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SUSTAINABLE MANUFACTURING PRACTICES IN MICRO, SMALL, MEDIUM ENTERPRISES (MSMEs): EVIDENCE FROM INDONESIA

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Abstract: This study aims to examine the drivers of sustainable manufacturing practices (SMP) using the Strategy, Technology, Organisation, People and Environment (STOPE) framework and whether those practices affect competitive capabilities (costs, quality, delivery and flexibility) amongst micro, small and medium enterprises (MSMEs) in Indonesia. Data was collected through face-to-face or in-person surveys of 169 MSMEs and validated using Structural Equation Model with Partial Least Squares approach. Our findings partially demonstrate similar results to the existing literature. We found that organisation is the only significant positive influence of SMP amongst the STOPE variables while SMP positively correlates with all competitive capabilities. This study contributes to SME nascent literature on SMP by illustrating the drivers and benefits of SMP to business capability. We expect relevant parties like practitioners, regulators and accounting academics to benefit from our study implications.

Keywords: STOPE, sustainable manufacturing, competitive capabilities, MSMEs.

Introduction

Despite being a powerful engine of the economy in most developing countries (Arnold *et al*., 1984), research on MSMEs' sustainable initiatives and practices is still limited (Widya-Hasuti *et al*., 2018). It has been documented, for example in Indonesia, where its 59.3 million MSMEs had contributed to the country's Gross Domestic Product (GDP) for 58.9% and 97% of total employment (OJK, 2016; OECD, 2018). MSME's competitive advantages have greatly influenced this rate, mainly due to its flexibility to adapt and survive in various economic conditions (Mitchell & Reid, 2000; Kurniawati *et al*., 2018). Although it has great to drive the country's economy further, MSMEs' sustainable manufacturing processes and practices are often questioned. Garetti *et al*. (2012) have noted that for companies to move beyond sustainable manufacturing, they need to incorporate innovation to significantly shift their traditional operational practices to more sustainable practices that consider the economic, social and environmental aspects (Carter & Rogers, 2008). Furthermore, Widya-Hasuti *et al*. (2018) also argued that an important issue in today's highly competitive businesses is determining the viability of business innovation and sustainable practices. However, MSMEs may find the shift to sustainable manufacturing practices challenging, as many of their characteristics differ from companies and larger enterprises (Williamson *et al*., 2006; Bos-Brouwers, 2010; Despeisse *et al*., 2013). For example, there is no clear definition of good and sustainable practices in MSMEs, given that innovative processes in MSMEs are considered a luxurious business add-on (Williamson *et al*., 2006; Despeisse *et al*., 2013). Consequently, innovation and sustainable practices are commonly viewed to negatively impact MSMEs (Bos-Brouwers, 2010), mainly due to the costly implementation that may lower the business's short-term profitability.

Regardless of the challenges mentioned above in adopting sustainable practices into the business, MSMEs are still believed to be capable of implementing innovation and sustainable practices with their competitive advantages of

having a high level of flexibility and adaptability, low bureaucracy, the close engagement between owners and consumers as well as owners' rapid development of learning and expertise (Jenkins, 2006; Madrid-Guijarro *et al*., 2009). The case is more apparent in Indonesia, given the huge potential MSMEs have on its economy. Sustainable practices and innovations for MSMEs hold a pivotal role for Indonesia in achieving the Sustainable Development Goals 2030. Therefore, sustainable manufacturing practices (SMP) can be considered as one of the solutions for MSMEs to promote energy efficiency, waste management, water savings, renewable energy, sustainable storage practices and innovation which consequently drive the MSMEs to achieve their competitive capabilities in cost, quality, delivery and flexibility (Ramayah *et al*., 2013; Aboelmaged, 2018).

Theoretical Background

Prior SMP Studies

Most prior literature takes a piecemeal approach to SMEs' sustainability practices, focusing on their drivers or performance (Table 1). Some authors examine the former variable (Agan *et al*., 2013; Shankar *et al*., 2016) whereas others focus on the latter (Bos-Brouwer, 2010; Ramayah *et al*., 2013; Mafini & Muphosi, 2017). Given the fragmented results, studies that take a comprehensive view of the aforementioned interrelated variables are limited (Ghazilla *et al*., 2015; Aboelmaged, 2018).

Table 1: Prior literature on SMP among SMEs

Author (Year)	Country	Size of Business	Industry	Findings
Bos-Brouwers (2010)	Netherlands	SMEs	Manufacturing	[SMP] Sustainable innovation efforts provide opportunities to improve the sustainability performance of technological processes (eco-efficiency) and lower production SMEs' costs.
Angeles (2012)	Canada	Not SMEs	Retailing sector	[Drivers] TOE framework effectively evaluates sustainable packaging in the retail sector - system analysis and design and use of socio-technical are essential for sustainable packaging.
Ramayah *et al*. (2013)	Malaysia	SMEs	Manufacturing	[SMP] Green practices are prevalent in SMEs within the inbound and the production phase of the manufacturing life cycle significantly affects manufacturing performance.
Agan *et al.* (2013)	Turkey	SMEs	Cross-section	[Drivers] The most significant driver is Expected Benefits with the most influential forces being soft performance expectations like image, reputation and brand. SMEs with ISO 14001 certification are likely to perform better on environmental processes. Government regulations are ineffective in dealing with environmental pollution and climate change.

