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Abstract: This study aims to investigate the mediating effect of material flow cost accounting (MFCA) on the external pressure (regulatory pressure and market pressure) – financial performance relationship. The topic of MFCA is rarely researched. The data was collected using questionnaires directed to the owners/managers of micro, small and medium-sized enterprises (MSMEs) in the East Java Province, Indonesia. As many as 156 respondents participated in this research. The finding reveals that MFCA partially mediates the external pressure-financial performance relationship proving that MFCA as one of the environmental management accounting methods is beneficial and needed to enhance financial performance. Employing institutional theory, this study provides additional support to the scarcity of empirical evidence focusing on MFCA in the MSME research setting.

Keywords: material flow cost accounting; MFCA; financial performance; institutional theory; external pressure; micro, small and medium-sized enterprises; MSMEs.

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1 Introduction

In today's business, business owners/managers need to deal with environmental issues as a basis for strategic change in line with the growing social and regulatory concern for the environment. By engaging in environmental business practices, companies will gain a better competitive advantage and improve their environmental performance (El-Kassar and Singh, 2019). The growing social and regulatory concerns for the environment will affect performance, especially for the companies that have failed to comply with the environmental issues.

The rapid growth of the manufacturing industry in Indonesia potentially generates environmental risks. The inadequate control of manufacturing activities will harm the natural resources of the country in the forms of hazardous waste and emissions as well as threats that endanger the biotic ecosystem and people therein (Dsikowitzky et al., 2017; Suherman et al., 2019). Therefore in 2009, Indonesia passed a law regulating the hazardous and toxic substances that must be absent in production processes and other sources, such as domestic waste and agricultural waste. To address this issue, business owners and managers need a better understanding of the environmental issues in this era as part of an environmental awareness society.

Institutional theory requires the need for an organisation to conform with other organisations and to adopt the changes necessary to achieve social and economic benefits. Institutional theory also states that a company is required to comply with the external pressures associating with regulators, customers, and competitors. Institutional isomorphism will result in organisational legitimacy that promotes environmental practices (DiMaggio and Powell, 1983; Rahman et al., 2014). In achieving corporate sustainable development, institutional views are useful to support the firms' commitment to promoting sustainable initiatives (Bansal, 2005). The three mechanisms of institutional theory consist of coercive isomorphism, normative pressures and mimetic processes. A study by Laguecir et al. (2020) explained the way that organisational actors employ management accounting systems in the context of institutional pressures for both social and financial accountability.

Environmental management is crucial in developing a business' competitive advantage. Environmental management accounting (EMA) refers to achieving environmental and economic performance through the implementation of appropriate environment-related accounting systems and practices. While this may include reporting and auditing in some companies, EMA typically involves life-cycle costing, full cost accounting, a benefit assessment and strategic planning for environmental management (IFAC, 2005). EMA raises the level of attention regarding social and environmental issues by identifying, collecting, analysing and the using physical and monetary environmental information (Burritt et al., 2009). EMA is useful, especially in terms of providing information regarding the measurement of the environmental and social risks

of non-product output. This is part of obtaining an advantage in terms of financial benefit and cleaner production (Burritt et al., 2009). This is as well as the cost reduction associated with production and waste (Sulong et al., 2015). A study by Ferreira et al. (2010) revealed that EMA encourages process innovations. A study by Hartlieb et al. (2020) confirmed the important role of managerial discretion making contributions when seeking to understand how environmental factors explain the differences in cost behaviour.

In 2011, the International Organisation for Standardisation (ISO) introduced material flow cost accounting (MFCA) to assist companies in tracing and quantifying the cost of the physical flow of material and energy used so then the management recognises the possible environmental and financial consequences. By recognising the consequences, a company can explore the opportunities to enhance environmental and financial performance. The efficient use of material and energy will generate a lower production cost and the reduction of negative impacts on the environment (ISO, 2011).

This study continues the previous studies focusing on the effect of institutional pressures, the adoption of EMA and business performance (Iredele et al., 2019; Wang et al., 2019; Zandi and Lee, 2019; Abd et al., 2020; Yassin and Ali, 2020). Some of the previous studies have employed case study and exploratory approaches (Rieckhof and Guenther, 2018; May and Guenther, 2020). Only a few studies have used a questionnaire (Nakajima et al., 2014; Yagi and Kokubu, 2018). This study provides a deeper understanding regarding the factors influencing the adoption of MFCA and its effect on financial performance in Indonesian MSMEs. The topic of MFCA is rarely researched. The scarcity of survey-based research and the use of statistical analysis to achieve a more generalised empirical result for MFCA have motivated this study.

2   Literature review and hypothesis development

2.1   *External pressures and financial performance*

Coercive isomorphism, as one of the mechanisms of institutional theory, is a mandatory order that must be followed by the firms from other agencies that have strong influences toward the firms (DiMaggio and Powell, 1983). Coercive isomorphism is strongly related to the government enforcing the firms to adopt environmental management using legal instruments (Delmas and Toffel, 2004; Zhu and Sarkis, 2007). The government provides assistance (incentives) to encourage the firms to promote environmental management. This must include the latest conditions of the targeted area to ensure its successful implementation (Al Irsyad et al., 2019; Kraal, 2019).

