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## Scope of E-Commerce use, innovation capability, and performance: Food sector MSMEs in Indonesia

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### ABSTRACT

This study aims to identify and evaluate the main factors that influence the performance of MSMEs in the food sector, focusing on two main variables: the scope of e-commerce use and the capacity for innovation. This research also uses Structural Equation Modeling (SEM) analysis techniques using smart-PLS software. The results show that technological readiness and adoption costs influence the extent to which MSMEs can utilize e-commerce, while government support plays a role in facilitating a conducive environment for the adoption of this technology. On the other hand, the factors of autonomy, proactivity, and risk-taking courage increase the innovation capacity of MSMEs, allowing them to adapt, experiment, and create unique added value in the competitive market. An in-depth understanding of the interaction between these variables is expected to provide strategic insights to improve the competitiveness and performance of food MSMEs in the digital era. The managerial implications of this study, MSMEs in the food industry in Indonesia can improve their performance through effective utilization of e-commerce, development of innovation capabilities, and government support, which can help strengthen the competitiveness of MSMEs in the increasingly competitive global market.

### Introduction

The development of innovation and technology does not directly put MSMEs in an advantageous position. The existence of various areas that are part of the term 'technology' means that MSME profits are no longer significant because large companies make more profits in many areas. The areas in question include e-booking and orders, B2G interactions, Enterprise Resource Planning (ERP), social media, customer relationship management, electronic invoicing, cloud computing, RFID, e-commerce, high-speed broadband, supplier-customer management, and big data (OECD, 2021).

One of the fastest growing trends is social commerce, which involves shopping directly through social media platforms. The use of influencers, live streaming, and interactive features make it easier for customers to find and buy goods. Several startups have used this technology to connect with and convert customers, especially consumers. In addition, companies are starting to implement headless e-commerce, which means there is no connection between the back-end features and the front-end of an e-commerce website. On platforms such as mobile apps and wearables, this technology allows for a more personalized and flexible shopping experience. This method has been implemented by

platforms such as Shopify and WooCommerce to provide greater flexibility for businesses. In e-commerce, flexible payment options such as buy now, pay later (BNPL) are gaining popularity. With this method, customers can make purchases easily and can pay in installments. To attract more customers, this is becoming a trend. Considering the wide area of business technology that can be used by businesspeople today, a gap appears between large companies compared to MSMEs for the use of certain technologies. MSMEs experience difficulties in investing in technologies that require large investments such as computer aided design (CAD) and material resource planning (MRP) even though these investments produce high returns (Kennedy and Hyland, 2003). The same thing happens to social media technology, the number of small companies that utilize social media tends to be smaller and face more challenges (Tiwasang, 2021). ERP technology, which is generally used by large companies, cannot necessarily be implemented in smaller scale companies such as MSMEs. This is due to several constraints such as limited capital, lack of business process engineering, and limited business network design (Lutfi et al., 2022).

Of course, this does not mean that there is no potential for MSMEs to continue to gain competitive advantages from developments in innovation and technology. This potential arises when there are certain gaps

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such as large investment costs and e-readiness. Two main things that are potential areas for MSMEs to access are the scope of e-commerce use and innovation capability. E-commerce is a technology that can enable market expansion for products produced by a business (Sanchez-Torres and Juarez-Acosta, 2019), this of course also applies to MSMEs. E-commerce can also make a business a market leader in its market (Yeng et al., 2016). In contrast to technologies with a high barrier to entry such as ERP and Business Intelligence (BI), e-commerce is a business technology that can be directly accessed by businesses on an MSME scale (Burgess, 2001; Perrino et al., 2017). E-commerce can be seen not just as one type of business technology, but rather a spectrum containing business activities that are accelerated by the use of various technologies such as advertising and marketing, online sales, and customer service (Gibbs and Kraemer, 2004). This encourages this research to further investigate two main questions related to the context of e-commerce and MSMEs: 1. Whether and how much the scope of e-commerce use affects MSME performance and 2. What factors encourage MSMEs to expand the scope of their e-commerce use.

In addition to the use of technology to improve efficiency and energy savings, the ability of MSMEs to innovate is also a key factor in the development of their businesses (Saunila, 2020). Innovation is not only important from a scientific perspective to understand and develop theories and best practices for MSME but is also a major concern from a government policy perspective. The Indonesian government, through the Coordinating Ministry for Economic Affairs, highlights the importance of innovation as a key element in increasing the competitiveness and passion of MSMEs (Coordinating Ministry for the Economy, 2022). Innovation capability is the ability of a business to create and implement new ideas that can produce products, services, or processes that are unique and different from those on the market (Enkel and Gassmann, 2010; West and Bogers, 2014; Naala et al., 2017). The expected results of this innovation include new products that are more environmentally friendly, more efficient services, or technology that makes it easier for customers. Innovation capability is important because it plays a role in maintaining business competitiveness in the long term. By having high innovation capabilities, businesses can respond to market needs and changes more effectively, adapt quickly, and create competitive advantages.

There are 5 main elements that are an important part of innovation capability which include: absorptive capacity and external knowledge, organizational structure and culture, leadership and communication, individual creativity and innovation capabilities, and organizational learning culture (Simon, 1991; Konsti-Laakso et al., 2012; Salampasis and Mention, 2018). The elements or components that form innovation capabilities—such as creativity, adaptability, research and development, and the ability to implement new ideas—have been shown to play an important role in the progress of MSMEs. Previous studies have shown that MSMEs that have or develop these elements tend to be more successful in creating attractive products or services, increasing competitiveness, and surviving in the market (Dahlander and Gann, 2010; Heilmann et al., 2020; Samsir, 2018). The relationship between innovation capability and MSME performance has been the main concern of various previous studies (Saunila, 2020). However, studies examining MSMEs with a specific focus/sector and integration of several variables are still limited. In the SLR conducted (Saunila, 2020), only one study was mentioned that used entrepreneurial orientation as a determinant variable of innovation capability (Odoom and Mensah, 2019).

This study aims to examine the innovation capability and performance of MSMEs in the food sector influenced by their entrepreneurship, especially in the context of e-commerce use. By adopting e-commerce and increasing innovation, MSMEs can improve their competitiveness and performance. In this context, the relationship between e-commerce use and innovation capability of food MSMEs can be direct or easily accessible to MSMEs, especially for those who have an open orientation towards innovation. This means that MSMEs that are

open to new or innovative ideas may not require large investments to make maximum use of e-commerce technology or to strengthen their innovation capabilities. This suggests that MSMEs that are flexible and quick to adopt innovation tend to be more likely to take advantage of e-commerce opportunities without requiring many additional resources (van de Vrande et al., 2009).

Food sector MSMEs are defined as types of MSMEs whose businesses are related to the production, processing, and distribution of food or beverage ingredients derived from natural sources, such as agriculture, plantations, forestry, fisheries, livestock, and waters. These ingredients can be processed products or still in their original (raw) form and are intended for human consumption. In addition, food MSMEs also include businesses that produce additional ingredients (such as spices or preservatives), raw materials (such as wheat or raw meat), and other ingredients needed in the process of preparing and making food or beverages (KEMENPAR, 2020). The more dynamic and competitive nature of the food sector can be an indication that the improvement in MSME performance can be seen through a special lens (Matopoulos et al., 2007). The development of innovation and technology does not directly put MSMEs in an advantageous position. The existence of various technological areas, each of which has special characteristics, means that the competitive advantage obtained from the use of innovation and business technology is not significantly felt by MSMEs. Most existing areas of business innovation and technology, such as business intelligence, ERP, and social media, are more profitable for large companies than for MSMEs (Benitez et al., 2018). Therefore, it is very important to investigate more deeply how innovation and accessible technology can be understood and utilized further.

The aim of this research is to find out what factors influence the performance of MSMEs in terms of the main variables, namely scope of e-commerce use and innovation capability. The factors that are antecedents of scope of e-commerce use and innovation capability are also further investigated using a conceptual framework that is appropriate to each main variable that influences MSME performance. For the scope of e-commerce use variable, the TOE conceptual framework is used, while for the innovation capability variable, the entrepreneurial orientation conceptual framework is used. The results of this research can contribute to the strategic direction of policy, especially within the scope of MSME development in the food sector. During the recovery period from the Covid-19 pandemic, research is needed that can be used as a survival strategy, such as testing the relationship between scope of e-commerce use and innovation capability on the performance of MSMEs. Therefore, this research will present these factors as antecedents in relating the relationship between innovation capability and organizational performance.

## Literature review

### *Technological, organizational, & environmental (TOE) frameworks*

The Technology, Organizational, & Environmental (TOE) framework classifies technology, organization and environment as three sets of factors that influence an organization in adopting innovation (Baker, 2012). TOE frameworks were first coined in the book *The Processes of Technological Innovation* by Tornatzky and Fleischer in 1990. TOE frameworks have a strong empirical basis and support and have been used to study technology adoption and innovation (Abed, 2020). TOE frameworks state that organizational structures should adapt to the needs of the organization and the environment (Hussain et al., 2022). In research discussing technology and innovation, the TOE framework is often used (Hussain et al., 2020). As the name suggests, TOE frameworks consist of three important factors according to (Baker, 2012), namely:

- a. **Technological Factors.** Technological factors include all technology that is relevant to the company, both technology that has been implemented by the company and technology that has not been

implemented by the company but is available on the market. The technology used by a company is important in the adoption process because the company has set limits on the scope and speed of technological change that can be made.

- b. *Organizational Factors.* Organizational factors refer to the characteristics and resources of the company, including the structure of relationships between employees, communication processes within the company, company size, and the amount of resources that are not optimal. There are several ways that companies can adopt and implement innovation technology. First, a system that connects a company's internal subunits or spans internal boundaries to promote innovation.
- c. *Environmental Factors.* Environmental factors include industry structure, technology service providers, and regulatory environment.

A number of unique characteristics were included in the development of TOE, such as: (1) an integrated approach between e-commerce adoption and product and process innovation, which has not been thoroughly examined in the context of MSMEs in the food sector before. (2) Market forces and competition are frequently the emphasis of TOE's environmental component. By examining government assistance in the form of subsidies for MSMEs and digitization programs, this study expands its purview. This offers a fresh viewpoint on how innovation and technological preparedness in MSMEs in the food sector are impacted by external regulations. This research presents a novel method for measuring TOE by integrating social and cultural aspects into an environmental framework. The adoption of e-commerce in Indonesia is often influenced by cultural norms and attitudes on technology and innovation. This study sheds light on how these variables may either encourage or impede creativity, offering fresh perspectives on how TOE may be tailored to regional cultural settings.

#### *Entrepreneurial orientation (EO)*

The concept of entrepreneurial orientation (EO) is a strategic approach to decision-making that aims to improve company performance. Entrepreneurial orientation is formed by three main elements, including innovation, proactivity, and risk-taking. The concept of EO introduced by Miller (Miller, 1983) has become the basis for much academic research, with other studies (such as Rauch et al., 2009; Rosenbusch et al., 2013) expanding and strengthening its validity. Lumpkin and Dess (Lumpkin and Dess, 1996) later developed a new perspective on EO, which incorporates additional and broader elements of entrepreneurial orientation.

Regarding the concepts mentioned above, in the context of MSMEs, EO is a characteristic of MSMEs that operate independently and innovatively, take risks and proactive efforts, and compete to seize opportunities in the market. The idea of EO is used to understand the entrepreneurial behavior of businesses or MSMEs. EO focuses on the fundamentals and procedures that support venture creation decisions and the framework for subsequent activities. All these measures include autonomy, highly competitive aggressiveness, creativity and innovation, and the pursuit of opportunities (G Thomas (Lumpkin and Dess, 2001).

