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## Article

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# Sustainability and strategic management accounting: evidence of green manufacturing in Thailand

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## ABSTRACT

This study aims to investigate the effects of Strategic Management Accounting (SMA) on sustainable performance consisting of economic, environmental, and social performance. A questionnaire was utilized to collect primary data through a survey approach. This study includes as samples 187 green manufacturing companies in Thailand with green industry certifications from the Department of Industrial Works of Thailand. The statistical software was applied to implement the structural equation model. The results show that the causal relationship model fit to the empirical data was at an acceptable level. SMA has a significant positive direct effect on economic, environmental, and social performance. Moreover, environmental and social performance act in a partial mediating role in the relationship between SMA and economic performance. The findings also reveal that the three components of sustainable performance have causal relationships. In dealing with dynamic changes in the business environment, decision-making based on SMA information can be more proactive. The implementation and adoption of SMA techniques are known to be limited in emerging economies, with little information available on adoption and integration. The results of previous investigation are also inconclusive.

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## 1. Introduction

Green manufacturing can promote global and local sustainable development (Toke & Kalpande, 2019). Since realizing its potential, numerous environmentally conscious businesses around the world have implemented an assortment of environmental management practices. According to Lee et al. (2017) ISO 14001 and ISO 26001 are the most widely recognized environmental and social management standards. These standards guide the implementation of environmental and social management systems. Regulatory, consumer, ethical, and environmental and social consciousness are altering manufacturing strategies. Toke and Kalpande (2019) noted the need for urgency in regard to industrial reform. Green manufacturing is increasingly viewed to increase corporate value and sustain competitive advantage over the long term. Sustainability and environmental concerns are gaining prominence in business, management, manufacturing, and new product development decisions (Afum et al., 2020, Afum et al., 2021; Çankaya & Sezen, 2019; Sezen & Çankaya, 2013; Yusliza et al., 2020).

Many businesses must overcome obstacles to maintain their competitive advantage (Ojra et al., 2021). To adapt to changing environmental conditions, a firm's management accounting systems (MAS) may need to be reassessed. According to Ghasemi et al. (2019), the literature implies that traditional management accounting may not be well-suited to modern manufacturing situations (Visedsun & Terdpaopong, 2021). Strategic management accounting (SMA) is an accounting approach that helps companies to better understand the market, competitors, and customers (Ojra et al., 2021). Senior executives use

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management accounting strategies to gather critical data to compete with other companies in a rapidly changing environment. Thus, management accounting may help manufacturing companies to succeed (Shahzadi et al., 2018). SMA evaluates corporate goals using external and internal non-financial data (Guilding et al., 2000). An organization must have strong cost measures as well as, robust planning, control, performance, and strategic decision-making procedures to compete. To stay competitive, the company must use customer and competitor accounting (Ojra et al., 2021).

The manufacturing industry will rely heavily on SMA to help it develop, improve, and apply ways to thrive in a volatile and changing environment (Oyewo, 2021). This will help the industry to stay competitive. However, in emerging economies, the reach of SMA practices is known to be rather limited, with little information available on the adoption and integration of SMA approaches. Given the positive impact of SMA strategies on business outcomes, it is critical to investigate the nature and scope of SMA practices in developing economies (Rashid et al., 2020). Prior studies have shown that SMA increases managerial and organizational performance (Al-Mawali, 2021; Cadez & Guilding, 2008; Kalkhouran et al., 2017; Lay & Jusoh, 2012; Pavlatos & Kostakis, 2018; Rashid et al., 2020; Zenita et al., 2015). Thailand's SMA model evaluates organizational performance. This model has been studied in regard to industrial estates (Sumkaew & Intanon, 2021; Terdpaopong et al., 2017; Thapayom, 2019, 2022; Visedsun & Terdpaopong, 2021). Additionally, Nimtrakoon and Tayles (2010) have examined this concept in companies that were publicly listed.

The empirical evidence on the extent to which SMA approaches have been adopted and/or thought to be beneficial in many nations. SMA tools enable businesses to comprehend their rivals, clientele, and industry sector's profit growth, thereby enhancing overall performance. According to SMA, which is based on contingency theory, a company's performance is contingent on its structure and environment (Kalkhouran et al., 2017; O'Higgins & Thevissen, 2017; Otley, 1980). In response to expanding sustainability concerns, manufacturing businesses must analyze sustainable performance and incorporate sustainable components into their operations (Amrina & Yusof, 2011). Green production is likely to stimulate the economy, particularly in Thailand. This research focuses on green manufacturing to boost competitiveness.

The importance of examining sustainable performance has grown in recent years. The concept of sustainable performance pertains to the comprehensive consideration and integration of economic, environmental, and social performance objectives inside organizations (Afum et al., 2020). This research sheds light on the scholarly body of knowledge pertaining to strategic management accounting, a field that has received limited attention, has been largely overlooked, and has not been extensively explored. Nevertheless, the accessibility of SMA data remains a challenge for researchers, impeding their ability to conduct comprehensive studies in many industrial sectors. SMA's influence on Thailand's green manufacturing makes this a noteworthy contribution. Thailand's manufacturing sector contributed 28% to GDP in December 2022. This sector contributes most to the Thai economy (The Office of Industrial Economics of Thailand, 2023). The BCG Model Policy stresses the value of generation and environmental sustainability. The idea can achieve sustainable goals in numerous sectors, especially Thailand's manufacturing sector (Maimun et al., 2023).

