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Small and medium-sized enterprises dynamic capabilities and competitive advantage: The mediating effect of digitalization

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ABSTRACT

Objective: The aim of the article is to examine the interplay among dynamic capabilities, digitalization, and competitive advantage, with a specific focus on exploring the mediating influence of digitalization in the relationship between dynamic capabilities and competitive advantage among small and medium-sized enterprises (SMEs) in the Indonesian context.

Research Design & Methods: We utilized a survey method for the collection of primary data. The respondents were SME founders in the provinces of Central Java and North Kalimantan, Indonesia, with a minimum of one year of business engagement. Moreover, we utilized Partial Least Squares Structural Equation Modelling (PLS-SEM) analysis on 230 collected responses to examine the proposed hypotheses on the relationships among dynamic capabilities, digitalization, and competitive advantage.

Findings: We found that dynamic capabilities, except for coordinating capability, positively influence the implementation of digitalization. This highlights the role of these capabilities in utilizing digital technologies effectively. The study also revealed a positive relationship between digitalization and SME competitive advantage. Furthermore, the study showed the significant role of digitalization in mediating the associations between sensing capability, learning capability, integrating capability, and competitive advantage. These findings underscore the importance of developing dynamic capabilities to facilitate digitalization for enhancing competitive advantage in the digital era.

Implications & Recommendations: The study's implications for SMEs seeking to enhance competitive advantage through digitalization include the importance of improving sensing capability for market understanding, cultivating a learning culture for employee tech updates, and strengthening integrating capability by seamlessly incorporating digital technology into existing processes and functions.

Contribution & Value Added: While many studies have concentrated on evaluating the direct impact of dynamic capabilities on firm competitive advantage or exploring different mediating factors, this research explored the indirect effects of SME's dynamic capabilities on competitive advantage, delving into digitalization's mediating role.

Article type: research article

Keywords: dynamic capability; competitive advantage; digitalization; SME; Indonesia

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INTRODUCTION

Small and medium-sized enterprises (SMEs) play a crucial influence in driving economic development around the world (Lin *et al*., 2022), not to mention the emerging economies. This is particularly notable in Indonesia, where SMEs represent nearly 99% of business units, contribute approximately 60.5% to

the Gross Domestic Product (GDP), and employ approximately 96.9% of the national labour force (Limanseto, 2022). However, the rapidly changing business environment has led to increased market volatility, posing challenges to the resilience of these SMEs (Onngam & Charoensukmongkol, 2023). The challenges are often more pronounced in emerging markets, especially among those operating within traditional industries (Chen *et al*., 2016). Limited financial resources further exacerbate these hurdles, particularly in comparison to their larger counterparts (Ratanavanich & Charoensukmongkol, 2023). This phenomenon underscores the need for SMEs to concentrate on developing appropriate strategies to endure in an increasingly competitive environment (Nyamrunda & Freeman, 2021).

Globalization is one of major challenges encountered by SMEs. While globalization presents new opportunities, it is important to acknowledge that without appropriate strategies, the benefits of globalization might not be uniformly accessible to all nations and organizations (Skare & Riberio Soriano, 2021). The challenges of globalization evolve over time, propelled by the rapid advancement of digital technology, and continues to reshape the competitive landscape. While in the past, enterprises competed only within their geographic boundaries, in the digital era, these geographical limitations have been eroded, allowing competitors of an enterprise to emerge from locations around the world (Ariansyah & Nuryakin, 2019). In the current globalized economy, enterprises encounter multiple competitive challenges, including the sustainability challenge, the global challenge, and the technological challenge (Noe *et al*., 2017). Such a situation brings tougher consequences for enterprises in developing economies (Jean *et al*., 2010).

Furthermore, the emergence of COVID-19 at the begining of 2020 has worsened the business landscape. Various responses undertaken by governments to this unforeseen condition, including lockdowns, social distancing protocols, and the cessation of physical business operations, lead to a significant contraction of global business activities (Soto-Acosta, 2020). In particular, SMEs have faced significant challenges and adverse impacts compared to larger enterprises due to their relatively limited financial resources, asset ownership, and productivity levels (OECD, 2020). Kalemli-Ozcan *et al*. (2020) found that a significant number of SMEs worldwide, ranging from 45% to 53%, experience financial debt due to the pandemic. In Indonesia, a survey by Katadata Insight Center (KIC) unveiled that the Covid-19 pandemic had detrimental effects on 82.9% of SMEs (Setyowati, 2020). Subsequently, a more recent survey by Bank Indonesia showed that 87.5% of the surveyed SMEs encountered unfavourable consequences of the COVID-19 pandemic (Bank Indonesia, 2022). In such a situation, resilience extends beyond the entrepreneur personally and encompasses the adaptability of their business model, strategy, and value creation efforts (Elo *et al*., 2022).

These constantly dynamic and challenging circumstances necessitate organizations, including SMEs, to enhance their adaptability and proactively adjust their business processes (Kuuluvainen, 2012) to sustain their competitive advantage and ensure their survival. This adaptive measure is commonly referred to as dynamic capabilities, which involves the utilization and management of resources to create value in a rapidly changing business environment (Teece *et al*., 1997). Dynamic capabilities enable enterprises to analyse the reasons behind technological changes and reconfigure their resources to integrate competent and less competent elements, ultimately generating significant value. In essence, SMEs need to adjust their resources to stay competitive in the evolving business environment, necessitating dynamic capabilities (Papadopoulos *et al*., 2020). This notion finds support in numerous empirical studies that have demonstrated the favourable impact of dynamic capabilities on the performance and competitive advantage of SMEs (Ahmad *et al*., 2022; Anggadwita *et al*., 2023; Dejardin *et al.*, 2023; Heredia-Portillo & Armas-Arévalos, 2023; Hernández-Linares *et al*., 2021; Martins, 2023).

Diverging from the above literature who asserted a direct connection between dynamic capabilities and competitive advantage, Cepeda and Vera (2007), Eisenhardt and Martin (2000), Helfat and Peteraf (2003), Pavlou and El Sawy (2011), Pundziene *et al*. (2021), and Prange and Verdier (2011) collectively contribute deeper conceptual and empirical insights into the dynamic capabilities and firms' competitive advantage relationship. Their findings suggest that these capabilities commonly exert an indirect influence on a firm's performance and competitive advantage. Cepeda and Vera (2007), Eisenhardt and Martin (2000), Protogerou *et al*. (2012), and Wilden *et al.* (2013) further suggest that the relationship between a firm's dynamic capabilities and its overall performance and competitive

advantage is mediated by the firm's operational capabilities, defined as a firm's capacity to conduct its daily activities effectively (Pavlou & El Sawy, 2011). Analysing the variable's mediating function – in this case operational capability – is essential for understanding the mechanisms or processes by which dynamic capabilities impact SME's competitive advantage. Recent research has delved into several factors that mediate the correlation between dynamic capabilities and competitive advantage as well as performance. These include organizational ambidexterity (Jurksiene & Pundziene, 2016), marketing and management capability (Ferreira & Coelho, 2017), innovation capability (Ferreira *et al*., 2020), and open innovation (Pundziene *et al*., 2021). While operational capabilities can take various forms, this current study posits digitalization as one of these capabilities as it enhances daily activities in a more effective and efficient manner. Digitalization refers to the capacity to utilize digital technologies to reshape a business model, thereby opening up new avenues for generating revenue and creating value (Bloomberg, 2018), reflecting the innovative integration of digital tools and strategies into the core business' operations. While existing literature acknowledges the connection between dynamic capabilities and firm digitalization, as suggested by Ellström *et al.* (2021), and recognizes the positive impact of digitalization on firm performance (Cheng *et al*., 2023; Masoud & Basahel, 2023; Vial, 2019), existing empirical research has not thoroughly expounded on the role of digitalization in mediating the relationship between dynamic capabilities and competitive advantage, especially within the context of SMEs. While a study by Vo Thai *et al*. (2024) does explore the mediating role of digitalization, the focus is primarily on the relationship between dynamic capabilities and business model innovation, as well as sustained performance.