- a. *Autonomy.* Autonomy is the right to exploit opportunities for a company's competitive advantage. Autonomy also relates to user intervention in introducing other concepts and testing them until they are successful. Autonomy is an important attribute of EO. Autonomy is generally associated with business strategy. Whenever team members are given more autonomy, they can develop the ideas and expectations necessary to solve the problem in front of them. Autonomy related to entrepreneurship refers to the ability to make important business decisions about what will be achieved, how things will be and when they will be achieved, as well as the company's overall business strategy (G Thomas (Lumpkin et al., 2009).

- b. *Risk-taking.* Risk-taking has long been considered an important component of EO (Anderson et al., 2015). Risk-taking was originally used to describe the risks faced by individuals once they choose to become self-employed rather than work for a company. Risk management has been commonly applied in business, especially to produce predictable consequences (Schillo, 2011). Specifically, risk-taking has the tendency to engage in risky business activities rather than being careful (G Thomas (Lumpkin and Dess, 2001). Risk tolerance in EO is closely related. In business, risk-taking results in opportunities for profit and loss that are subjectively assumed to be the same.
- c. *Proactiveness.* Proactiveness is a mindset for thinking about opportunities which is a characteristic of EO (Anderson et al., 2015). Proactivity refers to an organization's ability to respond to business contingencies by seeking to enter competitive markets. Proactiveness considers opportunities that include releasing innovative products and competitive services in the industry, as well as creating transformations that impact the environment (G Thomas (Lumpkin and Dess, 2001). Proactiveness is the capacity to prepare and adapt to new products and services. Companies that are successful in the market are confident and can predict competitive market demand. Therefore, they are always the first to enter new markets. Additionally, they are also known as "quick adherents," able to enter new markets, even though they are not first movers (G Thomas (Lumpkin and Dess, 2001). Likewise, (Astrini et al., 2020) stated that proactiveness is the capacity to develop insight from opportunities identified through extensive research or market research analysis. Proactivity helps businesses stay ahead of the competition (Astrini et al., 2020).

#### *Scope of E-commerce use*

One form of technology adoption that can be used by MSMEs is e-commerce. Use of e-commerce is defined as the extent to which e-commerce is used by a company to carry out operational activities (Zhu and Kraemer, 2005). Meanwhile, the scope of e-commerce use is the extent to which a company uses e-commerce for various activities along the value chain, from marketing to sales and procurement, customer support, and coordination with business partners and customers (Gibbs and Kraemer, 2004). E-commerce can be utilized as a tool for advertising and marketing; online sales; after-sales service; online purchases; data exchange with suppliers; and formal integration between the company and its stakeholders. Theoretical models for the use of e-commerce need to consider factors that influence the tendency to use e-commerce which originate from the technological, organizational and environmental conditions of an organization.

#### *Innovation capability*

Innovation is discussed in the literature in various ways (Jiménez-Jiménez and Sanz-Valle, 2011; Ngoc Thang and Anh Tuan, 2020). Most fall into two perspectives: 1) innovation is a behavioral variable; 2) innovation is an organization's capability to change (Calantone et al., 2002). This study focuses on an organization's capability to be willing to implement change. We define innovation capability as an organization's capability to engage in innovation; that is, the introduction of new processes, products, or ideas within an organization (Hult et al., 2004; Chesbrough and Di Minin, 2014; Bogers et al., 2018). Limitations associated with open innovation encompass the risks and constraints that businesses encounter when they open up their innovation processes (Dahlander and Gann, 2010). The concept of open innovation is an approach where MSMEs can collaborate openly with external parties to adopt new technologies, improve efficiency, and create added value through collective discovery. However, while open innovation offers many opportunities, there are also risks, such as loss of control over intellectual property, challenges in coordination, or innovation outcomes that may not be as expected. Examples of open innovation include digital payments, platform delivery, and collective

intelligence. Through open innovation, MSMEs can compete with large companies by leveraging innovative networks and external resources. This allows MSMEs to access technology, information, and skills that are usually only accessible to large companies, thereby increasing their adaptability to market developments while lowering the cost of adopting new innovations (van de Vrande et al., 2009).

Innovation capabilities enable organizations to apply the technology needed to develop new products, meet market needs, and survive competition (Rajapathirana and Hui, 2018). This allows organizations to integrate capabilities from stimuli into successful innovations (Lawson and Samson, 2001; Zott and Amit, 2010). Dadfar et al. (2011) argue that innovation capability is introducing new ideas to add to the product portfolio. Organizations that are able to introduce new products or services use a strategic mix of combinations of innovation behavior, strategic capabilities, and internal technological processes (Vicente et al., 2015).

#### *Firm performance*

EO is an important dimension to explain the entrepreneurial and innovation capacity of an MSME. However, understanding the sustainability and growth potential of MSMEs can fundamentally be seen from their performance (Drucker, 1958). Organizational performance is the most important indicator that an organization needs to pay attention to (Garengo et al., 2005). Even though it is on a smaller scale, organizational performance is also a very important indicator for MSMEs. In fact, organizational performance in the context of MSMEs can be considered as complex and has various dimensions (Wolff and Pett, 2006).

In recent decades, the notion of performance in entrepreneurship has been the focus of various studies, but despite the many contributions, there is no homogeneous and universal definition (Davidsson et al., 2010; Davidsson and Honig, 2003). Measuring performance based on metrics in various studies also produces non-uniform consensus (Eniola and Entebang, 2016; Ikram et al., 2019). For example, using perceptual measures to become the basis for assessing organizational performance (Kundu and Gahlawat, 2016). Meanwhile, other studies use a more integrative approach, where perceptual measures are measured by quantitative metrics (financial reports) (Wolff and Pett, 2006). We use MSME performance measurement based on the Balanced Score Card (BSC) methodology. This method has been tested and is widely used to explore the relationship between organizational performance and various factors, such as competitive variables and innovation (Van Auken et al., 2008), and organizational culture (Hartnell et al., 2011).

#### *Hypothesis development*

Because MSMEs differ from large organizations in their characteristics and dynamics, it is vital to do research on MSMEs using the Technology-Organization-Environment (TOE) Framework. MSMEs frequently face challenges with regard to money, labor, and technology. The TOE framework can be used to better understand how these restrictions promote or impede the uptake of new technologies, such as e-commerce platforms, and how innovation can still happen in spite of them. Regulation changes, competitive market dynamics, and shifting consumer preferences all have an impact on MSMEs frequently. To better understand how MSMEs respond to these pressures—particularly in the usage of digital technologies like e-commerce—further examination of the environmental setting in the TOE is important. This external environment may be more dynamic and influential than that of bigger firms. Numerous studies have demonstrated the positive effects of technology use, including e-commerce, on business performance. The technological process and its application in MSMEs and how this affects productivity have been explained by many researchers (Cataldo et al., 2020; Farooq et al., 2020; Joshi et al., 2024; Mohamed Zabri, 2024; Tria Wahyuningtihas et al., 2021; Wahyundaru et al., 2024), but the focus for MSMEs in the food sector needs to be explored. The relationship between improving MSME business performance and technical innovation

capability can be explained through the application of TOE. In terms of e-commerce adoption, previous studies have often focused on large companies; however, efficient e-commerce adoption by MSMEs still needs to be re-investigated for several main reasons, including: (1) many MSMEs face infrastructure limitations, especially in remote or less developed areas, so that access to adequate technology and internet is not evenly distributed, (2) MSMEs often have limitations in terms of capital, skilled labor, and technology. Research is needed to find efficient and low-cost solutions so that MSMEs can adopt e-commerce easily without the need for large investments, (3) the level of e-commerce adoption by MSMEs varies greatly depending on the type of business, location, and market segment served, (4) e-commerce technology continues to evolve, as do consumer needs and preferences. By understanding e-commerce adoption more deeply, MSMEs can gain a stronger competitive advantage, especially in facing competition with large companies that have adopted e-commerce effectively. TOE can be used to investigate how organizational, technological, and external environmental factors—including adoption barriers—affect the extent and size of e-commerce use by MSMEs (Tian et al., 2020). An important field of inquiry is how MSMEs, with their limited resources and reliance on external environmental factors, might enhance their innovative skills in the context of technology adoption. The importance that internal organization, technology, and environment play in fostering innovation can be better understood using the TOE paradigm. Further research is necessary to determine the causal relationship between e-commerce adoption, innovation capabilities, and performance in the context of MSMEs, despite data suggesting that technology use can enhance company performance. The extent to which e-commerce affects MSME business performance and the characteristics that, from a TOE viewpoint, have the greatest influence on that performance are questions that require further research.

This research uses the technological readiness factor as the technological factor to be considered. Technological readiness is a combination of information technology infrastructure, knowledge and human resources in organizations that relate to information technology (Zhu and Kraemer, 2005). Each manager in a company identifies and adopts what technology will be used in the company's operational activities (Hussain et al., 2022). Several studies explain that the combination of information technology and human resource expertise are two important factors in the adoption of new technology (Iyengar et al., 2015; Malhotra et al., 2005; Zhu and Kraemer, 2005). Previous research states that the combined impact of technological infrastructure factors and human resource expertise increases a company's scope of e-commerce use (Braojos et al., 2019; Hussain et al., 2022). From the explanation above, the hypothesis proposed is:

**H1.** : Technological readiness has a positive influence on the Scope of E-commerce Use

This research uses the adoption cost factor as an organizational factor to be considered. Adoption expenses are considered whereas beginning costs are excluded for a number of reasons. These reasons include: Research can examine the long-term advantages of e-commerce, such as higher sales, improved operational efficiency, and lower distribution costs, by evaluating the adoption costs' benefits. This gives a better idea of the advantages that can be realized upon adoption. (2) The analysis becomes less complex when it concentrates on the advantages of adoption costs. The initial expenses associated with adoption, such as the purchase of software or hardware, might differ greatly throughout MSMEs. Excluding these expenses allows research to concentrate on characteristics that are easier to measure and more stable, such as the advantages of e-commerce. (3) Because MSMEs sometimes have limited resources, their decisions to adopt new technologies are frequently predicated on projections of the potential advantages. Instead of concentrating on upfront expenses that might not be easily measured, MSME owners would be better served by calculating the adoption costs' benefits in order to comprehend the possible advantages



of e-commerce technology adoption. (4) There can be wide variations in the degree of e-commerce adoption among MSMEs in the food industry. Many MSMEs may leverage pre-existing e-commerce platforms or begin with minimal expenditure. As such, it is more crucial to evaluate the advantages of utilizing the platform than to concentrate on the upfront expenses, which might not accurately represent their actual circumstances. (5) Evaluating the advantages of adoption costs can motivate MSMEs to use e-commerce more creatively and adaptably. MSMEs will be more driven to get past the early adoption costs obstacles and concentrate on how they can benefit from the adopted technology if they know how e-commerce can boost their performance. Additionally (6) The food industry has particular dynamics, such as the need to adjust to changing market conditions and the quick shifts in consumer tastes. As a result, investigating the advantages of e-commerce—such as better customer satisfaction and expanded market access—is more pertinent than delving into an examination of the startup expenses, which could not accurately represent the real value that e-commerce offers. To use a technology such as using e-commerce, companies need to mobilize important technological resources such as information technology infrastructure, internet networks, software, hardware, and human resource training (Hussain et al., 2022). This means that to adopt a technology, a company needs to budget quite expensive costs. High costs are one of the factors inhibiting MSMEs from starting to adopt new technology (Wymer and Regan, 2005). Although the cost of implementing technology has decreased over the past two decades, for many Micro, Small, and Medium Enterprises (MSMEs), especially in developing countries like Indonesia, the cost remains a significant barrier. According to research by the Indonesian Ministry of Cooperatives and MSMEs (2020), around 60 % of MSMEs stated that limited capital was the main obstacle in adopting digital technology. In addition, a report from the World Bank (2021) shows that even though the cost of technology has decreased, MSMEs often face challenges in accessing the financing needed for technology investments. Therefore, despite the overall decline in the cost of technology, for many MSMEs, especially those with limited resources, the cost of implementing technology remains a significant challenge. Adoption costs include initial use of the technology and training costs to use the technology (Hussain et al., 2022). When compared to large companies, MSMEs have greater obstacles to adopting new technology. E-commerce is a new technology that if adopted, a company will need to incur adoption costs. Other research reveals that the costs incurred by companies for technology adoption directly influence the speed of use of the technology, especially for MSMEs (Mohtaramzadeh et al., 2018). From the explanation above, the hypothesis proposed is:

