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Entrepreneurial Orientation and Digital Intellectual Dynamics Affecting Competitive Advantage and Firm Performance: The Case of Fruit and Vegetables Processing SMEs in Thailand

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ABSTRACT

This study aims to analyze the impact of entrepreneurial orientation (EO) and digital intellectual dynamics (DID) on firm performance (FP), with competitive advantage (CA) as a mediating variable. The research used 387 valid responses collected from a survey of business owner, managers, and department heads of registered small and medium Enterprises (SMEs) in the processed fruit and vegetable sector across Thailand, which were analyzed using Structural equation modeling (SEM). Results revealed that EO and DID have a significant positive effect on FP; the effect of CA on FP was also significant. In addition, CA served as a partial mediator in the relationships between EO and FP, as well as DID and FP. This study strengthens the resource-based view (RBV) theory and expands knowledge on the role of DID in managing SMEs, paticularly in emerging economies. The findings suggest that EO and DID in SMEs enhance CA and improve performance by leveraging digital technologies to add product value, foster innovation, accelerate delivery, optimize resources, and increase employee satisfaction, ultimately driving growth and competitiveness on a larger scale.

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1. Introduction

The global economic landscape has faced significant challenges in recent years. This has been exacerbated by the COVID-19 pandemic, the ongoing Russia-Ukraine conflict, and rising inflation, all of which have dampened growth and reduced incomes (World Economic Outlook, 2023). In Thailand, small and medium-sized enterprises (SMEs) are pivotal to the nation's economic engine, spanning critical sectors such as agriculture, manufacturing, trade, and services. In 2022, SMEs represented an impressive 99.5% of all businesses, employing over 3.178 million people. With an expected output value of THB 6.31 trillion in 2023, SMEs' contribution to the economy remains indispensable. Amid these economic shifts, consumers are increasingly gravitating toward healthier food options, which has had a profound impact on the processed fruit and vegetable sector. According to the Department of Mental Health (2022), the consumption of fruits and vegetables can reduce the risk of contracting COVID-19 by 9% and decrease the severity of infection by 41%. These health-related findings align with the growth in demand for processed fruits and vegetables, particularly in Thailand, where fertile soil, a favorable climate, and an extensive agricultural base allow for abundant and diverse production. Supporting this growth, scholarly research on gastronomic enterprises highlights that organizational creativity and innovative performance,0 facilitated by effective knowledge management and strong customer orientation, are critical determinants in advancing innovation and enhancing competitive advantage within the food industry (Ccorisapra-Quintana & Portocarrero-Rivera, 2025). These findings underscore the imperative for fostering innovation capabilities to adequately respond to evolving consumer demands and to ensure sustainable development in Thailand's processed food sector. This positions Thailand as a leading global exporter, particularly in canned pineapples, with the processed food sector experiencing a significant uptick in exports. According to a survey by the Bank of Thailand (2023), the export value of processed fruits and vegetables increased from USD 12,006.05 million in 2018 to USD 14,239.63 million in 2022, reflecting a growth rate of 15.04%. This aligns with data from the Department of International Trade Promotion (2023), which highlights Thailand as a leading global exporter of canned pineapples.

This research focuses on SMEs in the processed fruit and vegetable sector in Thailand. These businesses are registered as legal entities and report their financial statements to the Department of Business Development, Ministry of Commerce (DBDMC). There was a total of 4,252 such enterprises, comprising 3,763 small enterprises and 489 medium enterprises (Department of Business Development, 2023). Although the overall situation in Thailand in 2022 showed increased growth, there are still significant challenges:

- Many SMEs are still household production firms, lacking modern digital technology to develop products that meet consumer needs adequately and grow into large firms that can compete in major markets.
- There is a lack of capital to develop machinery, digital technology for production, and personnel. If entrepreneurs had access to digital technology, it could enhance firm efficiency.
- The production index of fruits and vegetables in some sectors has decreased, such as a 53% decrease in durian exports and a 39.4% decrease in other fruits (Office of the National Economic and Social Development Council, 2022), due to unpredictable weather conditions. Entrepreneurs have not used digital technology to extend the shelf life of food for long-term consumption and trade throughout the year.
- There are decisions to dispose of fruit and vegetable produce due to market oversupply, indicating that both farmers and entrepreneurs lack the technology to add value to the products.
- Trade barriers from various countries, including higher transportation taxes than competitors, result in higher costs due to the failure to use digital technology to pioneer new logistics routes for penetrating new markets.
- Most export products often encounter problems with chemical residues exceeding standard limits. Digital technology could help make the screening of produce more standardized.

Given these challenges, technology digital has become indispensable. The SME Development Bank (2020) advocates for Thailand's 4.0 policy, encouraging digital adoption to future-proof SMEs. Prior studies reveal that Entrepreneurial Orientation (EO) characterized by proactiveness, risk-taking, and innovativeness significantly enhances firm performance, particularly when paired with Digital

Intellectual Dynamics (DID) (Al-Mamary et al., 2020; Pigola & Costa, 2021). However, research on EO and DID in Thailand's processed fruit and vegetable sector remains limited. This study addresses this gap by exploring how EO, DID, and competitive advantages (CA) influence firm performance (FP) in this industry.

Recent studies highlight the vital roles of innovation, EO, digitalization, and knowledge management in enhancing FP across various sectors. Samieifard et al. (2024) found that innovation and FP significantly improve online marketing effectiveness, while e-commerce development serves a supportive, context-dependent role. Arabiun et al. (2024) demonstrated that EO and digital processes positively impact sustainable performance in digital start-ups, especially when mediated by knowledge management. In the food industry, Ccorisapra-Quintana and Portocarrero-Rivera (2025) emphasized organizational creativity as a key driver of innovation, supported by absorptive capacity and customer orientation. Additionally, Javaid and Raza (2025) identified human capital, firm size, and efficient internal processes as critical factors for competitiveness and adaptability in manufacturing firms. Ghavamipour et al. (2025) further revealed that aligning dynamic managerial capabilities with business strategies enhances innovation performance, particularly when managers possess balanced human, social, and cognitive capabilities and adopt prospector or analyzer strategies. These findings underscore the importance of integrating innovation, digital capabilities, and EO to achieve CA and superior performance. Such insights are particularly relevant for Thailand's processed food SMEs, where digital capabilities and EO are essential to overcoming operational, technological, and market challenges.

This study offers a distinct contribution to the literature on EO and FP by focusing on the context of SMEs in Thailand's processed fruit and vegetable sector. Unlike prior studies that predominantly explored large enterprises in developed countries, this research examines the unique challenges and opportunities faced by SMEs in a developing economy. Specifically, the study addresses a gap in the existing literature regarding the application of DID and CA in enhancing the competitiveness and FP of SMEs. By emphasizing the potential of SMEs in a high-growth sector, this study offers fresh insights into how digital innovation can fuel sustainable growth for SMEs in emerging markets.

The integration of EO, DID, CA, and FP is of critical importance for SMEs in Thailand's processed fruit and vegetable industry. EO is essential for SMEs to remain proactive, innovative, and willing to take calculated risks in a highly competitive environment. As the demand for healthier food options increases, particularly in response to the COVID-19 pandemic, EO allows SMEs to adapt to these market shifts by innovating in product offerings and aligning with consumer trends. Digital transformation through DID is equally important for modernizing operations and improving efficiency in the production and distribution of processed fruits and vegetables. Many Thai SMEs in this sector face challenges such as unpredictable weather conditions, market oversupply, and inefficient logistics. The application of digital technologies can address these issues by enhancing production processes, extending product shelf life, and optimizing supply chain management, ultimately improving product quality and firm efficiency. CA is crucial for SMEs seeking to distinguish themselves in the global marketplace, where they face competition from larger firms. By leveraging EO and DID, SMEs can innovate their production methods, improve product quality, and develop unique value propositions that provide a sustainable competitive edge. These capabilities are critical for SMEs to successfully navigate a global market dominated by larger enterprises, ultimately leading to improved FP. This study is geographically focused on Thailand, where the SMEs landscape and agricultural base significantly shape the challenges and opportunities for firms in the processed fruit and vegetable sector. The findings are specific to the context of Thai SMEs, which face obstacles, such as the need for innovation under the Thailand 4.0 policy and unique export challenges. It is important to acknowledge that the results of this study may not be fully transferable to SMEs in other countries with different economic conditions, infrastructures, or market dynamics. While the findings offer valuable insights, they must be contextualized within Thailand's unique economic and policy environment.

Additionally, the processed fruit and vegetable sector is a specialized part of the broader agricultural industry. While this study offers significant insights into the relationship between EO, DID, CA, and FP within this specific industry, caution should be exercised when applying these results to other sectors, such as manufacturing, services, or retail. The dynamics of these industries

may differ substantially, and the variables affecting performance might not align as closely. Although the focus of this study is on the processed fruit and vegetable sector in Thailand, the findings have broader implications for other countries and industries facing similar challenges. The study illustrates how SMEs in key sectors, particularly in emerging markets, can harness EO and DID to enhance their competitive positioning. The research provides valuable lessons on the digital transformation of SMEs and highlights the importance of leveraging innovative strategies to stay competitive in an ever-evolving market. Furthermore, this research contributes to the broader discourse on digital innovation in emerging economies and the adaptability of agricultural SMEs to changing market demands. Future research could explore the applicability of these findings in other sectors or regions, offering further insights into the role of digital technologies and entrepreneurial strategies in driving SME success. This research aims to fill that gap by investigating how EO, DID, and CA influence the performance of SMEs in this sector, focusing specifically on their Financial Performance (FP). By examining the relationships between these factors, this study seeks to provide insights into how SMEs can leverage entrepreneurial strategies and digital technologies to enhance their competitive edge in the global marketplace.

There are relatively few studies focusing on EO in the processed fruit and vegetable business in Thailand. Therefore, research in conjunction with SMEs is crucial as it aims to promote the growth of SMEs into larger enterprises. This raises the question of whether the SME industry in the food production sector leverages such innovation by incorporating the concepts of dynamic resources and capability, leading to CA and improved FP. For this reason, the current study aims to achieve the following objectives:

1. To study the focus on EO and its impact on DID.
2. To study the focus on EO and DID ,and their impact on CA.
3. To study the focus on EO, DID, and CA, and their impact on FP.
4. To study the focus on EO and DID, and their indirect impact on FP, with CA acting as a mediating variable, particularly for SMEs in the processed fruit and vegetable sector in Thailand.

2. Literature Review and Development of Hypotheses

2-1. The Resource-Based View Theory (RBV)

The Resource-Based View (RBV) theory, first articulated by Wernerfelt (1984) and later expanded by Barney (1991, 2001), provides a critical framework for understanding how firms achieve and sustain competitive advantage (CA) by leveraging resources that are valuable, rare, inimitable, and non-substitutable (VRIN). According to RBV, the key to achieving superior firm performance (FP) lies in the firm's ability to deploy and manage its internal resources effectively, rather than relying solely on external market conditions. In today's digital economy, this framework has proven especially valuable for understanding how firms navigate technological disruptions and market volatility, particularly in the small and medium-sized enterprise (SMEs) sector (Kanchanda, 2022; Nasir et al., 2017). Recent empirical studies further emphasize that both tangible and intangible resources, such as firm size, liquidity, human capital, and technological capabilities, are vital for enhancing competitiveness and fostering innovation. Javaid and Raza (2025) highlighted the role of these resources in improving manufacturing firms' competitiveness in volatile environments, while Wu et al. (2025) identified skilled human capital as a key mediator of the positive impact of AI adoption on innovativeness.

In the context of SMEs in the processed fruit and vegetable industry in Thailand, the adoption of digital technologies and Entrepreneurial Orientation (EO) can be seen through the RBV lens as critical resources for maintaining competitive positioning. While RBV traditionally focused on tangible assets, modern interpretations extend to intangible resources, including human capital, technological capabilities, and dynamic capabilities (Y. Khan & Terziovski, 2014; Mubarik et al., 2019). This expanded view is particularly relevant for SMEs, where resource constraints necessitate strategic resource optimization (Nurhilalia et al., 2019).

