

In-Depth Study of the Strategic Interaction between Electronic Commerce, Innovation, and Attainment of Competitive Advantage in the Context of SMEs

Sutrisno^{1,*}, Widodo², Abu Muna Almaududi Ausat³

¹*Department of Management, Faculty of Economics and Business, Universitas PGRI Semarang, Indonesia*

²*Department of Management Science, Faculty of Economics and Business, Universitas Islam Sultan Agung, Indonesia*

³*Department of Business Administration, Faculty of Administrative Science, Universitas Subang, Indonesia*

**Corresponding author: sutrisno@upgris.ac.id*

Abstract: E-commerce has experienced significant growth in recent years. The advancement of information and communication technology has enabled businesses, including Small, and Medium Enterprises (SMEs), to conduct their operations online more efficiently and effectively. This research aims to analyze the influence of e-commerce and innovation on the competitive advantage of SMEs. This study employs a quantitative approach using Structural Equation Modeling (SEM) method supported by Partial Least Squares (PLS). The quantitative approach was chosen to allow for the quantitative and objective measurement of the variables involved. An online Likert scale survey was conducted among SMEs in Semarang City from September to October 2023, resulting in 152 initial respondents. After excluding 11 respondents who did not meet the study's requirements, the final sample size was 141 SMEs. The results of the study indicate that the utilization of e-commerce and innovation significantly influences the competitive advantage of SMEs in Semarang City. Through e-commerce, SMEs can reach a wider market, optimize operations, and strengthen their brand image. MSMEs in Semarang City should focus on developing responsive and engaging e-commerce platforms, enhancing targeted online marketing and promotion efforts, investing in research and development of new products and services, adopting new technologies to improve operational efficiency and product quality, as well as fostering mutually beneficial partnerships to expand market reach and resources.

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1. INTRODUCTION

In recent years, there has been a remarkable increase in the e-commerce sector. The advancements in information and communication technology have created new opportunities for businesses, including Micro, Small, and Medium Enterprises (MSMEs), to adopt more efficient and effective online business models [1]. This has facilitated their business expansion globally, reduced operational costs, and enhanced accessibility and convenience for consumers. Concurrently, the shift in consumer shopping behavior to the digital realm has further strengthened the dominance of e-commerce in the global economy, demonstrating significant potential in transforming the overall business landscape [2].

SMEs play a crucial role in the economic structure of a country [3]. Their contributions to job creation, economic growth, and social development have been proven significant. However, SMEs often face complex challenges when competing with large business entities that dominate the market. Limitations in resources, access to capital, inadequate infrastructure, and a lack of managerial skills are some of the primary obstacles SMEs encounter in their efforts to compete effectively [4].

In the midst of increasingly fierce market competition, competitive advantage becomes a determining factor for SMEs to sustain and grow their businesses. This advantage enables SMEs to attract customer attention, maintain their positions in a dynamic market, and optimize their profitability. By possessing advantages in product or service offerings, effective marketing strategies, innovative approaches to addressing market needs, and excellent customer service quality, MSMEs can build a strong reputation and earn consumer trust [5]. Factors such as efficient supply chain management, appropriate use of information technology, and strategic partnerships with other entities can also drive SMEs' competitive advantage [6]. This implies that investment in the development and strengthening of these factors is crucial for SMEs to maintain their competitiveness in a dynamic market.

The role of innovation in enhancing the competitive advantage of SMEs is highly vital. Innovation is not limited to the development of new products or services but also includes more efficient production processes, innovative marketing strategies, and unique approaches to meeting market needs [7]. SMEs that successfully adopt innovation tend to be more adaptable to changes in the dynamic business environment [8]. They can identify new opportunities, respond to market trends, and create significant added value for consumers. Innovation can also help SMEs differentiate themselves from competitors and strengthen their brand image [9]. Therefore, it is crucial for SMEs to integrate innovation as an integral part of their business strategy and

create a culture that encourages creativity and experimentation to maintain their competitiveness in rapidly changing markets.

The conceptual framework of this research is based on the relationship between E-commerce, innovation, and the competitive advantage of SMEs. Previous studies have indicated that the implementation of E-commerce can positively influence innovation and the competitive advantage of SMEs. Through E-commerce platforms, SMEs can access a broader market geographically, both domestically and internationally [10]. This enables them to reach consumers who were previously difficult to access through conventional means. The use of E-commerce can enhance the operational efficiency of SMEs, including inventory management, order management, and transaction processes [11]. Thus, SMEs can reduce operational costs and increase profitability [12].

However, E-commerce also has negative impacts on the competitive advantage of SMEs. With the entry of MSMEs into the E-commerce environment, competition among businesses becomes fiercer [13]. SMEs must compete with new competitors who may have greater resources and capital. Furthermore, the implementation of E-commerce brings new challenges related to technology and information security [14]. SMEs may face risks such as data leaks, cyber-attacks, or inability to understand and effectively use E-commerce technology. SMEs that depend on E-commerce are also vulnerable to technology infrastructure disruptions, such as network disruptions or system failures [15]. This can disrupt business operations and reduce their competitive advantage.

A previous study also found that SMEs actively involved in innovation, whether in product development, production processes, or marketing strategies, tend to have a higher competitive advantage [16]. Innovation helps MSMEs differentiate themselves from competitors, attract customer attention with unique products or services, and improve operational efficiency and effectiveness [17]. Conversely, some studies also highlight that not all types of innovation can have a positive impact on the competitive advantage of SMEs. For example, previous research indicates that inappropriate or irrelevant innovation to market needs can lead to resource wastage and even damage a company's reputation [18]. Too much innovation on products without considering quality or customer needs can diminish competitive advantage [19].