Henriques and Sadorsky (1996) found that government regulations become the main consideration of a firm when taking environmental actions. The Indonesian government as policymakers have a crucial role in formulating the regulations supporting the efforts of the related parties in developing sustainability in the business and environment through defensive (maintain proper control towards the business activities to ensure the compliance with the regulations) and repressive efforts (impose reasonable sanctions based on the regulations towards the violators as an act of responsibility) (Leick, 2019; Hidjaz, 2019). Environmental regulations are a set of standards formulated by the government and applied through command-and-control, voluntary or incentive approaches to promote the country's sustainability initiatives (Marotta et al., 2017;

López-Gamero et al., 2010; Li, 2014). Compliance in the form of corporate environmental responsibility (CER) is supported by the government, generates benefits for the firm by promoting both environmental compliance with the regulations and financial performance, compensating the costs associated with the engagement for CER (Li et al., 2017; Pizzi et al., 2020; Yusof et al., 2020). Based on the previous arguments, the first hypothesis is proposed.

H1 Regulatory pressure positively affects financial performance.

Normative pressure is associated with professionalisation from external sources in order to maintain the legitimacy of an organisation in society and how the organisation is perceived by those who put their interests in the organisation. Therefore it creates a social perception and understanding (DiMaggio and Powell, 1983). Normative standards are transferred to the society and create pressures for the firms to conform with. For example, the establishment of the Environmental Protection Agency (EPA) in the USA was mainly affected by the social views and ideas related to promoting sustainability initiatives (Jennings and Zandbergen, 1995).

It is necessary for firms to pay more attention to their customers and competitors. The growing environmental awareness among customers and competitors puts pressure on the firms to obtain customer satisfaction and to generate financial and market benefits (Chavez et al., 2016). Pursuing green initiatives should become an important issue for firms. The market is the most substantial element that drives a company to implement green design. The proper response towards customer pressure will result in maintaining good relationships with the customer and increasing customer satisfaction. This is positively linked to various financial and market performance benefits (Williams and Naumann, 2011). It also helps the company to develop the green identity of the firm in order to obtain legitimacy from the customers and society as a whole. This ultimately benefits the firm by opening access to more prominent resources and financial benefits (Soewarno et al., 2019). Globalisation opens up the path for a firm to adopt prosperous and suitable practices at the multinational level (Christmann and Taylor, 2001).The competitive pressure becomes one of the main drivers for firms to pursue environmental initiatives (Dai et al., 2015). Being active when promoting environmental activities can develop the competitive advantage of a firm in both the cost-leadership and differentiation approach, in addition to improving financial performance (Yadav et al., 2017; Junquera and Barba-Sánchez, 2018). Based on the previous arguments, the second hypothesis is proposed.

H2 Market pressure positively affects financial performance.

2.2 External pressure and MFCA

EMA has the characteristics of both administrative innovation and technical innovation. Thus, it supports the possibility of firms getting benefits from its implementation. Previous scholars and case studies have shown the advantage of the application of MFCA such as identifying a cost saving potential (Burritt et al., 2019), assisting in the provision of options for waste recover (Wan et al., 2015) and possessing the characteristics of innovation (dual-goal advantage, compatibility, low-level of complexity, trialability and observability) which make it easily adopted by firms, carrying a high-possibility of

successful implementation (Sulong et al., 2015). This is in addition to the lower purchasing cost resulting from cost identification and cutting (Nakajima et al., 2014).

Institutional pressures act as the main driver (coercive pressure) in the implementation of EMA to obtain legitimacy and create value based on the organisational logic of both customers and stakeholders. Some cases on organisational change have been conducted to address the government mandate as one of the sources of coercive pressure (DiMaggio and Powell, 1983). The government, as the regulator of compulsory environmental actions and other members in the society, is part of social structural factors that encourages the implementation of EMA in order to perform waste management better (Qian et al., 2011). MFCA is an accounting model that can be used by any management system including micro-businesses, regardless of the level of business sophistication, to promote pollution prevention and control as well as to increase the awareness of business impacts toward the environment (Fakoya, 2015). For SMEs, the systematic and technical support from the government and related agencies is important for its successful implementation (Chompu-Inwai et al., 2015). Regulatory pressure is proven to be the consistent factor concerning a business taking EMA actions (Qian and Burritt, 2008; Christ, 2014). Based on the previous arguments, the third hypothesis is proposed.

H3   Regulatory pressure positively affects MFCA.

