

Enhancing MSME Sales Performance on E-commerce Platforms: Exploring the Interplay of Digital Skills, Product Innovation, and User Experience

Titin^{1*}, Abu Muna Almaududi Ausat², M. Indre Wanof³, Syamsuri⁴, Kraugusteeliana Kraugusteeliana⁵

Abstract—This study aims to analyze the relationship between digital skills, product innovation, and user experience with the sales performance of MSMEs (Micro, Small, and Medium Enterprises) on e-commerce platforms in Semarang. Based on the Resource-Based View (RBV) and Diffusion of Innovations (DOI) theories, this study uses quantitative methods with Structural Equation Modeling-Partial Least Squares (SEM-PLS) techniques to analyze data from 100 MSMEs active on digital platforms. The results showed that digital skills have a positive and significant impact on sales performance, as they are able to assist MSMEs in optimizing digital marketing and online transaction processes efficiently. In addition, product innovation also makes an important contribution by aligning products with consumer needs and preferences, thereby driving customer loyalty and expanding market share. User experience (UX) also plays a crucial role in influencing customer satisfaction levels and the likelihood of repeat purchases, which directly impacts sales. The findings confirm that MSMEs need to prioritize digital skills development, continuous product innovation, and e-commerce platform optimization to remain competitive in the growing digital economy. This research contributes to the literature by offering an integrated framework of how digital capabilities can help MSMEs to stay competitive in the digital economy.

Index Terms— Digital skill, product innovation, user experience, MSME, e-commerce.

I. INTRODUCTION

In today's digital age, advancements in ICT have significantly reshaped how businesses operate across multiple sectors [1]. As a tangible manifestation of digital penetration, e-commerce has emerged as a driving force for market expansion and sales performance enhancement, particularly in the study of MSMEs [2]. Therefore, comprehensive knowledge of the factors influencing MSME sales effectiveness on e-commerce platforms has highlighted the significant escalation in the importance of understanding and implementing appropriate strategies in this field.

Globalization has underscored the central role of electronic commerce as one of the primary drivers for economic growth. Statista, in its data, highlights the exponential trend of global e-commerce transaction values, which continue to rise annually. In 2020, it peaked at \$4.28 trillion, with projections for 2022 showing a significant increase towards \$5.4 trillion [3], and this figure is expected to continue surging in 2024. Within this framework, e-commerce has emerged as a central stage for companies, including MSMEs, to optimize their sales performance through broader and more inclusive access to an increasingly diverse and expanding global market [4].

The growth of Indonesia's e-commerce industry has been strongly supported by the increasing number of internet users across the country. As reported by APJII (Indonesian Internet Service Providers Association), there were approximately 221.6 million internet users in 2024, out of a total national population of around 278.7 million as recorded in 2023. The APJII's 2024 report on internet penetration indicated a usage rate of 79.5%, marking an increase of 1.4% from the previous measurement period [5]. This increase highlights significant market opportunities for MSMEs to leverage e-commerce platforms as effective sales channels. However, MSMEs face considerable challenges in adopting e-commerce, such as limited digital proficiency, insufficient product innovation, and suboptimal user experience [6]. For MSMEs to fully harness the benefits of e-commerce within Indonesia's expanding market, addressing these challenges is essential.

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*Corresponding author

¹*Titin, Universitas Islam Lamongan, Indonesia (e-mail: titin@unisla.ac.id).

²Abu Muna Almaududi Ausat, Universitas Subang, Indonesia (e-mail: abumuna742@unsub.ac.id).

³M. Indre Wanof, Moscow State University of Technology, Russia (e-mail: wanofmindre8@gmail.com).

⁴Syamsuri, Universitas Tanjungpura, Indonesia (e-mail: syamsuri@untan.ac.id).

⁵Kraugusteeliana Kraugusteeliana, Universitas Pembangunan Nasional Veteran Jakarta, Indonesia (e-mail: gusteeliana@upnvj.ac.id).

MSMEs in Semarang serve as a crucial pillar of the regional economy, contributing significantly to employment opportunities and fostering long-term economic development. Nonetheless, most MSMEs in Semarang still face substantial challenges in leveraging the potential offered by e-commerce platforms to stimulate their sales performance. Obstacles such as a lack of necessary digital skills, insufficient product innovation breakthroughs, and imperfect user experiences (UX) often become significant barriers to progress [7]. Therefore, this study aims to conduct an in-depth examination of the implications of these three factors on the sales performance of MSMEs in Semarang adopting e-commerce platforms, focusing on identifying appropriate solutions to address these challenges and maximize the benefits of e-commerce utilization to enhance competitiveness and growth of MSMEs in the region.

Previous studies have explored the relationship between digital skills, product innovation, and user experience (UX) in enhancing MSME sales performance on e-commerce platforms. For instance, [8] investigated sales strategies adopted by MSMEs in the digital era and found that digitalization enables MSMEs to adopt technology to boost sales, although significant challenges remain—especially in the wake of the Covid-19 pandemic. A survey of 58 MSMEs identified several obstacles including limited capital, dependence on face-to-face transactions, and difficulties in utilizing the internet for market segmentation and customer acquisition. Additionally, gaps in digital literacy hinder MSMEs from leveraging e-commerce platforms effectively. MSMEs must utilize the internet for promotion, optimize online transactions, implement digital marketing, and adopt online payment methods. However, as [9] noted, digital skills alone may not significantly affect sales performance due to underutilization or the lack of integration of those skills into marketing strategies.

