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Article

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Environmental Management Accounting (EMA) practices and plastic pollution control in selected food and beverage firms

Smangele Nzama^{1*}, Odunayo Magret Olarewaju², Omolola A Arise³ and Idris Ganiyu³

Abstract: This study investigated the relationship between EMA and plastic pollution control. The study concentrated on Food and Beverage manufacturing companies since they use plastic goods to package their products. Plastic products are discarded once they have served their purpose, which pollutes the environment. A quantitative approach was adopted, with 124 self-completed questionnaires being administered to financial managers, management accountants, factory accountants and chief accountants of 38 selected food and beverage manufacturing firms in Durban. The findings revealed a significant relationship between environmental information and environmentally-related activities. Environmental information also had a positive relationship with corporate environmental strategy. Moreover, a strong positive relationship was discovered between environmental information and plastic pollution control. An analysis of the link between environmentally-related activities and plastic pollution control revealed an insignificant relationship. An insignificant relationship was also discovered between corporate environmental strategy and plastic pollution control. This study suggests that companies within the Food and Beverage industry must put in place sustainable environmental strategies, whereby eco-friendly disposal initiatives must be implemented for plastic waste management.

Subjects: Environmental Management; Environmental Issues; Management Accounting

Keywords: Environmental sustainability; CSR; corporate strategy; environmental management; accounting information; plastic waste

1. Introduction

The Plastics industry has grown significantly over the last century. The industry has diversified its product offerings and expanded its market globally, with a focus on the packaging sector and a subsequent increase in revenue for chemical, oil and manufacturing companies (Cristi et al., 2020). An estimated 300 million tons of plastic products are produced annually worldwide, with roughly half of these being single-use items (Matsuguma et al., 2017). Plastic is convenient to use because it has a low mass, high durability and costs less to manufacture (Naidoo et al., 2015). The problem with plastic is its life-cycle because after a plastic item has fulfilled its intended purpose, it is either recycled, burnt or thrown into landfill. Whichever process is followed, it will adversely affect the environment. When plastic is in the environment, it can take many years to degrade, if at all. Overall, plastic pollution in today's society is caused by the unsustainable use and disposal of

plastic products, thereby endangering economies, ecosystems and human health (Prata et al., 2019).

In recent years, plastic pollution has received much attention and has become a major environmental issue. South Africa ranks 11th (of 192 countries) in terms of the amount of mismanaged plastic waste entering the ocean (Trimble & Hutchinson, 2017; Van Rensburg et al., 2020). Developing countries are rapidly urbanizing and often lack the corresponding waste management facilities and infrastructure to account for the additional waste (Van Rensburg et al., 2020). Plastic pollution is irreversible as all the plastics cannot be recuperated and degraded. As prevention measures, clean-up activities, awareness instruments and civic science have been proposed, but it does not appear possible to remove all plastics from the environment due to already established widespread pollution. Whilst clean-up measures contribute to reducing plastic pollution pressure on the environment, (Prata et al., 2019) lament that they are not enough to manage this overwhelming problem.

The impact of the activities of manufacturing firms on environmental sustainability has gained significant global attention in recent decades. Governments and various regulatory bodies have further deepened their commitment to climate sustainability in recent years and as such, businesses are integrating relevant environmental information into their corporate strategies and environmental activities (Mokhtar et al., 2016). However, there remains great concern about rising rates of emission, waste, contaminated water, climate change, biodiversity loss, and the overuse of scarce resources, all of which have a direct impact on the environment and society (Khan et al., 2019). In addition, managers are pressured by stakeholders to concentrate mostly on ecological problems and environmental performance appraisal (Latan et al., 2018). Contributing significantly to environment degradation are the unsustainable practices of some firms, for instance, deforestation, pollution and carbon emissions (Ismail et al., 2014). Furthermore, the development of advanced industries is commensurate with the increase in emissions from the phase of industrial production (Agustia et al., 2019).

The rise in environmental pollution has prompted researchers to consider the relationship between economic growth (industrialization) and environmental degradation (Pei, 2017). Due to the rise in environmental concerns, researchers are focused more on Environmental Management Accounting (EMA) practices amongst manufacturing firms. EMA developed in response to the issues that traditional Management Accounting systems faced in connection with environmental operations. The application of Environmental Management Accounting has become a necessity because conventional Management Accounting systems grouped environmental costs as just one overhead cost (Mokhtar et al., 2016; Muhammad Jamil et al., 2015).

The level of adoption and implementation of EMA practice in many countries, mainly in developing nations, remains low (Iredele et al., 2020). The majority of managers are unaware of the advantages of improving environmental performance and lowering environmental impacts because they lack environmental knowledge (Muhammad Jamil et al., 2015). According to Solovida and Latan (2017), managers' overall work does not only include reducing costs but also minimizing the environmental impacts from firms' operations. Furthermore, reducing harmful environmental impacts necessitates the availability of data on the environmental costs associated with the company's operations. -

In recent years, rising societal concerns about environmental degradation have prompted some businesses to prioritize the implementation of environmentally-friendly supply, manufacturing and distribution systems. The effects of such processes can be demonstrated by the business's management's set of beliefs and values, or by the belief that an environmentally respectful management policy will contribute to the growth of a favorable perception of the business and its products. In other words, both economic and ethical considerations may be driving these decisions (Cambra-Fierro et al., 2008). The inability to account for the full economic costs of the

manufacturing and disposal of plastic fossil fuel, as well as its impact on environmental and human health services, results in plastic pollution. It is estimated that plastic pollution costs humanity over \$2.2 trillion annually in environment and social damage (Forrest et al., 2019).

Consequently, EMA practices developed to address the limitation(s) in traditional Management Accounting, which does not provide enough information about environmental management. It was pointed out that traditional management accounting cannot reveal hidden costs for unsustainable environmental-related activities (Ismail et al., 2014). According to Mokhtar et al. (2016), EMA assists businesses in measuring their environmental impacts and allocating associated costs and/or incomes attained from environmental activities. Furthermore, it reports environmental information to both internal and external stakeholders. The emergence of EMA has resulted from increased environmental impact and associated costs, as well as the inability of traditional accounting systems to provide the information needed for reducing these impacts and costs. Most environmental costs were undetectable and unidentified because they were classified as overheads in traditional accounting systems (Muhammad Jamil et al., 2015).

