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Research paper

Strategic Management Accounting and Data-Driven Innovation For Operational Efficiency In The Southern Border Manufacturing Industry Of Thailand

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Abstract

The domestic economy is experiencing continued improvement, driven by the recovery of the tourism sector. In turn, this has led to increased demand for related industrial goods. Businesses must adapt through innovation to survive in a rapidly changing market. Consequently, they are actively seeking competitive advantages to improve operational efficiency. Strategic management accounting is, therefore, a key factor in organizational success, designed to assist in controlling and managing issues related to the economic sector and organizational performance. Furthermore, the development of innovation will enhance operational efficiency and sustain competitiveness. This research aims to analyze the levels of strategic management accounting (SMA), innovation development, and operational performance efficacy within the southern border manufacturing industry of Thailand. This study employs a mixed-methods research design, incorporating structural equation modeling (SEM). The population comprises 136 southern border manufacturing industries. Data collection involves questionnaires and semi-structured interviews. Data analysis utilizes descriptive statistics, structural equation modeling, and content analysis. The research findings indicate that the manufacturing industry exhibits a high level of agreement regarding strategic management accounting, innovation development, and operational efficiency overall. Furthermore, innovation development positively influences operational efficiency, innovation development positively influences strategic management accounting, and strategic management accounting positively influences operational efficiency. Consequently, businesses can utilize these findings as a decision-making guide for employing management accounting techniques and fostering innovation, thereby maximizing resource utilization and leveraging existing knowledge for management to achieve a competitive advantage, ultimately leading to improved operational efficiency.

Keywords: *Strategic Management Accounting, Innovation Development, Data-driven Innovation, Operational Efficiency*

1. Introduction

The industrial economy in 2023, as assessed by the Manufacturing Production Index (MPI), contracted by 4.6%. The primary factor contributing to this contraction was the export sector, which declined due to the impact of the global economic slowdown. However, the domestic economy gradually improved. This improvement was supported by the tourism sector, which continued to recover. The tourism growth led to an increase in demand for related industrial goods. Consequently, businesses needed to adapt in terms of innovation to enhance operational efficiency and create a competitive advantage. The manufacturing industry currently prioritizes data-driven innovation (DDI) as a crucial resource for generating new knowledge and fostering value creation, which is essential for production efficiency and company growth (Brynjolfsson et al., 2011). Leveraging data and analytics also creates opportunities for new products, processes, and markets. Moreover, strategic management accounting is a key factor in the success of organizations and various sectors, designed to aid in controlling and managing issues related to the economic sector and organizational performance. This is because strategic management accounting involves accounting aligned with the organization's strategic direction, providing information for decision-making and control. The interconnectedness of strategic management accounting, innovation, and operational performance can be explained through the Resource-Based View (RBV). This is because businesses can maximize the utilization of their resources by developing critical resources to drive productivity, innovation, and value creation. Any enterprise should prioritize the application of strategic management accounting information to utilize management accounting for planning, controlling, and decision-making in operational activities to allocate resources for maximum efficiency. Besides, the Knowledge-Based View (KBV) posits that organizations can leverage knowledge to achieve a competitive advantage by utilizing research and development, customer data analysis, market analysis, and investments in skilled personnel,

among other strategies. Raksudjarit et al. (2024) emphasize the significance of strategic management accounting in enhancing operational efficiency within the food industry. Ahmad & Al-Shbiel (2019) reveal that management accounting systems are crucial for improving company performance, and the development of innovation strategies enhances efficiency and operational outcomes. Therefore, if managers utilize information from strategic management accounting in their administration, including the development of innovation, it may lead to improved organizational performance and the maintenance of competitiveness.