Regarding product innovation, [10] conducted quantitative research on 40 student entrepreneurs and found a significant positive effect of product innovation on MSME sales growth. MSMEs can foster loyalty and increase market competitiveness by aligning products with consumer needs. In contrast, [11] found no significant impact of product innovation on sales, possibly due to variations in the type and uniqueness of innovations across sectors or geographical locations. In many cases, MSMEs face constraints such as limited funding, time, or technical expertise, which impede the development and commercialization of innovative products on digital platforms [12].

In another study, [13] examined 191 MSMEs in the food and beverage sector in Malang using the Technology-Organization-Environment (TOE) framework and added individual context factors to enrich the model. The study found that technological, organizational, and individual dimensions significantly affect MSME performance in adopting e-commerce. The study emphasizes the importance of strategic orientation among business owners, such as capitalizing on core strengths and unique capabilities. Nonetheless, the complexity of e-commerce platforms can negatively influence user experience. When users face difficulties in navigating or completing transactions, the UX

element fails to contribute effectively to purchase decisions [14].

Within this context, the Resource-Based View (RBV) theory introduced by Barney is especially relevant [15]. RBV posits that internal resources such as digital skills, innovation capabilities, and user experience strategies can provide sustainable competitive advantage if they are valuable, rare, inimitable, and non-substitutable (VRIN). For MSMEs, these internal capabilities can be leveraged to improve their competitive position on digital platforms, provided they are strategically managed and aligned with market needs.

Complementing this, Diffusion of Innovation (DOI) theory by Rogers explains how technological innovations are adopted within social systems over time [16]. DOI highlights factors like relative advantage, compatibility, complexity, trialability, and observability as key influencers in the adoption process. In the MSME context, even when digital capabilities or innovations exist, their impact may remain limited unless supported by a conducive diffusion process. Many MSMEs lack access to formal training and rely heavily on informal networks, making the speed and effectiveness of innovation adoption highly variable.

Thus, previous studies have laid the groundwork for understanding the individual contributions of digital skills, product innovation, and UX to MSME performance. However, few have explored how these elements interact with each other in a localized context such as Semarang. The complexity of MSME operations, limited digital infrastructure, and resource constraints underscore the need for more nuanced research that captures these dynamics holistically.

Furthermore, inconsistencies across prior findings suggest the necessity of examining these variables through integrated theoretical lenses like RBV and DOI. This study aims to capture both the internal capabilities of MSMEs and the external processes by which innovation is adopted and diffused by combining these perspectives. This dual-theory approach will allow for a more comprehensive understanding of how digital skills, product innovation, and user experience collectively influence sales performance on e-commerce platforms, especially in the context of MSMEs in Semarang.

II. RELATED WORK

A. *Resources-Based View (RBV) Theory*

The RBV, introduced by Birger Wernerfelt in 1984 and later expanded upon by Jay Barney in 1991, underscores the strategic value of internal resources in establishing and sustaining a competitive edge [15]. According to this theory, not all organizational resources hold equal potential; rather, resources that are valuable, rare, difficult to imitate, and non-substitutable are essential for achieving a lasting competitive advantage [17]. In applying the RBV framework to this study, digital skills emerge as critical resources capable of positioning companies advantageously within competitive markets. Specifically, digital skills—including knowledge of information technology, proficiency in e-commerce platforms, and expertise in digital marketing—are essential for businesses striving to adjust and grow within the dynamic digital era. Such skills not only enable companies to capitalize on digital

platforms for enhanced reach and efficiency but also enhance their adaptability to technological changes, ultimately reinforcing their market position and competitiveness. Thus, in line with RBV, these digital competencies can be seen as a means of securing a sustainable competitive advantage by fostering innovation, operational excellence, and strategic agility.

B. Diffusion of Innovations (DOI) Theory

The DOI theory, introduced by Everett Rogers in his seminal 1962 work "Diffusion of Innovations," explores the process by which innovations, such as new products and technological advancements, are communicated and adopted within a society [16]. This theory emphasizes that the adoption of an innovation is largely influenced by communication mediums, social pressures, and the perceived value it offers. The speed at which individuals embrace new innovations can differ based on elements such as how complex the innovation is, how well it aligns with existing systems or values, and the advantages it presents compared to previous solutions [18]. In the context of this study, DOI theory is applied to examine the acceptance and adoption patterns of product innovations—encompassing new product development, product improvement, and product differentiation—as they enter the consumer market. The study seeks to understand how effectively innovative products can resonate with consumers and overcome market entry barriers by leveraging this framework, analyzing factors like consumer readiness, awareness, and the influence of social networks on adoption behaviors. Ultimately, the DOI theory provides a structured approach to predict and facilitate the diffusion of product innovations, offering insights into strategies that can accelerate market acceptance, enhance consumer engagement, and support sustainable product life cycle management in competitive markets.

C. User Experience (UX)

User experience (UX) on e-commerce platforms refers to how users perceive and interact with the platform, influencing their satisfaction and engagement with the service [19]. Recent research by [20] emphasizes that UX includes aspects such as ease of navigation, customer satisfaction, and interaction quality, all contributing to user retention and sales performance. [21] highlight that easy navigation enhances user satisfaction by allowing users to find products quickly, leading to higher conversion rates. Similarly, [22] stress that customer satisfaction, shaped by fast transactions, good service, and reliable product availability, significantly influences customer loyalty. Interaction quality, as noted by [23], involves the responsiveness, clarity, and appeal of a platform's interactive elements, which increases user engagement. The importance of mobile optimization is also growing, with [24] stated that mobile-friendly platforms enhance navigation and satisfaction. Furthermore, [25] point out that AI-driven personalization is becoming a key innovation, improving UX by tailoring content and recommendations to individual user preferences.

optimizing UX by focusing on navigation, satisfaction, interaction quality, and mobile optimization can significantly enhance user retention and boost sales performance on e-commerce platforms.

