ISSN 2723-6471

Digital Platform Utilization and ICT Literacy on Global Market Access among MSMEs: The Mediating Role of Digital Business Readiness and the Moderating Effect of Government Support

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(Received: February 05, 2025; Revised: May 04, 2025; Accepted: August 01, 2025; Available online: September 01, 2025)

Abstract

This study investigates how digital capabilities and institutional support shape global market access among Micro, Small, and Medium Enterprises (MSMEs) in Indonesia, with a specific focus on Banyumas Regency. The research integrates technology adoption, organizational readiness, and policy support into a unified structural model to explain MSME internationalization in semi-urban contexts. The objective is to assess the direct effects of digital platform utilization and ICT literacy on global market access, the mediating role of digital business readiness, and the moderating effect of government support. A survey of 125 digitally engaged MSMEs was analyzed using Partial Least Squares Structural Equation Modeling. The findings reveal that digital platform utilization ($\beta = 0.163$; $p = 0.008$) and ICT literacy ($\beta = 0.161$; $p = 0.004$) significantly and directly enhance global market access. Both constructs also positively influence digital business readiness digital platform utilization ($\beta = 0.600$; $p < 0.001$) and ICT literacy ($\beta = 0.497$; $p < 0.001$) which itself contributes to market access ($\beta = 0.154$; $p = 0.037$). Mediation analysis confirms that digital business readiness significantly mediates the relationship between digital capabilities and global market access, with indirect effects of 0.093 ($p = 0.045$) and 0.077 ($p = 0.035$) for digital platform utilization and ICT literacy, respectively. Furthermore, government support significantly moderates the effect of digital readiness on market access ($\beta = 0.222$; $p = 0.002$). The model demonstrates strong explanatory power ($R^2 = 0.782$ for global market access) and predictive relevance ($Q^2 = 0.507$). This study contributes to the digital transformation literature by positioning digital business readiness as a critical enabler of MSME internationalization and highlights the synergistic role of government interventions in amplifying internal digital capabilities. The novelty lies in applying an integrated model to a semi-urban developing economy setting, offering insights for inclusive digital ecosystem design and policy formulation.

Keywords: Digital Platforms, ICT Literacy, Msmes, Global Market Access, Digital Readiness, Government Support

1. Introduction

The rapid advancement of digital technologies has transformed how businesses operate and engage with global markets. For MSMEs, digital platforms such as e-commerce, mobile payment systems, and digital logistics provide new pathways to expand their reach and compete beyond local boundaries [1], [2]. These tools have significantly lowered market entry barriers and offer cost-effective solutions for internationalization. In Indonesia, where MSMEs account for over 60% of GDP and absorb more than 97% of the national labor force, the potential for digital transformation to facilitate global access is immense [3], [4].

However, despite the national emphasis on digital economy programs, MSMEs in semi-urban areas such as Banyumas Regency face substantial challenges in harnessing digital tools effectively. While internet and infrastructure access has improved, many MSMEs remain underprepared in utilizing digital platforms and lack sufficient ICT capabilities [5], [6]. This reveals a phenomenon gap between infrastructure availability and its strategic usage for market expansion.

Previous studies have predominantly addressed how digital adoption impacts firm-level productivity and domestic market performance [7], [8]. However, empirical insights remain limited on how specific factors such as ICT literacy

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DOI: https://doi.org/10.47738/jads.v6i4.893

and digital platform utilization directly affect global market access in the context of developing economies. Moreover, there is growing recognition of the role of digital business readiness, defined as an MSME's ability to reconfigure processes, adopt digital models, and build online competencies, as a mediating factor in this relationship [9], [10].

Equally critical, but underexplored, is the moderating role of government support ranging from access to digital training, fiscal incentives, to policy facilitation for cross-border commerce [11], [12]. In regions such as Banyumas, these institutional supports can either accelerate or inhibit the impact of digital transformation efforts among MSMEs. In Banyumas Regency, local government initiatives have been implemented to promote digital transformation among MSMEs. Notable programs include "Lapak Banyumas" a regional digital marketplace facilitating local product promotion digital entrepreneurship training by the Department of Industry and Trade (Disperindag), and structured business mentoring from the Office of Cooperatives and SMEs (DINKOP UKM). These interventions aim to support MSMEs in digital adoption, improve access to e-commerce platforms, and enhance global market participation.

To address these gaps, this study proposes and tests a structural model examining the effects of digital platform utilization and ICT literacy on global market access, mediated by digital business readiness, and moderated by government support. Using a quantitative approach and SmartPLS-based analysis on MSME data from Banyumas, this research provides empirical evidence on how digital ecosystems shape global competitiveness in emerging regions.

The novelty of this study lies in its integration of technological (platform use, digital skills), organizational (business readiness), and institutional (government support) variables in a unified model. Furthermore, by focusing on a regional Indonesian setting where digitalization is still maturing, this research contributes to the broader discourse on inclusive digital transformation and MSME internationalization strategies in developing countries [13], [14]. Nevertheless, given the unique socio-economic and infrastructural context of Banyumas Regency, the findings should be interpreted with caution when applied to other regions. Future comparative research across other semi-urban or urban districts could provide a broader understanding of regional disparities in digital readiness and global market integration among MSMEs.

2. Literature Review

The digital economy has introduced unprecedented opportunities for MSMEs to access international markets by leveraging digital platforms. These platforms ranging from e-commerce sites and social media to digital payment gateways have significantly reduced traditional barriers to global trade by enabling MSMEs to reach broader customer segments and operate more efficiently [1], [2]. However, the benefits of these digital platforms are not evenly realized, particularly among MSMEs in semi-urban and rural regions, where digital adoption remains limited due to infrastructure, cost, and knowledge constraints [15], [5].

A key factor influencing digital adoption is Information and Communication Technology (ICT) literacy. ICT literacy encompasses the skills and competencies needed to use digital tools effectively in business contexts. High levels of ICT literacy among MSME owners and managers have been associated with increased digital adoption, better marketing strategies, and improved customer engagement across digital channels [7]. Yet, many MSMEs in developing regions continue to face digital skill gaps, exacerbated by a lack of access to structured training, guidance, and affordable technologies[6]. This digital capability gap often impairs the ability of businesses to fully utilize available digital platforms for international expansion.

To bridge the gap between digital potential and digital outcomes, scholars have emphasized the importance of digital business readiness a firm's overall preparedness to adapt its strategy, structure, and processes to the demands of digital transformation. Digital business readiness includes infrastructure readiness, organizational flexibility, and the capability to integrate digital tools into everyday operations [9]. It acts as a mediating factor that determines whether MSMEs can convert their ICT literacy and platform use into tangible competitive advantages such as increased market reach and customer base [10].