Thus, the results of the study indicate that E-commerce has a complex impact on the competitive advantage of SMEs, with both positive aspects to be leveraged and negative aspects to be addressed in efforts to enhance the competitiveness of SMEs in the digital market. Previous research has also indicated that innovation can have a significant positive impact on the competitive advantage of SMEs but needs to be carefully implemented and tailored to the

relevant business context. Given the inconsistent results, the context of this research presents an opportunity to re-examine the relationship between E-commerce, innovation, and the competitive advantage of SMEs in a different research location with different conceptual models, thus providing novelty to this research.

Referring to the local scale, which is the object of this research, namely SMEs in Semarang City, it would be more interesting to examine the relationship between E-commerce, innovation, and competitive advantage in MSMEs. In Semarang City, Central Java, the use of E-commerce in SMEs has been an increasingly prominent phenomenon alongside the development of information and communication technology [20]. This phenomenon is closely related to innovation and the competitive advantage of SMEs in the region. This is evidenced by SMEs in Semarang City starting to utilize E-commerce as a means to innovate in various aspects of their businesses. They not only use E-commerce platforms to sell their products online but also utilize them as tools to develop new products, reach a wider market, and create more efficient business models [21]. Through E-commerce, SMEs in Semarang City can implement innovation in their business models, such as more personalized marketing strategies, more responsive customer service, and the use of advanced information technology to improve operational efficiency. This allows them to differentiate themselves from competitors and create added value for customers.

However, challenges also arise with the use of E-commerce in SMEs in Semarang City. For example, some SMEs may face constraints in coping with intensified online competition, understanding E-commerce technology, or gaining access to adequate digital infrastructure. Therefore, it is important to understand in more detail the utilization of E-commerce and the innovations used by MSME owners in developing their businesses to achieve competitive advantage in the modern era. This forms the basis for conducting this research.

2. LITERATURE REVIEW

2.1. The Resources-Based View (RBV) Theory

The Resource-Based View (RBV) theory underscores the paramount importance of internal resources and capabilities within an organization as the foundational elements for creating and sustaining competitive advantage. Within this framework, the utilization of E-commerce and innovation is posited as potent reservoirs for enhancing the competitive edge of SMEs. RBV contends that SMEs adept at harnessing E-commerce platforms and fostering innovation effectively stand to acquire a repertoire of resources that are not only valuable but also rare, difficult to imitate, and non-substitutable. Consequently, this strategic utilization of E-commerce and innovation endows SMEs with a sustainable competitive advantage, as it enables

them to differentiate themselves in the marketplace and fortify their market position against competitors over the long term. By leveraging these internal resources and capabilities, SMEs can not only adapt to evolving market dynamics but also carve out unique value propositions that resonate with customers, thereby solidifying their foothold in the competitive landscape. Hence, RBV underscores the significance of proactive resource management and strategic decision-making in unlocking the full potential of internal resources and capabilities to drive sustained competitive advantage and organizational success in the dynamic business environment.

2.2. Dynamic Capabilities Theory (DCT)

The Dynamic Capabilities Theory (DCT), introduced by [22], emphasizes the importance of an organization's ability to adapt, integrate, and reconfigure both internal and external resources to respond to changes in the dynamic business environment. In the context of SMEs, this theory is highly relevant in explaining how the utilization of E-commerce and innovation is not solely dependent on resource ownership but also on the firm's ability to continuously adjust and optimize their use. DCT argues that companies possessing sensing, seizing, and transforming capabilities will be more effective in responding to market opportunities and achieving a sustainable competitive advantage. In practice, SMEs that can identify market trends and customer behavior shifts through digital data from E-commerce (sensing), develop digital marketing strategies and technology-driven business models (seizing), and adjust their business processes and operational models according to market demands (transforming) will gain a stronger competitive edge over their rivals. Additionally, SMEs' ability to continuously innovate by adopting new technologies, collaborating with business ecosystems, and developing adaptive business strategies demonstrates that competitive advantage is not solely about resource ownership but also about how organizations manage and adjust themselves within an ever-changing business environment. Thus, the Dynamic Capabilities Theory complements the Resource-Based View (RBV) by highlighting that competitive advantage is derived not only from possessing valuable resources but also from an organization's ability to develop and optimize these resources dynamically and adaptively in an evolving business landscape.

2.3. Electronic Commerce

Electronic commerce, or E-commerce, refers to the process of buying and selling products or services electronically over the internet or other computer networks [15]. In this context, trade transactions such as purchasing, selling, payment, and delivery of goods or services are conducted online without the need for physical interaction between the seller and the buyer. E-commerce has significantly transformed the business landscape by providing easy access to global markets for businesses, enabling interactions between consumers and sellers without

geographical limitations, and offering various platforms and business models such as online stores, digital markets, and electronic payment platforms [1]. In this study, the authors use three dimensions to explain the variables of E-commerce:

- *E-commerce Platforms*: Selecting the right E-commerce platform or marketplace is crucial as it will influence market accessibility, integration with other services, and user-friendliness. Choosing a platform that fits the needs and characteristics of SMEs' businesses can help improve operational efficiency and achieve business goals.
- *Design and User Experience*: A good user experience on E-commerce websites or applications is crucial as it can influence customers' purchasing decisions and shape brand perceptions. Attractive design, intuitive navigation, and smooth checkout processes will increase conversion rates and customer satisfaction.
- *Online Marketing and Promotion*: Effective online marketing and promotion strategies can help SMEs increase brand visibility, reach potential customers, and boost sales. Through digital marketing, SMEs can optimize their marketing budgets by selecting the right channels and regularly measuring campaign performance to improve ROI (Return on Investment).

