Environmental management accounting, board role performance, company characteristics and environmental performance disclosure

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Abstract

Purpose – The increasing environmental challenges require efforts to expand the scope of accounting to better evaluate organizations' behaviour/practices. This paper aims to report the results of studying the link between environmental management accounting (EMA), board role performance (BRP), company characteristics and environmental performance disclosure (EPD) of Ugandan manufacturing firms.

Design/methodology/approach – The study was correlational and cross-sectional. The results are obtained through content analysis of company reports, websites and a questionnaire survey of 102 large and medium manufacturing firms in four districts of Uganda.

Findings – Results indicate that EMA causes significant variances in EPD in manufacturing firms. Also, BRP and firm size explain variances in EPD through EMA.

Research limitations/implications – The research does not control for industry type. Still, the results offer hope on how the reliability of environmental performance information that companies voluntarily provide outside financial statements, can be improved.

Originality/value – Results potentially extend available literature by providing a mechanism through which the environmental performance information is obtained for onward disclosure.

Keywords Disclosure, Firm characteristics, Environmental management accounting, Board role performance

Paper type Research paper

1. Introduction

The increasing environmental challenges call for efforts to expand the scope of accounting for better evaluation of an organization's behaviour/practices. In manufacturing companies, disclosure of information about the economic effects of their activities on the environment is crucial (Bewley and Li, 2000) because major industrial incidents such as the 2010 British Petroleum Gulf of Mexico disaster (Tripod Incident Analyses, 2010) have highlighted their innate impact on the environment. Locally, Uganda's Second National Development Plan 2015/2016 – 2019/2020 indicates that due to industrialization, pollution levels are increasing and the National Environmental Management Authority (NEMA) of Uganda regulates

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environmental issues. However, as Uganda confronts with what Ullmann (1976) called dual tasks of economic development and environmental protection, at its infancy in industrialization may, arguably, be concerned with growth regardless of second-order consequences and, unless there is environmental performance disclosure (EPD) so that informed corrective actions are undertaken, this is worrisome.

Available studies show that industry sensitivity, firm size and age (Welbeck *et al.*, 2017), large-sized and older firms with multinational operations and belonging to Software, IT, Oil and Gas (Bhatia and Tuli, 2017), external pressures acting as motivators and internal controls acting as facilitators (Nazari *et al.*, 2015) and political exposure, news coverage and higher pollution propensity (Bewley and Li, 2000) are related with environmental disclosure. According to Clarkson *et al.* (2008), environmental accounting research literature falls into three broad groups: that examining the value relevance of corporate environmental performance information, that examining factors affecting managerial decisions to disclose potential environmental liabilities and, that which explores the connection between environmental disclosures and environmental performance. Nazari *et al.* (2015) have documented inconsistent findings in this third group of literature. The inconsistences call for use of EPD, which this study considers more direct in observing how companies are protecting the environment and potentially avoids the endogeneity problem occasioned by a loop of causality between environmental reporting and performance. Studies focusing on firm performance generally rather than specific environmental performance miss the view that firms' performance specific to the environment has to be disclosed for better decision-making, hence, EPD. Therefore, EPD should be compounded of the terms "environmental disclosure" and "performance" as there cannot be meaningful environmental disclosure without environmental performance.

Furthermore, literature does not show how or by what means environmental performance information is generated in companies in spite of mounting pressure for firms to provide it (Nazari *et al.*, 2015). Literature seemingly assumes that the current financial accounting system robustly captures environmental performance information, and hence disclosure. We know that the importance of systems tracking organizational activities' effects on the environment dates from Ullmann's (1976) proposal for a corporate environmental accounting system. However, prevailing accounting and financial systems in delivering EPD are considered inadequate (Gray and Bebbington, 2000) as firms pursue growth, profit and traditional measures of success. Current EPDs appear to have no significant financial impact (Eugénio *et al.*, 2013). Similar to Bewley and Li, (2000), this study's position is that faced with growing environmental problems, regulators (e.g. NEMA), investors and the general public require assessing firms' environmental performance predicated on EPD.

Drawing on contingency theory (Thomas, 1986, 1991) legitimacy and stakeholder theory (Patten, 2002) and voluntary (discretionary) disclosure/proprietary cost theory (Dye, 1985; Verrecchia, 1983; Lang and Lundholm, 1993) and complementing on Nazari *et al.* (2015) work on sustainability reporting, this study examines the impact of internal facilitators such as board role performance (BRP), environmental management accounting (EMA) and company characteristics on EPD in Uganda's manufacturing companies. Contingency theory postulates that company financial reporting systems are affected by four contingent variables: societal, environmental, organizational structure and user characteristics, hence choosing accounting and disclosure practices are predicated on an internal process and structure that is influenced by outside contingencies. Internally, for example, the boards of directors pay attention to increased concerns over climate change, decreased natural resources and increased pressure from regulators, customers, investors and environmental

stakeholders (Dixon-Fowler *et al.*, 2015). In the Ugandan context, one primary source of increased pressure on boards is the enactment of the National Environmental Management Authority (NEMA), Act of 2019 that regulates environmental issues and so manufacturing firms' EPD are likely to be contingent upon this external variable in Uganda.

Legitimacy theory and stakeholder theory (Patten, 2002), predict a positive association between BRP and EPD and also that of EMA (system) with EPD. There is mounting evidence that firms are managing and reporting their greenhouse gas emissions voluntarily to signal their green credentials (Rankin *et al.*, 2011; Peters and Romi, 2014; Tauringana and Chithambo, 2014). The ethical branch of stakeholder theory indicates that regardless of the stakeholder power, all the stakeholders have similar rights to be treated fairly by an organization (Deegan, 2009). Apparently, the ethical perspective of stakeholder theory is grounded in critical accounting theory which is largely concerned with the approach to accounting research that focuses on the role of accounting or on the particular accounting method that should be used. Therefore, the observed level and pattern of voluntary disclosure can be found to be consistent with the ethical branch of stakeholder theory; and to be influenced strongly by the existence of an EMA system in a manufacturing company. The understandings that emerge potentially inform efforts aimed at improving the level, quantity and scope of disclosures of environmental performance. Legitimacy and stakeholder theories suggest that support for EMA (system) and EPD proclivity of firms is a function of social pressures facing the organization. Environmental issues affect everyone. Those charged with governance have a duty to disclose environmental performance to all stakeholders (Freeman, 1984), and therefore BRP is a positive element in EPD function. Also, manufacturing firms need to inform the public of their activities by providing sufficient EPD to improve overall public image and vindicated continued existence (Mousa and Hassan, 2015). This normative perspective provides a justification of why companies engaged in activities that affect the environment should disclose environmental performance information (Sharma, 2013). A company coveting legitimation might need a system that generates reliable environmental performance information for disclosure purposes.

Voluntary (discretionary) disclosure/proprietary cost theory (Dye, 1985; Verrecchia, 1983; Lang and Lundholm, 1993) predicts a positive association between company characteristics and EPD in the sense that companies limit disclosure of relevant information because of disclosure-related costs (e.g. preparation and competitive). In terms of company characteristics, it is, for example, hypothesized in the literature that larger companies have many financial analysts and other parties interested in their results, hence, the pressure on companies to release information is stronger (Schipper, 1991). Moreover, advantages a larger company enjoys relative to smaller companies incentivize the voluntariness in disclosure of information (see Prencipe, 2004 for explication of these advantages). Thus, company characteristics that induce lower proprietary costs, as a consequence, will have lower incentives to withhold information. In the context of this study, the notion is that large firms, for example, will point to unprejudiced environmental performance indicators which are difficult to mimic by smaller firms because they are unable to invest in EMA (systems) that potentially generate the information.