This research work is essential to literature exploring sustainable environmental practices. As climate change discussions deepen across societal spectrums amongst governments, organizations and non-governmental organizations, the need for sustainable environmental activities and efficient waste management practices has become very popular and essential. This research will help government officials and the manufacturing sector in general to understand the factors that support improved accounting and business sustainability. As such, this study investigates the relationship between Environmental Management Accounting practices and plastic pollution control in selected food and beverage manufacturing firms in Durban.

Previous literature review showed that several academics' and researchers' publications have highlighted EMA as an area that is rapidly increasing across nations (Iredele et al., 2020; Schaltegger et al., 2013). An important finding is the geographical range of the authors who have influenced the literature, as well as the places where the EMA conversation is thriving. The USEPA and Tellus Institute in the United States (US) were amongst the first organizations to adopt EMA and implement its concepts in a variety of industrial settings. Other adoptions took place in the United Kingdom (UK; Alkisher, 2018; Burritt, 2004; Burritt & Saka, 2006; Iredele et al., 2020). EMA research is slowly gaining traction in developing countries such as South Africa. However, the emphasis has been mostly on EMA implementation and identifying the factors that influence implementation by scholars such as Ambe (2007a); (Iredele & Ogunleye, 2017; Iredele & Ogunleye, 2018). Therefore, there is a research gap in EMA literature in South Africa.

There is limited academic research that attempts to explore EMA practices and plastic pollution control with a focus on food and beverage manufacturing firms, as they make use of plastic products for packaging. This study is significant because it addressed a growing environmental issue, i.e. plastic pollution. It seeks to explore EMA practices as a tool that can be used by food and beverage firms to manage plastic pollution. Existing literature on this topic is very scarce, hence the current study seeks to fill the gap in knowledge in Accounting research. It will assist managers in food and beverage firms with decision-making on matters relating to environmental sustainability, green operations and accountability. Additionally, the government will be better able to develop policies such as making it mandatory for firms to include environmental impact reports in their annual financial reports and banning single-use plastic products such as juice bottles, plastic cups, etc.

2. Background

Plastics' current worldwide pervasiveness and environmental implications—both known and undiscovered—appear to be gaining the attention of scientists, the general public and policy-makers (Da Costa et al., 2020). Plastic pollution is a global issue that necessitates systemic change in how people make, use and discard of plastics on a world-wide scale. The emphasis must shift from

purely end-of-pipe approaches to include structural interventions at the policy and governance levels, as well as measures throughout the plastics value-chain that take into account local customer behavior (De Kock et al., 2020). Governments in a majority of African countries have banned the use of single-use products such as plastics straws and cups, whilst others have imposed a levy on plastic with the aim to discourage plastic usage (Knoblauch & Mederake, 2021). Perspective methods, like replacing or prohibiting plastic items such as plastic bags, food containers and microbeads, are common in Africa, while their effectiveness is hotly debated. The recycling of polyethylene terephthalate in South Africa increased from 2% in 2000 to 55% by 2020 as a result of enhanced product responsibility regulations (Deme et al., 2022).

South Africa's plastic bag levy failed to reduce plastic over-consumption because it was not preceded by consumer education and stakeholder discussions. Plastic bag consumption decreased dramatically with the implementation of plastic levies on consumers, but climbed steadily in the long-run (Deme et al., 2022). South Africa, Botswana and Mozambique are the only SADC member countries that have both a partial prohibition and a levy. In May 2002, South Africa enacted legislation prohibiting the use of single-use plastic bags, which went into effect a year later. The initial legislation prohibited 80 m plastic bags and imposed a tax. However, due to industry pressure, the thickness of prohibited bags was reduced to 24 m. Due to objections, the charge amount was reduced, and shops paid for nearly half of it (Alpizar et al., 2020).

The United Nations Conference on the Environment was held in Stockholm, Sweden, in 1972. This forum raised awareness of worldwide environmental concerns. Moreover, this meeting served as a catalyst for developing-country governments, such as South Africa's, to enact pollution-control measures (Le et al., 2019). Furthermore, the Rio Earth Summit in 1992 pushed organizations to enhance their knowledge in order to accomplish sustainable economic operations while minimizing environmental impacts. The expanding environmental concerns of stakeholders, including governments, investors, customers and communities, have a direct and/or indirect impact on an organization's competitiveness (Dodds, 2014; Le et al., 2019). According to the United Nations Division on Sustainable Development (UNSD), EMA adoption is critical in order for businesses to implement cleaner and more productive operations such as reducing carbon emissions and making better use of physical resources such as water (Wachira & Wang'ombe, 2019). However, the degree of EMA practices is low since there appears to be a lack of a standard or widely approved framework for its implementation, thus organizations may use EMA procedures differently (Iredele et al., 2020).

3. Theoretical framework

3.1. Stakeholder theory

According to Michelon et al. (2016), Stakeholder Theory states that organizations are linked by a range of stakeholders, both domestic and foreign. The interests of these stakeholders must be acknowledged and handled in order for the company to continue to survive. Stakeholder Theory postulates that a business's performance is determined by how successfully it handles all of its engagements with its stakeholders (Iredele & Ogunleye, 2017). Chen and Roberts (2010) stated that this theory differs from others in that it emphasizes the institution's interactions with its stakeholders, particularly the environment. Basically, Stakeholder Theory acknowledges that different stakeholder groups have differing perspectives on how a firm should be run (Maama & Appiah, 2019).

In Environmental Management Accounting, Stakeholder Theory is regarded as an open-to-interpretation theory. It requires understanding and defining the link between the company's actions and their consequences for its stakeholders. The Stakeholder Theory viewpoint considers the business's environment, which includes customers wholesalers, employees and other concerned citizens (Ofoegbu et al., 2018). The organization's actions must be modified in order to obtain their approval. Environmental information disclosure could be viewed as a type of

conversation between the organization and its stakeholders. However, the power connection between stakeholders and organizations is not universal amongst entities. Stakeholder theory is concerned with how an organization handles its stakeholders because the manner in which an organization handles its stakeholders is determined by its strategic posture, which can be active or passive. An organization that takes an active stance may aim to influence its key stakeholders. Low levels of environmental disclosure are expected as a result of a lack of stakeholder engagement (Elshabasy, 2018; Liu & Anbumozhi, 2009). Prior research indicates that a firm's disclosure reduces information asymmetry by releasing information that enables stakeholders equal access to a firm's financial and other information (Fonseka et al., 2019).