**H2.** : Adoption costs have a positive influence on the Scope of E-commerce Use

This research uses government support as an environmental factor to consider. Support from will encourage companies to use technology (Lin and Luan, 2020; Manning et al., 2012). Previous research states that government support has an influence on technology adoption (Khotimah and Budi, 2020). Meanwhile, other research states that government support has no influence on technology adoption (Hussain et al., 2022). Other research states that the government focuses a lot on developing technology adoption in large companies (Merhi and Ahluwalia, 2017). Therefore, further research into the influence of government support on technology adoption such as the use of e-commerce for MSMEs has strong reasons to do so. From the explanation above, the hypothesis proposed is:

**H3.** : Government support has a positive influence on the Scope of E-commerce Use

By integrating the EO elements in a reflective model, the EO elements can be explained. Autonomy orientation is the freedom to manage decisions when launching products or services, to managing personnel. SMEs cannot have innovation without the freedom to develop new

products, processes, or business models. Alvarez-Torres, Lopez-Torres, and Schiuma (Alvarez-Torres et al., 2019) define autonomy orientation as the freedom to supervise staff and determine whether to introduce new goods or services. Autonomy plays a crucial role in accelerating the strategic decision-making process, especially in high-tech companies (Wei et al., 2025). Individuals with high levels of autonomy tend to be better able to optimize their absorptive capacity to create innovative ideas, thus supporting the formation of a work environment conducive to innovation (Frate and Bido, 2024). Research by Hussain et al. (Hussain et al., 2022) shows that autonomy in decision-making allows companies to respond to market changes more quickly and adaptively, which ultimately increases their innovation capacity. In addition, according to Nurqamarani et al. (Nurqamarani et al., 2024), autonomy encourages experimentation and creativity, two key elements in the development of sustainable innovation skills. Individuals with the greatest freedom can generate a variety of creative ideas more quickly in organizations with unlimited access and autonomy (Saunila, 2020). From the explanation above, the hypothesis proposed is:

**H4.** : Autonomy has a positive influence on innovation capability

By integrating EO elements into a reflective model, these EO elements can be explained. Proactive orientation is the tendency to actively seek and exploit new opportunities in various activities (Alvarez-Torres et al., 2019). In the context of MSMEs, innovation will not be achieved without a proactive tendency to develop new products, processes, or business models. Research by Nugroho et al. (Nugroho et al., 2021) shows that proactivity, supported by individual soft skills mastery, contributes significantly to increasing the ability to innovate. Proactive individuals are better able to take advantage of opportunities to learn and share knowledge within the organization, thereby creating a work environment that supports innovation. In addition, proactivity also allows organizations to respond quickly to market changes and take advantage of opportunities through strategic collaboration with alliance partners (Nugroho et al., 2021). On the other hand, according to Nathaniel and Dewi (Nathaniel and Dewi, 2024), proactivity increases employee engagement in their work, encourages the birth of innovative solutions, and helps organizations adapt to evolving needs. From the explanation above, the hypothesis proposed is:

**H5.** : Proactivity has a positive influence on innovation capability

By integrating the EO elements in a reflective model, these EO elements can be explained. Risk-taking orientation refers to the tendency to make decisions with well-considered risks (Alvarez-Torres et al., 2019). In the context of MSMEs, innovation cannot be achieved without the courage to take calculated risks to develop new products, processes, or business models. MSMEs that are willing to take risks by investing in new technologies, entering untapped markets, and developing innovative products can significantly increase their innovation capacity (Dahlan et al., 2023). Studies show that risk-taking has a significant positive impact on business performance, because this courage allows MSMEs to explore untapped market opportunities (Theresa and Hidayah, 2022). In addition, empirical research reveals that an organizational climate that supports calculated risk-taking can encourage the emergence of new ideas and creativity, which are important foundations for innovation (García-Granero et al., 2015). Although risk-taking is an essential element to ensure the sustainability and growth of MSME businesses, there are significant constraints that can limit their courage to take innovative steps, especially in the food industry. MSMEs in this sector often have the intention to take risks to introduce innovations, both in products and processes, but limited liquidity is a major obstacle. Without adequate cash, the decision to invest in innovation, such as the use of new technologies or product development, becomes more difficult. The uncertainty regarding the outcome of the investment also further amplifies their hesitation. Therefore, even though the desire to take risks exists, financial constraints often become a barrier for MSMEs to realize their maximum innovation potential, which can ultimately

affect the sustainability of their business (Dahlan et al., 2023). From the explanation above, the hypothesis proposed is:

**H6.** : Risk-taking has a positive influence on innovation capability

The use of e-commerce describes the extent to which e-commerce is used by companies to carry out operational activities. The scope of e-commerce allows MSMEs to collect, filter, and analyze data from various sources. The use of e-commerce technology has a significant impact on the innovation capabilities of MSMEs, especially in developing procedures, products, and marketing strategies. Charfeddine et al. (Charfeddine et al., 2024) found that the more e-commerce technology is utilized, the greater the business's ability to create fast and effective innovations. E-commerce technology provides resources and tools that accelerate the innovation process. In addition, according to Penagos Guzman and García Solarte (Penagos Guzman and García Solarte, 2024), widespread adoption of e-commerce encourages more intensive collaboration with external partners, increasing access to new concepts and resources from outside the organization. Rahayu & Day's research shows that MSMEs that actively use e-commerce tend to be more innovative in their operations and marketing strategies, because they have greater access to global markets and supporting technology. Furthermore, Damiyana et al. (Damiyana et al., 2024) emphasize that the implementation of e-commerce expands MSMEs' access to information and markets, increasing their ability to innovate. This technology allows MSMEs to utilize digital platforms to expand market reach, design strategies such as digital marketing campaigns, and customize products based on customer feedback (Tirtana et al., 2022). Thus, e-commerce becomes a key element in strengthening the competitiveness and innovation of MSMEs. From the explanation above, we propose the following hypothesis:

**H7.** : Scope of E-commerce use has a positive effect on Innovation Capability

Previous research states that the use of information technology can increase company performance (Hussain et al., 2022; Nwankpa and Roumani, 2016; Wixom et al., 2013). In the digital era, it is important for a company to innovate technologically to be able to survive and be successful compared to its competitors (Hussain et al., 2022). Therefore, the use of new technology can make the company's operational processes more effective and enable the company to be more competitive in the era of digital technology (Wardoyo et al., 2018). Previous research states that the use of e-commerce allows companies to reduce transaction costs while making internal business processes more efficient (Li et al., 2018; Santarelli and D'Altri, 2003). From the explanation above, the hypothesis proposed is:

**H8.** : Scope of E-commerce Use has a positive influence on firm performance

Innovation capability is necessary if a company wants to survive in a rapidly changing environment, therefore, this capability is one of the main drivers of long-term success in business. The innovation capability of MSMEs plays a key role in improving business performance, both financially and non-financially. A study by Cuijten et al. (Cuijten et al., 2024) shows that the more innovative an MSME is, the greater its impact on improving performance. Innovation enables MSMEs to create added value through new products and services that are in line with market needs, which in turn improves their financial performance and competitiveness (Saffitri and Maryanti, 2021). In addition, innovation supports technology development, product quality improvement, and the implementation of more attractive promotional strategies (Mohammad et al., 2019). However, the dynamics of open innovation often present cognitive constraints in the form of limited rationality, which require strategic handling by organizations (Cuijten et al., 2024). With the ability to innovate, MSMEs can apply new techniques in the production of goods or services, ensuring the continuity and success of their business in the future (Tereshchenko et al., 2024). This innovative

behavior enables MSMEs to meet the ever-growing needs of customers and increase competitiveness in local and international markets (Nugroho et al., 2021). Innovation, thus, becomes a vital element in ensuring the growth and sustainability of MSMEs. From the explanation above, the hypothesis proposed is:

**H9.** : Innovation capability has a positive influence on firm performance

## Method

This research utilizes a quantitative approach, employing statistical analysis to test hypotheses and draw generalizable conclusions, which involves developing constructs, measuring scales, designing questionnaires, sampling, and analyzing data statistically. A questionnaire survey was distributed to 200 food sector MSMEs in the East Java region of Indonesia. The process involved identifying respondents based on pre-defined characteristics, distributing the questionnaire via online forms, providing clear instructions for completion, collecting completed questionnaires, selecting valid and reliable responses for analysis, and ultimately tabulating the data. The respondent criteria are as follows: (1) Owners or managers of MSMEs engaged in the food industry, encompassing eateries, catering, grocery shops, and food production, are required to participate in the survey. (2) Owners or representatives with decision-making authority within the organization must be respondent. Those who are sole proprietors, co-founders, or managers with strategic decision-making authority fall under this category. (3) Respondents must have at least a rudimentary understanding of using e-commerce platforms, including digital marketing, online sales, and other e-commerce-related technology. (4) Respondents have to be MSMEs with at least two employees that meet specific scale requirements. (5) In order to operate an e-commerce firm, respondents have sufficient access to digital technology, including computers, cellphones, and strong internet connections. (6) Respondents with involvement in local networks, co-operatives, associations, or other business networks in the food industry will offer a deeper understanding of the dynamics of the sector. Based on data from the Central Statistics Agency (BPS) of East Java in 2020, there were 233,413 micro and small business units (MSEs) in the food sector. The sample was taken using the purposive sampling method. The 300 questionnaires was distributed, 213 were collected, and 200 samples met the research criteria.

The collected data was analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM), according to SEM is a combination of factor analysis and regression (correlation) analysis, which is used to test the relationship between variables in a model. PLS-SEM is a variance-based SEM technique well-suited for analyzing complex relationships within smaller sample sizes. PLS-SEM is known for its flexibility in accommodating both predictive and explanatory research questions, along with its robustness in handling complex relationships involving both formative and reflective measurement models. Additionally, Importance-Performance Matrix Analysis (IPMA) is used in this study to determine which factors—such as customer happiness or corporate performance—have the biggest effects on performance variables. Researchers and managers can concentrate on areas that require development with the biggest influence on total performance by comparing importance and performance. Additionally, firms can more efficiently deploy resources by understanding which elements are high priority yet low performer. By doing this, it is ensured that performance enhancement efforts are concentrated on the components that are most crucial. In addition, IPMA offers more thorough insights than traditional analysis since it evaluates each variable's performance in respect to its influence in addition to measuring the link between variables. This aids in enhancing performance through the making of better-informed strategic decisions. Lastly, by employing IPMA, institutions or scholars can create longer-term plans that are better informed and grounded in empirical evidence. While areas with low performance and high

importance are improved to attain sustainable performance, those with high performance and high importance can be left alone.