The study, which is based on data collected from green manufacturers in Thailand, provides information about the use of a wide range of SMA and uses structural equation modelling to examine the effects of SMA on sustainable performance consisting of economic, environmental, and social performance. This study contributes to the knowledge base on the contingency factors of SMA use. It is anticipated that the outcomes of this study would offer SMA practice as a framework for organizational decisions for green manufacturing businesses that are coping with changes in the contemporary business environment. The paper proceeds as follows: [Section 2](#) examines the background literature and develops the hypotheses; [Section 3](#) outlines the research methodology; [Section 4](#) presents the results and findings from the SEM analysis; and [Section 5](#) concludes and discusses the findings of this study. The last two sections include implications and contributions, limitations, and suggestions for further research.

## 2. Literature review and hypothesis development

### 2.1. Theoretical perspectives

#### 2.1.1. Strategic management accounting

The term 'strategic management accounting' (SMA) refers to management accounting (MAPs) sections that deal with providing strategically oriented data for decision-making and control (Guilding et al., 2000). When examining the stages of MAPs through four various stages of development (Pham et al., 2020; Terdpaopong et al., 2017), the International Federation of Accountants (IFAC) declarations on management accounting are utilized as a benchmark: Phase 1 (prior to 1950): Cost and budgetary control were the primary concerns. Phase 2 (1950–1965): Data for management decision - making, using a variety of strategies to aid decision-making; Phase 3 (1965–1985): Reduced resource waste through extensive use of mathematical models. Phase 4 (since 1985): Value creation through efficient resource utilization, as seen in emerging methodologies and MAPs in Thailand, which are at the same stage of development as those in Malaysia, Vietnam, and China (Pham et al., 2020).

Strategic management accounting (SMA) is optimal for organizational dynamics. In contrast, Thai businesses continue to use traditional management accounting methods in an environment that is dynamic and constantly changing. SMA techniques offer additional information for strategic decision-making (Sumkaew & Intanon, 2021). Due to increased competition, businesses must continually develop and employ effective management strategies to maintain stability and efficacy. Management accounting analyzes and consolidates data to meet the requirements of the organization. The synchronization of information between functions and goals increases efficiency and effectiveness (Bui et al., 2023). A strategic management accounting perspective aims to align accounting with strategy (Cescon et al., 2019). It is essential to note that the comprehensive use of SMA might result in advantages such as greater organizational competitiveness. Consequently, the long-term advantages of SMA may be of interest to forward-thinking corporations and result-oriented organizations looking to gain a competitive advantage (Cadez & Guilding, 2008; Kalkhouran et al., 2017; Lay & Jusoh, 2012; Oyewo, 2021; Rashid et al., 2020; Zenita et al., 2015).

SMA can be viewed as a set of strategically oriented accounting techniques. The following are the techniques in five categories (Cadez & Guilding, 2008; Cinquini & Tenucci, 2008; Oyewo, 2021): (1) Costing (attribute costing, target costing, and value-chain costing); (2) Planning, control and performance measurements (benchmarking, integrated performance measurement, and environmental management accounting); (3) Strategic decision making (strategic costing, strategic pricing, and brand valuation); and (4) Competitor accounting (competitor cost assessment, competitive position monitoring, and competitor performance appraisal) and (5) Customer accounting (Customer profitability, lifetime customer profitability analysis and the valuation of customers as assets)

#### 2.1.2. Sustainable performance

The current state of growth and development is mostly centered around the concept of sustainable development. Sustainability can be achieved by prioritizing the interests and value addition of multiple stakeholders, while also ensuring the preservation of the environment and natural resources, rather than solely pursuing profit maximization without regard for these factors (Gunarathne et al., 2021).

Measuring organizational performance is problematic, especially when the conditions for measurement are constantly changing (Suttipun, & Saelee, 2015). Even though big companies are working on sustainable reporting, there is no agreement on a single standard, and the different frameworks are so complicated that they cannot be combined (Hubbard, 2009). Since the idea of Triple bottom line (TBL) was coined by Elkington, the trend of organizations addressing the interests of various stakeholder groups has been expanding in many nations (Hubbard, 2009 Suttipun et al., 2021). The phrase 'corporate performance' has been broadened to encompass not just financial but also social and environmental dimensions. As a result, extended corporate performance, also known as sustainable performance, includes economic, social, and environmental performance measures (Alsayegh et al., 2020; Alt et al., 2015; Braccini & Margherita, 2018; Çankaya & Sezen, 2019; Fauzi et al., 2010; Hourneaux Jr. et al., 2018; Khan, Irshad et al., 2021).

