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Contingent Factors that Influence the Accounting Information System Quality and Environmental Management Accounting Adoption among Companies in Indonesia

Aulia Tri Utama, Idranisa Anis, Juniati Gunawan

Abstract

Environmental management accounting has received increasing interest in recent years. However, despite increasing interest, reference concerning the current state of environmental management accounting development remain scarce. The objective of the research presented here is to extend current knowledge by investigating whether accounting information system design could be used to develop a greater understanding of environmental management accounting use by Indonesian organisations. A research framework was developed from contingency theory to identify the circumstances under which organisations were more likely to develop a sophisticated accounting information system design and ultimately to investigate its impact to environmental management accounting activities. In order to test this framework, a web-based survey of Indonesian accountants in business was conducted. This research exploits the quantitative research methodology to understand the relationship between contingent factors, which are firm size, firm age, organizational structure, uncertainty environment, and manager profile that influence accounting information system design and environmental management accounting practice among various companies in Indonesia. The survey was conducted on companies located in Jabodetabek area. 100 questionnaires were received from various companies and the finding highlights that the firm age, environment uncertainty, and manager experience significantly affect accounting information system quality and environmental management accounting practice. In light of the results, it would also be valuable to employ qualitative research methods and attempt to develop a deeper understanding as to why such lack of engagement is the case.

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Contingent Factors that Influence the Accounting Information System Quality and Environmental Management Accounting Adoption among Companies in Indonesia

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Abstract

Environmental management accounting has received increasing interest in recent years. However, despite increasing interest, reference concerning the current state of environmental management accounting development remain scarce. The objective of the research presented here is to extend current knowledge by investigating whether accounting information system design could be used to develop a greater understanding of environmental management accounting use by Indonesian organisations. A research framework was developed from contingency theory to identify the circumstances under which organisations were more likely to develop a sophisticated accounting information system design and ultimately to investigate its impact on environmental management accounting activities. In order to test this framework, a web-based survey of Indonesian accountants in business was conducted. This research exploits the quantitative research methodology to understand the relationship between contingent factors, which are firm size, firm age, organizational structure, uncertainty environment, and manager profile that influence accounting information system design and environmental management accounting practice among various companies in Indonesia. The survey was conducted on companies located in Jabodetabek area. 100 questionnaires were received from various companies and the finding highlights that the firm age, environment uncertainty, and manager experience significantly affect accounting information system quality and environmental management accounting practice. In light of the results, it would also be valuable to employ qualitative research methods and attempt to develop a deeper understanding as to why such lack of engagement is the case.

Keywords

accounting information system;
contingency factors;
environmental management
accounting practices; Indonesia.



I. Introduction

As the business world endeavours to respond to increasing pressure from various stakeholders to reduce the impact of its activities on the physical environment, the need for new techniques to assist managers in meeting the challenge of environmental sustainability becomes apparent. One method suggested as being able to align corporate activities with the environmental agenda more closely is Environmental Management Accounting (EMA). EMA incorporates a few techniques and tools designed to assist organisations in recognising and managing their environmental impacts. These tools include but are not limited to environmental cost accounting; full cost accounting; life-cycle costing; environmental life-cycle budgeting; environmental capital investment appraisal; total

quality environmental management; and material and energy flow accounting (Schaltegger et al., 2012; Yakhou and Dorweiler, 2004).

EMA provides a pragmatic response to criticism that conventional management accounting has failed in its ability to provide explicit consideration of environmental issues with environmental costs frequently ‘hidden’ in general overhead accounts and potential environmental benefits often downplayed or ignored (Jasch, 2003; Papaspyropoulos et al., 2012; Xiaomei, 2004). By providing data on the physical and financial elements of environmental performance, it has been suggested EMA will provide information that can be used by corporate management to assess opportunities for economic and environmental improvement (Gale, 2006; Schaltegger and Burritt, 2000). With environmental degradation expected to maintain its prominence on both the national and international stage, it has become clear that failure to collect data on the environmental impacts associated with business operations will result in information that is insufficient to serve the needs of corporate management as they strive to meet the changing requirements of the contemporary marketplace (Jasch, 2003). The economic condition of the population is a condition that describes human life that has economic score (Shah et al, 2020). Economic growth is still an important goal in a country's economy, especially for developing countries like Indonesia (Magdalena and Suhatman, 2020).

While substantial effort has been devoted to normative arguments and commentary extolling the benefits to be obtained from the ‘greening’ of management accounting, a small but growing academic effort has been extended to investigating EMA in practice (Burritt, 2004; Ferreira et al., 2010). However, theoretical explanations for the current state of EMA development are still lacking (Bouma and van der Veen, 2002; Qian et al., 2011). Motivated by the need for theory informed explanations concerning EMA in practice, the present study offers an empirical survey-based project that seeks to extend current knowledge about the organisational characteristics behind EMA development. Specifically, Accounting Information System (AIS) design which is one of the most important organization characteristics will be discussed in this study.

The study of the accounting information system is one of the privileged themes in the field of research in management control and in management in general (Merchant and Van der Stede 2011). It is a vital tool in the organization which provides the necessary information used by professionals for effective decision making, planning, and control functions that ensure the competitiveness of the organizations (Saganuwan et al. 2013). Past research has uncovered that EMA is related to information system. To improve EMA practice, information system (IS) is one of the current solutions for evaluating, monitoring, and planning to manage the environment and performance, particularly in the manufacturing industry (Gimenez et al., 2015; Habidin et al., 2018a). stem. Stanciu et al. (2011) conducted research in Romania and indicated that EMAP is part of the practice in implementing environmental management accounting and it has a relationship with IS to address environmental issues. Furthermore, Mohd Fuzi et al (2020) revealed that there is a positive and direct significant relationship between Environmental Management Accounting Practice and Information System.

Nevertheless, accounting information system constitutes a subject of controversy mostly because of the absence of a universal definition and in the presence of mixed and contradictory results (Chapellier et al. 2013). Despite the increasing number of literatures on AIS, a sound theoretical foundation is still missing, which is also true for the concept of accounting information system itself in which the abovementioned past articles referred. For a better understanding of the accounting information system, this study use theory of structural and behavioral contingency adopted from a model developed by Ghorbel (2016).

In previous study by Ghorbel (2016), the factors that influence the design of the accounting information system in the Tunisian SMEs is identified through the characteristics of information, accounting management tools, and degree of formalism. The examination of structural contingency showed that there is a positive and significant effect of the firm's size on the degree of formalism. Besides, a positive and significant effect of the organizational structure on the characteristics of the accounting information systems was observed. Furthermore, investigating the behavioral contingency showed that the manager's profile affects in part the use of accounting management tools.

Through the adoption of the integrated contingency factors, the purpose of this research structured around the following questions: What is the effect of structural and behavioral contingency factors towards the design of the accounting information system? How are they impacting environmental management accounting practice in Indonesian organisations?

