
Assessing the Influence of Waste Recycling on Cost Reduction in Manufacturing Firms in Port Harcourt, Nigeria

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Abstract

This study investigated the influence of waste recycling on cost reduction in manufacturing firms in Port Harcourt, Rivers State. From a purposively selected population of 220 workers from 10 different manufacturing firms in Port Harcourt, Rivers State, a sample size of 140 was used for the study. This was gotten by calculating the population at 95% confidence level and 5% error margin using Roger Wimmer online sample size calculator. The instrument used to collect data for the study was a closed-ended questionnaire with a four-point Likert scale. The study utilized Pearson Product Moment Correlation (PPMC) in Scientific Package for Social Sciences (SPSS) package to analyze the data collected. The study found that measure by the indicators of both variables reveals that there is a positive correlation between waste recycling and cost reduction in manufacturing firms in Port Harcourt, Rivers State. This finding implies that waste recycling if done properly, helps manufacturing firms to enjoy an improved corporation image within their environment of operation, develop new market segments, expand into new markets, and maximize benefits in terms of cost reduction. Hence, the study recommended that manufacturing firms operating in Nigeria should make effective use of waste (original environmental pressures) by recycling them and turning them into avenues of cost reduction and competitive advantage.

Keywords: Waste, recycling, cost reduction, manufacturing firms, Nigeria

INTRODUCTION

1.0 Background to the Study

Global warming and increased pollution from all aspect of business activities highlight the importance of green management for firms operating in Nigeria and worldwide. The need to '*go green*' in order to preserve and sustain the ecological environment has become a major concern to many stakeholders, thus, using renewable energy sources capable of reducing emissions, reducing levels of waste through improve industry re-cycling programmes etc is a policy every business organization that has the interest of the society at heart must incorporate in its strategy (Onwudiwe, Agwamba and Ugwuegbu, 2019).

More so, sustainable development practices is one of the elements that contributes directly or indirectly to business value. It is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Therefore, sustainability development practice is according to Epstein and Buhovac (2011) it is the ability of any establishment to better comprehend the role of their host communities, customers, employees, stakeholders and proffer solutions to their respective needs which ensures better cooperation with the organisation.

According to the APICS, (2005) dictionary, the manufacturing industry is defined as "a series of interrelated activities and operations involving the design, material selection, planning, production, quality assurance, management, and marketing of discrete consumer and durable goods." More so, Manufacturers must deal with pollution risks during production processes and various demands from investors, NGOs, governments, customers, and other stakeholders. Ultimately, the activities of the manufacturing company are seen to have been actively contributing to the pollution of air and water, as well as environmental harm and disruption. At this point, it has been foreseen that green innovation can improve the value of products made by a firm, reduce the environmental costs, and eventually lead to a better firm performance (Handayani, Wahyudi and Suharnomo, 2017).

As the Nigeria population and its industries continue to grow, the problem of proper waste disposal increasingly becomes difficult. Solid garbage, for example, is usually buried in landfill sites or incinerated, which is extremely harmful to the environment. Decomposing garbage may attract parasites, give off a foul smell or leach into groundwater. The smoke given off by burning garbage contributes to air pollution. Certain by products of the manufacturing process amplify the need for improved waste disposal. Efficiency is sometimes pursued at the expense of environmental sustainability. To produce as much as possible in the most cost-effective manner, manufacturers may adopt practices that appear to be cheap but are actually resource-intensive in the long run (Onwudiwe, Agwamba and Ugwuegbu, 2019).

Generally, it is believed that most firms in Nigeria have not set or implemented their sustainable vision towards proper management of the environment in which they operate on which have out rightly hamper their performance. More so, it can visibly said to be connected to the seemingly desolate lack of interest of the Nigerian government to implementing and enforcing environmental laws and regulations; poor understanding of environmental issues, and lack of commitment to protecting and managing the environment by firms and business organisations. Finally, most organizations are anxious of implementing sustainability plans because at the initial stage, it will demand a very high level of managerial & technical know-how with specialized trained skill worker. Therefore, evaluating sustainable development in business organisation in Nigeria will contribute to knowledge, sustainability practices, and stimulate high standard of business development practices in the country and could direct or

indirectly contributes to the effectiveness of some of these firms that engage in sustainable practices.