It can be believed that EPD can make manufacturing companies more accountable for their actions. Such a belief is accentuated by ontological assumptions that suggest that EPD will reveal the truth about organizations and that accountability will follow naturally from the unmediated EPD (manufacturing firms' truth). However, this hypothesis can be problematic in EPD (Dillard and Vinnari, 2019) because the production of EPD to fulfil demands for transparency can be partial and consequential. This study then tests another

hypothesis: for manufacturing firms to be accountable, some form of responsible action must precede EPD. One of those actions to take might be investments in and usage of EMA – an action required of a board performing dully its roles and firms leveraging on their characteristics such as size. Dear reader, the examination of the impact of internal facilitators such as BRP, EMA and company characteristics on EPD in Uganda's manufacturing companies has adduced implications as in Section 5 which, when conflated, the results offer hope on how the reliability of environmental performance information that companies voluntarily provide outside of the financial statements, can be improved.

This paper's remainder proceeds as follows: Section 2 is a literature review in which hypotheses are developed. Section 3 is followed by the methodology adopted for the study. Then results and discussion follows penultimate in Section 4. Finally, the conclusion and implications are presented in Section 5.

2. Literature review

2.1 Theoretical underpinning

In literature, EPD is proposed as a dialog between firms and their stakeholders. The latter are interested in company environmental activities (Lu and Abeysekera, 2014). Consistent with this reality, the main goal of this paper is to examine the EPD in a developing country, i.e. Uganda, through stakeholder's theoretical lens and by quantitatively analyzing the link between EMA, BRP, company characteristics and EPD. The proper analysis of this relationship requires invoking the use of contingency, legitimacy and stakeholder theories; discussed next.

2.1.1 Contingency theory. Contingency theory (Thomas, 1986, 1991) asserts that management's preferences of reporting practices are related to the nature of environmental and organizational constraints instead of their relative income effects (Mohamed and El-Galfy, 2014). In the context of this study, EMA is not loop-sided in favour of generating only information relating to income effects because its existence is predicated on the board's need to comply with environmental laws such as those of NEMA in Uganda, although the NEMA Act of 2019 does not mandate public disclosure of environmental performance by manufacturing firms. What constitutes effective management is situational, predicated on the unique characteristics of each circumstance (Mohamed and El-Galfy, 2014). The determinants of effective internal organizational processes are contingent upon variations in the environment in which organizations operate (Lawrence and Lorsch, 1967). However, Sharma (2013) argues that contingency theory usage is biased to interpretive view of accounting and Qian and Burritt (2009) note numerous studies of this tradition explaining the development of environmental accounting, hence, biased to comparative accounting research. To compliment, the current study uses contingency theory together with legitimacy and stakeholder theories as a relevant framework for understanding EPD in Uganda.

The contingency perspective is potentially useful for explaining Uganda's environmental accounting, especially EMA as it relates to EPD. The Government of Uganda is currently emphasizing industrialization as a key pillar to achieving Vision 2040. Yet, the Second National Development Plan 2015/2016 – 2019/2020 notes increasing pollution levels. The country is struggling with new and emerging environmental issues arising from waste and the unsound use of chemicals. The report by NEMA (NEMA, 2016) suggests a need to identify ways by which to reverse this worrying trend. Correspondingly, bodies such as the Institute of Certified Public Accountants of Uganda and Uganda's Capital Market Authority have organized Financial Reporting awards that recognize manufacturing firms that report on their environmental performance. Because of these contingencies, manufacturing firms

adopt EMA to produce EPD but the adoption of EMA, this study claims, is also contingent upon company characteristics and the board's performance of its roles.

2.1.2 Legitimacy theory. Legitimacy theory is a probable explanation for the increase in environmental disclosure (Patten, 2002). It explains environmental/sustainability reporting as a strategic organizational tool for influencing society's perceptions of a company's legitimacy and for reducing and responding to stakeholder pressures and concerns, by demonstrating that the company's behaviour is acceptable (Damen, 2016) through EPD. It is necessary for the firm to communicate its activities to the public because legitimacy is conferred and controlled by those outside the organization (Buhr, 1998). According to Mousa and Hassan (2015), legitimacy is conceived as a congruence between institutional actions and social values and legitimization as actions that institutions take either to signal value congruency or to change social value. Legitimacy is achieved by demonstrating that companies' activities are concordant with social values, and therefore the theory suggests that manufacturing firms should aim to achieve congruence between their financial objectives and the accepted social norms. A manufacturing firm needs to provide sufficient environmental disclosure to improve its overall public image and ultimately justify its continued existence (Mousa and Hassan, 2015) and to change external users' opinion itself (Linthicum *et al.*, 2010).

2.1.3 Stakeholder theory. Stakeholder theory (Freeman, 1984) helps to explain, for example, business roles in society (Husillos and Álvarez-Gil, 2008). The broader ethical (normative) perspective that all stakeholders (both primary and secondary) have certain minimum rights that must not be violated can be extended to a notion that all stakeholders correspondingly have a right to information about how the organization is affecting them (perhaps, through pollution), even if they elect not to use the information and even if they cannot directly have an impact on the survival of the organization (O'Dwyer, 2005). Those charged with governance have a duty to disclose to all these stakeholders, the company's environmental performance.

2.2 Board role performance

Ong and Wan (2008) define BRP as a board's ability to perform its roles. The extant examination into the link between BRP and EPD on the African experience and Uganda, in particular, is remote. Related studies in Uganda such as Nkundabanyanga (2016), Nkundabanyanga *et al.* (2015), Nkundabanyanga *et al.* (2013) and Nalukenge (2020) explore board governance and board roles. Rizk *et al.* (2008) tentatively concluded that social and environmental disclosure in Uganda is limited and low grade. A study by Dkhili (2018) on environmental performance and institutions' quality among developed and developing countries (Uganda inclusive) found that good institutions' quality significantly enhances environmental performance. The current study argues that at an internal level, the board as an institution should be bothered about EPD consistent with their developed nations' counterparts. Part of good governance is to provide environmental disclosure (Nazari *et al.*, 2015). The study by De Villiers *et al.* (2011) shows that environmental performance is higher in firms that have larger boards, larger representation of active CEOs on the board and more legal experts on the board. Such a board is predicted to have a higher breadth of perspective; a perspective if well leveraged potentially enhances EPD. For example, legal experts on the board potentially evaluate pressures from regulators and require management's reports relating to how compliant the company has been in environmental regulatory compliance. Arena *et al.* (2015) found that board monitoring intensity reinforces the relationship between disclosure tone and future environmental performance. According to García Osma and Guillamón-Saorín (2011), the functioning of the board of directors constrains managerial

incentives to bias the presentation and the diffusion of information. Mallin *et al.* (2013) point out that the service role of the board with respect to stakeholders gives rise to the stakeholder orientation dimension of the board activity, a dimension that captures the board's ability in fulfilling its fiduciary duties to firm's all stakeholders, by responding to their various and diverse expectations. Mallin *et al.* (2013), find that stakeholder-oriented governance mechanisms lead to higher environmental performance and eventually to more transparent environmental disclosure. It is then safe to say that the success of implementing strategy is based on the achievement of the expected environmental performance indicators. Thus, if the board calls for EPD to make informed strategic decisions, management should be able to respond to this internal contingency factor. As there is evidence that positive EPD reflects strong organizational and management capabilities (Aragon-Correa, 1998), the following hypothesis is stated:

H1. BRP is positively related to EPD.

