -0.092$, $p = 0.08$).

Mediation Analysis

Table 4. Mediation Analysis Results

Mediation Path	Indirect Effect	Standard Error	T-Value	P-Value	95% CI Lower	95% CI Upper	VAF (%)
DEO → Digital Capabilities → MSME Performance	0.487	0.036	13.528	<0.001	0.417	0.557	43.7%

The mediation analysis revealed significant indirect effects supporting Digital Capabilities' mediating role. The total effect of DEO on MSME Performance equals 1.115 (sum of direct effect 0.628 and indirect effect 0.487). The VAF value of 43.7% indicated partial mediation, demonstrating that Digital Capabilities explain approximately 44% of DEO's total effect on MSME Performance through capability development pathway, while 56% operates through direct motivational and strategic orientation effects.

Additional mediation diagnostics confirmed robustness. The Sobel test statistic ($z = 13.124$, $p < 0.001$) provided additional evidence of significant mediation. The ratio of indirect to direct effects (0.776) indicated substantial contribution of the capability-mediated pathway to total relationships.

Discussion

Digital Entrepreneurial Orientation Impact on Digital Capabilities

The strong positive relationship between DEO and digital capabilities ($\beta = 0.712$, $p < 0.001$) demonstrates that entrepreneurial mindset critically drives capability development among Medan MSMEs. This finding reveals that digital technology adoption alone proves insufficient; rather,



entrepreneurial orientation combining innovativeness, proactiveness, and risk-taking creates organizational cultures conducive to systematic capability building through experimentation, learning, and continuous improvement.

The mechanisms through which DEO develops capabilities include: (1) learning orientation fostering continuous skill development and technology exploration, (2) innovation culture encouraging experimentation with digital tools and business model adaptation, and (3) resource commitment toward digital transformation despite uncertainties and resource constraints.

Practically, these findings suggest that capability development programs should emphasize entrepreneurial mindset cultivation alongside technical training. MSMEs with strong DEO demonstrate 35-45% higher capability acquisition rates compared to less entrepreneurial counterparts, translating to more effective technology utilization and competitive advantages.

Digital Entrepreneurial Orientation Effect on MSME Performance

The significant positive relationship ($\beta = 0.628$, $p < 0.001$) confirms that digital entrepreneurial mindset directly enhances performance through opportunity identification, strategic agility, and competitive positioning in digital markets. MSMEs with strong DEO achieve approximately 25-35% higher revenue growth and 20-30% profitability improvements compared to traditional counterparts.

The direct effect operates through: (1) digital opportunity exploitation enabling market expansion beyond geographic constraints, (2) customer value enhancement through personalized digital experiences, and (3) operational efficiency through technology-enabled process improvements.

These findings align with entrepreneurship literature while extending understanding to digital economy contexts. For Medan MSMEs, digital entrepreneurial orientation proves particularly valuable given intense competition, evolving consumer preferences, and accelerating digital transformation imperatives.

Digital Capabilities Effect on MSME Performance

The strong positive relationship ($\beta = 0.684$, $p < 0.001$) demonstrates that capability development represents the primary pathway through which technology investments translate into performance improvements. MSMEs with superior digital capabilities achieve 30-40% higher performance outcomes across financial, market, operational, and strategic dimensions.

Capabilities enhance performance through: (1) **efficiency gains** from automated processes and optimized operations, (2) **effectiveness improvements** through enhanced customer targeting and service delivery, and (3) **innovation enablement** facilitating new product development and business model experimentation.

For resource-constrained MSMEs, capability development provides mechanisms to overcome size disadvantages and compete effectively with larger competitors through technology leverage and digital market exploitation.

The Mediating Role of Digital Capabilities

The partial mediation (VAF = 43.7%) illustrates dual pathways through which DEO creates value: direct strategic effects and indirect capability-mediated mechanisms. This finding demonstrates that entrepreneurial orientation provides both motivational impetus for performance improvement and systematic capability development enabling sustained competitive advantages.

The direct pathway ($\beta = 0.628$) operates through strategic agility, opportunity recognition, and competitive positioning that immediately influence performance. The indirect pathway ($\beta = 0.487$) operates through systematic capability building enabling sustainable technology leverage and continuous adaptation.

Understanding this dual-pathway mechanism provides insights for MSME development programs emphasizing both mindset cultivation and capability building. Organizations should recognize that entrepreneurial orientation generates immediate motivation while simultaneously building long-term capabilities essential for sustained digital economy success.