Fatimah *et al*. (2013)	Indonesia	SMEs	Manufacturing	[Drivers] The key strategy or a new concept for sustainable manufacturing assessment framework through remanufacturing strategies products technically, economically, environmentally and socially sustainable in Indonesian SMEs (improvement opportunities, including eco-efficiency, cleaner production and green technology).
Halme and Korpela (2014)	Nordic	SMEs	ns	[Drivers] Environmentally and socially responsible SMEs' innovations with very different resource combinations comprise equity, research and development cooperation, networks, industry knowledge and reputation.
Aboelmaged (2014b)	UAE	Not SMEs	Cross-section	[Drivers] TOE is an effective framework to link drivers of innovation adoption. Technology infrastructure and competence positively affect four dimensions of e-maintenance readiness.
Roni *et al*. (2014)	Malaysia	SMEs	Manufacturing	[SMP] Regulation, strategic leadership, resource availability and market forces are drivers for sustainable manufacturing and practices toward firm performance.
Ghazilla *et al.* (2015)	Malaysia	SMEs	ns	[Drivers] Drivers and barriers faced by SMEs in implementing green manufacturing practices are improved company image, competitiveness and product quality. A weak organisational structure is the top critical barrier to GM.
Miemczyk *et al.* (2016)	Europe Union	ns	Multiple	[Drivers] Using the NRBV to explain the importance of new resources in technology, knowledge and relationships stress the role of DCs to constantly address changes in the business environment to renew these strategic resources.
Shankar *et al*. (2016)	ns	SMEs	ns	[Drivers] Quality is the primary driver that leads to SM adoption and implementation of green actions in the manufacturing strategy.
Mafini and Muphosi (2017)	South Africa	SMEs	ns	[SMP, Drivers] Green supply chain management (GSCM) practices, namely green procurement, green logistics and green manufacturing, positively affect environmental collaboration. The higher levels of environmental collaboration inspired the higher levels of SME financial performance.

Note: ns = not stated

Another reason to take a more comprehensive approach is to fill the missing gaps in prior literature. While many studies found a significant positive correlation between sustainable practices and performance, Ramayah *et al*. (2013) did not exhaustively explore the factors that drive their commitment. An early attempt was made by Ghazilla *et al*. (2015) who elicited a list of drivers and green manufacturing barriers in Malaysian SMEs. However, their study was drawn from a literature review and confirmation was done through a survey with experts and academicians. We believe that getting first-hand information from practitioners provides a better insight into the actual practices that might differ from the literature.

Lastly, SMEs operate at the grassroots level of the economy in any country. At this level, business owners, more often than not are the local people. In contrast to established firms that are usually managed globally, local characteristics like social norms and cultures play a crucial role in shaping business practices. Although SMP studies have grown and are likely to continue to grow in different geographical locations, given the large contributions of SMEs to Indonesia's economy, we believe our study provides a unique contribution to the literature that might strengthen similar findings in similar national characters.

STOPE and SMP

Sustainable manufacturing practices (SMP) can be considered as one of the solutions for MSMEs to promote energy efficiency, waste management, water savings, renewable energy, sustainable storage practices and innovation which consequently drive the MSMEs to achieve their competitive capabilities in cost, quality, delivery and flexibility (Ramayah *et al*., 2013; Aboelmaged, 2018).

MSMEs are unlike large companies in several significant ways, including the lack of financial resources, lack of information system management (Cerchione & Esposito, 2017), lack of expert knowledge management (Casidy *et al.*, 2019) and lower levels of available resources (Senarathna *et al*., 2018). Moreover, just one or two individuals are responsible for the most common responsibilities, rather than the specialised top management executives (Short & Gray, 2018). In addition, MSMEs face various challenges, including the globalisation of markets, economic change, increasing competition, decreasing product lifecycle, changes in consumer needs and rapid technological development (Puklavec *et al*., 2018). However, to overcome these challenges, MSMEs need to be more innovative in all their operation areas including planning, finance, production, marketing and human resource management (Yen *et al.,* 2019).

STOPE Framework

This study extends the original model of the Technology-Organisation-Environment (TOE) framework developed by DePietro *et al*. (1990). Previous studies favour this model for its flexibility (Aboelmaged, 2018) and appropriateness in providing a theoretical framework to identify SMP's main drivers in large and small businesses (Angeles, 2012). As well as being adopted in many IT studies (Hwang *et al*., 2016), TOE also provides valuable insights for adopting various kinds of innovations including the practices of sustainability (Garetti *et al*., 2012; Aboelmaged, 2018). Sustainability is considered an innovation because organisations need to transform their traditional practices/operations into more sustainable practice that concerns the economic, social and environmental aspects. In addition, Hwang *et al*. (2016, p. 2) added that "a theoretical model for innovation adoption needs to consider factors that are rooted in the specific technological, organisational and environmental contexts of organisations", thus, making the TOE framework fit as a base of the development of this study. In this context, SMEs are particularly required to be more innovative in their operations because they have to compete in the global market, face economic and rapid technological change (Puklavec *et al.,* 2018; Yen *et al.*, 2019).

