The Role of Digital Technology Adoption on Competitive Advantage and Firm Performance: Evidence from Fruit and Vegetable Processing SMEs in Thailand

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Abstract

The objective of this study was to investigate the relationships between Entrepreneurial Orientation (EO) and Digital Intellectual Dynamics (DID) and their effects on Competitive Advantage (CA) and Firm Performance (FP) under the context of fruit and vegetables processing small and medium enterprises (SMEs) in Thailand. Specifically, this research seeks to answer four key questions: 1) How does an entrepreneurial mindset influence CA and FP?, 2) What role does digital technology play in enhancing CA and FP?, 3) How do the development and sustainability of CA contribute to long-term business success?, 4) What are the key factors influencing the FP of SMEs? A qualitative approach, utilizing semi-structured in-depth interviews, was employed with 10 participants, including one business owner, eight managers, and one department head. Stratified random samples ensured a representative sample from three industrial groups per the Standard Industrial Classification: 1) C103 - fruit and vegetable processing (four cases), 2) C104 - vegetable oil production (one case), and 3) C106 - grain and root plant-based manufacturing (five cases). Firms met inclusion criteria for business characteristics and digital technology adoption in Digital Human Dynamics (DHUM), Digital Social Dynamics (DSOC), and Digital Structure Dynamics (DSTR). Interviews were transcribed verbatim, analyzed via content analysis, and supported by NVIVO Software. Triangulation ensured validity. Ethical approval was obtained from Naresuan University (COA No. 083/2023).

The findings indicated that EO enhances DID, allowing entrepreneurs to better integrate digital technologies into operations, thereby improving supply chain management and market responsiveness. Both EO and DID contribute to strengthening CA, with digital solutions improving efficiency and stakeholder relationships. CA positively affected FP, as businesses that adopted digital tools and embraced adaptability were more successful in meeting customer needs and maintaining high product standards. Furthermore, EO and DID indirectly enhanced FP through CA, with key factors such as innovation, strategic alliances, and digital talent development playing a crucial role. Entrepreneurs should focus on proactiveness, leveraging digital tools and government policies for sustainable growth, while managing risks, encouraging innovation, and collaborating with competitors. In addition, promoting a culture of digital expertise, enhancing communication, and facilitating product sharing can strengthen competitiveness and improve overall performance.

Keywords: Entrepreneurial Orientation, Digital Intellectual Dynamics, Competitive Advantage, Firm Performance, SMEs

Introduction

The global economic recovery in 2024-2025 faces challenges from trade uncertainties, climate change, and the lingering impacts of COVID-19 (International Monetary Fund, 2025). Thailand's 2025 GDP growth is projected at 2.9%, impacted by inflation and weak consumption (World Bank Group, 2025). SMEs remain vital, contributing significantly to Thailand's GDP and employment (Office of the National Economic and Social Development Council, 2022). The processed fruit and vegetable industry in Thailand offers growth opportunities for SMEs, driven by increasing demand for healthier options (The Active, 2025). The pandemic heightened consumer awareness of food safety and health, projecting substantial growth in health-related products (Thansettakij, 2022; Department of International Trade Promotion, 2023; Sowcharoensuk, 2022).

The industry faces challenges including weather variability, climate change, and supply chain disruptions. Digital technologies like precision farming and AI are critical for efficiency and quality (Bangkok Bank, 2021),

aligning with Thailand 6.0 (The101.World, 2024). However, SMEs face technological readiness, financial, and governmental support limitations (The Thai Chamber of Commerce & Board of Trade of Thailand, 2024).

Despite market potential, digital technology adoption is hindered by shipping delays, import taxes, weather, and expertise (Trade Policy and Strategy Office & Ministry of Commerce, 2022; Office of the National Economic and Social Development Council, Office of the Prime Minister, 2023; SME Development Bank, 2022).

This study examined the relationship between Entrepreneurial Orientation (EO), Digital Intellectual Dynamics (DID), Competitive Advantage (CA), and Firm Performance (FP) in Thailand's processed fruit and vegetable industry. It explores how SMEs utilize entrepreneurial strategies and digital technologies to enhance growth, competitiveness, and resilience, providing insights for smaller-scale entrepreneurs.

Research Objective

This study aimed to investigate the relationship between Entrepreneurial Orientation (EO) and Digital Intellectual Dynamics (DID) and their effects on Competitive Advantage (CA) and Firm Performance (FP) under the context of fruit and vegetables processing Small and Medium Enterprises (SMEs) in Thailand.

Research Question

1. How does an entrepreneurial mindset influence CA and FP in businesses?
2. What role does digital technology play in enhancing CA and FP for businesses?
3. How do the development and sustainability of CA contribute to long-term business success?
4. What are the key factors influencing the FP of SMEs?

Literature Review

The Resource-Based View Theory (RBV)

The Resource-Based View (RBV) emphasizes internal resources in shaping Competitive Advantage (CA) and Firm Performance (FP) (Barney, 1991; Wernerfelt, 1984). Valuable, Rare, Inimitable, and Non-substitutable (VRIN) resources are key for sustainable CA and FP (Kanchanda, 2022). This study uses RBV to explore the relationship between EO and DID, and their impact on CA and FP within Thai SMEs. RBV suggests firms with strong EO and effective DID management can create value through innovation and data utilization (Indriyani et al., 2025; Sudirman et al., 2025). Integrating EO and DID leads to technological differentiation and resilient business structures (Clampit et al., 2022). RBV aligns with Intellectual Capital (IC), fostering CA and FP through knowledge and digital strategies. Digital technologies enhance SME competitiveness (Fan et al., 2021; Hussain et al., 2020). RBV clarifies how EO and DID contribute to CA and FP (Abdelkareem et al., 2022). Entrepreneurial Orientation (EO) includes proactiveness, risk-taking, and innovativeness. High EO firms are more adaptive and innovative (Lumpkin & Dess, 1996), leading to CA. EO drives success by leveraging digital resources, building CA, and enhancing FP (Liu et al., 2021). Digital Intellectual Dynamics (DID) involves the integration of digital technologies into business operations. It includes Digital Human Dynamics (DHUM), Digital Social Dynamics (DSOC), and Digital Structure Dynamics (DSTR). DID enables SMEs to enhance their CA and FP by improving efficiency and stakeholder relationships. Competitive Advantage (CA) refers to the unique advantages a firm possesses, allowing it to outperform competitors. Digital technology is a key enabler of CA, helping businesses to differentiate themselves and improve market positioning. CA is critical for achieving superior FP. Firm Performance (FP) is the ultimate indicator of business success. It is influenced by EO, DID, and CA. SMEs that effectively adopt and manage digital technologies are more likely to achieve higher levels of FP.

