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International Digital Transformation of Smart MSMEs: Evidence from Indonesia and Malaysia

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Abstract

Micro, Small, and Medium Enterprises (MSMEs) in Indonesia and Malaysia play a crucial role in employment generation and economic growth; however, many Smart MSMEs still face challenges in competing in international markets due to unequal levels of digital adoption. This study investigates how international digital transformation contributes to enhancing the performance and sustainability of Smart MSMEs by providing empirical evidence from Indonesia and Malaysia. Using a mixed-methods approach, the study integrates quantitative survey data from MSME actors with qualitative in-depth interviews of business owners who have implemented international digital initiatives, including cross-border e-commerce, global digital payment systems, and international digital marketing platforms. Descriptive and comparative analyses are employed to examine key enabling factors, implementation barriers, and cross-country differences. The findings reveal that international digital transformation significantly improves market reach, operational efficiency, and business resilience, while the strategic integration of digital platforms and international business networks strengthens long-term sustainability performance. The study concludes that internationally oriented digital transformation serves as a critical driver for developing Smart MSMEs and achieving sustainable business development in emerging economies. Practical implications are provided for policymakers, MSME practitioners, and digital ecosystem stakeholders to support inclusive and sustainable digital business transformation.

Keywords: Smart MSMEs; international digital transformation; digital marketing; sustainability performance; MSME competitiveness;

1. Introduction

Micro, Small, and Medium Enterprises (MSMEs) represent a fundamental pillar of economic development in Southeast Asia, particularly in Indonesia and Malaysia, where they significantly contribute to employment creation, income distribution, and regional economic resilience (OECD, 2023). In Indonesia, MSMEs dominate the business landscape by contributing more than half of national GDP and employing the vast

majority of the labor force, while in Malaysia they account for a substantial share of economic output and formal sector employment (SME Corp Malaysia, 2024). Despite their economic importance, MSMEs increasingly face structural challenges related to international market access, technological capability gaps, and the growing demand for sustainable business practices in global value chains.

The rapid expansion of digital technologies has reshaped the competitive environment and created new opportunities for MSMEs to participate in cross-border trade and global digital ecosystems. International digital transformation, which encompasses cross-border e-commerce platforms, digital payment infrastructures, international digital marketing channels, and cloud-based business solutions, has become a strategic pathway for MSMEs seeking to internationalize their operations and improve business performance (Verhoef et al., 2021; Kraus et al., 2022). However, the adoption of digital tools alone does not automatically translate into sustainable competitive advantage. Many MSMEs implement digital solutions in an ad hoc manner, without aligning them with long-term business sustainability strategies or international growth objectives (Warner & Wäger, 2019).

The emergence of Smart MSMEs highlights a shift from basic digital adoption toward more integrated, data-driven, and ecosystem-oriented business models. Smart MSMEs are characterized by their ability to leverage digital technologies, analytics capabilities, and international networks to enhance innovation, operational efficiency, and sustainable value creation (Cenamor et al., 2019). Nevertheless, existing empirical studies tend to focus on isolated aspects of digitalization, such as e-commerce usage or social media marketing, while offering limited insight into how international digital transformation can be systematically integrated with sustainability goals, particularly in developing and emerging economy contexts (Ghobakhloo et al., 2023).

Furthermore, comparative evidence between countries remains scarce, especially within the ASEAN region, where institutional environments, digital infrastructure maturity, and policy support mechanisms vary significantly. This lack of cross-country analysis restricts the generalizability of existing findings and limits the formulation of regionally relevant policy recommendations. As a result, important research questions remain unanswered regarding how international digital transformation strategies differ between Indonesia and Malaysia and how these differences influence the sustainability performance of Smart MSMEs.

In response to these gaps, this study examines the international digital transformation of Smart MSMEs by providing empirical evidence from Indonesia and Malaysia using a mixed-methods research design. The study

contributes to the literature in three main ways. First, it develops an integrated conceptual framework that links international digital transformation dimensions with sustainable business performance. Second, it offers comparative empirical insights that highlight contextual differences and common patterns across the two countries. Third, it generates practical and policy-oriented implications to support the development of digitally enabled and sustainability-oriented MSMEs. The remainder of this paper is structured as follows. Section 2 presents the literature review and hypothesis development, Section 3 outlines the research methodology, Section 4 reports the empirical findings, Section 5 discusses the implications and proposed model, and Section 6 concludes the study with recommendations for future research and policy development.

2. Literature Review

This section synthesizes recent academic literature related to international digital transformation, Smart MSMEs, and sustainable business development. It critically examines dominant theoretical perspectives, empirical evidence, and unresolved research gaps, particularly in the context of emerging economies in Southeast Asia.

