

Extent of Application of Environmental Management Accounting Practices for Environmental Protection by Manufacturing Firms in Abia State, Nigeria

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Abstract

The need to ensure environmental protection necessitated this study to determine the extent of application of environmental management accounting practices for environmental protection by manufacturing firms in Abia State, Nigeria. Two specific purposes and two research questions guided the study and two null hypotheses were tested. Survey research design was used. Population of the study comprises 227 (179 male and 48 female) managers from the 64 registered manufacturing firms in Abia State. Sample was not drawn as the population size was manageable. The instrument for data collection was a 30-items structured questionnaire which was duly validated by three experts and its reliability tested using Cronbach Alpha which yielded 0.93 coefficients. Data were analyzed using the arithmetic mean and standard deviation while ANOVA was used to test the null hypotheses at 0.05 level of significance. Findings reveal that managers of manufacturing firms in Abia State applied environmental impact management and prevention practices for environmental protection to a moderate extent and environmental management cost allocation practices to a high extent. It was found also that qualification significantly affect the managers of manufacturing firms responses on environmental impact management and prevention practices while, they do not significantly affect the environmental management accounting cost allocation practices. Therefore, the study concludes that the environmental management accounting practices have not been fully applied for environmental protection by manufacturing firms in Abia State. Based on the findings and conclusion of the study, it was recommended among others that manufacturing firms should prioritize investment in ecological development, including the adoption of new technologies as a strategic measure for reducing the environmental impacts of their activities. Manufacturing firms should also apply environmental impact management and prevention practices, prior to production as a crucial means of minimizing environmental impact and promoting environmental sustainability and protection.

Keywords: Environment management accounting practice, manufacturing firm, environmental protection.

Introduction

The growth of public concern for the environment worldwide has been one of the most recent and important developments. Environmental issues and problems transcend national borders and pose serious challenges to the health of the planet. Notably, Oyebode (2018) opined that the development of more effective environmental laws and legal systems throughout the world has thus become critical to directing economic development and growth onto a path of environmental sustainability. The United Nations during the Sustainable Development

Summit held on 25th September, 2015 in New York City, USA made a clarion call with the development agenda titled “Transforming our World: The 2030 Agenda for Sustainable Development”. In the Summit, a seventeen (17) point agenda called Sustainable Development Goals (SDGs) was proposed and accepted by 193 countries, as a means through which the world can pursue threefold development in economic, social and environmental development.

The importance of environment has been understood in recent years. Today, the whole society searches for solutions concerning environmental management and protection. Environmental protection defines how to study and protect ecosystems, air quality and sustainability of our resources focusing on the elements that place stress on the environment. Supporting the above assertion, Hamilton, Patrizi, Macintosh and Bastianoni (2018) viewed environmental protection as the prevention of unwanted changes to ecosystems and their constituent parts. Adding to the above view, Dovelé and Vilmanté (2019) opined that the main aim of environmental protection is to prevent the degradation of the natural environment which is affected by population increase and advancement in technology which have created a negative impact on the environment. With environment sustainability and protection becoming critical issues for consumers and the government alike, Nyide and Lekhanya (2016) stated that it makes sense that manufacturing firms need to do what they can to address eco-friendliness in their operations to ensure environmental protection.

Manufacturing involves the processing and refinement of raw materials into finished products or semi-finished goods. Additionally, Owolabi (2017) noted that manufacturing firms are the productive sector with the aim of meeting the needs of the society through the conversion of raw materials and acts as an essential element of any vibrant economy. From the above definitions, it could be seen that manufacturing is the use of technology to effectively combine human and material resources to produce goods and services which will satisfy human needs and wants while manufacturing firms are firms that are involved in the conversion of raw materials into finished/semi-finished goods or services. Research has shown that manufacturing firms in Nigeria has contributed immensely to the growth and development of the economy. However, their numerous activities have brought negative impacts which are hazardous to both the environment and the human population. Awasthi (2023) pointed that despite the positive effects of manufacturing firms, some firms products comprise substances which are less degradable or some are toxic in characteristics with potential threat to environmental and public health and ecological risk. These negative environmental impacts from manufacturing process according to Phan, Baird, and Su (2017), result to extra costs for management in eliminating them and these costs can only be revealed through the application of environmental management accounting practices.