Against the background, we aimed to address the identified research gap by proposing and examining a model that elucidates the connections among dynamic capabilities, digitalization, and competitive advantage. It specifically investigates the mediating role of digitalization in the relationship between SMEs' dynamic capabilities and competitive advantage. This focused investigation represents a significant contribution and offers additional insights into optimizing SME strategy development and business adaptation amidst rapid market changes to ensure sustained competitiveness. Firstly, we addressed a previously overlooked theoretical gap by empirically examining the connection between dynamic capabilities and a firm's competitive advantage with a specific emphasis on digitalization's mediating role. Secondly, the findings contribute to research on SME digitalization and competitive advantage, presenting evidence of the positive impact of digitalization on SMEs' competitive positioning. Thirdly, the research results enhance the understanding of SME owners, particularly those in developing countries grappling with the challenges of an evolving business environment, by offering insights into achieving competitiveness through the enhancement of their dynamic capabilities and processes of digital transformation. To fulfil these objectives, we utilised a survey method to gather primary data from SME founders located in Central Java and North Kalimantan provinces, Indonesia, each having at least one year of business involvement. Furthermore, the study employed Partial Least Squares Structural Equation Modeling (PLS-SEM) analysis on a dataset comprising 230 responses to evaluate the proposed hypotheses concerning the interplay among dynamic capabilities, digitalization, and competitive advantage.

The subsequent sections are organized as follows: The second section will delineate the literature review and the hypotheses development, offering a synthesis of relevant theories and previous research findings. The third section will provide the research method utilized in this study. The fourth section will present results and discussion. Finally, the fifth section will provide a conclusive summary of the paper.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Dynamic Capability

The concept of dynamic capabilities is based on Schumpeter's (1934) idea of innovation-driven competition, where competitive advantage is achieved through the creative destruction and novel recombination of existing resources. These ideas were further refined in various academic works, such as configuration competence (Henderson & Cockburn, 1994), and combinative capabilities (Kogut & Zander, 1992). Building on preceding research, Teece *et al*. (1997) provided a comprehensive exploration of dynamic capabilities, with their seminal paper recognized as a highly influential source in the field.

Teece's (2007) recent framework on dynamic capabilities further contributes to shaping the discourse in this area. According to Teece and colleagues (Teece, 2007; Teece *et al*., 1997), competitive advantage in dynamic and unpredictable environments is contingent on a firm's dynamic capabilities rather than its competitive positioning or industry conflict.

Dynamic capability refers to a firm's proficiency in seamlessly incorporating, constructing, and adapting both internal and external capabilities to address rapidly changing environments (Teece *et al*., 1997). Dynamic capabilities align with Barney's (1991) resource-based view (RBV), a framework that has garnered significant attention in management, operations, and innovation studies. The RBV explains how organizations use their internal resources and capabilities to attain a competitive advantage and achieve exceptional performance in a constantly evolving business environment (Akenroye *et al*., 2020; Sousa-Zomer *et al*., 2020). While the RBV focuses on resource picking, which involves selecting and assembling specific combinations of resources, dynamic capabilities highlight resource renewal. These capabilities enable enterprises to sense environmental changes, seize emerging opportunities, and transform their business strategies and operations (Eisenhardt & Martin, 2000). In the context of SMEs, dynamic capabilities are particularly relevant due to their resource constraints and inherent flexibility. Often, SMEs face limited resources, which can be a challenge in the face of dynamic markets. However, dynamic capabilities enable SMEs to leverage their existing resources and build new capabilities, allowing them to compete effectively with larger competitors (Eisenhardt & Martin, 2000; Teece, 2014).

According to Pavlou and El Sawy (2011) and Matarazzo *et al*. (2021), dynamic capabilities encompass four dimensions, including sensing, learning, integrating, and coordinating capabilities. Sensing capability involves the organization's ability to detect changes in the business environment, including market trends and customer needs, enabling proactive responses to changes. Learning capability includes the ability to learn from experiences and new information, allowing organizations to develop deep knowledge and sustainable adaptation. Integrating capability involves the integration of internal and external resources to create value and innovation. Meanwhile, coordinating capability focuses on the organization's ability to manage and coordinate various internal elements to work synergistically. Overall, these four dimensions of dynamic capabilities unite to create organizations that are responsive, capable of learning, adapting, and innovating in the face of business environmental dynamics (Mikalef & Pateli, 2017; Teece, 2020).

Digitalization

As articulated by Bukht and Heeks (2017), digitalization refers to the utilization of digital technology to reconfigure the societal, economic, and cultural dimensions of existence. Furthermore, within the realm of enterprises, digitalization, as expounded by Bloomberg (2018), involves leveraging digital technologies to transform a business model, thereby introducing new channels for revenue generation and value creation. In contemporary business and leadership discourse, digitalization, alongside agility, resilience, and sustainability, is gaining traction, especially during turbulent times. Embracing strategically agile processes, enabled by digitalization, promotes proactive strategic resilience, facilitating the pursuit of opportunities amid change (Florek-Paszkowska *et al*., 2021). Digitalization, functioning not only within large enterprises but also as a pivotal business strategy, has gained escalating significance for SMEs aiming to uphold competitiveness within the contemporary digital age. Moreover, digitalization constitutes a vital strategy during crises. A survey by Bank Indonesia highlights that 12.5% of SMEs managed to sustain themselves throughout the pandemic, specifically those that successfully embraced digitalization (Victoria, 2021). By leveraging digital technologies, SMEs can explore new revenue streams, create disruptive business models, and develop innovative products and services. To execute the strategy, companies need a digital transforming capability (Warner & Wäger, 2019). SMEs need to integrate digital technologies and platforms into their value chain activities to drive business growth, innovation, and transformation. This enables SMEs to leverage digital tools and capabilities to enhance their operational efficiency, expand their market reach, and create new value propositions for customers (Westerman *et al*., 2014). Research has shown that the effective integration of digital technologies in areas such as production, marketing, sales, and customer service can lead to improved operational

performance and sustainable competitive advantage (Bharadwaj *et al*., 2013; Fonseka *et al*., 2022). However, the successful implementation of the digitalization requires SMEs to develop digital capabilities and cultivate a digital mindset within their organizations. SMEs with strong digital capabilities are better equipped to adapt to digital disruptions, seize emerging opportunities, and navigate the challenges of digital transformation (Bharadwaj *et al.*, 2013).

Competitive Advantage

Competitive advantage refers to the degree to which an organization can establish a strong and defendable position in relation to its competitors (Lo & Tian, 2020). Meanwhile, Farhikhteh, Kazemi, Shahin, and Shafiee (2020) define competitive advantage as the company's ability to create and sustain higher added value compared to its competitors over an extended period. It represents the unique qualities and strengths that enable a company to outperform others in the marketplace, allowing it to achieve superior performance and long-term success. Competitive advantage is a critical concept in strategic management and its significance for SMEs has garnered considerable attention in the literature. Various scholars have explored the sources and determinants of competitive advantage for SMEs, highlighting the unique characteristics and challenges faced by these organizations.

According to Porter's (1985) generic strategies framework, SMEs can achieve competitive advantage by either pursuing cost leadership or differentiation strategies. Cost leadership entails offering products or services at lower costs compared to competitors, while differentiation involves providing unique and valued offerings to customers. Both strategies can contribute to SMEs' competitive positioning in the market. In addition to Porter's framework, the resource-based view (RBV) offers insights into the sources of competitive advantage for SMEs. The RBV suggests that SMEs can gain a competitive edge by leveraging their unique resources and capabilities (Barney, 1991). These resources can include tangible assets like technology, equipment, or location, as well as intangible assets such as knowledge, reputation, and customer relationships. By effectively leveraging and deploying these resources, SMEs can differentiate themselves and create value for customers.