D. MSMEs Performance

The performance of MSMEs can be assessed through aspects such as competitiveness, customer retention, and market expansion, which together determine the resilience and long-term growth of the business. MSME competitiveness relates to the ability to present high-standard offerings that stand out in uniqueness and remain affordable in the market, enabling them to survive and excel in a highly competitive market [13]. Recent studies, such as [26], emphasize that MSME competitiveness is also heavily influenced by their ability to leverage technological innovations to differentiate their products and streamline operations, ensuring they maintain a competitive edge in a crowded marketplace. In order to build customer loyalty, MSMEs must prioritize delivering timely service, maintaining reliable product quality, and engaging in responsive communication. Retaining customers is essential, as those who are satisfied are not only more inclined to repurchase but also to advocate for the products within their networks. rasul [27] highlight that customer loyalty can be further enhanced through personalized experiences, especially through digital channels, which are increasingly becoming a vital part of customer engagement strategies. Additionally, market expansion is a key indicator of MSME performance in extending business reach to new markets or regions, whether by increasing production capacity, diversifying products, or employing digital marketing strategies that can attract a wider audience [12]. Recent research by [28] further supports this, showing that MSMEs are expanding their reach not only locally but globally through the use of e-commerce platforms and social media marketing. These three aspects—competitiveness, customer retention, and market expansion—are mutually supportive: strong competitiveness facilitates customer retention, while loyal customers provide a stable foundation for more sustainable and planned expansion, allowing MSMEs to grow continuously amidst market changes and emerging opportunities.

E. Conceptual Framework and Hypothesis Development

In this study, the two theories—Resource-Based View (RBV) and Diffusion of Innovations (DOI)—are used to analyze factors affecting the success of an e-commerce platform, including users' digital skills and market adoption of product innovations. Researchers can understand how user experience and product development strategies influence the performance of an e-commerce platform through this framework. A positive user experience is crucial for the success of an e-commerce platform. Satisfied users who feel comfortable interacting with the platform are more inclined to come back, express satisfaction, and suggest it to their peers [29]. Therefore, understanding and improving user experience is a primary focus in the development and management of

e-commerce platforms (Fig. 1).

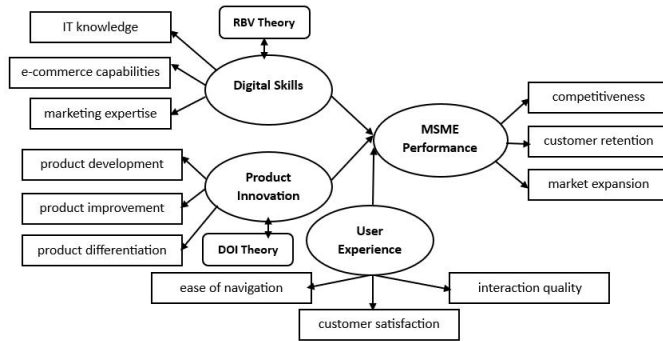


Fig. 1. Research conceptual framework.

Based on the theories and indicators explained in the context of e-commerce platforms, we believe that digital skills, product innovation, and user experience significantly impact MSME sales performance. We assume that MSMEs' ability to master digital skills, continuously develop products, and deliver a satisfying user experience will positively influence their sales performance on e-commerce platforms.

Firstly, we consider digital skills as a crucial foundation for the success of MSMEs on e-commerce platforms. Digital skills include understanding information technology, data analysis, digital marketing, and managing e-commerce platforms [30]. MSMEs with strong digital skills are more likely to utilize digital tools and strategies to enhance their product visibility, optimize marketing strategies, and swiftly adapt to shifts in customer preferences and evolving market dynamics [31]. Secondly, product innovation is a critical factor in attracting consumer interest and maintaining MSMEs' competitiveness in the fast-paced and competitive e-commerce market. Continuous product improvements, whether through quality enhancements, feature additions, or new product development, allow MSMEs to meet consumer needs and expectations more effectively [32]. Consequently, MSMEs can attract a broader market segment, increase conversion rates, and extend their product lifecycle [33]. Thirdly, a good user experience is a key factor influencing customer loyalty and long-term business growth. In the e-commerce platform environment, intuitive usage, responsive customer service, easy payment processes, and timely delivery are crucial for enhancing customer satisfaction [34]. A positive user experience builds customer trust and loyalty, generating positive reviews and recommendations, and thereby increasing customer retention and lifetime value [35]. Therefore, our hypothesis is that digital skills, product innovation, and user experience each significantly contribute to MSME sales performance on e-commerce platforms. We will test this hypothesis through data analysis encompassing sales performance parameters, product innovation, user experience, and MSMEs' digital skills, while controlling for external factors such as market conditions and competition.

H1: Digital skills significantly impact MSME sales performance on e-commerce platforms

H2: Product innovation significantly impacts MSME sales performance on e-commerce platforms

H3: User experience significantly impacts MSME sales

performance on e-commerce platforms

Building on the discussions presented, this research seeks to examine how digital competencies, product innovation, and user experience influence the sales performance of MSMEs operating on e-commerce platforms in Semarang. The findings are intended to offer actionable insights for MSME practitioners, helping them improve sales outcomes through more effective use of digital platforms. Additionally, this study aspires to address existing gaps in offers a more comprehensive insight into the dynamics between digital capabilities, innovative product development, and user-centered experiences within the Indonesian MSME landscape.