In parallel, government support is widely recognized as a crucial moderating factor in the digital transformation journey of MSMEs. Public policies and interventions such as digital literacy programs, e-commerce training, and subsidies for technology acquisition can either reinforce or hinder the effectiveness of MSME digitization efforts [11]. In regions

like Banyumas, targeted support from local or national authorities can reduce cost burdens, provide access to essential training, and stimulate platform adoption, thereby accelerating access to global markets [12]. However, the effectiveness of such interventions depends on their alignment with the specific needs and contexts of local businesses.

Ultimately, the dependent construct of interest in this study is global market access the ability of MSMEs to expand their reach beyond domestic borders. While digital tools offer pathways to global engagement, achieving meaningful and sustained access requires a combination of individual capability, organizational readiness, and supportive external environments [8], [3]. Without addressing the systemic issues of digital readiness and enabling infrastructure, the promise of digital platforms may remain largely aspirational, particularly for MSMEs operating outside major urban centers [13], [16], [14].

2.1. Digital Platform Utilization on Global Market Access among MSMEs

First, the integration of digital platforms into business operations has emerged as a pivotal strategy for MSMEs seeking to access international markets. Digital platforms ranging from e-commerce and social commerce to digital payment solutions offer MSMEs affordable and scalable mechanisms to connect with global buyers, streamline logistics, and reduce transactional friction. Prior research underscores that these platforms enhance MSMEs' ability to participate in global value chains by overcoming geographic and resource-related barriers [9], [6]. Specifically, platform-based business models, when aligned with digital entrepreneurship competencies, significantly extend MSMEs' global reach [6].

Empirical studies further reinforce the relationship between platform utilization and market expansion. According to the World Economic Forum, MSMEs that are digitally connected report substantial improvements in export performance, customer reach, and operational efficiency [8]. This observation is supported by findings showing that digital platform adoption improves firms' dynamic capabilities and enables greater agility in international environments [7]. Additionally, digital tools foster faster adaptation to shifting global market demands and amplify firms' visibility within international business ecosystems [2]. As such, MSMEs that actively leverage digital platforms are better positioned to discover, enter, and grow in cross-border markets.

Although digital infrastructure is unevenly distributed in many developing economies, the strategic use of digital platforms remains a critical enabler for global market access among MSMEs. In Indonesia where digital transformation is a national priority enterprise in semi-urban regions like Banyumas encounter both opportunities and constraints in adopting these technologies. Nevertheless, MSMEs that embrace digital platforms with clear strategic intent and operational readiness can effectively circumvent traditional globalization barriers [2]. On this basis, the following hypothesis is proposed: Digital platform utilization positively influences global market access among MSMEs. Based on the above discussion and empirical evidence, the following hypothesis is proposed:

H1: Digital Platform Utilization has a positive effect on Global Market Access among MSMEs

2.2. ICT Literacy on Global Market Access among MSMEs

ICT literacy has become a crucial competency that enables MSMEs to engage in global commerce. It involves the ability of business owners and employees to effectively utilize digital applications including software tools, online platforms, and digital communication channels for operational excellence and informed strategic decisions. Higher levels of ICT literacy allow MSMEs to better navigate digital environments, interact with international customers, and adapt swiftly to shifting global market trends [1]. This capability is particularly vital for enhancing integration into global value chains by fostering responsiveness, operational transparency, and digital agility [5].

Recent empirical findings emphasize a strong link between digital literacy and international competitiveness. For instance, firms with advanced digital skills are more likely to develop adaptable business models and seize global market opportunities [7]. Furthermore, digital proficiency supports the assimilation of emerging technologies that are critical for exporting and conducting business across borders [1]. The World Bank further notes that ICT literacy helps bridge information gaps, boosts e-commerce engagement, and enables smaller firms in developing nations to identify and pursue international market prospects [15].

In the Indonesian context, where digital readiness is not uniformly distributed, bolstering ICT literacy among MSMEs is seen as key to fostering equitable economic development. Even in resource-constrained settings like Banyumas, MSMEs with strong digital competencies can still successfully utilize online platforms, conduct cross-border transactions, and establish links with foreign customers [2]. Therefore, enhancing ICT capabilities is not only a technical necessity but also a strategic enabler of global market integration for MSMEs operating in semi-urban environments. Therefore, based on both theoretical reasoning and empirical evidence, this study proposes the following hypothesis: ICT literacy positively influences global market access among MSMEs. Grounded in the theoretical insights and recent empirical findings presented above, this study posits the following hypothesis:

H2: ICT Literacy has a positive effect on Global Market Access among MSMEs

2.3. Digital Platform Utilization on Digital Business Readiness among MSMEs

Digital platform utilization has transitioned from a secondary activity to a central strategic enabler for MSMEs undergoing digital transformation. Digital business readiness defined as an organization's technological, structural, and cultural capacity to absorb and implement digital innovations plays a pivotal role in this transition. Regular interaction with digital platforms, including e-commerce systems, CRM tools, and digital logistics, supports the development of digital orientation and organizational learning [1]. Through these engagements, MSMEs cultivate the infrastructure and routines necessary to function effectively within digital ecosystems [6].

Empirical research affirms the role of digital engagement in fostering enterprise transformation. For example, firms that frequently leverage digital technologies often reconfigure internal workflows, invest in digital infrastructure, and upskill personnel to sustain digital operations [7]. These adaptive actions significantly enhance the firm’s readiness to undertake more advanced digital initiatives. In this context, digital business readiness becomes both an outcome of platform usage and a facilitator of continuous innovation [9]. Furthermore, sustained use of digital tools allows MSMEs to access and apply data analytics and automation capabilities, contributing to greater adaptability and innovation capacity in dynamic markets [9].

In resource-constrained settings, such as those commonly found in developing countries, digital platform adoption also signals strategic foresight and operational agility. Firms that engage customers and partners through digital channels tend to build cumulative competencies that underpin digital maturity [2]. This maturity, in turn, translates into greater preparedness for scaling digital solutions and integrating emerging technologies [2]. Consequently, MSMEs that consistently utilize digital platforms are more likely to achieve a state of digital readiness essential for global competitiveness. This is particularly relevant in semi-urban regions like Banyumas, where external infrastructure may be limited, but platform use can internally drive readiness. Based on this reasoning, it is hypothesized that Digital platform utilization positively influences digital business readiness among MSMEs. In light of the reviewed literature, the hypothesis developed for this study is as follows:

H3: Digital Platform Utilization has a positive effect on Digital Business Readiness among MSMEs

2.4. ICT Literacy on Digital Business Readiness among MSMEs

ICT literacy has emerged as a critical driver of digital transformation, particularly for MSMEs striving to remain competitive in an increasingly digitized global economy. This literacy goes beyond technical know-how and includes strategic and cognitive skills that enable the effective integration of digital tools into business workflows. MSMEs with elevated levels of ICT proficiency are better positioned to evaluate digital technologies, implement them into core business functions, and enhance operational efficiency. As highlighted by Aminullah et al [5], business owners who demonstrate strong ICT competencies tend to exhibit a higher degree of digital readiness, reflected in their willingness to invest in supportive technologies and align strategic planning with digital growth trajectories.