Few studies have examined the degree of EMA practice in the Indonesian context and, to our knowledge, there is no research involving all of these contingency factors influencing the design of the accounting information system and environmental management accounting in the same study.

Our study extends the AIS and EMA literature and can enrich the reflections and analyses of professional accountants in shedding light on the AIS. In addition, this work can assist managers and leaders to have a frame of reference and ameliorate their ability to understand and design a satisfactory accounting information system for their needs and then help them to improve the EMA practice.

This paper is structured as follows: Section 1 includes the theoretical framework and hypotheses. Section 2 shows materials and methods. In section 3, the results are presented. Section 4 contains the research discussion. Finally, the research implications and limitations as well as the future prospects are presented in the conclusion

II. Review of Literature

2.1 Environmental Management Accounting Practice

EMAP is to promote companies to adopt environmental practices for managing the issues related to the environment. It highlights that the EMAP can assist companies to manage the environmental issues in the organization. Additionally, EMAP provides the environmental information to increase and evaluate the performance (Fuji et al., 2019a). and can be used as a tool for better and efficient environmental management.

2.2 Accounting Information System

AIS is an IS that is designed and developed to achieve certain accounting, economic, and financial tasks. AIS assembles, stores, and processes financial data or resources using specific procedures to produce necessary financial information for its users to make their business decisions throughout all organizational levels (Agung, 2015). Onalapo and Odetayo (2012) indicate that a good AIS helps the entities to improve organizational effectiveness and performance by evaluating their past results and to plan future goals using the information analyzed and provided by AIS. This means that the AIS quality will significantly affect all stakeholders such as employees, management and so forth in making accurate and good decisions (Nurhidayati, Sensuse, & Noprisson, 2017). Therefore, the quality of AIS can be interpreted as the evaluation of its ability in providing useful outcomes that reach the decision-makers' information demands. The quality of AIS can be assessed by its effects on accounting information quality, the effectiveness of

internal controls, the enhancement of decision-making procedures and assessment of business performances (Nguyen & Nguyen, 2020). Without quality AIS, there will be no high-quality accounting information.

2.3 Contingency Theory

In this research, we mobilize the contingency theory which, despite the attributed criticisms, is always appropriate in the field of management. In fact, some research showed the potential influence of the structural and behavioral contingency factors on the accounting information system. Examples of these factors are the size (Ben Hamadi et al. 2014; Chapellier et al. 2013), the age of the firm (Ben Hamadi et al. 2014; Davila 2005; Lassoued and Abdelmoula 2006), the organizational structure (Hammad et al. 2013; Sisaye and Birnberg 2010), the uncertainty of environment (Chapellier et al. 2013; Hammad et al. 2013), the profile of manager (Ben Hamadi et al. 2014; Ngongang 2007), and the export (Chapellier et al. 2013; Chapellier and Mohammed 2010).

2.4 Contingency Factors and Accounting Information System Quality

a. Size of the Firm

The size of the firm appears to be an explanatory variable of design accounting information system in a SMI. It is considered a key factor in the structural contingency that explains and justifies the use of management control tools in SMI (Ben Hamadi et al. 2011; Chapellier and Ben Hamadi 2012; Ngongang 2013). The more a company grows, the more its accounting information system becomes complex (Ben Hamadi et al. 2011; Chapellier and Ben Hamadi 2012). Davila (2005) revealed that size is expected to be associated with the formalization of the result control. Larger firms tend to make greater use of more formal administrative controls, as opposed to informal procedures. Indeed, leaders can manage their business informally without the use of formal management tools, up to a certain point, but beyond that, the increasing size and complexity of the business will be difficult to manage; hence, the necessity of formalism. Merchant (1981) emphasized that the larger the business is, the more likely it prefers formal rather than informal management information systems. Additionally, Merchant (1984) considered that the size was positively related to the degree of formality in the use of a budgeting system.

Large firms have resources that enable them to adopt more sophisticated management accounting practices than small firms (Abdel-Kader and Luther 2008). Besides, Haldma and Lääts (2002) argue that the sophistication level of cost accounting and budgeting systems tends to increase in line with a firm's size. Therefore, if the size of the company increases, there is more diversification, complication, sophistication of management tools, and formalization of the accounting information system. Accordingly, we tested the two underlying hypotheses:

H1: There is a positive relationship between the Firm Size and Accounting Information System Quality.

H1a: Accounting Information System Quality mediates the relationship between Firm Size and Environmental Management Accounting Practices.

b. Age of Firm

Little research has focused on the relationship between the age of the firm and its accounting practices (Bonache et al. 2015). In this context, one of the asked questions is the difference between the accounting practices of the older organizations and those of the younger ones. The study of Davila (2005) showed the relevance of the age on the

management control systems. Actually, the results indicated that low age is associated with a dominance of rather informal control systems, while high age leads to rather formalized and mechanistic management control systems. For several authors, age evolving into more bureaucratic forms is often associated with the growth of the organization. Mintzberg (1982) explains that as the age of the firm increases, its behavior becomes formalized. The model of growth phases of Greiner (1972) revealed that the emergence of the management control systems will intervene after a number of years. During the first phase, the entrepreneurial organization is characterized by informal ties, whereas in the second phase, it is characterized by a more formalized and standardized structure. However, Holmes and Nicholls (1989) showed that the acquisition or the preparation of a relatively detailed level of accounting information decreases as the firm's age increases. They explained that in the early years of the company's existence, the manager is requesting information because it is a learning situation but that over time, this demand will fall before stabilizing. Therefore, we side with Mintzberg in his statements and hypothesize that:

H2: There is a positive relationship between the Firm Age and Accounting Information System Quality.

H2a: Accounting Information System mediates the relationship between Firm Age and Environmental Management Accounting Practices.

c. Organizational Structure

One of the more common operationalisations of structure in the management accounting literature is the mechanistic/organic continuum (Burns and Stalker 1961; Chenhall 2003; Christ and Burritt 2013). Burns and Stalker (1961) advocate that organizational efficiency and effectiveness would be best served by what they termed a mechanistic structure when the environmental conditions are stable. However, when the environmental conditions are uncertain or in a state of flux, an organic structure would produce superior results. Given the context of our study, we adopted the organic structure. Choe (1998) argues that organic structures have higher information processing capabilities and more interdependence among sub-units. Previous studies have demonstrated the relationship between organizational structure and the characteristics of the accounting information system (Chang et al. 2003;

Therefore, an SMI with an organic organizational structure needs more information. As a consequence, the following hypothesis is put forward:

H3: There is a positive relationship between the organicness of organization structure and Accounting Information System Quality.

H3a: Accounting Information System mediates the relationship between the organicness of organization structure and Environmental Management Accounting Practices.

d. Uncertainty of the Environment

The environment is a dominant contextual variable which is at the basis of contingency-based research. Perhaps the most widely researched aspect of the environment is uncertainty (Chenhall 2003). In fact, uncertainty of the environment makes managerial planning and control more difficult because of the unpredictability of future events (Burns and Stalker 1961; Chenhall and Morris 1986; Lawrence and Lorsch 1967).