3.2. Legitimacy theory

According to Chen and Roberts (2010), this theory focuses on whether the value systems of the organization and the community are aligned with each other. It also considers whether an organization's goals align with societal beliefs. However, the Legitimacy Theory does not describe how to achieve compatibility or how to construct action.

The basis of the Legitimacy Theory is the notion of organizational legitimacy, which provides a firm with an obligation to carry out its business operations in conformity with the interests of the public. Therefore, companies aim to do business in accordance with the standards and expectations of the local community (Ofoegbu et al., 2018). According to Maama and Appiah (2019), the Legitimacy Theory is mainly based on the principle of a "social contract", which focuses on how businesses depend on their surroundings; the varying expectations of the community; and how a firm strives to justify its position in society by institutionalizing its operations. If society feels that an organization acts within the confines of a socially approved system of values, the organization is regarded as genuine and has the potential to survive and develop (Qian et al., 2011).

This study investigated the relationship of EMA practices with plastic pollution control. Previous studies on EMA practices have used these theories. Hence, this study will use both Stakeholder and Legitimacy theories. These theories are suitable for this study because the problem of plastic waste affects the environment and in order to minimize its negative effects, different stakeholders need to work together. The pressure placed by stakeholders pushes companies to operate in a sustainable manner which has minimal effects on the environment. According to Fonseca et al. (2019), Legitimacy and Stakeholder theories may provide a more comprehensive view of environmental information disclosure because they understand that enterprises are defined by political, social and institutional frameworks.

4. Literature review and hypothesis development

4.1. Environment Management Accounting (EMA) practices: Prospects and challenges

Successful firms do more than just delivering their core objective of production or delivering a service, they get involved in socially viable activities that contribute to the overall development of their communities. Firms are becoming more aware of the value that key stakeholders place on socially, environmentally and ethically responsible behavior. As a result, they actively seek to minimize their environmental impact in order to enhance their image and prevent the negative implications of possible conflicts with interested parties. Consequently, voluntary disclosure of information on environmental impact has become more common (Hassan & Ibrahim, 2012). However, emerging economies in developing countries appear to be confronted with a daunting task in promoting corporate environmental information disclosure (Zeng et al., 2010).

Staniskis and Stasiskiene (2006) examined the extent to which SMEs have implemented EMA practices using the innovative assessment and evaluation methods of EMS and Cleaner Production (CP). Although the study's findings were different compared to what is obtainable in other industries, their results suggested that EMA practices improve the disclosure of EMA information and motivated companies to do business in an environmentally-friendly manner. Qian et al. (2011) found that social

institutional factors motivate regional municipalities to adopt Environmental Management Accounting practices to manage waste. It was further discovered that these municipalities do use EMA information to manage waste. A study by Latan et al. (2018) revealed that EMA tools help organizations achieve superior environmental performance by presenting significant environmental information for decision-making. According to the findings of Christ and Burritt (2013), the current use of EMA is linked with environmental strategy, the size of the organization and environmentally-friendly firms. The study also found that organizational structure has nothing to do with how accountants perceive the use of EMA in their organizations. A study conducted by Iredele and Ogunleye (2017) discovered that the main barrier to implementing EMA in South African companies is a lack of access to funds. EMA practices were found to be costly to implement and required a large amount of money to integrate them into business processes and systems. In addition, Mohr-Swart (2008) found that the Mining sector in South Africa recorded environmental costs as general overhead costs, and they were assigned in a way that did not always correspond to their actual use.

Ambe (2007b) conducted a study which found that EMA is becoming well known in South Africa. However, the level of implementation remains very low. It was also discovered that some EMA components are seen in practice, but they are not referred to as EMA. Moreover, Iredele et al. (2020) found that the implementation of EMA is high in South African companies when compared with other African countries. The fundamental driver of EMA practice was discovered to be institutional isomorphism as a result of coercive pressure. Iredele and Ogunleye (2018) suggested that the South African government should implement green tax benefits and other market-based environmental policy instruments to compensate companies for their sustainability practices. Mohr-Swart (2008) noted that EMA benefits include improved pollution control measures; minimized use of natural resources; increased use of reusable or biodegradable materials; enhanced sustainability; and improved environmental and economic performances. According to (Ferreira et al., 2010), other potential benefits associated with EMA use include cost reductions, improved product pricing, attraction of human resources and reputational improvements. Thus, EMA provides firms with different information for decision-making. Such information may reveal hidden opportunities, such as better waste management processes, reduced energy and material consumption, or opportunities for material recycling.

4.2. Environmentally-related activities

Businesses are becoming more environmentally conscious, causing them to look for ways to motivate their staff to adopt environmental measures that will enhance the environmental performance of their business activities, goods and services (Jiang et al., 2018; Paillé et al., 2014; Ramus, 2002). In the past, industrial and individual involvement in environmental issues was generally neglected (Tapang et al., 2012). Environmental activities are those that aim to decrease or reduce environmental stresses while also making better use of natural resources (Nathaniel et al., 2021). Investing in pollution control or minimization technologies; restoring the environment after ecological harm; preserving the economic system from worsening environmental conditions; recycling; sustainability and management of resources; and the manufacture of environmental goods and services are some examples (OECD, 2005). Csutora (2007) stated that EMA measures environmental actions. Additionally, some advantages of engaging in environmental activities include Enhanced product quality, improved client relationships and a positive firm brand and image. The disclosure of hidden environmental costs, such as the labour cost of maintaining environmentally-related equipment, which is typically not charged as an environmental cost, would encourage organizations to make better decisions and perform better (Ismail et al., 2014).