2.3 Environmental management accounting

Few studies are suggestive of a relationship between EMA and EPD (Mokhtar *et al.*, 2014; Smit and Kotzee, 2016; Burritt *et al.*, 2002). For example, Mokhtar *et al.* (2014) suggest that, as companies seek to become more responsive and prudent towards environmental concerns, the integration of environmental information into business decision-making allows for a more efficient environmental and economic decision-making which potentially enhances the availability of relevant environmental information for reporting purposes. In rooting for EMA's implementation, Burritt *et al.* (2002) argue that EMA solves environmental issues given the deficiency of conventional accounting practices to capture environmental information. When Smit and Kotzee, (2016) indicate that many organizations do not adequately identify and separate environmental costs due to their limited knowledge of EMA, this underscores EMA's potential in EPD (Ambe, 2007; Schaltegger, 2018; United Nations Expert working Group (2001). As the contemporary role of accounting has extended beyond conventional financial reporting to the measurement and analysis of the environmental aspects of a firm's actions through EMA (Cho *et al.*, 2012), it is reasonable to expect that:

H2. EMA is positively related to EPD.

2.4 Company characteristics

Company characteristics are distinguishing attributes that describe the physical, functional and operational dimensions of a company (Madhoushi and Nasiri, 2011). For this study, company characteristics include firm size, age and foreign ownership. Previous studies have investigated the relationship between company characteristics such as size, foreign ownership and age and EPD (Liu and Anbumozhi, 2009; Patten, 2002 and Brammer and Pavelin, 2006). In the context of legitimacy theory, as a firm increases in size, it becomes more visible, and therefore more accountable for environmental issues. Hence, larger firms are expected to provide more environmental information to present that their operations are legitimate and consistent with good corporate citizenship (Patten, 2002). Patten, (2002) also finds a positive relationship between company age and the level of environmental disclosure because as a company matures, its reputation and involvement in discretionary activities such as environmental protection activities and disclosure of environmental information can become entrenched and more valuable to a company. In terms of foreign ownership,

environmental disclosures are used as a tool for influencing the perception and actions of stakeholders (Brammer and Pavelin, 2004). Some companies in Uganda have foreign linkages through shareholding. These companies may be subsidiaries of bigger companies or an extension of their mother companies. They are, therefore, obliged to disclose environmental information because of their association with their foreign counterparts who may have already adopted these practices (Welbeck *et al.*, 2017). While the above studies relate to developed contexts, still, for a developing country setting it is hypothesized that:

H3a. Larger firms are more likely to have a higher level of EPD than smaller firms.

H3b. Older companies are more likely to have a higher level of EPD than newer companies.

H3c. Foreign-owned companies are more likely to have a higher level of EPD than locally owned companies.

2.5 Board role performance, company characteristics, environmental management accounting and environmental performance disclosure

Contingency, legitimacy and stakeholder theories have provided a framework for investigating the relationships between BRP and EPD on one hand and company characteristics and EPD on the other; as mediated by EMA. On the first hand, there is evidence that strong organizational and management capabilities are positively related to EPD (Aragon-Correa, 1998). In the broader accounting quality literature (Dechow *et al.*, 2010, for a review) the importance of directors as potential monitors that may constrain wrong accounting choices, is recognized. So, if directors wish to disclose environmental performance, management will be directed to fulfilling this need. Similarly, directors or audit committee members are portrayed wishing to avoid litigation and regulatory enforcement costs, including longer-term costs to reputation (Fama, 1980; Hermalin and Weisbach, 1998). It is then concluded that BRP is positively related to EPD. However, as implied in Clarkson *et al.* (2008), the existence of the EMA system allows for awareness and understanding of the magnitude of environmental information such as environmental cost information, and hence their proper disclosure to satisfy stakeholders. Thus, a positive relationship exists between EMA and EPD. Moreover, investment decisions in EMA system (s) require the board's approval. Hence, BRP is positively related to the existence of EMA systems. Indeed within the context of accountability on the African scene, King III (2009) requires internal mechanisms such as the board to ensure the integrity of financial disclosures is considered one of the accountability mechanisms. Extending this line of thinking suggests that one of the roles of boards should be to ensure appropriate EMA systems. Theoretically, then, the mediation effect of EMA in the relationship between BRP and EPD can be said to be incontrovertible. While theoretical assertions potentially authenticate the mediating role of EMA in this relationship, empirical evidence is limited. This is surprising as mediation studies have long been advocated for (Rosenberg, 1968; Bennet, 2000; Friedrich, 1982). The following hypothesis was, thus, derived:

H4a. EMA mediates the link between BRP and EPD.

On the second hand, there is evidence to suggest that company characteristics such as size and age (Patten, 2002) and foreign ownership (Brammer and Pavelin, 2004) are related to EPD. Smaller companies may limit disclosure of relevant environmental information because of disclosure-related costs (e.g. preparation and competitive) consistent with the proprietary cost theory (Dye, 1985;

Verrecchia, 1983; Lang and Lundholm, 1993). However, larger firms have a greater environmental impact (Hackston and Milne, 1996; Patten, 2002) and face more stakeholder pressure to reveal their social responsibility because they are more visible (Aerts and Cormier, 2009; Schipper, 1991). Moreover, the advantages larger companies enjoy incentivize voluntariness in the disclosure of environmental information (Prencipe, 2004). Therefore, larger companies are positively associated with the likelihood of disclosing their environmental performance consistent with the greater political costs and scrutiny larger firms face from, e.g. NEMA monitoring, as well as the greater statutory knowledge that larger firms are more likely to possess (Patten, 2002; Peters and Romi, 2013). The other logic is that the preparation of detailed accounts becomes more essential as entities become larger (Haldma and Lääts, 2002). For example, managers require a better grasp of costs being incurred by different product lines, individual departments, among others, to improve their decision-making capacity. Similar beliefs can be made about older firms relative to new firms. For example, older firms' actions have a track record observed over a long time and because of this, they may have attracted the attention of stakeholders. Roberts (1992) shows that company age is significantly associated with environmental disclosure. In terms of foreign ownership, Cannizzaro and Weiner (2015) analysed a multinational enterprise's decision to voluntarily disclose information regarding its investments and found that firms disclose more when societal expectations of transparency are high. Foreign-owned firms in Uganda may disclose their environmental performance because they are associated with foreign firms that already may have adopted such performance disclosures (Welbeck *et al.*, 2017). Therefore, company characteristics are associated with EPD. These same characteristics may be associated with the existence of EMA systems. For example, larger or even older firms may have the resources to invest in EMA systems just as foreign-owned firms may adopt the systems prevalent in their parent companies such as if a parent company has an EMA system in place, the foreign-owned firm may have to do the same consistent with International Financial Reporting Standard 10. Following the logic in *H4a*, then:

H4b. EMA mediates the link between company characteristics and EPD.