*Measurement model*

The PLS-SEM analysis was conducted in two distinct stages. The first stage, the measurement model, assessed the reliability and validity of the measurement items used to represent each construct. This step ensured that the chosen indicators accurately captured the intended constructs. The measurement model’s quality was evaluated through various indicators, including factor loadings, composite reliability (CR), and average variance extracted (AVE). Factor loadings above 0.7 indicate a strong relationship between indicators and their corresponding constructs, while CR values above 0.87 suggest acceptable reliability. Additionally, AVE values above 0.62 demonstrate acceptable convergent validity. Table 1 shows the items that meet the threshold of the measurement model. We removed a total of 8 items that did not meet the requirements.

In this research, the target sample size was 200 food sector MSMEs spread across the East Java region. The data collection method was carried out through distributing questionnaires which were distributed to respondents, namely MSME actors. The procedures carried out in this research for data collection were:

1. Develop a questionnaire according to the topic being researched.
2. Search for respondents according to the predetermined target population characteristics and ask for the willingness of respondents to fill out the questionnaire.
3. Distribute questionnaires to respondents online using Google Form.
4. Explain to respondents the procedures for filling out the questionnaire.
5. Collect questionnaires that have been filled in by respondents.
6. Selecting questionnaires with the aim of finding out which questionnaires are appropriate, and which are not appropriate in order to produce valid and reliable data so that they can be used in this research.
7. Create data tabulation.

This research also uses Structural Equation Modeling (SEM) analysis techniques, namely multivariate analysis techniques developed to cover the limitations of previous analysis models such as regression analysis, path analysis and confirmatory factor analysis. SEM is a type of multivariate analysis that can analyze variable relationships in a complex or simultaneous manner and can test a series of relationships that are relatively difficult to measure simultaneously. According to SEM is a multivariate analysis technique which is a combination of factor analysis and regression (correlation) analysis, which is used to test the relationship between variables in a model. The data analysis technique uses PLS-SEM. PLS-SEM analysis was chosen because PLS-SEM is suitable for research that is construct-building and answers research hypotheses with a small number of respondents. PLS-SEM is a variant of based-SEM (VB-SEM) which has the advantage of being sensitive to less data.

**Result**

The study’s demographic findings are displayed in Table 2. The findings indicate that men continue to dominate MSME enterprises in Indonesia’s food sector. But there is also a sizable percentage of women working in this field, suggesting a well equal engagement of the sexes. The majority of MSME owners in the food industry are entrepreneurs of the productive age, who are typically more receptive to embracing new technologies like digital innovation and e-commerce. Furthermore, while MSMEs with only a secondary education are still highly active in the business world, higher education is crucial for the uptake of e-commerce and the growth of innovation in the food industry. Given that

**Table 1**  
Variables and questions.

Variables	No.	Questions	References
Technological Readiness –	1	We have sufficient experience with developing various e-commerce applications	(Hussain et al., 2022); (Molla and Licker, 2005)
	2	We have enough resources to implement eCommerce	
	3	We have high bandwidth connectivity to the Internet	
	4	The system we use can be adjusted to customer needs	
Adoption Cost -	1	Using e-commerce for our business operations with trading partners will save costs	(Hussain et al., 2022); (Soliman and Janz, 2004)
	2	It will be cheaper to do business with several trading partners that utilize e-commerce than other systems	
Government Support -	1	E-commerce roles, responsibilities and accountabilities are clearly defined	(Hussain et al., 2022); (Molla and Licker, 2005)
	2	eCommerce accountability is monitored through direct responsibility	
	3	Decision-making authority has been clearly defined	
	4	We thoroughly analyze possible changes that occur in organizations, suppliers, partners and customers as a result of each eCommerce implementation	
Autonomy –	1	Workers in our business are permitted to investigate deficiencies and make improvements to daily tasks	(Alvarez-Torres et al., 2019; Hughes and Morgan, 2007)
	2	Workers in our business are given the freedom to communicate without interference	
	3	Workers in our business are given the authority and responsibility to act, if they believe it will result in business profits	
	4	Workers in our business are given access to all important information about the business and the venture to generate profits	
Risk-taking –	1	The concept of “risk takers” is considered positive for people in our business	(Alvarez-Torres et al., 2019; Hughes and Morgan, 2007)
	2	The people at our business are motivated to take calculated risks with new ideas	
	3	Our efforts emphasize exploration and experimentation of opportunities in the marketplace	
Proactive –	1	We always try to take the initiative in every situation (pursue opportunities with other partners or suppliers)	(Alvarez-Torres et al., 2019; Hughes and Morgan, 2007)
	2	We stand out among our competitors in detecting and pursuing opportunities	
	3	We started pioneering actions which were then followed or responded to by other MSMEs	
Scope of e-commerce Use -	1	Our business is not connected to the Internet, does not have email	(Hussain et al., 2022); (Molla and Licker, 2005)

(continued on next page)



Table 1 (continued)

Variables	No,	Questions	References
	2	Our business is connected to the Internet with email but no website	
	3	Our business has a static website, that is, it publishes basic business information on the web without interaction	
	4	Our business uses an interactive web, that is, it can receive questions, emails; and an entry form from the user	
	5	Our business uses a transactive web, namely selling and purchasing products and services online including customer service	
	6	Our business uses an integrated web, namely a website that is integrated with suppliers, customers and others, and also an office system that allows most business transactions to be carried out electronically.	
	Innovation Capability –	1	Our business often tries new ideas.
2		Our business is looking for new ways to make a profit.	
3		Our business is often the first to market new products and services.	
4		Innovations in our company were deemed too risky and rejected	
5		Our new product introductions have increased over the last 5 years.	
MSMEs Performance –	1	Innovation in products/ services increases revenue in our business	(Dudic et al., 2020)
	2	Revenue from new customers in our business is high	
	3	Cash coming into our business is high	
	4	Customer satisfaction in our business is high	
	5	Consumers in our business are increasing	
	6	Our business distribution speed is high	
	7	Our business has unique products/services offered	
	8	We have the ability to develop products/services.	

the majority of respondents had very seasoned company experience, they might be more willing and daring to embrace cutting-edge products and services as well as new technology like e-commerce. These findings also show that the majority of MSMEs in the food industry are still small businesses, which may make it difficult for them to innovate and make the best use of technology due to a lack of funding. In the meantime, MSMEs in the food industry have adopted e-commerce at a very high rate, which can support innovation and enhance their performance in the digital age. The variety of goods that MSMEs in this industry offer, which may also have an impact on innovation tactics and e-commerce usage. Due of their accessibility and usability, marketplaces are the most widely used platforms; nevertheless, social media is also a significant component of MSMEs' digital marketing strategies. Particularly with regard to technology adoption and innovation initiatives, these demographic aspects can have an impact on their business success and capacity for innovation.

Table 3. is the Reliability and validity tests results and Table 4. is

discriminant validity test results. A good model has an outer loading value of > 0.7, while composite reliability is > 0.87, and average variance extracted is > 0.62.

Then, hypothesis testing will be carried out by looking at the p-value and t-statistics first before looking at the coefficient. If a p-value ≤ 0.05 is obtained, it can be concluded that the results are significant. If the p-value ≥ 0.05 then it can be concluded that the hypothesis is not accepted. Then a relationship between variables is said to be significant when the t-statistics value of each indicator is greater than the t-statistics table, namely 1.96. Table 5 shows the results of hypothesis testing in this study. Figure 2. is the result research framework in this research.

The findings of the IPMA's analysis of the significance and effectiveness of several factors pertaining to the scope of e-commerce use, innovation capability, and performance of MSMEs are displayed in Figure 3. Technological Readiness, Adoption Cost, Government Support, Autonomy, Proactivity, and Risk-Taking are the primary variables shown in this graphic. The link between these variables is depicted in this picture using a structural model, where the path coefficient values for each path indicate the degree to which the independent variable influences the dependent variable. Technological Readiness: Relevance (Affecting the Range of E-Commerce Use): 0.215. With a value of 0.215, technological preparedness has a very considerable impact on the extent of e-commerce adoption. This implies that the range of e-commerce use increases with MSMEs' technological readiness. Performance: The performance value of 49.012 shows that there is a reasonable level of technological readiness. Considering how important this variable is, there is room for optimization and speed enhancement. The adoption cost has an influence on the scope of e-commerce use, and its importance is 0.162. The extent to which e-commerce is used is also significantly impacted by adoption costs, but less so than by technological preparedness (0.162). Businesses with more e-commerce coverage are typically those who are adept at controlling adoption expenses. Performance: Better adoption cost performance is indicated by a performance value of 65,596. Although the organization does an excellent job of controlling adoption expenses, there is always space for improvement. The significance of government support in terms of its impact on the extent of e-commerce use is 0.332. With a value of 0.332, government backing has a rather strong impact on the extent of e-commerce use. This highlights how crucial government support and policies are in helping MSMEs embrace e-commerce. Performance: The level of government support is medium, with a performance value of 50,368. Its performance can yet be enhanced, notwithstanding its importance, to realize the potential of e-commerce.

The importance of autonomy (as a factor influencing innovation capability) is 0.120. The ability to innovate is significantly yet relatively little impacted by autonomy (0.120). Employees and MSME owners that have autonomy have more freedom to make decisions, which can spur innovation. Performance: With a performance value of 67,406, it is clear that autonomy has been implemented successfully, while there is still opportunity to promote greater autonomous decision-making among MSME leaders. The value of proactivity (as an influence on the ability to innovate) is 0.242. At a value of 0.242, proactivity has a higher impact on innovative capability than autonomy. MSMEs' capacity for innovation increases with how proactively they recognize and seize market possibilities. Performance: While initiative and risk-taking still need to be improved, a proactiveness score of 56.988 shows generally good performance in this area. 6.) The significance of risk-taking (as a factor influencing innovation capacity) is 0.142. At 0.142, the ability to innovate is positively impacted by having the guts to take chances. MSMEs with greater risk-taking tendencies also have more inventive products, procedures, and tactics. Performance: With a score of 57,635, one's readiness to take chances is at a respectable level of performance. MSMEs do, however, have a chance to promote moderate risk-taking even more in order to boost innovation. 7.) E-commerce Use and Performance of MSMEs: The aforementioned factors have a significant impact on the performance of MSME (55,022) and the use of e-