In summary, this model illustrates the relationships between EO, DID, and CA in driving FP, providing a comprehensive theoretical foundation. The application of the Theory Triangulation Model offers a more holistic understanding of the key factors contributing to a firm's competitive advantage in the digital era.

Methods and Materials

This qualitative case study investigated the relationship between Entrepreneurial Orientation (EO), Digital Intellectual Dynamics (DID), Competitive Advantage (CA), and Firm Performance (FP) in the context of fruit and vegetable processing SMEs in Thailand. In-depth interviews were conducted to gather comprehensive data from business owners, managers, and department heads.

Sample Selection and Participant Confidentiality

The study focused on SMEs in the fruit and vegetable processing industry, classified under the Standard Industry Classification (Thailand) 2009. The relevant industry groups include: Group C103 – Fruit and vegetable processing and preservation. Group C104 – Vegetable oil production. Group C106 – Grain and root plant-based product manufacturing. As of March 10, 2023, there were 4,252 SMEs, including 3,763 small and 489 medium-sized enterprises (Department of Business Development, n.d.). The quantitative phase involved 387 participants. The qualitative phase focused on 333 firms using digital technologies across Digital Human, Social, and Structural Dynamics, ensuring informants had relevant expertise.

Selection of Key Informants

Using purposive sampling (Vanichbuncha, 1999), the top 10 firms by revenue were selected from the 333 pre-screened firms. These firms were chosen for their credibility and potential to provide valuable insights. The selection criteria included: Firms must be legally registered and submit financial statements. Firms must operate within the specified industry groups. Firms must have a total revenue not exceeding 500 million baht and a minimum registered capital of 100,000 baht. Firms must utilize digital technology across DHUM, DSOC, and DSTR. To ensure participant confidentiality, the sample is referred to as "volunteers" throughout the study.

Data Collection

This study investigated technology adoption within organizations, focusing on its influence on CA and FP. Semi-structured, in-depth interviews (60-90 minutes) were conducted, using open-ended questions to gather comprehensive insights from participants. The interview structure explored technology identification, installation, maintenance, employee training, and the role of employee engagement in enhancing operational efficiency.

Data Analysis

Data analysis involved verbatim transcription of interviews followed by content analysis using NVIVO software (Lofland, 1971). The process included: 1) Coding and Indexing: Assigning codes to identify keywords representing specific topics, 2) Interim Summaries and Data Reduction: Connecting coded data to create summaries illustrating relationships between key themes, retaining only pertinent points, 3) Building Final Conclusions: Formulating conclusions by linking smaller findings into a coherent narrative, 4) Verifying Data Reliability: Employing triangulation methods to ensure validity.

Triangulation Methods (Cohen et al., 2017)

1. Data Triangulation: Responses from 10 key informants were compared across multiple interviews to identify consistent patterns and minimize biases. The informants represented diverse backgrounds.

2. Method Triangulation: Both quantitative (structured surveys) and qualitative (in-depth interviews) methods were utilized to reinforce research validity. Results from both methods were compared to validate findings and enhance robustness.

3. Theory Triangulation: Multiple theoretical frameworks, including Resource-Based View (RBV), Entrepreneurial Orientation (EO), Digital Intellectual Dynamics (DID), Competitive Advantage (CA) theories, and the Balanced Scorecard for Firm Performance (FP) were applied to comprehensively analyze the findings.

Variables Used in Research

This study examines four main variables within the framework of the Resource-Based View (RBV) Theory, which emphasizes how firms achieve sustainable competitive advantage through the strategic utilization of resources.

1. Independent Variable: Entrepreneurial Orientation (EO) – representing a firm's strategic posture, EO consists of five dimensions: Proactiveness (PROA) – the ability to anticipate and act on future opportunities, Risk-Taking (RISK) – willingness to invest in uncertain ventures, Innovativeness (INNO) – fostering new ideas, products, or processes, Competitive Aggressiveness (COAG) – intensity in outperforming competitors, Autonomy (AUTO) – independent decision-making and strategic execution.

2. Mediating Variables: (2.1) Digital Intellectual Dynamics (DID) – enhancing digital capabilities through: Digital Human Dynamics (DHUM) – human capital in digital transformation, Digital Social Dynamics (DSOC) – social interactions in the digital ecosystem, Digital Structure Dynamics (DSTR) – structural adaptability to digital innovation, (2.2) Competitive Advantage (CA) – strategic benefits gained through: Cost Leadership (COST) – minimizing operational expenses, Differentiation (DIFF) – unique product offerings, Quality (QUAL) – maintaining high product or service standards.

3. Dependent Variable: Firm Performance (FP) – measured across four perspectives: Financial Perspective (FINA) – revenue growth and profitability, Customer Perspective (CUST) – customer satisfaction and loyalty, Internal Process Perspective (INTE) – operational efficiency, Learning and Growth Perspective (LEAR) – organizational development and innovation.

Research Tool

The primary data collection tool was an in-depth interview guide with open-ended questions aligned to research objectives. The guide was divided into six parts: **Part 1** General information about informants and the organization, **Part 2** Opinions on Entrepreneurial Orientation (EO), **Part 3** Opinions on Digital Intellectual Dynamics (DID), **Part 4** Opinions on Competitive Advantage (CA), **Part 5** Opinions on Firm Performance (FP), and **Part 6** Open-ended questions about problems, obstacles, and suggestions. Audio recorders were used to capture interviews, and a notebook was employed for notetaking.

Testing the Quality of the Research Instrument

This study received ethical approval from the Institutional Review Board of Naresuan University (COA No. 083/2023). To ensure the accuracy and quality of the interview guide, the researcher sought feedback from experts and the advisory committee. Their input helped refine the semi-structured interview guide, ensuring its completeness and relevance to the study's objectives.

Findings

This study aimed to analyze the impact of Entrepreneurial Orientation (EO) and Digital Intellectual Dynamics (DID) on Competitive Advantage (CA) and Firm Performance (FP) in fruit and vegetables processing SMEs in

Thailand. The research involved in-depth interviews with executives from 10 high-performing firms, selected from a sample of 333 SMEs.