Entrepreneurial Orientation (EO), which encompasses proactiveness (PROA), risk-taking (RISK), innovativeness (INNO), is a key driver in the RBV framework, acting as a resource that can contribute significantly to a firm's competitive advantage (CA). EO is valuable as it enables firms to respond swiftly to market changes, fostering innovation that meets consumer needs. It is rare because only a

few firms possess the organizational culture and leadership that fully embrace these entrepreneurial behaviors. Moreover, EO is inimitable as it stems from a firm's unique history, leadership style, and accumulated experiences, making it difficult for competitors to replicate. Finally, EO is non-substitutable because no other resource can replace the combination of behaviors, attitudes, and values that drive a firm's entrepreneurial actions, making it a distinct and essential element for sustained CA.

Digital Intellectual Dynamics (DID), which involves leveraging digital technologies, data analytics, and intellectual property, is another crucial resource in the RBV framework that plays a pivotal role in enhancing a firm's capabilities. DID is valuable because it helps firms improve operational efficiencies, make data-driven decisions, and enhance customer experiences, all of which contribute to superior firm performance. It is rare because, while digital technologies are becoming more accessible, the ability to integrate these technologies and extract actionable insights is still uncommon, particularly in SMEs. DID is inimitable as it relies on a firm's unique technological infrastructure, knowledge base, and expertise, which are difficult for competitors to replicate. Lastly, DID is non-substitutable since no other resource can offer the same transformative potential in a rapidly evolving digital landscape, making it indispensable for firms striving to maintain a competitive edge in the modern market.

While prior research (Fan et al., 2021; Hussain et al., 2020) emphasizes EO as a driver of innovation and competitiveness, these studies often overlook how EO interacts with Digital Intellectual Dynamics (DID) to enhance firm capabilities. Moreover, although studies on RBV highlight its applicability to large firms, there is a gap in addressing how SMEs in emerging economies, such as Thailand, operationalize these resources to achieve competitive advantage. This study addresses this gap by examining how EO and DID, as valuable and dynamic resources, jointly influence CA and FP in Thailand's processed food sector.

In conclusion, the integration of EO and DID within the RBV framework offers a deeper understanding of how SMEs can leverage intangible, dynamic resources to achieve a sustainable competitive advantage. Both EO and DID, when strategically deployed, exhibit the characteristics of VRIN resources, providing firms with a distinct edge over competitors. This study contributes to the growing body of research by examining how these resources can be operationalized within SMEs in Thailand, offering practical insights for firms looking to thrive in the digital age.

2-2. Entrepreneurial Orientation (EO)

Entrepreneurial Orientation (EO) refers to a firm's strategic posture toward innovation, risk-taking, and proactiveness, as conceptualized by Miller (1983). Lumpkin and Dess (1996, 2001) expanded this framework to include competitive aggressiveness and autonomy. EO plays a pivotal role in enabling SMEs to identify and exploit market opportunities, especially under dynamic and uncertain conditions. In Thailand's processed fruit and vegetable sector, EO is particularly vital as firms contend with rapid technological changes and evolving consumer preferences.

While prior research confirms EO's positive impact on firm performance (FP) (Donbesuur et al., 2020; Nasir et al., 2017), findings are not always consistent. For instance, Al-Mamary et al. (2020) highlights a direct link between EO and financial performance, while Lechner and Gudmundsson (2014) argue that certain dimensions of EO, such as risk-taking, may hinder performance when market uncertainties are high. This contradiction suggests the need for further investigation into how EO functions under specific industry and national contexts. Several recent studies highlight the critical role of EO in driving innovation, sustainability, and CA across various industries. Arabiun et al. (2024) emphasize that EO, combined with digitalization and effective knowledge management, significantly enhances the sustainable performance of digital start-ups. Similarly, Samieifard et al. (2024) link EO-related dimensions such as innovation and FP to improved outcomes in online marketing within e-commerce settings. Wu et al. (2025) further demonstrates how EO is reflected through innovative adoption of artificial intelligence in manufacturing, implying that proactive entrepreneurial behaviors facilitate organizational adaptability and innovation. Additionally, Ccorisapra-Quintana and Portocarrero-Rivera (2025) explored the influence of EO-related creativity on innovative performance, mediated by absorptive capacity and customer orientation, in gastronomic firms, highlighting the importance of leveraging external knowledge and customer insights to sustain innovation. Collectively, these findings affirm that EO fosters innovation and adaptability through

strategic use of technology, knowledge, and market orientation, underpinning long-term organizational success. Similarly, Pornthep Navakitkanok (2020) stated that this study focuses on factors influencing entrepreneurship, utilizing the Resource-Based View (RBV) and Dynamic Capabilities theories to explain an organization's competitive potential. Key factors examined include EO, market orientation, learning orientation, digital orientation, and readiness for Industry 4.0, all of which impact business success. Additionally, the study discusses an entrepreneurship evaluation system and applies the Unified Theory of Acceptance and Use of Technology (UTAUT) to analyze the adoption of the evaluation system. Altogether, these insights contribute to understanding how to develop and enhance entrepreneurs' capabilities for greater competitiveness.

Moreover, existing studies often treat EO as a homogeneous construct, failing to consider how its dimensions interact with other strategic resources, such as digital intellectual dynamics. In Thailand's food industry, where SMEs often lack extensive physical resources, the ability to leverage EO alongwith digital capabilities becomes crucial. This study thus examines EO not only as an independent driver of CA and FP but also in conjunction with DID to explore their combined impact.

2-2-1. Entrepreneurial Orientation (EO) and Digital Intellectual Dynamics (DID)

From the literature review, Isichei et al. (2020) found that Entrepreneurial Orientation (EO) significantly impacts SME performance in Nigeria, with creativity and proactivity playing key roles. While their findings are consistent with EO as a driver of success, they also highlighted the importance of structural capabilities, suggesting that focusing on internal management activities, such as knowledge sharing, may improve performance beyond EO alone. It seems justifiable, as it emphasizes the need for a more comprehensive approach. Similarly, Murniningsih et al. (2022) found that EO influences relational capabilities and business performance, but they provide limited insight into the mechanisms underlying this relationship. Anggadwita et al. (2023) observed that dynamic capabilities and firm culture mediate the relationship between international EO and international performance, particularly during the COVID-19 pandemic, although external factors may also play a role in shaping performance. Keen et al. (2022) found that family businesses with stronger EO are more likely to exploit international opportunities; however, family social capital alone may not fully explain this success, suggesting the need for a broader perspective. Rodrigo-Alarcón et al. (2017) highlighted the positive impact of relational social capital and cognitive knowledge on EO, while structural social capital had a slightly negative effect, which dynamic capabilities could mitigate. While it seems compelling, the study's focus on the negative impact of structural social capital is somewhat limited. Lastly, there is a gap in research directly examining the relationship between EO factors and Digital Intellectual Dynamics (DID), with most studies focusing on EO's connection to intellectual capital or dynamic capabilities. This study aims to address this gap by exploring the integration of EO and DID. Therefore, this study expected the following relationship to hold true:

H1: EO has a direct effect on DID.

2-2-2. Entrepreneurial Orientation (EO) and Competitive Advantage (CA)

Entrepreneurial Orientation (EO) helps foster boldness in starting businesses, actively seeking information, taking risks, and maintaining flexibility and anticipation, which can lead to Competitive Advantage (CA) (Dahana et al., 2021). This aligns with Zeebaree and Siron (2017), who found that EO significantly influences the CA of SMEs in the Kurdistan Region of Iraq. Risk-Taking (RISK) has a substantial impact on CA, enabling firms to seize market opportunities and potentially gain high returns despite uncertain outcomes. Proactiveness (PROA) tends to identify and exploit market opportunities, adapt to changing market conditions, and stay ahead of competitors by anticipating customer needs, developing innovative products or services, and establishing a strong market position. Innovativeness (INNO) firms are likely to develop unique products or services. Additionally, Perdana and Prasasti (2023) and Sukmamedian (2021) found that higher levels of EO lead to increased CA. However, Lechner and Gudmundsson (2014) found that different dimensions of EO have varying effects on CA. INNO is closely related to differentiation strategies, while RISK and Competitive Aggressiveness (COAG) negatively correlate with Cost Leadership (COST) and Differentiation (DIFF) strategies. PROA had no influence on CA. Karnowati and Handayani (2022) also found that

EO alone did not have a direct impact on CA during the COVID-19 pandemic. EO has been widely recognized as a strategic resource that contributes to a firm's ability to create and sustain CA. In the context of small retailers, Tajeddini et al. (2013) highlighted how EO, through its dimensions of innovativeness, proactiveness, and risk-taking, enhances the firm's responsiveness to market trends and customer needs. Although their study does not explicitly measure CA as a construct, the findings imply that EO fosters capabilities aligned with the resource-based view (RBV) of the firm, thereby positioning EO as a key driver of unique, valuable, and difficult-to-imitate resources. These entrepreneurial capabilities enable small retailers to differentiate themselves, adapt quickly to environmental changes, and deliver superior value to customers, which are critical elements in building sustained competitive advantage. Therefore, the second hypothesis is proposed as follows:

H2: EO has a direct effect on CA.

2-2-3. Entrepreneurial Orientation (EO) and Firm Performance (FP)

Nasir et al. (2017) stated that Entrepreneurial Orientation (EO) positively impacts the performance of SMEs in Malaysia, indicating that SMEs should focus on strategies that promote EO to enhance performance. Entrepreneurs' proactive stance in addressing challenges in new product markets and changing customer demands is crucial for achieving superior Firm Performance (FP). Tajeddini et al. (2013) support this by demonstrating that EO significantly enhances growth-related outcomes, such as profit, sales, and market share, although its direct effect on efficiency measures such as return on investment is limited. Similarly, Alvarez-Torres et al. (2019) found that Risk-Taking (RISK) and Innovativeness (INNO) are key dimensions that contribute to the performance of SMEs in the leather footwear sector in the Bajio region of Mexico. Salam and Hoque (2019) also found a significant positive impact of EO on FP, although specific outcomes may vary depending on context and other influencing factors. Octavia et al. (2020) observed that SMEs adopting digital technologies, particularly e-commerce, as a marketing strategy can expand their market share. Al-Mamary et al. (2020) reported that PROA, RISK, and INNO improve financial performance, with RISK having a direct positive correlation with performance. Moreover, EO is essential for non-financial performance aspects, such as improving customer satisfaction, employee satisfaction, product quality, and service quality. However, these findings contrast with Kanaan-Jebna et al. (2022), who found that EO did not affect the financial performance of manufacturing SMEs in Malaysia but had a positive impact on non-financial performance. Nguyen et al. (2022) also noted that EO did not directly affect FP but facilitated social media use and management relationships, which are determinants of FP. Tajeddini et al. (2024) emphasized the importance of entrepreneurial capabilities, particularly resource orchestration and strategic information exchange, in promoting supply chain innovation and improving firm performance. These mechanisms appear to drive performance improvements independently of digital orientation's moderating role. Under this circumstance, the third hypothesis is posited as:

H3: EO has a direct effect on FP.

2-3. Digital Intellectual Dynamics (DID)

Digital intellectual dynamics (DID) is a concept derived from intellectual dynamics, initially proposed by Pigola and Costa (2021). This concept integrates intellectual capital and dynamic capabilities, highlighting the intersection where dynamic capabilities enhance various facets of intellectual capital. Intellectual capital encompasses intangible assets: human, social, and structural capital that are essential for resource utilization, innovation, and creating value. Dynamic capabilities, meanwhile, represent a firm's ability to adapt by reconfiguring internal and external capabilities in response to shifting environments. The intersection of intellectual capital and dynamic capabilities enables firms to leverage knowledge and capabilities for agility, innovation, and strategic advantage.