2.6 Control variable

Environmental performance is disclosed voluntarily either separately in a sustainable report or integrated within an annual report. Therefore, there are no accounting standards for an auditor to form an opinion about the reported environmental performance. Normally, the environmental performance is compared to global reporting initiatives' voluntary standards. Auditors or environmental consultants, therefore, provide an assurance of the quality of the disclosed information. Previous research, however, suggests that auditor type (big 4 versus small to medium practices) may be an influencing factor of EPD. As examples, Peters and Romi (2015) and Simnett *et al.* (2009) argue that assurance providers from the auditing profession, as opposed to for instance environmental consultants, increase the quality of external assurance on sustainability reports due to their independence and ethics requirements, maturity of standards and quality control mechanisms in place. Ahmad *et al.* (2003) find a positive association between disclosures and auditor type. Following from this, this study controls for auditor type.

3. Methodology

3.1 Design, population and sample

This is a cross-sectional study on manufacturing firms in Uganda. According to the Uganda Bureau of Standards (2018), the manufacturing sector in Uganda composed of 3,859 registered firms is small and varied. These firms are scattered across the country; some with

insufficient information (e.g. for small manufacturers) available about them. Thus, this study focussed on large and medium manufacturing firms located in Kampala (109), Wakiso (33), Jinja (26) and Buikwe (10) (Uganda Manufacturers Association, 2018). These districts have the highest number of large and/or corporate and medium industries at 178; only 123 of these have websites ((Kampala = 75, Wakiso = 23, Jinja = 18 and Buikwe = 7).

Because company websites are comprehensive and include some information not customarily found in company financial reports, this constituted the convenient sample. Dear reader, as the study is of 4 districts and not the population of large and medium manufacturing in Uganda, the sampling method used is appropriately convenience sampling. For each target manufacturing firm, either the Finance Manager or the Accountant (the nomenclature differs from company to company) was selected for the survey, giving a total of 123 survey respondents. The survey obtained 102 complete responses. According to Tabachnick and Fidell (2019), given the 6 independent variables, the appropriate observations would be 98. Thus, the obtained 102 responses are well above this standard. The firm and respondents' characteristics are presented in Table 1.

3.2 Measurement of variables, data sources, validity, reliability and management

Using a closed-ended questionnaire with items anchored on a six-point scale ranging from strongly disagree to strongly agree, data on EMA, BRP and company characteristics were collected from Finance managers and Accountants of the manufacturing firms under study.

Characteristic	Dimension	f	(%)	Valid (%)	Cum. (%)
Auditor type	Small to medium audit firms	46	45.1	45.1	45.1
	Big 4 audit firms	56	54.9	54.9	100.0
	Total	102	100.0	100.0	
Firm category according to UMA	Corporate	13	12.7	12.7	12.7
	Large	36	35.3	35.3	48.0
	Medium	53	52.0	52.0	100.0
	Total	102	100.0	100.0	
Firm age	Less than 5 years	5	4.9	4.9	4.9
	5–10 years	12	11.8	11.8	16.7
	11–15 years	20	19.6	19.6	36.3
	15 years and above	65	63.7	63.7	100.0
	Total	102	100.0	100.0	
Firm ownership	Locally owned	20	19.6	19.6	19.6
	Foreign owned	82	80.4	80.4	100.0
	Total	102	100.0	100.0	
Age of the respondent	35 years and below	24	23.5	23.5	23.5
	Above 35 years	78	76.5	76.5	100.0
	Total	102	100.0	100.0	
Gender of the respondent	Male	54	52.9	52.9	52.9
	Female	48	47.1	47.1	100.0
	Total	102	100.0	100.0	
Position in the organization	Head finance	14	13.7	13.7	13.7
	Accountant	88	86.3	86.3	100.0
	Total	102	100.0	100.0	
Length of service in the organization	Less than 10 years	78	76.5	76.5	76.5
	10 years and above	24	23.5	23.5	100.0
	Total	102	100.0	100.0	
Professional qualification?	Yes	102	100.0	100.0	100.0

Table 1.
Respondent and firm characteristics

Data on EPD were collected from the respective manufacturing firms' reports and websites. This study used the Wiseman (1982) index, subsequently adopted by Nazari *et al.* (2015), in the evaluation of EPD in reports and company websites to objectively assess whether companies disclosed or not the items. Items of information included in the index were selected through a review of the environmental reporting literature (Wiseman, 1982). Table 2 shows the variables and their measurements.

For content validity, five experts (accountants and finance) in practice and academia rated the relevancy of questionnaire items on a scale ranging from 1 = strongly disagree to 6 = strongly agree. The researchers then dichotomized the rating scale through a duo split of the scores such that: rating scores 1 – 3 = *measure not useable*, 4–6 = *measure useable*. The CVI was computed by obtaining the proportion of items assessed as *useable* divided by a total number of items (Amin, 2005). The overall content validity index was 0.938. For reliability, Cronbach's alpha (α) was used to determine the internal consistency of scales. Cronbach's α coefficient for all study variables was 0.77 and above. Nunnally (1978) gives a cut-off alpha coefficient of 0.70 as sufficient.

As the questionnaire enlisted a large number of observed variables thought to reflect a small number of latent variables, this study followed Field's (2009) advice and performed a factor analysis. Dear reader, this study performed factor analysis, typically, not for design considerations where sample size would be of the essence. Rather, factor analysis is used here for conceptual/theoretical considerations, according to which the purpose is essentially data reduction (for a discussion of the inherent considerations in the use of factor analysis, see Alhija, 2010). Items under EMA and BRP with a correlation of less than 0.5 were excluded from the rotation Tables 3 and 4.

The collected data were edited, coded, cleaned and aggregated using a firm as a breaking variable. This study followed the recommendations of Field (2009) for data management. Data were analysed using SPSS version 22, Pearson correlation coefficient was used to establish the relationship between EMA, BRP, company characteristics and EPD. Regression analysis was also used to establish the extent to which EMA, BRP and company characteristics influence EPD in manufacturing firms.

4. Results and discussion

4.1 Results

4.1.1 Descriptive statistics. The summary descriptive statistics of dependent, independent and control variables are presented in Table 5. The purpose of descriptive statistics is to check whether calculated means represent observed data, that is, whether the mean is a good replica of reality (Field, 2009). The standard deviations are small relative to the means and according to Field (2009), when deviations are small relative to mean values, it is evident that data points are close to the means, and hence, calculated means for this study highly represent the observed data.

4.1.2 Correlation analysis results. To establish the relationship among BRP, company characteristics, EMA and EPD, the research first examined zero-order correlation coefficients (Table 6). At this level of analysis, EMA has a significant positive relationship with EPD($r = 0.412^{**}$ and $p < 0.01$). BRP also a significant positive relationship with EPD ($r = 0.230^{*}$ and $p < 0.05$). In terms of characteristics, firm size and EPD are positively and significantly related ($r = 0.304^{**}$ and $p < 0.01$), age and EPD ($r = 0.187^{*}$ and $p < 0.05$) are significantly and positively related and there is a significant relationship between foreign ownership and EPD ($r = 0.167^{*}$ and $p < 0.05$). The relationships of age, foreign ownership and EPD, however, appear weak.