Upon TOE, we extend the constructs of strategy and people and have a complete STOPE framework, which was first introduced by Bakry (2004). Choi *et al*. (2016) stated that considering the factors of human capital and managerial commitments is considerably important in developing countries, thus, fitting the extension of strategy and people into this study. They added that the STOPE framework "serves as a lens through which to view the gap", represented in this study by the drivers that influence the implementation of sustainable practices in developing countries (p. 646). Even though the STOPE framework has been heavily applied to examine issues related to information technology (Saleh *et al*., 2007), it can also evaluate different problems including those of sustainable practices. Chong and Olesen (2017, p. 4) supported that the TOE framework in this context is the extended STOPE and "is a useful theoretical framework for studying factors that influence the adoption of green innovations". Further, it is argued that implementing innovative sustainable practices is affected by five factors: Strategies, technology, organisation, people and environment. Accordingly, the STOPE theory is an appropriate tool to examine the drivers of an organisation's sustainable practices based on these five constructs.

Clear Goal and Strategy (S)

Clear goals and firm strategies hold a pivotal role in any organisation. With regards to strategy, the main component is to determine the vision (expressed as 'where') and the mission of the strategy (expressed as 'why') to acquire the benefits of this economy (Bakry, 2004). Thus:

H1: Clear goals and strategy have a positive impact on SMP.

Technology Readiness (T)

The STOPE framework's technological aspects are divided into technological infrastructure and competence (Aboelmaged, 2014a). The former technology aspect refers to information and communication platforms, hardware, software, networking and smart devices (Aboelmaged, 2018). Technology infrastructure is considered one of the main capabilities to drive innovative manufacturing processes that can reduce energy and water consumption and optimises waste management while maintaining cost competitiveness.

The former aspect of technological competence reflects knowledge, expertise and the skills needed to operate technology infrastructure (Aboelmaged, 2018) effectively. It is said to leverage the implementation of technical knowledge and expertise that drives the company's performance to be more sustainable (Ifinedo, 2011). Thus:

H2: Technology readiness has a positive impact on SMP.

Organisation Support (O)

The third aspect of the STOPE framework, organisation is an important aspect that supports SMP to be run effectively. The organisational aspect covers two driving factors: Support from top-level management and employee engagement. The former factor concerns the extent of management commitment and decision-making to foster sustainability. Many studies found management support to be a significant factor in sustainable manufacturing systems and practices (Vinodh *et al*., 2016; Hamann *et al*., 2017). Similarly, employees as the main firm's capital internalise a sustainability-committed firm's values and play a significant role in implementing SMPs (Aboelmaged, 2018). Thus:

H3: Organisation support has a positive impact on SMP.

People (P)

The fourth aspect of the STOPE framework is people which covers three areas: User support, skilled workers and stakeholders' involvement. A sustainability-committed organisation should encourage and educate users to engage them in adopting sustainability practices. The

participation of stakeholders promotes the implementation and improvements of SMP.

In addition, an organisation should work internally to equip the workers with skills that promote sustainable practices. Stakeholders represent different parties affected by an organisation's decision regarding their businesses. Given the importance of stakeholders, past studies have documented the significant positive influence of their involvement on the organisation's sustainability (Brown, 2003; Tseng *et al*., 2008; Luk, 2009; Brown & Thompson, 2011). Thus:

H4: People have a positive impact on SMP.

Environment (E)

The last aspect of the STOPE framework is the environment, which consists of environmental pressure and regulations. The environment's pressure can come from various backgrounds, both within and outside the organisation such as investors, employees, media, consumers, competitors and NGOs. These parties are believed to influence an organisation in implementing strategic initiatives and SMPs. Thus:

H5: Environment has a positive impact on SMP.

Sustainability Manufacturing Practices and Competitive Capabilities

Research regarding the NRBV (Natural Resource-based View) principle has confirmed that the firms' interactions with their natural environment through sustainable development, pollution prevention and product control are sources of competitive advantages (Hart, 1995). Further, Schoenherr (2012) added that when firms adopt environmental initiatives within their business processes, they achieve the true benefits of excelling in operational performance and increasing overall competitive advantage, which means winning over their competitors. Based on prior research (Rosenzweig & Roth, 2004; Schoenherr, 2012), quality, delivery, flexibility and cost constitute acceptable measures for competitive capabilities greatly affected by the environmental initiatives and practices (Aboelmaged, 2018) and will be used within this study.

Adopting environmental initiatives or sustainability practices is both environmentally and financially beneficial for the firms because they lower the operational cost (Yang *et al*., 2011; Azevedo *et al*., 2012). Reducing waste, saving energy and using fewer materials can positively and significantly affect sustainable performance (Raharjo, 2019) including firms' operational processes. For example, a Danish Technological Institute (2010) study on MSMEs in the European Union concluded that sustainable practices could lower operational cost and energy use. In addition, sustainable practices enhance products' quality, as proven by Raharjo (2019), who conducted a study on MSMEs' sustainable performance in Central Java. He found that MSMEs that use natural colouring have competitive advantages due to the products' uniqueness compared to competitors who used chemical colouring. Other than the positive impact of sustainable practices on cost and quality, they enable the firms to respond better and faster to the market. By doing so, they become more flexible and improve the products' delivery time which are pivotal aspects of a firm's competitive capabilities. Based on the analysis above, we hypothesise the following:

H6a: SMP has a positive impact on product cost.

H6b: SMP has a positive impact on product quality.

H6c: SMP has a positive impact on product delivery.

H6d: SMP has a positive impact on product flexibility.