Each dimension of intellectual capital supports adaptability in specialized environments. Human capital fosters skills through knowledge accumulation, while structural capital enhances technological flexibility, forming the core of intellectual dynamics. Dynamic capabilities, combined with social capital, build relational networks that strengthen business connections. Human dynamics embody unique skills tied to value creation and innovation, supported by experience and training, thereby driving competitive advantage. Social dynamics drive distinctive innovations, enriching the

knowledge ecosystem and enhancing value creation. Structural dynamics provide the framework for processes and technology, connecting ecosystem actors and adapting to workforce changes. Together, these knowledge dynamics enable continuous innovation and value generation.

Pigola and Costa (2022) further recognized the significance of Digital Information Systems (DIS), which gained prominence following the COVID-19 pandemic. The e-commerce sector experienced increased influence as firms adopted strategies to introduce new products and services and transitioned from retail to digital platforms. This shift included online ordering, big data, omnichannel operations, and tools for measuring and managing performance. These advancements enhance decision-making, streamline stakeholder processes, boost productivity, and improve resource efficiency. Arabiun et al. (2024) emphasized the mediating role of knowledge management in linking entrepreneurial orientation and digitalization to sustainable performance in digital start-ups. Similarly, Ccorisapra-Quintana and Portocarrero-Rivera (2025) highlighted that organizational creativity and absorptive capacity enable firms to leverage external knowledge to boost innovation. Wu et al. (2025) further investigated AI adoption in Chinese manufacturing enterprises, revealing that AI enhances both internal innovation capabilities and external innovation interactions by accelerating knowledge dissemination and collaboration. The study also indicates AI's dual impact on labor structure, reducing low-skilled labor while increasing demand for highly skilled personnel, with firms possessing a skilled workforce benefiting most. These findings underscore the importance of strategic human capital development and industry-university-research cooperation to maximize AI-driven innovation.

The Digital Intellectual framework explains how DID enhances firm agility and resource management. This framework is composed of three key indicators: Digital Human Dynamics (DHUM): Aligns with the existence of valuable, rare, inimitable, and irreplaceable technological skills and knowledge. Digital Social Dynamics (DSOC): Corresponds to unique relational capabilities that provide varying levels of knowledge and technological innovation through partnerships and mergers. Digital Structure Dynamics (DSTR): Relates to the knowledge, norms, values, and culture that enable the agility of DIS development. Through these indicators, DID enhances firms' ability to receive and process information, improve decision-making, seize opportunities, and reconfigure resources for greater efficiency and competitiveness. Moreover, while intellectual capital is generally regarded as a source of sustainable competitive advantage (CA) (Kamukama et al., 2011; Obeidat et al., 2021), existing literature does not fully address how digital transformations redefine these dynamics. This study bridges this gap by analyzing how DID, in combination with EO, enhances competitive advantage and firm performance in the Thai SME context.

2-3-1. Intellectual Dynamics (DID) and Competitive Advantage (CA)

Kamukama et al. (2011) stated that intellectual capital promotes the Competitive Advantage (CA) of firms, leading to superior performance. Intellectual capital comprises valuable, rare, and hard-to-use resources and capabilities, which can create a sustainable CA. This is consistent with N. Khan et al. (2019a), who found that intellectual capital is a crucial intangible resource that can build sustainable CA. Phongphaw and Pakasat (2016) noted that entrepreneurs need mechanisms to manage the knowledge inherent in their personnel to generate economic value. Investing in key firms' resources, including financial capital, structural capital, relational capital, and human capital, is vital for driving firm success, differentiating it from market competitors. Obeidat et al. (2021) found that intellectual capital significantly influences CA. The dimensions of intellectual capital, including structural capital, relational capital, and human capital, play essential roles in achieving CA. Intellectual capital can improve firm performance, providing firms with CA. Yaseen et al. (2016) also noted that intellectual capital affects firm profitability and competitive positioning in various industries. Human capital is internally linked with relational capital, as internal personnel create and maintain relationships that enhance firm competitiveness. Structural capital includes internal processes, networks, and firm culture, which can improve FP levels and contribute to CA. Relational capital consists of the knowledge embedded in marketing channels and customer relationships developed through business operations, supporting firm competitiveness. Hence, the following hypothesis is proposed:

H4: DID has a direct effect on CA.

2-3-2. Digital Intellectual Dynamics (DID) and Firm Performance (FP)

From the literature review, Pigola and Costa (2022) stated that Digital Intellectual Dynamics (DID), including Digital Human Dynamics (DHUM), Digital Social Dynamics (DSOC), and Digital Structure Dynamics (DSTR), have a positive relationship with Firm Performance (FP). The role of DID in responding to intensified digital changes helps enhance FP. DID positively impacts knowledge management approaches, improving FP. DHUM assesses the extent to which e-commerce firms can innovate and transform current services and products into new offerings. This also involves applying existing knowledge from one part of the firm to emerging problems and opportunities in another part through innovative practices. DSOC positively influences FP by promoting dynamic capabilities for effective work processes. DSTR, another significant variable, also positively affects FP, although not at a statistically significant level. This aligns with Lee and Huang (2012), who found that FP across the four perspectives of the Balanced Scorecard (BSC) leads to the creation and enhancement of intellectual capital management. Strategies under the learning and growth perspective of the BSC form the foundation of innovation capital and Human capital within intellectual capital. The internal business process perspective of the BSC supports the process capital of intellectual capital, while the Customer Perspective (CUST) of the BSC contributes to customer capital or relational capital.

In a broader view of digital dynamics, Fan et al. (2023) found that digital technology application (DTA) enhances enterprise competitiveness through green technology innovation (GTI) and environmental, social, and governance performance (ESGP), both serving as mediating factors. However, the direct impact of DTA on firm performance may be diminished, suggesting that its benefits are often realized indirectly over time. Additionally, firm-specific characteristics, such as enterprise scale, moderate this relationship, underscoring the importance of aligning digital capabilities with firm strategy. Complementing this perspective, Shah et al. (2025) examined the adoption of AI-powered food delivery applications in the smart tourism sector. Their findings indicate that psychological drivers, including perceived autonomy, competence, and social connection, influence actual usage behavior, thereby enhancing digital engagement and indirectly contributing to firm performance.

This aligns with the findings from Laksaniyanon (2021), where the study on the impact of adaptability in meat processing and preservation businesses emphasizes the crucial role of adaptability in enhancing financial performance. Adaptability allows firms to respond effectively to market and consumer changes, which increase revenue and reduce production costs. Key aspects of adaptation, such as improving production processes, adopting new technologies, and adjusting marketing strategies, are essential for maintaining operational efficiency during economic shifts and market uncertainties. As Laksaniyanon (2021) suggests, businesses that can quickly adapt ensure long-term sustainability and a competitive edge, outpacing rivals who fail to adjust. Adaptability, much like digital intellectual dynamics, plays a direct role in improving financial performance and keeping businesses competitive in challenging markets. Additionally, Foster et al. (2022) found that intellectual capital in terms of knowledge, skills, and attitudes can improve FP when supported by firm infrastructure and communication capabilities. Human resource capabilities, backed by high knowledge and experience, enable maximum work performance. Hence, this study hypothesized the following:

H5: DID has a direct effect on FP.

2-4. Competitive Advantage (CA)

Competitive advantage (CA) refers to a firm's ability to outperform competitors through superior resource utilization (Porter, 1980, 1985). SMEs in the processed fruit and vegetable sector can achieve CA via cost leadership, differentiation, and quality improvements (Kanchanda, 2022; Kiyabo & Isaga, 2020). In line with RBV, these strategies are resource-dependent, implying that firms with robust EO and DID capabilities are better positioned to sustain CA.

The increasing consumer preference for healthier food products provides SMEs with an opportunity to create a CA by focusing on health-oriented innovations. Research indicates that a diet rich in fruits and vegetables is linked to reduced risks of chronic diseases such as heart disease and diabetes (Slavin & Lloyd, 2012). SMEs that prioritize producing and marketing health-focused

processed fruits and vegetables can not only meet consumer demand but also position themselves as leaders in health-conscious product innovation. This approach aligns with RBV's emphasis on leveraging unique and valuable resources to maintain a competitive advantage. Samieifard et al. (2024) found that innovation and FP significantly enhance online marketing effectiveness, contributing to CA in digital markets. Similarly, Arabiun et al. (2024) indicated that EO and digitalization, mediated by knowledge management, strengthen the sustainable performance of digital start-ups. Javaid and Raza (2025) further emphasized the role of effective resource management and internal processes by developing a competitiveness index for Pakistani manufacturing firms. Collectively, these studies highlight the critical importance of innovation, digital capabilities, and knowledge-based resources in achieving and sustaining competitive advantage.

However, the literature presents mixed findings on the stability of these relationships. For example, while Zaini et al. (2014) argue that CA directly boosts firm performance (FP), other scholars (Lechner & Gudmundsson, 2014) suggest that the relationship depends on contextual variables, such as market turbulence. This study seeks to clarify these ambiguities by investigating how EO and DID jointly shape CA and how CA mediates their effects on FP.

2-4-1. Competitive Advantage (CA) and Firm Performance (FP)

Competitive Advantage (CA) significantly impacts Firm Performance (FP). SMEs can gain a CA by offering unique products with high quality and competitive prices. The uniqueness of the product, its quality, and competitive pricing influence marketing performance, measured by sales growth, consumer growth, market share growth, and increased profits. CA also enhances marketing performance by providing a foundation for customer growth (Zaini et al., 2014). Perdana and Prasasti (2023) found that SMEs owners who invest in physical and intangible resources create CA that improve FP. Similarly, S. Khan et al. (2019b) found that CA significantly contributes to both financial and non-financial performance. Firms with strong and effective CA achieve higher outputs. Sareekham et al. (2021) noted that CA, which includes capabilities, quality, innovation, and quick response, leads to various performance efficiencies, including financial, customer, internal processes, and learning and growth perspective. Charusreni (2022) found that businesses with CA tend to dominate the market, leading to increased market share and profitability. Offering unique value can lead to higher customer loyalty, resulting in repeat business and stable revenue sources. CA can stem from superior operational processes, leading to cost savings and improved efficiency. This study proposed the following hypothesis:

H6: CA has a direct effect on FP.

2-5. Firm Performance (FP)

Firm performance (FP) reflects a company's ability to achieve its growth and strategic objectives, encompassing aspects such as cost efficiency, product quality, and timely delivery. To capture this complexity, various frameworks have been developed, among which the Balanced Scorecard (BSC) framework (Kaplan & Norton, 1996, 2000) is widely recognized for providing a multidimensional view of performance through key performance indicators (KPIs) across four interconnected perspectives.

The financial perspective (FINA) assesses organizational financial health by analyzing metrics such as revenue, profit, total assets, outstanding liabilities, and the debt-to-equity ratio. Traditional financial indicators, including Return on Investment (ROI) and Return on Capital Employed (ROCE), offer insight into profitability and resource efficiency (Kaplan & Norton, 1996, 2000). Nevertheless, relying solely on financial data fails to capture broader dimensions crucial for long-term sustainability. Al Mamun et al. (2022) found that SMEs leveraging EO through effective financial strategies could enhance performance, particularly when integrating competitive strategies to optimize resource allocation.

Customer perspective (CUST) focuses on understanding market positioning through indicators such as market share, customer acquisition, retention, satisfaction, and loyalty. For SMEs in the processed fruit and vegetable sector, embracing health-focused product innovation enhances consumer trust and brand loyalty, catering to the growing demand for healthier lifestyles and well-being.

According to Al-Omoush and Alsmadi (2024), customer-oriented strategies aligned with digital orientation positively impact competitive advantage, as digital tools enable deeper insights into customer behavior and preferences.