4.3. Corporate environmental strategy

Three stages are suggested in developing/designing the corporate environmental strategy of an organization, namely managing regulatory compliance; achieving a competitive advantage; and completing environmental integration (Gunarathne et al., 2015). Latan et al. (2018) described environmental strategies as a collection of interventions that can minimize the impact of operational activities on the environment through products, processes and corporate policies. These

policies include minimizing power usage and waste; utilizing environmentally-friendly resources; and putting in place EMSs. The use of EMA and Environmental Management Control System (EMCS) in businesses is influenced by the organization's environmental strategy, which is part of its overall business strategy.

4.4. Environmental information

The reporting of corporate environmental information refers to the release of information regarding their activities related to the physical environment's environmental protection, as well as the consumption of resources (Zeng et al., 2010). Environmental Accounting requires a corporation to declare any pollution-causing operations, as well as monitor and disclose the use of natural resources. It is assumed that such activities have a considerable influence on the resources and the performance of the organization (Noodezh & Moghimi, 2015). Moreover, many companies have voluntarily reported environmental information in financial statements or in independent environmental reports in response to stakeholder pressure (Hassan & Ibrahim, 2012). By detailing Accounting information relating to the environment, the natural security office can trace the general circumstances of the environment and make an objective evaluation of the corporation's environmental commitment. Disclosure has an impact on management staff's reputation and social profile, as well as helping the citizens and shareholders make informed investment decisions. Furthermore, Environmental Accounting incorporates financial, environmental performance and policy elements into annual reports and social responsibility reports (Li et al., 2018).

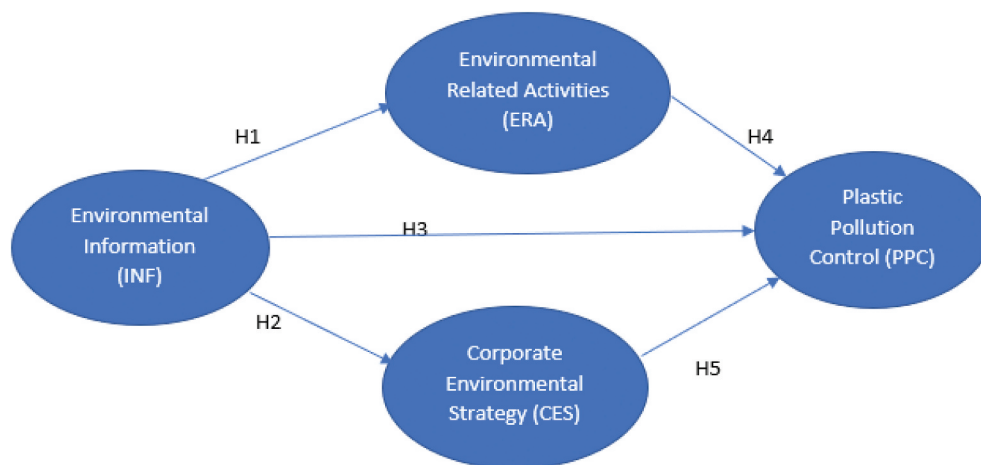
4.5. Plastic pollution: An ecological concern and widespread environmental degradation practice in South Africa

The Manufacturing sector is responsible for more than 70% of pollution and waste in South Africa due to faulty or misleading information on the management and fate of the energy, water and materials utilized to support its activities. EMA can provide some foundation for controlling pollution, waste and emission in South Africa (Klingelhöfer & Obioha, 2012). According to Adebisi-Abiola et al. (2019), plastic waste pollution is widespread in Africa, exacerbated by poor waste management and inadequate recycling capacities. The reduction of plastics waste in Africa is very closely linked to the recycling economy. Overall, in low-income countries, approximately 90 percent of all waste is dumped or burnt (Ferronato & Torretta, 2019). Waste management is more regulated in high-income regions, where recycling rates are higher. The collection of enough plastic waste for feeding recycling is an ongoing effort in Africa. Naidoo et al. (2015) found great amounts of plastic waste entering the ocean, which is transported by rivers in Durban. According to Weideman et al. (2020), rivers are considered to transport a large portion of the plastic debris that enters the sea from land. The study found microplastics and microfibre contaminants in the water sampled. In addition, the amount of micro-plastics increased towards the surface, implying that microplastic pollution occurs globally and increases with time (Matsuguma et al., 2017).

Plastic pollution is still a major environmental concern in South Africa, which is ranked amongst the top 20 countries with the highest levels of plastic pollution. Furthermore, South Africa is considering prohibiting the use of some plastic products (Muller, 2019; Ryan, 2018). According to Hodal (2019), plastic pollution costs society billions of dollars each year in terms of harmed and misplaced assets. Marine businesses are more adversely affected by plastic contamination. Thompson (2017) examined the facts on plastic pollution in the ocean. The study determined that plastic pollution is a worldwide ecological concern that impacts sea creatures from the tropics to the seashore, and from the sea surface to the deep sea. Viool et al. (2019) highlighted the difficulty of addressing marine plastic waste, particularly in terms of mitigation and clean-up costs. Above all, the assessment found that marine plastic pollution has an influence on the national economy by affecting important economic sectors, or by necessitating the removal of waste, which necessitates greater resources and expense.

Abbott and Sumaila (2019) discovered that countries with high levels of marine plastic pollution can minimize plastic outflows by addressing design and production decisions. Thus, consumers'

Figure 1. A conceptual framework on the relationship between environmental information management and plastic pollution control.



consumption and disposal decisions are addressed. These measures must be tailored to the circumstances of local institutions, social norms and recyclables markets. Furthermore, policy-makers play a critical role in ensuring that these techniques are implemented. According to Jia et al. (2019), policy interventions to minimize plastic pollution should take into account not only economic costs and benefits, but also human behaviour. Individuals and corporations should be encouraged to collaborate in the fight against plastic pollution.