2.1 International Digital Transformation and Global Market Participation of MSMEs

International digital transformation has fundamentally altered the way MSMEs access and compete in global markets. By utilizing digital platforms, cloud-based services, cross-border e-commerce marketplaces, and international payment infrastructures, MSMEs can bypass traditional entry barriers such as high capital requirements and limited physical presence abroad (Autio et al., 2018; Jean & Kim, 2020). This digitally enabled internationalization process enables firms to engage in rapid market expansion and develop global customer bases at relatively low operational costs (Monaghan et al., 2020).

Empirical studies indicate that MSMEs adopting international digital tools experience improvements in export performance, customer acquisition, and brand visibility across borders (Zhang et al., 2022). Digital marketing technologies, including search engine optimization, social media advertising, and platform-based analytics, further enhance firms' ability to target international consumers and personalize market offerings. However, the effectiveness of international digital transformation remains uneven across MSMEs. Structural constraints such as limited digital literacy, insufficient technological infrastructure, cybersecurity concerns, and weak institutional support often restrict the scalability and sustainability of digital initiatives (Ghobakhloo & Ching, 2019).

Moreover, existing literature frequently treats digital transformation and internationalization as separate strategic processes. This fragmented perspective limits the understanding of how digital technologies and international business strategies interact dynamically to generate competitive advantage. Recent calls in the literature emphasize the need for integrated analytical frameworks that capture the synergistic relationship between digital capabilities and international business expansion, especially for MSMEs operating in emerging economies (Kraus et al., 2022).

Despite the growing body of research on MSME digitalization, comparative cross-country evidence within the ASEAN region remains scarce. Differences in digital infrastructure readiness, regulatory environments, and ecosystem maturity between countries such as Indonesia and Malaysia create heterogeneous digital transformation outcomes. This contextual diversity highlights the importance of conducting comparative empirical studies to better understand region-specific challenges and opportunities.

2.2 Smart MSMEs and Sustainability-Oriented Business Development

The Smart MSMEs paradigm extends beyond basic technology adoption by emphasizing intelligent resource utilization, data-driven decision-making, and ecosystem-based collaboration. Smart MSMEs integrate digital technologies with organizational learning, innovation capability, and strategic agility to create adaptive and sustainable business models (Cenamor et al., 2019). This approach aligns closely with sustainability-oriented business development, which seeks to balance economic growth with social responsibility and environmental stewardship.

The sustainability perspective is commonly framed using the Triple Bottom Line framework, encompassing economic viability, social inclusiveness, and environmental responsibility (Elkington, 1997; Lozano, 2018). Recent empirical studies demonstrate that digitally enabled MSMEs are better positioned to optimize resource efficiency, reduce operational waste, improve supply chain transparency, and enhance stakeholder engagement. These outcomes contribute to long-term business resilience and sustainable competitive advantage.

However, systematic literature reviews reveal that sustainability integration within MSME digital transformation research remains limited (González-Varona et al., 2024). Most empirical studies focus predominantly on short-term financial performance indicators, while social and environmental dimensions receive comparatively less attention. Furthermore, existing research often lacks robust empirical models that

link international digital transformation practices with sustainability performance outcomes.

Preliminary empirical evidence from Indonesia and Malaysia suggests that MSMEs adopting international digital platforms report notable improvements in operational efficiency, market expansion, and business adaptability. Factors such as human capital capability, digital leadership, innovation culture, and adaptive business model design have been identified as critical success determinants (Verhoef et al., 2021; Kraus et al., 2022). Nevertheless, these findings remain fragmented and require validation through integrated cross-country analytical frameworks.

Building on these gaps, the present study advances the literature by developing and empirically testing an integrated international digital transformation model for Smart MSMEs that explicitly incorporates sustainability performance dimensions. By providing comparative evidence from Indonesia and Malaysia, this research contributes to a more holistic understanding of how digital globalization strategies can support sustainable MSME development in emerging economies.

3. Materials and Methods

This study applies a convergent mixed-methods approach combined with Partial Least Squares Structural Equation Modeling (PLS-SEM) to analyze the impact of international digital transformation on the sustainable business performance of Smart MSMEs in Indonesia and Malaysia. The use of PLS-SEM is appropriate given the exploratory nature of the proposed model, the relatively small sample size (n = 35), and the complexity of the structural relationships examined (Hair et al., 2022). This approach enables robust estimation of latent constructs while accommodating non-normal data distributions commonly found in MSME survey datasets.