The internal processes perspective (INTE) emphasizes operational effectiveness by enhancing workflows, customer engagement strategies, and innovation processes. Streamlining internal operations not only drives productivity but also builds organizational agility. As highlighted by Fitzgerald (2008), effective performance measurement requires examining both end results and the operational determinants that influence those outcomes. Furthermore, Liu et al. (2021) noted that dynamic capabilities, such as process innovation and adaptability, play a mediating role in translating entrepreneurial orientation into enhanced firm performance.

The learning and growth perspective (LEAR) addresses the development of human capital, fostering innovation, and driving continuous improvement. Empowering employees with the skills to adapt to industry changes strengthens organizational resilience and cultivates a culture of innovation, ultimately contributing to long-term performance. This aligns with the notion that SMEs investing in employee learning and technological adoption are better equipped to respond to market changes, fostering sustainable growth and competitiveness.

Emerging evidence from recent research provides deeper insight into these dynamics. For instance, Arabiun et al. (2024) emphasized the positive impact of EO and digitalization, mediated by knowledge management, on the sustainable performance of digital start-ups. Similarly, Samieifard et al. (2024) demonstrated that innovation and FP are key drivers of online marketing effectiveness in digital markets. Moreover, Javaid and Raza (2025) highlighted that asset management, operational efficiency, and financial performance jointly enhance the competitiveness of manufacturing firms. Collectively, these findings underscore the strategic importance of innovation, resource optimization, and knowledge management in driving FP. By applying the BSC, SMEs gain a holistic tool to align strategic objectives with actionable insights across these four perspectives. In the processed fruit and vegetable industry, prioritizing health-oriented innovation not only responds to shifting consumer preferences but also supports sustainable growth and enhances societal well-being. Moreover, integrating entrepreneurial orientation and digital intellectual dynamics into the BSC framework strengthens SMEs' capacity to achieve a competitive edge and long-term performance (Al Mamun et al., 2022; Al-Omoush & Alsmadi, 2024; Liu et al., 2021).

2-5-1. Entrepreneurial Orientation (EO) and Firm Performance (FP) with Competitive Advantage (CA) As A Mediating Variable

Competitive Advantage (CA) derived from Entrepreneurial Orientation (EO) enables firms to differentiate themselves from competitors and achieve a stronger market position. CA helps firm attain cost-effectiveness, improve product quality, and deliver superior value to customers, positively impacting performance. The mediating role of CA in the relationship between EO and Firm Performance (FP) demonstrates that having a CA enhances the positive impact of EO on FP (Mahmood & Hanafi, 2013). Similarly, Kiyabo and Isaga (2020) found that CA mediates the relationship between EO and the performance of SMEs, indicating its crucial role in driving better performance outcomes. CA amplifies the impact of entrepreneurial approaches on SME performance, highlighting the importance of investing in both physical and intangible resources to drive performance. As an intangible resource, CA explains not only physical resources but also intangible ones such as entrepreneurial approaches. Zaini et al. (2014) found that EO impacts FP both directly and indirectly through CA in SMEs in Great Malang, Indonesia. Galbreath et al. (2020) observed that promoting Proactiveness (PROA), Risk-Taking (RISK), Innovativeness (INNO) within EO helps firm achieve CA, leading to improved performance. However, Lechner and Gudmundsson (2014) found that while INNO is closely related to differentiation strategies, Risk-Taking (RISK), and Competitive Aggressiveness (COAG) negatively correlate with Cost Leadership (COST) and Differentiation (DIFF) strategies. COST and DIFF strategies positively correlate with performance. Therefore, this study proposed the following hypothesis:

H7: EO has an indirect effect on FP through CA as a mediating variable

2-5-2. Digital Intellectual Dynamics (DID) and Firm Performance (FP) with Competitive Advantage (CA) as a Mediating Variable

Tomaž Čater and Barbara Čater (2009) found that both COST and DIFF positively impact FP. COST is heavily influenced by financial resources and customer capital, while DIFF is significantly influenced by financial resources and all three components of intellectual capital. The relationship between physical resources and both COST and DIFF, and between human and social capital with COST, was not confirmed. Kamukama et al. (2011) found that CA mediates the relationship between IC and financial performance in microfinance institutions in Uganda. Jain et al. (2017) observed that firms with socially responsible behavior work with suppliers and extract valuable market information from customers, improving product quality and image. Additionally, S. Khan et al. (2019b) noted that sustainable CA mediates the relationship between financial capabilities and FP. The mediating variable fully mediates between financial capabilities and performance while partially mediating the relationship between intellectual capital and FP. Hence, the last proposed hypothesis was as followed.

H8: DID has an indirect effect on FP through CA as a mediating variable.

On the basis of the above discussed hypotheses, a conceptual framework has been developed, as represented in Figure 1.

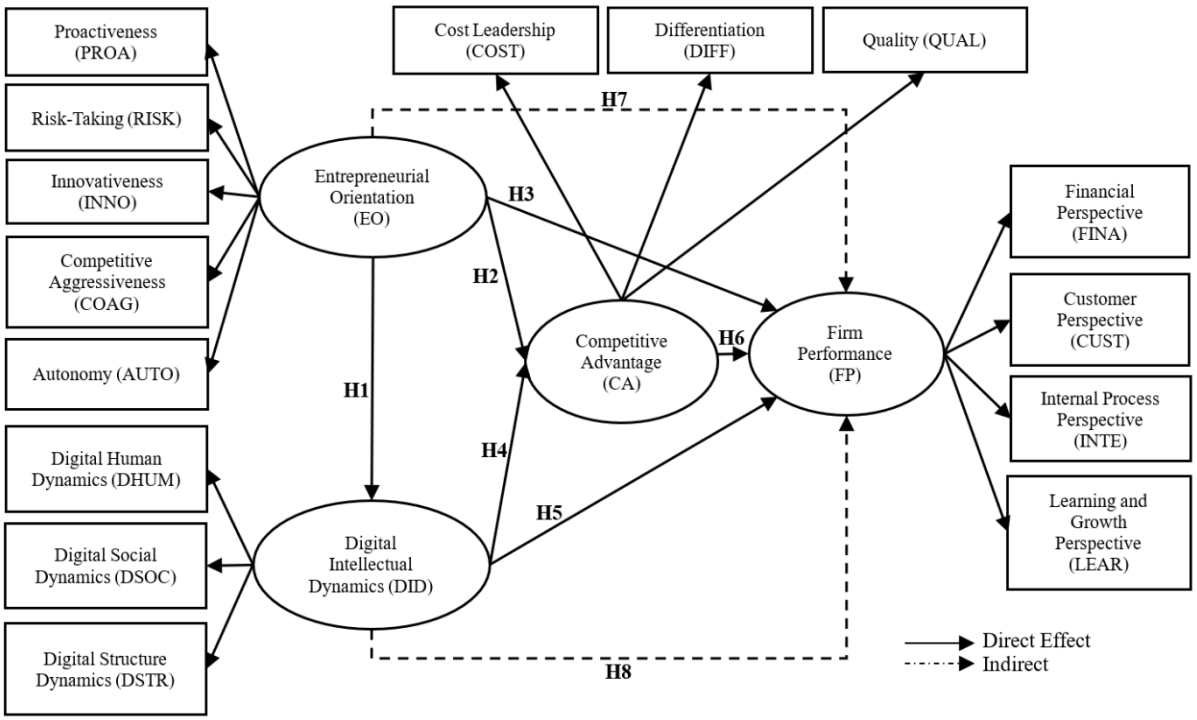


Fig. 1. Conceptual Framework

3. Method

3-1. Sample

The research population consisted of owners, managers, and department heads of SMEs in Thailand's processed fruit and vegetable sector, including 4,252 enterprises categorized under Group C103 (processing and preserving fruits and vegetables), Group C104 (manufacturing oils and fats), and Group C106 (manufacturing grain mill products, starches, and starch products). Of these, 3,763 were small enterprises and 489 were medium-sized enterprises, all legally registered and submitting financial statements to the Department of Business Development (2023). The target population for this study included small-sized enterprises (revenues ≤ 100 million baht) and medium-sized enterprises (revenues between 100 million and 500 million baht) in the processed fruit and vegetable sector. These enterprises had a minimum registered capital of 100,000 baht and generated at least 200,000 baht in annual revenue. A total of 1,922 enterprises met the criteria, consisting of 1,438 small and 484

medium-sized enterprises. A purposive sampling method (Vanichbuncha, 1999) was employed, selecting 387 enterprises with strong financial performance and digital technology adoption, prioritizing firms with high revenue rankings. The selected sample included 142 enterprises from C103, 28 from Group C104, and 217 from Group C106. A survey method was chosen for its generalizability and statistical robustness, though qualitative interviews could provide deeper insights into future research. A key limitation is the focus on a single industry, restricting broader applicability. Future studies could expand to other processed food sectors, such as meat and seafood, to enhance comparative analysis across industries.

3-2. Data Collection

This research utilized a non-probability, purposive sampling method, selecting enterprises with the highest annual revenues within the processed fruit and vegetable sector. Data were collected using an online, self-administered questionnaire via Google Forms. Initial contact was made by phone to explain the research purpose and request participation, followed by email invitations to owners, managers, or department heads. Follow-up calls were made after 7-14 days to remind participants and offer assistance with the questionnaire if needed. A total of 429 responses were collected, with 42 excluded due to excessive missing data, leaving 387 usable responses. The sample size was deemed sufficient based on the structural equation modeling (SEM) guideline by Bentler and Chou (1987), which suggests a sample size of at least five times the number of observed variables. With 70 observed variables in this study, the minimum sample size required was 350 responses, thereby making the 387 responses adequate for SEM analysis.

3-3. Measurement Scale

Fruit and Vegetable Processing Businesses encompass operations that focus on processing fruits and vegetables to extend their shelf life. These processes include producing items such as fruit juices or frozen vegetables but exclude daily food products, such as milk or yogurt. The main objective of these businesses is to enhance the longevity of perishable goods, ensuring that they remain viable for longer periods.

An entrepreneur is an individual who actively seeks profitable opportunities within the marketplace and is capable of effectively managing business risks. In the context of fruit and vegetable processing, entrepreneurs play a crucial role in identifying and exploiting new business opportunities while ensuring the sustainable operation of the enterprise.

Digital technologies refer to the use of digital tools and systems that facilitate the creation, storage, and processing of data. In the realm of fruit and vegetable processing, these technologies support various operations, from production management to marketing, enabling businesses to streamline their processes, improve efficiency, and enhance the overall effectiveness of their products in the marketplace.

The study used Entrepreneurial Orientation (EO) to refers to the behavior and characteristics of entrepreneurs in initiating new products from fruits and vegetables, including decision-making in risk-taking and innovation in new markets. EO measurements from Mudjijah et al. (2022) and others consist of 21 questions across five subscales: Proactiveness (PROA), Risk-Taking (RISK), Innovativeness (INNO), Competitive Aggressiveness (COAG), and Autonomy (AUTO).

Digital Intellectual Dynamics (DID) refers to the use of digital technologies to develop and manage resources in fruit and vegetable processing businesses, such as using digital systems for production management or communication. DID was measured using scales from Pigola and Costa (2021), Ruiz-Ortega et al. (2017), and others, with 16 questions across three subscales: Digital Human Dynamics (DHUM), Digital Social Dynamics (DSOC), and Digital Structure Dynamics (DSTR).

Competitive Advantage (CA) refers to strategies such as cost reduction or product differentiation in fruit and vegetable processing sector to attract customers and outperform competitors. CA was measured with scales from Anwar et al. (2018), including Cost Leadership (COST), Differentiation (DIFF), and Quality (QUAL).

Firm Performance (FP) refers to evaluating the success of fruit and vegetable processing business from perspectives such as financial performance (revenue, profit), customer satisfaction, and internal processes (production improvements). FP was measured using Kaplan and Norton (1996, 2000)

framework, with 19 questions across four subscales: Financial Perspective (FINA), Customer Perspective (CUST), Internal Processes Perspective (INTE), and Learning and Growth Perspective (LEAR).