The Relationships of Dynamic Capability, Digitalization, and Competitive Advantage

Dynamic capabilities are a field of study that explores how businesses can gain temporary advantages over time by effectively responding to environmental shocks and changes (Barreto, 2010; Kump *et al*., 2019). The capabilities emphasize that companies need dynamic capacities to achieve technological and evolutionary fitness (Eisenhardt & Martin, 2000). Dynamic capabilities are expected to be able to transform resources (Eisenhardt & Martin, 2000), capabilities (Teece, 2007), operating procedures, or a combination thereof, depending on the context of change.

This study utilizes the dynamic capabilities typology introduced by Pavlou and El Sawy (2011), which emphasizes the four dimensions of sensing, learning, integrating, and coordinating capabilities. Pavlou and El Sawy (2011) assert that the dimensions they introduce represent a synthesis of existing literature, consolidated into a concise set to align with Teece *et al.*'s (1997) and Teece's (2007) framework. In a field that has faced criticism for its lack of precise measurements and being perceived as a black box, Pavlou and El Sawy's typology offers a parsimonious model that provides a limited yet specific and measurable set of dynamic capabilities (Hernández-Linares *et al*., 2021). Below are the descriptions and hypotheses of each capability in relation to digitalization.

Sensing Capability and Digitalization

In the fast-paced and highly competitive business environments of today (Teece, 2007), it is crucial to have a distinctive sensing capability (Zhang & Wu, 2013) to effectively leverage the potential benefits of resources and translate them into tangible outcomes. Sensing capability is the proficiency to recognize, interpret, and seize opportunities within the external environment (Pavlou & El Sawy, 2011). To develop this capability, organizations must actively search and explore both local and distant markets and technologies (Hodgkinson & Healey, 2011; Teece, 2014). Entrepreneurs with enhanced sensing capabilities can identify environmental changes and emerging opportunities, tailor products to meet market preferences, and address existing product weaknesses. This constant vigilance and adaptability

enable organizations to stay ahead of emerging trends and capitalize on new opportunities. Furthermore, sensing capability is crucial for SMEs in successfully adopting digital technologies (Alshanty & Emeagwali, 2019; Baden-Fuller & Teece, 2019). Matarazzo *et al*. (2021) also support the notion that sensing capabilities play a crucial role in SMEs' digital transformation. The capability to detect changes in the business environment, such as market trends, customer information, competitor insights, and technology, enables SMEs to enhance their digitalization prospects (Helfat & Raubitschek, 2018). Moreover, SMEs with robust sensing capabilities can swiftly adapt to digital technology advancements, improve operational efficiency, and respond more precisely to customer needs (Yeow *et al*., 2018). Sensing capabilities empower SMEs to comprehend shifts in consumer behaviour within the digital ecosystem, reinforcing the development of effective digital strategies.

H1a: Sensing capability (SC) positively influences the digitalization in SMEs.

Learning Capability and Digitalization

Learning capability is the ability of acquiring and assimilating knowledge (Kim, 1998) and using that knowledge to enhance a firm's capabilities and resource base (Zahra *et al*., 2006; Zollo & Winter, 2002). Through learning, organizations can identify new production opportunities and improve tasks' efficiency and effectiveness (Ambrosini & Bowman, 2009; Lin & Wu, 2014; Teece *et al*., 1997). Learning capability enables firms to adapt to changing circumstances and perform tasks more effectively and efficiently. This capability has also been identified as a significant factor influencing the success and effectiveness of digital technology adoption by SMEs (Shen *et al*., 2022). Provided strong learning capabilities, SMEs are able to adapt to technological changes and update their knowledge and skills to stay current with the latest trends (Gomes & Wojahn, 2017; Shen *et al*., 2022), to acquire new knowledge, and to adapt traditional business models in the digital era (Matarazzo *et al*., 2021). Moreover, SMEs with strong learning capabilities can identify opportunities for digital innovation, understand the implementation of new technologies, and enhance SME skills in facing digital challenges (Yeow *et al*., 2018). Furthermore, according to Helfat and Raubitschek (2018), learning capabilities also assist SME actors in responding to customer feedback, allowing them to improve and optimize their digital strategies over time.

H1b: Learning capability (LC) positively influences the digitalization in SMEs.

Integrating Capability and Digitalization

The integration and coordination of knowledge-related assets yield value that is irreplaceable within the marketplace (Teece, 2007). Although certain academics have regarded integration and coordination as singular capabilities (Teece *et al*., 1997), more recent literature considers them to be distinct (Ettlie & Pavlou, 2006; Pavlou & El Sawy, 2011). In our study, we align with Pavlou and El Sawy (2011) in conceptualizing the integrating capability as the ability to integrate new knowledge into operational capabilities through the promotion of shared understanding. The capability to effectively integrate knowledge within an organization is seen as a source of competitive advantage (Tsai, 2001), as the value of a firm's knowledge and learning can only be realized through effective integration into business processes (Hung *et al*., 2010). In the context of implementing digital technology-based businesses, the integrating capability has been found as the critical factor for the success and effectiveness of digital technology adoption by SMEs (Khurana *et al*., 2022). SMEs with integrating capabilities can connect their various activities into a strong linkage, anticipate the constantly changing business environment, and effectively integrate their systems and business processes with digital technology (Khurana *et al.,* 2022; Kolbe *et al*., 2021). Furthermore, the capability to integrate internal and external resources enables SMEs to develop more integrated and effective digital strategies (Matarazzo *et al.*, 2021). Integrating capabilities also play a role in fostering collaboration with external partners, including digital service providers, to expand reach and enhance competitiveness (Teece, 2020). Thus, the integrating capability becomes a key success factor in addressing challenges in adopting digital technologies.

H1c: Integrating capability (IC) positively influences the digitalization in SMEs.

Coordination Capability and Digitalization

Efficient utilization of dynamic capabilities necessitates the coordination of resource deployment, entailing the orchestration of tasks, resources, and activities within new operational capabilities (Pavlou & El Sawy, 2011). The coordination capability enables organizations to allocate resources efficiently, respond flexibly to changes, and achieve superior returns (Huang *et al*., 2012; Miller & Shamsie, 1996). This is particularly important for SMEs, which face resource limitations and rely on purposeful coordination for their learning efforts (Corredoira & McDermott, 2014; McDermott & Corredoira, 2010). In the relation to the digitalization, coordinating capability is essential for integrating digital technologies across organizational functions, promoting effective communication and collaboration, and maximizing the utilization of digital tools and platforms. It aligns processes, systems, and people to support the implementation of digitalization and drive organizational transformation. A robust coordinating capability empowers SMEs to overcome coordination challenges, streamline operations, and ensure efficient deployment of digital technologies throughout the organization. It enables seamless integration of digital tools, facilitates data sharing and collaboration among employees, and fosters a cohesive digital strategy. The ability to coordinate allows SME entrepreneurs to manage and implement digital technology efficiently, ensuring alignment among various elements in their businesses (Matarazzo *et al*., 2021). With strong coordinating capabilities, SMEs can optimize the use of digital resources, reduce the potential for misinformation, and enhance internal collaboration (Yeow *et al.*, 2018).

H1d: Coordination capability (CC) positively influences the digitalization in SMEs.