Table 2. Variables and their measurements

Variable				
Global variable	Dimensions	Measurement	Definition	Sample item scales
Environmental management accounting	Physical EMA *(CVI = 0.90)*	Respondents' mean rank of the 10 items of information included in the questionnaire on a six-point Likert scale	The management accounting with a focus on environmental issues such as physical information on the flow of energy, water, products and materials, as well as monetary information such as cost of waste, cost of environmental projects and material cost of product outputs (Jasch, 2003)	The company generates and records physical information on air emissions
	Monetary EMA *(CVI = 0.86)*	Respondents' mean rank of the 7 items of information included in the questionnaire on a six-point Likert scale		The manufacturing firm generates and records monetary information on waste and emission costs
	Environmental cost allocation *(CVI = 0.79)*	Respondents' mean rank of the 6 items of information included in the questionnaire on a six-point Likert scale		The manufacturing firm allocates environmental costs directly to a specific product
Board role performance	Control *(CVI = 0.96)*	Respondents' mean rank of the 11 items of information included in the questionnaire on a six-point Likert scale	An efficient behavioural mechanism for ensuring firm's managers deliver desired results on behalf of investors and the ability of the board to perform its roles (Ong and Wan, 2008)	The board monitors and evaluates the company's environmental performance
	Service *(CVI = 0.95)*	Respondents' mean rank of the 9 items of information included in the questionnaire on a six-point Likert scale		Our board of directors brings to this firm beneficial ideas on environmental sustainability obtained elsewhere
	Strategic *(CVI = 1)*	Respondents' mean rank of the 8 items of information included in the questionnaire on a six-point Likert scale		The board reviews the corporate strategy on environmental reporting quite often
Company characteristics	Size	Size of company (natural logarithm of total turnover at the end of the year 2018)	Company characteristics are distinguishing attributes that describe the physical, functional and operational dimensions of a company (Madhoushi and Nasiri, 2011)	
	Age	The number of years of the company from the incorporation date		
	Foreign ownership	Dummy variable 1 and 0 for foreign and local companies, respectively		

(*continued*)

Table 2.

Global variable	Variable Dimensions	Measurement	Definition	Sample item scales
Environmental performance disclosure	Wiseman, 1982 index on environmental disclosure was used *(CVI = 1)*	Constructing an un-weighed environmental disclosure index (see Appendix 1 for items used to construct the index). An item disclosed in the annual report (YES) was given a weight = 1 and an item not disclosed (NO) = 0 A percentage level of disclosure was computed, where the number of items disclosed was divided by the total number of required disclosures, the percentage was put on a Likert scale of 1 to 6 to match the scale of the predictor variables. In this case 0–16.7% = 1; 16.8%–33.4% = 2; 33.5%–50.1% = 3; 50.2%–66.8% = 4; 66.9%–83.5% = 5 and 83.4%–100% = 6	The process of communicating environmental effects of an organization's economic actions to particular interest groups within society and to society at large (Wiseman, 1982)	Air emission information

Item scales (α = 0.87, pretest), (α = 0.86, main study)	Component Physical environmental information	Monetary environmental information	Environmental cost allocation
We generate and record physical information on solid waste	0.80		
We generate and record physical information on products	0.78		
We generate and record physical information on operating materials	0.78		
We generate and record physical information on hazardous waste	0.77		
We generate and record physical information on energy usage	0.76		
Our company generates and records physical information on raw materials	0.75		
We generate and record physical information on by-products	0.70		
We generate and record physical information on air emissions	0.69		
Our company generates and records physical information on water usage	0.61		
Our company generates and records monetary environmental information on prevention and other environmental management costs		0.76	
Our company generates and records monetary environmental information on waste and emission costs		0.70	
Our company generates and records monetary environmental information on environmental capital expenditure tracked independently of capital expenditure		0.66	
Our company generates and records monetary environmental information on research and development costs		0.65	
Our company generates and records monetary environmental information on the cost of material of non-product outputs		0.60	
Our company estimates environment-related contingent liabilities		0.51	
We classify environmental costs			0.81
Environmental expenses are mostly allocated to other overheads in the profit or loss account			0.80
We allocate environmental costs directly to a specific product			0.75
Environmental expenses are mostly allocated to production costs in the manufacturing cost statement			0.65
We create and use environment-related cost accounts for better cost allocation			0.54
Eigen values	3.83	3.70	2.93
Percentage of variance	19.25	17.61	14.97
Cumulative percentage	19.25	36.86	51.83

Notes: Extraction method: principal component analysis. Rotation method: varimax with Kaiser normalization. Rotation converged in 19 iterations
Source: Primary data

Table 3.
Factor analysis for EMA

Item scales (α = 0.89, pretest), (α = 0.81, main study)	Component Monitoring	Service	Strategic
The board encourages everyone in this firm to think globally	0.77		
The board ensures that the community is on good terms with the firm through monitoring activities of management with respect to the community	0.77		
The board has stated social and environmental targets and goals	0.72		
Our board of directors monitors the CEO	0.68		
The board addresses community issues/concerns and stakeholders concerns	0.64		
The board reviews communications related to any part of sustainability	0.53		
The board monitors and evaluates the company's environmental performance	0.51		
The board guides the managers to accomplish the company's objectives		0.79	
The board presides over important functions such as the Annual General		0.76	
The board gives advice and supports the management on environmental issues		0.55	
Our board encourages transparency about environmentally relevant corporate activities		0.54	
The board requires management to have a unique corporate strategy.			0.77
The Board reviews the corporate strategy on environmental reporting quite often			0.73
Our board of directors reviews present and future opportunities, threats and risks in the external environment and current and future strengths, weaknesses and risks of the company			0.66
Environmental performance disclosure is one of the most important targets to achieve			0.65
The Board ensures that corporate strategy is well thought and executed			0.62
The board sets and actively reviews company policy on the environment			0.58
The board hires managers with a background in environmental reporting			0.57
Eigen values	3.67	2.61	1.91
Percentage of variance	23.22	16.74	11.03
Cumulative percentage	23.22	39.04	51.00

Table 4.
Factor analysis for board role performance

Notes: "Extraction method: principal component analysis. Rotation method: varimax with Kaiser normalization. Rotation converged in eight iterations"
Source: Primary data

Variable	*n*	Minimum	Maximum	Mean	SD
Environmental management accounting	102	3.92	6.00	5.33	0.54
Board role performance	102	3.73	6.00	5.52	0.35
Firm size	102	14.76	32.00	23.75	4.18
Auditor type	102	0.00	1.00	0.66	0.48
Firm age	102	0.00	3.00	2.42	0.88
Foreign ownership	102	0.00	1.00	0.20	0.40
Environmental performance disclosure	102	2.00	6.00	4.60	1.04
Valid *n* (listwise)	102				

Table 5.
Descriptive statistics for dependent, independent and control variables

Source: Primary data

Variables	1	2	3	4	5	6	7	8	9	10	11	12
Environmental management accounting (1)	1											
Physical (2)	0.81**	1										
Monetary (3)	0.77**	0.45**	1									
Cost allocation(4)	0.90**	0.55**	0.59**	1								
Board role performance (5)	0.57**	0.45**	0.52**	0.47**	1							
Monitoring (6)	0.46**	0.30**	0.52**	0.40**	0.85**	1						
Service (7)	0.45**	0.38**	0.41**	0.36**	0.85**	0.66**	1					
Strategic (8)	0.51**	0.45**	0.41**	0.42**	0.86**	0.54**	0.57**	1				
Firm size (9)	0.34**	0.28**	0.29**	0.28**	−0.02	−0.04	−0.08	0.03	1			
Firm age (10)	0.03	0.06	0.04	−0.01	0.02	−0.04	0.02	0.05	0.01*	1		
Foreign ownership (11)	0.08	0.07	−0.00	0.11	−0.02	−0.06	−0.02	0.02	0.22*	−0.02	1	
Environmental performance disclosure (12)	0.41**	0.43**	0.34**	0.28**	0.23*	0.16*	0.19*	0.22*	0.30**	0.19*	0.17*	1