1.1 Statements of the Problem

In light of these developments, the perspectives on manufacturing companies' operations have expanded from economic to environmental and social aspects in current trends. Manufacturing companies are not only aiming to improve operations in terms of flexibility, delivery, quality, and cost, but also attempting to be competitive in terms of economic, environmental and social issues (Caniels, Gehrsitz, and Semeijn, (2013); Vachon and Klassen, 2008). Hence understating sustainable developmental practices is necessary and should be prioritized in the decision-making processes by company management.

However, there is still a question as to whether investments in environmental management practices such as waste cycling and other corporate social responsibility (CSR) initiatives offer direct relationship firm effectiveness in terms of productivity, cost reduction and pollution reduction. Thus, several studies have supported the notion that there is a positive relationship between sustainable development practices and better organizational effectiveness.

More so, Onwudiwe, Agwamba and Ugwuegbu, (2019) studied on Green Management and Organizational Effectiveness and the results showed waste recycling has a positive and significant effect on cost reduction and pollution reduction. Hofer, Cantor, and Dai, (2012) have also supported the premise that environmental management practices can lead to innovation. Innovation, in turn, can help companies to increase their market share and to reduce their costs, resulting in greater financial gains. Further research by Zhu, Sarkis, and Lai, (2012) supported the notion that improved economical, environmental and social practices can help companies to gain competitive advantage and subsequently improve their performance.

Anosike, (2016) revealed that organizational effectiveness in the age of sustainability pressure must include economic, social, and environmental performance to remain competitive. Also, Ukpabi, Ikaba, Enyindah, Orji, and Idatoru, (2014) study also revealed that there is a significant correlation between corporate social responsibility and organisational effectiveness. The results also indicate that a firm's active involvement in corporate social responsibility has a significant contribution to its productivity and stability.

With the above findings, it has been shown that many manufacturing firms poorly discarded waste products without considering its potential contribution to the effectiveness of the business hence, this study will look in to the relationship between the dimensions and measures of sustainable development practice particularly on environmental sustainability adopted in this work and organizational effectiveness with emphasis on increase in output, cost reduction, increase in sales volume and environmental pollution reduction in manufacturing firms in Port Harcourt, Rivers State, Nigeria in order to make recommendations on how effective sustainable development practices would either lead to organizational effectiveness in manufacturing firms in Port Harcourt, Rivers State, Nigeria.

1.2 Objectives of the Study

The general objective of this study is to investigate on the relationship between waste recycling and cost reduction in manufacturing firms in Port Harcourt, Rivers State.

1.3 Research Question

For the purpose of this study, the following research question is put forward;

- i. What is the relationship between waste recycling and cost reduction in manufacturing firms in Port Harcourt, Rivers State?

1.4 Research Hypothesis

Base on the previous empirical evidences and ideas from theories, the following hypothesis is formulated for the purpose of this study.

H₀₁: There is no relationship between waste recycling and cost reduction in manufacturing firms in Port Harcourt, Rivers State.

1.5 Definition of Terms

Sustainable Development: According to Unerman et al (2007) sustainable development concerns tend to focus on how to organize and manage human activities in such a way that they meet physical and psychological needs without compromising the ecological, social or economic base which enable these needs to be met. It is a development that attempts to bridge the divide between economic growth and environmental protection, while taking into account other issues traditionally associated with development.

Environmental Sustainability: United States Environment Protection Agency (2014) opined that environmental sustainability is defined as the creation and maintenance of good environment conditions for human habitation. That is, existing in a “productive harmony that permits fulfilling the social, economic and other requirements of present and future generations”.