Table 1.
Summary of Main Findings from Previous Studies

Aspect	Key Findings	Recent Studies
User Experience (UX)	UX influences user satisfaction, engagement, and retention on e-commerce platforms.	UX includes ease of navigation, customer satisfaction, and interaction quality, contributing to user retention and sales [20]. Easy navigation increases user satisfaction and conversion rates [21]. Customer satisfaction influences loyalty [22]. Interaction quality increases engagement [23]. Mobile optimization enhances UX [24]. AI-driven personalization improves UX [25].
MSME Competitiveness	MSMEs must offer unique products while maintaining affordability to stay competitive.	MSME competitiveness is influenced by their ability to leverage technological innovations for differentiation and streamlined operations [13]. Technological innovations help MSMEs maintain a competitive edge [26].
Customer Retention	Retaining customers is vital for growth. Satisfied customers are likely to repurchase and advocate for products.	Customer loyalty is enhanced through personalized experiences, especially via digital channels [27].
Market Expansion	Expanding market reach through increased production capacity, diversification, and digital marketing strategies is key to MSME growth.	Market expansion through digital marketing and product diversification attracts new customers [12]. MSMEs expand globally via e-commerce platforms and social media [28].
Digital Skills	Digital skills, such as IT, data analysis, and digital marketing, are crucial for MSMEs' success on e-commerce platforms.	Digital skills enable MSMEs to utilize digital tools and strategies effectively for market visibility and adaptability [30]. Strong digital skills help MSMEs adapt to market changes and customer preferences [31].
Product Innovation	Continuous product innovation helps MSMEs meet consumer needs and improve competitiveness in the digital market.	Product innovation through quality enhancements, new features, and product development attracts a wider market segment [32]. Product innovation leads to increased conversion rates and product

User Experience and Sales	Positive UX leads to increased customer loyalty, retention, and sales on e-commerce platforms.	life cycle extension [33]. Intuitive usage, responsive customer service, easy payment, and timely delivery enhance customer satisfaction [34]. A positive user experience increases customer trust and lifetime value, leading to higher sales [35].
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III. RESEARCH METHOD

This study employs a quantitative approach, collecting data in the form of numbers and statistics to uphold high scientific standards. This method ensures the research is grounded in objectivity, measurability, logical analysis, and adherence to systematic scientific procedures [36]. Within this framework, as shown in Fig. 2, digital skills (DS), product innovation (PI), and user experience (UX) function as independent (exogenous) variables, while the sales performance of MSMEs on e-commerce platforms is considered the dependent (endogenous) variable. This structure underscores the rationale for selecting these factors as exogenous variables in the study. This study is conceptually grounded in two main frameworks: the Diffusion of Innovation (DOI) Theory and the Resource-Based View (RBV) Theory, which serve as the foundation for its theoretical perspective. The DOI Theory provides insight into the patterns and factors influencing the spread of new technologies and ideas within a community, which, in this case, helps explain the adoption of digital skills and product innovation by MSMEs. Meanwhile, the RBV Theory highlights the strategic role of a business's internal resources—such as digital skills and innovation capabilities—as foundational elements for achieving a sustainable competitive edge.

The researcher contends that the application of these theoretical frameworks can support MSME owners in Semarang in comprehending and utilizing modern technologies that streamline daily operations, particularly in marketing and sales via e-commerce platforms. As a result, there is growing awareness among these business owners of the need for strong technological proficiency and adaptability to evolving digital business trends—principles that lie at the heart of the DOI and RBV theories. This research uses purposive sampling with specific criteria, including owning a smartphone or mobile device, internet access, mobile applications, an e-commerce account, and social media for marketing. These criteria are applied to SMEs that have been using e-commerce and social media for advertising in the past two years. This is based on the researcher's observation that MSMEs consistently using social media for advertising and selling over the past two years have utilized it for various purposes.

A. Research Sample and Analysis

A Likert scale questionnaire was administered online to

MSME owners in Semarang between March and April 2024, resulting in 109 initial responses. After a screening process to ensure data quality and respondent eligibility, 9 were excluded for not meeting specific criteria, leaving a final valid sample of 100 SMEs. Semarang was strategically selected as the research location due to its high smartphone penetration, strong digital literacy, and significant adoption of e-commerce platforms, making it a representative area for studying digital business practices among MSMEs. All respondents actively manage SMEs that utilize e-commerce and social media strategies, making their input relevant for understanding the relationship between digital competencies and sales performance. The demographic details of the respondents are presented in Table 2. Data analysis and hypothesis testing were conducted using the Structural Equation Modeling–Partial Least Squares (SEM-PLS) method via SmartPLS version 3.2.9. This approach is particularly suitable for this study due to its effectiveness in analyzing complex models with multiple latent variables, especially in exploratory research with relatively small sample sizes. SEM-PLS allows simultaneous evaluation of the measurement model (outer model), which assesses reliability, convergent validity, and discriminant validity, and the structural model (inner model), which examines path coefficients, R-square values, Q-square predictive relevance, and hypothesis significance. Its flexibility in handling both formative and reflective constructs, coupled with its minimal assumptions on data distribution, makes SEM-PLS an appropriate method for analyzing how digital skills, product innovation, and user experience influence MSME sales performance in a digitally evolving region like Semarang.