Multiple empirical studies substantiate the notion that ICT literacy forms the backbone of digital business preparedness. Enterprises proficient in digital technologies can more effectively reconfigure resources to incorporate innovations, thus accelerating transformation initiatives [7]. Kraus et al. [2] further explain that ICT-literate organizations are more capable of absorbing external knowledge and adapting to new technologies, which strengthens their internal capacities for innovation. Likewise, Hafeez et al. [1] argue that digitally aware firms are more agile in adopting new operational

frameworks, allowing them to actively participate in broader digital ecosystems and industry-level innovation networks.

This connection becomes even more vital in environments constrained by limited external digital infrastructure. In such settings, internal capabilities especially ICT literacy serve as the primary enabler of digital transformation. MSMEs in areas like Banyumas, for instance, often rely on internally cultivated skills to compensate for external technological gaps. This internal drive positions them to adopt digital platforms and prepare for broader digital integration. As Prihandono et al. [6] suggest, the journey toward comprehensive digital business readiness is frequently initiated by cultivating ICT skills within the enterprise. Therefore, it is hypothesized that ICT literacy positively influences digital business readiness among MSMEs. In light of the reviewed literature, the hypothesis developed for this study is as follows:

H4: ICT Literacy has a positive effect on Digital Business Readiness among MSMEs

2.5. Digital Business Readiness on Global Market Access among MSMEs.

Digital Business Readiness (DBR) refers to an enterprise's comprehensive preparedness to embed digital technologies into its operational framework, thereby enabling strategic responsiveness and scalability in competitive markets. For MSMEs, this construct encompasses more than just the availability of digital infrastructure it includes leadership vision, organizational culture, and employee digital competencies. Aminullah et al [5] assert that MSMEs demonstrating strong digital readiness are better equipped to manage uncertainty and align with digital commerce trends, particularly in the context of cross-border trade where adaptability is essential.

Recent empirical studies reinforce the role of DBR as a determinant of international market engagement. Maycotte et al. [7] found that SMEs with advanced digital capabilities exhibit a higher tendency to innovate and scale operations in alignment with global customer requirements. Hafeez et al. [1] further highlight that digitally prepared firms are more capable of adapting to the fast-changing demands of international supply chains, enhancing their resilience in turbulent market conditions. Supporting this, Bindeeba et al. [17] indicates that MSMEs with higher digital readiness are more likely to participate in global value chains and make effective use of digital channels such as e-commerce, thus enhancing their international footprint.

This relationship is particularly salient in emerging economies where MSMEs must overcome structural barriers like limited export linkages and cost-intensive logistics. In these contexts, DBR serves as a strategic enabler, allowing smaller firms to circumvent traditional market entry barriers through digital means. Prihandono et al. [6] argue that DBR functions as a transformative capability that translates digital platform access into real competitive advantages in global arenas. As such, DBR not only bridges internal capabilities with external opportunities but also positions MSMEs to thrive in an increasingly digital and interconnected global economy. Therefore, this study hypothesizes that Digital Business Readiness positively influences Global Market Access among MSMEs. In light of the reviewed literature, the hypothesis developed for this study is as follows:

H5: Digital Business Readiness has a positive effect on Global Market Access among MSMEs.

2.6. Digital Business Readiness mediates the relationship between Digital Platform Utilization and Global Market Access among MSMEs

Although digital platforms offer MSMEs opportunities to expand into international markets, the link between platform usage and global market access is neither straightforward nor guaranteed. The strategic impact of digital adoption hinges upon the firm's internal capacity to align digital tools with its operational goals a capability defined as DBR. As Hafeez et al. [1] highlight, while technology adoption is increasingly common, the absence of supporting competencies such as trained personnel, digital infrastructure, and proactive leadership often limits the value that can be derived from such technologies. DBR thus functions as a mediating mechanism that transforms digital engagement into international performance outcomes. Maycotte et al. [7] demonstrated that MSMEs with high DBR levels are better equipped to expand their digital footprint, manage complex supply chains, and meet international compliance standards. Complementing this view, Prihandono et al. [6] emphasize that DBR enables firms to embed digital technologies into their workflows and adjust their products and services to meet the expectations of global customers.

In the absence of adequate digital preparedness, however, MSMEs risk underutilizing platforms and failing to achieve meaningful international integration.

In the context of emerging markets like Indonesia, where many MSMEs operate in resource-constrained environments, DBR functions as a critical bridge between technology access and global performance. Firms in regions such as Banyumas may adopt digital platforms due to external pressures or market trends, but only those with a strong readiness framework will succeed in transforming this usage into sustainable international engagement. As such, this study hypothesizes that Digital Business Readiness mediates the relationship between Digital Platform Utilization and Global Market Access among MSMEs. Considering the interaction between internal capabilities and external enablers highlighted in recent literature, this study proposes the following hypothesis:

H6: Digital Business Readiness mediates the relationship between Digital Platform Utilization and Global Market Access among MSMEs

2.7. Digital Business Readiness mediates the relationship between ICT Literacy and Global Market Access among MSMEs

ICT literacy is increasingly acknowledged as a fundamental enabler for MSMEs aiming to embrace digital transformation. It empowers entrepreneurs and their teams to comprehend and effectively apply digital technologies to achieve business goals. Nonetheless, the existence of ICT proficiency alone does not guarantee international competitiveness. The actualization of global market access demands a higher-order capability DBR which reflects the firm's ability to embed digital solutions into its organizational processes. As observed by Aminullah et al. [5], even MSMEs with sufficient ICT skills may struggle to engage in international trade without internal systems that support digital integration, including adaptable infrastructure and strategic digital leadership.

This suggests that DBR plays a crucial mediating role in the relationship between ICT literacy and global market engagement. Maycotte et al. [7] emphasize that while foundational digital skills improve awareness and openness to innovation, they yield tangible results only when reinforced by organizational structures conducive to digital execution. Supporting this, Kraus et al. [2] contend that digital competence must be complemented by firm-wide alignment between technology use and strategic business models to create measurable performance outcomes. Consequently, while ICT literacy increases MSMEs' readiness for digital engagement, DBR provides the operational pathway for transforming this capacity into cross-border success.