Organizational Effectiveness: According to French and Bell (2003), organizational effectiveness illustrates the soundness of an organization’s culture, processes, and structure in terms of its overall system performance. Organizational effectiveness can be evaluated by looking at how an organization is attaining its multiple goals, both official and operative and environmental compliance.

Manufacturing Firms: According to the APICS (2005) dictionary, the manufacturing industry is defined as “a series of interrelated activities and operations involving the design, material selection, planning, production, quality assurance, management, and marketing of discrete consumer and durable goods.

2.1.3.1 Waste Recycling

Waste recycling is very important as waste has a huge negative impact on the natural environment and as well could contribute to the effectiveness of business organization. Harmful chemicals and greenhouse gasses are released from rubbish in landfill sites. However, waste collection helps to reduce the pollution caused by waste. Waste collection reduces the need for raw materials so that the rainforests can be preserved.

According to Onwudiwe, (2019) waste recycling is the recovery of useful materials, such as paper, glass, plastic, and metals, from the trash to use to make new products, reducing the amount of virgin raw materials needed. Producing recycled white paper creates 74% less air pollution and 35% less water pollution than producing paper from virgin fibres.

Using recycled cans instead of extracting ore to make aluminium cans produces 95% less air pollution and 97% less water pollution. Recycling and remanufacturing are 194 times more effective in reducing greenhouse gas emissions than land filling and virgin

manufacturing (IDEM Fact Sheet, 2010). Common consumer items that are widely accepted at community collection sites and private recyclers include: Paper, cardboard, plastic, glass, aluminium, and steel are widely accepted at community recycling programs. Unwanted, obsolete and broken electronics are collected by retailers and other electronics recyclers.