Quantitative modeling is complemented by qualitative thematic analysis to enhance interpretability and contextual understanding. A Fishbone Diagram technique is employed as a diagnostic tool to identify critical drivers, structural barriers, and enabling conditions influencing international digital transformation implementation.

3.1 Research Design and Data Collection Procedure

Phase 1 – Instrument Development and Pilot Testing

Measurement instruments are developed based on established constructs related to digital transformation capability, international platform utilization, Smart MSME readiness, and sustainability performance. All

items are measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

A pilot test involving 10 MSME respondents is conducted to evaluate item clarity, reliability, and content validity. Feedback obtained from the pilot study is used to refine questionnaire wording and improve construct consistency prior to large-scale data collection.

Phase 2 – Sampling Strategy and Respondent Profile

The study involves 35 MSMEs, consisting of 20 MSMEs from Indonesia and 15 MSMEs from Malaysia, selected using purposive sampling. The inclusion criteria are:
(1) active use of digital platforms for business operations,
(2) engagement in cross-border online transactions or international digital marketplaces, and
(3) minimum operational experience of two years.
This sample size meets the minimum requirements for PLS-SEM analysis based on the ten-times rule, where the maximum number of structural paths directed at a single construct does not exceed three (Hair et al., 2022).

Phase 3 – Quantitative Analysis Using SEM-PLS

Quantitative data analysis is conducted using SmartPLS 4 software. The analytical procedure follows a two-stage approach: evaluation of the measurement model and assessment of the structural model.
Measurement Model Evaluation
The reliability and validity of the measurement model are assessed using the following criteria:
Outer Loadings: ≥ 0.70
Cronbach's Alpha: ≥ 0.70
Composite Reliability (CR): ≥ 0.70
Average Variance Extracted (AVE):≥ 0.50
Discriminant Validity: Heterotrait–Monotrait Ratio (HTMT) ≤ 0.85
Indicators that do not meet the minimum thresholds are removed to improve model quality.
Structural Model Assessment
The structural model is evaluated using the following parameters:
Collinearity Assessment: Variance Inflation Factor (VIF) < 5
Path Coefficients: Estimated using bootstrapping with 5,000 subsamples
Coefficient of Determination (R^2):To assess explained variance
Effect Size (f^2): To evaluate predictor strength
Predictive Relevance (Q^2):Assessed using blindfolding procedure
These indicators ensure the robustness and predictive capability of the proposed model.

Phase 4 – Qualitative Analysis and Triangulation

Qualitative data are collected through semi-structured interviews with selected MSME owners and digital business practitioners in Indonesia and Malaysia. The data are analyzed using thematic coding techniques to identify key transformation patterns, adoption challenges, capability development strategies, and sustainability practices.

Triangulation is conducted by comparing qualitative insights with SEM-PLS results. A Fishbone Diagram is used to visualize root causes and enabling factors affecting international digital transformation and sustainable business performance.

Phase 5 – Framework Development and Validation

Integrated quantitative and qualitative findings are used to develop a Smart MSME International Digital Transformation Framework. The framework is validated through expert review sessions involving academic experts, MSME practitioners, and digital transformation consultants. Minor adjustments are made to improve clarity, applicability, and policy relevance.

3.2 SEM-PLS Analytical Workflow

SEM-PLS Procedure for International Digital Transformation of Smart MSMEs
Input: International digital transformation indicators; Smart MSME capability variables; sustainability performance metrics
Output:Validated Smart MSME international digital transformation structural model
1. Design conceptual framework and hypothesized relationships
2. Develop and pilot-test survey instruments
3. Collect data from 35 MSMEs in Indonesia and Malaysia
4. Screen data for missing values and outliers
5. Import dataset into SmartPLS 4
6. Evaluate measurement model (outer loadings, CR, AVE, HTMT)
7. Assess structural model (VIF, R^2, f^2, Q^2)
8. Perform bootstrapping analysis (5,000 subsamples)
9. Interpret hypothesis testing results
10. Integrate qualitative findings using Fishbone Diagram analysis
11. Finalize transformation framework and managerial recommendations

4. Results and Discussion

4.1. Profile of Smart MSMEs & Dataset Description and Initial Analysis

The profile analysis indicates that Smart MSMEs in Indonesia and Malaysia share comparable characteristics in terms of business scale,

ownership structure, and sectoral distribution. Most sampled firms operate in manufacturing, handicrafts, food and beverage, and creative services sectors, which represent the dominant MSME industries in both countries.

Despite these similarities, differences emerge in digital maturity and international market integration. Malaysian MSMEs demonstrate higher digital readiness, particularly in cross-border e-commerce adoption, digital payment utilization, and technology-enabled supply chain coordination. Indonesian MSMEs, on the other hand, exhibit rapid growth in social media marketing and international marketplace participation, although advanced system integration and digital skills development remain key challenges.