Figure 1 shows our proposed research model and hypothesis.

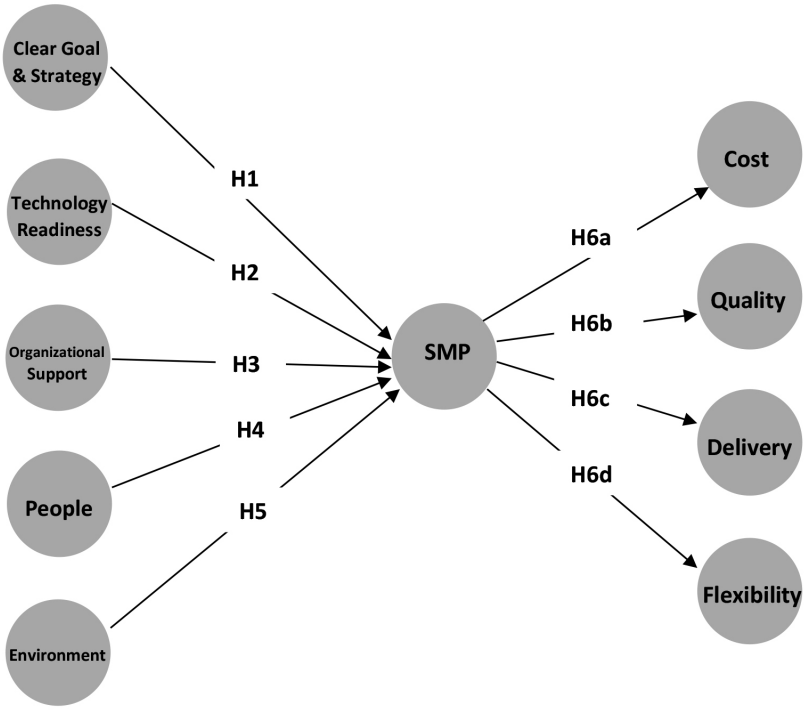

Figure 1: Research model

Methodology

Instruments Development

We adopted the variables and indicators from past studies across academic disciplines in this study to ensure validity. We adopted the Technology, Organisation and Environment (TOE) variables and indicators from Aboelmaged (2014a), except for the ones that did not meet the minimum requirement of a 0.5 loading score (Hair *et al*., 2010). In addition to the TOE framework, we added two dimensions of strategy and people to give comprehensive STOPE variables as the SMP drivers. As for the SMP and Competitive Capabilities constructs, we also adopted Aboelmaged (2014b). The details of our research constructs are presented in Table 2.

Data Collection

A questionnaire with a standard measurement scale was conducted to assess the proposed hypotheses. The draft questionnaire had been validity-checked by two Associate Professors with knowledgeable backgrounds in environmental accounting. As a result, the questionnaire was revised regarding wordings/ specific terms used, sequences and layout. In addition, we implemented a survey technique for our data collection because we could gather information within a limited time frame. The samples were collected from SMEs in the Province of DI. Yogyakarta, Indonesia. Despite representing less than 1% of total SMEs in Indonesia, SMEs in Yogyakarta contributed significantly to the Province's overall economy. In 2018, the Head Representative Office of Bank Indonesia in Yogyakarta stated that SMEs' contribution to the local economy had reached 94.6% (MedCom.id, 2018). He added that during the last five years, the economic growth in Yogyakarta was always above the national level and mainly sourced from SMEs. Due to these reasons, we focused on collecting our data from the conveniently selected SMEs in the Province of Yogyakarta. Prior literature has widely used

convenience sampling to collect samples from SMEs, particularly in developing and emerging nations (Chong, 2012; Arunagiri *et al.*, 2015; Lekhanya & Dlamini, 2017; Tehseen *et al.,* 2019).

We conducted the survey (paper-based) face-to-face or in-person surveys with 171 SMEs using our trained enumerators. The enumerators comprised 17 accounting postgraduate students under the MSc Program in the Faculty of Economics and Business UGM. Before collecting data, we trained the enumerators to conduct a face-to-face survey. We explained each question/instrument's operational definition, including the measures and special terms in the questionnaire, to reach a common understanding. Data were collected from 26 August 2019 to 29 September 2019 by our enumerators who visited the SMEs' locations/exhibitions directly and conducted the survey with the SME owners, managers or supervisors as the respondents. Out of 171 surveyed SMEs, 169 questionnaires were completed and analysed further.

Data Analysis

This study implements the partial least square approach to structural equation modelling (PLS-SEM) as it is an effective statistical method that can evaluate the relationship of multiple constructs (Hair *et al*., 1998). The approach is used because "the regression-based PLS approach is considered more appropriate than covariance-based methods such as LISREL. When a multivariate normal distribution cannot be assured, the small sample size in combination with a complex model including second-order constructs, formative indicators" (Venaik *et al*., 2005, p. 665). After that, the connections between constructs were analysed using SmartPLS 3.0 software to evaluate the measurement and structural model.