SMEs operating in a dynamic and uncertain environment have an accounting information system more complex than SMEs operating in a simple and stable environment. Indeed, as environmental uncertainty increases, decision-makers seek more extensive and detailed accounting information for planning and control (Hammad et al. 2013). Merchant and Van der Stede (2011) advocate that uncertainty has powerful effects

on the management control system. Indeed, when uncertainty increases, the need to collect information also increases (Daft and Macintosh 1981; Daft and Lengel 1986). Chenhall and Morris (1986), Chia (1995) and Chong and Chong (1997) believe that the increase of perceived uncertainty of the environment leads to a high recourse of firms to external and non-financial information. Several authors (Chenhall and Morris 1986; Gordon and Narayanan 1984) showed that perceived uncertainty of the environment can be diminished if managers provide information on a wider scope.

Post and Epstein (1977) argue that their effective management is linked to the availability of adequate and timely information. On the other hand, Mintzberg (1973) found that managers were concerned not only by obtaining accurate and complete information, but also by having it quickly. Therefore, if the environment is uncertain and dynamic, managers need to have a useful broad scope, timely and aggregated information for the decision-making process. Hence, our hypothesis is as follows:

H4: There is a positive relationship between the environment uncertainty and Accounting Information System Quality.

H4a: Accounting Information System mediates the relationship between the environment uncertainty and Environmental Management Accounting Practices.

e. Profile of the Manager

The manager of a SME has a very strong influence on its management system (Lefebvre 1991) when she/he tends to personify the company (Coupal 1994). Actually, she/he is the most dominant actor (Affes and Chabchoub 2007). Her/his profile is identified like a balance sheet, a photo at a given moment when it is often explained by the personality, the training, the professional experience, and the membership in social networks (Bernard 2010). To study the profile of the manager, we should consider her/ his age, experience, and training. Davila (2005) found that the entrepreneur's age is relevant to explain the accounting information system. Some researchers found that the degree of using accounting data decreases as the leaders' age increases (Begon 1990).

Thus, in the light of the foregoing, the following hypotheses can be stated:

H5.1: The younger the manager is, the higher accounting information system is.

H5.2: The more experienced the manager is, the higher accounting information system is.

2.5 Accounting Information System Quality and Environmental Management Accounting Practice

Stanciu et al. (2011) conducted research in Romania and indicated that EMAP is part of the practice in implementing environmental management accounting and it has a relationship with IS to address environmental issues. Besides, AIS implementation can assist organizations to improve EMAP, especially for Malaysian manufacturing industry. Hence, EMAP is likely to be significantly related with IS for Malaysian manufacturing industry. AIS also provides technology that can be used in assessing environmental information to make decisions for Malaysian manufacturing industry. By implementing EMAP and IS, it can improve the environmental management accounting for Malaysian manufacturing industry to reduce the environmental issues. Based on the discussion above, the following hypothesis is formulated:

H6: There is a positive relationship between the Accounting Information System Quality and Environmental Management Accounting Practice.

Therefore, our conceptual model can be presented as follows (Figure 1).

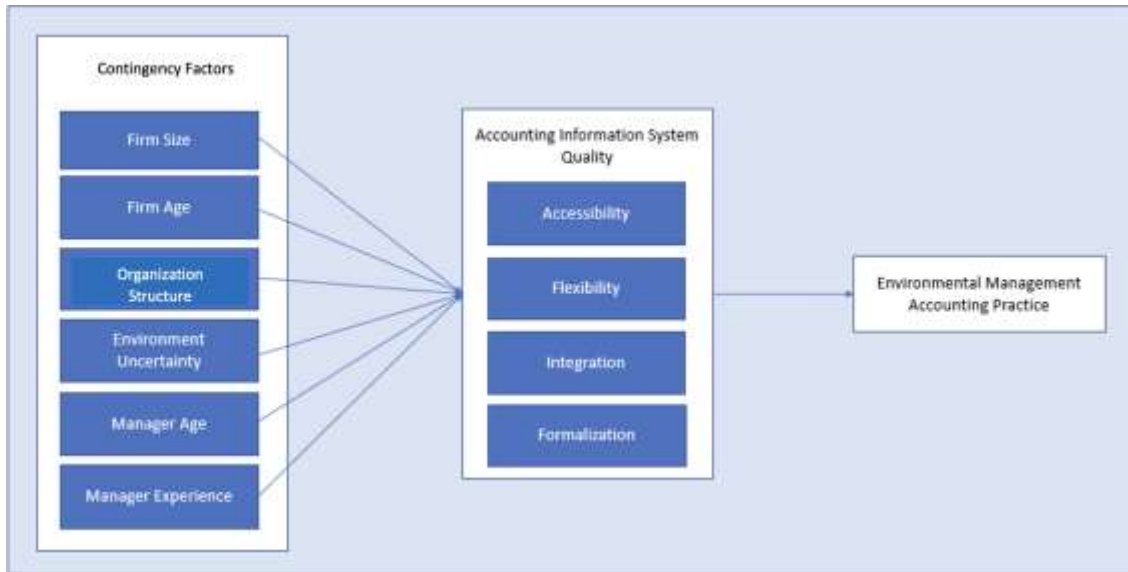


Figure 1. Research Framework

III. Research Method

The data for this study were collected through a survey technique, using an adopted and adapted instrument from previous studies to measure variables specified within the suggested framework.

Table 1. Operationalization of variables

| No | Variables | Measure |
|----|---|---|
| 1. | Size of firm (SIZE) | Number of employees |
| 2. | Age of firm (AGEF) | Number of years of existence |
| 3. | Organic organizational structure (STRU) | Items are measured on a Likert scale of 5 points adopted the work of Hage and Aiken (1969), Gordon and Narayanan (1984), Kalika (1987). |
| 4. | Uncertainty of the environment (ENVI) | Items are measured on a Likert scale of 5 points adopted the work of Govindarajan (1984). |
| 5. | Age of Manager (AGEM) | 20–30, 30–40, 40–50, 50–60, more than 60 years |
| 6. | Experience in the same business | EXP1: Experience 1: Number of years in this business: (<1 year, 1–3; 3–10, >10 years) |
| 7. | Experience in the different business | EXP2: Experience 2: Originally from experience: he has always worked in the current business or he has worked elsewhere |
| 8. | Accounting Information System Quality | Items were measured on a Likert scale of 5 points adopted the research instrument developed by Romney et al. (2018) |
| 9. | Environmental Management Accounting Practice (EMAP) | Items were measured on a Likert scale of 5 points adopted the research instrument developed by Ferreira et al. (2010) |

IV. Result and Discussion

4.1 Direct Hypotheses Testing

A partial least squares (PLS) analysis was used to test the research model and hypotheses. The PLS is a component-based structural equation modeling technique that simultaneously tests the psychometric properties of the scales used to measure the constructs (measurement model) and examine the strength of the relationships between the constructs (structural model). For this study, the PLS is suitable for the causal predictive analysis of complex relationships with multiple independent and dependent variables. The used sample size is relatively small (Hair et al. 2014) and does not require multivariate normal data (Chin 1998).