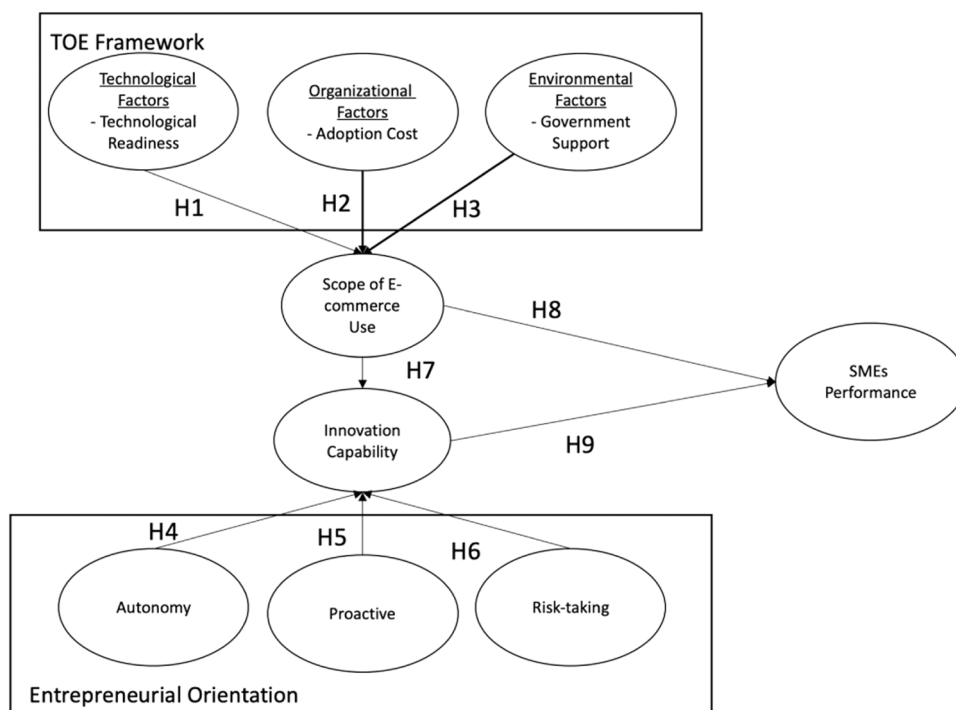


Fig. 1. Research Framework.

commerce (with a performance score of 56,000). The extent of e-commerce use and MSME performance had the strongest correlation (0.336). This demonstrates that MSMEs do better the more e-commerce is used. Although government support is crucial for expanding the usage of e-commerce, there is always room for improvement in terms of performance. Improvements in the areas of technological readiness and adoption cost will have a significant beneficial influence, since they currently perform at a reasonable level. Proactivity and autonomy play a major role in innovation, thus enhancing performance in these two areas will have a major positive impact on MSMEs' capacity for innovation in Indonesia's food industry.

**Discussion**

**H1.** : Technological readiness has a positive influence on the Scope of E-commerce Use

This concept states that technological readiness—a firm's ability to use digital technology and supporting infrastructure—influences the extent to which a firm can leverage e-commerce. The more technologically prepared a firm is, the more widely e-commerce will be implemented in its operations. Technology readiness has a significant beneficial influence on the scope and reach of e-commerce, and it plays a critical part in developing its landscape. Today's digitally-driven world has made the successful integration of cutting-edge technologies a given for online company endeavors. A strong and effective infrastructure is ensured by a high degree of technological preparedness, which makes it possible for seamless transactions, safe online payments, and effective supply chain management. The technology that will be utilized for operations is decided upon and adopted by each business manager (Hussain et al., 2022). From Figure 3, Technological Readiness has a path coefficient of 0.215 on the Scope of E-commerce Use, indicating a positive and significant influence. This supports the hypothesis H1 that technological readiness has a positive influence on the scope of e-commerce use. Zhu and Kraemer (Zhu and Kraemer, 2005) demonstrated that a company's technological readiness—particularly with regard to dependable information systems and sufficient internet access—plays a

major role in the adoption of e-commerce. Wang, Wang, and Yang also discovered that because they can more readily incorporate digital technology into their regular operations, businesses with strong technological resources are more likely to increase the amount of e-commerce they utilize. Technology readiness, according to Molla and Licker (Molla and Licker, 2005), makes e-commerce adoption easier since it allows businesses to overcome technological problems that less prepared businesses frequently confront. Information technology and human resource knowledge are two critical elements in the adoption of new technology, according to various research (Iyengar et al., 2015; Malhotra et al., 2005; Zhu and Kraemer, 2005). According to earlier studies, the combination of technology infrastructure components and HR know-how enables corporations to adopt e-commerce more widely (Braojos et al., 2019; Hussain et al., 2022). Furthermore, it enhances the user experience by facilitating quicker loading times, an adaptable interface, and customized suggestions. This level of technological complexity creates new opportunities for businesses to grow internationally while also fostering consumer trust. E-commerce platforms that have a strong technological presence can take advantage of machine learning, artificial intelligence, and data analysis to better understand customer behavior, target specific markets, and customize products. As a result, in the digital age, technological preparedness is essential for E-commerce's continuous development and expansion, serving as a catalyst for economic advancement.

**H2.** : Adoption costs have a positive influence on the Scope of E-commerce Use

This hypothesis proposes that e-commerce adoption costs, including initial investment and operating costs, positively affect e-commerce usage scope. When adoption costs are more affordable, firms are more likely to leverage e-commerce. The state of e-commerce is greatly influenced by technological preparedness, which also greatly expands its reach. The success of internet business endeavors has come to be associated with the smooth integration of cutting-edge technologies in today's digitally driven world. A strong and effective infrastructure, which supports seamless transactions, safe online payments, and effective supply chain management, is ensured by a high degree of technological

**Table 2**  
Demographic results.

No	Demographic Variables	Categories	Number of Respondents (n)	Percentage (%)
1	Gender	Male	120	60 %
		Female	80	40 %
2	Age of Business Owner	< 30 years old	30	15 %
		30–39 years old	70	35 %
		40–49 years old	60	30 %
		≥ 50 years old	40	20 %
3	Education Level	High School	60	30 %
		Diploma (D1-D3)	40	20 %
		Bachelor’s Degree (S1)	90	45 %
		Postgraduate (S2/S3)	10	5 %
4	Business Operational Years	< 1 year	20	10 %
		1–3 years	50	25 %
		4–6 years	70	35 %
		> 6 years	60	30 %
5	Business Scale	Micro (≤ Rp 300 million/year)	100	50 %
		Small (Rp 300 million - Rp 2.5 billion)	80	40 %
		Medium (> Rp 2.5 billion)	20	10 %
6	E-Commerce Usage	Yes	150	75 %
		No	50	25 %
7	Type of Products Sold	Ready-to-Eat Food Products	70	35 %
		Processed Food Products	80	40 %
		Food Raw Materials	50	25 %
8	E-Commerce Platform Used	Marketplace (Tokopedia, Shopee, etc.)	100	50 %
		Own Store Website	50	25 %
		Social Media (Instagram, Facebook)	50	25 %

preparedness. Every business management chooses and implements the technology that will be utilized in the operations (Hussain et al., 2022). Adoption Cost shows a path coefficient of 0.162 (Figure 3) on the Scope of E-commerce Use, indicating a positive influence. Although the value of its influence is relatively smaller compared to other factors such as government support, this result supports the hypothesis H2 that adoption costs have a positive influence on the scope of e-commerce use. Numerous studies indicate that information technology and human resource knowledge are two crucial elements in the adoption of new technology (Iyengar et al., 2015; Malhotra et al., 2005; Zhu and Kraemer, 2005). Prior studies indicate that the combination of technological infrastructure components and human resources knowledge leads to a wider adoption of e-commerce by corporations (Braojos et al., 2019; Hussain et al., 2022). It also enhances the user experience by enabling responsive design, quicker loading times, and customized recommendations. In addition to increasing consumer trust, this technological sophistication creates new opportunities for businesses to grow internationally. Although adoption costs are thought to be a barrier for small firms, Cloete, Courtney, and Fintz discovered that the use of e-commerce can be expanded by reducing initial costs through cloud-based and open-source solutions. According to research by MacGregor and Vrazalic, small firms are more likely to use e-commerce across a range of operational activities when technological expenses, such as infrastructure and software prices, are declining. This increases the adoption of e-commerce. According to Oliveira & Martins, as investments in digital technologies improve overall business productivity, organizations that can efficiently control adoption costs are more

**Table 3**  
Reliability and validity of test results.

Constructs and Items	Loadings	Composite Reliability (CR)	Average Variance Extracted (AVE)
A1 < - Autonomy	0.756	0.965	0.662
A2 < - Autonomy	0.759		
A4 < - Autonomy	0.719		
AC1 < - Adoption Cost	0.762	0.952	0.686
AC2 < - Adoption Cost	0.782		
GS2 < - Government Support	0.702		
GS3 < - Government Support	0.765	0.953	0.638
GS4 < - Government Support	0.757		
IC1 < - Innovation Capability	0.776		
IC2 < - Innovation Capability	0.790	0.922	0.683
IC3 < - Innovation Capability	0.777		
IC4 < - Innovation Capability	0.775		
P1 < - Proactive Performance	0.763	0.993	0.671
P2 < - Proactive Performance	0.800		
P3 < - Proactive Performance	0.796		
PF1 < - MSMEs Performance	0.789	0.878	0.617
PF2 < - MSMEs Performance	0.741		
PF3 < - MSMEs Performance	0.777		
PF7 < - MSMEs Performance	0.794	0.705	
PF8 < - MSMEs Performance	0.705		
RT1 < - Risk-taking	0.763		
RT2 < - Risk-taking	0.713	0.822	0.642
RT3 < - Risk-taking	0.731		
SEU1 < - Scope of e-commerce Use	0.725		
SEU2 < - Scope of e-commerce Use	0.708	0.936	0.677
SEU4 < - Scope of e-commerce Use	0.741		
SEU5 < - Scope of e-commerce Use	0.738		
TR1 < - Technological Readiness	0.740	0.949	0.671
TR2 < - Technological Readiness	0.703		
TR4 < - Technological Readiness	0.735		

inclined to grow their usage of e-commerce. E-commerce platforms with a strong technological presence can leverage machine learning, artificial intelligence, and data analysis to personalize goods to individual interests, optimize marketing methods, and gather important insights into consumer behavior. Technology readiness is therefore a key factor in the ongoing development and expansion of e-commerce, making it a vital force behind economic advancement in the digital age.

**H3.** : Government support has a positive influence on the Scope of E-commerce Use

Scope Government support, such as subsidies, training, and supportive regulations, can encourage e-commerce adoption among firms. The greater the government support, the more likely firms are to adopt and expand their use of e-commerce. The upward trajectory of Small and Medium Enterprises’ (MSMEs) e-commerce usage is mostly shaped by government backing. Governments all throughout the world have started taking action to improve MSMEs’ integration into the digital economy after realizing the revolutionary potential of digitalization. The government’s encouragement of e-commerce’s widespread use is the

**Table 4**  
Discriminant validity test results.

Variables	Adoption Cost	Autonomy	Government Support	Innovation Capability	Proactive	Risk-taking	Scope of e-commerce Use	Technological Readiness
Adoption Cost								
Autonomy	0.703							
Government Support	0.753	0.719						
Innovation Capability	0.852	0.771	0.712					
Proactive	0.752	0.767	0.739	0.758				
Risk-taking	0.728	0.783	0.748	0.790	0.792			
Scope of e-commerce Use	0.705	0.735	0.794	0.744	0.722	0.781		
Technological Readiness	0.768	0.713	0.786	0.725	0.704	0.789	0.703	

**Table 5**  
Structural model results.

Variables	Beta Value	T Statistics ( O/STDEV )	P Values
Adoption Cost -> Scope of e-commerce Use	0.202	3140	0.002 ***
Autonomy -> Innovation Capability	0.141	2343	0.019* ***
Government Support -> Scope of e-commerce Use	0.351	5657	0.000 ***
Innovation Capability -> MSMEs Performance	0.314	4458	0.000 ***
Proactive -> Innovation Capability	0.264	3872	0.000 ***
Risk-taking -> Innovation Capability	0.157	2035	0.042
Scope of e-commerce Use -> Innovation Capability	0.184	2792	0.005 ***
Scope of e-commerce Use -> MSMEs Performance	0.348	4705	0.000 ***
Technological Readiness -> Scope of e-commerce Use	0.222	3728	0.000 ***