Results and Discussion

Demographic Characteristics of Respondents

The direct survey gathered 169 respondents from Yogyakarta. Despite the limited number of respondents, our sample covers the business size and industry diversity. In addition, SMEs in Yogyakarta contributed almost 95% of the Province's fiscal. The region's economic growth has been at the nation's top tier for the past five years. Descriptions of respondents' demographic profiles are shown in Table 3. Our respondents' gender profile was almost equal, with male respondents numbering 86 (51%) and women respondents numbering 83 (49%). Using the business size criteria, most of our respondents (41%) were categorised as micro-enterprises with less than five employees. Small and medium enterprises, with respective numbers of employees 5 to 19 and 20 to 99, counted as 24% and 35% of our respondents. Our analysis also looked at the criteria of annual sales revenue to alternate the firm classification. 86% of our respondents were at the micro-businesses level, with an annual turnover of less than IDR 300 million. The significant number of micro-enterprises in our respondent profile is no surprise, given that more than 90% of Indonesian MSMEs are micro. The remaining 12% are at the level of small businesses and an insignificant 1% were at the level of medium-sized businesses whose turnover is more than IDR 2.5 billion to IDR 50 billion.

Test of Measurement Model (Outer Model)

To test the measurement model, we checked the score of internal consistency reliability as measured by Cronbach Alpha and Composite Reliability. Given the sensitivity of Cronbach's α to the number of indicators that might undermine the reliability score (Hair *et al.,* 2013), our study made the Composite Reliability alternative. As seen in Table 4 below, our Composite Reliability scores are all above 0.7, indicating good reliability (Fornell-Larcker, 1981; Chin, 1998; Hair *et al*., 2010). As for the individual outer loading, the score can be referred back to Table 2. All these scores have surpassed the threshold of 0.5 *(ibid)*.

Concerning discriminant validity, we assess the Average Variance Extracted (AVE) score. As seen above, our AVE scores indicate

Table 2: Development of research constructs

Research Construct					Outer Loading
Variable	**Operational Definition**	**Reference**		**Indicators**	
Strategy	The strategy reflects the process of goal setting and how top management exerts its control to ensure feasibility. Benchmarking with developed countries could be adopted to determine clear goals and strategies.	Choi *et al.* (2016)	Clear goal and strategy	GS1: Our firm uses benchmarking strategies that could be adopted from developed countries.	0.944
				GS2: Our firm considers the firm's specific characteristics and particular backgrounds to ensure feasible goal setting and strategy planning.	0.801
Technology	Technology reflects technical processes, competencies and infrastructures that support innovations in implementing sustainable practices.	Aboelmaged (2014a)	Technology infrastructure	TI1: Our firm uses information, communication and networking technology.	0.599
				TI2: Our firm uses smart devices and appliances that can be used to save waste and energy.	0.795
				TI3: Our firm uses new manufacturing innovations.	0.733
		Shankar *et al.* (2016)	Technology competence	TC1: Our employees have the skills to manage new technology and smart devices.	0.807
				TC2: Our employees are trained in using new technology and smart devices.	0.637
				TC3: Our firm recruits staff with high technology skills.	0.667
Organisation	Organisational context involves human capital and its environment that promotes sustainable practices.	Agan *et al.* (2013); Roni *et al.* (2014)	Management support	MS1: Top managers are committed to reducing waste or saving energy.	0.897
				MS2: Top managers take necessary decisions to foster sustainability in the firm.	0.837
		Yusoff *et al.* (2016)	Employees' engagement	EE1: Our employees share the responsibility for sustainability.	0.827
				EE2: Our employees are concerned with protecting the environment.	0.838

People	People reflect the participation of stakeholders who encourage the organisation to commit to adopting sustainable practices.	Chen *et al.* (2006); Manoharan (2013); Choi *et al.* (2016)	User support	US1: Users/customers are well-aware of the necessity to reduce waste and save energy.	0.808
			Skilled worker	SW1: Competent human resources with knowledge of sustainable manufacturing practices.	0.856
			Stakeholders involvement	SI1: Our firm made an effort to promote and socialise sustainability practices to inspire stakeholders' commitment.	0.818
Environment	The environmental context reflects external drivers of the organisation, i.e., the extent of regulatory and environmental pressures that influence sustainable practices.	Zhu and Geng (2013)	Environmental regulations	ER1: Level of national environmental regulations.	0.668
				ER2: Level of regional environmental regulations.	0.883
			Environmental pressures	EP1: Extent of environmental pressures from customers.	0.693
				EP2: Extent of environmental pressures from news/media.	0.639
				EP3: Extent of environmental pressures from competitors.	0.704
Sustainable Manufacturing Practices (SMP)	SMPs are expected to enable value creation throughout manufacturing processes while reducing production costs and environmental/social impact.	Rusinko (2007); Despeisse *et al.* (2013)	Sustainable Manufacturing Practices (SMP)	SMP1: Reducing energy use.	0.745
				SMP2: Improving water use.	0.601
				SMP3: Reducing material use.	0.698
				SMP4: Reducing emissions.	0.732
				SMP5: Reducing wastewater.	0.719
				SMP6: Reducing solid waste.	0.837

Competitive capabilities	To maximise its value, a firm needs to deliver its product/service that responds to changes, meets customers' expectations at minimum cost and is delivered promptly.	Aboelmaged (2014b)	Cost	OPC1: Price of goods/services is low.	0.787
				OPC2: Cost of materials is low.	0.824
			Quality	OPQ1: Our goods/services are of high quality.	0.793
				OPQ2: Specifications of goods/services are appropriate.	0.79
				OPQ3: Working conditions and safety are appropriate.	0.705
			Delivery	OPD1: Delivery of our goods/services is dependable.	0.947
				OPD2: Delivery of our goods/services is fast.	0.889
			Flexibility	OPF1: Amounts of goods/services are quickly altered.	0.705
				OPF2: We introduce new goods/services quickly.	0.778
				OPF3: We offer a broad range of goods/services.	0.638