This interaction becomes particularly relevant in emerging regions, where digital awareness may advance more quickly than institutional or structural readiness. In Indonesia's Banyumas region, for example, many MSMEs demonstrate growing familiarity with digital platforms yet remain hindered by weak integration of these tools into export and compliance systems. According to Prihandono et al. [6], DBR is essential for converting digital familiarity into global performance by fostering system-level change that bridges internal competencies with international requirements. Accordingly, this study proposes that Digital Business Readiness mediates the relationship between ICT Literacy and Global Market Access among MSMEs. Considering the interaction between internal capabilities and external enablers highlighted in recent literature, this study proposes the following hypothesis:

H7: Digital Business Readiness mediates the relationship between ICT Literacy and Global Market Access among MSMEs

2.8. Government Support moderates the effect of Digital Business Readiness on Global Market Access among MSMEs.

Government support is increasingly acknowledged as a pivotal external driver that enables the digital transformation and internationalization of MSMEs. Within the framework of DBR, institutional interventions such as digital literacy initiatives, regulatory facilitation, financial incentives, and infrastructure provision enhance a firm's ability to convert internal digital capabilities into tangible market opportunities. The OECD [18] emphasizes that targeted and context-sensitive government policies can significantly enhance the effectiveness of digital transformation, particularly when designed to meet the operational realities of small businesses. In this regard, MSMEs with high levels of digital readiness are more likely to navigate global market challenges effectively when institutional support mitigates external constraints such as regulatory complexity or funding limitations. While prior studies have theorized the mediating role

of digital capabilities [7]; [19], empirical cases from Indonesia further reinforce these dynamics. For instance, government-led initiatives like 'Bangga Buatan Indonesia (BBI)' and the MSME Go Digital program by Kominfo have facilitated platform adoption and export-oriented training. Shopee International and TikTok Shop Global also actively partner with local MSMEs to enable direct cross-border selling through digital storefronts. These real-world cases highlight the growing synergy between institutional support and platform utilization in accelerating digital transformation among Indonesian SMEs, especially in semi-urban regions such as Banyumas.

Empirical findings reinforce the argument that government support functions as a moderator in strengthening the link between DBR and global performance outcomes. According to Hafeez et al. [1], external assistance can amplify the effectiveness of internal capabilities by reducing operational uncertainties and boosting firms' confidence in digital innovation. This is supported by Maycotte et al. [7], who reported that MSMEs operating under favorable policy conditions were more capable of converting digital readiness into sustained global competitiveness. Consequently, the interaction between government support and DBR becomes a determining factor in whether MSMEs can translate their digital investments into cross-border engagement. Kraus et al. [2] further assert that such synergy is especially vital in emerging markets, where infrastructural and logistical barriers often inhibit MSMEs from scaling globally. Therefore, fostering supportive public-private ecosystems is essential for unlocking the full international potential of digitally equipped MSMEs. Therefore, this study hypothesizes that Government Support moderates the relationship between Digital Business Readiness and Global Market Access among MSMEs, such that the relationship is stronger when government support is high. Considering the interaction between internal capabilities and external enablers highlighted in recent literature, this study proposes the following hypothesis:

H8: Government Support moderates the effect of Digital Business Readiness on Global Market Access among MSMEs.

The research model highlights five critical constructs influencing global market access among MSMEs: digital platform utilization, ICT literacy, digital business readiness, government support, and global market access. Each construct plays a distinct role in shaping MSMEs' international engagement. Digital platform utilization facilitates broader market outreach and operational efficiency, while ICT literacy enhances the ability of MSMEs to adopt and integrate digital tools effectively. Digital business readiness reflects the internal preparedness of MSMEs to respond strategically to digital opportunities. Government support functions as a contextual enabler that amplifies the impact of organizational readiness on global performance. Together, these components form an integrated framework explaining how technological capability, organizational alignment, and institutional backing interact to drive MSME internationalization. Based on this conceptual foundation, the authors propose a specific structural model as depicted in figure 1.

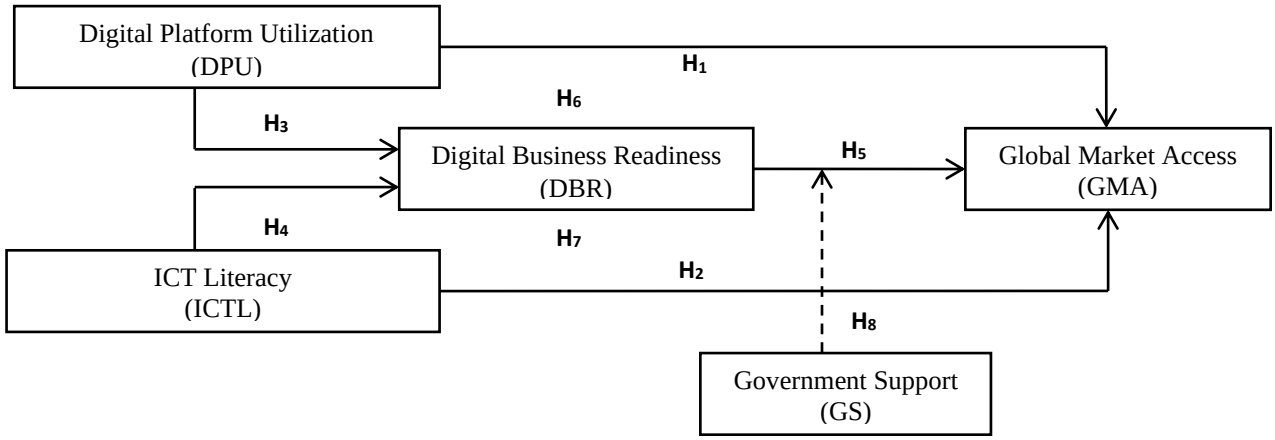

Figure 1. Research framework

3. Methodology

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3.1. Research Design

This study employed a quantitative, cross-sectional research design to explore the structural relationships among digital platform utilization, ICT literacy, digital business readiness, government support, and global market access in the context of Indonesian MSMEs. PLS-SEM was utilized as the primary analytical technique due to its robustness in handling complex models, suitability for exploratory studies, and capacity to assess predictive relationships among latent constructs. This method is particularly recommended for emerging research domains such as digital transformation and SME internationalization [20].