The research team, recognizing the significance of this issue, aims to investigate innovations driven by strategic management accounting for operational efficiency within the manufacturing industry in the southern border provinces of Thailand. The study seeks to determine the levels of strategic management accounting, innovation development, and operational efficiency within the southern border manufacturing industry. Furthermore, the research will examine the impact of strategic management accounting practices and innovation on the operational efficiency of the manufacturing industry, taking into account the unique economic and social environment of the Southern Border Provinces of Thailand. This type of research has not yet seen interest from domestic researchers in examining variables in conjunction with the southern border manufacturing industry. The findings, once discovered, will provide knowledge that the target group can utilize and build confidence in decision-making for organizational management, enhancing competitiveness in the market. Furthermore, it will enable the development of innovations and management strategies to ensure organizational survival and stability, leading to a stable increase in organizational value.

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2. Literature Reviews

The interconnectedness of strategic management accounting, innovation, and operational efficiency can be elucidated through the 'Resource-Based View (RBV)' theory, which posits that organizations can maximize resource utilization. It involves analyzing which resources are valuable and likely to generate competitive advantages and subsequently developing and enhancing the capabilities of crucial resources. Examples include employee training, the adoption of new and appropriate technologies, and investments in research and development, all aimed at driving productivity, innovation, and value creation. Businesses should prioritize the application of strategic management accounting data for planning, control, and decision-making in resource allocation to achieve optimal efficiency and effectiveness. Furthermore, the 'Knowledge-Based View (KBV)' theory suggests that organizations can leverage knowledge to gain a competitive edge. It involves utilizing both internal and external knowledge sources. For instance, research and development can facilitate the development of new products, processes, or technologies, thereby differentiating the organization from its competitors. Data analysis also helps organizations understand customer needs and market trends, enabling more informed decision-making and adaptability to changing circumstances. Investing in capable personnel enables an organization to possess a workforce with the knowledge and skills necessary to drive organizational advancement, among other benefits.

The Organization for Economic Co-operation and Development (OECD) categorizes innovation into four types: product innovation, process innovation, marketing innovation, and organizational innovation (OECD, 2018). Research by Ramadani et al. (2019) found a positive correlation between product innovation activities and firm performance, which was measured by assessing profitability, sales volume, and firm growth. Furthermore, the study by Saleem et al. (2020) revealed a relationship between process innovation and firm performance, as measured by sales growth, increased market share growth, increased pre-tax profit growth, and cash flow success. The study by Tsourvakas et al. (2016) revealed a positive relationship between marketing innovation and firm performance. Furthermore, research by Hervas-Oliver et al. (2014) and Illmudeen et al. (2021) found a positive correlation between organizational innovation and firm performance. This research measures performance using a Balanced Scorecard approach, encompassing financial, customer, internal process, and learning and growth perspectives, as conceptualized by Kaplan and Norton (1996).