Analytic Results of General Information of Key Informants and Firms

The key informants comprised 10 business owners, managers, or department heads in Thai processed fruit and vegetable SMEs. Informant 4 had the longest operating business (over 21 years), followed by Informant 6 (19 years). Most informants were male, aged 41-50, held bachelor's degrees, and were general managers. Work experience ranged mainly from 6-10 years.

Basic information details of 10 volunteers: **Informant 1:** A 33-year-old male manager with a bachelor's degree and seven years of work experience. He manages a business that has been operating for seven years. **Informant 2:** A 59-year-old male manager with a bachelor's degree and three years of work experience. His business has been established for nine years. **Informant 3:** A 27-year-old female department head with a bachelor's degree and six years of work experience. She works in a long-standing business that has been operating for 18 years. **Informant 4:** A 33-year-old male manager with a bachelor's degree and nine years of work experience. He leads the longest running business among the informants, with 21 years of operation. **Informant 5:** A 41-year-old male manager with less than a bachelor's degree and 11 years of work experience. He manages a relatively new business, which has been in operation for three years. **Informant 6:** A 43-year-old female manager with a master's degree and four years of work experience. She oversees a well-established business that has been running for 19 years. **Informant 7:** A 41-year-old male business owner with a doctorate degree and six years of work experience. His business has been in operation for six years. **Informant 8:** A 49-year-old female manager with a bachelor's degree and 15 years of work experience. She works in a business that has been running for 18 years. **Informant 9:** A 33-year-old male manager with a bachelor's degree and 11 years of work experience. He manages a business that has been running for 17 years. **Informant 10:** A 45-year-old male manager with a master's degree and four years of work experience. He oversees a business that has been established for four years.

Opinions on Entrepreneurial Orientation (EO)

The researcher analyzed the Entrepreneurial Orientation (EO) dimensions in 10 selected fruit and vegetables processing SMEs in Thailand. The findings are detailed as follows:

1. Proactiveness (PROA)

All 10 key informants agreed that product development is crucial for increasing value, diversifying offerings, and establishing new brands. However, some businesses prefer avoiding direct competition in their existing markets. They also stressed the importance of market expansion through diversification, such as entering the plastics industry, and improving product standards for international markets (e.g., Halal, GSP, HACCP). Digital technologies like Line, Facebook, TikTok, Shopee, and Alibaba are widely used to improve logistics, marketing, and production. Opinions on government support differed: informants 4, 6, 8, 9, and 10 emphasized its importance for growth, while informants 1, 2, 3, 5, and 7 believed businesses should rely on their own finances and seek lower bank interest rates. Lastly, informants 2, 3, 5, 7, 8, and 9 highlighted the significance of standardization systems like GMP, HACCP, and Halal certifications for gaining customer trust.

2. Risk-Taking (RISK)

All key informants emphasized the importance of careful risk assessment before making investment decisions, considering factors such as market demand, organizational capability, investment costs, break-even points, logistics, and economic fluctuations. Informants 3, 5, 6, 7, and 10 opted for high-risk investments in

pursuit of higher returns, but only with thorough strategic planning. In contrast, informants 1, 2, 4, 8, and 9 preferred low-risk investments, prioritizing income stability over aggressive expansion.

3. Innovativeness (INNO)

All 10 informants agreed on the need for continuous digital technology updates to enhance product quality, reduce costs, and improve efficiency. Technologies like solar panels, robotics, X-ray machines, and forklifts were cited as examples of industry innovation. However, investment capital remains crucial, as skilled labor and machine upgrades are required for successful implementation. Informants 1, 2, 3, 4, 6, 7, and 10 reported ongoing product development over the past five years to meet customer demands and reduce waste. In contrast, informants 5, 8, and 9 had not introduced new products due to economic challenges and COVID-19 but expressed interest in future innovation.

4. Competitive Aggressiveness (COAG)

All informants agreed on the need for diverse competitive strategies, including shifting from a mass market to a niche market, engaging directly with customers to reduce sales costs, setting clear profit margin criteria to manage quality and cost, and treating competitors as partners to learn from successful businesses. Informants 1, 4, 5, 6, 7, 8, 9, and 10 saw intense competition due to Thailand's technological and innovation gap with China and other countries, along with high import tariffs. In contrast, informants 2 and 3 believed that strict industry standards and association regulations lessen competition intensity.

5. Autonomy (AUTO)

All informants highlighted that employee autonomy boosts leadership and motivation by allowing employees to voice opinions and make decisions, while business owners maintain overall authority. The extent of internal information sharing varies by job position, with restricted details on customer pricing, client information, and profit margins. Informants 1, 3, 4, 8, 9, and 10 stressed the importance of regular psychological assessments to reduce stress and enhance employee commitment, with performance-based bonuses identified as a key motivator for productivity.

For Question 1) "How does the entrepreneurial mindset influence CA and FP in businesses?", it was found that Entrepreneurial Orientation (EO) significantly influences Competitive Advantage (CA) and Firm Performance (FP) by driving new product development, using digital technology, reducing costs, and increasing efficiency. Innovation and effective risk management help businesses remain competitive, allowing SMEs to expand both domestically and internationally.

For Question 1.1) "What are the key components of EO in fruit and vegetables processing SMEs in Thailand?", EO is driven by Proactiveness, Risk-Taking, Innovativeness, Competitive Aggressiveness, and Autonomy, which promote adaptation and growth in competitive markets.

For Question 1.2) "How does EO affect the competitiveness of businesses?", EO enhances competitiveness by developing new products, expanding market share, and utilizing digital technologies to improve efficiency and marketing. Accepting calculated risks and using diverse marketing strategies help businesses compete effectively both domestically and internationally.

Opinions on Digital Intellectual Dynamics (DID)

The researcher analyzed data on Digital Intellectual Dynamics (DID) in the various sectors of fruit and vegetables processing SMEs in Thailand, specifically for 10 SMEs. The details are as follows:

1. Digital Human Dynamics (DHUM)

Most of the 10 informants agreed that digital technology knowledge should be acquired from conferences, universities, sales representatives, competitors, partners, or Facebook groups. They also recommended training every 3 to 6 months on digital technologies, machinery, and equipment. Regarding specialized teams, informants 3, 6, 7, 8, and 10 stated that their organizations have specialized teams, improving operational efficiency and eliminating the need for extra staff, with roles being adjusted. However, informants 1, 2, 4, 5, and 9 reported a lack of specialized teams due to a shortage of skilled personnel. When purchasing machinery, a representative handles installation and maintenance, but there is still a need for specialists like engineers, technicians, researchers, developers, and system supervisors. On application development, Informant 6 mentioned their organization is creating an application to enhance user convenience, but others did not mention this due to high costs.