Table 3: Respondent profile

Profile	Number	Percentage
Industry		
Basic metal products	8	5%
Fashion	12	7%
Food and beverages	61	36%
Furniture and wood products	12	7%
Handcrafts	32	19%
Jewellery	4	2%
Rubber and plastics	1	1%
Textiles, wearing apparel and leather	39	23%
Gender		
Male	86	51%
Female	83	49%
Number of Employees		
Less than 5	70	41%
5 - 19 people	41	24%
20 - 99 people	58	35%
Annual Revenue		
Less than IDR 300 million	146	86%
IDR 300 mio - 2,5 bio	21	12%
IDR 2,5 - 50 bio	2	1%

Table 4: Reliability and convergent validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Clear goal and strategy	0.718	0.9	0.867	0.767
Technology readiness	0.802	0.827	0.858	0.505
Organisational support	0.872	0.884	0.912	0.723
People	0.771	0.78	0.867	0.685
Environment	0.818	1.157	0.843	0.522
Cost	0.46	0.462	0.787	0.649
Quality	0.644	0.646	0.807	0.583
Delivery	0.821	0.896	0.915	0.844
Flexibility	0.504	0.509	0.751	0.503

an adequate convergent validity level, as all indicators surpass the cut-off value of 0.5 (Hair *et al*., 2017). In addition, we double-checked the discriminant validity using other criteria such as Fornell-Larcker and the heterotrait-monotrait ratio of correlation (HTMT). Our model satisfies the former criterion, in which the squared correlation between the two constructs is greater than any of the two constructs' AVE. As for the latter criterion, the HTMT criterion is recently suggested as a superior alternative. The exact threshold of HTMT, however is debatable. According to Henseler *et al*. (2015), some authors suggest a strict 0.85 threshold while others suggest a more lenient threshold of 0.90 or below 1. Our HTMT test is presented in Table 5.

Table 5: Discriminant validity (HTMT)

	Clear Goal and Strategy	Cost	Delivery	Environment	Flexibility	Organisational Support	People	Quality	SMP	Technology Readiness
Clear goal and strategy										
Cost	0.301									
Delivery	0.076	0.138								
Environment	0.349	0.162	0.159							
Flexibility	0.416	0.354	0.303	0.554						
Organisational support	0.598	0.503	0.185	0.435	0.535					
People	0.610	0.444	0.383	0.708	0.638	0.905				
Quality	0.456	0.410	0.334	0.270	0.803	0.688	0.725			
SMP	0.417	0.668	0.222	0.215	0.590	0.734	0.618	0.645		
Technology readiness	0.645	0.451	0.218	0.560	0.651	0.659	0.766	0.595	0.477	

Test of Structural Model (Inner Model)

The bootstrap method with 2000 subsamples using the SmartPLS 3.0 software is applied to test the hypothesised path coefficients' direction, strength and significance. The result is depicted in Figure 2.

Next, we test our hypothesis by looking at the value of path coefficients (β), T Statistics and p-values as seen in Table 6. Hypothesis 1 predicted a clear goal and strategy positive impact on SMP that this study found insignificant (β = 0.487, p-value = 0.627); thus, H1 is not supported. About technology readiness, we found it to be a positive, yet, insignificant drive to SMP (β = 0.854, p-value = 0.393). Hence, H2 is also not supported. Next, we found organisational support as the only positive and significant driver of SMP (β = 5.413, p-value = 0) that led H3 to be supported. Whereas organisational support emphasised the internal working environment, we found the more external-driven variable of people to be an insignificant SMP driver. Taken together, the low path coefficient (β = 0.705) and p-value (p = 0.481) led us to reject H4. The last STOPE variable is environment that we found also insignificant (β = 0.701, p-value = 0.484). So, H5 is not supported. The other hypothesis of H6 tested the impact of SMP on competitive capabilities. Our study confirmed these path