Saleh and Al-Nimer (2022) found an insignificant mediating effect of management accounting systems in the relationship between innovation activities and financial performance. Therefore, companies should adopt contemporary or strategic management accounting practices to maintain competitiveness. Miftah (2020) indicated that innovation activities significantly contribute to improving company performance. Furthermore, the study emphasized the mediating role of management accounting systems in the relationship between innovation activities and company performance, suggesting that management accounting systems can act as a mediating variable between management's innovation activity orientation and company performance. Tsai et al. (2020) found a positive impact of product innovation on company performance using management accounting systems. Kolisnyk et al. (2023) found that the implementation of blockchain technology can mitigate the likelihood of accounting errors and enhance data security. The utilization of blockchain in accounting transactions can lead to a reduction in penalties associated with accounting errors, as well as facilitate more rapid detection and correction of mistakes without incurring additional financial costs. Furthermore, blockchain technology can effectively minimize the loss of economic data and its misuse by malicious actors. Raksudjarit et al. (2024) found that strategic management accounting positively influences the operational performance of the food industry. Phornlaphatrachakorn (2017) stated that strategic management accounting is a valuable tool for enhancing organizational efficiency, enabling competitive advantage, and improving business performance. It was found that strategic management accounting partially mediates the relationship, positively impacting the operational performance of businesses. Furthermore, strategic management leads to data completeness and goal achievement, and key strategic performance measurements related to organizational excellence and strategic management accounting are considered significant sources of competitive advantage and business efficiency. The study by Abdelraheem, Serajeldin, and Jedo (2017) found that the use of strategic costing enables companies to reduce costs and support competitive advantage. Thapayom (2019) found that planning, competitor accounting, and customer accounting are significantly and positively related to organizational competitiveness and sustainable organizational performance. This aligns with the study by Al-Mawali et al. (2012), which found that Customer Profitability Analysis (CPA) has a significant impact on organizational performance. Customer accounting, which provides important information related to customers, plays a crucial role in strategic decision-making and leads to improved company performance. This research references the management accounting model proposed by Cinquini and Tenucci (2010), incorporating the concepts of Cadez and Guilding (2011) identified three aspects of strategic management accounting: (1) strategic costing, (2) customer accounting, and (3) competitor accounting. The challenges of doing business in the three southernmost provinces of Thailand are multifaceted. These include the need for Halal certification, which may pose a constraint for entrepreneurs seeking to export products to international markets. Consumer preferences in the area may differ from other regions, necessitating careful consideration in marketing and product planning. Furthermore, the ongoing violence and unrest in the area raise concerns about the safety of investors and employees. However, there are also development opportunities, as the area possesses abundant natural resources, such as agricultural products and marine resources, which have the potential to be developed into value-added products and goods. The Halal food market is of high value and is continuously expanding, presenting an opportunity to improve products and goods that cater to Muslim consumers. Additionally,

there are numerous border checkpoints with the potential to connect with neighboring countries. Based on the literature review above, the following research hypotheses can be formulated.

Hypothesis 1: A positive relationship exists between innovation development and operational efficiency in the manufacturing industry.

Hypothesis 2: A positive relationship exists between innovation development and strategic management accounting in the manufacturing industry.

Hypothesis 3: A positive relationship exists between strategic management accounting and operational efficiency in the manufacturing industry.

Framework of Research

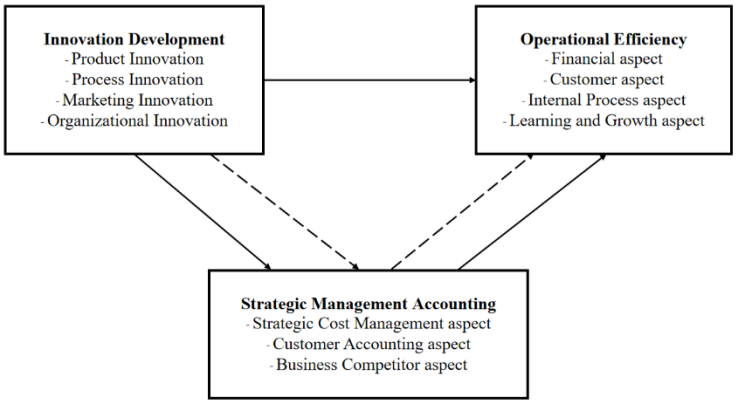


Fig.1: Framework of Research

Figure 1 presents a research framework that illustrates the relationships among three key variables. The independent variable is innovation development, defined as an organization's capacity to foster innovation to bolster its capabilities, encompassing product, process, marketing, and organizational innovations. The mediating variable is strategic management accounting, which involves leveraging accounting data to inform strategic decisions, including strategic costing, customer accounting, and competitor accounting. The dependent variable is operational performance, representing the outcomes of implementing strategic management accounting and innovation, assessed across four primary dimensions: financial, customer, internal processes, and learning and growth. This framework suggests that innovation development elevates organizational operational performance. Furthermore, organizations consistently engaged in innovation development influence the application of strategic management accounting information, which in turn facilitates precise decision-making and ultimately enhances organizational operational performance.