Notes: $n = 102$; *; **. Correlation is significant at the 0.05 and 0.01 level, respectively (one-tailed)
Source: Primary data

Table 6.
Pearson correlations between the dependent and independent variables

4.1.3 Regression analysis. It is recognized that univariate analyses do not control for other factors and this considerably attenuates the ease with which interpreting the results can be made. For this reason, the analysis extended to a multivariate setting. Firstly, inter-correlations were checked and no correlation between independent variables was found to be greater than 0.90. Myers (1990) suggests that none of the correlation coefficients should be very large. Checking variance inflation factors (Table 7) also shows that they were below the threshold value of 10 (Field, 2009), hence, multicollinearity does not cause problems to the regressions. The analysis then progressed with regression analysis to test the study hypotheses. It first used regression (with the enter method) coefficients as indicators of whether the contribution of each variable is significant and the overall contribution of variables is indicated by variance explained (R^2) that also shows explanatory power of variables.

Results in Table 7 show that EMA, BRP and company characteristics predict 20.2% of the variance in EPD (*Adjusted* $R^2 = 0.202$). With a significant β value of 0.583, the results confirm that EMA is significantly associated with EPD at a 5% significance level or better. At this level of analysis, BRP and company characteristics are not significantly associated with EPD. As a means of statistical control and for examining incremental validity, hierarchical regression analysis to assess the individual contribution of independent variables was performed. Variables were entered simultaneously with each hierarchical group (Field, 2009; Aiken and West, 1991) as shown in Table 8.

Standardized β coefficients (which are easier to interpret, are directly comparable and are not dependent on the units of measurement of variables (Field, 2009)) for independent variables are presented in models 1–6. Model I in Table 8 indicates the baseline model with only the control variable, auditor type and does not explain significant variances in EPD, hence, with no confounding effect. Models 2 and 3 introduce foreign ownership and firm age, respectively, and reveal both as not significant independent variables of EPD. Model 4 introduces BRP and is significant in causing variations in EPD. Model 5 presents all independent variables apart from EMA and the results show that firm size significantly causes variances in EPD at 1% level (standardized $\beta = 0.282$**), followed by BRP which is significant at 5% level (standardized $\beta = 0.235$*). These results provide support for *H2* and *H3a* (*H2* and *H3a*). Model 6 introduces all independent variables, including EMA. However, only EMA is significant in this model. Generally, results suggest that Model 6 in Table 8 is the most acceptable model. At this level of analysis, it is useful to note that incremental

Model	Unstandardized coefficients		Standardized coefficients			Collinearity statistics	
	B	Std. error	Beta	t	Sig.	Tolerance	VIF
1 (Constant)	−1.206	1.594		−0.757	0.451		
EMA	0.583	0.230	0.302	2.537	0.013	0.556	1.797
Board role performance	0.183	0.334	0.062	0.549	0.584	0.627	1.595
Firm size	0.044	0.025	0.177	1.772	0.080	0.788	1.269
Firm age	0.193	0.105	0.165	1.832	0.070	0.977	1.024
Foreign ownership	0.328	0.244	0.126	1.343	0.182	0.893	1.119
Auditor type	−0.166	0.192	−0.080	−0.863	0.390	0.918	1.090

Table 7.
Multiple regression analysis results

Notes: $R = 0.500$, $R^2 = 0.250$, Adjusted $R^2 = 0.202$, F = 5.272, Sig = 0.000, e = 0.92573. Dependent variable: environmental performance disclosure
Source: Primary data

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	4.674	4.321	3.796	0.027	−1.584	−1.206
Foreign ownership		0.195	0.191	0.195	0.132	0.126
Firm age			0.177	0.173	0.169	0.165
Board role performance				0.230*	0.235*	0.062
Firm size					0.282**	0.177
EMA						0.302**
Control variable						
Auditor type	−0.067	−0.115	−0.088	−0.086	−0.085	−0.080
Model F	0.446	2.071	2.487	3.414*	4.768**	5.272**
Adjusted R^2	−0.006	0.021	0.042	0.087	0.157	0.202
F change	0.446	3.684	3.226	5.826*	9.052**	6.439**
R^2 change	0.004	0.036	0.031	0.053	0.076	0.051
Durbin Watson static						1.555

Note: $^{**}p < 0.01$ and $^{*}p < 0.05$
Source: Primary data

Table 8. Hierarchical regression results

improvement in adjusted R^2 in models 1–6 in Table 8 suggests a better fitting model which develops as company characteristics, BRP and EMA are successively introduced (Field, 2009). Durbin–Watson test was carried out to test for serial correlations between errors in regression models. For this study, the Durbin-Watson statistic was 1.555, which justifies the assumption of independent errors or no serial correlation (Field, 2009).

4.1.4 Results of the mediation test. The pre-specified hypothesis (*H4a*) suggested that EMA mediates the link between BRP and EPD. Results indicate that four conditions for mediation according to Baron and Kenny (1986) are met: there is an effect to be mediated ($\beta = 0.23$, $p < 0.05$) (hence, H_1 is substantiated); there is a significant relationship between BRP and the mediator (EMA) ($r = 0.57$, $p < 0.01$) and also that between EMA and EPD ($r = 0.41$, $p < 0.01$) (hence, H_2 substantiated); the coefficient of EMA is significant in model 6 (Table 8) with both EMA and BRP as predictors ($\beta = 0.30$, $p < 0.001$); the absolute effect of BRP is less in model 6 than in model 4. Figure 1 shows that the standardized total effect of BRP on EPD is significant ($\beta = 0.23$). However, when the path coefficients of the relationship between BRP and EMA and also that of the relationship between EMA and EPD are controlled, the original significant path between BRP and EPD becomes non-significant ($\beta = -0.00$). The difference is the indirect effect ($\beta = 0.23$) hence, full mediation of EMA on the relationship between BRP and EPD. This result substantiates *H4a* ($Z = 2.28$, $p < 0.05$).