Manufacturing businesses use TBL to address stakeholders' use of available environmental management and resolution (Khan, Irshad et al., 2021). The terms TBL and sustainable performance have been used interchangeably, and TBL and corporate performance are both used to refer to sustainable performance (Braccini & Margherita, 2018; Fauzi et al., 2010; Khan, Irshad et al., 2021). The content of each assessment factor, and thus the sustainable performance, can change over time and between situations (Fauzi et al., 2010).

Several research have categorized factors as sustainable performance variables (Cadez & Guilding, 2008; Kalkhouran et al., 2017; Lay & Jusoh, 2012; Thapayom, 2019, 2022; Zhu et al., 2019). Moreover, a number of scholarly investigations have classified performance indicators into three separate dimensions, namely economic, social, and environmental in the context of analyzing sustainable performance (Alsayegh et al., 2020; Çankaya & Sezen, 2019; Foo et al., 2018; Khan, Irshad et al., 2021; Le, 2020; Maletič et al., 2016; Sezen & Çankaya, 2013). This study examines the multifaceted dimensions of sustainable performance, encompassing economic, social, and environmental considerations.

In the social dimension, which mainly assesses employee well-being (Foo et al., 2018), the indicators of employee satisfaction, worker safety, and education and skills focus on the importance of employees as key stakeholder for industries (Amrina & Yusof, 2011; Fuzi et al., 2017; Hourneaux Jr. et al., 2018; Khan, Irshad et al., 2021; Khan, Wu et al., 2021; Maletič et al., 2016; Zhu et al., 2019).

The environmental dimension focuses on the consistency between the use and renewal of natural resources (Braccini & Margherita, 2018). Several indicators reflect environmental performance, including waste reduction and resource and energy utilization (Amrina & Yusof, 2011; Foo et al., 2018; Fuzi et al., 2017; Hourneaux Jr. et al., 2018; Khan, Irshad et al., 2021; Khan, Wu et al., 2021; Le, 2020; Maletič et al., 2016; Zhu et al., 2019).

The economic dimension of the organization's performance is focused on its economic or financial aspects (Braccini & Margherita, 2018). Within the economic dimension, the indicators of profit growth rate (Foo et al., 2018; Hubbard, 2009; Khan, Irshad et al., 2021; Khan, Wu, Saufi et al., 2021; Maletič et al., 2016; Rabbani et al., 2014), reducing cost (Amrina & Yusof, 2011; Foo et al., 2018; Le, 2020; Maletič et al., 2016; Rabbani et al., 2014) and increasing market share (Hubbard, 2009; Khan, Irshad et al., 2021; Khan, Wu et al., 2021; Le, 2020; Maletič et al., 2016) are common indications of an organization's value offer in the economic dimension.

## **2.2. Hypothesis development**

The management accounting literature based on contingency theory is predominantly involved with manufacturing organizations (Nimtrakoon & Tayles, 2010). According to the contingency approach in SMA, there is no universal accounting system that can be used by all organizations in all situations (O'Higgins & Thevissen, 2017; Otley, 1980). As a criterion variable, the concept of a contingency fit necessitates some measure of effectiveness. So, we can say that a good contingent fit is more effective than a bad match (Nimtrakoon & Tayles, 2010; Otley, 2016).

Prior studies have shown that SMA increases managerial and organizational performance (Al-Mawali, 2021; Cadez & Guilding, 2008; Kalkhouran et al., 2017; Lay & Jusoh, 2012; Pavlatos & Kostakis, 2018; Rashid et al., 2020; Sumkaew & Intanon, 2021; Thapayom, 2019, 2022; Zenita et al., 2015). Therefore, strategic management accounting is critical to a company's decisions (Alamri, 2019).

Management accounting scholars and managers have long focused on organizational performance. As the corporate environment has evolved rapidly, non-financial performance measures have also arisen (Al-Mawali, 2021; Suttipun, & Arwae, 2020). Manufacturing organizations are important to the growth of a country's economy and must have a long-term growth and success strategy if they are to increase quality (Khan, Wu et al., 2021). Companies throughout the world must combine environmental, social, and economic factors into their plans (Hristov & Chirico, 2019). This study divided performance into three areas; economic, social, and environmental performance, with each factor having relationships with the others.

Previous research has significantly expanded the existing body of literature on green production and environmental management (Afum et al., 2020, 2021). The relationship between sustainable performance and operational effectiveness merits consideration. The results demonstrate a distinct and favorable

correlation between environmental performance and social performance, thereby affecting economic performance. While there was no significant intermediate association observed, the development of a competitive advantage was found to be influenced by performance associations. Prior research has shown that there is a link between environmental performance, social performance, and economic or financial performance (Afum et al., 2020, 2021; Albertini, 2013; Al-Mawali, 2021; Asiaei et al., 2022; Hourneaux Jr. et al., 2018; Liu, 2020).

Inter-performance studies, such as that conducted by Liu (2020), present a comprehensive multi-level framework for examining the intricate association between environmental performance and financial performance. The findings of this study reveal a generally positive correlation between environmental performance and financial performance. In addition, the study of Hourneaux Jr. et al. (2018) conducted a comprehensive analysis of the interplay between economic, social, and environmental performance. Although environmental and social performance were found to affect economic performance, the study did not reveal a relationship between environmental performance and social performance.