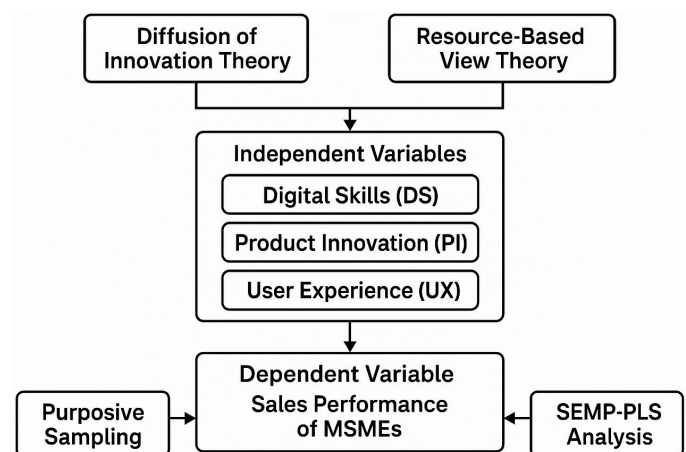


Fig. 2. Research method flowchart.

Table 2.
Demographic Respondents

Demographic	Frequency	Percentage
Duration of Use	1-5 years	92%
	6-10 years	8%
	11-15 years	0%
	>15 years	0%

Gender	Total	100	100%
	Male	41	41%
	Female	59	59%
Respondents Age	Total	100	100%
	15-25 years	8	8%
	26-35 years	66	66%
	36-45 years	21	21%
	>45 years	5	5%
MSMEs Sector	Total	100	100%
	Culinary Industry	9	9%
	Fashion and Accessories	46	46%
	Agriculture and Horticulture	2	2%
	Handicrafts	3	3%
	IT, Electronic, and Creative Industry	38	38%
	Construction	1	5%
	Tourism	1	10%
	Total	100	100%
	Tokopedia	30	30%
	Shopee	30	30%
E-commerce Frequently Used	Bukalapak	15	15%
	Lazada	10	10%
	Blibli	5	5%
	JD.ID	4	4%
	Zalora	2	2%
	Bhinneka	1	1%
	Elevenia	1	1%
	GoFood	0	0%
	Sociolla	1	1%
	Orami	1	1%
	Total	100	100%

Refer Table 2, the majority of respondents (92%) have been using the services for 1–5 years, while only a few have used the services for 6–10 years (8%). None have used the services for 11–15 years or more than 15 years. Female respondents (59%) outnumber male respondents (41%). The majority of respondents (66%) are in the age range of 26–35 years. Additionally, 21% of respondents are aged 36–45 years, 8% are aged 15–25 years, and 5% are over 45 years old. The Fashion and Accessories sector dominates with 46% of the total respondents, followed by the IT, Electronics, and Creative Industry sector (38%). Other sectors have smaller contributions. Tokopedia and Shopee are the most frequently used e-commerce platforms, each by 30% of the total respondents. Bukalapak, Lazada, and Blibli are also quite popular, each having a significant percentage of users, while other platforms have smaller percentages.

IV. RESULT

A. Outer Model Evaluation

The first step in the SEM-PLS analysis focuses on thoroughly assessing the outer model, which plays a critical role in validating the accuracy of the construct measurements within this research. This stage involves a detailed examination of convergent validity, discriminant validity, and reliability to ensure the indicators used are both reliable and valid. The assessment of convergent validity, conducted with Smart-PLS 3.2.9, confirms that the reflexive indicators align with expected standards. Specifically, each construct's manifest variables have loading factor values of 0.70 or above, which is consistent

with the threshold recommended by [37]. As outlined in Table 3, these indicators meet the 0.70 loading factor requirement, thus affirming their convergent validity and validating their capacity to represent the underlying constructs accurately.

To assess discriminant validity, a conventional method is applied by comparing the square root of each construct's Average Variance Extracted (AVE) with its correlations to other constructs. As outlined by [37], discriminant validity is established when the AVE's square root exceeds the construct's correlations with any other variables within the model. This criterion confirms that each construct is distinct from the others, ensuring that they measure unique concepts. As demonstrated in Table 4, the results affirm the model's discriminant validity, showcasing a clear separation between constructs, thereby reinforcing the robustness of the construct measures in the model.

The assessment of construct reliability using both Cronbach's Alpha and composite reliability is a fundamental step in ensuring the internal consistency of the measurement model, especially when dealing with reflective indicators. Cronbach's Alpha evaluates the degree to which items within a construct consistently measure the same underlying concept, while composite reliability provides a more nuanced estimation by accounting for the individual loadings of each indicator, making it particularly relevant in SEM-PLS analysis. In this study, the reliability scores reported in Table 3 show that all constructs comfortably exceed the commonly accepted threshold of 0.70, as recommended by [37]. This outcome suggests that the indicators within each construct whether measuring digital skills, product innovation, user experience, or sales performance are statistically coherent and reliably reflect their intended latent variables. The alignment between high Cronbach's Alpha and composite reliability values reinforces the robustness of the measurement model, minimizing the risk of measurement error and increasing confidence in the integrity of subsequent structural analysis. Furthermore, these high reliability scores imply that respondents interpreted the survey items consistently, which is particularly important in social science research involving perceptual or attitudinal data from diverse MSME owners. With this strong reliability foundation, the study is well-positioned to explore the causal pathways between constructs with greater precision, enhancing both the theoretical validity and the practical applicability of its findings in the context of MSMEs' digital adoption and performance outcomes.