2.4. Innovation

Innovation refers to the process of creating or implementing new ideas, products, services, or ways of doing things that provide added value and relevance in the market or within a specific context [23]. It involves creative thinking, experimentation, research, and development to produce solutions that are more effective, efficient, or different from what already exists. Innovation can occur in various fields, including technology, business, science, social, and culture, and can help organizations or individuals solve problems, meet evolving market needs, improve quality of life, and achieve desired strategic or competitive goals [24]. In this study, the authors use three dimensions to explain the innovation variable:

- *Research and Development (R&D)*: This dimension is key to creating new innovations. Through investment and commitment to research and development, SMEs can generate superior products or services that meet the needs of a continuously changing market.
- *Implementation of New Technology*: The adoption of new technology is crucial for improving operational efficiency and the quality of products or services. By embracing the latest technology, SMEs can gain a competitive advantage in terms of production processes, inventory management, and customer interactions.

- *Collaboration and Partnerships*: Through collaboration with other parties, SMEs can expand access to knowledge, resources, and new markets. Collaborating with research institutions, government agencies, or other businesses can accelerate the pace of innovation and help SMEs remain relevant in increasingly competitive markets.

2.5. Competitive Advantage of SMEs

Competitive advantage of SMEs refers to the relative ability of these businesses to offer better or superior value than their competitors in the market [25]. This includes factors such as product or service quality, competitive pricing, strong differentiation, accessibility, responsiveness to customer demands, as well as reputation and consumer trust. Competitive advantage enables MSMEs to maintain market share, attract customers, and achieve better outcomes in the context of fierce business competition, both locally and globally [26]. In this study, the authors use three dimensions to explain the innovation variable:

- *Market Understanding and Customer Segments*: This dimension involves a deep understanding of the needs, preferences, and behaviors of customers in specific markets. MSMEs that can identify the right market segments and accommodate customer needs well will have a strong competitive advantage in attracting and retaining their customer base.
- *Product or Service Differentiation*: This entails the development of unique products or services that provide differentiating value from competitors. With strong differentiation, SMEs can stand out in the market and create high customer loyalty. It also helps SMEs withstand price competition pressure and improve profitability.
- *Operational Efficiency*: This dimension includes efforts to improve operational efficiency, optimize production costs, inventory management, and other business processes. SMEs that can operate at lower or more efficient costs tend to have a greater competitive advantage in offering competitive prices or improving their profit margins.

2.6. The Relationship Between Variables

Now, we will look at the relationship between the variables used in this study. Implementation of E-commerce by SMEs has the potential to significantly impact their competitive position in the market. By leveraging E-commerce platforms, SMEs can not only enhance the visibility of their products or services but also expand their market reach substantially, surpassing limitations they may face through conventional distribution channels [27]. Furthermore, the use of E-commerce has the potential to improve operational efficiency for

SMEs, including more effective inventory management, faster transaction processes, and detailed business performance monitoring through accurate data analysis [28]. By integrating E-commerce into their business models, SMEs can broaden their footprint, increase market share, and enhance their competitiveness in the continually evolving digital era [29].

SMEs that successfully implement innovation across various aspects, ranging from products, processes, to business strategies, are likely to gain a more significant competitive advantage [30]. Through innovation, SMEs can produce products or services that are more appealing to consumers, improve their operational efficiency, and build advantages that are difficult for competitors to replicate [31]. Innovation in products may involve developing new features, enhancing quality, or even diversifying portfolios to meet evolving market needs [32]. On the other hand, innovation in business processes may include the implementation of new technologies, improvements in the supply chain, or overall operational efficiency enhancements [33]. Additionally, innovation in business strategies may encompass targeting new markets, forming strategic partnerships, or brand differentiation to create a unique image in consumers' minds [34]. By adopting this holistic innovative approach, SMEs can strengthen their position in the competitive and ever-evolving market.

H₁: There is a significant influence between the utilization of E-commerce and the Competitive Advantage of SMEs.

H₂: There is a significant influence between the level of innovation and the Competitive Advantage of MSMEs.

3. METHODOLOGY

This study employs a quantitative approach utilizing the Structural Equation Modeling-Partial Least Squares (SEM-PLS) method to analyze the influence of E-commerce and innovation on the competitive advantage of SMEs in Semarang City, Central Java. The SEM-PLS method is chosen because of its ability to handle complex models, analyze relationships between latent variables, and work effectively with data that do not meet normal distribution requirements. This method also allows hypothesis testing while accommodating smaller sample sizes, making it suitable for SME-based research. The use of a quantitative approach enables the objective measurement of the relationships between variables, ensuring statistical rigor in examining the research hypotheses.