Digitalization and Competitive Advantage

Moreover, Porter's (1985) generic strategies framework shows that enterprises could attain competitive advantage through the pursuit of two distinct strategies: cost leadership and differentiation. These strategies represent two fundamental approaches that SMEs can adopt to position themselves effectively within their markets and outperform their competitors. In the contemporary digital age, both Porter's generic strategies, can be effectively pursued by integrating digital technology into the core business strategy of companies. Cuthbertson and Furseth (2022) express that SMEs digitalization plays a crucial role in enhancing the competitive advantage of SME entrepreneurs. Furthermore, Sousa-Zomer *et al.* (2020) highlight the significance of organizations having the ability to continuously transform their overall resource base to successfully implement digital strategies and hence sustain their competitiveness. Digital technology offers significant advantages to SMEs by reducing production and operational costs, enabling them to provide products or services at a lower price compared to their competitors. For instance, Ariansyah *et al.* (2021) underscore that entrepreneurs can leverage online sales platforms to efficiently find raw materials of their products at the most competitive price, resulting in more cost-effective production processes and ultimately leading to more competitive selling prices for their products. This cost reduction can attract price-conscious customers and contribute to gaining a competitive edge in the market. Moreover, Turban *et al.* (2009) highlight that in addition to reduced costs, online sales platforms also help entrepreneurs increase sales, enhance productivity, improve processing speed, reach broader market, and improve customer loyalty. Digital technology plays a pivotal role in enhancing the competitiveness of SMEs by facilitating the development of differentiated products through the innovation process. The mechanism through which digital technology can impact enterprise competitive advantage is by augmenting the potential for knowledge absorption. Digitalization also drives competitive improvement by streamlining the supply chain. It enables the implementation of digital accounting systems, providing accurate information to navigate uncertain and competitive markets, processing data swiftly, and enhancing customer service. Furthermore, digitalization contributes to the development of intellectual capital, a primary source of sustainable competitive advantage, by offering differentiation and creating customer value that is challenging to imitate. Moreover, digitalization is essential for SMEs to innovate and adapt to the business environment, thereby enhancing their competitive advantage. Several research findings indicate that digital technology and digital capabilities play a crucial role in improving corporate competitiveness

(Knudsen *et al*., 2021). Digital innovation, supported by digital technology, is also identified as a key factor in ensuring SME sustainability in the face of competition (Cuthbertson & Furseth, 2022). The success of digital technology transformation and adoption in SMEs significantly improves overall performance and competitiveness (Khurana *et al*., 2022). Florek-Paszkowska *et al*. (2021) also underscores the pivotal role of digital maturity in enhancing business resilience, stability, and competitive advantage amid the fourth industrial revolution, technological progress, and turbulent environments.

H2: The digitalization positively impacts SME competitive advantage (CA).

The Mediating Role of Digitalization

Dynamic capabilities are essential for companies to adjust to evolving environments and sustain a competitive edge (Harun *et al*., 2023; Li, 2022), as the companies can perceive and capitalize on market opportunities over time, thus achieving enduring business performance (Teece, 2007). Cepeda and Vera (2007), Eisenhardt and Martin (2000), Helfat and Peteraf (2003), Pavlou and El Sawy (2011), Pundziene *et al*. (2021), and Prange and Verdier (2011) collectively provide enhanced conceptual and empirical insights into the interplay between dynamic capabilities and a firm's competitive advantage. Their findings indicate that these capabilities typically exert an indirect influence on a firm's competitive advantage and performance. Moreover, Cepeda and Vera (2007), Eisenhardt and Martin (2000), Protogerou *et al.* (2012), and Wilden *et al*. (2013) propose that the relationship between a firm's dynamic capabilities and its competitive advantage is mediated by the firm's operational capabilities. In a simpler term, operational capability refers to a firm's effectiveness in carrying out its daily activities (Pavlou & El Sawy, 2011).

In this research, we considered digitalization as one of the operational capabilities, as it enhances daily activities more effectively and efficiently. In today's increasingly digital world, companies that adapt to customer preferences and evolving market needs can mitigate the negative impacts of fluctuating demand on their economic performance (Harun *et al*., 2023). Ariansyah *et al*. (2023) also emphasize the significant role of digital technologies for sustainable economic development. Teece (2014) highlights the pivotal role of dynamic capabilities (DCs) in enabling companies to develop and deliver digitalized processes and products tailored to evolving customer needs, ultimately leading to increased profitability. Furthermore, Martins (2023) emphasizes the need to incorporate digitalization strategies into the framework of dynamic capabilities (DCs) to boost flexibility and agility in digital technologies. This integration enables organizations to swiftly adapt, innovate, customize, and implement products and services, thereby strengthening their competitive advantage (Vo Thai *et al*., 2024). As technological capabilities integrate into organizational practices, their significance increase, rendering them progressively challenging to replicate and indispensable, solidifying their role as a critical driver of innovation, profoundly influencing sustainable business performance (Martins, 2023).

Despite existing evidence on the correlation between digitalization and SME competitive advantage, there remains a need for additional research into how digitalization mediates the relationship between dynamic capabilities (DCs) and SME competitive advantage. Therefore, as dynamic capabilities can be represented by sensing, learning, integrating, and coordinating capabilities (Pavlou & El Sawy, 2011), we put forth a few hypotheses, as outlined below:

H3a: The digitalization mediates the relationship between sensing capability (SC) and competitive advantage (CA).

H3b: The digitalization mediates the relationship between learning capability (LC) and competitive advantage (CA).

H3c: The digitalization mediates the relationship between integrating capability (IC) and competitive advantage (CA).

H3d: The digitalization mediates the relationship between coordinating capability (CC) and competitive advantage (CA).

The hypotheses suggest that the dynamic capabilities, encompassing sensing, learning, integrating, and coordinating capabilities (Pavlou & El Sawy, 2011) will positively influence the adoption of

digital technology in the core of SME business strategy. In turn, this is expected to positively impact the SME competitive advantage.

RESEARCH METHODOLOGY

Research Design

This study refers to the Law Number 20 of 2008 on the micro, small, and medium enterprises in defining SME. According to the Law, the classification is based on their total assets and annual sales. Micro-enterprises are characterized by a net worth not surpassing IDR 50 million, excluding land and buildings, or annual sales not exceeding IDR 300 million. Small enterprises have a net worth ranging from over IDR 50 million to a maximum of IDR 500 million, excluding land and buildings, or annual sales surpassing IDR 300 million but not exceeding IDR 2.5 billion. Medium enterprises are distinguished by a net worth exceeding IDR 500 million but not surpassing IDR 10 billion, excluding land and buildings, or annual sales exceeding IDR 2.5 billion but not surpassing IDR 50 billion.

To validate the proposed hypotheses, we employed a quantitative research approach and utilized a cross-sectional research design. The data collection process spanned two months, specifically from September to October 2022, utilizing a face-to-face survey approach. Four enumerators distributed and assisted respondents in completing questionnaires, with each questionnaire taking no longer than 20 minutes to finish. As outlined in Table 1, the questionnaire adapted from previous research served as the primary research instrument. Furthermore, we utilized purposive sampling to select samples comprising SME founders with a minimum of one year of engagement in their businesses. Another criterion for sample selection was that the SME should have no direct or indirect affiliation with large companies.

We selected the locations for data collection based on the geographical classification of Indonesia, which can be roughly distinguished between Java and non-Java regions. Java is widely acknowledged for its advanced infrastructure, more densely population, concentration of business activities, and superior internet services, etc., in comparison to regions outside Java. To ensure a comprehensive understanding of the research topic, we deliberately chose representative locations in both Java and non-Java regions. Specifically, we focused on Central Java and North Kalimantan provinces due to their strategic significance. These provinces are centrally located within their respective classifications and serve as home for numerous SMEs. Moreover, North Kalimantan was selected to gain valuable insights into SMEs operating in border areas, where they encounter distinct challenges arising not only from domestic competitors but also from competitors in neighbouring countries such as Malaysia.

Our face-to-face data collection approach ensures a 100% response rate, resulting in the final sample size of 230. We may describe the profile of the samples can as follows: the business sectors of the respondents are classified into seven categories, namely, food and beverage processing (18%), handicrafts (11%), trade (23%), fashion products (20%), agriculture (13%), service sector (10%), and others 5%. Most SMEs fall into the small business sector, accounting for 158 (69%), while the medium-sized sector comprises 72 (31%). In terms of income, most respondents have a net monthly income between 3 million to 5 million rupiahs, with 112 (49%) respondents falling into this category. Regarding the business tenure, most respondents have been in business for a period ranging from 4 to 7 years, totalling 122 (53%).