Figure 2 shows the results of the path analysis, which showed that the R² value was 0.646, suggesting that 64.6% of the variance in accounting information system quality can be explained by firm size, firm age, organization structure, environment uncertainty, age of manager and manager experience.

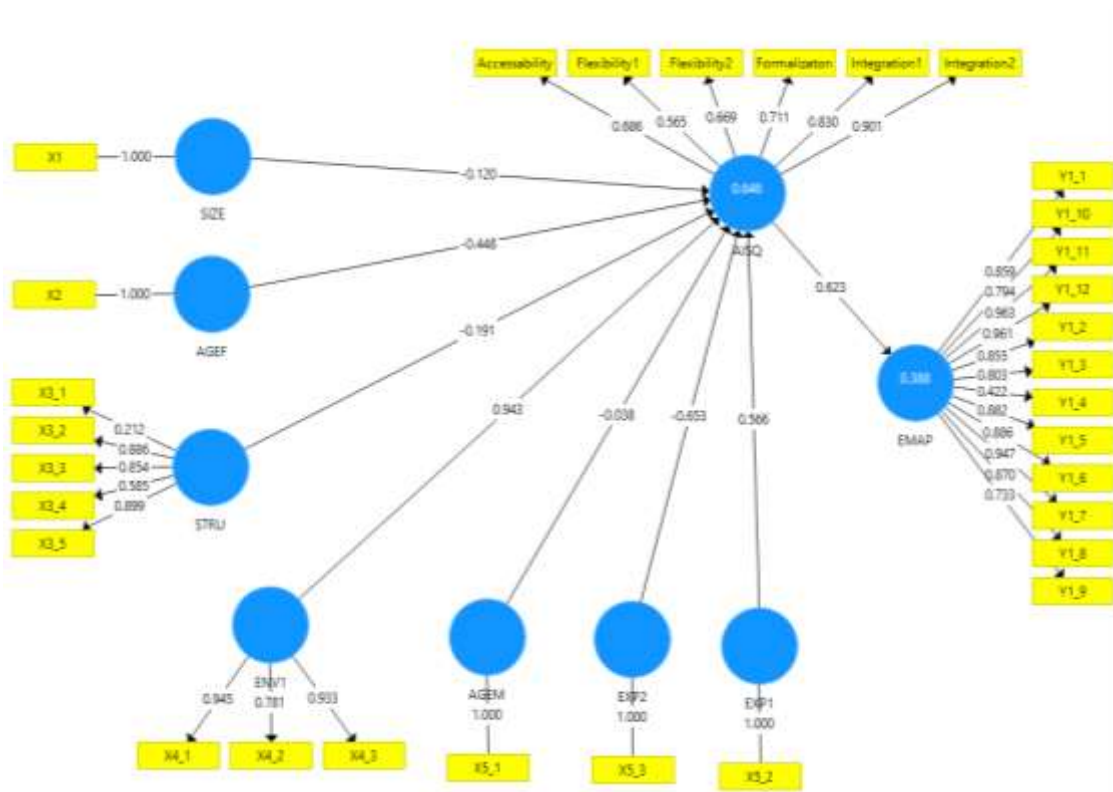


Figure 2. Result of Path Analysis

Based on the analysis shown in Table 3, H2, H4, H5.2, and H6 of this study are supported, whereas H1, H3, and H5.1 are not. H6 is supported by the R² value of 0.388, which suggests that 38.8% of the variance in environmental management accounting practice can be explained by the extent of accounting information system quality, and there is a positive relationship ($t = 14.365$, $p < 0.01$) between the extent of accounting information system quality and environmental management accounting practice. In this study, it was found that manager experience in different business is the most significant predictor of the extent of accounting information system quality, followed by environment uncertainty. At the same time, firm size, organization structure, and age of manager were measured with p values of 0.321, 0.329, 0.758. Thus, in this study H1, H3, and H5.1 are

not supported due to the weak correlation with accounting information system quality and environmental management accounting.

Table 3. Direct Relationship path coefficients and hypothesis

| Hypothesis | Description | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T Statistics (O/STDEV) | P Values |
|------------|--------------|---------------------|-----------------|----------------------------|--------------------------|----------|
| H1 | SIZE -> AISQ | -0.12 | -0.14 | 0.121 | 0.993 | 0.321 |
| H2 | AGEF -> AISQ | -0.448 | -0.4 | 0.116 | 3.867 | 0.000* |
| H3 | STRU -> AISQ | -0.191 | -0.22 | 0.196 | 0.977 | 0.329 |
| H4 | ENV1 -> AISQ | 0.943 | 0.954 | 0.188 | 5.019 | 0.000* |
| H5.1 | AGEM -> AISQ | -0.038 | -0.03 | 0.123 | 0.308 | 0.758 |
| H5.2 | EXP1 -> AISQ | 0.566 | 0.512 | 0.122 | 4.632 | 0.000* |
| H5.2 | EXP2 -> AISQ | -0.653 | -0.7 | 0.102 | 6.418 | 0.000* |
| H6 | AISQ -> EMAP | 0.623 | 0.632 | 0.043 | 14.365 | 0.000* |

*Supported

4.2 Mediation Test

To test the mediating effect of accounting information system quality (AISQ), a mediating variable was introduced into the relationship between contingent factors and environmental management accounting practice, as shown in Table 4. The analysis showed that contingent factors influence the AISQ, which is consistent with the argument of CT.

To further analyze the mediating factor's impact on the contingent factors, based on Hayes's (2009) bootstrapping analysis, the indirect effect showed that mediation happens from time to time, but not at the same time. The results (in Table 3) showed that the indirect effect ($\beta = 0.623$, t-value of 14.365) is significant, indicating that there is a mediating effect.

From the analysis (in Table 4), this study was able to demonstrate mediating effect of accounting information system towards relationship between firm age and EMAP ($t = 3.639$, $p < 0.01$); environmental uncertainty and EMAP ($t = 4.679$, $p < 0.01$); manager experience in the same business and EMAP ($t = 4.420$, $p < 0.01$); experience in different business and EMAP ($t = 6.142$, $p < 0.01$).