According to Makgae (2011), key waste disposal difficulties in South Africa include a poor waste management system in densely populated cities; improper disposal; unauthorized waste management tasks; a lack of space at authorized landfill sites; inadequate pollution prevention and recycling initiatives; and a lack of waste information. According to Sibisi (2019), consumers, South African corporates, enterprises and merchants hold the key to minimizing plastic pollution that degrades the environment and waterways. Reusable packaging, novel delivery techniques and a full re-think of existing business structures could all help to reduce plastic waste. Recycling is a major approach for reducing plastic pollution. Plastic recycling is a way of re-using waste or plastic trash and turning it into useable commodities. Thus, plastics can be recycled numerous times, based on the nature of the waste portion recovered, while retaining their value and useful capabilities (Milios et al., 2018). Waste plastic recycling is an environmentally-friendly approach to the waste plastic disposal problem that has become industrial common procedure (Gu et al., 2017).

4.6. Conceptual framework

The conceptual framework in Figure 1 showcases the constructs to be tested, with the following formulated hypotheses:

H1: There is a significant relationship between environmental information and environmentally-related activities in Food and Beverage manufacturing firms in Durban.

H2: There is a significant relationship between environmental information and Corporate Environmental Strategy in the Food and Beverage manufacturing firms in Durban.

H3: There is a significant relationship between environmental information and plastic pollution control in the Food and Beverage manufacturing firms in Durban.

H4: Environmentally-related activities mediate the relationship between environmental information and plastic pollution control in the Food and Beverage manufacturing firms in Durban.

H5: Corporate Environmental Strategy mediates the relationship between environmental information and plastic pollution control in the Food and Beverage manufacturing firms in Durban.

5. Research design

This research used the quantitative research method to examine the relationship between Environmental Management Accounting and plastic pollution control. The study followed a Positivist research paradigm. Research objectives play a significant role in the choice of study design, and researchers are tasked with the responsibility of adopting and implementing the most appropriate research design to effectively answer their outlined questions (McCusker & Gunaydin, 2015). As a study setting out to investigate the correlation between EMA and plastic pollution control, a quantitative design offers very relevant and useful tools not just to determine if these variables are correlated, but also to ascertain the nature of these relationships. According to (San et al., 2018), EMA is a hybrid technique that delivers financial and non-financial information for smooth manufacturing process operations, with the goal of reducing environmental impacts and increasing efficiency. Accountants and managers can act accurately in dealing with plastic pollution due to these relationships. When designing a Corporate Environmental Strategy, it is critical that accountants and management within a company are aware of environmental information and environmentally-related activities within the organization.

To better understand the relationship between the variables studied, the researcher chose a commonly used method to collect primary data, i.e., survey questionnaires. Survey questionnaires allowed the researcher to collect data directly from the main source. This method of collecting data was inexpensive and time efficient (Nayak & Narayan, 2019). The questionnaire adopted a Five-Point Likert Scale ranging from “strongly disagree” to “strongly agree”. The questions were framed and structured in a simple and unambiguous way to allow respondents to easily comprehend and provide relevant scaled answers. The research location is selected Food and Beverage production companies situated in Durban. The study focused on this type of manufacturing enterprises because they make use of single-use plastics for packaging food, fruits and other items, as well as plastic carry-bags, which are the largest source of plastic pollution (Muller, 2019). There are approximately 55 companies producing food and beverages in Durban (Robbins & Velia, 2015), of which 32 were sampled. The researcher used convenience sampling, hence only 32 firms were sampled.

The researcher approached the respondents online via email and briefed them on the purpose of the study. The email address of each respondent was gathered from their firm website, and each potential participant identified was invited to join by an emailed request. Questionnaires were distributed to the 128 respondents from the sampled firms, with 4 respondents chosen from each of the selected 32 Food and Beverage manufacturing firms. However, when the questionnaires were returned, four (4) of them were completed incorrectly, hence only 124 questionnaires were analysed. The chosen respondents perform similar tasks in their organizations. Their major responsibility is to prepare financial statements, budgets and reports on the business activities. Financial managers, management accountants and factory accountants report to a chief accountant/chief financial officer. The fieldwork was carried out during the Covid-19 pandemic hard lockdown period and, as such, the researcher relied on firms that were available and willing to participate in the study.

Data from the survey questionnaires were collected and analyzed using the Statistical Package for the Social Sciences (SPSS). SPSS is an application that can run a wide range of tests and produce outputs that can be incorporated into study reports (Habes et al., 2021). For ordinal data, the

Table 1. Target population and sample size

Respondent category	Number in each company
Financial Manager	1
Management Accountant	1
Factory Accountant	1
Chef Accountant	1
Total	4
Total questionnaires to be distributed $32 \times 4 = 128$	

Table 2. Reliability, convergent and discriminant validity

Variable	CR	AVE	CES	INF	ERA	PPC
Corporate Environmental Strategy	0.799	0.452	0.672			
Environmental information	0.950	0.762	0.452	0.873		
Environmentally-Related activities	0.932	0.696	0.465	0.853	0.834	
Plastic pollution control	0.782	0.380	0.339	0.615	0.595	0.616

measuring scales used were 1 (strongly disagree) to 5 (strongly agree). For the nominal data, the codes were one (1), which represented “Yes” and (2), which represented “No”.