All variables were measured using a 5-point scale, with additional ranking for owner/manager experience and firm age.

To ensure the reliability and validity of the questionnaire, it was adapted from previous studies and reviewed by five experts: three faculty members from the Faculty of Business Administration, Economics, and Communication at Naresuan University, as well as two entrepreneurs from Thailand's SMEs sector in the processed fruit and vegetable industry. These experts assessed the clarity, coherence, and appropriateness of the language used to measure the variables. Based on their feedback, the questionnaire was refined using the Index of Item-Objective Congruence (IOC) method. The study received ethical approval from the Institutional Review Board of Naresuan University (COA No. 083/2023). A try-out was conducted with a sample closely resembling the target population, confirming that the questionnaire met the established acceptance criteria, demonstrating its quality and suitability for the study.

4. Results

The survey participants were predominantly female (63.05%), with the most common age range being 31-40 years old (35.40%). The majority held a bachelor's degree (73.39%), and most were department heads (45.48%). In terms of work experience, 47.80% had 5 years or less. Regarding business information, 35.40% of businesses have been operating for over 20 years, as detailed in Table 1.

Table 1. Frequency of Respondents According to Demographic Variables

Characteristics	Indicator	Frequency	Percentage
Gender	Male	143	36.95
	Female	244	63.05
Age	20-30 years old	64	16.54
	31-40 years old	137	35.40
	41-50 years old	112	28.94
	51-60 years old	74	19.12
Education Level	Under bachelor's degree	57	14.73
	Bachelor's degree	284	73.39
	Master's degrees	42	10.85
	Doctor's degrees	4	1.03
Position	Owners	113	29.20
	Managers	98	25.32
	Department heads	176	45.48
Years of experience	Less than or equal to 5 years	185	47.80
	6-10 years	96	24.81
	11-15 years	43	11.11
	More than 15 years	63	16.28
Firm age	Under 5 years	42	10.85
	5-10 years	106	27.39
	11-20 years	102	26.36
	More than 20 years	137	35.40

Table 2. Descriptive Statistics and Pearson Correlation Matrix

	Constructs	Mean	S.D.	Correlation		
				1	2	3
1	Entrepreneurial Orientation (EO)	3.56	0.62			
2	Digital Intellectual Dynamics (DID)	3.64	0.66	0.300**		
3	Competitive Advantage (CA)	3.65	0.74	0.333**	0.264**	
4	Firm Performance (FP)	3.61	0.74	0.370**	0.320**	0.430**

The construct-wise descriptive statistical measures, such as mean, standard deviation and correlations, were studied as presented in Table 2. The means of all constructs ranged from 3.65 to 3.56, indicating that most respondents agreed with the performance factors. The low standard deviations suggest minimal variation in responses. Additionally, the correlations between key variables were statistically significant ($p < 0.01$), indicating positive relationships with Firm Performance (FP).

Table 3. Construct Reliability and Normal Distribution

Constructs	Cronbach's Alpha Coefficient	Skewness	Kurtosis
Entrepreneurial Orientation (EO)	0.941	-0.137	-0.216
Proactiveness (PROA)	0.897	-0.145	-0.397
Risk-Taking (RISK)	0.892	-0.156	-0.344
Innovativeness (INNO)	0.891	-0.193	-0.499
Competitive Aggressiveness (COAG)	0.890	-0.297	-0.224
Autonomy (AUTO)	0.864	-0.162	-0.536
Digital Intellectual Dynamics (DID)	0.935	-0.079	-0.577
Digital Human Dynamics (DHUM)	0.929	-0.320	-0.220
Digital Social Dynamics (DSOC)	0.929	-0.092	-0.588
Digital Structure Dynamics (DSTR)	0.902	-0.249	-0.388
Competitive Advantage (CA)	0.934	-0.297	-0.488
Cost Leadership (COST)	0.931	-0.370	-0.343
Differentiation (DIFF)	0.931	-0.264	-0.640
Quality (QUAL)	0.936	-0.435	-0.336
Firm Performance (FP)	0.950	-0.345	-0.465
Financial Perspective (FINA)	0.928	-0.157	-0.584
Customer Perspective (CUST)	0.924	-0.534	-0.233
Internal Processes Perspective (INTE)	0.914	-0.449	-0.466
Learning and Growth Perspective (LEAR)	0.916	-0.263	-0.628

The model measurements in SEM were evaluated using criteria such as loading factor, Cronbach's alpha, normal distribution, composite reliability, average variance extracted (AVE), discriminant validity, and model fit (Tables 3-6). Harman's Single Factor test (Podsakoff et al., 2003) was applied to check for common method bias (CMB), revealing a variance of 25.81%, confirming no bias (Eichhorn, 2014). Reliability was confirmed with Cronbach's α and composite reliability (CR) exceeding 0.7 (Hair et al., 2017), with Cronbach's α values ranging from 0.950 to 0.934. Validity was assessed through content and construct validity, including convergent and discriminant validity. Normality tests showed skewness and kurtosis values between -0.569 to 0.017 and -0.878 to 0.045, confirming data normality (Kline, 2005; Westfall & Henning, 2013).

Table 5 presents the evaluation of the measurement model's fit using Structural Equation Modeling (SEM) with the AMOS software, based on the following fit indices: GFI, CFI, and TLI, with a recommended value of ≥ 0.90 (Diamantopoulos et al., 2000; Hu & Bentler, 1999; Schreiber et al., 2006); RMSEA, with a recommended value of ≤ 0.10 (Hu & Bentler, 1999); RMR, with a recommended value of ≤ 0.05 (Tabachnik & Fidell, 2007); CMIN/DF, with a recommended value of ≤ 3 (Hu & Bentler, 1999; Wheaton et al., 1977); and P-close, with a recommended value of ≥ 0.05 (Diamantopoulos et al., 2000; Hu & Bentler, 1999). These criteria are used to assess the model's goodness of fit. The results indicate that the Final model meets all recommended thresholds, suggesting that the model is well-fitting and consistent with the empirical data.

The analysis began with Confirmatory Factor Analysis (CFA) to validate the relationship between observed variables and their latent constructs, ensuring accurate variable grouping and a good fit with the data. A subsequent Second-order Confirmatory Factor Analysis (S-CFA) verified the suitability of the higher-order structure for use in the Structural Equation Model (SEM). The results indicated that the final model meets all recommended thresholds, confirming its adequacy and alignment with the data, thereby supporting its use in further structural analysis.

Table 4. Discriminant Validity

Fornell-Larcker Criterion				
Construct	**EO**	**DID**	**CA**	**FP**
Entrepreneurial Orientation (EO)	0.729#			
Digital Intellectual Dynamics (DID)	0.371***	0.720#		
Competitive Advantage (CA)	0.421***	0.347***	0.710#	
Firm Performance (FP)	0.413***	0.370***	0.516***	0.784#

Notes: *# – more than the correlations between latent variables.*

Table 5. Model Fit Statistics of the Measurement Model

Indices	Recommended value	Reference	Initial model	Final model
GFI	≥ 0.90	Hu & Bentler (1999), Diamantopoulos et al. (2000)	0.963	0.971
CFI	≥ 0.90	Hu & Bentler (1999)	0.986	0.998
TLI	≥ 0.90	Schreiber et al. (2006), Hu & Bentler (1999)	0.983	0.997
RMSEA	≤ 0.10	Hu & Bentler (1999)	0.030	0.012
RMR	≤ 0.05	Tabachnik & Fidell (2007)	0.024	0.022
CMIN/DF (normed chi square)	≤ 3	Wheaton et al. (1977), Hu & Bentler (1999)	1.354	1.053
P-close	≥ 0.05	Hu & Bentler (1999), Diamantopoulos et al. (2000)	0.017	0.349

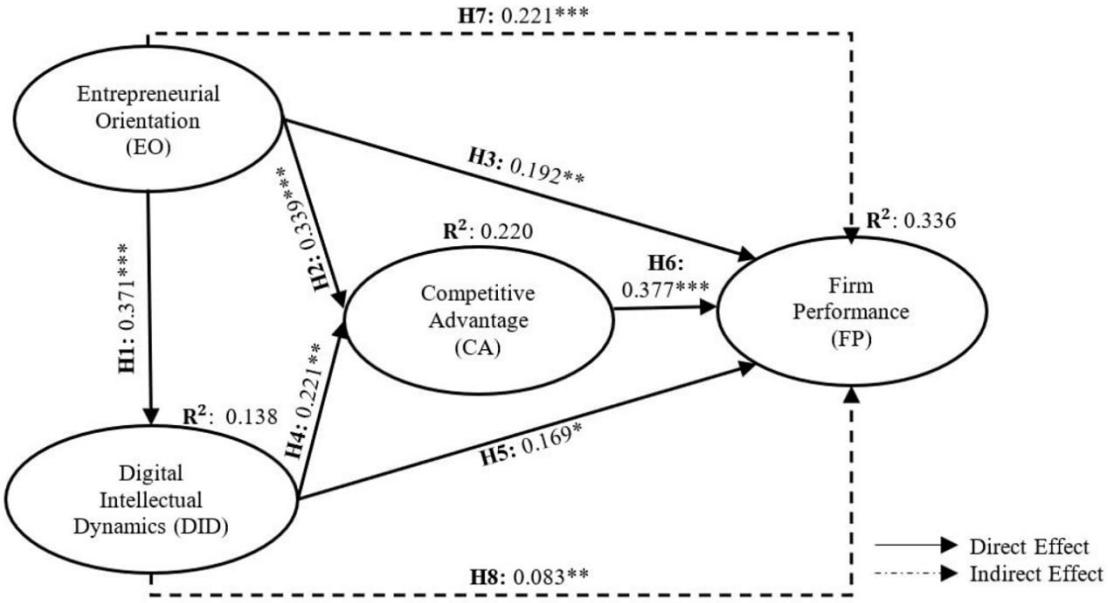
Table 6. Regression Estimates and Validity of Constructs Items

Constructs	Unstandardized estimate	Standardized estimate	S.E.	C.R.	R^2	CR	AVE
Entrepreneurial Orientation (EO)						0.850	0.531
Proactiveness	1.000	0.725	-	-	0.526		
Risk-Taking	1.038	0.718	0.081	12.882	0.516		
Innovativeness	1.076	0.719	0.083	12.901	0.517		
Competitive Aggressiveness	1.025	0.739	0.077	13.238	0.546		
Autonomy	0.988	0.743	0.074	13.305	0.552		
Digital Intellectual Dynamics (DID)						0.762	0.518
Digital Human Dynamics	1.000	0.786	-	-	0.618		
Digital Social Dynamics	0.885	0.684	0.082	10.822	0.468		
Digital Structure Dynamics	0.846	0.684	0.078	10.819	0.468		
Competitive Advantage (CA)						0.753	0.504
Cost Leadership	1.000	0.726	-	-	0.527		
Differentiation	1.000	0.702	0.092	10.853	0.493		
Quality	0.988	0.702	0.091	10.854	0.493		
Firm Performance (FP)						0.864	0.615
Financial Perspective	1.000	0.787	-	-	0.619		
Customer Perspective	0.898	0.744	0.068	13.278	0.554		
Internal Processes Perspective	1.087	0.893	0.076	14.331	0.797		
Learning and Growth Perspective	0.850	0.699	0.067	12.604	0.489		

The study confirmed discriminant validity using the Fornell and Larcker (1981) criterion, ensuring that the latent variables in the research model had adequate distinctiveness for SEM analysis. Positive correlations were found between latent variables, with significant relationships at the .001 level. Model fit estimation indicated strong fit indices (GFI=0.971, CFI=0.998, TLI=0.997, RMSEA=0.012, RMR=0.022, CMIN/DF=1.053, and P-close=0.349). All fit indexes met the criteria, confirming the model's consistency with the data (Diamantopoulos et al., 2000; Hu & Bentler, 1999; Tabachnik & Fidell, 2007; Wheaton et al., 1977). Additionally, all items had significant loadings on their constructs, with standardized weights above 0.60 (Table 5). Construct validity, as defined by Hair et al. (2017), refers to the extent to which measured variables reflect their intended latent constructs. To assess this,

both convergent and discriminant validities were established. Convergent validity was confirmed using the following criteria: Standardized Factor Loading ≥ 0.60 (Hair et al., 2010; Hayes & Rockwood, 2017; Malhotra et al., 2006; Mueller & Hancock, 2018), CR ≥ 0.70 (Hair et al., 2017), and AVE ≥ 0.50 (Fornell & Larcker, 1981; Hair et al., 2017).