3.1. Population and Sample Selection

The population of this study consists of SMEs operating in Semarang City, Central Java, which are involved in various sectors, including trade, manufacturing, and services. The research

sample is selected using a purposive sampling technique, where SMEs are chosen based on specific criteria to ensure their relevance to the study. The criteria include: (1) SMEs that are actively operating in Semarang City, (2) SMEs that utilize E-commerce platforms for business operations, and (3) SMEs that engage in product or service innovation as part of their competitive strategy. The sample list is obtained from the official SME database provided by the Department of Cooperatives and SMEs of Semarang City, ensuring that the selected respondents accurately represent the target population. A total of 152 initial responses were collected through an online survey, but 11 responses were excluded due to incomplete data or failure to meet the selection criteria, resulting in a final sample size of 141 SMEs. This sample size aligns with the recommended thresholds for SEM-PLS analysis, ensuring the robustness of statistical estimations.

3.2. Data Collection

The data collection process is conducted using an online questionnaire, which is distributed through multiple digital channels, including Google Forms, email, and social media platforms such as WhatsApp, Facebook business groups, and LinkedIn. The survey is carried out over a period from September to October 2023, with follow-up messages sent to encourage participation and increase response rates. To ensure data validity and reliability, the respondents are limited to business owners or managers who have direct decision-making authority regarding E-commerce adoption and innovation strategies within their SMEs. This targeted approach ensures that the data collected accurately reflects the strategic perspectives and practices of SMEs in leveraging E-commerce and innovation for competitive advantage.

The questionnaire is structured into four key sections to systematically capture the required data. The first section gathers demographic information, including details such as business sector, years of operation, and number of employees, providing contextual insights into the characteristics of SMEs in the sample. The second section focuses on E-commerce adoption, measured through platform utilization, digital marketing strategies, and transaction volume, to assess the extent of digital engagement within SMEs. The third section examines innovation practices, which are assessed based on R&D activities, technological adoption, and business model adjustments, reflecting the firms' commitment to continuous improvement and adaptation. The fourth section evaluates competitive advantage, which is measured through market positioning, differentiation strategies, and operational efficiency, determining how SMEs establish and maintain their unique value in the market. All items are measured using a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree), ensuring consistency in data

interpretation. The questionnaire items are adapted from validated previous studies, enhancing the reliability and construct validity of the measurement instruments.

3.3. Data Analysis

The collected data is analyzed using Smart-PLS 4.0 software, following the standard procedures of SEM-PLS analysis to test the research hypotheses. The analysis consists of two main stages: assessment of the outer model and assessment of the inner model. The outer model evaluation involves testing convergent validity (using factor loadings and AVE), discriminant validity (using the Fornell-Larcker criterion), and reliability testing (using Cronbach’s Alpha and Composite Reliability) to ensure the measurement model is statistically sound. The inner model assessment includes path coefficient analysis to test the significance of relationships between variables, R² value assessment to evaluate the explanatory power of the model, and additional tests such as effect size (f²) and predictive relevance (Q²) to determine the strength and predictive capability of the model. These analytical steps provide a comprehensive understanding of the extent to which E-commerce and innovation impact SMEs' competitive advantage, as well as the key factors influencing this relationship.

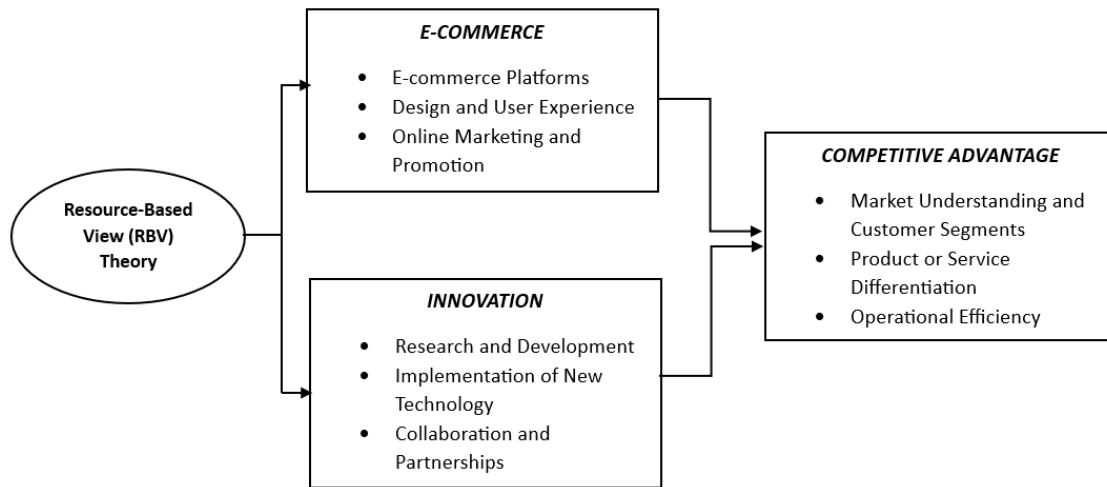


Figure 1. Theoretical basis of research construct relationships
(Source: Authors’ research)

Table 1. SMEs criteria

Enterprises scale	Asset	Turnover	Number of employees
Small enterprises	>Rp 50-Rp500 million	>Rp 300 million-Rp2.5 billion	5-19 people
Medium enterprises	>Rp 500 million-Rp10 billion	>Rp 2.5 billion-50 billion	20-99 people

Source: Law No 20 of 2008

4. RESULT

4.1. Sample Characteristics

Table 2 illustrates that out of 141 respondents in Semarang City, 81 of them are small-scale enterprises, while the other 60 respondents are medium-scale enterprises. Moreover, there are 63 female respondents out of the total 141, and 78 male respondents. As a result of these findings, it can be concluded that males have contributed the most to the success of this research. Additionally, based on the age of the businesses, it is evident that 56 respondents fall within the age range of 6 to 10 years, and they are the primary contributors to this research. Furthermore, based on the e-commerce platforms mostly utilized by SMEs, Shopee is preferred by 48 respondents. Finally, SMEs in the culinary sector predominantly participated in filling out the research questionnaire.