The sustainability issue has been growing. In this era, companies cannot only sell products but also promote sustainability by suggesting that the government and shifting customer behaviour is related to their environmentally friendly products (Hart, 1997). Normative pressure drives a firm to become a more professional organisation in order to promote organisational reputation and legitimacy for the benefit of the firm (DiMaggio and Powell, 1983). Market pressure encourages the firms to perform environmental initiatives by implementing EMA so then the firms obtain societal legitimacy (Sarkis et al., 2011; Garrone et al., 2018). Firms need to provide eco-friendly products while trying to remain competitive in the market. Customers also demand that firms provide products and adopt techniques that are similar to or even better than that of their competitors (DiMaggio and Powell, 1983). To deal with market pressure, the firms need to employ MFCA in order to seek potential cost savings and to produce environmentally-friendly products (Marota et al., 2017). The increasing demand for eco-friendly products will shift the firms' focus to developing green products and/or implementing green processes in their production activities. Therefore, customer pressure arises from the specific expectations and demands for the offered products to be environmentally-friendly (Iranmanesh et al., 2019). Complying with the customer pressure provides possible financial benefits because the firms obtain more legitimacy and trust as the result of implementing green initiatives (Chu et al., 2019). To ensure customer satisfaction, MFCA provides a solution in the form of an efficient and optimal inspection model to detect the existing waste costs from the unidentified items processed during the production stage (Supakulwattana and Chattinnawat, 2018). Based on the previous justifications, the fourth hypothesis is proposed.

H4   Market pressure positively affects MFCA.

2.3 MFCA and financial performance

The efforts and resources used to develop corporate environmental management in the form of technologies and a coherent strategy are considered to be necessary for a company to gain potential financial benefits. With a well-executed environmental management strategy, it can reduce both the realised and unrealised cost of dealing with pollution control in addition to shifting into pollution prevention activities as well as the reduction in the cost of energy and input used during the process. This is aligned with building new and stronger relationships with directly and indirectly related stakeholders (the government, customers, suppliers and competitors, etc.) in addition to the development of the employee skills and capabilities. This can possibly lead to better business processes and contribute to the competitive advantage of a company (Hart, 1997; Albertini, 2013). The initialisation of one EMA tool in the business practices can be used to make an introduction to another related EMA tool alongside the progress of establishing an environmental accounting system in a company (Burritt et al., 2019). As one of the EMA tools, MFCA has the strong ability to generate data concerning the financial and non-financial material information, ensuring an equal amount of material input compared to the output production. This puts the focus on discovering the actual cost of the products and non-product (wastes and emissions) output produced during the production processes (Tachikawa, 2014; Tu and Huang, 2019). With the proper actions taken to implement MFCA and either strategic or corrective actions based on the data provided by MFCA, the firm can reap the benefits of the significant cost decrease resulting from the cutting down of inefficient materials use and recovering the waste produced in the production processes. This is where lower costs will lead to a higher business profit (Nakajima et al., 2014; Wan et al., 2015; Burritt et al., 2019). Based on the previous justification, the fifth hypothesis is proposed.

H5 MFCA positively affects financial performance.

Complying with regulations and environmental concerns becomes the driver for firms to adopt EMA (Järvenpää and Länsiluoto, 2016; Ferdous et al., 2019). Furthermore, it will improve the profitability of the firms because they are promoted by the government, customers, investors and society and obtain more trust via a good image and reputation (Iii, 2018; Le et al., 2019). The cost of implementing good environmental practices does not reduce the profitability of the firms. Therefore the financial performance remains stable and even potentially increases (Bartolacci et al., 2018). Thus, the potential of MFCA as an EMA tool is not only to support environmental sustainability but also to align with an economic performance improvement. This will encourage the firms' survivability and growth (Christ, 2014; Dekamin and Barmaki, 2019; May and Guenther, 2020). Based on the arguments, the sixth hypothesis is proposed.

H6 MFCA mediates the regulatory pressure – financial performance relationship.

Institutional pressure from society and the organisation's situational needs promotes the application of EMA, specifically in relation to waste management (Qian et al., 2015; Wang et al., 2019). The customer is one of the main stakeholders. A firm needs to combine customer values with organisational logic in order to obtain more legitimacy by adopting EMA (Ferdous et al., 2019). A firm needs to seek out the most suitable environmental strategy to face the challenge of the market competition (Marota et al., 2017; Duanmu et al., 2018). Therefore, by applying MFCA as an EMA tool, a firm can

track its production costs using the material flow approach. This will reveal the hidden cost of the waste associated with the production processes. By detecting the hidden cost of the waste, a firm will be able to better manage its wastes so then the costs are reduced. This will improve the economic and environmental benefits (Jasch, 2003; Wan et al., 2015). Based on the previous justification, the seventh hypothesis is proposed.

H7 MFCA mediates the market pressure – financial performance relationship.

Figure 1 presents the research framework of this study. It depicts the relationship between external pressure (regulatory pressure and market pressure) and financial performance with MFCA as the mediating variable.

Figure 1   Research framework
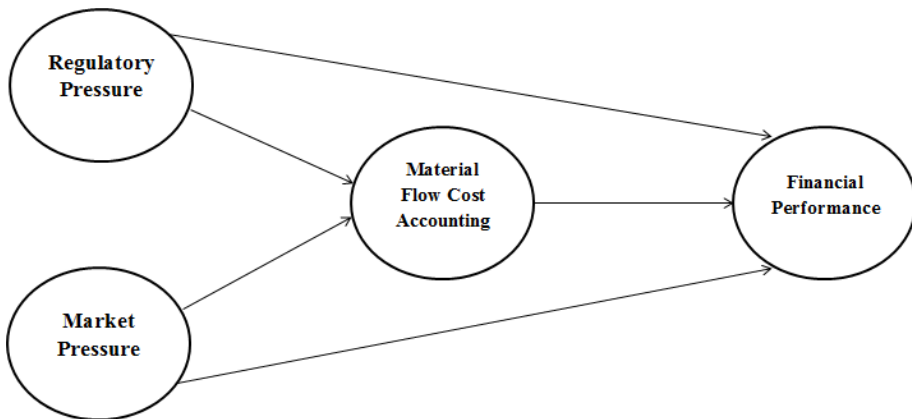
3   Method