There is also a link between environmental and social performance and economic sustainability performance, which means that the economic value of a company that also provides value for society, is also connected to social and environmental factors (Alsayegh et al., 2020; Alt et al., 2015). Moreover, social performance has a favorable influence on environmental performance, indicating that employees are crucial stakeholders who can influence the effectiveness of environmental management and that their influence is bolstered in companies with strong levels of common vision (Alt et al., 2015).

Afum et al.'s (2020) research demonstrated that green manufacturing has a direct impact on economic, social, and environmental performance. Notably, social performance plays an important role as a mediator variable in this relationship. Furthermore, Al-Mawali's research (2021) found a positive correlation between environmental cost accounting and both financial and environmental performance. Additionally, the findings of the study also support the notion that environmental performance plays a mediating role in this relationship. The significance of sustainability in corporate management can be perceived as an alternative path. In addition, the concept of equilibrium across the dimensions of sustainable performance is never discussed, despite its obvious importance and implementation necessity. There is a lack of conclusive research on the mediating factors of the relationship between environmental performance, social performance, and economic efficiency, and the results are equivocal.

The contingency theory of management accounting (MA) has been empirically studied in a variety of contexts at industry, business, and unit levels (Haldma & Lääts, 2002). The current study was conducted at the level of the main business unit. It had two goals: to look into the relationship between the degree of use of strategic management accounting techniques (SMA Techniques) and sustainable performance, including economic, environmental, and social performance; and to test the indirect effects of social and environmental performance on the relationship between the degree of use of SMA techniques and the economic performance of green manufacturing. Structural equation modeling can also be employed to explain the hypothesised relationship between SMA techniques and sustainable performance by using contingency theory. Therefore, there are nine hypotheses in this study which are:

H1: There is a positive relationship between the degree of use of SMA techniques and economic performance.

H2: There is a positive relationship between the degree of use of SMA techniques and social performance.

H3: There is a positive relationship between the degree of use of SMA techniques and environmental performance.

H4: There is a positive relationship between social performance and economic performance.

H5: There is a positive relationship between environmental performance and economic performance.

H6: There is a positive relationship between social performance and environmental performance.

H7: Social performance mediates the relationship between the degree of use of SMA techniques and economic performance.

H8: Environmental performance mediates the relationship between the degree of use of SMA techniques and economic performance.

H9: Social performance and environmental performance mediate the relationship between the degree of use of SMA techniques and economic performance.

### 3. Research methodology

A questionnaire was utilized to collect primary data using the survey approach. The method of sampling used in the investigation was simple randomization. The study's participants included green manufacturing firms that had earned Department of Industrial Works of Thailand green industry certificates at levels 3–5, which are comparable to ISO14001 and ISO26001. According to the Department of Industrial Works of Thailand website (Green Industry), there were 1,229 green manufacturing firms on the list as of August 2021, with the companies divided into seven categories. Only 195 of the 645 questionnaires were returned, which represents, a 30.23% response rate, and eight questionnaires were deemed unusable and the 187 valid responses was then examined. In this study, the primary unit of analysis is the organization itself. The questionnaire was completed by the manager or senior staff in the accounting and finance department, or individuals with similar roles, on behalf of the company.

In this study, questionnaires with a Likert scale were used to evaluate and measure the influence that the degree of usage of SMA techniques has on sustainable performance. All 15 items of measurement for the degree of use of SMA techniques were concept from Cadez and Guilding (2008), Cinquini and Tenucci (2008) and Oyewo (2021), whereas all nine items of the measurement for sustainable performance were adopted from Amrina and Yusof, (2011), Hourneaux Jr. et al. (2018), Khan, Irshad et al. (2021), Khan, Wu et al. (2021), Le (2020), Maletič et al. (2016), Fuzi et al. (2017) and Zhu et al. (2019). For example, the questionnaire asked, 'To what extent does your company use the following accounting techniques?' All SMA techniques are assessed on a 5-point Likert scale from 1 ('never') to 5 ('always'), and all sustainable performance factors are assessed on a 5-point Likert scale from 1 ('Strongly Disagree') to 5 ('Strongly Agree').

The results were subjected to quantitative data analysis, and the data were interpreted using structural equation modeling (SEM) with the use of statistical software. The SEM process has two distinct stages, namely the measurement model and the structural model. The discussion began by providing an overview of the company's background information, followed by an examination of the adoption of SMA inside the organization and an assessment of the extent to which it is utilized.