In summary, the model demonstrates consistency with empirical data, as evidenced by the following R^2 coefficients: (1) R^2_{DID}=0.138, indicating that the entrepreneurial orientation (EO) variable explains 13.8% of the variance in the digital intellectual dynamics (DID) variable, with the remaining 86.2% influenced by other factors. (2) R^2_{CA}=0.220, implying that EO and DID together explain 22% of the variance in the competitive advantage (CA) variable, with 78% influenced by other factors. (3) R^2_{FP}=0.336, indicating that EO, DID, and CA together explain 33.6% of the variance in organizational performance (FP), with the remaining 66.4% influenced by other factors.



Notes: * p < 0.05, ** p < 0.01, *** p < 0.001.

Fig. 2. Structural Model Output

Table 7. Path Coefficient

Hypothesis	Relationship	b	S.E.	C.R.	β	P-Value	Result
H1	EO → DID	0.421	0.073	5.735	0.371	0.000	Accepted
H2	EO → CA	0.394	0.081	4.859	0.339	0.000	Accepted
H3	EO → FP	0.253	0.080	3.178	0.192	0.003	Accepted
H4	DID → CA	0.226	0.072	3.133	0.221	0.003	Accepted
H5	DID → FP	0.196	0.070	2.797	0.169	0.011	Accepted
H6	CA → FP	0.428	0.077	5.552	0.377	0.000	Accepted
H7	EO → CA→ FP	-	-	-	0.221	0.000	Accepted
H8	DID → CA→ FP	-	-	-	0.083	0.002	Accepted

Notes: * p < 0.05, ** p < 0.01, *** p < 0.001, Standardized indirect effects (Bootstrap = 5,000, bias-corrected, 95%)

The findings indicate that all values conform to the established standards, and the adequacy of the measurement models has been evaluated using three reliability indicators: factor loadings, Cronbach's alpha, composite reliability (CR), and convergent validity (AVE), all of which are deemed optimal.

Path analysis (structural model), using SEM, assessed the relationships between Entrepreneurial Orientation (EO), Digital Intellectual Dynamics (DID), Competitive Advantage (CA), and Firm Performance (FP). The results showed significant positive relationships between the constructs. EO directly influenced DID (β = 0.371), CA (β = 0.339), and FP (β = 0.192). DID directly influenced CA (β = 0.221) and FP (β = 0.169), while CA had a direct effect on FP (β = 0.377). Bootstrap analysis

confirmed that EO and DID indirectly impacted FP through CA. The R^2 values indicated that EO explained 13.8% of DID, EO, and DID together explained 22% of CA, and EO, DID, and CA together explained 33.6% of FP.

4-1 Summary of the Research Findings

1. Entrepreneurial Orientation (EO) and Digital Intellectual Dynamics (DID). The study reveals that EO has a significant positive direct effect on DID at a 0.001 significance level, with an influence coefficient of 0.371. Interviews highlight the accelerating role of digital technologies in contemporary business practices, underscoring the need for SMEs to adopt an entrepreneurial mindset focused on digital adaptation. Entrepreneurs who actively integrate digital tools enhance organizational efficiency, streamline supply chains, reduce delays, and improve market responsiveness.

2. Entrepreneurial Orientation (EO), Digital Intellectual Dynamics (DID), and Competitive Advantage (CA). The findings indicate that EO and DID significantly and positively impact CA, with significance levels of 0.001 and 0.01, and influence coefficients of 0.339 and 0.221, respectively. Interviews suggest that combining EO and DID fosters innovation across products, production processes, and quality control, creating competitive advantages through cost leadership and product differentiation. Additionally, digital-savvy teams enable SMEs to resolve production challenges effectively and strengthen relationships with customers, employees, and supply chain partners.

3. Entrepreneurial Orientation (EO), Digital Intellectual Dynamics (DID), Competitive Advantage (CA), and Firm Performance (FP). EO, DID, and CA exhibit significant positive direct effects on FP at significance levels of 0.01, 0.05, and 0.001, respectively. CA had the highest influence coefficient at 0.377, followed by EO at 0.192 and DID at 0.169. Interviews corroborate these findings, indicating that entrepreneurs who embrace digital tools and cultivate innovation achieve product differentiation and ensure high-quality standards, enhancing organizational efficiency. The Balanced Scorecard (BSC) framework supports these performance improvements across financial, customer, internal process, and learning and growth dimensions.

4. Indirect Effects of Entrepreneurial Orientation (EO) and Digital Intellectual Dynamics (DID) on Firm Performance (FP) Through Competitive Advantage (CA). The study further confirms that EO and DID have significant positive indirect effects on FP through CA at significant levels of 0.001 and 0.01, with influence coefficients of 0.221 and 0.083, respectively. Interviews highlight the importance of fostering entrepreneurial traits such as opportunity-seeking and innovation, alongwith forging strategic partnerships to alleviate market competition. Integrating digital technologies into logistics and communication enhances operational agility, ultimately contributing to sustained CA and FP.

4-2 Novel Findings

1. The Direct Influence of Entrepreneurial Orientation (EO) on Digital Intellectual Dynamics (DID). This study affirms the positive direct relationship between EO and DID, reinforcing the significance of digital integration as part of entrepreneurial strategies. Entrepreneurs are encouraged to adopt digital tools for innovation, enhance workforce technological competencies, and leverage social media for broader market engagement. These efforts contribute to sustaining long-term competitiveness and boosting firm performance.

2. Digital Intellectual Dynamics (DID) Role in Competitive Advantage (CA). The findings underscore DID's positive influence on CA, highlighting the need for SMEs to develop digital human, social, and structural dynamics. Enhancing employee digital skills, adopting e-commerce platforms, and refining organizational structures to support technological innovation drive sustainable competitive advantage. Furthermore, digital integration strengthens internal collaboration, improves decision-making, and fosters organizational resilience in navigating market changes. This study offers fresh insights into leveraging digital intellectual dynamics for sustainable growth in the digital era.

5. Discussion and Conclusions

This research explores the impact of Entrepreneurial Orientation (EO) and Digital Intellectual Dynamics (DID) on Competitive Advantage (CA) and Firm Performance (FP) among SMEs in Thailand's processed fruit and vegetable sector. The findings highlight the crucial role of EO and DID in enhancing CA, which in turn drives FP, with CA acting as a significant mediator. The study

indicates that EO positively influences DID, with SMEs prioritizing proactivity, risk-taking, innovation, and autonomy being better positioned to leverage digital capabilities. This finding aligns with prior studies (Isichei et al., 2020; Keen et al., 2022) which emphasize EO's role in fostering innovation and adaptability in a digital context. EO strengthens digital capabilities by enabling businesses to develop the necessary structures and knowledge-sharing practices, further improving their competitive edge and operational flexibility.

1- Entrepreneurial Orientation (EO) Affecting Digital Intellectual Dynamics (DID)

This study indicates that Entrepreneurial Orientation (EO) has a significant positive direct effect on Digital Intellectual Dynamics (DID), which aligns with Hypothesis 1. This can be explained by the fact that, within small and medium-sized enterprises (SMEs) in the processed fruit and vegetable sector in Thailand, an EO not only assists in creating new businesses but also promotes adaptation and growth in a rapidly changing business environment. Key factors such as proactiveness, risk-taking, innovativeness, competitive aggressiveness, and autonomy play crucial roles in enabling SMEs to leverage digital technology to enhance their internal intellectual capabilities effectively. Moreover, EO helps entrepreneurs adjust strategies to cope with both internal and external factors that impact the success and sustainability of the business.

Building on this, EO plays a pivotal role in strengthening DID by fostering organizational creativity, absorptive capacity, and effective knowledge management. These capabilities encourage firms to strategically adopt and integrate advanced digital technologies, including artificial intelligence, which accelerate innovation processes and facilitate knowledge sharing (Arabiun et al., 2024; Wu et al., 2025). Furthermore, EO-driven digitalization supports greater organizational adaptability and long-term success by aligning human capital development and external collaborations with technological advancements (Ccorisapra-Quintana & Portocarrero-Rivera, 2025). This finding is consistent with studies conducted by Isichei et al. (2020) and Keen et al. (2022), which highlighted the positive effects of EO on firm performance, particularly in terms of innovativeness and proactiveness, both of which are vital for long-term success.

However, while the findings support the importance of EO in fostering DID, the impact may not always be clear-cut. EO may not yield positive results if other factors, such as financial capital or market access, are lacking. This can hinder SMEs from fully exploiting their potential to implement digital technologies effectively. Additionally, it is noteworthy that the ability to share knowledge within the firm could be a critical factor that needs continuous development. If firms fail to manage knowledge sharing effectively, it may hinder innovation and the adoption of new technologies within the business.

Simultaneously, the success of SMEs is also dependent on several external factors, such as the economic and political environment, external support from government and other agencies, and existing technological infrastructure, all of which may influence the ability to adopt digital technology. This is consistent with the research of Anggadwita et al. (2023), which discusses the role of dynamic capabilities and organizational culture in expanding international markets. The effects of EO become more apparent when firms can adapt and develop strategies that align with rapidly changing environments, as seen during the COVID-19 crisis, which served as a prime example of the adaptive capabilities of SMEs with EO at an international level.

Therefore, this study confirms the importance of EO in fostering DID and enhancing SMEs' adaptability; however, it also highlights the need to consider external factors that significantly impact long-term operations. This holistic approach is crucial for ensuring sustainable growth and competitiveness in the highly dynamic market.

2- Entrepreneurial Orientation (EO) and Competitive Advantage (CA)

The results of hypothesis testing reveal that Entrepreneurial Orientation (EO) has a significant impact on Competitive Advantage (CA), which aligns with hypothesis 2. This suggests that an organization's focus on entrepreneurship supports the creation of innovations and the development of more efficient business processes, enabling firms to adapt to market changes and consumer demands. Furthermore, it enhances the ability to differentiate from competitors within the industry. This finding is consistent with the research by Dahana et al. (2021), which demonstrates that entrepreneurial courage and

information-seeking behaviors can also lead to a CA. Galbreath et al. (2020) found that organizations with a strong EO often innovate in product markets, despite the associated high costs. Similarly, Mahmood and Hanafi (2013) highlighted that proactiveness, risk-taking, and innovativeness are critical factors for firms to adapt to market changes and introduce new, creative products, thereby enhancing differentiation from competitors. Additionally, Zeebaree and Siron (2017) confirmed that risk-taking significantly affects CA, enabling firms to seize market opportunities despite uncertainty.

Recent studies further emphasize EO as a key strategic resource aligned with the Resource-Based View (RBV), fostering unique and difficult-to-imitate capabilities that drive sustained CA. EO enhance firms' responsiveness to market trends and customer needs, enabling differentiation and agility (Tajeddini et al., 2013). Moreover, dynamic managerial capabilities—when integrated with EO—strengthen innovation performance and competitive positioning, particularly when supported by strong human capital and efficient internal processes (Ghavamipour et al., 2025; Javaid & Raza, 2025). These insights highlight the importance of combining EO with organizational resources to maximize competitive benefits.