Table 2. Demographic respondents

Demographic		Frequency	Percentage
Enterprises Scale	Small	81	57.45%
	Medium	60	42.55%
	Total	141	100%
Enterprises Age	6-10 years	56	43%
	11-15 years	31	24%
	16-20 years	24	18%
	>20 years	20	15%
	Total	141	100%
Gender	Male	78	55.32%
	Female	63	44.68%
	Total	141	100%
Age of Respondent	21-30 years	13	9.22%
	31-40 years	73	51.10%
	41-50 years	29	20.60%
	>51 years	26	18.45%
	Total	141	100%
E-commerce	Tokopedia	31	21.9%
	Shopee	48	34.05%
	Bukalapak	20	14.20%
	Lazada	13	9.25%
	Instagram dan Facebook	29	20.60%
	Total	141	100%
MSME Sector	Culinary Industry	69	48%
	Fashion and Accessories	21	15%
	Agriculture and Horticulture	14	10%
	Handicrafts	20	15%
	Information Technology and Creative Industry	17	12%
	Total	141	100%

Source: Authors' research

4.2. Outer Model

The initial phase of SEM-PLS analysis involves the evaluation of the outer model, which is exemplified in this investigation through assessments of convergent validity, discriminant validity, and reliability.

4.2.1. Convergent Validity

The tenet stipulating that an indicator of a construct should exhibit a robust correlation underscores the assessment of convergent validity. This scrutiny, conducted via the Smart-PLS 3.0 software, necessitates that the loading factor values for each manifest variable of the construct surpass the threshold of 0.70 [35]. Examination of the analysis output, as delineated in Table 3, evinces that all indicators of constructs yield loading factor values exceeding 0.70, thereby affirming their validity and fulfillment of convergent validity criteria.

4.2.2. Discriminant Validity

Assessment of discriminant validity involves juxtaposing the square root of the Average Variance Extracted (AVE) with inter-construct correlation values. When the square root of AVE exceeds the correlation value between constructs, it signifies compliance with discriminant validity criteria [35]. As delineated in Table 4, the output results affirm the model's validity, indicating the fulfillment of discriminant validity prerequisites.

4.2.3. Reliability Test

Reliability testing, employing Cronbach's Alpha and Composite Reliability metrics, entails assessing values surpassing 0.60 to deem variables with reflexive indicators as passing the test [35]. The outcomes of the reliability test are presented in Table 3, where it is evident that all Cronbach's Alpha and Reliability values surpass the threshold of 0.60. Consequently, all research constructs are affirmed to be reliable.

Table 3. Measurement model analysis

Variable	Item	Factor Loading	Cronbach's Alpha	Composite Reliability	AVE
E-commerce (X1)	X1.1	0,774	0,703	0,787	0,884
	X1.2	0,778			
	X1.3	0,872			
Innovation (X2)	X2.1	0,769	0,756	0,705	0,722
	X2.2	0,912			
	X2.3	0,785			
Competitive Advantage (Y1)	Y3.1	0,722	0,710	0,732	0,759
	Y3.2	0,910			
	Y3.3	0,813			

Source: Authors' research

Table 4. Discriminant validity

Var/Ind	X1	X2	Y1
X1.1	0,774	0,510	0,482
X1.2	0,778	0,453	0,570
X1.3	0,872	0,582	0,488
X2.1	0,311	0,769	0,531
X2.2	0,436	0,912	0,409
X2.3	0,445	0,785	0,346
Y1.1	0,373	0,512	0,722
Y1.2	0,490	0,522	0,910
Y1.3	0,499	0,444	0,813

Source: Authors' research

4.3. Inner Model

The subsequent phase in SEM-PLS analysis involves scrutinizing the inner model, which is showcased in this study through the utilization of R-square, Q-square, and hypothesis testing methodologies.

4.3.1. R-Square

The R-square value serves as a metric to ascertain the degree to which exogenous constructs contribute to endogenous constructs. The R-square outcome is succinctly presented in Table 5 below, indicating a value of 0.577. This denotes that the variables of e-commerce and innovation elucidate 57.7% of the competitive advantage variables, while the remaining 42.3% is attributable to unaccounted factors beyond the scope of this study. The R-square value of 0.577 renders the SEM model concurrently deemed suitable and robust [35].

Table 5. R-square

No	Variable	R-square
1	(Y1)	0.577

Source: Authors' research

4.3.2. Q² Predictive Relevance

Evaluation of the structural model entails assessing the Q2 value, indicative of Predictive Relevance. A model is deemed satisfactory with predictive relevance if its Q2 value surpasses 0 [35]. The formula for Q2 calculation is as follows:

$$Q2 = 1 - (1 - R12).$$

$$Q2 = 1 - (1 - 0.577).$$

$$Q2 = 1 - (0,423).$$

$$Q2 = 0, 577.$$

The computation yields a Q2 value of 0.577. This metric serves as a yardstick to gauge the efficacy with which the model and its estimating parameters generate the observed values [35].