Environmental management accounting practice involves environmental protection practices and a system and technique that provides decision-makers and management with financial and non-financial environmental information about the firm. Supporting the above assertion, Kumar, Jat and Sharma, (2016) posited that environmental management accounting practices is a veritable tool that enable management plan, manage public resources, control pollution so as to help an organization to determine and compare the cost of preventing environmental damages through using greener technologies, redesign of processes and products and what it will cost to remedy the damages caused by their activities on the environment. Similarly, Abiola and Ashamu (2019) maintained that environmental management accounting is broadly defined to be the identification, collection, analysis and the use of two types of information for internal decision making: Physical information on the use, flow and destinies of energy, water, and materials (including wastes) and; monetary information on environmental-related cost, earning and savings. EMA practices helps to manage environmental performance and report environmental performance to both internal and external stakeholders. The environmental management practices firms can put in place to achieve environmental protection are environmental impact management and prevention practices, and environmental management cost allocation practices among others.

Environmental impact management and prevention practices are all activities put in place by firms to improve environmental mitigation measures to manage and prevent impacts of their activities on the environment. Similarly, Homan (2016) posited that environmental impact management and prevention practices are all activities carried out by business organization to reduce or eliminate pollution from the production process and other contaminations that may pose challenges to the environment. These practices according to Homan include: proper selection of equipment to control pollution, evaluation and selection of suppliers, designing

processes and products to reduce or eliminate contaminations, indulging in human development exercise such as training employees on environmental management system, studying environmental impacts, undertaking environmental research, developing environmental management systems, recycling products among others. In the context of this study, the researcher views environmental impact management and prevention practices as all practices and mechanism for helping organizations to reduce all their negative environmental impacts caused through their numerous production processes. The whole essence of environmental impact management and prevention practices is to avoid the creation of wastes from the initial production process and seeking ways for clean-up mechanism after wastes have been generated. Olaoye and Adekanmbi (2018) stated that there are low practices of environmental management accounting in South-West, Nigerian Universities due to resistance to change, lack of environmental responsibility, lack of institutional pressure, among others. Iredele and Ogunleye (2017) reported that there is low level of environmental management accounting practices based on the number of cost techniques used in Nigeria and higher in South Africa. In support, Tran, Nguyen and Nguyen (2021) noted that applying EMA tools is considered too complicated and requires highly qualified staff. Okoye and Adeniyi (2017) reported that there was negative relationship between environmental regulatory cost and product pricing decision as a result of not adopting the appropriate accounting system that incorporate environmental factors as a result of managers' qualification.

When wastes are generated, the costs of the wasted materials, capital, labour and cost of impacts management and prevention practices have to be added using environmental management cost techniques to arrive at total corporate environmental costs and a sound basis for further calculations and decisions. Environmental management (EM) cost allocation techniques are skill needed to effectively and efficiently identify and allocate cost incurred in the production of products or execution of a project. Hasan and Hakan (2015) opined that in EM costing, not only disposal fees are regarded, but the wasted materials purchase value and the production costs of waste and emissions are added. In conventional management accounting system, some techniques used for cost absorption are floor area, machine hours, labour hours, value of plant or building among others which have no direct link to environmental factors. Therefore, new cost accounting techniques such as, environmental impact assessment, life cycle assessment, activity-based costing, full cost accounting among others have emerged for identifying and allocating all cost incurred in production of products to achieve better environmental performance and environmental protection. Ijeoma (2015) revealed that environmental cost accounting helps in managing negative effects of companies' waste discharge in the environment. Okafor, Okaro and Egbunike (2013) stated that majority of the firms have not embraced environmental cost accounting, majority of the firms lump indirect cost under overhead and use mostly one absorption method which does not have any relationship with indirect cost for their cost apportionment. In support, Tran, Nguyen and Nguyen (2021) noted that applying EMA tools is considered too complicated and requires highly qualified staff. The finding disagrees with Okoye and Adeniyi (2017) who reported that there was negative relationship between environmental regulatory cost and product pricing decision as a result of not adopting the appropriate accounting system that incorporate environmental factors as a result of managers' qualification.