The quantitative dataset consists of MSMEs that have adopted at least one form of international digital technology, including e-commerce platforms, online payment systems, and digital marketing tools. This dataset provides a representative sample for examining the impact of International Digital Transformation (IDT) on Smart MSME capability development and Sustainable Business Development (SBD)

4.2 Hypothesis Testing Results (Bootstrapping Analysis)

Structural equation modeling using the PLS-SEM bootstrapping technique confirms that all proposed hypotheses are statistically supported. The results satisfy the recommended significance criteria, with all T-statistics exceeding 1.96 and P-values below 0.05.

Direct Effects , the relationship between International Digital Transformation (IDT) and Sustainable Business Development (SBD) is positive and significant ($\beta = 0.421$; $T = 6.98$; $P < 0.001$). This finding supports H1, indicating that international digital adoption directly enhances MSMEs' sustainability performance by improving market access, operational efficiency, and long-term business resilience.

Furthermore, IDT shows a strong and significant effect on Smart MSME capability development ($\beta = 0.763$; $T = 14.52$; $P < 0.001$), supporting H2. This result demonstrates that international digital transformation is a major driver of Smart MSME characteristics, including digital capability, innovation orientation, organizational adaptability, and data-driven decision-making.

The effect of Smart MSME capability on Sustainable Business Development is also statistically significant ($\beta = 0.384$; $T = 5.87$; $P < 0.001$), supporting H3. This indicates that MSMEs with stronger smart capabilities are more likely to achieve sustainable growth, operational efficiency, and social and environmental responsibility.

Mediation Effect Analysis, the mediation test reveals that Smart MSME capability partially mediates the relationship between International Digital Transformation and Sustainable Business Development. The indirect effect is significant ($\beta = 0.293$; $T = 4.62$; $P < 0.001$), supporting H4

This result indicates that while international digital transformation directly contributes to sustainability outcomes, a substantial portion of its impact is transmitted through the development of Smart MSME capabilities. In other words, digital transformation becomes more effective when MSMEs simultaneously strengthen internal capabilities such as digital skills, innovation capacity, and organizational flexibility.

4.3 Quantitative Interpretation: Implications of Structural Relationships

The strong coefficient value of IDT → Smart MSMEs ($\beta = 0.763$) highlights that digital transformation serves as a foundational mechanism for building Smart MSME ecosystems. This suggests that investments in cross-border digital platforms, cloud-based operations, and international digital marketing tools significantly enhance MSME readiness for global competition.

Meanwhile, the direct effect of IDT → SBD ($\beta = 0.421$) confirms that international digitalization generates immediate economic and sustainability benefits, including improved revenue stability, supply chain efficiency, and market diversification.

The Smart MSMEs → SBD path ($\beta = 0.384$) further demonstrates that internal organizational transformation amplifies sustainability performance. MSMEs that adopt smart operational models achieve superior adaptability, stakeholder engagement, and resource efficiency.

4.4 Integration with Qualitative Findings

Qualitative evidence reinforces the quantitative results by highlighting the importance of leadership commitment, digital mindset, and ecosystem support in maximizing the benefits of international digital transformation.

Indonesian MSME owners emphasize capacity-building programs, mentoring, and platform-based training as critical drivers of Smart MSME capability development. Meanwhile, Malaysian respondents highlight institutional support, government incentives, and digital infrastructure investment as enablers of structured digital adoption.

These insights confirm that Smart MSME capability development functions as a strategic bridge between technology adoption and sustainable business outcomes.

4.5 Development of an Integrated Smart MSME Conceptual Model

Based on the structural relationships and mediation results, this study proposes an Integrated Smart MSME International Digital Transformation Model. The model positions:

a. International Digital Transformation as the primary external strategic driver,
b. Smart MSME capability as an internal transformation mechanism, and
c. Sustainable Business Development as the long-term strategic outcome.

The partial mediation structure indicates that digital transformation impacts sustainability both directly and indirectly through organizational capability development. This highlights the importance of aligning technology investments with human capital development and organizational learning processes.

4.6 Comparative Interpretation between Indonesia and Malaysia

Although Malaysian MSMEs demonstrate higher digital maturity levels, Indonesian MSMEs exhibit stronger digital experimentation and innovation agility. These differences influence the magnitude of transformation outcomes and sustainability performance.

The findings suggest that policy-driven digital ecosystems in Malaysia accelerate structured digital adoption, while entrepreneurial flexibility in Indonesia supports rapid market adaptation. Combining these strengths through regional collaboration may enhance ASEAN MSME competitiveness in the global digital economy.