4.3.3. Hypothesis Testing

The hypothesis is posited to exhibit a positive correlation when the path coefficient value exceeds 0.1 and demonstrates significance at a P-value less than 0.05. The findings of hypothesis testing are presented in Table 6 below.

Table 6. Hypothesis testing results

Hypothesis	Variable	Path coefficient	P-values	Decision
H1	(X1) -> (Y1)	0.508	0.000	Accepted
H2	(X2) -> (Y1)	0.622	0.000	Accepted

Source: Authors' research

5. DISCUSSION

5.1. E-commerce has a positive and significant impact on the competitive advantage of SMEs

The first hypothesis suggests that the utilization of e-commerce has a positive and significant impact on the competitive advantage of SMEs. This finding is consistent with previous research that yielded similar results [36]. The logical explanation for this finding is that by leveraging e-commerce platforms, SMEs in Semarang City have broader access to reach both local and global markets. They can optimize the streamlined transaction processes provided by e-commerce platforms, enhance operational efficiency, and reduce overhead costs such as store rental and the need for additional employees. Additionally, SMEs can analyze consumer data and market trends available through e-commerce platforms to better understand consumer needs, adjust marketing strategies, and develop products that align with market demand [37]. Their presence on professional and trustworthy e-commerce platforms also helps to enhance branding and corporate image, thereby expanding consumer trust and brand reputation. Furthermore, e-commerce platforms also open up collaboration and partnership opportunities among SMEs, allowing them to collaborate on packaging, product delivery, and resource optimization to enhance competitiveness and operational efficiency in an increasingly competitive market [38]. Thus, the utilization of e-commerce has a positive and significant impact on SMEs in Semarang City, enabling them to thrive and survive in this digital era.

Furthermore, the dimension of design and user experience has a significant impact on explaining the utilization of e-commerce and competitive advantage for SMEs in Semarang City. A well-designed and captivating user experience can make a significant difference in the success of an e-commerce platform. Firstly, an attractive and intuitive design can enhance user attraction and engagement with the e-commerce platform. With a user-friendly interface and pleasing aesthetics, consumers are more likely to interact longer with the website or application, increasing

the likelihood of purchasing products from SMEs listed on the platform [39]. A good user experience also includes the platform's responsiveness to various devices, from desktop to mobile devices, ensuring that consumers can easily access and make purchases from wherever they are. Additionally, features such as secure and user-friendly payment systems, transparent product reviews, and responsive customer support are also essential parts of a positive user experience [40]. SMEs in Semarang City that can optimize the design and user experience dimensions of their e-commerce platforms will have a significant competitive advantage. By providing a pleasant and user-friendly online shopping environment, they can attract more consumers, build trust, and increase customer loyalty. This will enable SMEs to compete effectively in the increasingly crowded and dynamic e-commerce market, and make a positive contribution to the growth of their businesses in this digital era.

Furthermore, the dimension of online marketing and promotion also has a significant impact. The logical reason is that through effective online marketing and promotion, SMEs can increase the visibility of their brands, reach a wider audience of potential consumers, and strengthen their position in the digital market. Firstly, online marketing enables SMEs to target specific and relevant audiences using various tools and techniques such as targeted advertising, email campaigns, and social media [9]. By understanding consumer behavior online, SMEs can devise more effective and targeted marketing strategies, thus increasing sales conversion and ROI (Return on Investment) [41]. Additionally, online promotions allow SMEs to create direct interactions with consumers through engaging and creative content, such as online contests, webinars, or collaborations with digital influencers [42]. This not only helps build closer relationships with customers but also enhances brand awareness and customer loyalty. Moreover, being present on e-commerce platforms also provides opportunities for SMEs to participate in major promotional events such as National Online Shopping Day or seasonal discount programs, which can significantly boost sales [43]. By effectively leveraging the dimension of online marketing and promotion, SMEs in Semarang City can gain a significant competitive advantage in the e-commerce market. They can expand their market reach, boost business growth, and strengthen their position as relevant and competitive players in the ever-evolving digital trading ecosystem.

The Resource-Based View (RBV) theory offers valuable insights into understanding the competitive advantage of SMEs in Semarang City through the lens of e-commerce utilization. RBV posits that a firm's competitive advantage is derived from its unique bundle of resources and capabilities. In the context of e-commerce, SMEs in Semarang City leverage various resources such as technology infrastructure, consumer data analytics, and market intelligence available

through e-commerce platforms. These resources enable SMEs to enhance operational efficiency, expand market reach, and improve customer engagement, thereby gaining a competitive edge in the digital market landscape.

Furthermore, the Dynamic Capabilities Theory (DCT), introduced by [22], complements RBV by emphasizing a firm's ability to continuously adapt, integrate, and reconfigure its internal and external resources to respond to changing business environments. While RBV focuses on the possession of valuable resources, DCT highlights the importance of developing capabilities that allow firms to sense opportunities, seize market potential, and transform their operations accordingly. In the case of SMEs in Semarang City, their ability to leverage e-commerce platforms is not merely dependent on owning digital tools but also on their capacity to adapt to shifting consumer behavior, adopt new marketing strategies, and innovate in their business processes. For instance, SMEs that excel in sensing digital trends can effectively analyze customer preferences through e-commerce analytics, allowing them to adjust product offerings in real-time. Similarly, those with strong seizing capabilities can implement strategic digital marketing campaigns, optimize supply chains, and enhance customer service through automation and AI-driven tools. Finally, the ability to transform existing business models—such as transitioning from traditional brick-and-mortar stores to hybrid online-offline operations—demonstrates how SMEs dynamically reconfigure their capabilities to sustain a competitive edge.