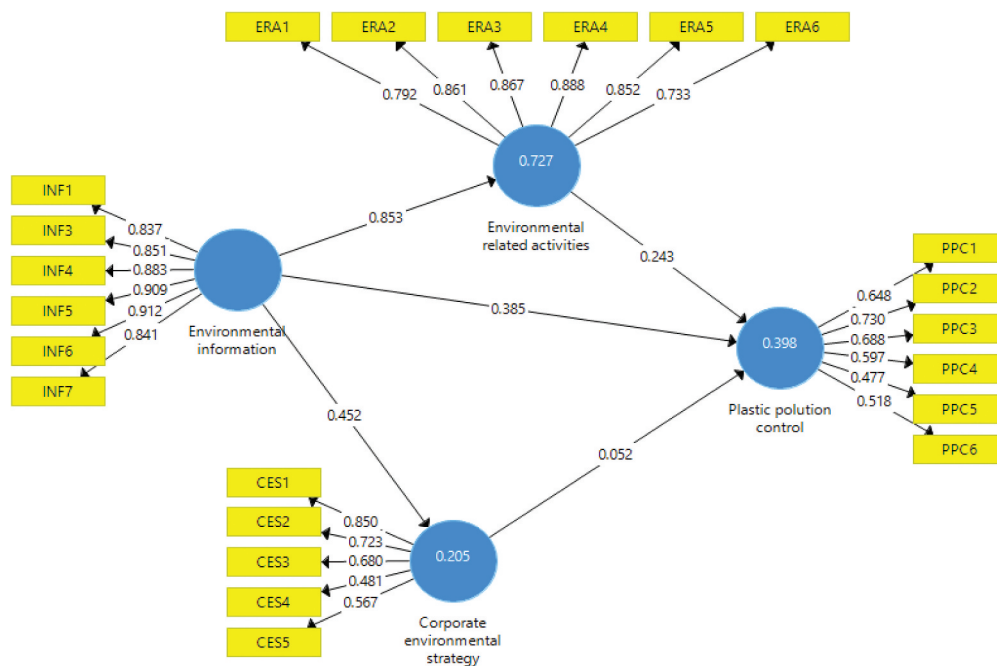
6. Empirical findings and discussions

IBM SPSS version 26 was valuable to code and label the quantitative data collected in this study. The coded data in SPSS was subsequently saved as Comma Delimited to be able to import into the SmartPLS software. Then, the SmartPLS version 3.3 was used to conduct component-based SEM. Empirical evidence suggests that component-based SEM can be used to conduct analysis for a small sample size (Hair et al., 2014; Tenenhaus, 2008). This informed the choice of component-based SEM, as it was found appropriate to test the formulated hypotheses because of the small sample size of 128 illustrated in Table 1.

The reliability of the measuring instrument was evaluated using the Composite Reliability (CR). In addition, the convergent validity was established using the Average Variance Extracted (AVE), while discriminant validity was ensured in this study using Table 2 to illustrate the results of the reliability and validity tests conducted in this study.

The statistical analysis in Table 2 revealed that the composite reliability of all constructs measured in this study are reliable as they were above the threshold of 0.6 (Pallant, 2020). For emphasis, the reliability for *corporate environmental strategy* was 0.799; *environmental information* was 0.950; *environmentally related activities* was 0.932; and *plastic pollution control* was 0.782. The AVE conducted revealed the convergent validity of all constructs except plastic pollution control, which was below the acceptable level. However, the Fornell and Larcker criterion conducted revealed that discriminant validity was not violated in this study. This was achieved by comparing the square root of the AVE to the correlations (the values in the diagonal). The structural model in Figure 2 showcased the direct and indirect paths on the relationship between environmental information and plastic pollution control.

Figure 2. Structural model.



As illustrated in the SmartPLS analysis in Figure 2, the beta loading from environmental information to environmentally-related activities shows a strong significant positive relationship at ($r = 0.853, p < 0.0001$). This positive relationship indicates a direct relationship between environmental information and environmentally-related activities. The R^2 value of (0.727) is an indication that environmental information accounts for a 72.7% variance in environmentally-related activities at the Food and Beverage firms surveyed. Based on this outcome, Research Hypothesis One, which states that a significant relationship exists between environmental information and environmentally-related activities, is affirmed. When firms disclose their environmental information, this enables them to be aware of environmental activities that the firm may engage in. Similarly, the path from environmental information and Corporate Environmental Strategy revealed a significant positive relationship between the two constructs ($r = 0.452, p < 0.0001$). This result implies that environmental information has a direct relationship with Corporate Environmental Strategy in Food and Beverage firms in Durban, South Africa. The R^2 value of (0.205) implies that environmental information explained 20.5% of the variance in Corporate Environmental Strategy. This result supports Hypothesis Two, which states that a significant relationship exists between environmental information and Corporate Environmental Strategy. Environmental information disclosure plays a crucial role in decision-making on matters relating to the environment and the development of environmental policies within the organization.

The path coefficient from environmental information to plastic pollution control revealed that environmental information has a significant positive relationship with plastic pollution control at ($r = 0.385, p < 0.0001$). The value of the R^2 (0.398) shows that environmental information explains a 39.8% variance in plastic pollution control. Based on the result of the statistical analysis, Hypothesis Three, which states that a direct positive relationship exists between environmental information and plastic pollution control, is affirmed. The reporting of environmental information may assist firms in developing control measures that will manage plastic pollution. However, the path coefficient from environmentally-related activities to plastic pollution control is not significant ($r = 0.243, p > 0.05$). This insignificant relationship implies that environmentally-related activities do not mediate the relationship between environmental information and plastic pollution control.

Based on this outcome, Hypothesis Four, which aimed at establishing the mediating influence of environmentally-related activities on the relationship between environmental information and plastic pollution control, is rejected. A majority of the firms in South Africa are still reluctant to engage in environmentally-related activity as it is not a mandatory practice. In a similar vein, the path coefficient between Corporate Environmental Strategy and plastic pollution control is not significant ($r = 0.052$, $p > 0.05$). This insignificant relationship implies that Corporate Environmental Strategy does not mediate the relationship between environmental information and plastic pollution control. This is due to the fact that environmental information disclosure is a developing aspect in South Africa and firms have not fully integrated it within their practice.

The growing concern for environmental sustainability in South Africa is complicated by the unfettered damaging activities of certain enterprises, which has re-kindled the interest of researchers and policy-makers in how corporations are obligated to play a role in decreasing their negative impact on the environment and engaging in eco-friendly operations. The findings of this study show a significant relationship between environmental information and environmentally-related activities. This indicates that if firms have relevant and up-to-date sustainable environmental information, there will be proper planning and the implementation of sustainable environmental activities in product designs and disposal measures. Hassan and Ibrahim (2012) discovered that firms disclose their environmental information because of environmental awards. As part of the requirements for these awards, firms are not just required to commit to sustainable environmental practices, but they are obligated to disclose their environmental practices such as waste management systems, climate change risk, climate change activities and carbon emissions. The more environmental activities a firm participates in and reports on, the better their chances of receiving the environmental prize. Meng et al. (2019) discovered that the amount of environmental information disclosure is positively associated with enterprises' advertising intensity, which is consistent with a strategic perspective of corporate social responsibility (CSR) in which firms use social and environmental activities as part of their competitive strategy.