## 4. Results and findings

### 4.1. Company background and characteristics

Table 1 presents a summary of the research companies' data characteristics. First, by dividing the companies into six categories (according to the Thailand Industries Sentiment Index) a total of 187 green

**Table 1.** Profiles of sample green manufacturing companies (n=187).

Categories	Frequency	Percentage
<i>Industry Type</i>		
Supporting	58	31.02
Automotive and machinery	55	29.41
Food and Pharmaceuticals	25	13.37
Electrical and Electronics	24	12.83
Construction and electrical appliances	13	6.95
Energy	12	6.42
<i>Firm size by Revenue</i>		
Large industry	140	74.86
Medium industry	33	17.65
Others	14	7.49



Table 3 presents a statistical summary of the observed variables utilized in this study, including the minimum and maximum values, mean, standard deviation (SD), skewness, and kurtosis. Based on the established criteria, it is recommended that the skewness value falls within the range of -2 to +2, while the kurtosis value should be within a range of -7 to 7 (Byrne, 2010; Hair et al., 2010). Table 4 shows the correlation matrix employed to evaluate the presence of multicollinearity between the latent variable and the variables utilized in this research.

To evaluate the presence of common method variance (CMV) with the Harman single factor technique, exploratory factor analysis (EFA) was employed. The results indicated that a single factor exhibited the highest amount of volatility, accounting for 38.423% of the total variance. Consequently, the probability of encountering CMV difficulties in our data set, which was obtained from a single source, was reduced (Eichhorn, 2014).

#### 4.3. Evaluation of measurement models

SEM's measurement model is the CFA, which illustrates the pattern of observed variables for the hypothesized model's latent components. The test of the observed variables' reliability is an important part of CFA (Schreiber et al., 2006). First, the Fornell and Larcker (1981) measurement model was utilized to conduct convergent and discriminant validity tests.

In order to determine the degree of agreement among many indicators of the same construct, the CV (convergent validity) method is employed (Ab Hamid et al., 2017). An appropriate convergence is demonstrated by a factor loading and an AVE value higher than 0.50 and a CR of 0.70 or higher, which are all essential conditions for the assumption of CV (Hair et al., 2019).

The scale items and evaluation of the variable are shown in Table 5. The factor loadings of the variables' scale items ranged from 0.686 to 0.916, and the corresponding Z-test ranged from 12.312 to 51.169, exceeding the significance threshold of 1.96. In addition, the AVE ranged from 0.594 to 0.779, and the CR ranged from 0.812 to 0.913. The results for Cronbach's alpha varied from 0.801 to 0.925 for external and internal consistency assessments and were greater than 0.70, (Cortina, 1993). The CV assumption was validated by the data, and the model's measurement scales showed high reliability.

**Table 3.** Descriptive statistics.

Variable	Minimum	Maximum	Mean	SD	Skewness	Kurtosis
Cost	1.00	5.00	3.838	1.060	-0.757	0.040
Pcpm	1.00	5.00	3.757	0.976	-0.550	-0.051
StdM	1.33	5.00	3.968	0.894	-0.511	-0.518
Comp	1.00	5.00	3.820	1.079	-0.909	0.416
Cust	1.00	5.00	3.680	1.144	-0.656	-0.308
socp1	1.00	5.00	4.075	0.714	-0.557	0.957
socp2	2.00	5.00	4.278	0.646	-0.458	-0.104
socp3	2.00	5.00	4.182	0.655	-0.322	-0.212
envp1	2.00	5.00	4.225	0.713	-0.537	-0.233
envp2	2.00	5.00	4.348	0.641	-0.589	-0.004
envp3	2.00	5.00	4.401	0.643	-0.728	0.102
ecop1	2.00	5.00	4.198	0.725	-0.834	0.978
ecop2	1.00	5.00	4.032	0.768	-0.630	0.712
ecop3	1.00	5.00	3.957	0.768	-0.575	0.667
Sma	1.40	5.00	3.812	0.850	-0.482	-0.240
Socp	1.67	5.00	4.178	0.620	-0.396	0.503
Envp	2.00	5.00	4.324	0.610	-0.540	-0.035
Ecop	2.33	5.00	4.062	0.638	-0.392	0.032

**Table 4.** Pearson's parametric correlation coefficients.

Variable	Sma	Socp	Envp	Ecop
Sma	1	-	-	-
Socp	.314**	1	-	-
Envp	.348**	.706**	1	-
Ecop	.426**	.543**	.524**	1

Note: Significance \*\*\* $p < 0.001$ ; \*\* $p < 0.01$ ; \* $p < 0.05$ .

To assess the discriminant validity of the measurements, the AVE in the diagonal is compared with the correlation coefficients (off-diagonal) for each construct in the relevant rows and columns of Table 4. The correlation of latent constructs ranged from 0.121 to 0.637, whereas the AVE ranged from 0.594 to 0.779, indicating that the AVE was greater than the correlation of latent constructs (Fornell & Larcker, 1981). It is better for a latent construct to explain the variation in its own indicator than the variation in the indicators of other latent constructs (Ab Hamid et al., 2017). In general terms, the discriminant validity of this measurement model can be accepted (Table 6).

Table 7 shows that all fit statistics have satisfied the acceptable levels after modification (MOD):  $\chi^2 = 134.174$ ,  $df = 70$ , and Chi-square divided by the degrees of freedom = 1.917. The comparative fit index (CFI) = 0.963, the Tucker-Lewis fit index (TLI) = 0.952, the root means square error of approximation (RMSEA) = 0.070 with 90% C.I 0.052–0.088 and the standard root means square residual (SRMR) = 0.056. These values show that the model and observed data are in good agreement and Figure 1 shows the standardized parameter estimations.