The pre-specified hypothesis (*H4b*) suggested that EMA mediates the link between company characteristics and EPD. A cursory look at Tables 6 and 8 suggests that firm age and foreign ownership have weak relationships with EPD ($r = 0.19$, $p < 0.05$; $r = 0.17$, $p < 0.05$) and no significant effects to be mediated - suggesting that the first of Baron and Kenny (1986) conditions is not met. However, Table 6 shows that firm size is significantly related to EPD ($r = 0.30$, $p < 0.05$), it is significantly related with EMA ($r = 0.34$, $p < 0.01$) and as already indicated EMA is significantly related to EPD ($r = 0.41$, $p < 0.01$). There is also a significant relationship to be mediated ($r = 0.30$, $p < 0.01$). The significance of mediation effect and nature or type of mediation was also tested by calculating Sobel's z-value and ratio index using the MedGraph programme and results are indicated in Figure 2. As can be seen from Figure 2, a Sobel z-value of 2.56 with a p-value of 0.01 and the beta weight for the

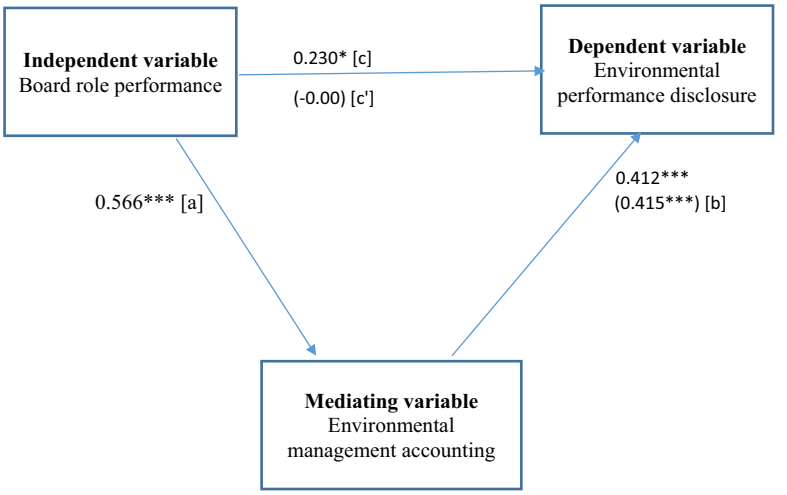

Figure 1.
MedGraph – PC: Mediation effect of EMA on the link between BRP and EPD

basic relationship between firm size and EPD ($r = 0.187$, $p < 0.001$) were registered. These results indicate that: firstly, as the Sobel z-value is large with a p-value less than 0.05, it means that a significant mediation of EMA in the relationship between firm size and EPD exists. In a real sense, it indicates that the association between the predictor variable (firm size) and the criterion variable (EPD) has been significantly reduced (i.e. from 0.304 to 0.187) by the inclusion of the mediating variable (EMA) (Jose, 2008). Secondly, the partial type of mediation was also registered because the correlation between the independent variable and dependent variable was reduced to a significant level (that is, from 0.304** to 0.187**). Thirdly, the ratio index of 0.385% given by (0.117 ÷ 0.304)*100)), implies that 38.5% of the effect of firm size on the EPD goes through the EMA and about 61.5% of the effect is direct. Accordingly, H_{4b} is partially substantiated in the sense that EMA clarifies the link between firm size and EPD.

4.1.5 Sensitivity analysis. To test for whether the reported results are sensitive to potential endogeneity arising from biases of respondents, an independent samples t-test was performed. An independent-samples t-test was conducted to compare the EDP for (gender) men and women. There were no significant differences in scores for men ($M = 4.6296$,

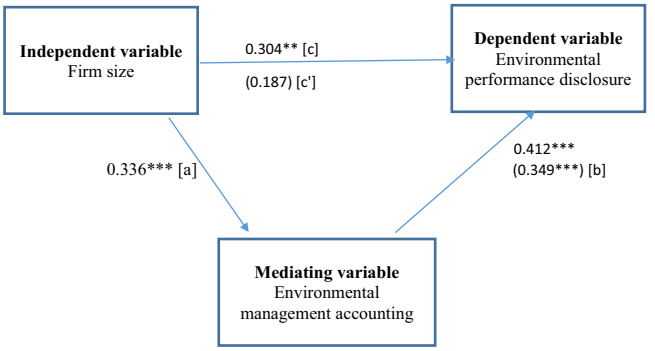

Figure 2.
MedGraph – PC: Mediation effect of EMA on the link between firm size and EPD

$SD = 0.97702$) and women [$M = 4.5625$, $SD = 1.10908$; t (100) = 0.325, $p = 0.746$]. The Eta squared is 0.001 and this is very trivial according to Cohen (1988). See also Figure 3. An independent-samples t-test was conducted to compare the EPD for (age) Youth (0–35 years of age) and adults (above 35 years of age). There was a significant difference in scores for Youth ($M = 4.1667$, $SD = 1.09014$) and Adults [$M = 4.7308$, $SD = 0.98920$; t (100) = −2.385, $p = 0.019$]. See also Figure 4. The Eta squared was 0.054. This is considered a trivial effect according to Cohen (1988). Predicated on these tests, the reported results were considered not sensitive to respondents' biases.

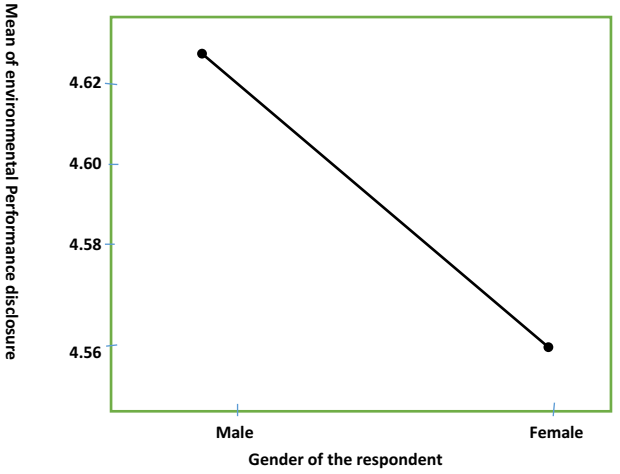

Figure 3.
Mean plots – gender of the respondent and EPD gender of the respondent

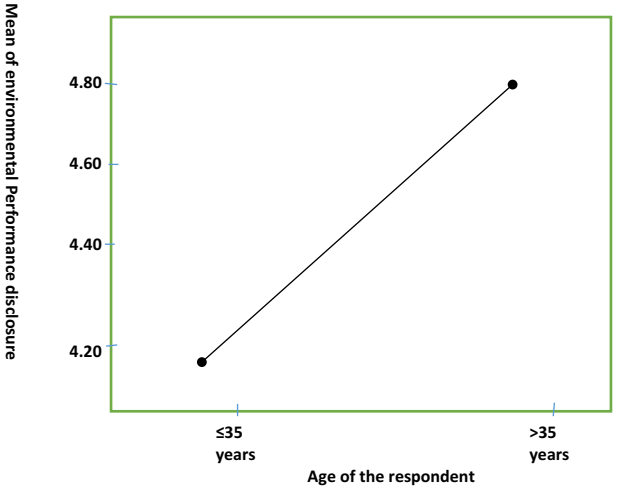

Figure 4.
Mean plots – age of the respondent and EPD age of the respondent

4.2 Discussion

This research investigated and tested the link between EMA, BRP, company characteristics and EPD. *H1–H3* were dedicated to testing for the significance of the relationships between BRP, company characteristics, EMA and EPD. Overall, EMA is the most significant predictor of EPD. The essence of H_4 was to test specific causal theories about time-ordered relationships among variables and the particular mechanism or pathway by which a relationship occurs. In this case, the results indicated in Section 4.1 show the specific drivers of EPD in their causal chain relationships. While the results suggest that BRP is significantly related to EPD, this same relationship can be fully mediated by EMA. This signifies that the connection between BRP and EPD is fully weakened by the presence of EMA. The foregoing discussion confirms that the presence of EMA acts as a conduit in the association between BRP and EPD in manufacturing firms. This finding links well with what Mallin *et al.* (2013) point out: the board's service role to stakeholders triggers its activity in the context of environmental disclosure to fulfil the board's fiduciary duties towards all firms' stakeholders. This shows that the ethical branch of stakeholder theory (Deegan, 2009) is a relevant framework for understanding the EPD of manufacturing firms. The present result makes intuitive sense predicated on the view that the board's role is not to directly (but through a medium of disclosure) disclose environmental performance information. The current results show that EMA explains variances in EPD suggesting that the generation of useful environmental performance metrics for disclosure occurs by the use of appropriate EMA. Thus, as part of the accountability mechanism, the board's role is to ensure the organization has EMA systems in place to track environmental performance information for disclosure by manufacturing firms to all stakeholders. Some of the board's roles (Table 3) are to state social and environmental targets for management and review the corporate strategy on the environment. Such roles are to be carried out through the use of EMA which makes it highly possible for the company to disclose environmental performance information.