3. Research Methodology

This study employs a mixed-methods research design, focusing on the population of southern border manufacturing industry executives of Thailand: Yala (158 establishments), Pattani (152 establishments), and Narathiwat (158 establishments), totaling 468 establishments (Department of Industrial Works, 2024). The research focuses on manufacturing industries with comprehensive decision-making information systems. The research team aims to study a sample of the southern border manufacturing industries group. The sample size determination in this research was calculated using Cohen's (1992) statistical method through the G*Power program, utilizing an effect size of 0.5, α = 0.05, and power = 0.80, resulting in a sample size of 136 establishments. Stratified random sampling was employed, with proportional allocation, meaning that provinces with a larger population received a proportionally larger representation in the sample. For the qualitative research component, the study focuses on manufacturing industry executive representatives who agreed to participate, totaling eight individuals. The research instruments used were questionnaires and semi-structured interviews. Data collection involved questionnaires distribution in person and conducting interviews via online channels. The data analysis employed descriptive statistical analysis, including the examination of means and standard deviations, and inferential statistics. It also encompassed structural equation modeling techniques and content analysis. For Confirmatory Factor Analysis (CFA), three latent variables were used to assess the validity of the measurement model: innovation development, strategic management accounting, and operational performance. The analysis results indicated that the model passed both evaluation stages, signifying the quality of the validity of the model for all three variables. It implies that the theories used to construct measurement instruments are appropriate for the characteristics of the studied population.

4. Research Results

4.1 The analysis results of opinions regarding strategic management accounting, innovation development, and operational efficiency within the manufacturing industry

The analysis of the level of opinion regarding strategic management accounting in the manufacturing industry, as presented in Table 1, revealed that the overall level of opinion was high, with a mean of 4.08. When considering each aspect individually, ranked from highest to lowest, the strategic cost aspect had a mean of 4.19, followed by the customer accounting aspect with a mean of 4.15, and the business competitor aspect with a mean of 3.91.

The analysis of opinion levels regarding innovation development in the manufacturing industry revealed that the overall opinion level concerning innovation development was high, with an average of 4.00. When considering each aspect individually, ranked from highest to lowest, product innovation had an average of 4.11, followed by organizational innovation with an average of 4.04, process innovation with an average of 4.03, and marketing innovation with an average of 3.82.

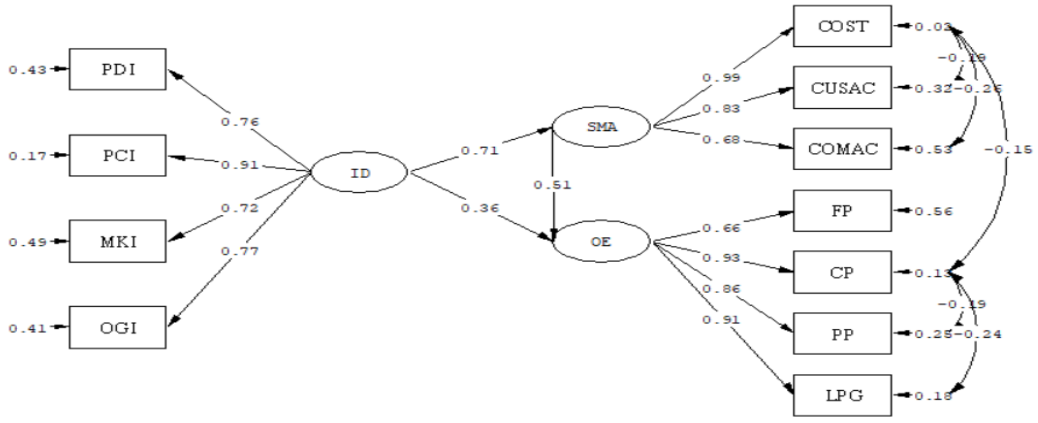
The analysis of opinion levels regarding the operational efficiency of the manufacturing industry revealed that the overall level of opinion concerning operational efficiency was high, with an average score of 3.95. When considering each aspect, ranked from highest to lowest,

the internal process perspective had an average score of 4.11, followed by the customer perspective with an average score of 3.99, the learning and growth perspective with an average score of 3.98, and the financial perspective with an average score of 3.70, respectively.