Table 4. Indirect/mediating Effects of AISQ

| Hypothesis | Description | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T Statistics (O/STDEV) | P Values |
|------------|------------------------------|---------------------|-----------------|----------------------------|--------------------------|----------|
| H1a | SIZE -> AISQ SIZE -> EMAP | -0.075 | -0.088 | 0.076 | 0.982 | 0.327 |
| H2a | AGEF -> AISQ AGEF -> EMAP | -0.279 | -0.255 | 0.077 | 3.639 | 0.000* |
| H3a | STRU -> AISQ STRU -> EMAP | -0.119 | -0.139 | 0.125 | 0.95 | 0.342 |

| | | | | | | |
|-------|-----------------|--------|--------|-------|-------|--------|
| | ENV1 -> AISQ | | | | | |
| H4a | ENV1 -> EMAP | 0.587 | 0.601 | 0.125 | 4.679 | 0.000* |
| | AGEM -> AISQ | | | | | |
| H5.1a | AGEM -> EMAP | -0.023 | -0.019 | 0.078 | 0.302 | 0.763 |
| | EXP1 -> AISQ | | | | | |
| H5.2a | EXP1 -> EMAP | 0.352 | 0.323 | 0.080 | 4.420 | 0.000* |
| | EXP2 -> AISQ | | | | | |
| H5.2a | EXP2 -> EMAP | -0.406 | -0.439 | 0.066 | 6.142 | 0.000* |
| | AISQ -> EMAP | | | | | |

4.3 Discussion

The primary purpose of this study was to identify the contingent factors that influence accounting information system quality and environmental management accounting practice. The current study found that firm age, environment uncertainty, and manager experience, have a significant relationship with AISQ and EMAP. Firstly, uncertain environment seems to be driving organization from having a high-quality accounting information system. Secondly, the firm age and manager experience are also important determinant in building accounting information system with better quality. Thirdly, it is found that it is also important to have accounting information system with good quality as it will ultimately determine the higher degree of environmental management accounting practice.

V. Conclusion

This study sought to investigate whether finance managers or accountants perceived the degree of EMA practice in organization in Jabodetabek area. Drawing on CT, a research framework was developed that incorporated the following contingent variables: firm size, firm age, organization structure, environment uncertainty, manager age, and manager experience. Overall, the quantitative research showed that the organizations in Jabodetabek are aware of the implementation of accounting information system quality and the environmental management accounting, regardless of the company size, organization structure, and manager age. Furthermore, the implementation of good accounting information system leads to better adoption in environmental management accounting.

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6 Contingent Factors that Influence the Accounting Information System Quality and Environmental Management Accounting Adoption among Companies in Indonesia

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Abstract

Environmental management accounting has received increasing interest in recent years. However, despite increasing interest, reference concerning the current state of environmental management accounting development remain scarce. The objective of the research presented here is to extend current knowledge by investigating whether accounting information system design could be used to develop a greater understanding of environmental management accounting use by Indonesian organisations. A research framework was developed from contingency theory to identify the circumstances under which organisations were more likely to develop a sophisticated accounting information system design and ultimately to investigate its impact to environmental management accounting activities. In order to test this framework, a web-based survey of Indonesian accountants in business was conducted. This research exploits the quantitative research methodology to understand the relationship between contingent factors, which are firm size, firm age, organizational structure, uncertainty environment, and manager profile that influence accounting information system design and environmental management accounting practice among various companies in Indonesia. The survey was conducted on companies located in Jabodetabek area. 100 questionnaires were received from various companies and the finding highlights that the firm age, environment uncertainty, and manager experience significantly affect accounting information system quality and environmental management accounting practice. In light of the results, it would also be valuable to employ qualitative research methods and attempt to develop a deeper understanding as to why such lack of engagement is the case.

Keywords

accounting information system;
contingency factors;
environmental management
accounting practices; Indonesia.



1. Introduction

5
As the business world endeavours to respond to increasing pressure from various stakeholders to reduce the impact of its activities on the physical environment, the need for new techniques to assist managers in meeting the challenge of environmental sustainability becomes apparent. One method suggested as being able to align corporate activities with the environmental agenda more closely is Environmental Management Accounting (EMA). EMA incorporates a few techniques and tools designed to assist organisations in recognising and managing their environmental impacts. These tools include but are not limited to environmental cost accounting; full cost accounting; life-cycle costing; environmental life-cycle budgeting; environmental capital investment appraisal; total

quality environmental management; and material and energy flow accounting (Schaltegger et al., 2012; Yakhou and Dorweiler, 2004).

EMA provides a pragmatic response to criticism that conventional management accounting has failed in its ability to provide explicit consideration of environmental issues with environmental costs frequently 'hidden' in general overhead accounts and potential environmental benefits often downplayed or ignored (Jasch, 2003; Papaspyropoulos et al., 2012; Xiaomei, 2004). By providing data on the physical and financial elements of environmental performance, it has been suggested EMA will provide information that can be used by corporate management to assess opportunities for economic and environmental improvement (Gale, 2006; Schaltegger and Burritt, 2000). With environmental degradation expected to maintain its prominence both the national and international stage, it has become clear that failure to collect data on the environmental impacts associated with business operations will result in information that is insufficient to serve the needs of corporate management as they strive to meet the changing requirements of the contemporary marketplace (Jasch, 2003). The economic condition of the population is a condition that describes human life that has economic score (Shah et al, 2020). Economic growth is still an important goal in a country's economy, especially for developing countries like Indonesia (Magdalena and Suhatman, 2020).

While substantial effort has been devoted to normative arguments and commentary extolling the benefits to be obtained from the 'greening' of management accounting, a small but growing academic effort has been extended to investigating EMA in practice (Burritt, 2004; Ferreira et al., 2010). However, theoretical explanations for the current state of EMA development are still lacking (Bouma and van der Veen, 2002; Qian et al., 2011). Motivated by the need for theory informed explanations concerning EMA in practice, the present study offers an empirical survey-based project that seeks to extend current knowledge about the organisational characteristics behind EMA development. Specifically, Accounting Information System (AIS) design which is one of the most important organization characteristics will be discussed in this study.

The study of the accounting information system is one of the privileged themes in the field of research in management control and in management in general (Merchant and Van der Stede, 2011). It is a vital tool in the organization which provides the necessary information used by professionals for effective decision making, planning, and control functions that ensure the competitiveness of the organizations (Saganuwan et al. 2013). Past research has uncovered that EMA is related to information system. To improve EMA practice, information system (IS) is one of the current solutions for evaluating, monitoring, and planning to manage the environment and performance, particularly in the manufacturing industry (Gimenez et al., 2015; Habidin et al., 2018a). Stanciu et al. (2011) conducted research in Romania and indicated that EMAP is part of the practice in implementing environmental management accounting and it has a relationship with IS to address environmental issues. Furthermore, Mohd Fuzi et al (2020) revealed that there is a positive and direct significant relationship between Environmental Management Accounting Practice and Information System.

Nevertheless, accounting information system constitutes a subject of controversy mostly because of the absence of a universal definition and in the presence of mixed and contradictory results (Chapellier et al. 2013). Despite the increasing number of literatures on AIS, a sound theoretical foundation is still missing, which is also true for the concept of accounting information system itself in which the abovementioned past articles referred. For a better understanding of the accounting information system, this study use theory of structural and behavioral contingency adopted from a model developed by Ghorbel (2016).