Table 3.
Measurement Model Analysis

Variable	Item	Factor Loading	Cronbach's Alpha	Composite Reliability	AVE
Digital Skills (X1)	X1.1	0.822	0.827	0.837	0.641
	X1.2	0.890			
	X1.3	0.776			
Product Innovation (X2)	X2.1	0.733	0.744	0.766	0.669
	X2.2	0.745			
	X2.3	0.813			
User Experience (X3)	X3.1	0.813	0.829	0.832	0.609
	X3.2	0.828			
	X3.3	0.773			
MSME Performance (Y1)	Y1.1	0.894	0.717	0.717	0.642
	Y1.2	0.791			
	Y1.3	0.774			

Table 4.
Discriminant Validity

Var/Ind	X1	X2	X3	Y1
IT knowledge (X1.1)	0.822	0.512	0.465	0.422
E-commerce capabilities (X1.2)	0.890	0.533	0.569	0.413
Marketing expertise (X1.3)	0.776	0.569	0.359	0.518
Product development (X2.1)	0.502	0.733	0.588	0.508
Product improvement (X2.2)	0.517	0.745	0.495	0.531
Product differentiation (X2.3)	0.556	0.813	0.550	0.440
Ease of navigation (X3.1)	0.433	0.410	0.813	0.437
Customer satisfaction (X3.2)	0.498	0.555	0.828	0.541
Interaction quality (X3.3)	0.466	0.448	0.773	0.349
Competitiveness (Y1.1)	0.519	0.586	0.576	0.894
Customer retention (Y1.2)	0.595	0.507	0.439	0.791
Market expansion (Y1.3)	0.451	0.477	0.336	0.774

B. Inner Model Evaluation

Following the SEM-PLS study's assessment of the outer model, the analysis progresses to the examination of the inner model, focusing on key metrics such as R-square, Q-square, and hypothesis testing to determine the model's structural efficacy and predictive reliability. This in-depth approach reveals critical insights into the inner workings of the model, offering a clearer understanding of its explanatory and predictive power, as well as its ability to validate the proposed hypotheses within the research framework.

The R-square (R^2) statistic serves as a crucial indicator in assessing the overall fit and predictive power of a structural model, particularly in Structural Equation Modeling using Partial Least Squares (SEM-PLS). In the context of this study, the R-square value of 0.661 for the construct "Sales Performance on E-commerce Platforms" indicates that 66.1% of the variance in MSME sales performance in Semarang can be explained by the combined influence of digital skills, product innovation, and user experience (Table 5). This suggests a robust explanatory model, as more than half of the outcome variable's variation is accounted for by the proposed predictors. Interpreting this further, MSMEs with stronger digital competencies, higher levels of innovation in their products, and a focus on enhancing user experience are more likely to experience improvements in their sales performance via e-commerce platforms. The remaining 33.9% of unexplained variance highlights the existence of other influential factors not captured in this model, such as pricing strategies, customer trust, logistics efficiency, market competition, branding efforts, or macroeconomic conditions—elements that future research may consider integrating. According to established guidelines in SEM-PLS literature, particularly those cited in [37], an R-square value above 0.50 represents a moderate-to-substantial level of model fit, reinforcing the empirical adequacy and relevance of the

research framework. This also validates the model's capacity to provide reliable insights for both theoretical development and practical decision-making, especially in the evolving landscape of MSME digital transformation.

In addition, Q^2 values are used in this research to assess the predictive relevance of the structural model. Following [37] guidelines, a Q^2 value greater than zero is an indicator of the model's predictive power. The Q^2 value is calculated using the formula: $Q^2 = 1 - (1 - R^2)$. For this model, substituting the R^2 value yields: $Q^2 = 1 - (1 - 0.661) = 1 - 0.339 = 0.661$. The resulting Q^2 value of 0.661 demonstrates that the model has a strong predictive relevance, affirming its capacity to reliably predict observed values based on the data, in line with [37] benchmarks.

Finally, hypothesis testing in this SEM-PLS model utilizes path coefficients and significance levels to assess the relationships between constructs. Following [37], a hypothesis is considered significant if its path coefficient is above 0.1, accompanied by a P-value less than 0.05 or a T-value above 1.96, which indicates a positive and statistically significant correlation. The hypothesis testing results, presented in Table 6, provide a detailed breakdown of these relationships, substantiating the model's ability to support or refute the hypotheses based on empirical data. This comprehensive analysis enables a robust evaluation of the model's structural integrity and its alignment with theoretical expectations, highlighting its efficacy in interpreting the dynamics at play in MSME performance on e-commerce platforms.

Table 5.
R-square

No	Variable	R-Square
1	Y1	0.661

Table 6.
Hypothesis Testing Results

Hypothesis	Path Coefficient	T-Value	P-Value	Result
X1→Y1	0.517	4.313	0.000	Accepted
X2→Y1	0.533	5.551	0.000	Accepted
X3→Y1	0.474	5.819	0.005	Accepted

C. Discussion

The results of the first hypothesis in Table 6 indicate that an increase in digital skills at both the individual and business levels have a positive and significant impact on the sales performance of MSMEs through e-commerce platforms. This finding supports previous research that found similar results [38]. Digital skills encompass knowledge of information technology, the ability to use e-commerce platforms, and expertise in digital marketing. The rationale for this finding is that with strong digital skills, MSMEs can compete more effectively in the global market. They can optimize the use of e-commerce platforms to reach a wider audience, not only locally but also regionally and internationally. MSMEs have

the opportunity to offer their products to a larger audience with easier access to global markets, thereby increasing their competitiveness in an increasingly competitive market [39].