The findings also revealed a positive relationship between environmental information and Corporate Environmental Strategy. This indicates that companies with relevant and up-to-date sustainable environmental information are better positioned to develop and implement better environmental strategies. According to Wang et al. (2020), companies need to implement strategies to enhance their environmental behaviors; pay attention to the construction of environmental strategies; and change how they respond to environmental pressures from various stakeholders. Corporate Environmental Strategies include the development of green products and markets, cleaner technologies, and the integration of green business portfolios. The study further revealed a direct relationship between environmental information and plastic pollution control. In a study conducted by Tian et al. (2016) on the role of environmental information disclosure in pollution reduction, it was discovered that higher PITI scores are connected with lower pollutant levels and more pollution-control investments, implying that environmental information is beneficial in pollution control. In order to promote improved environmental management, public or information disclosure combines traditional environmental monitoring, self-regulation and public pressure via environmental ratings. As a result, it serves as an effective technique for reducing pollution in developing countries (Kathuria, 2008). According to (Dolucà et al., 2018), when businesses invest in environmental initiatives, their public reputation improves. Firms in South Africa are still reluctant to disclose environmental information and engaging in practices that control plastic pollution. According to Nath and Ramanathan (2016), some businesses are less devoted to meeting their environmental commitments and instead construct their environmental management procedures only to comply with legal requirements. On the other hand, some firms are more committed to improving their environmental standards, taking a proactive approach, investing in resources and designing environmental management procedures. Firms that disclose environmental information significantly enhance their environmental performance, as the more information on environmental investment and pollution control costs released, the better the company's

economic performance (Liu & Anbumozhi, 2009; Ma et al., 2019). In addition, Foulon et al. (2002) demonstrate that public disclosure of sustainability practices creates unique and better rewards for pollution control.

7. Summary and conclusion

The literature on the application of Environmental Management Accounting practice is scarce, particularly in terms of plastic pollution control in South Africa. As such, this study contributes to this body of literature. This study aimed to examine the relationship between Environmental Management Accounting practices and plastic pollution control amongst Food and Beverage firms in Durban. The following variables were used to develop the hypotheses, corporate environmental strategy, environmental information, environmentally-related activities, and plastic pollution control.

The findings of this study revealed that relevant sustainable environmental information enhances Corporate Environmental Strategies and promotes the implementation of sustainable environmentally-related activities. This discovery suggests that releasing Environmental Information Benefits Management in reducing plastic pollution and ensuring accountability. The study focuses on the firm's ability to invest in environmental activities, report on environmental information and develop Corporate Environmental Strategies with an aim to come up with ways to control plastic pollution. Environmental challenges are directly linked to company sustainability goals. Policy-makers should understand the need for regulatory pressure to support environmentally-friendly business practices. The South African government can start by making it mandatory for firms that make use of plastic products to include an environmental information report in their Annual Financial Statements. To motivate the Food and Beverage firms in engaging in environmentally-related activities, the FOODBEV sector can host environmental awards annually and provide incentives.

The research method utilized in this study was insufficient to determine the extent to which Food and Beverage manufacturing companies have implemented various EMA procedures. Since the study was conducted in Durban and focused on Food and Beverages firms, extrapolating the findings to other sectors could lead to an erroneous conclusion. While the findings of this study might not give a broad overview of the state of EMA practices obtainable across Food and Beverage firms in South Africa, it provides a critical conceptual ground for other studies to be developed. The research should be expanded to other South African provinces so that a detailed comparison of EMA application on plastic pollution reduction may be performed across the country, with a focus on the Food and Beverage production sector. It is suggested that more research on the same topic be conducted utilizing a mixed method approach. Finally, expanding the study to include plastics manufacturing businesses is also recommended.

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I hereby do declare that the co-authors and primary researcher do not have any conflicts of interest.

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Appendix 1

EDITING LETTER

696 Clare Road

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24 May 2022

To: Whom it may concern

Editing of Article by Smangele Nzama

Environmental Management Accounting (EMA) practices and Plastic Pollution Control in selected Food and Beverage firms

This letter serves as confirmation that the aforementioned article has been language edited.

Any queries may be directed to the author of this letter.

Regards

MP MATHEWS

Lecturer and Language Editor

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Appendix 2: Questionnaires

TOPIC: THE APPLICATION OF ENVIRONMENTAL MANAGEMENT ACCOUNTING PRACTICES ON PLASTIC POLLUTION CONTROL IN FOOD AND BEVERAGES MANUFACTURING FIRMS IN DURBAN, SOUTH AFRICA.

SECTION A: BIOGRAPHIC INFORMATION

1. Job Designation

Financial Manager

Management Accountant

Factory Accountant

Chief Accountant

2. Employment Experience

- 0 to 5 years
- 6 to 10 years
- 11 to 15 years
- 16 to 20 years
- > 21 years

3. Age Group

- 20 years or below
- 21 to 30 years
- 31 to 40 years
- older than 40 years

4. Marital Status

- Single
- Married
- Divorced
- Widowed

5. Highest level of qualification

- Diploma/ Bachelor's Degree
- Honours Degree/ Btech
- Masters
- Doctorate

6. Firm scale

- Small
- Medium
- Large

7. Existence of environmental costs

Yes

No

8. Investments on environmental activities

Yes

No

SECTION B: ENVIRONMENTAL MANAGEMENT ACCOUNTING PRACTICES IN A FIRM

INSTRUCTIONS TO RESPONDENTS:

1. Please select ONLY ONE response with a tick ✓ for each Likert Scale statement below.
2. Answer ALL the pre-coded statements in this section.
3. Please DO NOT leave any statement blank.