2. Digital Social Dynamics (DSOC)

Most of the 10 informants agreed that their organizations use digital technology to 1) receive new feedback, and 2) communicate to strengthen relationships with customers for product orders, employees for real-time problem-solving, and partners or suppliers for price negotiations and loyalty building. However, opinions varied on using digital technology to create organizational profiles. Informants 5, 6, 7, 8, 9, and 10 believed organizations should regularly update and maintain activity to build trust and brand image with customers through booths, social activities, and advertising to expand their customer base. Conversely, informants 1, 2, 3, 5, 6, 7, and 9 saw product advertising as a way to expand the customer base but emphasized that it must be continuous and engaging. Some high-sales organizations may not rely as heavily on digital communication.

3. Digital Structure Dynamics (DSTR)

Most of the 10 informants agreed that digital technology should be used to 1) organize work schedules, assign tasks, and manage accounts using tools like Excel, Word, Workflow, and Timeline to increase efficiency and speed, and 2) collect and organize data using tools like Google Drive, Cloud, and Dropbox to ensure centralized and accessible data storage.

For Question 1) "What is the role of digital technology in enhancing CA and FP for businesses?", it was found that digital technology plays a crucial role in enhancing both Competitive Advantage (CA) and Firm Performance (FP) by improving operational efficiency in management, communication, data storage, analysis, and application development tailored to organizational needs. It also helps build relationships with customers and partners through digital channels, facilitating more agile operations that enable businesses to better adapt to changes.

For Question 1.1) "How does the use of digital technology enhance the performance of fruit and vegetables processing SMEs?", the use of digital technology enhances efficiency in data management, accounting, and real-time communication with customers and partners. It also improves production processes and quality control through machinery and digital equipment and enables the development of applications to meet organizational needs, enhancing operational convenience and customer satisfaction.

For Question 1.2) "What role does digital technology play in the development and expansion of SMEs in this industry in terms of knowledge management and innovation?", digital technology plays a critical role by allowing businesses to access information and knowledge from various sources, such as conferences, universities, and online platforms. These fosters learning and innovation, enabling the development of new products, improved production processes, and stronger relationships with customers and partners.

Opinions on Competitive Advantage (CA)

The researcher analyzed data on Competitive Advantage (CA) in relation to fruit and vegetables processing SMEs in Thailand, comprising 10 firms. The details are explained as follows:

1. Cost Leadership (COST)

All 10 informants agreed that cost management, both internal and external, as well as management costs, should be considered. These include costs related to digital technology, innovation, machinery, and various resource costs such as electricity, water, chemicals, telephone, and packaging, in addition to external costs such as finding good partners and increasing order volumes from suppliers. However, most informants (1, 3, 4, 5, 6, 9, 10) viewed the challenge in achieving cost leadership as stemming from the inability to control agricultural raw material prices, with large exporters setting the prices. As a result, when prices drop, customers compete for purchases. Additionally, the use of technology has led to an increase in electricity costs.

2. Differentiation (DIFF)

All 10 informants agreed that differentiation comes from product design, such as packaging (vacuum-sealed bags, fixed weight bags), and the creation of easy-to-remember logos to build a strong brand. However, opinions differed on differentiating from factory standards. Some informants emphasized the importance of having multiple suppliers to address shortages of raw materials and maintaining standards for food products by using laboratories and food institutes to inspect the products. On the other hand, some organizations felt that differentiation might increase costs.

3. Quality (QUAL)

All 10 informants agreed that creating good quality is about meeting customer expectations, such as addressing or solving problems that arise, and having responsible employees within the organization, which ensures customer acceptance. The use of modern machinery also helps in accurately detecting contaminants. Most informants agreed that the price and quality of the products should be balanced, with customers not having complaints and placing more trust in the quality than in the price. However, some organizations felt that the price may not always be appropriate for the quality, as raw material prices are volatile, even if the selling price drops.

It can be summarized that Question 1) "How do the development and sustainability of CA contribute to business success over time?" can be explained as follows: The development and sustainability of Competitive Advantage (CA) are crucial factors in achieving long-term business success. A competitive advantage allows a business to differentiate itself from competitors in areas such as quality, production cost, or customer service, thus making its products or services more attractive. Additionally, CA development enables businesses to remain flexible in responding to changes in the business environment, ensuring sustained market position. This includes investing in new technologies, innovating products, and building strong customer relationships.

For Question 1.1) "What are the key elements that help fruit and vegetable processing SMEs create a competitive advantage?", can be explained as follows: the key elements that help fruit and vegetable processing businesses create a competitive advantage include maintaining high and consistent product quality standards, which builds customer confidence. In addition, the adoption of technology and innovation in production and packaging to enhance durability and visual appeal, as well as efficient cost management both internally and externally (such as raw material costs, transportation), are vital. Building strong relationships with suppliers and customers also helps in creating a robust brand and gaining a competitive advantage.

For Question 1.2) "What factors do you think accelerate or hinder the development of competitive ability in this industry?", can be explained as follows: Factors that accelerate the development of competitive ability in this industry include the adoption of new technologies in production and the development of packaging that preserves product quality over time. Adapting to market demands and new trends, such as producing pesticide-free products or products with high nutritional value, also helps. However, obstacles businesses face include uncontrollable raw material prices, which affect production cost control, intense competition in the industry, and logistical limitations that may impact the freshness and quality of products.

Opinions on Firm Performance (FP)

The researcher analyzed data on Firm Performance (FP) across different areas of 10 fruit and vegetables processing SMEs in Thailand, and the details are as follows:

1. Financial Perspective (FINA)

Most informants (from informants 3, 5, 6, 7, 8, and 10) agreed that sales, revenue, and return on investment increased compared to the previous year, which was influenced by the growth of the food industry during the COVID-19 pandemic. This led to higher stockpiling food. Global situations affected the organization's financial performance and stimulated higher sales. However, some informants (1, 2, 4, 9) did not mention the impact of global situations.