Table 1: The opinions regarding strategic management accounting, innovation development, and operational efficiency within the manufacturing industry

	$\overline{X}$	S.D.	Opinions Level
Strategic Management Accounting	**4.08**	**0.81**	**High**
Strategic cost aspect	4.19	0.73	High
Customer accounting aspect	4.15	0.79	High
Business competitor aspect	3.91	0.92	High
Innovation Development	**4.00**	**0.81**	**High**
Product innovation	4.11	0.76	High
Process innovation	4.03	0.82	High
Marketing innovation	3.82	0.89	High
Organizational innovation	4.04	0.78	High
Operational Efficiency	**3.95**	**0.79**	**High**
Financial Perspective	3.70	0.85	High
Customer Perspective	3.99	0.78	High
Internal Process Perspective	4.11	0.70	High
Learning and Growth Perspective	3.98	0.84	High

4.2 A Causal Relationship Study of Data-Driven Innovation through Strategic Management Accounting for Operational Efficiency in the Manufacturing Industry within the Southern Border Provinces of Thailand



Chi-Square = 39.85, df = 28, p-value = 0.07 , RMSEA=0.06

Fig. 2: Parameter Values of a Data-Driven Innovation Model of Strategic Management Accounting for Operational Efficiency in the Manufacturing Industry of the Southern Border Provinces of Thailand

Table 2: The Thai text translates to: "Direct Effects (DE), Indirect Effects (IE), Total Effects (TE), and the Coefficient of Determination (R2) of an innovation model driven by strategic management accounting data for operational performance in the manufacturing industry in the Southern Border Provinces of Thailand

DV / IV	SMA			OE		
	DE	IE	TE	DE	IE	TE
SMA	-	-	-	0.51**	-	0.51**
				(0.12)		(0.12)
ID	0.71**	-	0.71**	0.36**	0.37**	0.73**
	(0.09)		(0.09)	(0.12)	(0.11)	(0.13)
R^2		0.51			0.66	

Note. ** Significant at the .01 level, values in parentheses indicate the standard error.

From Figure 2 and Table 2, when considering Strategic Management Accounting (SMA), the Innovation Development (ID) factor directly influences Strategic Management Accounting (SMA) with a positive influence of 0.71, which is statistically significant at the .01 level and can explain 51 percent of the variance in Strategic Management Accounting (SMA). An examination of Operational Efficiency (OE) revealed that the most influential factor impacting OE is Innovation Development (ID), followed by Strategic Management Accounting (SMA). The effect sizes were 0.73 and 0.51, respectively. Both factors exerted a statistically significant positive influence at the .01 level. Furthermore, Innovation Development (ID) directly influenced Operational Efficiency (OE) with a positive effect size of 0.36, which was statistically significant at the .01 level. Innovation Development (ID) also indirectly influenced Operational Efficiency (OE) through Strategic Management Accounting (SMA), with a positive effect size of 0.37, which was statistically significant at the .01 level. Strategic Management Accounting (SMA) only had a direct effect. Overall, Innovation Development (ID) and Strategic Management Accounting (SMA) collectively explained 66% of the variance in Operational Efficiency (OE).

4.3 Content Analysis Results

The content analysis regarding innovation development impacts on operational efficiency reveals that businesses must enhance their products, focusing on aspects such as product quality and packaging, and tailor them to the target market to expand sales both domestically and internationally. It involves establishing product quality standards, as customers prioritize standards, such as those set by the Food and Drug