3.1   Data collection

The data was collected using an online questionnaire. The respondents were the owners and managers of MSMEs in the East Java Province of Indonesia. According to the cooperative and MSMEs Office, there are 1,104 MSMEs under their supervision. The online questionnaires were sent via the WhatsApp application to the listed mobile phone number provided by the office. A letter requesting their participation in the survey and the associated Google form link was sent to each respondent. As many as 156 respondents participated in this survey. Before the data collection, a pilot test was conducted on university students and business owners in order to verify the reliability and validity of the items. To consider cost and time, purposive sampling was applied using the following criteria:

1   The MSMEs must have complete information such as a business name, owner(s), business activity and an active mobile phone number connected to WhatsApp.

2   The MSME must be a manufacturing firm.

3.2 Measurement of the constructs

The variables were measured using the instruments developed by the previous studies. The instruments were translated into the Indonesian language (Bahasa) and then translated back into English to ensure that they had the same meaning. This was also in order to improve the understanding of the statements, to avoid misinterpretation and to increase the response rate. All items were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

3.2.1 Regulatory pressure

Regulatory pressure is defined as the pressure to comply with environmental regulations (laws, rules, directives) as well as the industry standards designed by the government and other authorised parties to build the commitment to reducing the burden of the environment and consumption of resources. It is usually exercised by governments that have the power to accept or reject the existence of an entity in their jurisdiction (Rennings and Rammer, 2011; Berrone et al., 2013). In order to measure the company responses toward the regulatory pressures, an instrument developed by Qi et al. (2010) and Cao and Chen (2018) was adopted as follows.

1   The regulations for environmental protection have a considerable impact on the business (RP1).

2   The regulations for environmental protection can effectively deal with issues regarding the greening of the business process (RP2).

3   The environmental protection laws are appropriate for Indonesia's industrial environment (RP3).

4   Enterprises that fail to meet the relevant environmental standards or regulations will be required to pay repair costs within a certain time limit or compulsory measures such as closing down the production process (RP4).

5   The environmental protection department (or other related departments) formulates detailed environmental plans according to the relevant laws, regulations, or rules (RP5).

3.2.2 Market pressure

Market pressure is defined as the pressure from environmentally-conscious customers and competitors regarding the offered products, services and activities which should not harm the environment (Hojnik and Ruzzier, 2016; Fernando and Wah, 2017). An instrument developed by Hojnik and Ruzzier (2016) was adopted as follows.

1   Our customers have clear demands regarding environmental issues (MPR1).

2   Our customer demands become the motivation behind the company's environmental efforts (MPR2).

3   Our customers often bring up environmental issues (MPR3).

4   Our company establishes its environmental image by comparing it to its competitors through the green concept (MPR4).

5   Our company improves the competitive advantage over its competitors through the green concept (MPR5).

3.2.3   Material flow cost accounting

MFCA is defined as an EMA tool that supports an organisation in obtaining a better understanding of the consequences and opportunities related to their material and energy usage in both environmental and financial perspectives. MFCA increases the transparency of material and energy usage via the advancement of the material flow model that detects and quantifies the movement and material stocks within an organisation in both physical and monetary units (ISO, 2011). Therefore in order to measure the level of MFCA implementation, an instrument was developed based on the manual for the MFCA standard of application and case study regarding the implementation of MFCA by the Asian Productivity Organisation (Tachikawa, 2014) as follows.

1   Our company has expert staff in the operational, technical, quality control, environmental and accounting domains (MFCA1).

2   We have established multiple quantity centres for each process and the quantified costs associated with each process are calculated accurately (MFCA2).

3   We have divided the costs into the material cost, energy cost, system cost and waste management cost (MFCA 3).

4   We have allocated all disposal costs to material loss (MFCA 4).

5   We have prepared a material flow cost matrix in which all costs were classified as part of the products or as material losses (or used similar terms) (MFCA 5).

6   We have prepared a material flow profit-and-loss statement (or used similar terms) (MFCA 6).

7   We have recognised the material losses and costs associated with these losses accurately (MFCA 7).

8   Our cost accounting system which is based on material flow has helped us to cut costs and reduce the environmental impact simultaneously (MFCA 8).

3.2.4   Financial performance

Financial performance is defined as a measure of how a company utilises the assets from its primary business model and generates revenue. This can be achieved through improving the operational efficiency and firm profitability (Chan et al., 2016). To assess financial performance, an instrument developed by Çankaya and Sezen (2019) and Chan et al. (2016) was adopted as follows.