Measures

We conducted a literature review to operationalize the variables and select suitable instruments and adapt scales used in previous studies. We modified the questions and adapted them to ensure better understanding among Indonesian respondents. All participants were asked to provide their responses using a 7-point Likert scale, where they indicated their level of agreement or disagreement with each statement. The scale ranged from 1 (strongly disagree) to 7 (strongly agree). Table 1 presents the complete research variables, including indicators and references of each.

Table 1. Variables and indicators

No.	Variable	Indicator	Reference
1.	Sensing Capability (SC)	a. Sensing the environment to identify new opportunities; b. Observing the change in the business environment and its impact on customers; c. Understanding the market to develop products desired by customers; d. Applying ideas to new products and improving the quality of old products.	(Hernández-Linares *et al.*, 2021)
2	Learning Capability (LC)	a. Seeking, identifying, and learning new information; b. Assimilation of various new information into the selected new information; c. Transforming new information into new knowledge; d. Using new knowledge for developing new products; e. Using new knowledge for improving customers service.	(Hernández-Linares *et al.,* 2021)
3.	Integrating Capability (IC)	a. Giving contributions and input to the organization; b. Creating good understandings about tasks and responsibilities; c. Knowing individuals in the group who have skills and knowledge relevant to the job; d. Correlating carefully one action to another to anticipate the always-changing business environment; e. Connecting various activities into a strong linkage.	(Hernández-Linares *et al.,* 2021)
4	Coordinating Capability (CC)	a. Ensuring that the job output of one individual is in accord with that of others; b. Ascertaining that resources (for instance, information, schedules, reports) are fairly allocated in the group; c. Giving assignments based on the knowledge and skills that the individuals have; d. Making sure that the skills of group members are in tune with job process; e. Making sure that the groups are well coordinated.	(Hernández-Linares *et al.,* 2021)
5	Digitalization (DIGIT)	a. Using digital marketing technologies to capture a larger customers share; b. Using social media to promote and offer the products; c. Providing online payment services (including money transfers) to facilitate customers transactions; d. Optimizing the utilization of mobile marketing for promotion events; e. Using email marketing to reach special customers; f. Building a collaboration with an online sale platform (application); g. Using software to record daily transactions (point of sale system/ POS); h. Optimizing online marketing services to still serve customers despite their physical absence in the store; i. Optimizing the corporate profile on the internet to make the corporate contents easily recognized by internet search engines.	(Susanto *et al.,* 2021; Olson *et al*., 2021; Trinugroho *et al*., 2022)
6	Competitive Advantage (CA)	a. Our product is competitively priced; b. The quality of our product meets the consumer expectations; c. Our product innovations can adapt to current trends; d. Fast and responsive customer service; e. Our product can reach the market more efficiently.	(Gutiérrez-Martínez & Duhamel, 2019; Kristal *et al*., 2010; Liao *et al*., 2017)

Source: own study based on literature.

Estimation Method

We employed PLS-SEM as the estimation method, which is a commonly used approach in the field of business and management sciences. It aims to estimate models by minimizing the squared deviation between observed values and estimated values (Dijkstra & Henseler, 2015; Hair *et al*., 2011). The selection of PLS-SEM over covariance-based SEM (CB-SEM) is driven by its predictive orientation. As outlined by Hair *et al*. (2011), CB-SEM is suited for causal modelling in situations characterized by well-established prior theory and a goal of further testing and confirmation, while PLS-SEM is aligned with a predictive focus. Sholihin (2013) outlines a few stages involved in the implementation of PLS-SEM. These stages include conceptualizing the model, selecting the appropriate algorithm analysis method for the outer and inner models, and applying the resampling method. A path diagram is then constructed, which incorporates the components of an empirical model along with the results of the measurement and structural model evaluations. Furthermore, evaluating the reliability and validity of the indicators employed to measure theoretical concepts is crucial to ensure the factorial structure of the instrument (Hair *et al*., 2019; Sarstedt *et al*., 2019). We utilized PLS-SEM technique supported by WarpPLS version 8.0 to conduct this analysis.

RESULTS AND DISCUSSION

The Evaluation of the Research Model

The evaluation of the research model consists of two stages: the measurement model evaluation and the structural model evaluation. The measurement model is evaluated using the PLS mode B algorithm method, which is suitable for constructs with reflective indicators. For the structural model, we employed the Warp algorithm method, known for its capability to estimate non-linear relationships among variables. The resampling method, known for its stability, is utilized to assess the stability of the estimated path coefficients (Sholihin, 2013).

The Evaluation of Measurement Model

The purpose of evaluating the measurement model is to evaluate the reliability and validity of the reflective indicators used to measure the research variables. In line with the model conceptualization, we measured all variables in the research model using reflective indicators. Following the guidelines by Latan and Ghozali (2016), the evaluation of the reliability and validity (outer model) of the reflective indicators involves the following rules of thumb:

1. Indicator reliability: An indicator is considered reliable if its factor loading value is greater than 0.7.
2. Internal consistency reliability: The internal consistency reliability is considered acceptable if the composite reliability value is greater than 0.7.
3. Convergent validity: Convergent validity is achieved if the average variance extracted (AVE) value exceeds 0.5.
4. Discriminant validity: Discriminant validity is established if the square root of the AVE exceeds the inter-construct correlations.

In the preliminary test of the research instrument, we found that one indicator, efficiency/price advantage (KK1) had a factor loading value below 0.7 (0.504). According to the rules of thumb mentioned above, this indicator will be eliminated from the measurement of the research variables. Table 2 provides detailed information regarding the factor loading values, composite reliability values, and AVE values.

Table 2 displays the factor loading values for all indicators, which are found to be above 0.5. However, one indicator (CA1) has a loading value below 0.5 and is therefore excluded from the variable measures. Moreover, all construct indicators exhibit an AVE value exceeding 0.5, indicating good convergent validity. The construct reliability and Cronbach's Alpha values are also above 0.7,

indicating good instrument reliability. Thus, considering the factor loading, AVE, and composite reliability values, we can infer that the instruments used were valid and reliable. Despite composite reliability values surpassing 0.95, such as those for IC and DIGIT, being undesirable due to the potential presence of redundant items restating the same question (Hair *et al*., 2022), we were confident in the absence of such redundancy in our questionnaire items. Hence, we maintained that the values in our study were acceptable, which is a stance supported by Latan and Ghozali (2016).

Table 2. Factor loading, composite reliability, and average variance extract

Variable	Indicator	Factor Loading	Composite Reliability	AVE
Sensing Capability (SC)	SC1	0.882	0.930	0.768
	SC2	0.932		
	SC3	0.876		
	SC4	0.810		
Learning Capability (LC)	LC1	0.892	0.936	0.746
	LC2	0.900		
	LC3	0.944		
	LC4	0.861		
	LC5	0.905		
Integrating Capability (IC)	IC1	0.892	0.956	0.811
	IC2	0.900		
	IC3	0.944		
	IC4	0.861		
	IC5	0.905		
Coordinating Capability (CC)	CC1	0.868	0.934	0.739
	CC2	0.879		
	CC3	0.916		
	CC4	0.761		
	CC5	0.865		
Digitalization (DIGIT)	DTBBS1	0.869	0.954	0.699
	DTBBS2	0.828		
	DTBBS3	0.776		
	DTBBS4	0.906		
	DTBBS5	0.776		
	DTBBS6	0.872		
	DTBBS7	0.778		
	DTBBS8	0.861		
	DTBBS9	0.850		
Competitive Advantage (CA)	CA2	0.821	0.936	0.786
	CA3	0.883		
	CA4	0.889		
	CA5	0.911		

Source: own study.