2.1.4 Significance of waste recycling to manufacturing companies

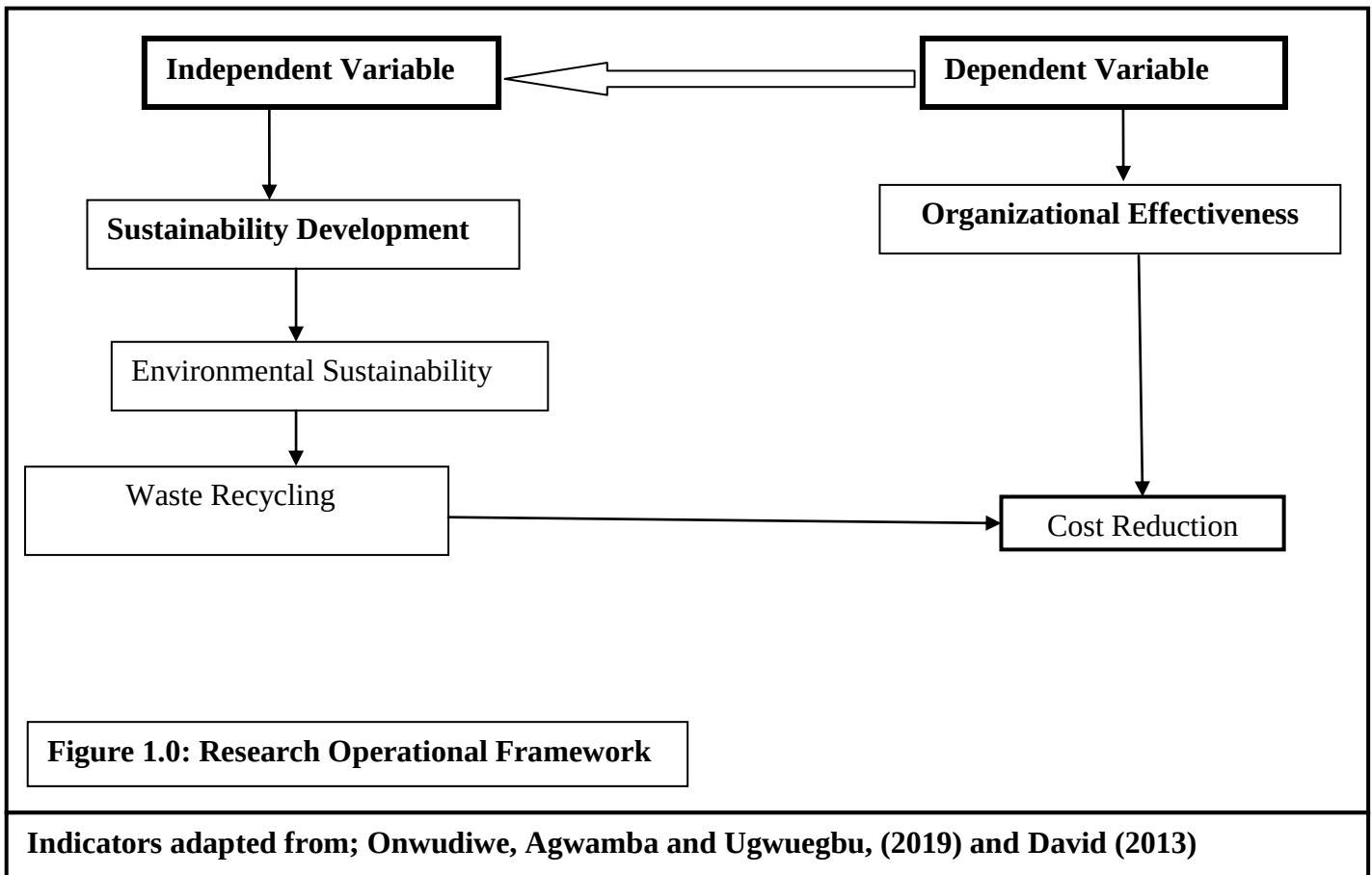
Recycling paper, glass, plastic, aluminium and steel, tires, electronics and batteries (which contain plastic, lead and other materials), and used oil helps protect natural resources, conserve energy and water, reduce air emissions generated in manufacturing processes, save landfill space, and prevent environmental pollution from occurring. Information on waste collection and disposal as contain in Act 2007 of National Environmental Standards and Regulation Enforcement Agency (NESREA) of Nigeria seems not currently have a database that enables a proper records of waste collection and disposal activities. Hence, the United States Environmental Protection Agency (U.S. EPA, 2005) provides information on recycling benefits and statistics on municipal solid waste disposal such as:

- a. Recycling 10 aluminium cans are estimated to save enough energy to power a laptop for almost 52 hours.
- b. Recycling 10 plastic bottles are estimated to save enough energy to power a 60 watt CFL light bulb for almost 100 hours.
- c. Almost 27 percent of the trash generated and over 51 percent of the recyclables collected in 2012 was paper. It is used in more than 5,000 paper and non-paper products. Energy saved from recycling one ton would power the average home for six months and conserve about 7,000 gallons of water.
- d. According to U.S. EPA's report (2012), 54 percent of waste was disposed of in landfills, 11.7 percent was combusted (burned) to create energy, and 34.5 percent was recycled. The resulting reduction in carbon emissions is estimated to be more than 168 million metric tons—the equivalent of the greenhouse gases emitted from over 33 million cars. The resulting energy savings is estimated to be more than 1.1 quadrillions BTUs—an amount consumed by almost 10 million households in a year.

2.1.6.1 Cost reduction: The most cited benefit of sustainable business practices is the reduction of costs (Landrum and Edwards, 2009; Bohdanowicz et al., 2004; Hobson and Essex, 2001; Hitchcock and Willard, 2009; Swarbrooke, 1999) as cited in Chen, (2015). Tzschentke et al. (2004) declare it as the prime motive behind introducing environmental initiatives. In particular the rising costs for water, energy and waste disposal led many businesses to look for alternatives. Operational measures are for example recycling systems, using recycled materials, installing water-saving devices, using low energy light bulbs, energy-conservation measures such as insulation or solar-powered water heating systems. These initiatives focus exclusively on the environmental dimension of sustainable business practices (Swarbrooke, 1999).