In the last three years:

1   We have experienced a decrease in costs related to energy consumption (FP1).

2   We have experienced a decrease in costs related to waste disposal (FP2).

3   We have experienced growth related to profit (FP3).

4   We have experienced growth related to sales (FP4).

5   We have been able to produce products at a low cost (FP5).

6   We have been able to produce products with low inventory costs (FP6).

7   We have been able to produce products with low overhead costs (FP7).

8   We have been able to offer the lowest or lower product prices compared to that of our competitors (FP8).

3.3 Analytical techniques

Partial least square structural equation modelling (PLS-SEM) was employed to test the hypotheses. It is suitable for this study because PLS-SEM can be construct a model with many variables that cannot be measured directly, in addition to answering systematic and comprehensive research problems, evaluating mediation relationships and not requiring a normal distribution assumption (Chin, 1998). A full collinearity test was carried out to determine the common method bias with the value of the variance inflation factor (VIF) not exceeding or equal to 3.3. This study was therefore found to be free of common method bias (Kock, 2015).

4   Result

4.1 Characteristics of the respondents

Table 1 shows the characteristics of the respondents and their businesses. The respondents were dominated by the owners/managers of MSMEs in the food and beverage business (44%) with a total revenue of less than 300 million (66%), an average company age of 4–8 years (44%) and a total number of employees of less than 10 (88%).

4.2 Descriptive statistics

Table 2 presents the classification of the respondents' answers. Table 3 shows the descriptive statistics of this study. They indicate that the respondents 'agree' with the questionnaire items and understand each indicator of the construct. The standard deviation value is smaller than the mean for each variable, indicating that the variance of the data is relatively small. It is concluded that the average MSMEs in Indonesia have considered the importance of regulatory pressure, market pressure, and MFCA in achieving their financial performance. The results of the full collinearity VIFs for regulatory pressure, market pressure, MFCA, and financial performance are 1.992, 2.070, 1.889 and 1.411 respectively. These values are less than the cut-off value of 3.3, thus all constructs are free from potential bias.

Table 1   Characteristics of the respondents

Classification	Description	Total	
		Absolute	*Percentage*
Industry	Food and beverages	68	44%
	Fashion	22	14%
	Crafting	46	29%
	Others	20	13%
	Total	*156*	*100%*
Revenue per year	≤ Rp 300 million	103	66%
	Rp 300 million – Rp 2,500 million	29	19%
	Rp 2,500 million – Rp 50,000 million	24	15%
	Total	*156*	*100%*
Company age	< 4 years	33	21%
	4–8 years	68	44%
	9–14 years	33	21%
	≥ 15 years	22	14%
	Total	*156*	*100%*
Number of employees	≤ 10	137	88%
	11–30	19	12%
	Total	*156*	*100%*

Table 2   Response categories

Interval	*Category*
$1.00 < \alpha < 1.80$	Strongly disagree
$1.80 < \alpha < 2.60$	Disagree
$2.60 < \alpha < 3.40$	Neutral
$3.40 < \alpha < 4.20$	Agree
$4.20 < \alpha < 5.00$	Strongly agree

Note: Interval class = (highest class – lowest class)/number of classes = $(5 – 1)/5 = 0.8$.

Table 3   Descriptive statistics

Variable	*Mean*	*Standard deviation*	*Category*
Regulatory pressure	3.79	0.93	Agree
Market pressure	3.82	0.96	Agree
Material flow cost accounting	3.53	1.07	Agree
Financial performance	3.65	0.99	Agree

Table 4   Results of the reliability and convergent validity tests

Latent variables	Mean	SD	Loading factor	p-value
Regulatory pressure (CR = 0.879; AVE = 0.708; Cronbach's alpha = 0.792)				
RP2	3.96	0.93	0.880	p < 0.001
RP3	3.64	0.90	0.869	p < 0.001
RP5	3.78	0.95	0.771	p < 0.001
Market pressure (CR = 0.899; AVE = 0.692; Cronbach's alpha = 0.849)				
MPR1	3.42	1.06	0.732	p < 0.001
MPR2	4.01	0.88	0.871	p < 0.001
MPR4	3.88	0.98	0.835	p < 0.001
MPR5	3.97	0.94	0.880	p < 0.001
Material flow cost accounting (CR = 0.952; AVE = 0.713; Cronbach's alpha = 0.942)				
MFCA1	3.32	1.06	0.801	p < 0.001
MFCA2	3.62	1.02	0.861	p < 0.001
MFCA3	3.67	1.09	0.825	p < 0.001
MFCA4	3.44	1.12	0.818	p < 0.001
MFCA5	3.44	1.09	0.882	p < 0.001
MFCA6	3.62	1.09	0.807	p < 0.001
MFCA7	3.55	1.04	0.877	p < 0.001
MFCA8	3.56	1.04	0.881	p < 0.001
Financial performance (CR = 0.928; AVE = 0.722; Cronbach's alpha = 0.903)				
FP3	3.73	0.98	0.854	p < 0.001
FP4	3.77	0.97	0.844	p < 0.001
FP5	3.60	1.00	0.863	p < 0.001
FP6	3.58	1.02	0.885	p < 0.001
FP7	3.57	0.97	0.799	p < 0.001