2. Customer Perspective (CUST)

All 10 informants agreed that the number of existing customers increased due to their satisfaction with the products and their trust in those products. Customers made repeated purchases and even requested additional orders. New customers, particularly those from social media platforms, showed more interest in trying the products, allowing entrepreneurs to expand their customer base and strengthen long-term relationships with existing customers.

3. Internal Process Perspective (INTE)

All informants (1-10) agreed that selecting employees with experience and appropriate skills for specific tasks is essential. Additionally, training and skill development in areas such as digital technology enable employees to adapt and work more efficiently. Reducing errors by adjusting operational systems and implementing digital technology also made the workflow more convenient and faster. The incorporation of technology into internal processes also helped reduce employee and labor issues, minimize delays in transportation, and improve control over desired quantities. Furthermore, many informants (1, 2, 3, 4, 5) emphasized the importance of handling customer complaints, stating that when feedback is received, immediate action is necessary to resolve issues and maintain customer satisfaction.

4. Learning and Growth Perspective (LEAR)

All informants (1-10) agreed that promoting knowledge through training programs focused on digital technology, innovation, and modern machinery improves work efficiency and employee skills. Support from entrepreneurs in applying knowledge and making decisions fosters confidence and teamwork with shared goals. Adapting to crises like the COVID-19 pandemic requires flexibility and preparedness to maintain operational continuity and customer service. Enhancing employee welfare, such as providing COVID-19 prevention equipment and offering financial support when necessary, strengthens the organization in the long term.

In summary, Question 1) "What are the key factors influencing the FP of SMEs?" can be explained as follows: Sales growth, customer satisfaction, digital technology, employee training, and crisis adaptation (e.g., COVID-

19) are key drivers of firm performance in fruit and vegetable processing SMEs. Efficient customer complaint management also plays a critical role in maintaining satisfaction and fostering loyalty.

For Question 1.1) "What are your views on the factors affecting the success of fruit and vegetables processing SMEs?", Success in this industry depends on meeting customer demands, enhancing satisfaction, employing digital technology, improving workflows, and adapting to crises. Additionally, handling complaints and ensuring fast responses are vital for customer trust and organizational success.

For Question 1.2) "What factors should SMEs in this industry prioritize to improve firm performance?", SMEs should focus on leveraging digital technology to improve efficiency, enhancing employee skills for better problem-solving, and maintaining high customer satisfaction to ensure long-term success.

The analysis of four key perspectives— 1) EO, 2) DID, 3) CA, and 4) FP—revealed valuable insights from all ten informants. Using the Theory Triangulation approach (Cohen et al., 2017) alongside theoretical frameworks from the literature, we gained a comprehensive understanding of their relationships, as illustrated in Figure 1.

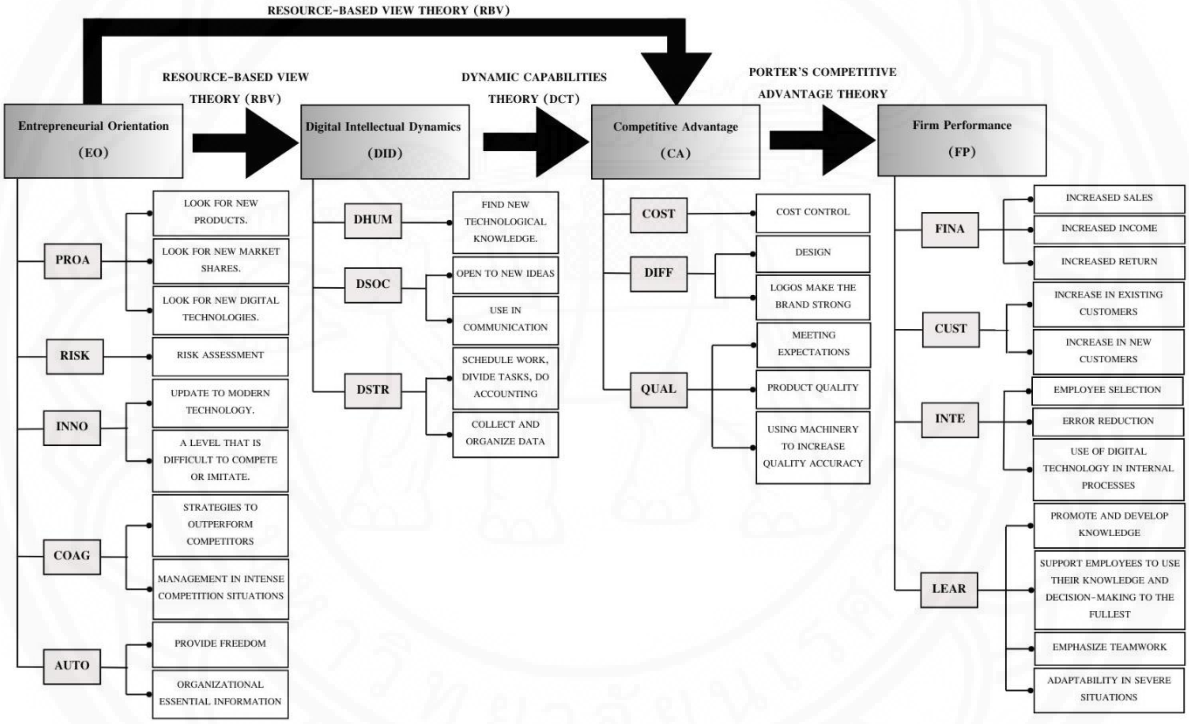

Figure 1 Result Finding from Using Theory of Triangular.

Source: Authors.

Figure 1 presents a conceptual framework illustrating the findings from applying the Theory of Triangulation, which explains the relationships among EO, DID, CA, and FP. Based on the literature review, the Theory Triangulation Model in this study is grounded in three key theoretical frameworks: Resource-Based View Theory (RBV) (Barney, 1991; Wernerfelt, 1984), Dynamic Capabilities Theory (DCT) (Teece et al., 2008), and Porter's Competitive Advantage Theory (Porter, 1985). These theories provide a foundation for understanding the factors influencing CA and FP.

The Resource-Based View (RBV) emphasizes that internal resources like EO and DID enhance competitiveness, giving firms with unique assets a strategic edge. The Dynamic Capabilities Theory (DCT) argues that DID helps firms adapt, innovate, and respond to change, boosting performance. Porter's Competitive Advantage Theory links

EO and DID to FP, showing how firms leverage entrepreneurship and digital capabilities to improve performance through cost control, differentiation, and quality. This model highlights how EO, DID, and CA drive FP, providing a strong theoretical foundation. Firms that pursue new opportunities, manage risks strategically, and adopt modern technologies can strengthen digital intellectual dynamics, gaining a competitive edge and improving performance. The Theory Triangulation Model offers a holistic view of key factors shaping competitive advantage in the digital era, benefiting both research and business strategies.