Conceptual Model

A conceptual framework is the diagrammatic presentation of variables, showing the relationship between the independent variable and dependent variables. In this study, the independent variable is; sustainability development in this context is capture as environmental sustainability and further broken down as waste recycling. The dependent variable is organizational effectiveness which for the purpose of this study is measured by increase in output, cost reduction, increase in sales volume and environmental pollution reduction. However, the study therefore sought to examine the relationship between the dependent variable and independent variables in manufacturing firms in Rivers State, Nigeria.



2.3 THEORETICAL FRAMEWORK

Considering the background and research methods of this study, this study is anchored on two theories that includes, resource-based view, institutional theory.

2.3.1 Resource-based View Theory: The resource-based view holds that firms can earn supra-normal returns if they have superior resources and the resources are protected by some form of isolating mechanism preventing their diffusion throughout the industry (Hibbets, Albright, & Funk, 2003). According to resource-based view, organizations that own “strategic resources” have important competitive advantages over organizations that do not have strategic resource. Hence a Strategic allocation of resources aid in improving the organization’s effectiveness and efficiency while neutralizing the opportunities and threats of competitors. Jay Barney who is considered as the father of modern RBV suggests that, there can be heterogeneity or firm level differences among firms that allow some of them to sustain competitive advantage. Therefore, the RBV emphasis on strategic choice, changing the firm’s management with the important tasks of identifying, developing and deploying key resources to maximize returns (Razzaque and Sheng, 2009).

Although the manufacturing industry is extremely competitive, manufacturing firms that practice waste collection and disposal turn a profit virtually every year. The ability of a manufacturing firm to cooperate and coordinate scarce resources is seen as an intangible resource and earning positive returns on the value of resources depends on its sustainability. Thus, this theory is of importance to this study because the current situation in the manufacturing industry is branded by increased competition and consequently demands effective and efficient operational decision-making processes based on the available and

sufficient performance information. As a result, the manufacturing companies need to use the scarce resources efficiently, analyze and measure the performance of all services that play a crucial role in operation of the organization.

2.3.2 The Resource Dependence Theory

The Resource Dependence Theory is developed by the American business theorist Jeffrey Pfeffer and the American organizational theorist Gerald R. Salancik in the year of 1978 at the Stanford University (Pfeffer & Salancik, 1978). The concept of the RDT is first published in their work: "The External Control of Organizations, A Resource Dependence Perspective" (1978). Pfeffer & Salancik (2003) define resource dependence as the dimensions of the power and authority which is widespread in the environment in which organizations are situated; the uncertainty of resource availability as the lack of, shortfall in or abundance of critical resources; and resource interconnectedness as the number and type of the relationships or connections between organizations.

This theory is concerned with how organizational behavior is affected by external resources the organization utilizes, such as raw materials. The theory is of great importance to this study because the success of any organization is determined by its ability to gather, alter and exploit raw materials faster than competitors. Resource dependence theory is underpinned by the idea that resources that are controlled by organizations are keys to organizational success and that access and control over resources is a basis of power. This means that organizational strategies must be carefully considered in order to maintain open access to resources (Cemal, Mine, Kudret, 2019).

Resources dependence theory (RDT) maintains that organizations are resource insufficient; they strive to acquire and sustain resources from their external environment that are controlled by external actors who exert demands on organization. These actors perceive certain advantages in their relationship with the organizations and exercise power through control over resources. The heavier the dependence on external resources, the more the demands of particular actors controlling these resources are influential.