By integrating RBV and DCT, it becomes evident that the competitive advantage of SMEs in Semarang City is not solely determined by their digital resource ownership but also by their ability to develop and optimize these resources dynamically. E-commerce utilization serves as a critical enabler for SMEs to enhance business agility, foster innovation, and respond to evolving market conditions, ensuring long-term success in the highly competitive digital economy. Thus, the synergy between RBV and DCT provides a comprehensive framework for understanding how e-commerce-driven strategic resource management and dynamic capability development collectively contribute to the sustainable competitive advantage of SMEs in Semarang City.

5.2. Innovation has a positive and significant impact on the competitive advantage of SMEs

The second hypothesis indicates that innovation has a positive and significant impact on the competitive advantage of SMEs. This finding supports previous research results that have similar outcomes [44]. The first dimension is Research and Development (R&D), which has a significant impact on explaining innovation and competitive advantage for SMEs in Semarang City. The logical reason is that through focused research and development activities, SMEs can create innovative products and services, meet the evolving market needs, and enhance their competitiveness in the e-commerce business. Firstly, investment in R&D enables SMEs to

understand market trends, consumer needs, and the latest technological developments [45]. By conducting thorough research, they can identify new opportunities, anticipate changes in market demand, and develop unique and relevant solutions. Moreover, SMEs actively engaged in R&D activities have the opportunity to create products with features and functions superior to their competitors, thus providing significant added value to consumers [46]. Furthermore, the development of new products and services can also expand SMEs' market share and help them penetrate previously untapped market segments. For example, by developing environmentally friendly products or following healthy lifestyle trends, SMEs can attract consumers concerned about sustainability and health. Additionally, innovation in production or logistics processes can help improve operational efficiency and reduce production costs, which in turn can increase SMEs' profitability and competitiveness [47]. Thus, the Research and Development dimension plays a crucial role in helping SMEs in Semarang City generate innovations that drive their business growth and strengthen their position in the competitive e-commerce market. By focusing on R&D, SMEs can create sustainable competitive advantages, differentiate their brands from competitors, and win over consumers with innovative and quality products.

The second dimension, Implementation of New Technology, also has a positive impact on explaining innovation and competitive advantage for SMEs in Semarang City. In this digital era, adopting new technology is key to enhancing operational efficiency, improving product and service quality, and expanding market reach [48]. Firstly, by implementing new technology, SMEs can increase productivity and efficiency in various aspects of their business, such as inventory management, production processes, and financial management. The use of software and automation systems can reduce the time and manpower required for routine tasks, allowing SMEs to focus on more strategic activities such as product innovation and customer service. Additionally, new technology also opens opportunities to develop more advanced products and services in line with market trends [49]. For example, SMEs can leverage Internet of Things (IoT) technology to create connected smart products or utilize Artificial Intelligence to enhance personalized services to customers. The implementation of new technology also enables SMEs to expand their market reach through e-commerce platforms and other digital distribution channels. By leveraging digital technology for marketing and promotion, SMEs can reach potential consumers in various regions at relatively low costs compared to traditional marketing methods. Moreover, technology allows SMEs to obtain valuable data and insights into consumer behavior and market trends, which can be used to inform their strategic decisions [50]. Thus, the dimension of Implementation of New Technology plays a key role in helping SMEs in Semarang City enhance their innovation and competitive advantage in the evolving e-commerce market. By

adopting new technology wisely and progressively, SMEs can strengthen their position as relevant and competitive players in the digital business ecosystem.

The last dimension, Collaboration and Partnerships, has a significant impact on explaining innovation and competitive advantage for SMEs in Semarang City. In the ever-evolving business world, collaboration and partnerships with other parties are key to accessing resources, knowledge, and networks needed to strengthen competitive positions [51]. Firstly, through collaboration with other SMEs, both within and outside Semarang City, SMEs can expand their product and service offerings, enhance portfolio diversification, and deliver added value to customers. Such collaborations can involve the exchange of products, services, or other resources, which help improve operational efficiency and expand market share collectively. Moreover, collaboration with research institutions, universities, or other institutions can also serve as a valuable source of innovation for SMEs. By working together on research and development projects, SMEs can access the latest knowledge and technology, thus accelerating innovation in their products and services [52]. Furthermore, partnerships with external parties such as suppliers, distributors, or logistics service providers can also help enhance supply chain efficiency and expand SMEs' distribution reach. Through strategic partnerships, SMEs can optimize production, delivery, and distribution processes, thus speeding up order fulfillment and enhancing customer satisfaction. Additionally, partnerships with e-commerce platforms or marketplaces can be a strategic move for SMEs to expand their online market reach. By partnering with established e-commerce platforms, SMEs can access robust technological infrastructure, a large customer base, as well as integrated support and promotional services [53]. Therefore, the Collaboration and Partnerships dimension play a crucial role in helping SMEs in Semarang City enhance their innovation and competitive advantage. By fostering strategic collaborations and partnerships, SMEs can expand resources, improve operational efficiency, and broaden their market reach, thus strengthening their position in the increasingly competitive market.