Discussion

Resource-Based View Theory (RBV) in the Context of SMEs and Digital Technology

The Resource-Based View (RBV) asserts that a firm's internal resources are crucial for achieving and sustaining a competitive advantage, particularly when these resources have VRIN attributes (Barney, 1991). In Thailand's processed fruit and vegetable industry, SMEs can gain long-term competitiveness by effectively utilizing distinctive resources such as specialized knowledge, skilled labor, and business networks (Kanchanda, 2022). These resources allow SMEs to differentiate themselves in a competitive market. In the digital era, technology is vital in optimizing resources. Digital tools like AI, Big Data, IoT, and Blockchain help SMEs reduce costs, enhance product quality, and improve market responsiveness (Bangkok Bank, 2021). AI ensures product consistency, Big Data helps predict trends, while IoT and Blockchain enhance supply chain transparency and consumer trust (Hussain et al., 2020). These technologies enable SMEs to maximize their resources and maintain a Competitive Advantage (CA). Entrepreneurial Orientation (EO), which includes proactiveness, risk-taking, and innovation, is key to how SMEs use their resources effectively. SMEs with high EO are more likely to integrate Digital Intellectual Dynamics (DID) for strategic decision-making, which helps them innovate and capitalize on digital opportunities (Ali et al., 2021). By managing EO and DID, SMEs can develop unique products and refine operations, strengthening their market position (Indriyani et al., 2025; Sudirman et al., 2025).

The RBV also emphasizes two strategies for achieving competitive advantage: cost leadership and differentiation (Porter, 1985). SMEs can reduce production costs and improve efficiency with digital automation (Kiyabo & Isaga, 2020), or focus on developing innovative products targeting niche markets (Setiawan et al., 2022). Aligning internal capabilities with these strategies enhances SMEs' long-term success (Siregar et al., 2024). However, external factors such as market uncertainty, financial constraints, and a shortage of digital skills hinder SMEs' resource utilization (Office of the National Economic and Social Development Council, Office of the Prime Minister, 2023). Government support through incentives, tax relief, and digital training is essential for SMEs to maximize their potential (SME Development Bank, 2022). Policies encouraging technology adoption and knowledge transfer further strengthen SMEs' competitiveness (The Thai Chamber of Commerce & Board of Trade of Thailand, 2024). In conclusion, the RBV framework helps SMEs leverage internal resources for sustained competitive advantage. When combined with EO and DID, SMEs can innovate, optimize, and differentiate themselves in the market. Yet, the successful application of RBV depends on external factors like government policies and infrastructure (The101.World, 2024). A comprehensive approach integrating RBV, digital transformation, and supportive policies is key for the growth and global competitiveness of Thailand's processed fruit and vegetable SMEs.

Opinions on Entrepreneurial Orientation (EO)

The adoption of digital technologies in Thai fruit and vegetable processing SMEs significantly enhances Firm Performance (FP) and helps firms adapt to market demands by fostering innovation. This aligns with Karnowati and Handayani (2022), who noted that businesses with proactive adaptation and strategic planning grow faster than those without clear response plans, highlighting the importance of nurturing entrepreneurial potential in competitive markets. Digital technologies drive growth by improving operational efficiency and fostering innovation. Consistent with Liu et al. (2021), who found that CEO-driven Entrepreneurial Orientation (EO) enhances FP by promoting innovative behaviors and leadership, SMEs with strong EO benefit from dynamic capabilities, such as sensing and seizing opportunities, leading to superior performance. The analysis identified five main EO dimensions: 1) In terms of proactiveness, all 10 informants agreed that proactive operations are essential, emphasizing new product development to increase value and diversity in alignment with customer needs, including the creation of new brands. However, some organizations approach market entry cautiously to minimize market cannibalization. They also consider expanding their market share in new business areas, such as developing product standards for export and utilizing social media for marketing. This is consistent with studies by Keen et al. (2024), which found that proactive operations create opportunities in new markets, where the adoption of machinery and innovations improves transportation, production efficiency, and cost reduction. In addition, the study by Al-Mamary et al. (2020) found that proactiveness contributes to improved financial performance. Opinions on government support for growth, however, varied. Some participants viewed government support as a key driver, while others preferred to rely on self-funding. In terms of customer trust-building, developing standards such as GMP, GSP, and HACCP were deemed essential, 2) In terms of risk-taking, all informants acknowledged the importance of risk assessment when making investment decisions, analyzing factors such as market demand, organizational capability, and required investment capital. While some expressed a willingness to invest in high-risk situations for high returns, as stated by Zeebaree and Siron (2017) and Dahana et al. (2021), others preferred to avoid excessively risky investments in order to maintain financial stability, 3) In terms of innovativeness, informants agreed that organizations should continuously update digital technologies and innovations to enhance product quality and reduce operational costs. Innovation competitiveness depends on financial investment and employee skills, which directly influence new product development. As Galbreath et al. (2020) stated, highly innovative organizations tend to succeed in competitive markets. However, the study data indicates that while many organizations have developed new products in the past five years, some have faced challenges due to economic conditions and the impact of COVID-19. The role of innovativeness in EO was a key focus of this study, with informants underscoring the need to consistently update digital technologies and introduce new product innovations to maintain market competitiveness. This echoes the findings of Campos-Núñez and Serrano-Malebrán (2024), who emphasized that firms with high EO leverage Information Technology Capabilities (ITC) to enhance their competitive edge. The incorporation of ITC facilitates data-driven decision-making, process optimization, and innovation, all of which contribute to improved firm performance, 4) In terms of competitive aggressiveness, informants agreed that diverse strategies are critical, including shifting from mass markets to niche markets. They also viewed competitors as partners from whom they could learn and improve their businesses. This is consistent with the findings of Mahmood and Hanafi (2013), who noted that competitive aggressiveness arising from EO enables organizations to create differentiation and establish a strong market presence, even in the face of intense competition. Some informants further stated that strong standards help maintain

competitive capability. Lastly, 5) in terms of autonomy, informants confirmed that granting decision-making freedom to employees is crucial for fostering leadership and motivation within the organization. Information disclosure should follow a hierarchical structure to help employees feel integrated into the organization. Psychological evaluations and performance-based bonuses were also highlighted as significant factors in enhancing performance. This study provides valuable insights for developing effective and sustainable organizational competitiveness through the application of appropriate strategies and innovations. This is consistent with Suder et al. (2025), who stated that EO positively influences firm performance across various market conditions, though contextual adaptations are necessary, particularly during economic crises. However, it is important to note that the results of this study may be influenced by additional factors, such as varying constraints across different industries. This is in line with Kanaan-Jebna et al. (2022), who found that the impact of EO varies by industry context.