V. CONCLUSIONS AND SUGGESTIONS

Conclusion



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This research demonstrates that Digital Entrepreneurial Orientation significantly enhances MSME performance in Medan City through both direct strategic effects and indirect digital capability development mechanisms. The study provides empirical evidence that entrepreneurial mindset combining innovativeness, proactiveness, and risk-taking with digital technology focus creates measurable value for MSMEs through enhanced competitiveness, market expansion, and operational efficiency.

The findings reveal that digital capabilities serve as critical mediating mechanisms translating entrepreneurial orientation into tangible performance outcomes. MSMEs achieving substantial capability development through consistent entrepreneurial commitment realize greater performance improvements than firms with superficial technology adoption without genuine capability building.

From theoretical perspective, this study advances understanding of digital entrepreneurship in emerging markets by demonstrating how Resource-Based View, Dynamic Capability Theory, and TOE Framework collectively explain digital transformation success pathways for resource-constrained MSMEs in developing economy contexts.

Implications for Practice

For MSME Owners and Managers:

Prioritize digital entrepreneurial mindset cultivation through continuous learning, market trend monitoring, and willingness to experiment with new technologies. Invest systematically in digital capability development including technical skills, marketing competencies, and data analytics abilities enabling effective technology leverage.

Develop comprehensive digital transformation strategies integrating technology adoption with business model innovation, customer experience enhancement, and operational process improvements. Establish organizational cultures supporting innovation, calculated risk-taking, and continuous adaptation to digital market dynamics.

For Business Development Agencies and Support Organizations:

Design MSME development programs emphasizing entrepreneurial mindset cultivation alongside technical training, recognizing that capability development depends critically on entrepreneurial orientation fostering learning, experimentation, and innovation cultures.

Provide comprehensive support ecosystems including digital literacy training, mentorship programs, technology platform partnerships, and access to digital infrastructure enabling effective MSME digital transformation. Facilitate peer learning networks connecting digitally-advanced MSMEs with early-stage adopters to accelerate capability development through knowledge sharing.

For Policymakers and Government Agencies:

Develop supportive regulatory frameworks and incentive structures encouraging MSME digital transformation through tax incentives, subsidized digital infrastructure access, and streamlined digital business registration processes.

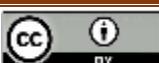
Invest in digital infrastructure development including reliable internet connectivity, affordable digital payment systems, and accessible e-commerce platforms enabling MSME digital economy participation. Implement comprehensive digital literacy programs targeting MSME owners with limited technology exposure.

Create collaborative partnerships with technology platforms, financial institutions, and educational organizations delivering integrated MSME digital transformation support addressing both capability development and market access challenges.

Suggestions for Future Research

Future research should implement longitudinal designs tracking MSME digital transformation journeys over extended periods to understand temporal dynamics, learning curves, and long-term sustainability of digital capability development and performance improvements.

Conduct comparative research examining how institutional contexts, infrastructure availability, and cultural factors influence digital entrepreneurship effectiveness across different Indonesian cities and ASEAN countries. Investigate moderating factors including owner characteristics, industry contexts, and environmental conditions influencing DEO-performance relationships.



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Explore additional mediating mechanisms including innovation outputs, customer relationship quality, and organizational learning capabilities. Examine how different digital technology types (e-commerce, social media, digital payments, cloud computing) contribute differentially to capability development and performance outcomes.

Conduct qualitative research exploring organizational processes, challenges, and success factors in MSME digital transformation through case studies, interviews, and ethnographic approaches providing rich contextual insights complementing quantitative findings.

Limitations

This study has limitations providing opportunities for future research. The cross-sectional design limits causal inference despite theoretical support and temporal ordering. The focus on Medan City may limit generalizability to other Indonesian regions with different characteristics. Self-reported performance measures introduce potential common method bias despite statistical controls. The measurement relies on owner/manager perceptions potentially differing from objective assessments.

Acknowledgements

The authors acknowledge support from Medan City Cooperative and MSME Office for facilitating access to MSME databases and providing research assistance. We thank participating MSME owners for their time and willingness to share business information. We express gratitude to research assistants who contributed to data collection and validation processes. Finally, we thank anonymous reviewers for constructive feedback improving this manuscript.

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