#### 4.4. Structural model of SMA on sustainable performance

The results are presented in Table 8 and Figure 1. In terms of direct effects, path standard coefficient results revealed that H1: Sma has a positive effect on Ecop ( $\beta=0.243$ ,  $p<0.001$ ), H2: Sma has a positive effect on Socp ( $\beta=0.348$ ,  $p<0.001$ ) and H3: Sma has a positive effect on Env. ( $\beta=0.135$ ,  $p<0.05$ ). The results also show that H4: Socp has a positive effect on ecop ( $\beta=0.235$ ,  $p<0.05$ ), H5: Env. has a positive effect on ecop ( $\beta=0.360$ ,  $p<0.01$ ) and H6: Socp has a positive effect on ecop ( $\beta=0.751$ ,  $p<0.001$ ).

**Table 5.** Scale items and latent variable evaluation.

Variable	Factor loading	Z	CR	AVE	Cronbach's Alpha
<i>SMA techniques (sma)</i>			0.883	0.603	0.925
Costing (cost)	0.686	15.557***			
Planning, control and performance measurement (pcpm)	0.818	26.201***			
Strategic decision-making (stdm)	0.778	22.434***			
Competitor accounting (comp)	0.791	23.600***			
Customer accounting (cust)	0.804	24.833***			
<i>Social performance (socp)</i>			0.913	0.779	0.911
The level of employee satisfaction inside the organization has increased. (socp1)	0.871	38.915***			
The organisation's employees have good health and safety. (socp2)	0.859	36.571***			
The organisation's employees have increased knowledge and skills. (socp3)	0.916	51.169***			
<i>Environmental performance (envp)</i>			0.876	0.702	0.903
Organizations have the ability to consistently decrease their energy and resource use. (envp1)	0.888	31.973***			
Organizations have the capacity to consistently mitigate air pollution and industrial waste. (envp2)	0.823	25.391***			
Organizations have the capacity to consistently mitigate industrial wastewater. (envp3)	0.799	22.536***			
<i>Economic performance (ecop)</i>			0.812	0.594	0.801
The rate of profit growth has shown an increase in alignment with the established aim. (ecop1)	0.787	21.117***			
The organization has the ability to effectively decrease the overall cost in alignment with the predetermined objective. (ecop2)	0.866	26.097***			
The organization has the potential to consistently expand its market share. (ecop3)	0.642	12.312***			

Notes: Significance \*\*\* $p<0.001$ .

**Table 6.** Measurement model validity.

Lconstructs	Sma	Socp	Envp	Ecop	VIF	Tolerance
Sma	<b>0.603</b>	–	–	–	1.236	0.809
Socp	0.121	<b>0.779</b>	–	–	1.581	0.632
Envp	0.157	0.637	<b>0.702</b>	–	1.436	0.697
Ecop	0.218	0.368	0.415	<b>0.594</b>	–	–

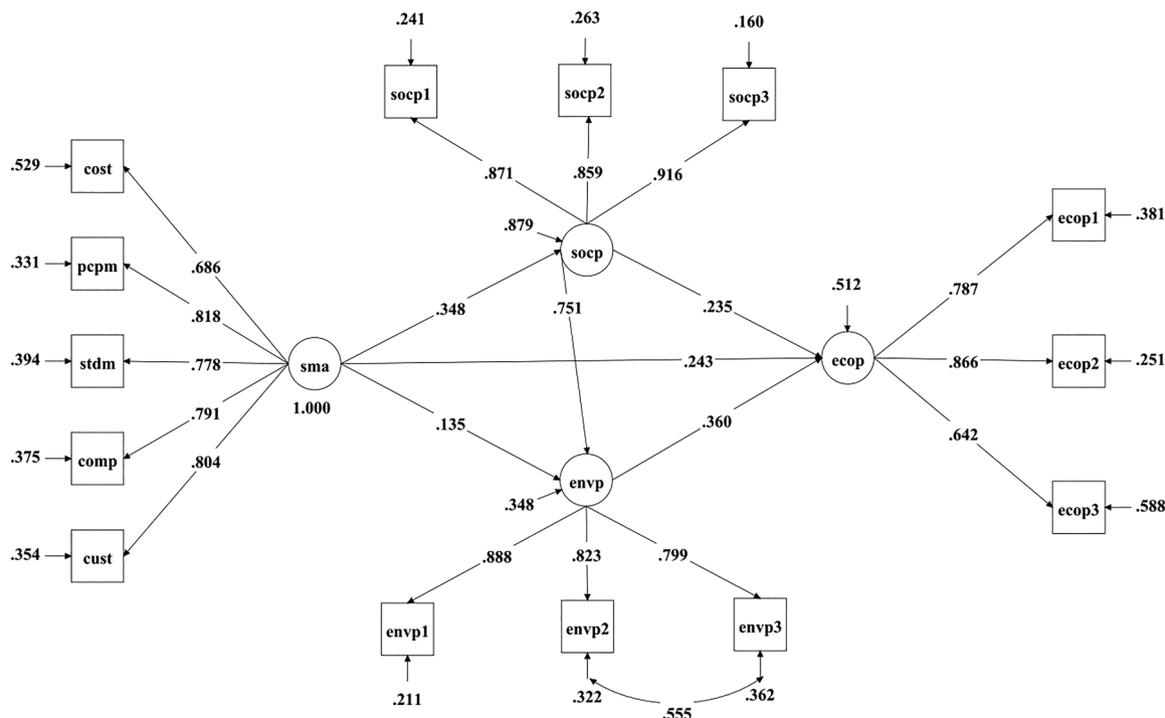
Note: The off-diagonal values are the latent correlation coefficients, and the diagonal values are the AVEs., Dependent variable = Ecop.