However, while these findings support the positive relationship between EO and CA, it is essential to consider certain limitations and contexts that may affect the outcome. For instance, research by Lechner and Gudmundsson (2014) indicates that different dimensions of entrepreneurship have varying impacts on CA. While innovation is positively correlated with differentiation strategies, risk-taking and competitive aggressiveness may have negative correlations in certain contexts. In fact, the overemphasis on risk-taking can lead to poor decision-making or unsustainable investments, especially for SMEs that have limited resources. This is consistent with the study by Paulus and Hermanto (2022), which found that EO in SMEs in East Java's furniture industry positively influenced competitive advantage, while risk-taking did not significantly impact it. It could be argued that risk-taking, while essential in some cases, should be strategically balanced to avoid excessive exposure to business risks. Additionally, Karnowati and Handayani (2022) found that EO had no direct impact on CA during the COVID-19 pandemic, further suggesting that external factors, such as market disruptions and global crises, can play a significant role in diminishing the expected positive effects of EO. In such situations, even firms with a strong entrepreneurial focus might struggle to maintain a CA due to factors beyond their control.

From this study, it can be concluded that EO plays an important role in creating a CA for SMEs. However, the implementation of this approach must consider the context and factors that differ across firms. These factors include industry characteristics, market environment, organizational culture, and employee capabilities. A comprehensive analysis of these contexts will allow SMEs to develop more appropriate and effective entrepreneurial strategies, thereby enhancing their CA in rapidly changing markets. While the overall conclusion that EO is crucial for fostering CA seems acceptable, it could be argued that its effectiveness is not only dependent on internal entrepreneurial strategies but also influenced by external factors, as seen during the COVID-19 pandemic. Therefore, a more balanced view is required. Firms should consider both internal capabilities and external environmental factors to develop a comprehensive, flexible strategy. Simply focusing on EO might not be sufficient and could even be detrimental if external risks are not considered. In this regard, a more dynamic, adaptive approach to entrepreneurship, which accounts for both internal and external factors, would likely lead to more sustainable CA for SMEs.

3- Entrepreneurial Orientation (EO) and Firm Performance (FP)

The results of hypothesis testing indicate that Entrepreneurial Orientation (EO) significantly impacts firm performance (FP), as suggested by Hypothesis 3. This implies that SMEs in Thailand's processed fruit and vegetable sector with a focus on entrepreneurship are likely to see improved performance across financial, customer, internal process, and learning and growth perspectives. Such focus encourages innovation and effective adaptation in fast-changing markets, leading to better resource management and quicker responses to challenges. These findings align with those of Octavia et al. (2020) and Al-Mamary et al. (2020), who found that digital technologies and innovation drive operational efficiency and financial performance. EO also positively affects non-financial aspects, such as customer and employee satisfaction (Jemal, 2020). Arabiun et al. (2024) found that EO, combined with digitalization and knowledge management, boosts sustainable performance in digital start-ups. Similarly, Samieifard et al.

(2024) linked EO-driven innovation to better online marketing outcomes. In addition, Wu et al. (2025) underscored that proactive EO behaviors, including AI adoption, enhance adaptability and performance in manufacturing. Moreover, Tajeddini et al. (2024) highlighted entrepreneurial capabilities as key to supply chain innovation and FP. Together, these studies confirm that EO enhances FP through effective use of technology, knowledge, and market focus.

However, some studies contradict this view. Kavana and Puspitowati (2022) and Kanaan-Jebna et al. (2022) found that EO had no significant impact on FP, especially in industries like food and beverages or handicrafts. Similarly, Nguyen et al. (2022) noted that while EO didn't directly impact performance, it played a role in enhancing social media presence, which affects performance indirectly.

While EO clearly helps improve FP and sustainability, the effectiveness of this orientation may depend on contextual factors such as market conditions and the organization's maturity. For example, the positive impacts of EO might be less significant during market disruptions, such as the COVID-19 pandemic. Additionally, focusing too much on financial performance could ignore the importance of internal processes and employee well-being, which are crucial for long-term success. Therefore, while the general findings seem true, a more balanced approach, considering both external and internal factors, would be beneficial for SMEs in the long term.

4- Digital Intellectual Dynamics (DID) and Competitive Advantage (CA)

The results of hypothesis testing indicate that DID significantly impact CA, aligning with hypothesis 4. Firms that leverage DID—comprising human, social, and structural digital dynamics—can use these insights to innovate or enhance internal processes, enabling them to respond effectively to market demands. Utilizing data-driven decision-making and developing flexible business strategies boosts competitive capability. This is supported by Obeidat et al. (2021), who demonstrated that intellectual capital, including structural, human, and relational capital, significantly contributes to sustained competitive advantage. Yaseen et al. (2016) further emphasized the importance of human capital, linking it to relational capital to enhance competitiveness. Knowledge management links EO and digitalization to sustained performance by enabling firms to leverage intellectual resources for innovation (Arabiun et al., 2024). Organizational creativity and absorptive capacity also enhance innovation and competitive positioning through effective use of external knowledge (Ccorisapra-Quintana & Portocarrero-Rivera, 2025). Innovation and FP further improve online marketing effectiveness, strengthening CA in digital markets (Samieifard et al., 2024). Effective resource management and internal processes are equally vital for competitiveness (Javaid & Raza, 2025). Overall, managing intellectual resources and digital capabilities is essential for SMEs to sustain CA in dynamic, digital environments.

Moreover, Rotjanakorn et al. (2020) highlighted that dynamic capabilities can drive quick changes, leading to a CA, particularly in responding to competitive pressures and adapting to a changing environment. However, some studies, such as Hermawan et al. (2020), suggest that human capital impacts CA directly by enhancing capabilities and knowledge, while structural capital influences indirectly through fostering creativity and innovation culture. Kamukama (2013) further argued that human capital may not directly impact CA but has an indirect influence through relational capital, stressing the importance of integrating internal knowledge and continuous innovation. In summary, DID empowers SMEs to access market and customer data more effectively, which is critical for formulating modern, competitive strategies. Furthermore, fostering digital skills within the organization facilitates continuous innovation and adaptability in a fast-evolving market, ensuring long-term CA. I would add that the ability to maintain a balance between human, social, and structural capital is key to sustaining the competitive edge in today's digital age. Without this integration, the potential benefits of DID might not be fully realized.

5- Digital Intellectual Dynamics (DID) and Firm Performance (FP)

It is deemed that Digital Intellectual Dynamics (DID) significantly impact firm performance (FP). Specifically, the use of digital resources, such as human digital dynamics, social digital dynamics, and structural digital dynamics, plays a crucial role in creating innovation and adapting to market changes efficiently (Pigola & Costa, 2022). Particularly, human digital dynamics enhances creativity in

developing new products and services, while social digital dynamics influences effective work processes, which aligns with Thanh Nhon et al. (2020), who discussed the impact of human capital and dynamic capabilities on FP.

However, findings from Zhou et al. (2019) indicate that dynamic capabilities in integration have a minimal impact on innovation and FP. This may reflect the challenges that many firms still encounter in fully integrating digital technologies and knowledge management. This aligns with Lee and Huang (2012), who found that FP across the four perspectives of the Balanced Scorecard (BSC) leads to the creation and enhancement of intellectual capital management. Under the BSC framework, strategies related to learning and growth drive innovation capital and human capital, while internal business processes contribute to process capital. The customer perspective fosters customer capital or relational capital, reinforcing the importance of adaptability in sustaining FP. Laksaniyanon (2021) supports this, highlighting how adaptability in meat processing and preservation businesses enhances financial performance. By adjusting production processes, adopting new technologies, and refining marketing strategies, firms maintain efficiency despite economic shifts and uncertainties. Businesses that can rapidly adapt secure long-term sustainability and competitive advantage outperform those unable to adjust. AI adoption enhances innovation and collaboration while shifting labor needs toward skilled workers (Wu et al., 2025). Digital technologies also boost competitiveness through green innovation and ESG performance, often with indirect effects on performance (Fan et al., 2023). Psychological factors in adopting AI-driven services further support FP by increasing digital engagement (Shah et al., 2025). Together, these studies highlight the importance of managing digital resources and capabilities to drive innovation and growth.

Moreover, Foster et al. (2022) found that intellectual capital, including knowledge, skills, and attitudes, improves FP when reinforced by firm infrastructure and communication capabilities. Human resource capabilities, supported by extensive knowledge and experience, enhance work performance. In my view, the impact of structural digital dynamics may vary depending on technological development and implementation levels in each firm. As digital integration and resource management improve, structural dynamics could have a more significant impact in the future. This study underscores the necessity of advancing and applying DID to boost operational efficiency and competitive advantage (CA). Utilizing data and intellectual resources to refine strategies and processes that add value will enable firms to thrive sustainably in the digital era.

6- Competitive Advantage (CA) and Firm Performance (FP)

Firms that can create and sustain a CA—through cost leadership, differentiation, and quality—tend to have better overall operational efficiency (Dahana et al., 2021). CA enhances market confidence, customer satisfaction, and the likelihood of repeat purchases. It also enables firms to set competitive prices, increasing revenue and profit over time, contributing to long-term sustainability.

Sareekham et al. (2021) emphasized that CA, which includes capabilities, quality, innovation, and responsiveness, positively impacts performance across various perspectives, including financial, customer, internal processes, and learning and growth perspectives. Perdana and Prasasti (2023) further highlighted that SMEs investing in both tangible and intangible resources can create CA that significantly improve operational efficiency, aligning with S. Khan et al. (2019b), who found that strong CA led to better financial and non-financial performance. Recent studies highlight a strong link between CA and FP; for instance, innovation and FP mutually reinforce one another, boosting online marketing and CA in digital markets (Samieifard et al., 2024). Furthermore, EO and digitalization, supported by knowledge management, enhance sustainable performance and CA (Arabiun et al., 2024). In addition, effective resource management and efficient processes are key to competitiveness, as underscored by Javaid and Raza (2025). Overall, these studies emphasize that integrating innovation, digital capabilities, and knowledge resources is essential for achieving sustained CA and improved FP.

However, Galbreath et al. (2020) indicated that while differentiation strategies can enhance FP, low-cost strategies may harm efficiency, particularly when combined with an entrepreneurial focus. This suggests that competitive strategies need to be carefully selected to balance cost leadership and differentiation to avoid unintended negative consequences. These findings support the idea that firms with a strong CA tend to perform better in terms of resource utilization, market adaptability, and

innovation, which ultimately satisfies customer needs. However, the importance of selecting appropriate CA strategies, such as differentiation and efficient resource use, should not be overlooked. Investing in both tangible and intangible resources, as well as fostering innovation, will help firms maintain their CA in highly competitive markets.

7- Entrepreneurial Orientation (EO) and Firm Performance (FP), with Competitive Advantage (CA) as a Mediating Variable

The findings that entrepreneurial orientation (EO) indirectly influences firm performance (FP), with competitive advantage (CA) acting as a crucial mediating factor, aligned with hypothesis 7, suggest that EO significantly contributes to positive organizational outcomes through strategies that maximize competitive capabilities. The study emphasizes that CA plays a central role in strengthening the impact of EO on FP. Research by Kiyabo and Isaga (2020) supports the idea that CA serves as a vital mediator between EO and FP, particularly highlighting the importance of intangible resources in enhancing organizational efficiency. This aligns with the resource-based view, which argues that both CA and organizational success stem from resources under the control of the firm.

Further studies, such as Dahana et al. (2021), reinforce this idea, implying that firms with a CA typically outperform their competitors. Similarly, Sunargo (2022) emphasizes that MSMEs focusing on entrepreneurship tend to face greater risks, yet they also take proactive steps that ultimately improve performance through CA. Additionally, Asad et al. (2022) found that EO can harness big data to gain a CA and boost their operational efficiency. Sukmamedian (2021) found that the combination of EO and CA has a stronger effect on FP than EO alone. Yang and Aumeboonsuke (2022) further supported this by showing that competitive strategy and knowledge creation processes link EO and FP, highlighting the critical role of CA in this relationship. Arabiun et al. (2024) emphasized that knowledge management, a key component of DID, mediates the link between entrepreneurial orientation, digitalization, and sustainable performance in digital start-ups. Similarly, Samieifard et al. (2024) demonstrated that innovation and FP contribute to CA, which in turn enhances online marketing effectiveness, suggesting CA as a pivotal intermediary between intellectual capital and performance outcomes. Further supporting this, Javaid and Raza (2025) underlined the importance of effective resource management and internal processes in fostering competitiveness, indicating that CA bridges the impact of intellectual and digital capabilities on firm results. Ghavamipour et al. (2025) also revealed that dynamic managerial capabilities enhance innovation and competitive positioning, reinforcing the mediating role of CA between intellectual resources and FP. Together, these studies confirm that DID improves FP not only directly but also indirectly through building and sustaining competitive advantage. For SMEs, developing intellectual and digital capabilities alongside strategic resource management is vital to leveraging CA for superior performance in dynamic markets.