3.2. Population and Sampling Procedure

The research population comprised MSME actors operating in Banyumas Regency, Central Java, with a focus on creative and trade-related sectors. A purposive sampling method was employed to ensure that selected respondents had prior experience with digital tools or platforms in their business processes. Guided by the PLS-SEM sample size criteria suggested by Hair et al. [20], the minimum required sample size was calculated as ten times the largest number of structural paths pointing to any endogenous construct. A total of 125 valid responses were gathered, surpassing the threshold for robust model estimation.

3.3. Data Collection

Data were collected using a structured questionnaire administered via both online and offline channels. The instrument was divided into sections reflecting the study's five primary constructs. All items were measured on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). The questionnaire was adapted from existing validated scales and underwent a pilot test involving 20 MSME representatives to ensure clarity, contextual relevance, and comprehensibility.

3.4. Measurement of Constructs

The measurement of constructs in this study was based on validated indicators from prior literature. Digital Platform Utilization was measured using four items adapted from Kraus et al. [2], evaluating the strategic use of digital tools such as e-commerce platforms, online marketing, and payment technologies. ICT Literacy was assessed through five items derived from Aminullah et al. [5], emphasizing digital proficiency and confidence in utilizing ICT to support business operations. Digital Business Readiness was operationalized using five indicators developed by Maycotte et al. [7], which captured firms' structural and strategic preparedness for digital transformation. Although Government Support was initially operationalized with four items adapted from Hafeez et al. [1], addressing access to digital infrastructure, policy facilitation, training initiatives, and fiscal incentives the final measurement retained a single-item indicator due to high collinearity among items and to maintain model parsimony. This follows the justification provided by Diamantopoulos et al. [21], who argue that single-item constructs may be acceptable when the concept is concrete, specific, and well-defined. However, this limitation is acknowledged and should be addressed in future studies by adopting a broader multi-item scale. Finally, Global Market Access was evaluated through five items reflecting MSMEs' engagement in cross-border trade, use of digital export channels, and perceived competitiveness in international markets. Global Market Access was measured using five items adapted from Prihandono et al. [6], capturing MSMEs' engagement in international-oriented activities. These included participation in cross-border digital marketplaces (such as Shopee International or TikTok Shop Global), outreach to overseas customers through social media or reseller networks, the use of digital platforms supporting export transactions, and perceived readiness and competitiveness to serve international buyers. This construct reflects both emerging tangible access (e.g., inquiry volume, trial exports) and aspirational positioning in the global digital landscape, which is particularly relevant for semi-urban MSMEs like those in Banyumas Regency.

3.5.Data Analysis Method

Data were analyzed using SmartPLS 4, a software application designed for variance-based SEM analysis. The assessment of the measurement model included tests of construct reliability and validity, utilizing composite reliability, Cronbach's alpha, and Average Variance Extracted (AVE). Discriminant validity was evaluated using both the Fornell–

Larcker criterion and the Heterotrait–Monotrait (HTMT) ratio. The structural model was tested through bootstrapping with 5,000 resamples to determine the statistical significance of path coefficients. Additional model quality indicators, including R^2 (coefficient of determination), f^2 (effect size), and Q^2 (predictive relevance), were used to evaluate the explanatory and predictive power of the model. Mediation and moderation effects were assessed using the two-stage approach, following methodological recommendations from recent SEM literature [22]. To address concerns regarding potential multicollinearity among exogenous constructs particularly between ICT Literacy and Digital Platform Utilization a collinearity assessment was conducted using Variance Inflation Factor (VIF). As shown in the structural model output, all VIF values ranged from 1.001 to 3.512, remaining well below the commonly accepted threshold of 5.0. This indicates that multicollinearity is not a concern in the estimation of the structural paths, validating the distinctiveness of the predictor variables. To mitigate potential Common Method Bias (CMB) due to the use of self-reported survey data, a Harman's single-factor test was conducted using Principal Axis Factoring. The results indicate that the first unrotated factor accounted for 46.97% of the total variance, which is below the conservative threshold of 50% [23]. This suggests that CMB is not likely to pose a significant threat to the validity of the study's findings.

4. Results and Discussion

4.1. Outer Loadings

Prior to assessing the structural relationships among constructs, the reliability of each measurement item was evaluated through outer loadings. According to Hair et al. [20], an outer loading value above 0.70 indicates acceptable item reliability. Table 1 presents the outer loading values of all indicators used to measure each latent construct in the model.

Table 1. Outer Loadings of Measurement Items

Construct	Indicators	Outer Loading
Digital Business Readiness (DBR)	DBR1	0.957
	DBR2	0.961
	DBR3	0.940
	DBR4	0.950
	DBR5	0.933
Digital Platform Utilization (DPU)	DPU1	0.935
	DPU2	0.967
	DPU3	0.965
	DPU4	0.941
Global Market Access (GMA)	GMA1	0.993
	GMA2	0.996
	GMA3	0.993
	GMA4	0.996
	GMA5	0.995
Government Support (GS)	GS	1.000
ICT Literacy (ICTL)	ICTL1	0.956
	ICTL2	0.942
	ICTL3	0.969
	ICTL4	0.953
	ICTL5	0.943
Interaction Term (GS × DBR)	Interaction	1.000

The The outer loading values presented in table 1 indicate that all measurement items meet or exceed the commonly accepted threshold of 0.70, as recommended by Hair et al. [20], signifying strong convergent validity. Specifically, indicators for *Digital Business Readiness*, *Digital Platform Utilization*, and *ICT Literacy* exhibit loadings ranging from 0.933 to 0.969, suggesting that these items are highly representative of their respective latent constructs.

Notably, the indicators for *Global Market Access* yield exceptionally high loadings (≥ 0.993), which, while indicating excellent construct measurement, also warrant careful consideration regarding potential redundancy or multicollinearity. Meanwhile, *Government Support* and the *Interaction Term (GS × DBR)* are each measured using a single-item construct, resulting in a fixed outer loading of 1.000. While single-item constructs are acceptable in certain contexts, their use should be theoretically justified, and limitations duly acknowledged in the discussion section. Overall, the measurement model demonstrates robust item reliability and convergent validity, thereby establishing a solid foundation for subsequent analysis of the structural relationships among constructs.

4.2. Average Variance Extracted (AVE) Construct Reliability and Validity

The results in table 2 confirm that all constructs demonstrate excellent internal consistency reliability and convergent validity, in alignment with the criteria suggested by Hair et al. [20]. First, Cronbach's Alpha values for all constructs exceed the threshold of 0.70, indicating reliable internal consistency among the measurement items. However, as Cronbach's Alpha assumes equal indicator loadings, Composite Reliability (CR) is a preferred metric in PLS-SEM. All constructs yield CR values above 0.95, affirming strong reliability of the latent constructs. Second, the AVEvalues are all well above the minimum recommended value of 0.50, with scores ranging from 0.899 to 0.989. These results suggest that each construct captures more than 89% of the variance from its indicators, establishing robust convergent validity.