Note:  
 \*\* significant 1 %.  
 \* significant 3 %.  
 \*\*\* significant 0.5 %.

environmental element taken into account in this study. If there is support, businesses won't employ technology (Lin and Luan, 2020); Manning, (Charfeddine et al., 2024). While some research (Khotimah and Budi, 2020) indicates that government funding affects technological adoption, other study (Hussain et al., 2022) finds no influence from the government. According to other studies, the government focuses on encouraging big businesses to utilize technology (Merhi and Ahluwalia, 2017). Therefore, there is a compelling need to carry out further research on how government support affects the adoption of technologies like e-commerce MSMEs. As previously explained, financial incentives, subsidies, and special programs designed to make it easier for small firms to use E-commerce technologies act as catalysts. Government Support has a path coefficient of 0.332 (Figure 3) on the Scope of E-commerce Use, indicating a significant and positive influence. This is the largest influence among other factors that affect the scope of e-commerce. These results support the hypothesis H3 that government support has a positive effect on the scope of e-commerce use. According to research by Cuijten et al. (Cuijten et al., 2024) government assistance—particularly in the form of money, tax breaks, and training initiatives aimed at small and medium-sized businesses—has a major impact on how successfully digital technology is used. Ifinedo also discovered that businesses are more likely to embrace and expand the usage of e-commerce technology when the government offers assistance in the form of digital infrastructure and supportive regulations. Government assistance, particularly in the form of internet access and technological infrastructure, facilitates small enterprises' adoption of e-commerce and broadens its application, as noted by Awa, Ojibo, and

Emecheta. The government is helping MSMEs get past early adoption hurdles and grow the scope of their E-commerce activity by funding website construction, cybersecurity measures, and training in digital skills. A legal and policy framework that fosters an atmosphere that is favorable for internet enterprises also helps to build consumer and company confidence and security. In addition to lowering the perceived risks connected with online shopping, this government backing creates an atmosphere that allows MSMEs to grow and develop. The positive effects of government and private sector collaboration are growing, generating synergies that propel MSMEs into the digital age. In summary, government assistance is essential for expanding MSMEs' usage of e-commerce since it gives them the boost they need to grow sustainably and remain competitive in the rapidly changing digital market.

**H4.** : Autonomy has a positive influence on innovation capability

This concept states that decision-making autonomy (a firm's ability to make decisions without strict external constraints) can encourage innovation. The greater the autonomy, the greater the firm's ability to innovate. One key element that has been shown to have a significant positive influence on small and medium-sized enterprises' (MSMEs') capacity for innovation is autonomy. High degrees of autonomy provide MSMEs the freedom to decide for themselves and look for creative solutions that are specific to their problems. Independence versus Innovation Capability: EO components can be understood by including them into a reflecting model. Alvarez-Torres, Lopez-Torres, and Schiuma (Alvarez-Torres et al., 2019) define autonomy orientation as the liberty to oversee staff and determine whether to introduce new goods or services. Only MSMEs, who have the freedom to create new goods, procedures, or business models, may innovate. Autonomy shows a path coefficient of 0.120 (Figure 3) on Innovation Capability. Although the effect is small, this value still shows a positive relationship. These results support the hypothesis H4 that autonomy has a positive effect on innovation capability, although not too large. Autonomy gives employees freedom in methods, resources, and time, allowing them to develop creative ideas. However, this effect is more optimal if supported by leadership that supports and encourages creativity (Nussbaum et al., 2021). Autonomy plays an important role in accelerating the strategic decision-making process in high-tech companies (Wei et al., 2025). Freedom of decision-making allows top management teams to recognize opportunities and implement new ideas more quickly. In a competitive environment, autonomy supports the development of innovative products by allowing teams to focus on exploiting opportunities efficiently. Autonomy in production-based learning provides space for students to develop ideas and innovations through the application of theory to direct practice (Shlyakhova et al., 2021). By providing the freedom to try and create new solutions, trainees can produce better innovations in an environment that supports flexibility and creativity. Research shows that the integration of learning with production activities in the field encourages the formation of innovation capabilities. Autonomy occurs in both individual and group contexts. Individuals with high autonomy tend to be more able to utilize their absorptive capacity to generate

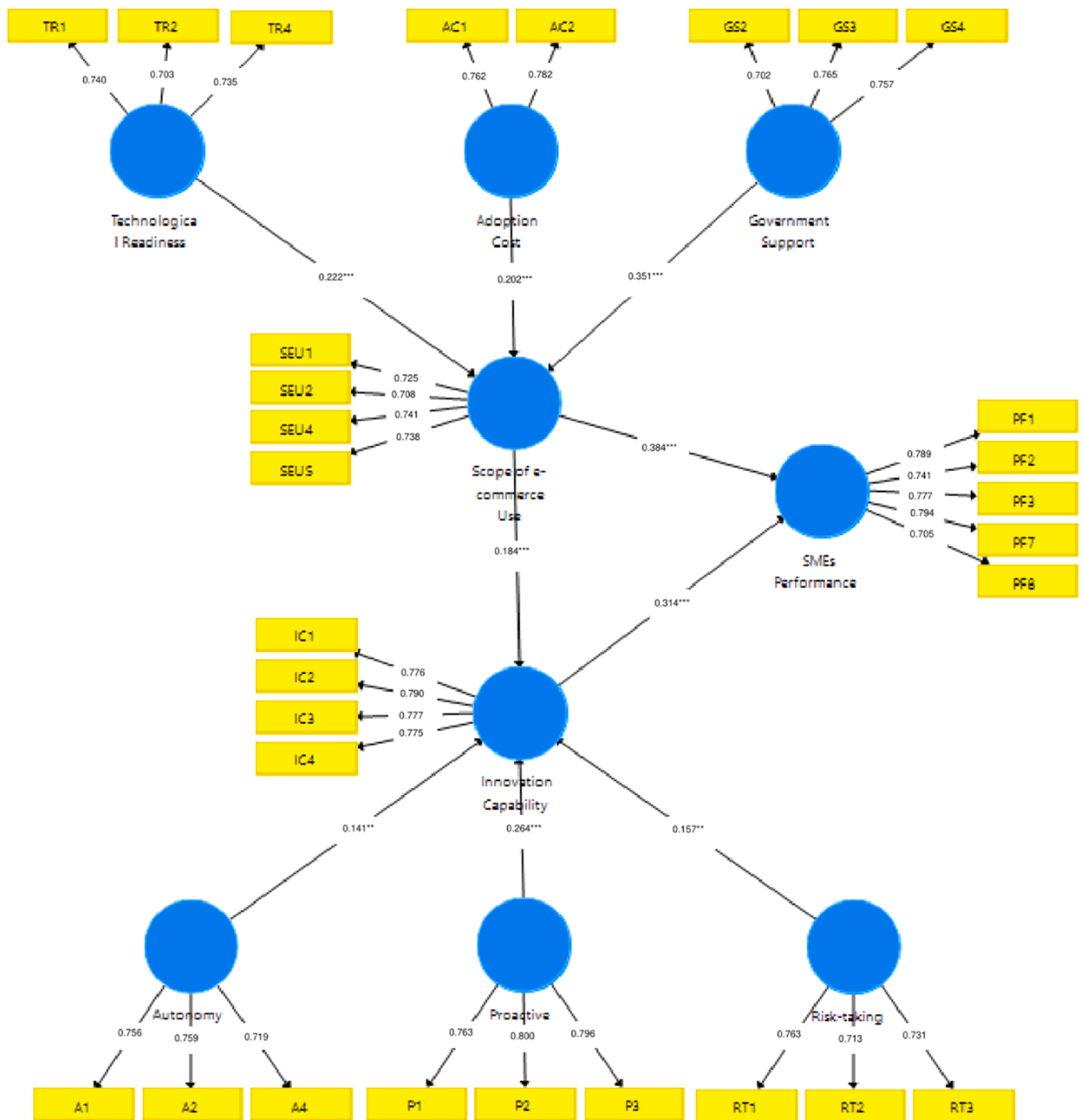


Fig. 2. Results research framework.

innovative ideas. This creates a more supportive work environment for innovation (Frate and Bido, 2024). Meanwhile, autonomy at the group level was found to have a synergistic effect with collective creativity on product innovation (Schwenk et al., 2014). Autonomy gives groups the freedom to explore and implement new ideas without being too constrained by organizational formalities. Autonomous MSMEs are more likely to explore new avenues for meeting market demands, push the limits of conventional procedures, and devote time and money to research and development. Furthermore, autonomy makes it possible for MSMEs to quickly respond to shifting market conditions and seize new possibilities. Because MSMEs with autonomy are more inclined to

experiment with novel ideas that have the potential to transform their industry, the flexibility to take risks and learn from failure becomes a fuel for innovation. Furthermore, autonomy encourages a sense of ownership in workers, motivating them to come up with creative solutions and take the initiative to propel the business forward. Essentially, autonomy is showing to be the primary factor behind MSMEs' increased capacity for creativity, enabling them to successfully negotiate complexity, welcome change, and establish a unique identity in the cutthroat economic world. However, excessive autonomy can divert focus from collective goals. This study emphasizes that a balanced combination of autonomy and collective creativity significantly



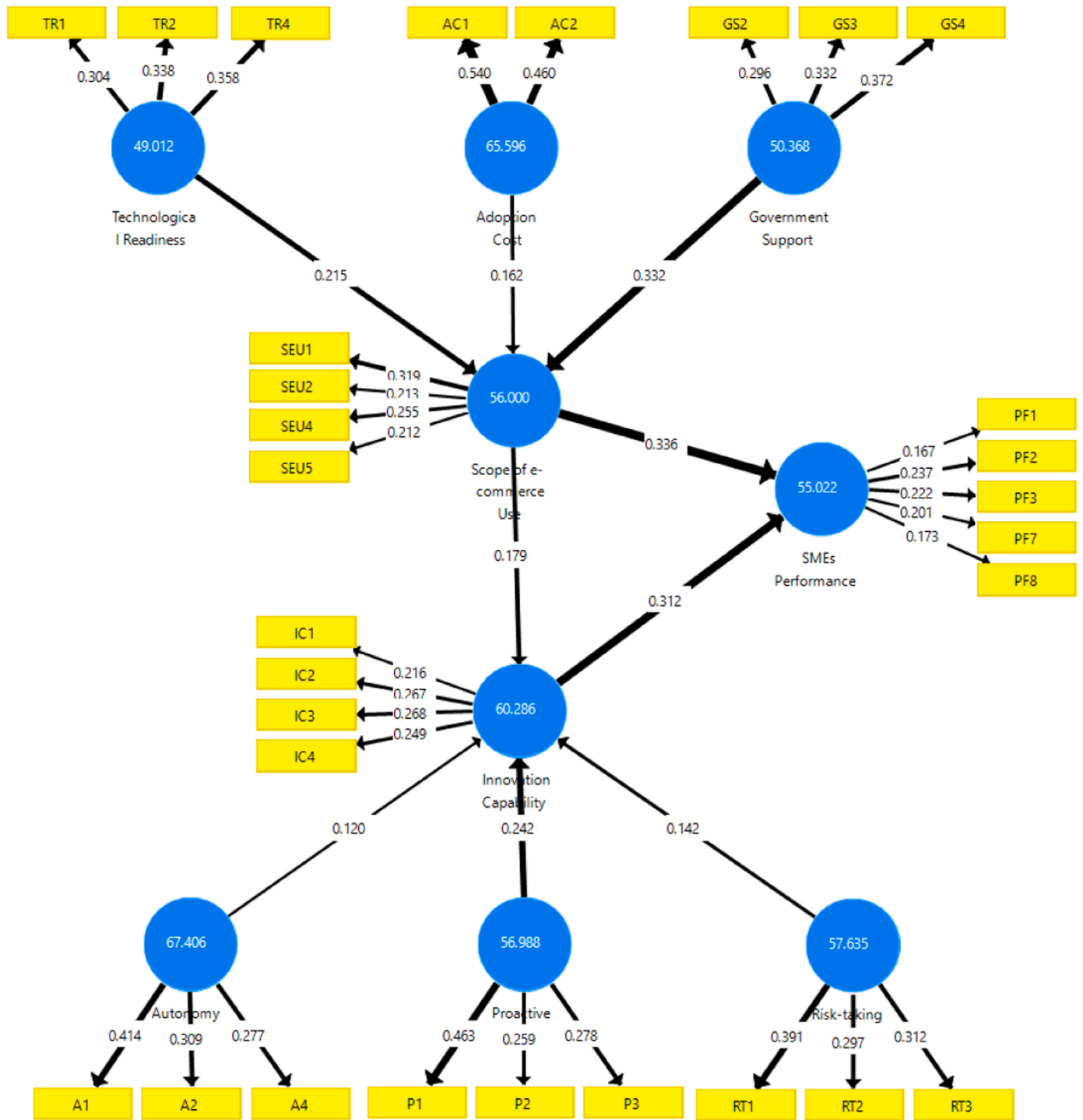


Fig. 3. Results of importance-performance matrix analysis.