In previous study by Ghorbel (2016), the factors that influence the design of the accounting information system in the Tunisian SMEs is identified through the characteristics of information, accounting management tools, and degree of formalism. The examination of structural contingency showed that there is a positive and significant effect of the firm's size on the degree of formalism. Besides, a positive and significant effect of the organizational structure on the characteristics of the accounting information systems was observed. Furthermore, investigating the behavioral contingency showed that the manager's profile affects in part the use of accounting management tools.

Through the adoption of the integrated contingency factors, the purpose of this research structured around the following questions: What is the effect of structural and behavioral contingency factors towards the design of the accounting information system? How are they impacting environmental management accounting practice in Indonesian organisations?

Few studies have examined the degree of EMA practice in the Indonesian context and, to our knowledge, there is no research involving all of these contingency factors influencing the design of the accounting information system and environmental management accounting in the same study.

Our study extends the AIS and EMA literature and can enrich the reflections and analyses of professional accountants in shedding light on the AIS. In addition, this work can assist managers and leaders to have a frame of reference and ameliorate their ability to understand and design a satisfactory accounting information system for their needs and then help them to improve the EMA practice.

This paper is structured as follows: Section 1 includes the theoretical framework and hypotheses. Section 2 shows materials and methods. In section 3, the results are presented. Section 4 contains the research discussion. Finally, the research implications and limitations as well as the future prospects are presented in the conclusion

II. Review of Literature

2.1 Environmental Management Accounting Practice

EMAP is to promote companies to adopt environmental practices for managing the issues related to the environment. It highlights that the EMAP can assist companies to manage the environmental issues in the organization. Additionally, EMAP provides the environmental information to increase and evaluate the performance (Fuji et al., 2019a), and can be used as a tool for better and efficient environmental management.

2.2 Accounting Information System

AIS is an IS that is designed and developed to achieve certain accounting, economic, and financial tasks. AIS assembles, stores, and processes financial data or resources using specific procedures to produce necessary financial information for its users to make their business decisions throughout all organizational levels (Agung, 2015). Onalapo and Odetayo (2012) indicate that a good AIS helps the entities to improve organizational effectiveness and performance by evaluating their past results and to plan future goals using the information analyzed and provided by AIS. This means that the AIS quality will significantly affect all stakeholders such as employees, management and so forth in making accurate and good decisions (Nurhidayati, Sensuse, & Noprisson, 2017). Therefore, the quality of AIS can be interpreted as the evaluation of its ability in providing useful outcomes that reach the decision-makers' information demands. The quality of AIS can be assessed by its effects on accounting information quality, the effectiveness of

internal controls, the enhancement of decision-making procedures and assessment of business performances (Nguyen & Nguyen, 2020). Without quality AIS, there will be no high-quality accounting information.

2.3 Contingency Theory

In this research, we mobilize the contingency theory which, despite the attributed criticisms, is always appropriate in the field of management. In fact, some research showed the potential influence of the structural and behavioral contingency factors on the accounting information system. Examples of these factors are the size (Ben Hamadi et al. 2014; Chapellier et al. 2013), the age of the firm (Ben Hamadi et al. 2014; Davila 2005; Lassoued and Abdelmoula 2006), the organizational structure (Hammad et al. 2013; Sisaye and Birnberg 2010), the uncertainty of environment (Chapellier et al. 2013; Hammad et al. 2013), the profile of manager (Ben Hamadi et al. 2014; Ngongang 2007), and the export (Chapellier et al. 2013; Chapellier and Mohammed 2010).

2.4 Contingency Factors and Accounting Information System Quality

a. Size of the Firm

The size of the firm appears to be an explanatory variable of design accounting information system in a SMI. It is considered a key factor in the structural contingency that explains and justifies the use of management control tools in SMI (Ben Hamadi et al. 2011; Chapellier and Ben Hamadi 2012; Ngongang 2013). The more a company grows, the more its accounting information system becomes complex (Ben Hamadi et al. 2011; Chapellier and Ben Hamadi 2012). Davila (2005) revealed that size is expected to be associated with the formalization of the result control. Larger firms tend to make greater use of more formal administrative controls, as opposed to informal procedures. Indeed, leaders can manage their business informally without the use of formal management tools, up to a certain point, but beyond that, the increasing size and complexity of the business will be difficult to manage; hence, the necessity of formalism. Merchant (1981) emphasized that the larger the business is, the more likely it prefers formal rather than informal management information systems. Additionally, Merchant (1984) considered that the size was positively related to the degree of formality in the use of a budgeting system.

Large firms have resources that enable them to adopt more sophisticated management accounting practices than small firms (Abdel-Kader and Luther 2008). Besides, Haldma and Lääts (2002) argue that the sophistication level of cost accounting and budgeting systems tends to increase in line with a firm's size. Therefore, if the size of the company increases, there is more diversification, complication, sophistication of management tools, and formalization of the accounting information system. Accordingly, we tested the two underlying hypotheses:

H1: There is a positive relationship between the Firm Size and Accounting Information System Quality.

H1a: Accounting Information System Quality mediates the relationship between Firm Size and Environmental Management Accounting Practices.

b. Age of Firm

Little research has focused on the relationship between the age of the firm and its accounting practices (Bonache et al. 2015). In this context, one of the asked questions is the difference between the accounting practices of the older organizations and those of the younger ones. The study of Davila (2005) showed the relevance of the age on the

management control systems. Actually, the results indicated that low age is associated with a dominance of rather informal control systems, while high age leads to rather formalized and mechanistic management control systems. For several authors, age evolving into more bureaucratic forms is often associated with the growth of the organization. Mintzberg (1982) explains that as the age of the firm increases, its behavior becomes formalized. The model of growth phases of Greiner (1972) revealed that the emergence of the management control systems will intervene after a number of years. During the first phase, the entrepreneurial organization is characterized by informal ties, whereas in the second phase, it is characterized by a more formalized and standardized structure. However, Holmes and Nicholls (1989) showed that the acquisition or the preparation of a relatively detailed level of accounting information decreases as the firm's age increases. They explained that in the early years of the company's existence, the manager is requesting information because it is a learning situation but that over time, this demand will fall before stabilizing. Therefore, we agree with Mintzberg in his statements and hypothesize that:

H2: There is a positive relationship between the Firm Age and Accounting Information System Quality.

H2a: Accounting Information System mediates the relationship between Firm Age and Environmental Management Accounting Practices.

c. Organizational Structure

One of the more common operationalisations of structure in the management accounting literature is the mechanistic/organic continuum (Burns and Stalker 1961; Chenhall 2003; Christ and Burritt 2013). Burns and Stalker (1961) advocate that organizational efficiency and effectiveness would be best served by what they termed a mechanistic structure when the environmental conditions are stable. However, when the environmental conditions are uncertain or in a state of flux, an organic structure would produce superior results. Given the context of our study, we adopted the organic structure. Choe (1998) argues that organic structures have higher information processing capabilities and more interdependence among sub-units. Previous studies have demonstrated the relationship between organizational structure and the characteristics of the accounting information system (Chang et al. 2003;

Therefore, an SME with an organic organizational structure needs more information. As a consequence, the following hypothesis is put forward:

H3: There is a positive relationship between the organicness of organization structure and Accounting Information System Quality.