Administration (FDA), Good Manufacturing Practice (GMP), and Hazard Analysis and Critical Control Points (HACCP). Furthermore, improving products continuously enhances customer satisfaction, contributing to business sustainability and increased sales. Additionally, businesses utilize suitable machinery and equipment to control production quality and provide training to employees to enhance their knowledge and expertise in production, ensuring consistent quality and standardized products, which improves internal work processes. The business focuses on marketing for innovation development, primarily emphasizing product quality and brand recognition to create market opportunities, thereby increasing market share and acquiring new customers. The diversification of products significantly impacts customer satisfaction. Regarding organizational innovation development, the business conducts continuous meetings, encourages employee participation in presenting past performance results, identifies problems, and provides suggestions or opinions on operational processes to improve internal processes. In terms of innovation development affecting strategic management accounting, the business experience increased initial costs due to investments in machinery and equipment. However, the implementation of machinery or technology to control production process standards leads to long-term cost reduction, as these technologies minimize production errors and reduce working hours while maintaining the required production output. However, the organization encourages employees to receive specialized training relevant to their positions to enhance their knowledge, expertise, and practical skills. This, in turn, improves internal work processes and reduces costs associated with damage. The strategic management accounting effects on operational efficiency are evident in several areas. Regarding strategic costing, businesses engage in production planning and quality control, starting from the procurement of raw materials through the manufacturing process and culminating in product inspection before delivery to customers. This comprehensive approach aims to prevent errors and minimize production losses, including ensuring adherence to established standards. This, in turn, contributes to achieving the targeted costs. Furthermore, businesses conduct monthly or annual performance comparisons, such as sales and profits, to analyze their operational status and plan operations to meet their objectives. In terms of customer accounting, businesses assess customer satisfaction with products using methods such as direct customer interaction and evaluating sales performance by individual customers and customer groups. It involves collecting data on customer details, characteristics, needs, or target markets, which can help maximize customer satisfaction through quality, price, and delivery. Businesses primarily focus on retaining existing customers by controlling product quality to meet their needs, resulting in customer satisfaction and increased sales. In terms of competitor accounting, businesses monitor competitor pricing by inquiring about competitor prices from customers to inform their product pricing.

5. Research Discussion

The discussion of the results according to Objective 1 is as follows: The study found that the manufacturing industry had an overall high level of opinion regarding strategic management accounting, innovation development, and operational efficiency. This aligns with the study by Jaipen (2014), which found that the effectiveness of applying strategic management accounting techniques was generally high, as measured by the minimal use of resources and economical operations. Additionally, Ubonwan Suwanphusit and Amphon Chayomchai (2018) found that innovation development in the manufacturing industry primarily focused on product innovation and process innovation simultaneously, as process development helps to improve process efficiency and product quality, thereby better meeting customer needs. These factors contribute to improved organizational performance. Furthermore, Thanika Chawalit and Praphatsorn Wisetprapha (2021) found that small and medium-sized enterprises (SMEs) gave significant importance to overall operational efficiency, focusing on financial aspects, customer aspects, internal processes, and learning and development.