increases product innovation. According to research by Hussain et al. (Hussain et al., 2022) decision-making autonomy enables businesses to react to market changes more swiftly and adaptably, which improves their capacity for innovation. According to Nurqamarani et al. (Nurqamarani et al., 2024) autonomy promotes experimentation and creativity within businesses, both of which are critical components in building innovation skills. Higher autonomy organizations typically exhibit greater operational innovation and are better able to adjust to changes in their surroundings. Individuals with the greatest degree of freedom can generate various creative notions more quickly in organizations with unrestricted access and autonomy (Saunila, 2020). This

autonomous strategy encourages innovation and trial spirit within the company.

**H5.** : Proactivity has a positive influence on innovation capability

Proactivity, or a company’s tendency to respond to and even anticipate market changes, is considered to increase innovation capability. Proactive companies tend to be more adaptive and better prepared to develop new products or services. In Small and Medium-Sized Enterprises (MSMEs), a proactive strategy is recognized as a potent accelerator to support innovative capabilities. MSMEs that are proactive show that they have a forward-thinking mentality by aggressively searching

for possibilities and spotting problems before they happen. Being proactive fosters an atmosphere that supports adaptation and ongoing learning, two qualities that are essential to a vibrant, creative culture. MSMEs that place a high priority on initiative are more likely to make R&D investments, keeping up with technology advancements and industry trends. Proactivity has a path coefficient of 0.242 (Figure 3) on Innovation Capability, which is a significant and positive influence. This shows that the more proactive a company is, the greater its innovation capability. These results support the hypothesis H5. Research (Nugroho et al., 2021) links proactivity through individual soft skills with increased innovation capability. Proactive individuals tend to be better able to take advantage of opportunities to learn and share knowledge in the organization, which creates a conducive environment for innovation. Proactivity also allows individuals to be more responsive to change, which is important in the era of the industrial revolution 4.0, strengthening the innovation capabilities of higher education institutions. Individual proactivity, such as taking the initiative, proposing creative solutions, and acting to change working conditions, are key drivers of innovation (Unsworth and Parker, 2002). Proactiveness also encourages calculated risk-taking, which is a necessary component of the innovation process. Risk-taking MSMEs are more inclined to try out novel concepts and out-of-the-ordinary tactics, which helps them develop their goods, services, and operational procedures. Additionally, a proactive mindset creates an environment where staff members are motivated to exchange ideas and participate in the innovation process, which not only benefits the leadership but also penetrates the entire company. In summary, proactiveness has a beneficial impact on MSME innovation skills, as evidenced by its ability to promote continuous development, welcome change, and establish the organization as a dynamic participant in the dynamic business environment.

Proactivity creates a more dynamic work environment where employees can generate new ideas and implement them. Proactivity allows organizations to react quickly to market changes and take advantage of opportunities through collaboration with alliance partners. The study also found that knowledge-based dynamic capabilities (KDC) act as a mediator in the relationship between alliance proactivity and competitive advantage. This underlines that proactive actions not only accelerate innovation but also increase competitiveness. It is also supported that proactivity allows employees to be more engaged in their work, generate innovative solutions, and adapt to changing organizational needs (Nathaniel and Dewi, 2024). MSMEs cannot be innovative if they don't keep creating new goods, processes, or business plans. Similarly, corporations cannot adopt a proactive approach if they do not venture into new markets and forecast future demand. Proactivity and innovation are related to one another. More innovation is produced by proactive corporate management (Joshi et al., 2024). They are at the vanguard of innovation because of their constant quest for knowledge and insight, which makes them more adept at seeing market gaps and coming up with original solutions.

#### H6. : Risk-taking has a positive influence on innovation capability

Risk-taking, or the courage to face opportunities in strategic decision-making, can increase a company's innovation capability. With the readiness to take risks, companies are more likely to conduct experiments that can produce new innovations. Taking risks is crucial to enhancing Micro, Small, and Medium-Sized Enterprises' (MSMEs) capacity for innovation. Despite the common perception that risk is bad or frightening, MSMEs can greatly benefit from taking calculated and wise risks in order to strengthen their capacity for innovation. In addition, taking chances can inspire originality and creative thought. MSMEs are urged to think creatively and find novel solutions to problems when they encounter risks or difficulties. For instance, MSMEs who are willing to take chances may come up with original marketing plans or produce goods that set them apart from the competitors in the face of fierce rivalry or shifting market trends. Taking chances can therefore be a catalyst for innovation that gives MSMEs a competitive edge. Moreover,

taking chances promotes quicker learning and development for MSMEs. MSMEs that take chances and fail might learn from their mistakes, strengthen their plans, and obtain fresh perspectives. MSMEs can learn to deal with failure more adeptly and lessen their fear of it by taking risks. Failure is a necessary element of the innovation process. This enables them to carry out more experiments, gain knowledge from past mistakes, and gradually enhance their capacity for invention. Risk-taking has a path coefficient of 0.142 (Figure 3) on Innovation Capability, which shows a positive and significant influence. This supports the hypothesis H6 that the courage to take risks has a positive effect on innovation capability. MSMEs that are willing to take risks by investing in new technologies, entering new markets, and developing new products can improve their innovation capabilities (Dahlan et al., 2023). Support from the government through financial access and business training can help MSMEs manage risks to improve their innovation capabilities. Actions such as making uncertain business decisions, but potentially providing high returns, encourage innovation in products and services. In this study, risk-taking showed a significant positive effect on business performance, indicating that the courage to take risks allows MSMEs to take advantage of unexplored market opportunities (Theresa and Hidayah, 2022). Taking risks is regarded as a crucial component of contemporary business dynamics and is thought to enhance an organization's capacity for innovation. This indicates that while having the guts to take chances might lead to new opportunities and inspire the development of innovative ideas, it is not always a direct or substantial component in raising the capacity for creativity. This can be brought on by a number of different elements, including organizational culture, the availability of resources, and management's skill in risk management—all of which are essential elements that propel innovation. Hence, even when taking risks is crucial, a comprehensive and integrated strategy is still required to genuinely increase an organization's capacity for innovation. The study's findings revealed nothing noteworthy. The Resource-Based View (RBV) theory provides an explanation for this. The internal resources and capacities of MSMEs are the main emphasis of this approach. Risk-taking isn't always important in this situation. MSMEs might not have the resources to take the necessary risks to innovate because of their restricted resources. For instance, even if an MSME in the food industry wants to take risks, they can be reluctant to invest the necessary funds in innovation if they do not have enough cash available. Risk-taking is an important element of MSME business sustainability, especially in creating new innovations (Dahlan et al., 2023). By facing uncertainty and taking strategic risks, MSMEs can create new products and services that meet customer needs. In addition, risk-taking increases MSMEs' competitiveness by allowing them to adapt quickly to market changes. In general, taking risks significantly improves MSMEs' capacity for innovation. MSMEs may foster an environment that encourages experimentation and creativity and generates profitable innovation by taking calculated risks. As a result, it's critical that MSMEs embrace risk-taking, think through potential consequences, and have the guts to take the required actions to realize their creative potential.

#### H7. : Scope of E-commerce use has a positive effect on Innovation Capability

The scope of e-commerce use is considered to contribute to a company's innovation capability. E-commerce provides data and networks that allow companies to identify new opportunities, thereby strengthening innovation capability. Micro, Small, and Medium-Sized Enterprises' (MSMEs') usage of e-commerce affects their capacity for innovation in addition to serving as a tool for transactional purposes. Because e-commerce is so widely used, MSMEs can expand their capacity for innovation in a number of ways. First of all, e-commerce gives MSMEs more access to markets and market data. MSMEs can gain a better understanding of consumer buying patterns, market trends, and client requirements by leveraging e-commerce platforms. MSMEs can use this data to find new business opportunities, assess market demand,

and come up with creative ideas for creating goods and services that better meet the demands of their target audience. For instance, MSMEs might identify unfilled market gaps and develop innovative solutions to address these demands by analyzing e-commerce data. In addition, e-commerce enables MSMEs to obtain insightful feedback and boost client involvement. Online client contacts, be they via social media, e-commerce platforms, or other communication tools, allow MSMEs to get direct feedback regarding customer happiness, requests for new products, and even issues that customers are having. These comments may serve as an inspiration for fresh ideas or upgrades to already-released goods. MSMEs may enhance their competitiveness in the market and forge closer bonds with their clients by listening to their input and acting promptly. Scope of E-commerce Use has a path coefficient of 0.179 (Figure 3) on Innovation Capability, indicating a significant positive influence. This supports the hypothesis H7 that the scope of e-commerce use has a positive influence on innovation capability. This means that the wider the use of e-commerce by MSMEs, the greater their ability to innovate. Charfeddine et al. (Charfeddine et al., 2024) discovered that businesses are more able to develop their procedures, goods, and marketing tactics the more e-commerce technologies they utilize. E-commerce technology offers resources and instruments that facilitate quicker and more effective innovation. According to Penagos Guzman and García Solarte (Penagos Guzman and García Solarte, 2024), widespread e-commerce use promotes improved external partner collaboration, which can boost innovation capabilities by increasing access to fresh concepts and outside resources. Because they have more access to broader markets and technologies that encourage innovation, MSMEs that use e-commerce more frequently have been shown to be more inventive in their business operations and marketing tactics.

Adoption of e-commerce enhances the innovation capability of MSMEs by expanding access to information and markets (Damiyana et al., 2024). By using e-commerce, MSMEs can manage information better, improve business performance, and create an environment for sustainable innovation. E-commerce enables MSMEs to accelerate their product and service innovation process, thereby increasing their competitiveness in local and global markets.