KEY: SD = Strongly Disagree (1); D = Disagree (2); N = Neutral (3); A = Agree (4); SA = Strongly Agree (5)

Please select the appropriate environmental management accounting tool(s) used in your firm:

Environmental cost accounting

Lifecycle costing

Target costing

Material flow assessment

Energy flow assessment

Lifecycle inventories

Lifecycle analysis

Flow cost accounting

Input/output analysis

Environmental life cycle budgeting

Environmental life cycle target pricing

Other

S/N	Statements	SD	D	N	A	SA
1.1	CORPORATE ENVIRONMENTAL STRATEGY OF FIRM:					
1.1.1	Environmental sustainability is important to our firm.					
1.1.2	Integrated environmental issues are incorporated into the company's strategic planning process.					
1.1.3	Environmental objectives are linked with the company's corporate goals.					
1.1.4	During the development of new products, environmental issues are always considered.					
1.1.5	The current financial management/costing system provide the company with data required to analyse environmental costs.					
1.2	ENVIRONMENTAL RELATED ACTIVITIES:					
1.2.1	The firm identifies environment related costs					

(Continued)

(Continued)						
S/N	Statements	SD	D	N	A	SA
1.2.2	The firm allocate environment related costs to production processes					
1.2.3	The firm assign environment related costs to products					
1.2.4	The firm create environment related costs account					
1.2.5	The firm uses environmental related cost account.					
1.2.6	The firm improve environment related cost management					
1.3	PERSPECTIVES OF ENVIRONMENTAL MANAGEMENT ACCOUNTING:					
1.3.1	Environmental information is disclosed in the present management accounting information system					

(Continued)

<i>(Continued)</i>						
S/N	Statements	SD	D	N	A	SA
1.3.2	Formal accounting procedures are available when dealing with a specific environmental issue					
1.3.3	The firm undertake environmental impact audits to assess the firms impact on the environment resulting from economic activities					
1.3.4	The firm report environmental information to external stakeholders					
1.4	FACTORS INFLUENCING THE ADOPTION OF ENVIRONMENTAL MANAGEMENT ACCOUNTING (EMA) PRACTICES					
1.4.1	The level of education affects the adoption of Environmental management accounting practices					
1.4.2	Experience assist in identifying suitable environmental management accounting practices					

(Continued)

(Continued)						
S/N	Statements	SD	D	N	A	SA
1.4.3	The firm require resources to train the management stuff to adopt environmental management accounting practices					
1.4.4	The number of years in which the firm has been in operation influences the adoption of environmental management accounting practices					
1.4.5	The size of the firm impact the adoption of EMA practices					
1.4.6	The complexity of an enterprises has an impact on the adoption of EMA practices					
1.4.7	Environmental management accounting practices are expensive to implement in a food and beverage manufacturing industry					
1.4.8	Environmental management accounting practices are complex to implement in a food and beverage manufacturing industry					

(Continued)

(Continued)

S/N	Statements	SD	D	N	A	SA
1.4.9	It is difficult to collect environmental costs					
1.4.10	It is difficult to allocate environmental costs					
1.4.11	The benefits of implementing Environmental Management Accounting outweigh the lack thereof					

SECTION C: PLASTIC POLLUTION CONTROL

INSTRUCTIONS TO RESPONDENTS:

1. Please select ONLY ONE response with a tick ✓ for each Likert Scale statement below.
2. Answer ALL the pre-coded statements in this section.
3. Please DO NOT leave any statement blank.

KEY: SD = Strongly Disagree (1); D = Disagree (2); N = Neutral (3); A = Agree (4); SA = Strongly Agree (5)

Section D: Environmental management practices on plastic pollution control

Instructions to respondents:

1. Please select ONLY ONE response with a tick ✓ for each Likert Scale statement below.
2. Answer ALL the pre-coded statements in this section.
3. Please DO NOT leave any statement blank.

KEY: SD = Strongly Disagree (1); D = Disagree (2); N = Neutral (3); A = Agree (4); SA = Strongly Agree (5)

THANK YOU FOR YOUR PARTICIPATION!

S/N	Statements	SD	D	N	A	SA
2.1	PLASTIC POLLUTION CONTROL WITHIN THE FIRM:					
2.1.1	A majority of the product produced are short-lived products					
2.1.2	A majority of our short-lived products are made of plastic					
2.1.3	Plastic packaging are a major contributor to plastic waste					
2.1.4	The firm support different plastic recycling design					
2.1.5	The firm encourages environmentally friendly practices to customers					
2.1.6	Controlling plastic waste require an effort from the consumer as well					
2.1.7	There are procedure available to assess plastic waste incurred by the firm					
2.1.8	The firm invest to research to determine ways to reduce environmental impact of the firm associated with plastic waste					

(Continued)

(Continued)						
S/N	Statements	SD	D	N	A	SA
2.2	REASON FOR FIRMS TO REDUCING PLASTIC WASTE:					
2.2.1	The fear for the firm's sustainability in the future and its uncertainty					
2.2.2	The market pressure for products that are environmentally friendly					
2.2.3	Strict legislation and environmental crime law					
2.3	BARRIERS TO SUSTAINABILITY AND ADOPTION OF ALTERNATIVE METHODS:					
2.3.1	The are no incentive on economic polices					
2.3.2	Alternative methods (use of biodegradable plastic or paper) are expensive to implement					
2.3.3	Additional infrastructure is required to adopts new methods					
2.3.4	The firm prioritize more the production processes					

(Continued)

(Continued)

S/N	Statements	SD	D	N	A	SA
2.3.5	The firm prioritizes the products					
2.3.6	Concern about competitiveness influences the decision to adopt alternative methods					
2.3.7	Management resistance to change affect the decision to adopt alternative methods					

S/N	Statements	SD	D	N	A	SA
3.1	ENVIRONMENTAL INFORMATION AND ENVIRONMENTAL COSTS ASSOCIATED WITH PLASTIC POLLUTION					
3.1.1	The firm report environmental costs associated with plastic pollution					
3.1.2	Major environmental costs incurred by the firm relate to prevention of plastic pollution					
3.1.3	The firm tries to reduce the threat of plastic waste to the environment by implementing environmental management accounting tools					
3.1.4	The firm identify environmental costs relating to plastic using environmental management accounting tools					
3.1.5	The firm trace environmental costs associated with plastic using environmental management accounting tools					

(Continued)

(Continued)						
S/N	Statements	SD	D	N	A	SA
3.1.6	The firm record environmental costs associated with plastic using environmental management accounting tools					
3.1.7	Environmental management accounting practices provide the expertise that enables the firm to track the impact of plastic waste caused by its processes or product					
3.1.8	Environmental management accounting tools provide the management with environmental information associated with plastic pollution that assist in decision making					
3.1.9	Environmental management accounting practices ensures that adequate resources are available to control costs of plastic pollution					



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