At the same time, the only company characteristic that has been shown to explain variances in EPD is company size. The present results show that this same relationship is partially mediated by EMA. This is true because an organization is likely to invest in systems commensurate with its size. At the same time, such systems get leveraged for better performance outcomes, again matching with their size. This finding links well with proprietary cost theory (Dye, 1985; Verrecchia, 1983; Lang and Lundholm, 1993) and vindicates Prencipe's (2004) suggestion that advantages larger companies enjoy incentivize voluntariness in disclosure of environmental information.

When describing environmental disclosures, it has hitherto been unclear about what and how to measure and classify information about the environment in a developing country context like Uganda. The present results indicate three kinds of environment information that EMA potentially generates: physical, monetary and environmental cost allocation (Table 2; Appendix). Thus, results suggest that when physical and monetary environmental information is captured and environmental costs are properly classified and allocated by management, manufacturing firms are highly likely to disclose their environmental performance information to stakeholders. Consistent with Mokhtar *et al.* (2014), this suggests that EMA makes and enhances the availability of relevant environmental information for reporting purposes.

Abdel-Kadera and Luther (2008), note literature showing that characteristics such as size and corporate strategy affect organizational structure. The current results show that the board's performance of its strategic roles towards transparency about environmentally relevant activities supports this tradition. The present results suggest that EMA, as a

management accounting system to generate physical and monetary environmental information and environmental cost allocation information, evolves partly in response to corporate strategy (Abdel-Kadera and Luther (2008) and size (Patten, 2002) of the firm - the expectation being that, e.g. larger manufacturing firms disclose more information than smaller firms because of visibility considerations and to present that their operations are consistent with good corporate citizenship. Firm size is known to be a proxy for a number of factors such as public visibility; large firms tend to attract the attention of diverse stakeholders (Tauringana *et al.*, 2017; Qian and Schaltegger, 2017. Therefore, in addition to EMA and BRP being associated, the results also confirm the tradition arguing that EMA evolves partly in response to firm-specific characteristics such as size (Figure 2). The study fails to find support for foreign ownership (in spite of the fact that 80% of studied firms were foreign-owned) and age (in spite of 64% of studied companies being existence for more than 15 years) of manufacturing companies in Uganda contrary to expectations (Brammer and Pavelin, 2004; Patten, 2002), perhaps, because the majority of current study manufacturing firms' EPDs are of a general nature such as on compliance with regulations and requirements. For Patten, (2002) as a company grows, its involvement in discretionary activities such as environmental protection and disclosure increases, this study posts the contrary. As earlier indicated this may be a contextual issue. The foreign companies (who may be *quasi* subsidiaries), e.g. understand that Uganda in its industrialization infancy may be concerned with growth irrespective of second-order consequences.

5. Conclusion and implications

The objective of this research was to examine the link between and, as a corollary, the effect of EMA, BRP and company characteristics (such as size) on the EPD of manufacturing firms. The study finds that EMA, BRP and firm size, on their own, are significant independent variables of EPD. However, the relationships between BRP and EPD and, between size and EPD are significantly mediated by EMA.

These results have important implications. Firstly, they establish the significance of EMA in the environmental reporting process and add to the continuous search for a more plausible accounting system that corresponds to Jones's (2010) need for a new holistic accounting that captures corporate environmental impacts. The results are, thus, helping companies preparing environmental performance reports and to stakeholders who make decisions predicated on those reports and by extension, potentially inform policymakers like National Environmental Management Agency (for the case of Uganda) about what they should be keen on while doing environmental audits on manufacturing firms. One regulatory instrument would be to require manufacturing firms to invest in and use EMA systems. Still, external auditors might need to assess the suitability of EMA systems in this regard. Secondly, because previous empirical evidence on the relationship between corporate environmental performance and the level of environmental disclosures is mixed, Clarkson *et al.* (2008) improved on the prior literature and focused purely on discretionary environmental disclosures. By developing a content analysis index predicated on the global reporting initiative sustainability reporting guidelines, they assessed the extent of discretionary disclosures in environmental and social responsibility reports. The results of this study potentially extend such works by suggesting a mechanism through which the environmental performance information is obtained for onward disclosure. Thirdly, the methodology used here is also novel. Using medigraph, EMA fully explains the link between BRP and EPD and also a significant part of the link between firm size and EPD in manufacturing firms. Conflating these, the results of this paper offer hope on how the

reliability of the environmental performance information that companies voluntarily provide outside of the financial statements, can be improved – use EMA.

As with any study, there are some limitations worth mentioning. As this study is cross-sectional, there is a point for more longitudinal research by focussing on those firms that have implemented EMA. The study's only focus on Ugandan manufacturing firms in Kampala, Wakiso, Jinja and Buikwe districts may mean that the results only apply to those districts and the manufacturing sector. A study on EPD in other firms like the service and energy firms is needed. Moreover, this study did not control for industry type which has the potential to contaminate the results. Still, the results offer hope on how the reliability of the environmental performance information that companies voluntarily provide outside of the financial statements, can be improved.

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Appendix

For an item of disclosure appearing/disclosed on the company website or report, Tick YES and tick No if the item is not disclosed.

Index categories and items of disclosure (α = 0.80, pretest), (α = 0.78, main study)

Item scales			Field results: No. of firms disclosing the information	Field results: No. of firms not disclosing the information
E1:General information related to the environment				
Environment policies or company concern for the environment	Yes	No	100	2
Compliance with regulations and requirements	Yes	No	101	1
Environmental impacts of products and services	Yes	No	91	11
Awards for environmental protection	Yes	No	49	53
E2:Environmentally financial information				
Past and current expenditures for pollution control	Yes	No	67	35
Past and current operating costs for pollution control	Yes	No	54	48
Future estimates of expenditures for pollution control	Yes	No	34	68
Future estimates of operating costs for pollution control	Yes	No	29	73
Financing for pollution control	Yes	No	52	50
Investment for pollution control	Yes	No	62	40
E3:Pollutant discharge and abatement				
Air emission information	Yes	No	59	43
Water discharge information	Yes	No	73	29
Solid waste disposal information	Yes	No	81	21
Energy consumption	Yes	No	96	6
Control, installations, facilities or processes described	Yes	No	85	17
E4:Environmental sustainability				
Energy services and/ or consumption information	Yes	No	92	10
Conservation of natural resources	Yes	No	98	4
Recycling	Yes	No	48	54
Tax advantage on economizing resources	Yes	No	44	58

Table A1. Environmental performance disclosure