The use of e-commerce by MSMEs contributes to increased operational efficiency and marketing performance (Yusgiantoro et al., 2019). In the context of innovation, e-commerce provides MSMEs with the ability to integrate digital technology with their business processes, which drives innovation in products, services, and the way they interact with customers. e-commerce creates opportunities to increase financial inclusion, which in turn drives sustainable innovation (Yusgiantoro et al., 2019). The TOE (Technological, Organizational, and Environmental) framework to explain how e-commerce supports MSME sales growth through technological innovation. E-commerce technology introduces MSMEs to digital platforms that expand their market reach and enable them to design innovative strategies, such as digital marketing campaigns and product customization based on customer feedback (Tirtana et al., 2022). Thus, e-commerce becomes a major catalyst for MSMEs' innovation capabilities.

**H8.** : Scope of E-commerce Use has a positive influence on firm performance

This hypothesis states that the wider the use of e-commerce, the greater the impact on company performance. E-commerce can improve operational efficiency, expand market reach, and provide access to a wider range of consumers, all of which have the potential to improve business performance. In the business sector, e-commerce, or electronic commerce, has become revolutionary, particularly for MSMEs, or micro, small, and medium-sized enterprises. Due to e-commerce's broad application, MSMEs have a lot of opportunity to grow their businesses. Improved business performance is one of the key benefits of MSMEs using e-commerce. First of all, MSMEs may access a larger market through e-commerce than they can if they just rely on traditional sales in physical places. Scope of E-commerce Use shows a path coefficient of

0.336 (Figure 3) on MSMEs Performance, which is a significant and positive influence. These results support the hypothesis H8 that the scope of e-commerce use has a positive influence on company performance. The greater the use of e-commerce, the better the performance of MSMEs. According to Zhu and Kraemer's (Zhu and Kraemer, 2005) research, e-commerce adoption has a direct correlation with a firm's performance, both in terms of operational effectiveness and market accessibility. According to Li et al., businesses can enhance their performance by utilizing e-commerce effectively to increase market access, facilitate improved client interactions, and become more competitive through technology-driven tactics. In their research on MSMEs in Malaysia, Ainin et al. (2015) discovered a favorable correlation between e-commerce use and higher sales, cost effectiveness, and market expansion—all of which improve company performance. The presence of an e-commerce platform allows MSMEs to transcend national borders and connect with clients throughout the globe. As a result, MSMEs are able to raise sales, improve their market share, and directly support the rise in corporate revenue. In addition, using e-commerce helps MSMEs drastically cut their operating expenses. E-commerce is frequently more affordable than traditional enterprises, which need substantial investments for things like business space renting and other running expenses. Using an effective e-commerce platform can help MSMEs cut labor, storage, and promotional costs. MSMEs can thereby improve their financial performance and profit margins.

Beyond its function as a transactional instrument, e-commerce enables MSMEs to leverage data and analytics to enhance their comprehension of markets and consumer behavior. MSMEs can improve their marketing strategy, pricing, and product development by gathering and evaluating transaction data, consumer preferences, and market trends. In a market where competition is escalating, this aids MSMEs in staying relevant and competitive. MSMEs may access a wider audience, cut expenses associated with operations, boost productivity, and make better use of data to inform decisions by employing e-commerce skillfully. Thus, in order to achieve long-term growth and success, MSMEs must comprehend the potential of e-commerce and incorporate it into their business plan. The performance of businesses is improved by the usage of e-commerce. Information technology utilization has been found to enhance business performance in the past (Hussain et al., 2022; Nwankpa and Roumani, 2016; Wixom et al., 2013). In order to thrive and contend in the digital age, businesses need to innovate technologically (Hussain et al., 2022). Consequently, in the digital age, implementing new technology can boost a company's operational efficiency and competitiveness (Wardoyo et al., 2018). Previous studies have shown that companies may speed up internal procedures while lowering transaction costs (Hussain et al., 2022). All things considered, it can be said that the extent of e-commerce usage significantly improves MSME business performance.

**H9.** : Innovation capability has a positive influence on firm performance

Innovation capability is assumed to have a positive effect on company performance. Companies that are able to innovate tend to be more competitive, can respond better to market demands, and ultimately achieve higher performance. One of the most important characteristics that separates Micro, Small, and Medium-Sized Businesses (MSMEs) from successful ones is innovation. Innovation Capability has a path coefficient of 0.312 (Figure 3) on MSMEs Performance, indicating a significant and positive influence. This supports the hypothesis H9 that innovation capability has a positive influence on company performance. The more innovative the MSMEs are, the greater the impact on improving performance. High innovation capability has been proven to be positively correlated with improved business performance, both financially and non-financially (Cuijten et al., 2024). Innovation enables MSMEs to create added value through new products and services that meet market needs, which ultimately improves their financial performance and competitiveness (Saffitri and Maryanti, 2021). Innovation

helps MSMEs to develop technology, improve product quality, and run attractive promotions (Mohammad et al., 2019). In addition, MSMEs that can innovate continuously are better able to stay relevant and adjust to changes in the market and in technology. MSMEs who can effectively use information and communication technology will have a major competitive edge in the increasingly complex digital environment. For example, MSMEs can increase their market reach without incurring major additional costs by utilizing e-commerce platforms or implementing digital solutions to enhance operational efficiency. The cognitive constraints that people or organizations encounter when engaging in open innovation are characterized by bounded rationality in open innovation dynamics (Cuijten et al., 2024). They are unable to efficiently process all of the information available to them in order to manage collaboration and innovation. Innovation that arises from open collaboration to address social issues is known as open social innovation (Chesbrough and Di Minin, 2014). Communities, businesses, and people all freely participate in developing cooperative solutions that prioritize social welfare and group advantages. Open innovation dynamics show how organizations can adopt new technologies, increase efficiency, and generate added value through communal innovation through open cooperation.

MSMEs can use new techniques to manufacture goods or services since they have the ability to innovate (Tereshchenko et al., 2024). MSMEs' business survival and future success are ensured by such behavior (Tereshchenko et al., 2024). As a result, it's critical that MSMEs maintain their innovative culture, provide adequate funding for research and development, and foster an atmosphere that encourages experimentation and responsible risk-taking. MSMEs can improve their position in the market, become more competitive, and maximize their financial performance in this way. With higher innovation capabilities, MSMEs can improve their operational standards, which helps them stay competitive in the market. Innovation capabilities are an important component that improves MSME performance through synergy with entrepreneurship, marketing capabilities, relationship capital, and empowerment. By utilizing innovation, MSMEs can meet the growing needs of customers and increase competitiveness in local and international markets (Nugroho et al., 2021).

## Conclusions

This study aims to identify and elicit key factors influencing the performance of MSMEs in the food sector, focusing on two main variables: scope of e-commerce use and capacity for innovation. Factors proposed as important determinants include technological readiness, implementation costs, government support, autonomy, proactivity, and risk-taking. Technological readiness and implementation costs influence the extent to which MSMEs can utilize e-commerce, while government support plays a role in facilitating an environment that supports the implementation of this technology. On the other hand, autonomy, proactivity, and risk-taking factors enhance the innovation capacity of MSMEs, allowing them to adapt, experiment, and create unique added value in market competition. A deeper understanding of the interactions between these variables is expected to provide strategic insights to improve the competitiveness and performance of food MSMEs in the digital era. A conceptual framework suited to each major variable influencing MSME performance is used to further study the elements that are antecedents of the breadth of e-commerce adoption and innovation capability. Additionally, this study makes use of smartPLS software and structural equation modeling (SEM) analysis methodologies. The breadth of the research is innovative since it makes use of the Technology, Organizational, and Environmental (TOE) Frameworks for the e-commerce use variable and the Entrepreneurial Orientation Conceptual Framework for the innovation capability variable.

MSMEs' food industry is essential to the advancement of economic growth via e-commerce because it allows for constant expansion and adaption in a quickly changing digital environment. Many MSMEs

initially view the expenses of implementing e-commerce as a financial hardship. But these expenses ought to be seen as a calculated risk that will greatly expand their market reach and internet visibility. Food MSMEs should place a high priority on creating user-friendly websites, putting safe payment methods in place, and participating in efficient digital marketing if they want to successfully expand their e-commerce capabilities. Through the utilization of open-source technology and cloud-based platforms, food MSMEs can optimize their e-commerce potential and reduce total implementation costs. Their heightened accessibility gives them a competitive advantage in the digital marketplace, opens up new revenue streams, and cultivates consumer loyalty. A strategic approach to adoption cost management enables these businesses to leverage e-commerce as a potent instrument for enduring and expanding within a digital economy. In addition, government support is crucial in assisting MSMEs in overcoming the preliminary obstacles to e-commerce adoption by offering funding for website construction, cybersecurity precautions, and training in digital skills. Their ability to extend their e-commerce activities depends on this backing. The independence granted to food MSMEs promotes creativity and risk-taking since companies that are allowed to try new things are more inclined to look into innovative ideas that have the potential to revolutionize their sector. It's critical to foster an innovative culture in food MSMEs where staff members are encouraged to contribute ideas and take part in the innovation process. The organization is infused with this proactive mentality, which promotes an openness to new ideas that improve services, goods, and operational procedures. In the end, food MSMEs that embrace innovation and e-commerce are better positioned to prosper in a digital economy that is becoming more and more competitive.

Implications for food sector MSMEs in Indonesia can take advantage of e-commerce platforms to increase the visibility of their products nationally and internationally. By choosing a platform that suits their needs and capacities, MSMEs can increase market access and sales. MSMEs need to allocate resources for research and development of new products that can meet growing market needs. By innovating in products and production processes, MSMEs can increase their competitiveness and relevance in the market. Additionally, developing partnerships with other stakeholders, such as local raw material producers, distributors, or even technology companies, can help MSMEs to access additional resources and enhance their innovation capabilities.

The implication for the government is that the government needs to continue to improve digital infrastructure in all regions, including fast and affordable internet access and digital training for MSMEs. This will help MSMEs adopt e-commerce more effectively. The government can also develop special support and training programs for MSMEs in the food sector in terms of e-commerce management and product innovation development. This can help MSMEs improve their ability to utilize technology and innovate. Lastly, the government can work with financial institutions to provide easier access to financing for MSMEs who want to develop or expand their operations through e-commerce and innovation. By implementing these practical implications, it is hoped that MSMEs in the food sector in Indonesia can improve their performance through effective use of e-commerce, development of innovation capabilities, and support from the government. This will help strengthen the competitiveness of MSMEs in an increasingly competitive global market. The limitations of this study are that the sampling was intentional and calculations for infinite samples were not used. Future studies are expected to use probability sampling techniques to increase the generalizability of the results. In addition, sample calculations based on infinite populations can be considered to determine a more accurate sample size, thus providing a better representation of the population.

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## Ethical Statement

This study was conducted in accordance with ethical standards as outlined by the University of Surabaya, and was approved under protocol number 186/ST-Lit/LPPM-01/FBE/XII/2023. Informed consent was obtained from all participants involved in the study, ensuring their voluntary participation and confidentiality of their personal information. The research adhered to the principles of the Declaration of Helsinki, and all procedures were performed with the highest ethical considerations in mind. The authors declare that there is no conflict of interest regarding the publication of this paper.

## CRedit authorship contribution statement

**Andri Rianawati:** Writing – review & editing, Writing – original draft, Software, Methodology. **Muhammad Izharuddin:** Writing – review & editing, Writing – original draft, Visualization, Software, Resources, Project administration, Investigation. **Zunairoh Zunairoh:** Writing – review & editing, Writing – original draft, Validation, Resources, Project administration, Formal analysis, Data curation, Conceptualization. **Liliana Inggrit Wijaya:** Writing – original draft, Visualization, Supervision, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

## Declaration of Competing Interest

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

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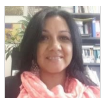
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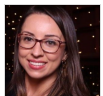
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