Environmental costs optimization and better environmental performance in manufacturing firms requires the services of managers. Manns (2017) indicated that managers are positioned to play a critical role in advancing environmental protection/sustainability and social responsibility in the organization. The managers irrespective of their qualifications are useful in this study because as the heads of the management team in the manufacturing firms, they are always aware of the environmental management accounting practices their firms have put in place and the extent to which their firms are environmentally responsible. Tran, Nguyen and Nguyen, (2021) lent credence that staff qualifications are considered an important factor in successfully applying environmental management accounting practices. Study such as Iredele and Ogunleye (2017) revealed that institutional barriers affect the adoption of EMA practices in Nigeria. Similarly, Olaoye and Adekanmbi (2018) revealed that there are low practices of environmental management accounting in South-West, Nigerian Universities due to resistance to change, lack of environmental responsibility, lack of institutional pressure, among others. Similarly, Ijeoma (2015) revealed that environmental cost accounting helps in managing negative impacts of companies' waste.

The perception of identifying the environmental impact costs associated with a product, process, system or an organisation is very important in determining organisation's environmental performance for a sound decision making in every firm. In the same vein, Igbodo, Uwague and Aigbadon (2018) asserted that there is general trend to evaluate the organizations performance according to its social and environmental effectiveness and not only on its economic effectiveness. It is against this background that this study is set to seek the extent manufacturing firms in Abia State have applied environmental management accounting practices to achieve environmental protection.

Statement of Problem

Environmental protection is the primary concern of the future of humanity. It involves the protection of ecosystems, air quality, integrity and sustainability of our resources and focusing on the elements that place stress on the environment. It is on this basis that seven out of the 17 sustainable development goals focused on environmental issues and how it can be maintained and sustained. These goals are to pursue sustainable management of water and sanitation, making human settlement safe, sustainable consumption and production patterns, combat climate change and its impacts among others. Unfortunately, the activities of manufacturing firms have really affected the realization of these goals in terms of effects of technologies adopted in production processes and greenhouse gas emission that depletes the ozone layer, causes contamination of water bodies and excessive air pollution. Many environmental problems have been connected to the activities of manufacturing firms which have affected both human and the environment generally. As results of this, managements of manufacturing firms are expected to be more proactive in taking into account and to account for the environmental impact of their activities to enable them minimize the effects on the environment.

Regrettably, the manufacturing firms over the years have focused on conventional accounting practices/system which lumps the environmental costs under the firms overhead cost without management having knowledge of them and how these cost can be reduce. Thus, the need for manufacturing firms to effectively apply environmental management accounting practices for environmental protections which provide adequate information for properly supporting decision-making in environmental management responsibilities. Although, despite the importance and benefits of environmental management accounting practices, most managers in manufacturing firms do not realize the benefits of improving their environmental management practices to achieve high level of environmental performance (Phan, Baird and Su, 2017). Additionally, (Iredele, and Ogunleye, 2018) pointed out that these green practices among manufacturing firms have not received much attention from researchers. Therefore, this situation leaves a significant gap in studies on environmental management accounting practices in manufacturing firms. The focus of this study therefore is to find out the extent to which manufacturing firms have applied environmental management accounting practices for environmental protection in Abia State.

Purpose of the Study

The main purpose of the study was to determine the extent of application of environmental management accounting practices for environmental protection by manufacturing firms in Abia State, Nigeria. Specifically, the study determined the extent to which:

1. Environmental impact management and prevention practices are applied for environmental protection by manufacturing firms in Abia State
2. Environmental management cost allocation practices are applied for environmental protection by manufacturing firms in Abia State.