2.4 EMPIRICAL REVIEW

For companies operating in a competitive global environment, studying sustainability issues is necessary and should be prioritized in the decision-making processes by company management. Otherwise, companies will not be able to maintain their competitive advantage in the long run. However, there is still a question as to whether investments in economic, social and environmental management practices have direct significant on organizational effectiveness. Hence related studies collected reveal diverse results with respect to the relationship between waste collection and disposal and organizational effectiveness. Some possible reasons for these discrepancies in the results can be attributed to divergent instrument of measurement, scales of labelling, locality factors and others. It is therefore pertinent to note that if the measurement indicators and scales are different, the measurement results of waste collection and disposal and organizational effectiveness of a company can vary. Some of these studies are listed below;

Russo and Fouts (2014) investigated the effect of corporate environmental sustainability on profitability and economic performance. They set out to solve a problem of how corporate environmental sustainability, profitability and economic performance relate. The methodology used was survey design which includes the collection of data from a survey and the test of hypotheses with an analysis of 243 firms over two years, using independently developed environmental ratings. The finding of the study was that environmental

sustainability, profitability and economic performance are positively linked and that industry growth moderates the relationship, with the returns to environmental performance higher in high-growth industries.

In a study done in Kenya, Mercyline and Kamande (2014) investigated an “eco-efficiency and eco-commitment analysis of Kenyan manufacturing firms”. This study examines the linkage between the profitability of firms measured by Return on Assets (ROA) and environmental performance measured by eco-efficiency and eco-commitment and also the impact of a good Environmental Management System on profitability and eco-efficiency of firms. The methodology used for the study is survey design through which questionnaire was shared to six Kenyan manufacturing firms. The finding shows that there is a potential gain in the profitability of the firm by improving eco-efficiency in resource use.

Ainia and Deddy (2014) conducted study on sustainability practices and financial performance: empirical evidence from Indonesia. There are 58 companies which selected from the Index LQ 45 listed in 2010 to 2012. There are two types of secondary data. Linear regressions are employed in this research to analyze the strength of the relationship among the outcome and explanatory variable as represented by the equation. The result shows that there is a significant relationship between sustainability practices and financial performance.

Miidom, Dumbor and Sholokwu, Boniface (2017) investigated on the operations Management Activities and organizational sustainability in manufacturing companies in Rivers State, Nigeria, West Africa. The study draws 200 respondents which consisted of heads of departments, managers and supervisors as sample size from the population of 400 respondents, using Krejcie and Morgan’s sample table, and focused on eight manufacturing companies in Rivers State. The study adopted quasi-experimental research design as it was a cross-sectional survey research. The findings revealed a positive and significant relationship between operations management activities and organizational sustainability. Also, Karimi (2014) investigated the relationship between green operations practices and operational performance of hotels in the coastal region. The finding of the study indicated that green hotel operations have a positive effect on hotel operational performance.

Although most studies find a positive correlation between waste collection and disposal and organizational effectiveness, some results are conflicting and ambiguous. For example, a study by Min and Galle cited in Thomas & Suhong, (2014) suggests that compared to liabilities and product disposal costs, competitive advantage plays a relatively minor role for managers considering green purchasing. In addition, Walley and Whitehead cited in Thomas & Suhong (2014) argue that corporate environmental initiatives generate unrecoverable costs, divert resources from other productive investments, and conclude that they are unsustainable.

However, the contradiction in empirical findings with regard to explaining how waste collection and disposal affects organizational effectiveness in manufacturing industry necessitate the need for this study to be conducted herein. More so, it is our disputation that by cross examining the relationship between sustainability development and organizational effectiveness in the manufacturing firm, we shall contribute significantly toward the findings of earlier related literatures.

RESEARCH METHODOLOGY

3.0 Introduction

This section covers discussion on the research methodology for the study. According to Collins Dictionary (2010), methodology is defined as “the techniques and strategies employed within a discipline to manipulate data and acquire knowledge”.

Hence, the section describes the research design, population of the study, area of the study, sources of data, instrument for data collection, sample and sampling techniques, data analysis techniques and organization of the study. More so, this section addresses the cardinal aim of the study that was realized through a pilot study.