This study highlights the role of Entrepreneurial Orientation (EO) in boosting performance and sustaining competitive advantage among Thailand's fruit and vegetable processing SMEs. EO dimensions—proactiveness, risk-taking, innovation, aggressiveness, and autonomy—enable adaptation and market expansion. However, external factors like economic uncertainty and policies impact EO's effectiveness. SMEs should integrate digital technology, enhance autonomy, and focus on differentiation. Future research should explore industry-specific factors, regulatory policies, and cross-sector comparisons to refine EO-based strategies in digital economies.

1. Relationship between Entrepreneurial Orientation (EO) and Digital Intellectual Dynamics (DID)

Entrepreneurial Orientation (EO) plays a key role in Digital Intellectual Dynamics (DID) by helping Thailand's fruit and vegetable processing SMEs leverage digital technology for business growth. Proactiveness, innovation, and risk-taking enhance competitive capabilities (Keen et al., 2024). Dynamic capabilities and culture support international expansion, especially during crises (Anggadwita et al., 2023). Absorptive capacity links intellectual capital with entrepreneurship, boosting competitiveness (Yaseen et al., 2023). SMEs prioritizing EO can effectively use digital tech to adapt, create value, and drive sustainable growth.

2. Relationship between Entrepreneurial Orientation (EO) and Competitive Advantage (CA)

Entrepreneurial Orientation (EO) fosters Competitive Advantage (CA) through proactiveness, innovation, and adaptability. Research by Dahana et al. (2021) and Galbreath et al. (2020) shows that opportunity-seeking and innovation enhance competitiveness. Mahmood and Hanafi (2013) and Zeebaree and Siron (2017) highlight risk-taking as a key market differentiator. However, EO's impact on CA may vary by industry, as Paulus and Hermanto (2022) suggest. Therefore, aligning entrepreneurial strategies with the business environment and organizational traits is crucial for strengthening CA.

3. Relationship between Entrepreneurial Orientation (EO) and Firm Performance (FP)

Entrepreneurial Orientation (EO) significantly impacts Firm Performance (FP) in Thailand's fruit and vegetable processing SMEs. EO boosts various performance aspects, such as financial results, customer satisfaction, and internal processes, fostering an innovation-driven culture (Al-Mamary et al., 2020; Octavia et al., 2020). Entrepreneurs who manage resources well, adapt quickly to changes, and refine processes improve efficiency (Jemal, 2020). EO also aids in risk management and innovation, crucial for long-term growth (Maaodhah et al., 2021; Nuraeni et al., 2022). Despite mixed findings in some industries (Kanaan-Jebna et al., 2022), EO remains vital for SME performance and sustainability (Nguyen et al., 2022).

Opinions on Digital Intellectual Dynamics (DID)

The analysis of informants' opinions on Digital Intellectual Dynamics (DID) highlighted the crucial role of digital technology in improving firm performance and ensuring sustainable competitiveness, aligning with Sánchez et al. (2009), who emphasized the importance of intellectual capital in managing challenges and allocating intangible resources. Three key dimensions of DID were emphasized, comprising Digital Human Dynamics: All 10 informants agreed that acquiring knowledge of digital technologies is essential for organizational success. Informants recommended periodic training every 3 to 6 months, focusing on areas such as technology, machinery, and equipment. Some organizations have dedicated teams to streamline operations, while others face challenges due to a lack of specialized staff, particularly in regions with limited skilled personnel such as engineers and researchers. This is consistent with Singh and Verma (2024) assertion that Learning Capability (LDC) is essential for transforming intellectual capital into improved firm performance. The need for dedicated digital teams was also emphasized, although many SMEs encounter difficulties due to the scarcity of skilled personnel. These challenges emphasize the need for continuous digital upskilling, as human capital is vital for innovation (Ali et al., 2021). While the development of applications to improve efficiency is recognized, financial constraints remain a barrier. In Digital Social Dynamics, informants highlighted the role of digital technology in fostering new ideas and building relationships through fast communication. Regarding Digital Structure Dynamics, digital tools like Excel, Word, Workflow, and storage platforms such as Google Drive, Cloud, and Dropbox are crucial for task management and data accessibility. These are consistent with Anggadwita et al. (2023), who emphasized the relationship between dynamic capabilities, organizational culture, and international entrepreneurial orientation in the performance of Indonesian SMEs. The integration of technology into production and management processes is critical for increasing Competitive Advantage (CA) and achieving sustainable growth. This is consistent with Singh and Verma (2024) focus on Integration Capability (IDC), which enhances competitive advantage by consolidating internal and external knowledge. The findings also support Shiferaw and Kero (2024), who emphasized that business model innovation, driven by dynamic capabilities, is essential for firms to adapt and thrive in competitive markets. The adoption of cloud storage solutions such as Google Drive and Dropbox reflects the growing reliance on digital infrastructure to streamline operations and improve efficiency. However, research by Aminu and Mahmood (2015) suggests that the relationship between intellectual capital and Firm Performance (FP) depends on dynamic capabilities, underscoring the importance of knowledge asset management and organizational adaptability in building competitive advantage. Despite some conflicting studies, the findings of this research suggest that effective DID management can significantly enhance FP.

1. Relationship between Digital Intellectual Dynamics (DID) and Competitive Advantage (CA)

Digital Intellectual Dynamics (DID) enhances Competitive Advantage (CA) by optimizing processes, driving innovation, and enabling rapid market response. Studies (Obeidat et al., 2021) highlight the positive impact of human, structural, and relational capital on competitiveness. Investing in digital resources and fostering a learning culture support adaptive strategy (Rotjanakorn et al., 2020). Human and relational capital further strengthen organizational capabilities (Hermawan et al., 2020). Prioritizing knowledge integration, data-driven insights, and digital skills sustains competitive advantage.