H3a: Accounting Information System mediates the relationship between the organicness of organization structure and Environmental Management Accounting Practices.

d. Uncertainty of the Environment

The environment is a dominant contextual variable which is at the basis of contingency-based research. Perhaps the most widely researched aspect of the environment is uncertainty (Chenhall 2003). In fact, uncertainty of the environment makes managerial planning and control more difficult because of the unpredictability of future events (Burns and Stalker 1961; Chenhall and Morris 1986; Lawrence and Lorsch 1967).

SMEs operating in a dynamic and uncertain environment have an accounting information system more complex than SMEs operating in a simple and stable environment. Indeed, as environmental uncertainty increases, decision-makers seek more extensive and detailed accounting information for planning and control (Hammad et al. 2013). Merchant and Van der Stede (2011) advocate that uncertainty has powerful effects

on the management control system. Indeed, when uncertainty increases, the need to collect information also increases (Daft and Macintosh 1981; Daft and Lengel 1986). Chenhall and Morris (1986), Chia (1995) and Chong and Chong (1997) believe that the increase of perceived uncertainty of the environment leads to a high recourse of firms to external and non-financial information. Several authors (Chenhall and Morris 1986; Gordon and Narayanan 1984) showed that perceived uncertainty of the environment can be diminished if managers provide information on a wider scope.

Post and Epstein (1977) argue that their effective management is linked to the availability of adequate and timely information. On the other hand, Mintzberg (1973) found that managers were concerned not only by obtaining accurate and complete information, but also by having it quickly. Therefore, if the environment is uncertain and dynamic, managers need to have a useful broad scope, timely and aggregated information for the decision-making process. Hence, our hypothesis is as follows:

H4: There is a positive relationship between the environment uncertainty and Accounting Information System Quality.

H4a: Accounting Information System mediates the relationship between the environment uncertainty and Environmental Management Accounting Practices.

e. Profile of the Manager

The manager of a SME has a very strong influence on its management system (Lefebvre 1991) when she/he tends to personify the company (Coupal 1994). Actually, she/he is the most dominant actor (Affes and Chabchoub 2007). Her/his profile is identified like a balance sheet, a photo at a given moment when it is often explained by the personality, the training, the professional experience, and the membership in social networks (Bernard 2010). To study the profile of the manager, we should consider her/ his age, experience, and training. Davila (2005) found that the entrepreneur's age is relevant to explain the accounting information system. Some researchers found that the degree of using accounting data decreases as the leaders' age increases (Begon 1990).

Thus, in the light of the foregoing, the following hypotheses can be stated:

H5.1: The younger the manager is, the higher accounting information system is.

H5.2: The more experienced the manager is, the higher accounting information system is.

2.5 Accounting Information System Quality and Environmental Management Accounting Practice

Stanciu et al. (2011) conducted research in Romania and indicated that EMAP is part of the practice in implementing environmental management accounting and it has a relationship with IS to address environmental issues. Besides, AIS implementation can assist organizations to improve EMAP, especially for Malaysian manufacturing industry. Hence, EMAP is likely to be significantly related with IS for Malaysian manufacturing industry. AIS also provides technology that can be used in assessing environmental information to make decisions for Malaysian manufacturing industry. By implementing EMAP and IS, it can improve the environmental management accounting for Malaysian manufacturing industry to reduce the environmental issues. Based on the discussion above, the following hypothesis is formulated:

H6: There is a positive relationship between the Accounting Information System Quality and Environmental Management Accounting Practice.

Therefore, our conceptual model can be presented as follows (Figure 1).

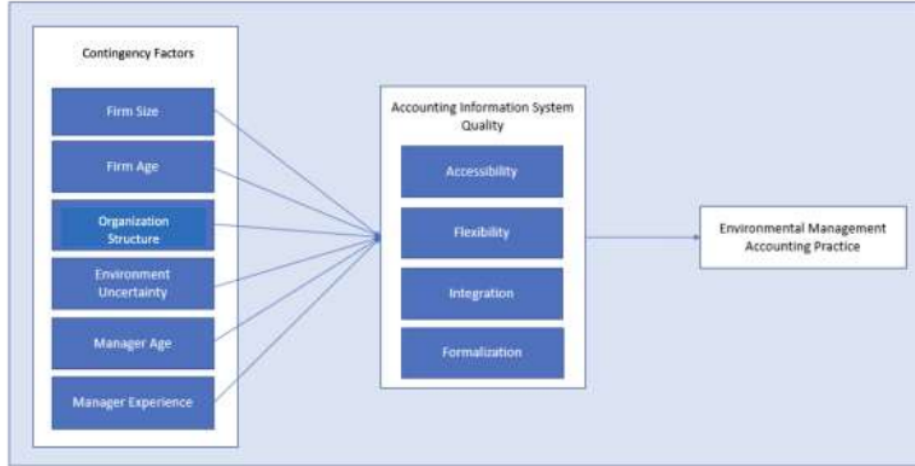


Figure 1. Research Framework

III. Research Method

¹ The data for this study were collected through a survey technique, using an adopted and adapted instrument from previous studies to measure variables specified within the suggested framework.

Tabel 1. Operationalization of variables

| No | Variables | Measure |
|----|---|---|
| 1. | Size of firm (SIZE) | Number of employees |
| 2. | Age of firm (AGEF) | Number of years of existence |
| 3. | Organic organizational structure (STRU) | Items are measured on a Likert scale of 5 points adopted the work of Hage and Aiken (1969), Gordon and Narayanan (1984), Kalika (1987). |
| 4. | Uncertainty of the environment (ENVI) | Items are measured on a Likert scale of 5 points adopted the work of Govindarajan (1984). |
| 5. | Age of Manager (AGEM) | 20–30, 30–40, 40–50, 50–60, more than 60 years |
| 6. | Experience in the same business | EXP1: Experience 1: Number of years in this business: (<1 year, 1–3; 3–10, >10 years) |
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IV. Result and Discussion

4.1 Direct Hypotheses Testing

A partial least squares (PLS) analysis was used to test the research model and hypotheses. The PLS is a component-based structural equation modeling technique that simultaneously tests the psychometric properties of the scales used to measure the constructs (measurement model) and examine the strength of the relationships between the constructs (structural model). For this study, the PLS is suitable for the causal predictive analysis of complex relationships with multiple independent and dependent variables. The used sample size is relatively small (Hair et al. 2014) and does not require multivariate normal data (Chin 1997).