Table 2. Construct Reliability and Validity

Construct	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Digital Business Readiness	0.972	0.978	0.899
Digital Platform Utilization	0.965	0.975	0.906
Global Market Access	0.997	0.998	0.989
ICT Literacy	0.974	0.980	0.907

4.3. Discriminant Validity Heterotrait-Monotrait Ratio (HTMT)

Although the detailed HTMT values are not presented here, the analysis confirms that all HTMT ratios fall well below the recommended threshold of 0.90, indicating strong discriminant validity among the latent constructs. The highest HTMT value was observed between Government Support and Global Market Access at 0.749, which, while relatively high, remains within acceptable boundaries. In particular, the HTMT values involving Digital Business Readiness ranged from 0.065 to 0.680, suggesting that the constructs represent conceptually distinct domains. Nonetheless, it is important to note that one of the indicators for Global Market Access exhibited an exceptionally high outer loading (>0.99), which may imply item redundancy or conceptual overlap within the construct. While the overall construct reliability remains within acceptable thresholds, future research is advised to refine these indicators to improve discriminant clarity and prevent inflation of measurement quality.

4.4. Path Coefficients

The results of the structural model assessment, as presented in table 3 and figure 2, reveal that all hypothesized relationships are statistically significant, supporting the proposed conceptual framework. Direct effects (H1–H5) show that both Digital Platform Utilization and ICT Literacy exert significant positive effects on Global Market Access (H1: $\beta = 0.163$, $p = 0.008$; H2: $\beta = 0.161$, $p = 0.004$), suggesting that MSMEs equipped with higher digital capabilities and ICT skills are more likely to penetrate international markets. These findings align with previous studies that emphasized the impact of digitalization on enhancing global competitiveness [1], [2]. Collinearity diagnostics further confirmed the appropriateness of modeling ICT Literacy and Digital Platform Utilization as separate predictors, with VIF values of 1.659 and 1.971 respectively well within acceptable thresholds. This affirms that the observed effects on Global Market Access are not inflated due to predictor overlap. Furthermore, Digital Platform Utilization and ICT Literacy significantly influence Digital Business Readiness (H3: $\beta = 0.600$, $p < 0.001$; H4: $\beta = 0.497$, $p < 0.001$), reinforcing the view that technological competence is a critical enabler of digital transformation readiness. Notably, Digital Business Readiness also demonstrates a significant positive impact on Global Market Access (H5: $\beta = 0.154$, $p = 0.037$), suggesting that firms that are digitally prepared are better positioned to expand globally. In terms of mediation effects, both indirect paths are significant. Digital Business Readiness mediates the relationships between Digital Platform Utilization and

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Global Market Access (H6: β = 0.093, p = 0.045), and between ICT Literacy and Global Market Access (H7: β = 0.077, p = 0.035). Bootstrapped 95% confidence intervals further support these mediation effects, with the indirect effect for H6 ranging from [0.001, 0.183], and for H7 from [0.001, 0.147], indicating both effects are statistically significant as the intervals do not include zero.

Table 3. Structural Model and Hypothesis Testing

Hypothesis		Original Sample	T statistics	P values	Result
H1	Digital Platform Utilization → Global Market Access	0.163	2.654	0.008	Supported
H2	ICT Literacy → Global Market Access	0,161	2.860	0.004	Supported
H3	Digital Platform Utilization → Digital Business Readiness	0.600	11.788	0.000	Supported
H4	ICT Literacy → Digital Business Readiness	0.497	9.728	0.000	Supported
H5	Digital Business Readiness → Global Market Access	0.154	2.086	0.037	Supported
H6	Digital Platform Utilization → Digital Business Readiness → Global Market Access	0.093	2.008	0.045	Supported
H7	ICT Literacy → Digital Business Readiness → Global Market Access	0.077	2.110	0.035	Supported
H8	Government Support x Digital Business Readiness → Global Market Access	0.222	3.052	0.002	Supported

These intervals do not cross zero, confirming the statistical robustness of the mediation pathways. These findings support the theoretical proposition that digital readiness plays a pivotal role in translating digital competencies into global market outcomes. Finally, the interaction effect of Government Support × Digital Business Readiness on Global Market Access (H8: β = 0.222, p = 0.002) is also significant, indicating a positive moderating effect. This implies that the impact of digital readiness on international expansion is amplified in the presence of strong government support. Such a result underscores the importance of public sector interventions in facilitating the digital globalization of MSMEs, especially in emerging economies.