The next step was to evaluate the discriminant validity, a concept that assesses the distinctiveness of different constructs or variables in a study. It examines whether the measures used to assess different constructs truly capture unique aspects of those constructs and do not overlap with one another. A common method to assess discriminant validity is to compare the correlations between constructs with the square root of the AVE for each construct (Awang, 2014). If the AVE square root is greater than the correlation between constructs, it indicates that the constructs have good discriminant validity. The evaluation results in Table 3 show that all variables have good discriminant validity.

Table 3. Discriminant validity

Construct	Correlations						AVE Square Root
	SC	LC	IC	CC	DTBBS	CA	
SC	–	0.804	0.622	0.769	0.502	0.703	0.876
LC	0.804	–	0.719	0.785	0.616	0.677	0.864
IC	0.622	0.719	–	0.879	0.501	0.670	0.901
CC	0.769	0.785	0.879	–	0.511	0.803	0.860
DIGIT	0.502	0.616	0.501	0.511	–	0.634	0.836
CA	0.703	0.677	0.670	0.803	0.634	–	0.887

Source: own study.

Evaluation of the Structural Model

The evaluation of the structural model, also known as the inner model, aims to predict the relationships between variables by estimating the explained variance and determining the significance of the P-values (Latan & Ghozali, 2016). This evaluation serves as a hypothesis test for the conceptual framework. Prior to examining the relationships between variables, it is crucial to evaluate the goodness of fit of the proposed research model.

Table 4 presents the results of the goodness of fit assessment for the research model, indicating that the model fits well. This is supported by the significant P-values (<0.05) for APC, ARS, and AARS, with values of APC = 0.314, ARS = 0.478, and AARS = 0.461. Moreover, both AVIF and AFVIF values are below 5. According to Hair *et al*. (2022) and Latan and Ghozali (2016), the VIF value is recommended to be below 5 and ideally below approximately 3. Therefore, we considered the values acceptable. Meanwhile, the value of goodness of fit was 0.602, which exceeds the threshold of 0.36, indicating a very good fit for the model. Furthermore, SPR, RSCR, SSR, and NLBCDR had values of 1, suggesting the absence of causality problems in the model (Latan & Ghozali, 2016).

Table 4. Goodness of fit of structural model

Criteria	Value	Rules of Thumb
Average path coefficient (APC)	0.314, P<0.001	Acceptable P < 0.05
Average R-squared (ARS)	0.478, P<0.001	Acceptable P < 0.05
Average adjusted R-squared (AARS)	0.461, P<0.001	Acceptable P < 0.05
Average block VIF (AVIF)	3.635	acceptable if <= 5, ideally <= 3.3
Average full collinearity VIF (AFVIF)	4.623	acceptable if <= 5, ideally <= 3.3
Tenenhaus GoF (GoF)	0.602	small >= 0.1, medium >= 0.25, large >= 0.36
Sympson's paradox ratio (SPR)	1	acceptable if >= 0.7, ideally = 1
R-squared contribution ratio (RSCR)	1	acceptable if >= 0.9, ideally = 1
Statistical suppression ratio	1	acceptable if >= 0.7
Nonlinear bivariate causality direction ratio (NLBCDR)	1	acceptable if >= 0.7

Source: own study and Latan and Ghozali (2016).

The Direct Effects Among Variables

Table 5 and Figure 1 provide important insights into the explained variance and predictive relevance of the research model. For the variation that affects digital-based business strategy (digitalization), the R-squared (R2) value was 0.54, indicating that 54% of the variation in digitalization can be explained by the combined effects of sensing capability, learning capability, integration, and coordinating capability. The remaining 46% of the variation is attributed to other variables not incorporated in the research model. The R^2 value for digitalization falls within the strong category, as it exceeds the threshold of 0.45, demonstrating a substantial impact. Likewise, the Q-squared value for digitalization was 0.448, indicating predictive relevance of the research model as it was greater than 0, meaning that it effectively predicted the observed data for digitalization (Latan & Ghozali, 2016). Similarly, for the variation that affects competitive advantage, the R^2 value was 0.42, indicating that 42% of the variation in competitive advantage can

be attributed to the variation in digitalization. The remaining 58% of the variation is influenced by other factors beyond the research model. The R2 value for competitive advantage was also classified as strong, because it surpassesed the threshold of 0.45. Moreover, the Q-squared value for competitive advantage was 0.429, which confirmed the predictive relevance of the model (Latan & Ghozali, 2016). Furthermore, Figure 1 visually represents the estimated relationship across variables and its variance. The figure serves as a graphical representation of the statistical findings, allowing for a clear visualization of the relationships and their magnitudes. It provides a concise summary of the estimated results and serves as a useful tool for communication and interpretation of the research findings.

These results provide evidence of the significant contributions of dynamic capabilities, as represented by sensing capability, learning capability, integration, and coordinating capability, in explaining the variation in both digitalization and competitive advantage.

Table 5. Estimated results

Description Path	Path Coeff.	P value	R^2	Q^2
SC → DIGIT	0.181	0.018	0.536	0.448
LC → DIGIT	0.419	<0.001		
IC → DIGIT	0.220	0.006		
CC → DIGIT	0.101	0.119		
DIGIT → CA	0.649	<0.001	0.421	0.429

Source: own study.

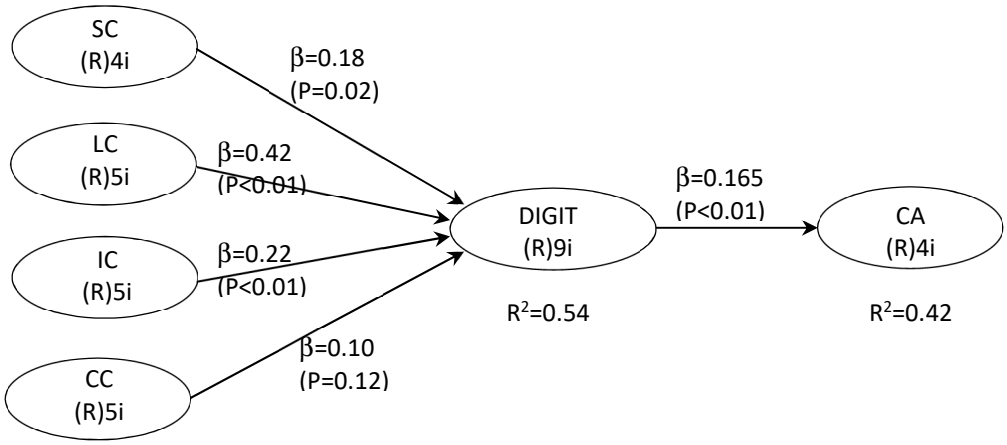

Figure 1. Hypotheses testing results
Source: own elaboration.

The Effect of Sensing Capability on the Digitalization

Based on empirical evidence, we found that sensing capability has a positive and significant impact on the SME's digitalization. It supports the notion that sensing capability plays a crucial role in shaping the success and effectiveness of SMEs in embracing digital technology (Alshanty & Emeagwali, 2019; Baden-Fuller & Teece, 2019). Moreover, SMEs that excel in sensing capability are better positioned to adeptly incorporate digital technology into their business strategies (Hernández-Linares *et al.*, 2021). Entrepreneurs who continuously improve their sensing capability are better equipped to identify environmental changes and new market opportunities. By understanding customer preferences, entrepreneurs can develop new products and address weaknesses in existing ones (Papadopoulos *et al.*, 2020). Moreover, a strong sensing capability encourages entrepreneurs to adopt digital technologies and utilize digital platforms (*e.g.*, websites, social media, online marketplaces) to expand their customer base (Song *et al.*, 2022). Furthermore, online payment options and search engine optimization strategies can further enhance their digital presence.

In a rapidly changing business environment, sensing capability enables companies to adapt to market dynamics and seize new opportunities (Hernández-Linares *et al*., 2021). The need to remain viable in such an environment often prompts businesses to adopt digital technologies (Papadopoulos *et al.*, 2020). Overall, the findings highlight the crucial role of sensing capability in facilitating the successful implementation of digital technology-based business strategies.