4.3   Measurement model analysis

The measurement model analysis was used to evaluate the reliability and validity of the constructs. Construct reliability was assessed using composite reliability (CR) and Cronbach's alpha. Convergent validity was assessed using the loading factor and average variance extracted (AVE) while discriminant validity was assessed using the square root of AVE and the latent variable correlations. In the first iteration, five variables (RP1, RP4, MPR3, FP1 and FP8) do not meet the loading factor of 0.7, therefore they were dropped. The second iteration shows that one variable (FP2) has a loading factor of less than 0.7, therefore it was dropped. The last iteration demonstrates that each variable meets the loading factor of more than 0.7. Table 4 shows that the loading factor for each indicator has exceeded the minimum acceptable requirement of 0.7 (Sholihin and Ratmono, 2013; Hair et al., 2017). This reveals that the CR coefficients for all constructs are more than the accepted level of 0.70. Referring to Nunnaly (1967), it suggests that the measures are reliable. The AVE value of each construct is greater than 0.5

(regulatory pressure = 0.708; market pressure = 0.692, MFCA = 0.713, and financial performance = 0.722), thus indicating that all constructs have fulfilled the convergent validity requirement (Hair et al., 2017).

To evaluate discriminant validity, Table 5 compares the square roots of the AVEs with the correlation between the constructs. It shows that the square root of the AVE of a construct is higher than the correlation between the construct and the other constructs. The results suggest that each construct has met the discriminant validity requirement.

Table 5   Discriminant validity test

	RP	*MPR*	*MFCA*	*FP*
Regulatory pressure	*0.842*	***0.669	***0.564	***0.413
Market pressure	***0.669	*0.832*	***0.592	***0.403
Material flow cost accounting	***0.564	***0.592	*0.845*	***0.517
Financial performance	***0.413	***0.403	***0.517	*0.850*

Note: ***significant at $p < 0.01$.

4.4   Structural model analysis

The structural model analysis consisted of two steps. The first step was to test the direct effect of the independent on the dependent variables before introducing the mediating variable of MFCA. The second step was to test the indirect effect of regulatory pressure and market pressure on financial performance by inserting the mediating variable of MFCA. Table 6, Figure 2 and Figure 3 show the summary of the structural model analysis. Table 6 (panel A) shows the results of the first step indicating that regulatory pressure has a direct positive effect on financial performance (β coefficient = 0.29 with $p < 0.01$). H1 is therefore supported. Moreover, it reveals that market pressure also has a direct positive effect on financial performance (β coefficient = 0.25 with $p < 0.01$). H2 is thus also supported. Table 6 (panel B) shows that regulatory pressure has a positive effect on MFCA (β coefficient = 0.33 with $p < 0.01$). H3 is thus supported. Furthermore, it reveals that market pressure also has a positive effect on MFCA (β coefficient = 0.37 with $p < 0.01$). H4 is also supported. It also presents the positive effect of MFCA on financial performance (β coefficient = 0.39 with $p < 0.01$). Therefore, H5 is supported.
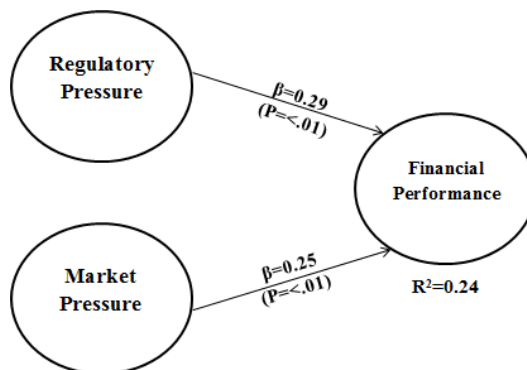
Figure 2   Result of the direct effect test

Table 6 Summary of the structural model analysis

Panel A: before including MFCA as the mediating variable	β coefficient	p-value	Decision
Direct effect			
Regulatory pressure > Financial performance	0.29	$p < 0.01$	Support H1
Market pressure > Financial performance	0.25	$p < 0.01$	Support H2
Panel B: after including MFCA as the mediating variable	**β coefficient**	**p-value**	**Decision**
Direct effect			
Regulatory pressure > Financial performance	0.13	$p = 0.04$	Significant
Market pressure > Financial performance	0.12	$p = 0.06$	Significant
Regulatory pressure > MFCA	0.33	$p < 0.01$	Support H3
Market pressure > MFCA	0.37	$p < 0.01$	Support H4
MFCA > Financial performance	0.39	$p < 0.01$	Support H5
	Indirect effect (VAF)	*p-value*	*Decision*
Indirect effect			
Regulatory pressure > MFCA > Financial performance	30.68%	0.010	Support H6
Market pressure > MFCA > Financial performance	36.48%	0.005	Support H7

Notes: 1. VAF less than 20%: no mediation.
     2. VAF 20%–80%: partial mediation.
     3. VAF more than 80%: full mediation.

This study proves that H6 is supported. As presented in Table 7, MFCA partially mediates regulatory pressure-financial performance relationship (VAF = 30.68% with $p < 0.01$). This study also demonstrates that H7 is supported. Table 8 shows the VAF value is 36.48% indicating that MFCA partially mediates market pressure-financial performance relationship.