4.7 Strategic and Policy Implications Based on Empirical Results

From a managerial perspective, MSMEs should prioritize:

a. Strengthening international digital platform integration,
b. Developing Smart MSME capabilities through continuous digital training, and
c. Embedding sustainability principles into digital business strategies.

From a policy perspective, governments are encouraged to expand cross-border e-commerce infrastructure, provide targeted digital capacity-building programs, and offer sustainability-oriented digital transformation incentives. Such coordinated interventions will enhance MSME digital maturity and reduce regional disparities.

4.8 Discussion

The empirical findings confirm that international digital transformation significantly drives Smart MSME capability development and sustainable business performance. The strong IDT → Smart MSMEs relationship (β = 0.763) indicates that digitalization is not merely a technological upgrade but a strategic organizational transformation process. The partial mediation effect demonstrates that sustainability outcomes are optimized when MSMEs combine digital adoption with internal capability development. This aligns with contemporary digital transformation theory, which emphasizes the interaction between technology, organizational culture, and human capital.Furthermore, the complementary strengths observed between Indonesian and Malaysian MSMEs suggest that regional cooperation can accelerate digital capability diffusion and sustainability performance across ASEAN.

The Effect of International Digital Transformation on Sustainable Business Development .The results of this study indicate that international digital transformation has a positive and significant effect on the business sustainability of MSMEs ($\beta = 0.421$; $p < 0.001$). This demonstrates that the use of cross-border e-commerce, global digital marketing, and digital payment systems can improve economic performance and business resilience. This finding aligns with research by Autio et al. (2018) and Kraus et al. (2022), which states that cross-border digitalization accelerates market expansion and enhances the competitive advantage of MSMEs.

The Effect of International Digital Transformation on Smart MSMEs' Capability .The path coefficient of 0.763 indicates that digital transformation has a very strong impact on improving the capabilities of Smart MSMEs. This suggests that the adoption of digital technology encourages increased digital literacy, technological readiness, and data-driven decision-making.

These results support the Dynamic Capability theory (Teece, 2018), which emphasizes the importance of adaptive capabilities in the digital business environment.

The Mediating Role of Smart MSME Capability,the results of the mediation test demonstrate that Smart MSME Capability strengthens the relationship between digital transformation and business sustainability. This means that digitalization will not be optimal without the readiness of human resources and internal business systems.This finding reinforces Barney's (1991) view that internal capabilities are a source of sustainable competitive advantage.

Comparison of Indonesia and Malaysia . Descriptive analysis shows that Malaysian MSMEs have a slightly higher average digital adoption rate, while Indonesian MSMEs show faster growth in the e-commerce sector. This difference is influenced by MSME digital policies, infrastructure, and the startup ecosystem.

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5. Conclusion

This study examines the international digital transformation of Smart Micro, Small, and Medium (MSMEs) in Indonesia and Malaysia within a sustainability-oriented framework. Using a mixed-methods approach, the research provides empirical evidence that integrated adoption of international digital technologies—such as cross-border e-commerce platforms, global digital payment systems, and international digital marketing—significantly enhances MSMEs' sustainable business performance.

The main findings indicate that digital transformation has a positive and substantial impact on operational efficiency, international market reach, and long-term business resilience. These effects are strengthened when digital initiatives are aligned with sustainability capabilities encompassing economic, social, and environmental dimensions. The results confirm that human capital capability, innovation-driven organizational culture, and ecosystem support play critical roles in enabling successful digital transformation. These findings directly address the research objectives by identifying key success factors and validating the proposed Smart MSME international digital transformation model.

The synthesis of results demonstrates that sustainability is not merely an outcome of digitalization but a strategic enabler that amplifies the benefits of international digital transformation. The comparative analysis between Indonesia and Malaysia further reveals complementary strengths, suggesting that cross-country collaboration can accelerate MSME digital maturity and global competitiveness within the ASEAN region.

From a theoretical perspective, this research contributes to the digital transformation and sustainable entrepreneurship literature by integrating internationalization and Triple Bottom Line principles into a unified and empirically validated framework. Practically, the proposed model offers actionable insights for MSMEs, policymakers, and

development agencies in designing sustainability-oriented digital transformation strategies and support programs.

Despite its contributions, this study has several limitations. The cross-sectional design restricts the ability to capture dynamic transformation processes over time, and the geographical focus on two countries may limit generalizability. Future research is encouraged to adopt longitudinal approaches, expand the study to additional regions, and explore advanced analytical techniques—such as artificial intelligence–based modeling—to further examine the long-term impact of digital transformation on MSME sustainability.

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