Digital skills enable MSMEs to expand their market more efficiently and strategically. They can identify new market opportunities, tailor their products and marketing strategies, and reach consumers in previously inaccessible locations by using e-commerce platforms. Consequently, MSMEs can expand their geographic reach without facing the physical barriers often encountered in traditional expansion. This expansion can lead to significant increases in sales and business growth [40]. Additionally, through effective digital marketing, MSMEs have the potential to establish a strong brand reputation and image within their market, increasing consumer recognition and trust in their brand. Consumers are more likely to trust and engage with brands that maintain an active digital presence. MSMEs can effectively raise awareness of their brand by employing a range of digital marketing strategies including the development of engaging content, the strategic use of social media platforms, and the implementation of digital advertising. A solid reputation attracts new customers and helps retain current ones and may even draw the interest of investors who wish to support the business's growth [41]. Specifically, for MSMEs in Semarang, a collective enhancement of digital skills is anticipated to have a favorable and measurable effect on their sales performance within e-commerce platforms. MSMEs have the potential to enhance their competitive edge and expand their market presence, and reinforce their brand identity through the strategic application of information technology and digital marketing. These efforts contribute substantially to the growth of the regional economy and the overall success of the business.

The results of the second hypothesis in Table 6 above indicate that product innovation has a positive and significant impact on the sales performance of MSMEs through e-commerce platforms. This finding is consistent with previous research findings [42]. Digital skills encompass knowledge of information technology, the ability to use e-commerce platforms, and expertise in digital marketing. Key indicators of product innovation include the development of new products, improvement of existing products, and product differentiation. Possible reasons for this finding include that product innovation is a crucial strategy for MSMEs to strengthen their position in the digital market. Developing new products is a proactive step in adapting to changes in consumer needs and preferences. MSMEs can expand their market share on e-commerce platforms by identifying market gaps and creating products to meet those needs [43]. Additionally, improving existing products helps enhance product quality and features, thereby strengthening their appeal to consumers. This can lead to increased sales volume and customer loyalty.

Product differentiation is also a vital strategy in creating a competitive advantage for MSMEs. When MSMEs offer products that are unique in design, features, or other added value, they can distinguish themselves from competitors and attract consumer attention on e-commerce platforms. Differentiated products can create a perception of higher value in the eyes of consumers, allowing MSMEs to set higher prices and increase their profit margins [44]. The positive impact of

product innovation can also be observed through the increased competitiveness of MSMEs in the digital market. If MSMEs offer unique and differentiated products, they can become the preferred choice for consumers amid intense competition [45]. This enables them to expand their market share and increase their visibility on e-commerce platforms. Furthermore, product innovation also facilitates market expansion for MSMEs. If MSMEs offer attractive and innovative products, they can reach consumers in wider geographical areas, both locally and internationally [46]. This opens up new opportunities for business growth and expands the economic impact of MSMEs in Semarang. Lastly, product innovation can help build a strong brand reputation and image for MSMEs. Innovative products reflect MSMEs' commitment to quality and excellence, which can enhance consumer trust in their brand [47]. Product innovation is essential in driving the sales performance of MSMEs on electronic commerce platforms, while simultaneously strengthening their brand image with consumers. Consequently, innovation in products has a notable positive impact on the sales outcomes of MSMEs operating in the e-commerce space in Semarang. MSMEs can enhance their competitive position and expand their market reach by embracing innovation, and establish a strong brand reputation, all of which contribute to sustainable economic growth and long-term success by embracing innovative approaches in product development, enhancement, and differentiation.

The findings presented in Table 6 for the third hypothesis demonstrate that product innovation positively and significantly affects the sales performance of MSMEs on e-commerce platforms. This result is consistent with the conclusions of prior studies [48]. User Experience is a crucial factor in determining the success of MSMEs on e-commerce platforms. In this context, three key indicators of user experience (UX) are considered: ease of navigation, customer satisfaction, and interaction quality. These three aspects provide a logical explanation for this finding and play a crucial role in shaping consumers' positive perceptions of MSMEs' products and brands, which in turn influence sales performance.

Firstly, ease of navigation within e-commerce platforms forms the foundation of a good user experience. Consumers can quickly find the products they are looking for without confusion or difficulty with an intuitive interface and easy-to-understand navigation [49]. For example, clear product categories and an efficient search system will help consumers find products faster, increasing the likelihood of purchase conversion. Secondly, customer satisfaction is a direct result of good user experience (UX). Consumers tend to feel satisfied when they have a smooth and satisfactory shopping experience online [50]. This includes aspects such as product quality, delivery speed, and responsive customer service. High customer satisfaction not only increases the likelihood of repeat purchases but also encourages product recommendations to others, directly supporting sales growth. Thirdly, the quality of interaction between consumers and e-commerce platforms, as well as between consumers and MSMEs, also plays a crucial role in creating a positive user experience. Prompt responses to inquiries, friendly customer support, and seamless transaction processes are examples of good interaction quality. Interactive

features such as customer reviews and product recommendations can also enhance consumer engagement and assist in purchase decision-making [51].

When it comes to the sales performance of MSMEs on electronic commerce platforms in Semarang, a high-quality user experience (UX) significantly contributes to improved outcomes. Business can enhance their competitiveness in the market with improvements in ease of navigation, customer satisfaction, and interaction quality. A positive user experience not only fosters customer loyalty but also enables MSMEs to reach a wider market and attract new customers [52]. This market expansion then contributes to increased sales volume and revenue. Additionally, good user experience (UX) also helps in building a positive brand reputation and image. Consumers tend to have a better perception of brands that offer superior user experiences [53]. Therefore, investment in improving UX not only provides short-term benefits in terms of increased sales but also contributes to the long-term growth and sustainability of MSMEs on e-commerce platforms.