**Table 7.** Descriptive measures of overall model fit.

Fit measure	Acceptable Fit <sup>a</sup>	Before-MOD	After-MOD
1. $\chi^2$ /df	$0 \leq \chi^2/df \leq 3$	2.175	1.917
2. CFI	$0.95 \leq CFI < 0.97$	0.952	0.963
3. TLI	$0.95 \leq TLI < 0.97$	0.938	0.952
4. RMSEA	$0.05 < RMSEA \leq 0.08$	0.079	0.070
5. SRMR	$0.05 < SRMR \leq 0.10$	0.061	0.056

Notes: MOD=modification.

<sup>a</sup>Schermelleh-Engel et al. (2003).

**Figure 1.** Results for the structural equation model.

The test for the indirect effect of Sma on Ecop via Socp and Env. H7: Socp as a partial mediator of the relationship between Sma and Ecop ( $\beta=0.082, p<0.05$ ), H8: Env as a partial mediator of the relationship between Sma and Ecop ( $\beta=0.048, p<0.05$ ) and H9: the boots of Socp and Env as partial mediators of the relationship between Sma and Ecop ( $\beta=0.094, p<0.05$ ). Thus, this study concludes that social performance and environmental performance mediate the relationship between the degree of use of SMA techniques and economic performance. Consequently, the SEM results confirmed that H1-H9 were also supported and the model explained ( $R^2$ ) 12.50%, 48.80%, and 65.20% of the variance in social performance, economic performance, and environmental performance, respectively. According to the given guidelines, the  $R^2$  values of 0.75, 0.50, and 0.25 might be regarded as substantial, moderate, and weak, respectively (Hair et al., 2019). This analysis revealed that the explanatory power of the  $R^2$  for economic performance was weak-moderate, whereas environmental performance was moderate-substantial. However, the  $R^2$  values must always be interpreted within the scope of the investigation (Hair et al., 2019).

## 5. Conclusion and discussion

The results indicated that SMA has a significant positive effect on economic performance, environmental performance, and social performance. This research into the contingency perspective of SMA for green manufacturing offers new insights into the effects on sustainable performance. The basic assumption of contingency theory, that organisational effectiveness is dependent on the fit between context and structure, is thus supported by previous research (Cadez & Guilding, 2008; Lay & Jusoh, 2012; Rashid et al.,

**Table 8.** Hypothesis testing results from structural equation modeling.

Hypothesis	Path	Est	SE	Z	p-value	Results
H1	sma→ecop	0.243	0.074	3.307***	0.0005	Supported
H2	sma→socp	0.348	0.073	4.779***	0.0000	Supported
H3	sma→envp	0.135	0.063	2.131*	0.0165	Supported
H4	socp→ecop	0.235	0.130	1.806*	0.0355	Supported
H5	envp→ecop	0.360	0.135	2.671**	0.0040	Supported
H6	socp→envp	0.751	0.047	16.115***	0.0000	Supported
H7	sma→socp→ecop	0.082(IE)	0.048	1.701*	0.0445	Supported
H8	sma→envp→ecop	0.048(IE)	0.029	1.691*	0.0455	Supported
H9	sma→socp→ envp→ecop	0.094(IE)	0.041	2.288*	0.0110	Supported

Notes: IE=indirect effects, significance \*\*\* $p < 0.001$ ; \*\* $p < 0.01$ ; \* $p < 0.05$  (1-tailed).

2020; Thapayom, 2019; Zenita et al., 2015). Although uncertainty and performance have a significant impact on the usage of numerous performance measures, the degree of emphasis placed on performance is impacted by a variety of other factors, such as organizational and business strategy. Therefore, this approach to management accounting is consistent with the contingency perspective, and the organization's management accounting instruments must be established and implemented strategically to suit the organization's conditions. SMA is a combination of innovative accounting methodologies, and it mandates that businesses should always be on the lookout for creative prospects in the external business environment (Oyewo, 2021; Thapayom, 2019). Companies that employ SMA in their operations are always seeking new ways to gain an advantage over their competitors.