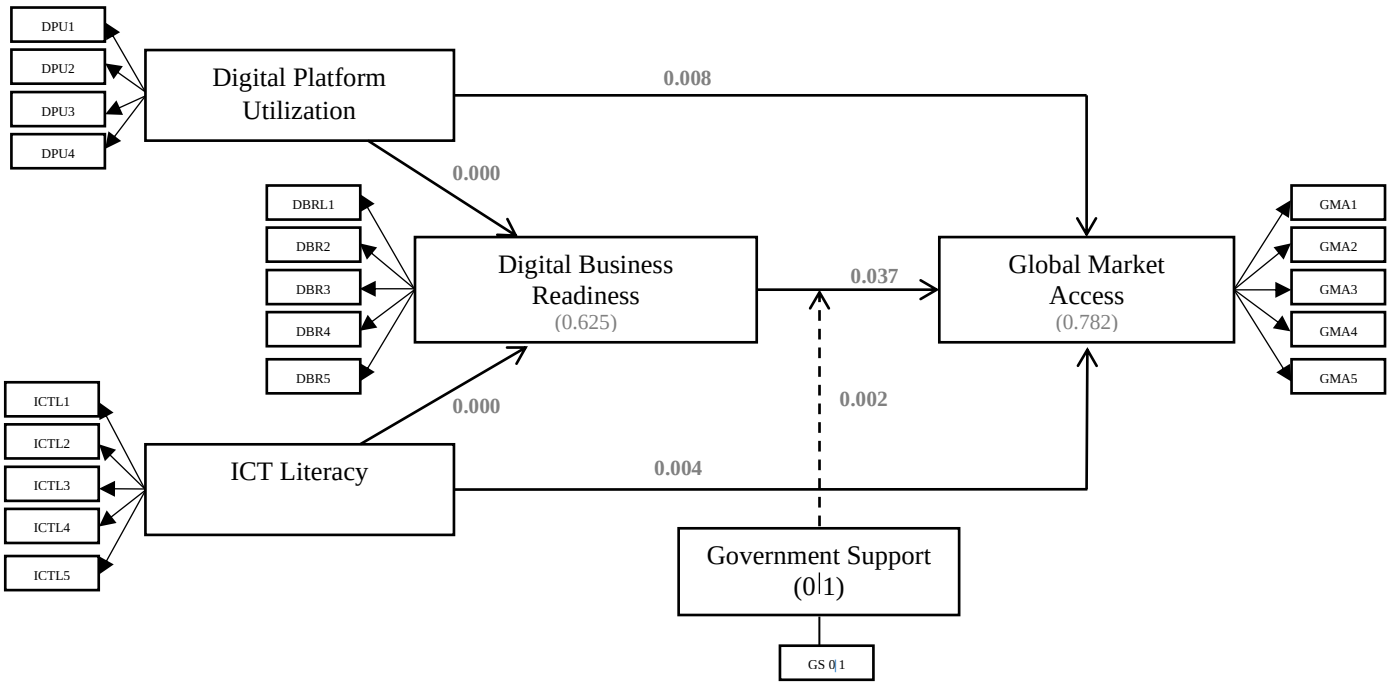

Figure 2. Analysis results model

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Collectively, these results validate the hypothesized structural relationships and highlight the multidimensional role of digital capabilities and institutional support in enabling global market access among MSMEs. The path analysis results provide standardized coefficients, standard errors, and t-statistics derived from bootstrapping with 5,000 subsamples. This approach enhances the robustness of inference by generating confidence intervals around the estimated effects. Although PLS-SEM does not test for endogeneity directly, the research design minimized potential reverse causality by ensuring theoretical directionality and collecting predictor and outcome variables within a consistent framework. Future studies could consider using extended PLS techniques such as PLS-SEM with instrumental variables (PLS-IV) to account for potential endogeneity. While the bootstrapping results confirmed the significance of direct and indirect relationships, it is important to note that this analysis did not explicitly test for potential endogeneity among constructs. Although PLS-SEM is considered robust to certain endogeneity issues, future research could incorporate advanced techniques such as Gaussian copula methods or instrumental variable approaches to more rigorously account for unobserved confounding and enhance causal interpretation.

4.5. Coefficient of Determination (R^2) and Predictive Relevance (Q^2 via Blindfolding)

To evaluate the explanatory power of the structural model, both coefficient of determination (R^2) and effect size (f^2) were assessed, following the guidelines proposed by Hair et al. [20]. The R^2 values indicate the proportion of variance explained by the exogenous constructs for each endogenous variable. As shown in the output, Digital Business Readiness has an R^2 value of 0.625, suggesting that approximately 62.5% of its variance is explained by Digital Platform Utilization and ICT Literacy. This reflects a moderate-to-substantial level of explanatory power. Meanwhile, Global Market Access records an R^2 of 0.782, meaning 78.2% of its variance is accounted for by the combined influence of Digital Platform Utilization, ICT Literacy, Digital Business Readiness, Government Support, and the interaction term (Government Support × Digital Business Readiness). According to Chin [24], R^2 values above 0.67 are considered substantial, thus indicating that the model provides a strong explanation of global market access among MSMEs. To complement the R^2 analysis, predictive relevance (Q^2) values were derived using a blindfolding procedure. The results show that Q^2 for Digital Business Readiness was 0.546, and Q^2 for Global Market Access was 0.507 both exceeding the acceptable threshold of 0.00. These findings affirm the model's strong predictive accuracy for both endogenous constructs, in accordance with PLS-SEM standards[20]. Furthermore, model fit was assessed using the Standardized Root Mean Square Residual (SRMR) metric. The SRMR value of 0.022, derived from the saturated model, is substantially below the recommended threshold of 0.08, indicating an excellent fit between the hypothesized model and the observed data [20]. This result reinforces the structural model's empirical adequacy and reliability.

The f^2 effect size is used to examine the relative contribution of each exogenous construct to the R^2 value of the endogenous variables. The results reveal that Digital Platform Utilization exerts a large effect on Digital Business Readiness ($f^2 = 0.960$), and ICT Literacy has a medium effect ($f^2 = 0.657$) on the same construct. Regarding Global Market Access, Government Support demonstrates a very large effect size ($f^2 = 2.367$), underscoring its pivotal role in facilitating international expansion. The mediating variable, Digital Business Readiness, shows a small-to-medium effect ($f^2 = 0.031$) on Global Market Access, suggesting that its role, while significant, is not dominant in isolation. Additionally, the interaction term (Government Support × Digital Business Readiness) contributes a small but meaningful effect ($f^2 = 0.056$), validating its moderating influence.

4.6. Discussion

The findings of this study begin by highlighting the positive and significant effect of digital platform utilization on global market access (H1). This result reinforces prior work by Kraus et al. [2] and Matarazzo et al. [25], who emphasize that digital platforms are strategic enablers for SMEs seeking to internationalize. By offering scalable infrastructures and greater global visibility, these platforms lower traditional market entry barriers. Moreover, the integration of digital tools, as noted by Zhang & Deborah [26], empowers MSMEs to reconfigure their business models to better serve diverse markets, thus enhancing their global competitiveness.

Building on this, the second hypothesis (H2) confirms that ICT literacy also significantly enhances global market access. This finding supports Korayim et al. [27], who emphasize that digital competencies enable entrepreneurs to effectively adopt and manage online business tools critical for cross-border trade. In a similar vein, Bindeeba et al. [17] note that digital fluency facilitates regulatory compliance and customer relationship management in international

contexts. Hence, both technological tools and the skills to use them are foundational for MSMEs aiming to expand globally.

In line with the technological dimension, the study also reveals a significant positive relationship between digital platform utilization and digital business readiness (H3). This suggests that consistent use of platforms fosters the internal capacity required to operate effectively in a digital economy. Qin [28] explains that platform integration leads to better resource allocation, improved data handling, and digital agility. Therefore, digital platforms not only extend market reach but also enhance a firm's readiness to innovate and grow sustainably.

Complementing this, hypothesis four (H4) shows that ICT literacy positively contributes to digital business readiness. This confirms the view of Kane et al. [24], who argue that leadership digital capabilities play a pivotal role in technology assimilation and business process reengineering. Furthermore, Didas & Chali [19] emphasize that digital literacy improves governance structures and fosters an innovation-oriented culture. Together, these findings underline that digital transformation is not only about adopting technology but also about equipping human capital to lead that transformation.

Continuing this trajectory, hypothesis five (H5) reveals that digital business readiness significantly impacts global market access. This aligns with the dynamic capabilities framework proposed by Ahmed et al. [29], which suggests that firms with adaptive digital capacities are better able to respond to volatile market demands. In support, Prasannath et al. [30] argue that readiness improves logistics, compliance, and market intelligence three essential factors for international success. Readiness, therefore, is the operational bridge between internal capacity and external opportunity.