The Effect of Learning Capability on the Digitalization

The analysis indicated a significant and positive relationship between learning capability and the digitalization within SMEs. In fact, SMEs with strong learning capabilities are more likely to successfully adopt and utilize digital technologies in their business operations. Learning capability enables SMEs to adapt to technological changes, stay updated with digital trends, and enhance individual skills and competencies related to digital technology (Ahmed *et al*., 2022; Gomes & Wojahn, 2017; Shen *et al.*, 2022). Overall, the ability to learn plays a crucial role in the implementation of digital technology-driven businesses. This capability empowers organizations to adjust, assimilate technology, innovate, enhance business processes, and cultivate the requisite skills and competencies (Hooi, 2020).

The Effect of Integrating Capability on the Digitalization

The empirical analysis provides strong evidence of a notable and favorable association between integrating capability and the integration of digital technology in SME business strategy. This discovery supports the earlier research conducted by Khurana *et al*. (2022) and implies that SMEs possessing higher levels of integrating capability are more likely to successfully incorporate digital technology into their existing processes, systems, and functions (Hernández-Linares *et al.*, 2021). This capability enables SMEs to establish connections between their current applications and systems and new digital technologies. It involves the automation of business processes using digital software or platforms, as well as the integration of data and information from diverse sources (Khurana *et al.,* 2022). By effectively integrating digital technology into their operations, SMEs can enhance efficiency, optimize technology usage, and achieve operational harmony. The integration capability further enhances collaboration and communication among members within an organization, particularly in a business context centered around digital technology. Moreover, SMEs equipped with robust integration capabilities can deploy collaborative tools and platforms, fostering more efficient information sharing and teamwork (Kolbe *et al*., 2021). Overall, integrating capability plays a crucial role in the successful SME digitalization.

The Effect of Coordinating Capability on the Digitalization

The research reveals that among the studied capabilities, coordinating capability is the only one that does not have a statistically significant impact on digitalization within SMEs. One of possible justifications of this finding is that the scale and simplicity of SMEs' scope of work do not require extensive coordination. Aligned with the findings of Verwaal *et al.* (2010), the capacity of a company to synchronize its business strategies and objectives with the integration of digital technology is significantly influenced by factors such as company size and available resources. Moreover, small companies often require hierarchical assistance and government support to effectively coordinate and build networks through partnerships (Gardet & Fraiha, 2012).

The Effect of Digitalization on the Competitive Advantage

The analysis results reveal that the digitalization has a significant positive effect on competitive advantage, aligning with the findings of Valdez *et al.* (2016) that the increased adoption of digital technology is associated with an elevated level of competitive advantage. It also supports the idea that SMEs can boost their competitive edge by aligning digital platform-based capabilities with their business orientation (Cenamor *et al*., 2019).

The integration of digital technology empowers SMEs to create distinctive and specialized products and services, as well as to harness data efficiently. Making decisions based on data allows organizations to improve their responsiveness, adaptability, and proactive approach in navigating market changes

and competition. Utilizing digital platforms offers organizations the opportunity to broaden their consumer base and access wider markets, both geographically and demographically (Cuthbertson & Furseth, 2022). Furthermore, SMEs can leverage social media, websites, mobile applications, and various online channels to extend their reach, enhance brand visibility, and foster connections with potential customers. Embracing business strategies rooted in digital technology empowers organizations to be more agile in responding to market shifts and innovations (Shen *et al*., 2022). This strengthens SME competitive advantage by enabling swift adaptation, innovation, and improved customer satisfaction through better alignment with their needs.

Overall, a well-implemented digitalization significantly impacts an organization's competitive advantage. It enables organizations to differentiate themselves, enhance operational efficiency, expand market presence, leverage data analytics, and respond to changing dynamics. This competitive advantage positions organizations for long-term growth, profitability, and success in the rapidly evolving digital era.

The Mediating Effects of Digitalization

Table 6 displays the analytical outcomes concerning the mediating impact of digitalization on the connection between dynamic capabilities (specifically sensing capability, learning capability, integrating capability, and coordinating capability) and competitive advantage.

Table 6. Estimated results of mediation effect

Description Path	Path Coefficient	P value	Description
Sensing Capability → Digitalization → Competitive Advantage	0.118	0.027	Mediation
Learning Capability → Digitalization → Competitive Advantage	0.272	<0.001	Mediation
Integrating Capability → Digitalization → Competitive Advantage	0.143	0.010	Mediation
Coordinating Capability → Digitalization → Competitive Advantage	0.066	0.139	Non Mediation

Source: own study.

The Mediating Effect of the Digitalization Between Sensing Capability and Competitive Advantage

The results indicate that the effect of sensing capability on the SME's competitive advantage is positive and significant when mediated by the digitalization. Moreover, SMEs that adopt digital technology in their business effectively utilize sensing capability and identifying new opportunities, analyzing the business environment, understanding market preferences, and applying innovative ideas to meet customer demands. In connection with this issue, SMEs that demonstrate proficiency in utilizing digital marketing technologies and social media for the promotion and delivery of their products and services are more likely to enhance their competitive edge (Mikalef & Pateli, 2017). Moreover, the study found that SMEs that can provide online payment services, utilizing mobile marketing for promotional events, and collaborating with online selling applications or platforms have a higher likelihood of improving their competitive advantage, particularly in highly competitive markets. These findings align with earlier research by Hernández-Linares *et al.* (2021) and Teece (2018).

A strong sensing capability enables SME entrepreneurs to detect market changes and business opportunities more effectively. The demonstrated role of digitalization, as a mediator, illustrates the transformation of SMEs into an environment closely intertwined with the use of digital technology, access to information, and the ability to adapt to external changes. Through the utilization of digital technology, SMEs can enhance operational efficiency, respond rapidly to the market, and improve service quality. In turn, this plays a crucial role as a vital link between sensing capability and competitive advantage (Mikalef *et al*., 2020). Through effective adoption of digital technology, SMEs can create a competitive advantage by providing more innovative products and services, delivering superior customer experiences, and strengthening their position in an increasingly dynamic market.

The Mediating Effect of the Digitalization Between Learning Capability and Competitive Advantage

The estimated results on the Table 6 support the mediation role of the digitalization in the relationship between learning capability and the SME's competitive advantage. This suggests that SMEs learning capability has a notable impact on enhancing their competitive advantage through the adoption of

digital technology in their business. The SMEs' abilities to seek, assimilate, identify, and learn new information and knowledge significantly contribute to their capability in implementing digital technology, for instance by using digital marketing technologies and social media to offer their products/services and providing digital payment services to facilitate transactions and collaborating with online selling applications. This strategy is required to improve their competitive advantage, especially in highly competitive markets (Hernández-Linares *et al.*, 2021).

Good learning capability enables SMEs to respond to changes in the business environment and enhance the knowledge and required skills. As a mediator, digitalization reflects the internalization of digital technology in the learning and adaptation processes of SME actors. By leveraging digital technology, SMEs can improve efficiency, optimize production processes, and explore innovation opportunities. Through digitalization, SMEs can more easily access market information and emerging trends. Therefore, through digitalization, SMEs can convert learning capabilities into a competitive advantage by creating more innovative products and services, improving operational efficiency, and adapting quickly to the ever-changing dynamics of the market (Teece, 2020).

The Mediating Effect of the Digitalization Between Integrating Capability and Competitive Advantage

Table 6 also provides support that digitalization acts as a mediator in the relationship between SME's integrating capability and competitive advantage. This implies that integrating capability had a notable impact on enhancing competitive advantage through the implementation of digitalization. Moreover, SMEs that possess the capability to integrate various business activities into a cohesive connection are more likely to implement digitalization, which further improve their competitive advantage (Hernández-Linares *et al*., 2021).