The comprehensive discussion above reveals several key findings regarding the factors that influence the sales performance of MSMEs through e-commerce platforms in Semarang City, which can be coherently understood through the lens of Resource-Based View (RBV) Theory and Diffusion of Innovation (DOI) Theory. According to RBV, internal resources that are valuable, rare, inimitable, and non-substitutable serve as foundational elements for gaining competitive advantage. Within this framework, digital skills and product innovation emerge as critical resources for MSMEs. Digital skills equip business owners with the capability to utilize digital tools and e-commerce platforms effectively, enhancing operational efficiency and market reach, while product innovation enables them to develop unique and differentiated offerings that stand out in competitive markets. These two elements embody the RBV principles, reinforcing the notion that strategic internal competencies are essential to achieving superior performance.

From the perspective of DOI Theory, which emphasizes how innovations are adopted over time within a social system, the use of e-commerce and digital marketing by MSMEs can be interpreted as the diffusion of technological innovations. MSMEs in Semarang that possess higher levels of digital literacy and stronger capacities for innovation tend to adopt e-commerce platforms more effectively. DOI Theory posits that innovation adoption is influenced by perceived usefulness, ease of use, compatibility with existing practices, and perceived need. The study's finding that MSMEs with digital capabilities and a propensity for product innovation show improved sales performance through e-commerce platforms reflects a successful diffusion process, where the innovation is not only adopted but also utilized to achieve tangible business outcomes.

Moreover, RBV underscores the importance of differentiation in achieving competitive advantage. Product innovation directly supports this by enabling MSMEs to introduce novel, value-added products that distinguish them from competitors. In a highly competitive digital marketplace,

such differentiation becomes a strategic asset, allowing MSMEs to attract and retain customers more effectively. This supports the RBV assertion that firms possessing unique, hard-to-replicate capabilities can sustain long-term advantages over rivals. In this case, product innovation functions not merely as an operational improvement but as a strategic mechanism to achieve distinctiveness in the marketplace.

In addition, the role of user experience (UX) aligns with DOI Theory, particularly in terms of how positive interactions with digital platforms can accelerate innovation adoption. The research highlights that MSMEs providing a seamless, satisfying, and interactive customer experience through their e-commerce channels see a significant impact on their sales performance. According to DOI Theory, user-centered factors such as platform navigability, perceived reliability, and responsiveness influence consumer willingness to engage with new technologies. Thus, high-quality UX can act as a catalyst for consumer acceptance of digital commerce, ultimately contributing to increased sales and sustained platform usage.

In essence, these findings, when examined through the combined theoretical lenses of RBV and DOI, offer a holistic understanding of how digital capabilities, innovation practices, and user-centric strategies synergistically influence MSME performance in the e-commerce sector. Researchers and practitioners can gain a deeper comprehension of the dynamic interplay between internal resources and external adoption behaviors by applying these frameworks, which together shape the digital competitiveness of MSMEs, particularly in digitally progressive regions such as Semarang.

V. CONCLUSION

This study makes a significant contribution to the existing literature by reinforcing and extending the understanding of how internal capabilities—specifically digital skills and product innovation—serve as strategic enablers of MSME sales performance in the context of digital commerce. This research enriches existing theoretical frameworks, particularly the Resource-Based View (RBV) and the Diffusion of Innovation (DOI) Theory, through an empirical focus on Semarang City, a region characterized by high digital engagement and accelerated growth in e-commerce adoption, thereby demonstrating the relevance and applicability of these theories within the Indonesian MSME context. Unlike previous studies that often isolate single variables, this research highlights the interplay between digital capabilities, innovative practices, and user experience, showing that these elements jointly influence MSME success in online marketplaces. Furthermore, by empirically validating the role of user experience (UX) in enhancing digital platform engagement and sales outcomes, this study introduces a more consumer-centered perspective into MSME performance analysis—an area that has received comparatively less attention in MSME literature.

In addition to advancing theoretical knowledge, the findings also provide actionable insights for stakeholders, offering a

multidimensional view that links internal MSME competencies with external support systems. The study underscores the need for integrated efforts from local governments, educational institutions, and private sector actors in developing MSMEs' digital readiness. This research provides a basis for policy development and program implementation aimed at strengthening MSME competitiveness by advocating for structured digital training and support in product innovation. Moreover, e-commerce platforms are encouraged to enhance UX design elements, as user satisfaction has been shown to directly impact sales outcomes, especially in digital-first economies.

Building on these insights, several directions for future research are proposed. First, subsequent studies could broaden the geographical scope by examining MSMEs in other cities or provinces across Indonesia or even conducting cross-country comparisons to assess how local digital ecosystems influence the adoption and impact of e-commerce. Second, researchers are encouraged to explore deeper, more granular strategies for building digital capacity among MSMEs, including evaluating the effectiveness of specific training modules or innovation toolkits. Third, future investigations could incorporate a longitudinal design to analyze how improvements in digital skills and innovation practices evolve over time and how they sustain MSME growth. Fourth, it would be valuable to examine the moderating or mediating effects of government interventions—such as tax relief programs, access to low-interest loans, or digital infrastructure investment—on the relationship between digital readiness and MSME performance.

Despite its contributions, this study has several limitations that future research should address. Its findings are context-specific to Semarang City and may not be fully generalizable to areas with different socio-economic or technological profiles. The sample size, although sufficient for PLS-SEM analysis, still limits the breadth of generalization across the diverse MSME population in Indonesia. Moreover, as the study relies primarily on self-reported survey data, it may be subject to response bias or measurement error. To enhance the robustness of future findings, researchers could complement survey data with qualitative methods, such as in-depth interviews or case studies, and incorporate additional data sources such as platform analytics or financial records. Addressing these limitations would enable a more nuanced and comprehensive understanding of MSME performance dynamics in the digital economy.

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