Research Questions

The following research questions guided the study

1. To what extent are the environmental impact management and prevention practices applied for environmental protection by manufacturing firms in Abia State?
2. To what extent are the environmental management cost allocation practices applied for environmental protection by manufacturing firms in Abia State?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance.

1. Managers do not differ significantly in their mean responses on environmental impact management and prevention practices applied by manufacturing firms in Abia State based on their qualification
2. There is no significant difference between the mean responses of managers of manufacturing firms on environmental management cost allocation practices applied by manufacturing firms in Abia State based on their qualification.

Method

The study adopted descriptive survey research design. The study was carried out in Abia State of Nigeria. The population of the study comprised 227(179 males and 48 females) managers from the 64 registered manufacturing firms in Abia State. The instrument for data collection was a 5 – point rating scale - Very High (VH), High (H), Moderate (M) and Low (L) and Very Low (VL) structured questionnaire titled “Application of Environmental Management Accounting Practices (AEMAP) which was duly validated by three experts and its reliability tested using Cronbach Alpha which yielded 0.93 coefficients. The instrument was administered to the respondents in their firms by the researchers with the help of one research assistants selected from each firm. This yielded a high response rate as 221 copies representing 97.31 percent were returned and used for the study. Data collected were analyzed using the arithmetic mean while ANOVA was used to test the null hypotheses at 0.05 level of significance. Where the calculated p-value was less than 0.05, means there was significant difference and the hypothesis was rejected. Conversely, where the calculated p-value was equal to or greater than the table value at level of significant (0.05), the hypothesis was not rejected.

Research Question

To what extent are the environmental impact management and prevention practices applied for environmental protection by manufacturing firms in Abia State?

Table 1: Managers mean ratings on the extent they applied environmental impact management and prevention practices for environmental protection by manufacturing firms in Abia State. N=221

S/N	Environmental impact management and prevention practices for environmental protection	X	SD	Remarks
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1. Set up pollution control measures	3.50	0.53	High Extent
2. Selection of pollution control equipment	4.70	0.45	Very High Extent
3. Training of employees on how to avoid waste during production processes	2.54	0.59	Moderate Extent
4. Selection of alternative materials that greatly reduce pollution	4.64	0.46	Very High Extent
5. Adoption of cleaner production technology	3.51	0.49	High Extent
6. Redesigning products to reduce contaminations	3.24	0.56	Low Extent
7. Undertaking environmental research to determine possible environmental threat associated with a product of process	2.20	0.62	Low Extent
8. Adoption of low waste technologies in production	3.52	0.52	High Extent
Cluster Mean	3.48		Moderate Extent

Data in Table 1 shows the cluster mean score of 3.48 indicating that Managers rated they applied environmental impact management and prevention practices for environmental protection by manufacturing firms in Abia State to a moderate extent. The analysis of the items further indicates that Managers rated two items out of the eight listed items to very high extent. The mean rating for the two items ranged from 4.69 to 4.70, while they rated three items to a high extent with the mean rating ranged from 3.50 to 3.52. One item was rated by Managers to a moderate extent with mean ratings ranged of 2.54, while the remaining one item was rated to a low extent with mean ratings ranged to 2.20. The standard deviation of 0.45 to 0.62 showed that respondents are not wide apart in their mean ratings which indicate homogeneity.

Research Question 2

To what extent are the environmental management accounting cost allocation practices applied for environmental protection by manufacturing firms in Abia State?