The integrating capability encompasses the agility of SME actors in effectively managing internal and external resources. The proven role of digitalization as a mediating variable illustrates how digital technology facilitates the integration of data, processes, and interactions with various stakeholders. Through the adoption of digital technology, SMEs can strengthen internal collaboration, enhance connectivity with suppliers and customers, and expedite decision-making processes. In turn, this creates a competitive advantage by improving operational efficiency, responsiveness to market changes, and the ability to deliver value more rapidly and effectively (Mikalef *et al.*, 2020). Thus, digitalization serves as a primary link between integrating capability and competitive advantage in the SME context.

The Mediating Effect of the Digitalization Between Coordinating Capability and Competitive Advantage

The findings presented in Table 6 indicate that digitalization does not function as an intermediary factor in the connection between coordinating capability and SMEs' competitive advantage. This suggests that coordinating capability does not exert a significant impact on the competitive advantage of SMEs by way of digitalization. These findings suggest that coordinating capability in SMEs does not contribute significantly to the implementation of digitalization and further the improvement of competitive advantage. Unlike large enterprises that establish elaborate internal coordination mechanisms (Monteiro *et al*., 2019), SMEs often face challenges due to limited resources and manpower. In fact, SMEs may face difficulties in dedicating specific roles or departments solely for coordination purposes. Instead, employees in SMEs often must juggle various tasks and responsibilities simultaneously, which can lead to challenges in effectively coordinating activities and experiencing the full benefits of coordination (Wilden & Gudergan, 2017). Thus, digitalization cannot mediate the relationship coordinating capability and competitive advantage. This discovery may also imply the existence of a direct association between coordinating capability and competitive advantage.

We may attribute the analysis results indicating that digitalization does not mediate the relationship between coordinating capability and competitive advantage to several possibilities. Firstly, it could be due to infrastructure barriers or limited technology access at the SME level, especially in smaller business sectors or groups, resulting in less dependency on digital technology for interdepartmental coordination. Another possibility is the organization's low capacity to align business strategies with digital technology, which could also be a triggering factor. Hence, these constraints may hinder the effective mediating role of digitalization between coordinative capability and competitive advantage.

CONCLUSIONS

This research employs a quantitative approach to explore how digitalization mediates the connection between dynamic capabilities (specifically, sensing capability, learning capability, integrating capability, and coordinating capability) and the attainment of competitive advantage in SMEs. The analysis reveals that dynamic capabilities, except for collaborating capability, positively influence the implementation of digitalization, emphasizing their role in facilitating effective utilization of digital technologies. Moreover, the study finds a significant and positive association between digitalization and SME competitive advantage. Moreover, the findings demonstrate the mediating role of digitalization in the relationships between sensing capability, learning capability, integrating capability, and competitive advantage.

Summarizing, the digitalization has proven to enhance SMEs in elevating their competitive advantage by leveraging dynamic capabilities, particularly sensing, learning, and integrating capabilities. In other words, digitalization serves as a pathway through which dynamic capabilities can influence competitive advantage in the context of Indonesian SMEs.

Theoretical Implications

The present study makes a substantial contribution to the existing literature in strategic management. Specifically, while recent empirical research has delved into the direct impact of dynamic capabilities on SME performance (Ahmad *et al.*, 2022; Anggadwita *et al.*, 2023; Dejardin *et al*., 2023; Heredia-Portillo & Armas-Arévalos, 2023; Hernández-Linares *et al*., 2021; Martins, 2023), our study sheds light on the indirect impact dynamic capabilities and SME's competitive advantage, particularly by examining the mediating role of digitalization. Our findings align with the proposition put forth by Cepeda and Vera (2007), Eisenhardt and Martin (2000), Protogerou *et al*. (2012), and Wilden *et al*. (2013) regarding the pivotal role of operational capability in mediating the connection between an SME's dynamic capabilities and its competitive advantage. This mediation is exemplified by the capability to seamlessly integrate digital technologies into daily operations, which we term 'digitalization' in this study. This concept serves to elucidate how an SME's dynamic capabilities facilitate the successful implementation of digitalization, ultimately leading to an enhanced competitive advantage.

By examining the specific pathways and relationships between dynamic capabilities, represented by sensing, learning, integrating, and collaborating capabilities, and competitive advantage, the study provides a deeper understanding of the strategic management process in SMEs operating in the dynamic and challenging business environment. The findings emphasize the significance of sensing capability, learning capability, and integrating capability as key drivers in the successful implementation of digitalization. The study also highlights the importance of adopting digital technologies and leveraging them strategically to drive competitive advantage.

Practical Implications

The positive and significant of SME's sensing, learning, and integrating capabilities in promoting the SME's digital technology-based business strategies, which further enhance the SME's competitive advantage, lead to several practical implications. Firstly, SMEs should focus on improving their sensing capability to better understand market dynamics and identify new opportunities. This can be achieved by actively monitoring and collecting information about changes in the external and internal business environment. SMEs can leverage digital tools and technologies to gather data, analyze market trends, and gain insights that can inform their strategic decision-making.

Secondly, SMEs should prioritize building a learning culture within their organizations. They can encourage employees to seek new knowledge, attend training programs, and stay updated on technological advancements relevant to their industry. Creating opportunities for knowledge sharing and collaboration can foster a continuous learning environment, enabling SMEs to adapt quickly to technological changes and leverage digital technologies effectively.

Thirdly, SMEs need to strengthen integrating capability. SMEs need to focus on integrating digital technology into their existing processes, systems, and functions. This can involve connecting

various applications, automating business processes, and ensuring seamless data integration. By enhancing their integrating capability, SMEs can optimize the use of digital technology, streamline operations, and improve efficiency.

Fourthly, while collaboration and coordination are important in any organization, for SMEs that are characterized by their limited work scope, the impact of coordinating capability on competitive advantage through the implementation of digitalization is limited. The practical implication of this finding suggests that SMEs should prioritize and allocate their resources to areas that have a more significant impact on their competitive advantage.

The finding that the digitalization of SMEs mediates the relationship between dynamic capabilities and competitive advantage underscore the crucial role of digitalization in enhancing the competitive advantage of SMEs by mediating the impact of dynamic capabilities on their competitiveness. Therefore, the continuous improvement of digital transformation, the adoption of e-commerce technology, innovations in digital marketing, digital entrepreneurship strategies and orientation, the use of information technology to enhance the value chain, and the digital capabilities of SME actors are logical consequences of the recognized vital role of digitalization in enhancing SME competitiveness.

Limitations and Future Research Direction

This study recognizes various limitations that open avenues for future research. Firstly, the respondent composition was primarily small-scale SMEs, which may limit the generalizability of the findings. Future research should strive to include a more balanced representation of SMEs, including medium-scale SMEs, to enhance the comprehension of the dynamic capabilities and competitive advantage relationship.

Furthermore, this study relied on the perceptions and opinions of SMEs, which may not capture the complete spectrum of SME competitive advantage. To address this limitation, future research could incorporate objective competitive advantage data obtained from local government records or other reliable sources. By combining subjective perceptions with objective competitiveness measures, researchers can gain a more robust understanding of how dynamic capabilities impact the growth and success of SMEs.

Another limitation pertains to the study's scope. While this study aims to represent SMEs from both Java and non-Java regions, it is imperative to acknowledge that drawing conclusions solely from the findings of Central Java as a representative of Java and North Kalimantan as a representation of non-Java might not fully encapsulate the extensive diversity of SMEs across Indonesia. Indonesia is a diverse country with varying business environments, resources, and cultural factors, which can impact the dynamics of SMEs and further influence the relationship among variables under investigation. Future research should consider replicating the study in broader regions or even across different countries to validate the results and examine potential variations in the mediating role of digitalization on the dynamic capabilities and competitive advantage relationship.

Overall, overcoming these limitations and conducting additional research with a more diverse sample, incorporating objective competitiveness data, and expanding the geographical scope will strengthen the validity and applicability of the findings, providing a more comprehensive understanding of the role of dynamic capabilities in enhancing competitive advantage for SMEs.

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Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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