Table 7 VAF calculation (RP-MFCA-FP)

(a) Indirect effect:		
1 Regulatory pressure > Material flow cost accounting	0.332	
2 Material flow cost accounting > Financial performance	0.388	
(a) = (a1) × (a2)		0.1288
(b) Direct effect:		
1 Regulatory pressure > Financial performance (excluding MFCA as the mediation)		0.291
(c) Total effect = (a) + (b)		0.4198
VAF:		
Indirect effect (a)	0.1288	
Total effect (c)	0.4198	
(a)/(c)		*0.3068*

Figure 3   Result of the structural model
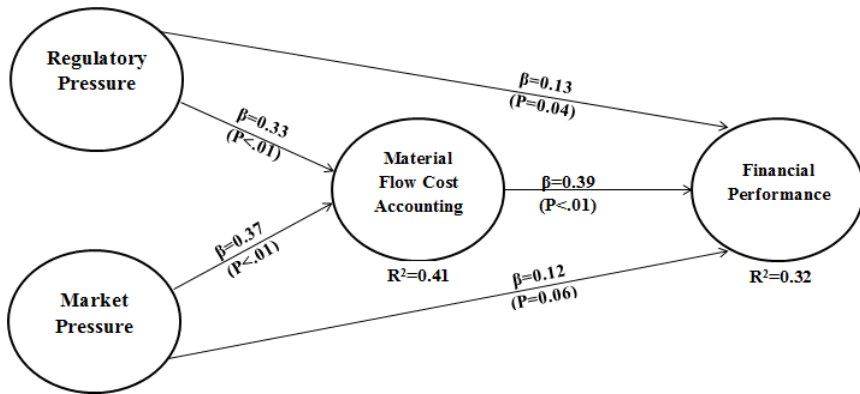
Table 8   VAF calculation (MPR-MFCA-FP)

(a) Indirect effect:			
1	Market pressure > MFCA	0.373	
2	MFCA > Financial performance (a)	0.388	
(a) = (a1) × (a2)			0.1447
(b) Direct effect:			
1	Market pressure > Financial performance (excluding MFCA as the mediation)	0.252	
(c) Total effect = (a) + (b)			0.3967
VAF:			
	Indirect effect (a)	0.1447	
	Total effect (c)	0.3967	
(a)/(c)			*0.3648*

5   Discussion

H1 states that regulatory pressure positively affects financial performance. This is supported. This is in line with some of the previous studies (Leonidou et al., 2016; Li et al., 2017; Pizzi et al., 2020; Yusof et al., 2020). This result confirms that pressure not only affects big companies but also MSMEs. The majority of MSME owners/managers in East Java have experienced the benefits of complying with the existing environmental regulations and have taken appropriate actions to deal with the regulations while maintaining their business. Thus the coercive pressure from the government has been a positive. This implies that the MSMEs need to comply with the government regulations in order to achieve a high level of financial benefits. Stakeholder pressure can also come from local regulators and religious communities (Majelis Ulama Indonesia). The increased capability to comply with the government regulations and religious community will increase the benefits gained from the implementation (Leonidou et al., 2016), including the contribution to environmental sustainability. This result also implies that

the government should promote sustainability initiatives while increasing the welfare of the MSMEs. The government regulations should educate the owners/managers of the MSMEs regarding eco-friendly business activities, providing incentives for their compliance.

H2 stating that market pressure positively affects financial performance is supported. This result is in line with several of the previous studies (Williams and Naumann, 2011; Chavez et al., 2016; Yadav et al., 2017; Junquera and Barba-Sánchez, 2018). This confirms that the owners/managers of the MSMEs are aware of their customer needs and market condition which allows them to better compete against their competitors and to achieve better financial performance. The MSMEs that are capable of responding to green customers and green competitors will be able to enhance their capability to market their environmentally-friendly products. This will increase their profitability. The implementation of sustainable activities will enhance the legitimacy given by society and strengthen the relationship with green stakeholders. This will open the access to various benefits including financial benefits, sustainability development and competitive advantage (Soewarno et al., 2019). Obtaining social legitimacy must be the priority of every business because it improves the organisational reputation as an environmentally-friendly company. This will lead to long-term profitability.

H3 states that regulatory pressure positively affects MFCA. This is supported. This is in line with some of the previous studies on the implementation of EMA and MFCA (Qian and Burritt, 2008; Qian et al., 2011; Christ, 2014; Chompu-Inwai et al., 2015). This study confirms that government regulations and religious community have the power to pursue sustainable business practices, including the halal-ness of a product and the endorsement of environmental accounting practices. The MSMEs in East Java have either fully or partially, explicitly or implicitly, implemented MFCA in their business processes in order to comply with the environmental regulations. MFCA helps the MSMEs in East Java to respond to the coercive pressure from the government in order to maintain environmentally-friendly business practices. The decision taken to enact the regulations should be followed by proper technical and systematic support to ensure the success of MFCA implementation (Chompu-Inwai et al., 2015). For example, the adoption of the ISO 14051 supports the implementation of the regulations and provides incentives for the MSMEs to implements it. Furthermore, a proper set of regulations will induce the proactive environmental performance of MSMEs in the near future, thus supporting the sustainability initiatives of the country.