2. Relationship between Digital Intellectual Dynamics (DID) and Firm Performance (FP)

Digital Intellectual Dynamics (DID) enhances Firm Performance (FP) through data management, technology use, and innovation. Studies (Pigola & da Costa, 2022; Foster et al., 2022) highlight the impact of

human, social, and organizational capital. Effective knowledge integration boosts adaptability, efficiency, and competitive advantage.

Opinions on Competitive Advantage (CA)

Understanding Competitive Advantage (CA) dimensions helps SMEs adapt strategies and boost competitiveness in dynamic markets. Cost Leadership is vital, with informants agreeing on the importance of cost management, including internal costs, digital technology, and resources. Charusreni (2022) noted that strong CA leads to market dominance and profitability, but low-cost strategies must be integrated with others to be effective. Perdana and Prasasti (2023) emphasized that SMEs investing in resources can lower costs, but price volatility and energy-dependent technology complicate cost control. Regarding Differentiation, informants highlighted the role of quality design and packaging in strengthening brand image. Differentiation through factory standards and reliable suppliers is crucial, though some warned that increased costs may affect long-term competitiveness. Sareekham et al. (2021) suggested that product differentiation improves financial success and customer relationships, while Siregar et al. (2024) identified Entrepreneurial Marketing Architectural Innovation Capability (EMAIC) as a key driver of CA. In terms of Quality, all informants agreed on the importance of high standards, continuous verification, and modern machinery. Aligning product price with quality is crucial, although external factors like rising raw material costs may impact pricing. Training in cost management and the use of digital technology are recommended. Studies by Dahana et al. (2021) and Sukmamedian (2021) confirmed that high-quality standards are essential for competitiveness. Consistent quality control enhances customer satisfaction and long-term success.

1. Relationship between Competitive Advantage (CA) and Firm Performance (FP)

Competitive Advantage (CA) enhances Firm Performance (FP) by improving efficiency, market confidence, and customer satisfaction. Research (Dahana et al., 2021; Sukmamedian, 2021) highlights differentiation and quality, while innovation and adaptability are crucial (Sareekham et al., 2021). Investing in resources drives growth (Perdana & Prasasti, 2023), and CA directly impacts financial and operational success (Kiyabo & Isaga, 2020). Effective strategy selection, innovation, and resource management ensure long-term sustainability.

Opinions on Firm Performance (FP)

Firm Performance (FP) is directly tied to effective resource management, a key factor in achieving organizational goals. SME entrepreneurs must adjust strategies to stay competitive, as CA boosts employee satisfaction and profitability (Dahana et al., 2021). This study used the Balanced Scorecard (BSC) framework (Kaplan & Norton, 1996; Niven, 2012) to assess FP across four perspectives: 1) Financial Perspective: Improved sales, revenue, and returns, particularly due to the food industry's growth during the COVID-19 pandemic, 2) Customer Perspective: Increased customer base, satisfaction, and loyalty, driven by effective marketing and strong relationships, 3) Internal Process Perspective: Focus on employee skills, reducing errors, and integrating technology to improve efficiency and communication, 4) Learning and Growth Perspective: Emphasis on employee training, digital skills, and teamwork to enhance FP. Entrepreneurs should prioritize financial planning, customer relations, and continuous improvement to boost performance.

Conclusion and Suggestions

Despite the limitations posed by a small sample size, this qualitative study provides valuable insights. Findings from in-depth interviews emphasized several key factors influencing entrepreneurs' decisions to adopt and implement digital technology. Market competition pressures emerged as a significant driver, with many entrepreneurs

acknowledging that intensified competition in both domestic and international markets necessitates technological adoption to enhance production efficiency and reduce costs. In addition, firm performance demands play a crucial role, as the increasing emphasis on product quality compels businesses to utilize digital technology to ensure precise quality control, compliance with international standards, and responsiveness to evolving market demands. Government and institutional support also contribute significantly to digital adoption. While some entrepreneurs benefit from assistance, such as consultancy services or funding opportunities, many perceive the available support as inadequate to effectively advance their businesses. However, significant obstacles hinder digital technology adoption. A prevalent challenge is the lack of digital skills and knowledge among organizational personnel. Many entrepreneurs reported that their staff, particularly those in management and production roles, lack the necessary skills to effectively implement and utilize digital technologies, leading to inefficiencies and delays. Moreover, financial constraints pose a major challenge, as investing in digital technology requires substantial capital, which remains a significant hurdle for Small and Medium-Sized Enterprises (SMEs). Some entrepreneurs also express concerns regarding the risks associated with investing in technological transitions, further complicating digital adoption for certain SMEs. Furthermore, inadequate infrastructure remains a barrier, with businesses in some areas reporting limited access to essential digital resources, such as high-speed internet, which is crucial for integrating digital solutions into business operations. Despite these challenges, the research findings indicate that digital technology adoption significantly enhances production efficiency by accelerating and refining operational processes, particularly through automation in production control. This reduces raw material waste and improves product quality. Furthermore, entrepreneurs leveraging digital platforms for distribution report improved access to new customers, diversification of sales channels, and greater adaptability to shifting consumer behaviors. In terms of internal organizational dynamics, digital technology facilitates streamlined communication between departments, reduces coordination complexity, and enhances overall firm performance.

Suggestions

Entrepreneurs should enhance technological skills across all levels, focusing on digital tools and automation. Hands-on training will boost employee confidence and adaptability. The government should provide financial support for SMEs adopting digital technologies, ensuring better funding access. Tailored assistance should help SMEs integrate suitable digital solutions for local industries. A public-private network should promote digital adoption through consultancy platforms, guiding SMEs in optimizing technology for better business outcomes.

Limitations of the Study

This study has limitations, including a sample size and geographic scope that may not fully represent Thailand's processed fruit and vegetable SMEs. A broader sample could offer more insights. Findings may not be generalizable to industries with different technological needs. The short observation period prevents assessing long-term digital adoption effects. The reliance on key informants, while insightful, limits study depth. Given these constraints, the study mainly presents demographic data. Future research with a larger sample could improve applicability.

Future Directions

Future research should examine a larger SME sample to explore factors affecting competitiveness, such as consumer behavior, online marketing, and sustainable practices. Longitudinal studies would assess the long-term impact of digital tools on profitability. Research could also inform policies that support SMEs in digital transformation, helping governments create strategies that drive innovation and technology adoption.

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