This study contributes to the literature on sustainable performance, which consists of economic, environmental, and social performance, and suggests that there are causal relationships between the three components of sustainable performance. According to the findings, environmental performance has a positive effect on economic performance. Generally, the results are supported by previous findings in the literature (Albertini, 2013; Al-Mawali, 2021; Liu, 2020). The positive impact on organisational costs results in the influence of environmental performance on organizational performance. It implies that reducing pollution allows businesses to save money on pollution control expenses, that these costs vary depending on the characteristics of the business and industry sector, and that businesses must have adequate financial resources to implement proactive environmental policies and initiatives (Hourneaux Jr. et al., 2018; Liu, 2020). The findings also revealed that social performance has a positive effect on economic performance. Improvements in health and safety conditions have a beneficial effect on the motivation and morale of workers, and also on their level of involvement with their employer and their commitment to the company, which can enhance organisational performance and reduce hiring and training expenses (Alsayegh et al., 2020). As a consequence of this, environmental and social performance have been found to be directly related to the performance of manufacturing organizations and also have a significant impact on the organization's economic performance (Hourneaux Jr. et al., 2018).

The extent to which an organization has been effective in implementing its social goals, which may include improving working conditions, safety and health, health and wellbeing, and diversity, is reflected in its social performance (Alsayegh et al., 2020). Regardless of the context in which organizations operate, employees take central stage in the successful implementation of environmental goals (Alt et al., 2015). Rather than simply controlling emissions through end-of-pipe improvements, the purpose of an environmentally proactive strategy is to drastically reduce pollution through well-defined environmental objectives. This type of strategy is people-intensive and relies on employee involvement to create tacit skills (Albertini, 2013).

The results also show that the relationship between the degree of use of SMA techniques does have indirect effects on economic performance via social performance and environmental performance. This may be simply interpreted as meaning that higher SMA techniques will provide information to support decisions making and acquire competitive advantages, which in turn enhance environmental and social performance, which eventually enhances economic performance. As a result, it is expected that increased access to information enables more effective managerial decisions, which improves organizational performance (Cadez, & Guilding, 2008) and for the first time, the outcomes of this study were linked to social and environmental performance as mediating variables and provided valuable conclusions. As a result, this research contributes to the literature on SMA and performance.

The primary objective of the majority of organizations is to maximize profits. Therefore, economic performance indicates financial viability (Alsayegh et al., 2020). In a previous study (Alamri, 2019), the influence of SMA on economic performance was found to be greater than the influence it had on non-financial performance. However, the data indicate that SMA considerations must place equal emphasis on improving financial and non-financial performance, including social and environmental performance, in order to obtain a comprehensive view of the company (Alamri, 2019).

The findings provide more explanation and support for contingency theory assumptions for strategic management accounting academics. This is one of the first attempts in Thailand to use contingency theory and social and environmental performance as mediators. In dealing with rapid changes in the business environment, actions based on a strategic management accounting system will be more anticipative. Organizations' ability to confront uncertainty will be increased as a result of better decision-making based on strategic management accounting (Zenita et al., 2015). As a result, this research enables green manufacturing to improve its competitiveness, efficiency, and profitability, thereby achieving its long-term goals (maximizing shareholder wealth) (Foo et al., 2018).

## 6. Contribution and implications

Sustainability is a management trend that is critical to modern organizational strategy and refer to the capacity of a business to integrate sustainability into its plans to make it more dynamic (Amui et al., 2017). The findings establish the first empirical relationship between the application of SMA techniques and sustainable performance in green manufacturing. There are only a few studies in Thailand that have examined the impact of SMA on sustainable performance in a variety of areas, including social, environmental, and economic performance. Additionally, the findings indicate causal relationships between the three components of sustainable performance, demonstrating that green manufacturing businesses can use SMA methodologies to help them make better decisions and to gain a competitive edge. Additionally, contemporary management accounting systems enable businesses to improve their overall innovative capacity and adaptability, enabling them to change and improve performance in both financial and non-financial areas (Thapayom, 2022).

However, the contingency approach to SMA is predicated on the premise that no universal accounting system fits all businesses in all circumstances (O'Higgins & Thevissen, 2017; Otley, 1980). Typically, executives use management accounting to make choices. Management accounting is employed to varying degrees in enterprises, depending on the level of requirements, management perceptions, and the readiness of the information. Each business, industry, and country will employ unique management accounting tools and methods, depending on the industry's growth, the requirements of management, management assistance, and field knowledge (Cadez, & Guilding, 2008; Terdpaopong et al., 2017).

## 7. Limitations and suggestions for future study

This research is subject to a number of limitations. It is difficult to generalize these results to all organizations because the study was limited to green manufacturing companies that had acquired green industry certificates from the Department of Industrial Works of Thailand at levels 3 to 5. Second, since this study employed questionnaires, the research was based on perception measures (Pavlatos & Kostakis, 2018). Finally, the primary data acquired at random from managers (or senior accounting and finance workers, or related) limits the generalizability of conclusions to other managers representing their organizations.

This study investigated a list of fifteen SMA approaches gathered from prior studies. In future studies, researchers should study the utilization of SMA approaches not previously identified. In emerging economies, several SMA techniques, including comprehensive quality management, just-in-time (JIT), lean management, and the possibilities of value chain integration with suppliers and customers have not been investigated.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

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