Furthermore, the mediating role of digital business readiness between digital platform utilization and global market access (H6) is confirmed. This mediating effect highlights that mere technology adoption does not guarantee international success without internal preparedness. Zhang & Deborah [26] and Vial [31] both argue that digital capabilities must be institutionalized within organizational processes to yield meaningful strategic benefits. Thus, readiness translates the potential of digital tools into tangible global reach.

Likewise, hypothesis seven (H7) affirms the mediating role of digital business readiness in the relationship between ICT literacy and global market access. This finding is consistent with Didas & Chali [19] and Korayim et al. [27], who argue that knowledge alone is insufficient it must be operationalized. Bindeeba et al. [17] further emphasize the importance of structured interventions that guide SMEs from digital skills acquisition to system-wide digital transformation. Hence, this pathway underscores the strategic role of readiness in actualizing the benefits of ICT proficiency. Building on this, the results confirm that digital business readiness mediates the effects of both digital platform utilization and ICT literacy on global market access. Given that the direct effects of DPU and ICTL on GMA remain statistically significant even after including the mediator, the mediation is best categorized as partial rather than full. This suggests that while DBR enhances the explanatory power of the model, both DPU and ICTL continue to exert independent influence on MSMEs' global market performance. Furthermore, this study intentionally focused on a specific, theory-driven mediation model and did not test alternative mediating pathways. Constructs such as organizational innovation or export readiness though potentially relevant were beyond the scope of this analysis. Future research is encouraged to explore these alternative mediators through parallel or serial mediation frameworks to uncover more nuanced mechanisms linking digital capabilities to international expansion.

Finally, hypothesis eight (H8) validates the moderating effect of government support on the relationship between digital business readiness and global market access. This suggests that public policy plays a catalytic role in transforming readiness into global performance. As shown by Mohamad et al. [32] and Prasannath et al. [30], support mechanisms such as digital infrastructure, training programs, and regulatory incentives enhance the effectiveness of internal capabilities. Therefore, a synergistic interaction between institutional support and organizational readiness is vital to fostering international competitiveness among MSMEs. These results align with the types of institutional support available in Banyumas, where public programs such as Lapak Banyumas and subsidized digital skills workshops actively strengthen the readiness of MSMEs to operate in digital and international markets. Such context-specific support mechanisms illustrate the moderating role of government interventions in real-world setting. This implies that strengthening public-private synergies can be a decisive factor in enabling digitally ready MSMEs in less-urbanized regions to overcome structural barriers and expand their international reach.

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5. Conclusion

This study concludes that digital platform utilization and ICT literacy significantly influence global market access among MSMEs, both directly and indirectly through digital business readiness, with government support further strengthening this pathway. Theoretically, the findings extend the digital capability literature by positioning digital business readiness as a key mediating construct that transforms digital competencies into strategic market outcomes. Managerially, the results emphasize the need for MSME leaders to invest in digital upskilling and platform integration, while policymakers should enhance supportive ecosystems that amplify the benefits of internal readiness. For MSME decision-makers, this means not only investing in digital platforms but also ensuring employees undergo targeted digital literacy training aligned with operational goals. Managers should prioritize integrating export-oriented e-commerce channels such as Shopee International or TikTok Shop Global, and proactively form digital partnerships with logistics and payment providers that facilitate global transactions. Periodic digital audits and the appointment of digital transformation champions within the firm could also enhance strategic alignment and execution. Such initiatives can serve as practical pathways to translate digital readiness into sustainable global engagement.

However, this study is limited by its cross-sectional design and reliance on self-reported data, which may constrain causal inference. Although this study offers a valuable snapshot of digital and institutional dynamics at a single point in time, the use of a cross-sectional design limits the ability to capture how MSMEs evolve in their digital readiness and global orientation over time. Digital transformation is not a static phenomenon; it is shaped by changing technologies, shifting policy environments, and evolving consumer behaviors. A longitudinal approach would allow future studies to track these transitions, examine causal pathways more rigorously, and detect time-lagged effects between government interventions and measurable outcomes such as global market penetration. For example, the impact of digital training may not be immediately observable in export growth but could become significant over a 6- to 12-month period. Such insights are critical for designing timely and adaptive policies to support MSMEs across different stages of digital maturity. It is also based on the assumption of linear and additive relationships among constructs, as is common in PLS-SEM. In reality, interactions between digital capabilities and market outcomes may follow nonlinear or threshold dynamics. Future research could explore quadratic models or apply Generalized Additive Modeling (GAM) to capture curvilinear or synergistic relationships more accurately. Additionally, the use of a single-item measure for Government Support and its interaction term, although grounded in literature that supports their use for specific constructs, may limit measurement robustness. Future studies are encouraged to adopt multi-item operationalizations to better capture the multidimensional nature of institutional support.

A further limitation lies in the geographic scope of the study, which focuses solely on MSMEs in Banyumas Regency. While this region offers valuable insights into digital transformation in semi-urban Indonesia, the findings may not generalize to MSMEs in urban or more digitally mature areas. Future research should consider multi-regional or cross-provincial comparisons to enhance external validity. Moreover, the study did not incorporate control variables such as firm size, sector, or age, which could also affect global market access. Although this exclusion supports model parsimony, future research may benefit from including such variables to better isolate the effects of digital capabilities. Lastly, the sample only includes MSMEs with prior digital exposure, potentially introducing selection bias by excluding digitally lagging firms. While this choice ensured relevance to digital transformation, it limits generalizability. Future work should include MSMEs at varying levels of digital maturity to provide a more nuanced understanding of how digital and institutional factors interact to shape global market participation.

6. Declarations

6.1. Author Contributions

Conceptualization: Y.N., A.A.K., H.H., D.I.S.S., S.N.A., and L.N.H.; Methodology: S.N.A.; Software: Y.N.; Validation: Y.N., S.N.A., and L.N.H.; Formal Analysis: Y.N., S.N.A., and L.N.H.; Investigation: Y.N.; Resources: S.N.A.; Data Curation: S.N.A.; Writing Original Draft Preparation: Y.N., S.N.A., and L.N.H.; Writing Review and Editing: S.N.A., Y.N., and L.N.H.; Visualization: Y.N.; All authors have read and agreed to the published version of the manuscript.

6.2. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

6.3. Funding

This research received financial support in 2025 from the Ministry of Higher Education, Science, and Technology (Kemdiktisaintek), Indonesia.

6.4. Institutional Review Board Statement

Not applicable.

6.5. Informed Consent Statement

Not applicable.

6.6. Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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