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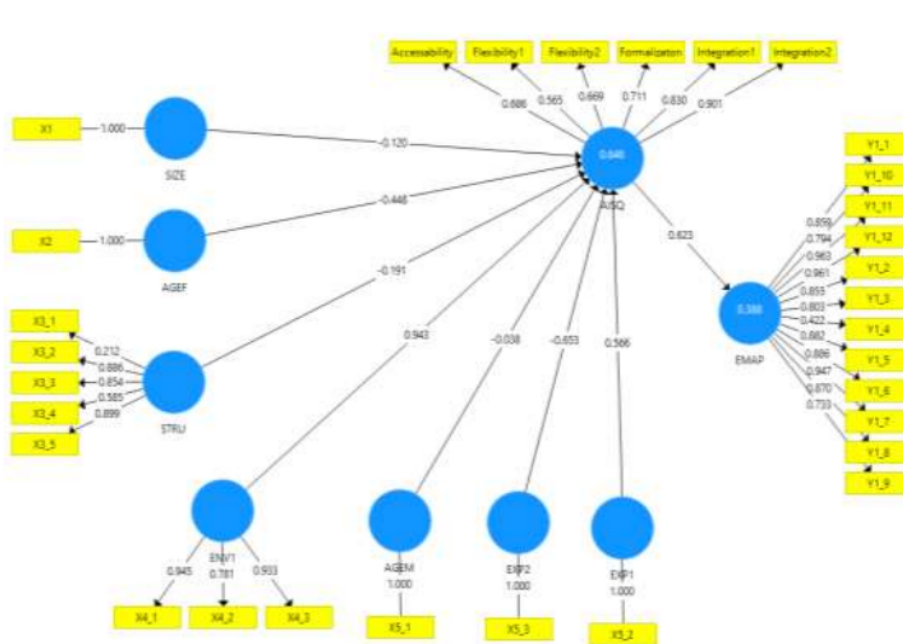


Figure 2. Result of Path Analysis

Based on the analysis shown in Table 3, H2, H4, H5.2, and H6 of this study are supported, whereas H1, H3, and H5.1 are not. H6 is supported by the R2 value of 0.388, which suggests that 38.8% of the variance in environmental management accounting practice can be explained by the extent of accounting information system quality, and there is a positive relationship ($t = 14.365$, $p < 0.01$) between the extent of accounting information system quality and environmental management accounting practice. In this study, it was found that manager experience in different business is the most significant predictor of the extent of accounting information system quality, followed by environment uncertainty. At the same time, firm size, organization structure, and age of manager were measured with p values of 0.321, 0.329, 0.758. Thus, in this study H1, H3, and H5.1 are

not supported due to the weak correlation with accounting information system quality and environmental management accounting.

Table 3. Direct Relationship path coefficients and hypothesis

| Hypothesis | Description | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T Statistics (O/STDEV) | P Values |
|------------|--------------|---------------------|-----------------|----------------------------|------------------------|----------|
| H1 | SIZE -> AISQ | -0.12 | -0.14 | 0.121 | 0.993 | 0.321 |
| H2 | AGEF -> AISQ | -0.448 | -0.4 | 0.116 | 3.867 | 0.000* |
| H3 | STRU -> AISQ | -0.191 | -0.22 | 0.196 | 0.977 | 0.329 |
| H4 | ENV1 -> AISQ | 0.943 | 0.954 | 0.188 | 5.019 | 0.000* |
| H5.1 | AGEM -> AISQ | -0.038 | -0.03 | 0.123 | 0.308 | 0.758 |
| H5.2 | EXP1 -> AISQ | 0.566 | 0.512 | 0.122 | 4.632 | 0.000* |
| H5.2 | EXP2 -> AISQ | -0.653 | -0.7 | 0.102 | 6.418 | 0.000* |
| H6 | AISQ -> EMAP | 0.623 | 0.632 | 0.043 | 14.365 | 0.000* |

*Supported

4.2 Mediation Test

To test the mediating effect of accounting information system quality (AISQ), a mediating variable was introduced into the relationship between contingent factors and environmental management accounting practice, as shown in Table 4. The analysis showed that contingent factors influence the AISQ, which is consistent with the argument of CT.

To further analyze the mediating factor's impact on the contingent factors, based on Hayes's (2009) bootstrapping analysis, the indirect effect showed that mediation happens from time to time, but not at the same time. The results (in Table 3) showed that the indirect effect ($\beta = 0.623$, t-value of 14.365) is significant, indicating that there is a mediating effect.

From the analysis (in Table 4), this study was able to demonstrate mediating effect of accounting information system towards relationship between firm age and EMAP ($t = 3.639$, $p < 0.01$); environmental uncertainty and EMAP ($t = 4.679$, $p < 0.01$); manager experience in the same business and EMAP ($t = 4.420$, $p < 0.01$); experience in different business and EMAP ($t = 6.142$, $p < 0.01$).

Table 4. Direct/mediating Effects of AISQ

| Hypothesis | Description | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T Statistics (O/STDEV) | P Values |
|------------|------------------------------|---------------------|-----------------|----------------------------|------------------------|----------|
| H1a | SIZE -> AISQ SIZE -> EMAP | -0.075 | -0.088 | 0.076 | 0.982 | 0.327 |
| H2a | AGEF -> AISQ AGEF -> EMAP | -0.279 | -0.255 | 0.077 | 3.639 | 0.000* |
| H3a | STRU -> AISQ STRU -> EMAP | -0.119 | -0.139 | 0.125 | 0.95 | 0.342 |

| | | | | | | |
|-------|---|--------|--------|-------|-------|--------|
| H4a | ENV1 -> AISQ ENV1 -> EMAP AGEM -> AISQ | 0.587 | 0.601 | 0.125 | 4.679 | 0.000* |
| H5.1a | AGEM -> EMAP EXP1 -> AISQ | -0.023 | -0.019 | 0.078 | 0.302 | 0.763 |
| H5.2a | EXP1 -> EMAP EXP2 -> AISQ | 0.352 | 0.323 | 0.080 | 4.420 | 0.000* |
| H5.2a | EXP2 -> EMAP AISQ -> EMAP | -0.406 | -0.439 | 0.066 | 6.142 | 0.000* |

4.3 Discussion

The primary purpose of this study was to identify the contingent factors that influence accounting information system quality and environmental management accounting practice. The current study found that firm age, environment uncertainty, and manager experience, have a significant relationship with AISQ and EMAP. Firstly, uncertain environment seems to be driving organization from having a high-quality accounting information system. Secondly, the firm age and manager experience are also important determinant in building accounting information system with better quality. Thirdly, it is found that it is also important to have accounting information system with good quality as it will ultimately determine the higher degree of environmental management accounting practice.

V. Conclusion

This study sought to investigate whether finance managers or accountants perceived the degree of EMA practice in organization in Jabodetabek area. Drawing on CT, a research framework was developed that incorporated the following contingent variables: firm size, firm age, organization structure, environment uncertainty, manager age, and manager experience. Overall, the quantitative research showed that the organizations in Jabodetabek are aware of the implementation of accounting information system quality and the environmental management accounting, regardless of the company size, organization structure, and manager age. Furthermore, the implementation of good accounting information system leads to better adoption in environmental management accounting.

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