Table 2: Managers mean ratings on the extent the application of environmental management accounting cost allocation practices for environmental protection by manufacturing firms in Abia State. N=221

S/N	Items on application of EMA cost allocation practice	X	SD	Remarks
<i>Activity Based Costing (ABC)</i>				
9.	Identification of resources drivers	4.50	0.46	Very High Extent
10.	Identification of environmental activities	4.20	0.51	High Extent
11.	Assigning resources to each environmental activity	3.70	0.53	High Extent
12.	Analysis of environmental cost for each activity	4.69	0.38	Very High Extent
13.	Calculating the total environmental cost for each product using established drivers' rate	3.54	0.58	High Extent
<i>Full Cost Accounting</i>				
14.	Identification of environment costs	4.24	0.50	High Extent
15.	Identification of social costs	3.20	0.63	Moderate Extent
16.	Identification of direct and indirect economic costs	1.50	0.78	Low Extent
17.	Identification of health costs	4.38	0.48	High Extent

<i>Life Cycle Assessment</i>			
18. Assessing raw materials for production	4.56	0.43	Very High Extent
19. Assessing production process to detect environmental impacts	3.20	0.63	Moderate Extent
20. Matching product usage against environmental impact	1.70	0.76	Low Extent
21. Assessing the disposal mechanism for recycling and waste management	2.69	0.64	Moderate Extent
<i>Material Flow Costing Accounting</i>			
22. Identification of energy cost	3.54	0.58	High Extent
23. Identification of waste management cost	4.54	0.44	Very High Extent
24. Identification of material cost	4.20	0.51	High Extent
25. Identification of system cost	3.38	0.61	Moderate Extent
<i>Environmental Impact Assessment</i>			
26. Predicting environmental impact of product	3.69	0.55	High Extent
27. Scoping the project to identify possible environmental issues	4.50	0.46	Very High Extent
28. Putting in place mitigation practices	2.54	0.68	Moderate Extent
29. Screening products for environmental impact	4.24	0.50	High Extent
30. Conducting post project monitoring	1.50	0.78	Low Extent
Cluster Mean	3.54		High Extent

Data in Table 2 shows the cluster mean score of 3.54 indicating that managers rated they applied environmental management accounting cost allocation practices for environmental protection by manufacturing firms in Abia State to a high extent. The analysis of the items further indicates that managers rated five items out of the 22 listed items to very high extent. The mean rating for the two items ranged from 4.50 to 4.69, while they rated nine items to a high extent with the mean rating ranged from 3.54 to 4.38. Five items were rated by managers to a moderate extent with mean ratings ranged from 2.54 to 3.38 while the remaining three items were rated to a low extent with mean ratings ranged from 1.50 to 1.70. The standard deviation of 0.38 to 0.78 showed that respondents are not wide apart in their mean ratings which indicate homogeneity.

Hypothesis 1

Managers of manufacturing firms do not differ significantly in their mean responses on the extent they applied environmental impact management and prevention practices in Abia State based on their qualification.

Table 3: Summary of Analysis of Variance on the mean ratings of managers of manufacturing firms on the extent they applied environmental impact management and prevention practices in Abia State based on their qualification.

	Sum of Squares	df	Mean Square	F	P-value	Remarks
Between Groups	3.336	2	2.168	15.029	.000	Significant
Within Groups	4.839	218	2.025			
Total	8.175	220				

Table 3 shows that there is a significant difference among the three groups (NCE/OND, HND/B.Sc, M.Sc/Ph.D) in terms of their mean ratings on the extent they applied environmental impact management and prevention practices of manufacturing firms in Abia State based on their qualification. It was observed that at 0.05 level of significance, 2 is nominator and 218 of denominator, the calculated F-ratio is 15.029 and P-value .000 which is less than the 0.05 alpha level. Therefore, the null hypothesis is rejected.

Table 4: Summary of Analysis of Variance on the mean ratings of managers of manufacturing firms on the extent they applied environmental management accounting cost allocation practices in Abia State based on their qualification.

	Sum of Squares	df	Mean Square	F	P-value	Remarks
Between Groups	1.043	2	1.033	11.168	1.882	Not Significant
Within Groups	1.615	218	1.028			
Total	2.658	220				

Table 4 shows that there is no significant difference among the three groups (NCE/OND, HND/B.Sc, M.Sc/Ph.D) in terms of their mean ratings on the extent they applied environmental management accounting cost allocation practices in Abia State based on their qualification. It was observed that at 0.05 level of significance, 2 is nominator and 218 of denominator, the calculated F-ratio is 11.168 and *P-value* 1.882 which is greater than the 0.05 alpha level. Therefore, the null hypothesis is not rejected.