H4 states that market pressure positively affects MFCA and this is supported. This study is in line with the previous studies on the implementation of EMA and MFCA (Jalaludin et al., 2011; Marota et al., 2017; Ferdous et al., 2019). This result confirms that the pressure of competition and green customers' demand becomes the main factor for MSMEs to adopt MFCA, either intentionally or unintentionally. The MSMEs in East Java respond to the public concern regarding the environmental issues (mainly derived from customers and competitors) by implementing MFCA in their business processes, either fully or partially. The market pressure thus becomes the driver of the adoption of MFCA. MFCA becomes a strategic tool to improve the competitiveness of a firm (Marota et al., 2017). The Department of Workforce has provided training on MFCA to the owners/managers of MFCA in Indonesia. Therefore they understand that the MFCA practices in their business activities will improve their legitimacy as an eco-friendly

business. The potential cost savings and increased societal legitimacy are the benefits of implementing MFCA.

H5 states that MFCA positively affect financial performance. This is supported. This result supports that of the previous studies (Nakajima et al., 2014; Wang et al., 2019; Burritt et al., 2019). The MSMEs in East Java have proven that implementing MFCA generates more financial benefits because MFCA is relatively easy to implement and low cost (Huang et al., 2019). MFCA provides information on material losses and the hidden cost of processing the input into output as well as the complete physical and monetary material flow (Wang et al., 2019). MSMEs adopting MFCA will generate both better environmental and financial performance and raise the attention of eco-friendly business practices. Proper actions and systems should be developed to ensure the successful implementation of MFCA in addition to providing high quality information for decision makers.

H6 is supported in this study, proving that MFCA partially mediates the effect of regulatory pressure on financial performance. H7 is also supported, revealing that MFCA partially mediates the effect of market pressure on financial performance. This result suggests the importance of MFCA's implementation in the business processes and the role of EMA in general. The MSMEs in East Java have proven that responding to the regulation and market pressures by adopting MFCA provides a solution for eco-friendly businesses in the form of enhanced financial performance. MFCA is a proven method able to provide comprehensive information on the material and energy usage for better decision making.

6   Conclusions and implications

6.1   Conclusions

All of the hypotheses in this study are supported. This study provides the following conclusions. First, complying with government regulations, especially those on environment protections, improves the financial performance of the MSMEs. Second, responding to market pressure, especially green customers and competitor, enhances the financial performance of the MSMEs. Both regulatory and market pressures have encouraged the MSMEs in East Java to adopt sustainable initiatives in order to increase their financial performance. Third, the government regulations require the MSMEs to adopt sustainable methods such as MFCA as a tool. Therefore the regulatory pressure affects the adoption of MFCA. Fourth, the green market has also demanded that the MSMEs deal with green customers and competitors. Therefore the MSMEs should adapt by adopting a management system accommodating the environmental issues such as MFCA. Market pressure has driven the MSMEs to implement MFCA. Fifth, MFCA implementation enhances the legitimacy that the business gets from society and this strengthens their relationship with green stakeholders. This opens up access to various benefits including financial benefit, sustainable development and a competitive advantage. Finally, responding to regulatory and market pressures has encouraged the MSMEs in East Java to adopt MFCA in their business processes. MFCA provides strategic information on material losses, the hidden cost of processing products as well as the complete physical and monetary material flow. Therefore MSMEs are able to make a

better decision to increase their financial, social and environmental sustainability performance.

6.2 Contributions

From the theoretical perspective, this study supports the institutional theory with empirical evidence. It also fills in the scarcity of research on MFCA, especially in the MSME research setting. From the practical perspective, this study contributes to the development of MSME sustainability performance. MSMEs should not view the environmental regulations and green market as a burden or a threat to their business. Instead, they should view the issue as an opportunity to increase their business performance and develop their ability to fully implement MFCA in their business processes. MFCA has the flexibility necessary to be implemented in any management system regardless of the size of the firm (Fakoya, 2015). This study also contributes to public policy decision making because MSMEs play a crucial role in the enhancement of societal welfare. Decision makers need to understand that in the era of environmental awareness, it is important to develop environmentally-friendly MSMEs. The stakeholders of the MSMEs should also be aware of the environmental issues specifically related to the impact of production activities on the environment. Adopting the green initiative by increasing awareness and being critically aware of environmental issues is the foundation for a sustainable business. MSMEs play a significant role in eliminating poverty by absorbing the workforce, reducing the level of unemployment and distributing economic equality better. The key to developing MSMEs is by enhancing the sustainability performance consisting of economic, social and environment sustainability.

6.3 Limitations

This study has its limitations. First, the sample of this study is relatively small and derived from one region in Indonesia, namely the East Java Province. Future studies are encouraged to enlarge the sample size to different provinces. Second, the COVID-19 pandemic has affected the willingness of MSME owners/managers to fill in the questionnaires as they are busy finding ways to survive in the declining economic condition. Future studies need to consider using secondary data instead of primary data based on a survey. Notwithstanding its weaknesses, the research model and the results of this study still contribute to the theoretical development and practical implementation of MCFA in the MSMEs.

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