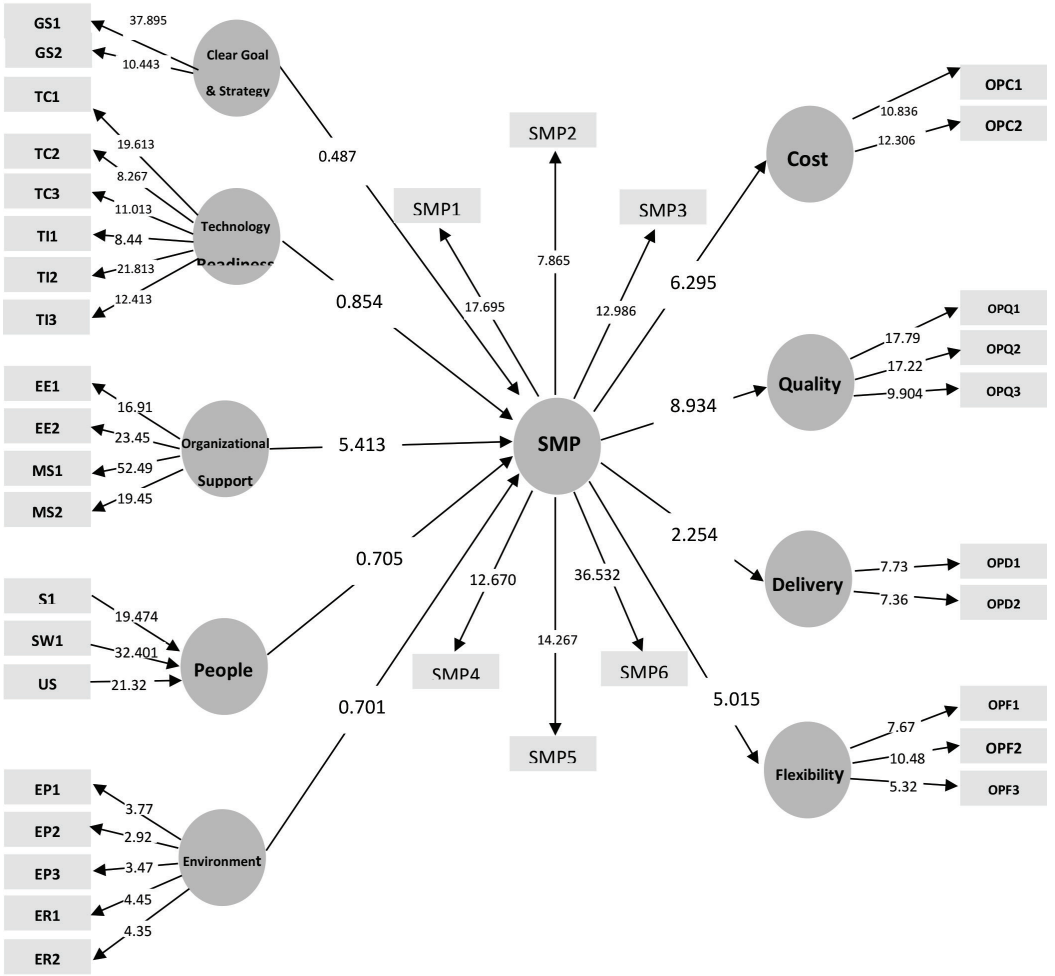

Figure 2: Structural model

coefficients to be positive and significant for cost (β = 6.295, p-value = 0), quality (β = 8.934, p-value = 0), delivery (β = 2.254, p-value = 0.024) and flexibility (β = 5.015, p-value = 0). Thus, H6a, H6b, H6c and H6d are supported.

Discussion

While partially supporting our hypotheses, the above findings provide intriguing insights that may differ from what past literature found. Regarding the STOPE framework, our research found that for our respondents, only organisational support significantly drives MSME's sustainable manufacturing practice. Taken together, some plausible explanations exist for the insignificant results of STOPE variables. First, Indonesian MSMEs do not have adequate experience, skill, resources, technology and financial support in the remanufacturing area (Fatimah *et al*., 2013). The notion is widely supported by similar findings in other developing countries like India, where "they do not even know the basic rules of green manufacturing and in such regions, this study was inactive" (Govindan *et al*., 2015). Secondly, SMEs are unique and sustain their specific way of doing business that, more often than not is very different from larger entities. Hence, what might have been the drivers and barriers for the

Table 6: Path coefficient and t-values

Path	Hypothesis	β	P Values	Result
Clear goal and strategy -> SMP	H1	0.487	0.627	Not supported
Technology readiness -> SMP	H2	0.854	0.393	Not supported
Organisational support -> SMP	H3	5.413	0	Supported
People -> SMP	H4	0.705	0.481	Not supported
Environment -> SMP	H5	0.701	0.484	Not supported
SMP -> Cost	H6a	6.295	0	Supported
SMP -> Quality	H6b	8.934	0	Supported
SMP -> Delivery	H6c	2.254	0.024	Supported
SMP -> Flexibility	H6d	5.015	0	Supported

[a]Two-tailed test with a confidence level of 95%

large firms are simply not applicable to MSMEs (Govindan *et al*., 2015). In the following sections, we will analyse each STOPE variable, followed by SMP's impact on competitive capabilities.

Taking a closer look at clear goal and strategy, we had an inconsistent result with Chen *et al*. (2014) which perceived the importance of clear strategy visualisation to guide organisations in implementing sustainable practices. One explanation for our non-resulting hypothesis can be triggered by the low loading score of indicators GS2 (i.e., firms consider their specific characteristics and backgrounds to ensure feasible goal setting and strategy planning).

Next, our finding on Technology drivers is consistent with Zhou *et al*. (2015), arguing that SMEs hesitated to adopt technologies without promising cost-performance and return models. The notion is plausible, given the limited data, resources, technical expertise and experience required to implement sustainable initiatives (Govindan *et al*., 2015). These results contradict prior research that emphasisess technology's strong influence on green business practices (Hernandez & Ona, 2014).

Concerning organisation and the influence on SMP, we found a significant relationship as suggested by Langwell and Heaton (2016). Similar to their findings, we found that employee engagement (EE) is a critical element of sustainability as measured by the high scores of path coefficients. Similarly, our study suggested the crucial role of management in fostering and supporting sustainability in the organisation. As suggested in past literature, our results did not observe the barriers to sustainable practices such as weak organisational structure (Ghazilla *et al*., 2015) and job design (Yusoff *et al*., 2016).