Discussion of Findings

Findings of the study revealed that managers applied environmental impact management and prevention practices for environmental protection by manufacturing firms in Abia State to a moderate extent. This indicate that managers of manufacturing firms in Abia State do not give adequate attention on ways to remove or eliminate pollution from the production process and other contaminations that may pose challenges to the environment. This finding is in line with Olaoye and Adekanmbi (2018) who stated that there are low practices of environmental management accounting in South-West, Nigerian Universities due to resistance to change, lack of environmental responsibility, lack of institutional pressure, among others. The findings agreed with Iredele amd Ogunleye (2017) which reported that that there is low level of environmental management accounting practices based on the number of cost techniques used in Nigeria and higher in South Africa.

The findings of the study further revealed that there is a significant difference in managers' of manufacturing firms mean ratings on the extent they applied environmental impact management and prevention practices for environmental protection in Abia State based on their qualification. These finding agrees with Smangele, Odunayo, Omolola and Idris (2022) who stated that environmental impact management and prevention practices for environmental protection has a positive relationship with corporate environmental strategy based on gender and their qualification. The reason for the similarities in test of hypotheses is because most of the managers of manufacturing firms do not recognized their businesses should be regulated to manage the environmental effects of their activities and to keep their own carbon emissions low.

Findings of the study revealed that managers applied environmental management cost allocation practices for environmental protection by manufacturing firms in Abia State to a high extent. This implies that managers of manufacturing firms in Abia State have adequately applied environmental management accounting cost allocation practices for environmental protection as been effective in environmental costing. This finding is in line with Ijeoma (2015) who revealed that environmental cost accounting helps in managing negative effects of companies' waste discharge in the environment. The finding disagrees with Okafor, Okaro and Egbunike (2013) stated that majority of the firms have not embraced environmental cost accounting, majority of the firms lump indirect cost under overhead and use mostly one absorption method which does not have any relationship with indirect cost for their cost apportionment.

The findings of the study further revealed that there is no significant difference in in managers of manufacturing firms mean ratings on the extent they applied environmental impact management and prevention practices for environmental protection in Abia State based on their qualification. In support, Tran, Nguyen and Nguyen (2021) noted that applying EMA tools is considered too complicated and requires highly qualified staff. The finding disagrees with Okoye and Adeniyi (2017) who reported that there was negative relationship between environmental regulatory cost and product pricing decision as a result of not adopting the appropriate accounting system that incorporate environmental factors as a result of managers' qualification. The reason for determining extent managers' applied environmental impact management and prevention practices for environmental protection is because they are always aware of the environmental management accounting practices the firms have put in place and the extent to which their firms are environmentally responsible for effective environmental protection.

Conclusion

Based on the findings of this study, it was concluded that environmental management accounting practices have not received adequate attention by manufacturing firms especially area of environmental impact management and prevention practices. Some of these practice were not widely applied which is as a result of managers' inability to determine the important of these practices and due to the reality that most managers are not qualified and do not master the knowledge and skills which poses difficulties in the application of these practices The application of environmental management and accounting practices will help firms to determine the risk associated with their investment and firms, manage the environmental effects of their activities and to keep their own carbon emissions low to enhance environmental protection. Therefore, there is need for managers of manufacturing firms to improve in their improving their environmental management practices to achieve high level of environmental performance.

Recommendations

The researcher makes the following recommendations based on findings of the study:

- 1 Manufacturing firms should apply effective environmental impact prevention practices, prior to production as crucial means of minimizing environmental impact and promoting environment sustainability and protection.
- 2 Management of firms should integrate environmental issues into strategic planning, provide incentives for environmental management activities within the organisation, and give the needed support and leadership for environmental performance within firms in Abia State where

EMA practice is low for possible improvement, and in Nigeria where EMA practice is higher to ensure sustainability of this practice.

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