However, it is important to consider the complexity of competitive strategies. Lechner and Gudmundsson (2014) pointed out that innovation is often associated with differentiation strategies, while risk-taking and aggressive competition may harm performance coupled with cost leadership strategies. This insight underscores the need for careful strategic planning to achieve sustainable success. In conclusion, this study reinforces the significance of CA as a mediator between EO and FP. EO not only enables firms to differentiate but also improves product quality and cost efficiency. Strong CA, supported by differentiation and cost leadership strategies, can enhance productivity and innovation. Investing in both tangible and intangible resources is essential for SMEs to remain competitive and efficient in the long run. Despite these insights, the complexity of competitive strategies calls for a nuanced approach to ensure long-term success. Strategic adaptation and continuous innovation will be key for organizations seeking to maintain their CA.

8- Digital Intellectual Dynamics (DID) and Firm Performance (FP), with Competitive Advantage (CA) as a Mediating Variable

The findings that digital intellectual dynamics (DID) indirectly affect firm performance (FP), with competitive advantage (CA) serving as a significant mediating factor, align with hypothesis 8. This suggests that the development of DID enhances a firm's competitive capabilities by supporting knowledge management and facilitating effective responses to digital market changes. Firms that

integrate DID effectively can leverage existing data and resources to gain a CA, which leads to improved overall FP.

Once an organization establishes a clear CA, it becomes better equipped to create value for customers and respond to market demands more effectively. This results in continuous improvements in FP. The findings are consistent with Rotjanakorn et al. (2020), who found that dynamic capabilities significantly affect FP, with CA and innovation capability acting as mediators. Similarly, S. Khan et al. (2019b) noted that sustainable CA serves as a mediator between financial capability and FP, playing a vital role in the relationship between intellectual capital and FP. Kamukama et al. (2011) also found that CA acts as a mediator in the relationship between intellectual capital and financial performance in microfinance institutions in Uganda. Additionally, Jain et al. (2017) highlighted that socially responsible organizations can collaborate with suppliers and gather valuable marketing data from customer perspectives to improve product quality and enhance brand image. These relationships underscore the importance of developing DID in an era where technology is rapidly evolving. By fostering the integration of digital knowledge and resources, firms can create lasting CA and improve their efficiency, responding effectively to shifts in the market. Effective resource management also drives competitiveness, with CA serving as the link between digital capabilities and firm outcomes (Javaid & Raza, 2025). Moreover, dynamic managerial capabilities strengthen the mediating role of CA (Ghavamipour et al., 2025), while innovation-driven DID boosts performance through CA by enhancing marketing effectiveness (Samieifard et al., 2024).

This study significantly contributes to the understanding of how entrepreneurial orientation (EO), digital intellectual dynamics (DID), competitive advantage (CA), and firm performance (FP) interrelate, particularly within SMEs in Thailand's processed fruit and vegetable sector. The findings are firmly rooted in the resource-based view (RBV), which emphasizes that sustainable competitive advantage and superior performance are derived from a firm's unique internal resources and capabilities.

The RBV theory highlights that EO, as a dynamic capability, enables SMEs to leverage and exploit their internal resources, such as innovativeness, proactiveness, and risk-taking, to create CA. This aligns with prior research by Isichei et al. (2020) and Keen et al. (2022), who demonstrated that EO positively influences FP by fostering innovation and adaptability, both of which are vital in a competitive and digitalized business environment. The study thus supports RBV's view that EO is a key resource that enhances internal capabilities, allowing SMEs to adapt and grow. When discussing DID, the study extends the RBV by incorporating digital resources as vital elements of a firm's intellectual capital. As highlighted by Obeidat et al. (2021) and Yaseen et al. (2016), DID—comprising human, social, and structural capital—enables firms to access and manage valuable digital knowledge, which is crucial for innovation and strategic flexibility. The integration of DID into the RBV framework emphasizes that SMEs with robust digital capabilities can achieve a sustained competitive advantage by continuously adapting to market shifts and technological advancements. The findings on CA align with the work of Dahana et al. (2021) and Galbreath et al. (2020), which suggest that EO drives innovation and, consequently, CA. The study also builds on RBV's concept that CA is not only about internal capabilities, such as innovation, but also about how firms strategically leverage external factors, such as market conditions and available resources, to maintain their competitive edge. Lechner and Gudmundsson (2014) highlighted the importance of balancing innovation and risk-taking, which this study reinforces by acknowledging the contextual factors that influence the relationship between EO and CA.

The impact on SMEs from these findings is significant. SMEs in Thailand's processed fruit and vegetable sector that adopt an EO can better leverage their internal resources, such as innovation and risk-taking, to adapt and thrive in a highly competitive and rapidly changing market. This proactive approach enables them to continuously innovate, develop new products, and differentiate themselves from competitors. Additionally, DID plays a crucial role by allowing SMEs to efficiently utilize digital technologies, enhancing their intellectual capital and overall strategic flexibility. This digital transformation is increasingly essential in a world where technological advancements and consumer demands are evolving quickly. Moreover, SMEs that foster a strong CA through their EO and DID are more likely to improve their FP, customer satisfaction, and financial sustainability. By focusing on both internal resources and external digital capabilities, SMEs can create a balanced strategy that

drives long-term success and growth. The findings underscore the importance of considering both internal and external factors when developing business strategies, as focusing solely on one dimension may not yield the desired results.

In terms of Firm Performance (FP), SMEs that integrate EO and DID into their business operations can expect improved financial, customer, and internal process performance, as these strategies enhance resource management, innovation, and adaptability. However, the study also suggests that external factors, such as market conditions and economic disruptions, play a significant role in influencing the effectiveness of EO and DID, particularly during times of crisis. SMEs must therefore adopt a flexible, dynamic approach to entrepreneurship, accounting for both internal capabilities and external risks, to ensure sustained competitive advantages and long-term performance. In conclusion, the study reinforces RBV theory by emphasizing that EO, DID, and CA are critical intangible resources that directly influence FP. These findings expand on existing literature by highlighting how SMEs can leverage both internal resources and external digital capabilities to foster sustainable CA in an increasingly digital and competitive marketplace. The study suggests that RBV's focus on valuable, rare, inimitable, and non-substitutable resources can be applied to EO, DID, and CA to explain the dynamics of FP in the context of SMEs. The results further indicate that SMEs must focus on both internal entrepreneurial strategies and external environmental factors to build adaptable, resource-driven strategies for long-term success.

6. Research Implications

6-1. Theoretical Implications

This research presents a novel structural model for SMEs in Thailand's fruit and vegetable processing sector, integrating entrepreneurial orientation (EO), digital intellectual dynamics (DID), competitive advantage (CA), and firm performance (FP). Based on the resource-based view (RBV), the model illustrates how valuable, rare, and non-substitutable resources contribute to sustainable competitive advantage and improved performance. By combining EO with DID, the study emphasizes the pivotal role of digital technology in enhancing competitiveness and operational efficiency. The findings affirm that both EO and DID positively influence CA and FP, offering theoretical contributions to existing frameworks and suggesting new directions for research. These results not only validate previous theories but also extend the understanding of how digital transformation and entrepreneurial orientation can lead to sustainable success, providing a foundation for future research in various industries and contexts.

6-2. Management Implications

For business owners, the findings offer actionable strategies to enhance both EO and DID within their organizations. Entrepreneurs should focus on fostering a proactive organizational culture, encouraging innovation, and taking calculated risks to stimulate business growth. Additionally, leveraging digital technologies to improve internal processes and knowledge sharing can significantly strengthen DID. Specifically, entrepreneurs can integrate digital tools for resource management, customer engagement, and process optimization to enhance their firm's performance. Government agencies, such as the Ministry of Commerce and the Food and Agricultural Industries Institute, are advised to design training programs that equip business owners with the skills needed to embrace EO and DID. These programs can help entrepreneurs gain the necessary knowledge to build sustainable competitive advantages. Furthermore, academics are encouraged to explore the application of these concepts in other sectors, contributing to a broader understanding of how EO and DID can drive competitive success in diverse business environments.

6-3. Business Implications

For SMEs, the findings suggest practical steps to enhance EO and DID. Entrepreneurs should prioritize the development of a proactive organizational mindset by promoting risk-taking, innovation, and market responsiveness. This can be achieved through regular strategy reviews, encouraging creative problem-solving among employees, and setting clear innovative goals. In parallel, strengthening DID requires building specialized teams, fostering relationships through digital platforms, and utilizing technology to improve communication and knowledge sharing. To gain a

competitive advantage, particularly in times of uncertainty such as the COVID-19 pandemic, SMEs should focus on efficient resource management, cost leadership, and product differentiation through branding and quality standards. These efforts will not only enhance the firm's performance but also improve market positioning and customer satisfaction.

6-4. Policy Implications

The findings of this research have significant implications for policymakers, particularly considering the importance of SMEs to Thailand's economic development. Policymakers should prioritize initiatives that support the digital transformation of SMEs, such as offering financial incentives, tax breaks, and subsidies for adoption of technology. Programs aimed at capacity building, such as workshops and training on EO and DID, can empower entrepreneurs with the skills to adapt to the rapidly changing business environment. Additionally, policies that encourage innovation and risk-taking in SMEs, such as providing access to venture capital or grants for research and development, will help strengthen the competitiveness of the sector. These efforts are essential for fostering a robust and resilient SME ecosystem, which is crucial for the continued economic growth of Thailand.

7. Limitation

This research primarily focuses on the impact of entrepreneurial orientation (EO) and digital intellectual dynamics (DID) on competitive advantage (CA) and firm performance (FP). However, other factors may also play a significant role in these outcomes, which were not explored in the current study. The research is limited to SMEs in the fruit and vegetable processing sector in Thailand, and the results may need to be adapted for other industries or market conditions. For example, different sectors such as processed meat, seafood, and dairy may exhibit distinct dynamics due to varying consumer behaviors, access to technology, and operational models. Therefore, the findings may not be directly applicable to all industries.

Additionally, this study relies solely on quantitative research methods, which may limit the depth of insights gained from qualitative perspectives. The study's reliance on online surveys and smartphones for data collection raises potential concerns regarding data security and sensitivity, which might have affected the accuracy and completeness of the results. Improving data security protocols and utilizing multiple data collection methods would enhance the reliability and precision of the findings.

8. Future Research

Future research should explore additional variables such as digital orientation, marketing orientation, knowledge dynamics, and innovative capabilities, as these factors may further enhance competitive advantage and organizational performance. Investigating these variables across a broader range of industries, such as processed meat, seafood, and dairy, will help assess the model's applicability and relevance in various sectors. These industries often present distinct dynamics, influenced by variations in consumer behavior, technology access, and operational models, which can provide valuable insights into the generalizability of the model. Moreover, comparing SMEs of different sizes could reveal how organizations of various scales approach unique challenges and implement tailored strategies for achieving competitive advantage. Additionally, adopting a mixed-methods approach, combining both qualitative and quantitative data, would enrich the analysis by offering a more comprehensive understanding. Using diverse data collection methods, such as field surveys, interviews, and focus groups, could improve the reliability of findings, providing deeper insights into market trends and organizational behavior.

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