Fourth, despite the past findings on customer demands and competitiveness as powerful drivers of sustainable business practices (e.g., Bey *et al*., 2013), SMEs are still struggling with their limited knowledge and expertise in implementation (e.g., Clarke-Sather *et al*., 2011; Fatimah *et al*., 2013). As opposed to large enterprises, organisational supports like training, incentives and recruitment are underutilised to cater to skilful workers in SMEs (Langwell & Heaton, 2016).

The last STOPE variable is an environment we found insignificant to SMP. Our study resonates with what past literature has pointed out; the smaller the firm's size, the less concerned the environment (Tikul, 2014; Ghazilla *et al*., 2015; Madsen & Ulhøi, 2015). Some plausible explanations are due to their limited capabilities to adopt advanced technology (Bey *et al*., 2013), resulting in more pollutants and waste

(Fatimah *et al*., 2013) as well as failure to meet environmental regulations (Wadhwa, 2014). Our results, nevertheless, were in contrast with past studies that acknowledged the key drivers of green business performance, i.e., compliance with regulation (Govindan *et al*., 2015), environmental management (Schoenherr, 2012), production efficiency and occupational safety (Sezen & Çankaya, 2013).

In addition to the above findings on STOPE variables, our results also confirm prior research (Rosenzweig & Roth, 2004; Montabon *et al*., 2007; Schoenherr, 2012; Aboelmaged, 2018) that SMP has exerted positive impacts on MSMEs' competitive capabilities namely cost, quality, flexibility and delivery. Practising sustainable manufacturing such as reducing energy use, waste and materials not only can MSMEs improve their operational performance but also their financial performance particularly by reducing their operational or production costs (Earnhart & Lizal, 2006; Yang *et al*., 2011; Azevedo *et al*., 2012; Raharjo, 2019).

The lack of funding and investments has pushed SMEs in Indonesia to produce lower quality and less reliable products, which forces them to compete in the domestic rather than in the global market (Fatimah *et al*., 2013). However, against these odds, the surveyed MSMEs were fully aware that improved operational performance as a result of sustainable manufacturing initiatives, positively impacted their product quality (Bortolotti *et al*., 2015; Raharjo, 2019).

As for the flexible capability, an interesting finding by Roostika (2019) showed how the greatly flexible nature of an SME could be its competitive capability that provides more room for learning and innovation (Sok *et al*., 2013) which consequently become an effective way out of its lack in funding. Furthermore, her study on SMEs in Yogyakarta also suggested an increase in SMEs' performance, particularly in product delivery time.

Despite the constraints above the SMP adoption in MSMEs, we believe sustainable initiatives are valuable tools to enhance MSMEs' competitiveness in product cost, quality, delivery and flexibility. Our findings support Aboelmaged (2018) and Schoenherr (2012), particularly on the notion that sustainable initiatives exerted a greater positive impact on MSMEs' competitive capabilities in developing countries including Indonesia.

Conclusion

Extending prior literature by Aboelmaged (2018) in evaluating sustainable manufacturing practices, this study has purported to examine multiple relationships between sustainable manufacturing drivers within the STOPE framework to Sustainable Manufacturing Practices and those practices' impacts on competitive capabilities. Based on the above results and discussion, we conclude that despite being reliable drivers of sustainable manufacturing within the STOPE framework for corporations, they could not support the adoption of sustainable manufacturing in the context of Indonesian MSMEs. We found that out of the STOPE framework, only organisational support (O) significantly affected SMP. This significant impact is aligned with Aboelmaged (2018) where both of the organisational drivers in his TOE framework, namely management support and employee engagement had a positive impact on sustainable manufacturing practices in Egyptian SMEs. Similar to his findings, our study also proved that Indonesian MSMEs were also concerned and realised the importance of SMP to boost their competitive capabilities, despite being unable to fully adopt sustainable manufacturing into their current practice due to limitations explained in the analysis section.

Our study has implications for practice and future research. There continues to be considerable interest from practitioners, regulators and accounting academics in the determinants of sustainability practices in MSMEs as they differ from past literature on large companies and are worthy of study on their own (Ghazilla, 2015). We contribute to this nascent literature by extending the Technology-Organisation-Environment (TOE) framework.

Using the STOPE framework in small businesses, this study offers a more exhaustive approach to the a priori TOE literature dominant in the Information and Technology (IT) area. Theoretically, our paper illustrates the misfit of popular frameworks and calls for distinct attention for MSMEs. This is also suggested by Aboelmaged (2018, p. 210) who found that "an absence of relevant theoretical frameworks that lay the foundation for such SM practices, drivers and outcome drivers is evident".

By extending the TOE framework, our research provides additional and novel findings on what drives SMP and whether SMP benefits business capability. Compared to the popular findings, our empirical findings illustrate that while all STOPE elements were positively correlated, only one was significant: Organisational support. While past literature documents the findings mostly in developed countries with slight differences in MSME categorisation, our study provides a refreshing view in the context of a developing country. We believe that our study will assist small business practitioners who aspire to engage in sustainable practices.

Despite the limitation of this study in representing the whole view of Indonesian MSMEs, it is one of the first attempts to capture SMP within such enterprises. Future researchers can utilise our approach as the basic reference and apply it to their demographic and geographic context. Furthermore, we suggest that data be collected from multiple locations to represent the population well.

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