The discussion of results according to objective 2: From the testing results on the development of a causal relationship model of innovation driven by strategic management accounting data for operational efficiency in the manufacturing industry in the Southern Border Provinces of Thailand, it was found that innovation development positively impacts operational efficiency. This supports Hypothesis 1, concordant and connected with the qualitative analysis results, as businesses focus on improving and diversifying products to suit target markets, expand markets, and meet customer needs. The emphasis is placed on defining and maintaining product quality standards, which continuously satisfy customers, leading to business sustainability and increased sales. There is the implementation of machinery and employee training to enhance manufacturing expertise to control and maintain consistent quality standards, resulting in improved internal work processes. The study by Amores-Salvado et al. (2014) found a non-significant positive relationship between product innovation and operational efficiency. Saleem et al. (2020) found a relationship between process innovation and firm performance, and Tsourvakas et al. (2016) found a positive relationship between marketing innovation and firm performance. Furthermore, the study by Illmudeen et al. (2021) revealed a positive relationship between organizational innovation and firm performance. The development of innovation positively impacts strategic management accounting, thus supporting Hypothesis 2, concordant and connected with the qualitative analysis findings. This is because the implementation of machinery or technology reduces the production costs of the business and helps to reduce production errors. Additionally, promoting specialized training for employees improves internal work processes, leading to a reduction in costs resulting from damages. The findings align with Scarpellini et al. (2017), who discovered a positive correlation between a company's innovation activities and its management accounting systems, as well as strategic management accounting, which positively impacts operational performance, thereby supporting Hypothesis 3, concordant and connected with the qualitative analysis findings. Given the uncertain circumstances, managers recognize the importance of cost management, leading to production planning and product quality control to meet established standards, preventing potential errors and production losses. Performance is compared to previous results to analyze situations and plan operations. Customer segments that contribute to profit are analyzed to inform resource allocation decisions, ensuring sufficient resources to meet demand. Furthermore, competitor pricing is monitored to inform product pricing strategies. This is consistent with Phornlaphatrachakorn (2017), who stated that strategic management accounting is a valuable tool for enhancing organizational efficiency, enabling competitive advantage, and improving business performance. The implementation of strategic costing methods has been shown to positively impact a company's ability to reduce costs and enhance its competitive position, ultimately improving performance effectiveness. The study also corroborates the findings of Ditkaew (2023), which revealed a positive correlation between strategic management accounting and competitive advantage, and the research by Tirado and Mavlutova (2023) demonstrated the influence of strategic management accounting on financial performance. Abdelraheem, Serajeldin, and Jedo (2017) found that strategic costing aids in cost reduction and supports the attainment of a competitive advantage, thereby increasing performance effectiveness. Furthermore, research highlights the significance of various strategic aspects in fostering competitive potential and sustainable effectiveness within organizations. Thapayom (2019) identified that planning, competitor accounting, and customer accounting all have a significantly positive relationship with the competitive potential and sustainable effectiveness of enterprises.

The research compares the findings with those of Raksudjarit et al. (2024), who investigated the impact of Strategic Management Accounting (SMA) on the operational performance of the food industry. The study emphasizes the use of SMA to improve operational efficiency, without a specific focus on technology or innovation. In contrast, this study focuses on the application of SMA and innovation to enhance

the operational performance of the manufacturing industry. The research findings indicate that the food industry exhibits a moderate level of overall strategic management accounting implementation. In contrast, the manufacturing industry demonstrates a high level of overall strategic management accounting implementation. However, both industries show a positive impact of strategic management accounting on operational performance. The limitations of this study are constrained by its focus on the three southernmost provinces of Thailand. Consequently, the research findings may not be generalizable to other geographical areas. Furthermore, the study only examines the strategic management accounting techniques explicitly mentioned. Therefore, other strategic management accounting techniques may also be employed within the manufacturing industries of Thailand's southern border region.

6. Conclusion and Recommendation

The southern border manufacturing industry of Thailand exhibits an overall high level of perceived strategic management accounting, innovation development, and operational performance. Furthermore, the development of a causal relationship model of innovation driven by strategic management accounting for operational efficiency in the manufacturing industry of Thailand's southern border provinces aligns with the hypothesis. This research examines a period of recovery in the tourism industry following the COVID-19 pandemic, within a region that has experienced over 20 years of unrest. This context makes the research target group unique, necessitating strategies beyond those applicable to other industries. Consequently, the manufacturing industry can improve Strategic Management Accounting (SMA) practices and promote innovation in the southern manufacturing sector of Thailand. This can be achieved through the adoption of digital technologies and efficient management approaches to enhance operational efficiency and organizational sustainability. Furthermore, workshops on waste reduction using Lean techniques and incorporating digital tools such as Microsoft Power BI to analyze machine downtime and production waste. Alternatively, implementing open-source ERP systems is beneficial for business resource management, including finance, accounting, production, and inventory management. Future research could apply the research framework to other areas with different contexts or to other businesses, such as the rubber industry, hotels, hospitals, etc., or it could be applied to other regions facing similar economic, social, and political challenges, such as ASEAN countries, to facilitate research and comparative analysis for the development of innovation and the application of strategic management accounting techniques, other strategic management accounting techniques not examined in this research could be explored. Furthermore, the role of social capital or the impacts of government support programs could be investigated.

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Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.
Conflicts of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.
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