The Resource-Based View (RBV) theory offers valuable insights into understanding how innovation contributes to the competitive advantage of SMEs in Semarang City. RBV emphasizes that a firm's competitive advantage stems from its unique bundle of resources and capabilities, and innovation plays a pivotal role in this context. The dimensions of innovation discussed in the context of SMEs in Semarang City align well with RBV principles. Firstly, the dimension of Research and Development (R&D) underscores the importance of SMEs investing in exploring new market opportunities, understanding consumer needs, and leveraging emerging technologies to develop novel products and services. Through focused R&D efforts, SMEs can not only differentiate their offerings but also enhance operational efficiency and market

responsiveness, thereby gaining a competitive edge. Additionally, the Implementation of New Technology dimension highlights the significance of adopting and integrating cutting-edge technologies into SMEs' operations to streamline processes, improve product quality, and expand market reach. By embracing new technologies such as IoT and AI, SMEs can enhance their value proposition, optimize resource utilization, and stay ahead of competitors in the dynamic e-commerce landscape. Furthermore, the Collaboration and Partnerships dimension underscores the importance of forming strategic alliances with other SMEs, research institutions, and external partners to access complementary resources, share knowledge, and foster innovation synergies. Collaborative ventures enable SMEs to pool their strengths, mitigate risks, and capitalize on collective expertise to drive innovation and competitiveness.

In addition to RBV, the Dynamic Capabilities Theory (DCT), introduced by [22], further strengthens the understanding of how SMEs in Semarang City leverage innovation to sustain competitive advantage. While RBV focuses on the possession of valuable resources, DCT highlights the ability of firms to adapt, integrate, and reconfigure their resources dynamically in response to changing business environments. This perspective is particularly relevant to SMEs in Semarang City, as they operate in a rapidly evolving digital landscape where continuous innovation is critical. SMEs with strong sensing capabilities are able to identify emerging consumer trends and technological advancements through R&D investments, enabling them to proactively develop innovative solutions. Similarly, SMEs with seizing capabilities effectively implement new technologies to enhance their business operations, such as integrating AI-driven customer service solutions or automating supply chain management through digital platforms. Finally, transforming capabilities allow SMEs to adapt their business models, restructure operational workflows, and build long-term strategic partnerships that foster sustained innovation.

By integrating RBV and DCT, it becomes evident that the competitive advantage of SMEs in Semarang City is not solely dependent on their ability to innovate through resource ownership, but also on their capacity to dynamically reconfigure and optimize these resources. Innovation-driven SMEs that continuously refine their business strategies, leverage digital transformation, and collaborate with ecosystem partners are better positioned to sustain their market competitiveness. Thus, the synergy between RBV and DCT provides a comprehensive framework for understanding how innovation, when combined with dynamic capability development, enhances the long-term competitive advantage of SMEs in Semarang City, ensuring sustainable growth in the evolving digital economy.

6. CONCLUSION

The Resource-Based View (RBV) theory explains how e-commerce and innovation enhance the competitive advantage of SMEs in Semarang City by providing unique resources, such as market expansion, operational efficiency, and brand visibility, while research and development, technology adoption, and strategic partnerships further strengthen their market position. However, RBV alone is insufficient to capture the dynamic nature of digital transformation, making the Dynamic Capabilities Theory (DCT) a crucial complement. DCT emphasizes SMEs' ability to sense market trends, seize digital opportunities, and transform business models through AI-driven customer insights, automated marketing, and agile operations, ensuring long-term resilience and adaptability. By integrating RBV and DCT, this study highlights that SMEs must not only possess valuable resources but also continuously reconfigure them to sustain competitiveness in the evolving digital economy.

6.1. Academic Implications

This study reinforces the RBV theory by demonstrating that e-commerce and innovation function as strategic resources that enhance SMEs' competitive advantage. The findings highlight the significance of design, user experience, and digital marketing, which align with RBV's emphasis on resource optimization and customer value creation. Additionally, collaboration and strategic partnerships play a crucial role in expanding SMEs' access to resources and strengthening their market position. Beyond RBV, this study highlights the importance of integrating DCT to understand how SMEs adapt and sustain digital transformation. While RBV focuses on resource acquisition and utilization, DCT provides insights into how firms continuously reconfigure their capabilities in response to technological and market changes. Future research should explore how SMEs balance resource-based advantages with dynamic capabilities, ensuring their long-term growth and resilience in the digital economy.

6.2. Practical Implications

SMEs in Semarang City should focus on the development of user-friendly and aesthetically pleasing e-commerce platforms, invest in targeted online marketing, and allocate resources to research and development for product and service innovation. Adopting emerging technologies will improve operational efficiency and product quality. Additionally, SMEs should actively pursue partnerships and collaborations to expand their market reach and resource base. These strategies will help SMEs navigate the competitive digital marketplace and sustain long-term growth.

6.3. Recommendations for Future Research

Future studies should expand the scope beyond Semarang City to include SMEs from diverse geographical regions, as the dynamics may vary significantly across different contexts. Research should also explore the technical and financial barriers that SMEs face in implementing these strategies. A broader investigation into how SMEs in various environments optimize e-commerce and innovation strategies will provide deeper insights into the application of RBV in diverse business settings. This will contribute to a more comprehensive understanding of the mechanisms that drive competitive advantage for SMEs globally.

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