3.1 Research Design

The study utilized survey research design. The design has permitted the examination of independent variables in respect for their relationship with the dependent variables. The choice of this design was informed by the nature of the research problem and the objectives of the study. According to McMillan and Schumacher (2001); Paavo (2017), research design is a plan for a study that sets out the activities to be undertaken, such as data collection procedures and sampling strategy in order to provide answers to the research questions.

3.2 Area of Study

This research will be carried out in Rivers State, Port-Harcourt; Rivers State Nigeria was created by decree 19 of 31st May 1967, during the administration of General Yakubu Gowon. Rivers State is situated between latitude 4°44' and 59.06" North and longitudes 6°49' and 39.58" East of Greenwich Meridian (Tamunoitekema, 2003). The state is located in the south-south region of Nigeria. Rivers State is bounded on the North by Imo State, on the south by the Atlantic Ocean, on the East by Asaba and Akwa Ibom States and on the West by Bayelsa. Out of 23 LGA, 14 are in the upland area, 8 in the riverine and 1 is a combination of upland and riverine (Dosunmu, 2003). The state is made up of various ethnic groups, which include: Ekpeye, Ikwerre and Etche, Ibani, Opobo, Ogoni, Eleme, Obolo, Engenni, Kalabari and Okirika.

3.3 Population of the Study

According to Hassan, (2016) a research population is “generally a large collection of individuals or objects that is the main focus of a scientific query”. In other words, a research population can be said to consist of individuals having similar characteristics which is of concern to the researcher. The question is, in pursuance of sustainability development activities does manufacturing firms such as oil producing firms makes profit? To find out, this study, carried out in Rivers state Nigeria captures selected plastic manufacturing companies in Port Harcourt, Rivers State.

As reported by the Manufacturing Association of Nigeria (MAN) Rivers/Bayelsa States Chapter on their website (<http://phmanufacturersnigeria.org>), there are thirty-two (32) manufacturing firms in Rivers State. In order to have easy accessibility, the researcher adopted ten of these manufacturing firms which are located within Obio/Akpor Local Government Area and Port Harcourt City Local Government Area, and are into plastic manufacturing as the target population for this study. The accessible population from the ten firms included managers, supervisors and foremen. The accessible population of this study from the selected ten (10) plastic manufacturing consists of staff in the account/finance, human resources, production, sales, safety and health environment department. The reason for this selection is that these are Departments that can adequately supply information on policies concerning sustainability development and organizational effectiveness. Specifically, the selections cut across all the members of staff of these departments such as; Junior staff, supervisors and management staff in the five departments who have adequate knowledge of the variables as stated in the given questionnaire to answer necessary questions related to this study.

A breakdown of the total population of the respondents of each plastic manufacturing firm is stated as shown in the table 3.0 below:

Table 3.0: Selected Plastic Manufacturing Firms in Rivers State and population size
Source: Field Survey, 2019

S/N	Name of Organization	Population Size
1	New China Rubber & Plastic Footwear Ind. Ltd	32
2	Dozie Plastic Company Nig.	19
3	Sunflower Manufacturing Company	32
4	United Plastic Conglomerates Nigeria Ltd	21
5	C and B Plastics Limited	16
6	Ace Toys & Plastics Nigeria Ltd	16
7	Belhope Plastics Industries Ltd.	24
8	Explosive & Plastic & Co Ltd	19
9	General Plastic Nigeria Ltd	22
10	Metal & Plastic Industries (Nigeria) Ltd	19
	Total	220

3.4 Sample Technique

In determining the sample size for the target population for this study, Taro Yamane statistical formula is apply as stated thus:

$$S = \frac{N}{1 + N(C)^2}$$

Where;

S = sample size,

N = population size,

C = level of significance or error (0.05)

3.5 Sources of Data

For this study, both primary and secondary data were use to derived useful information needed for the successful conduct of this research study. The primary data were collected through structured questionnaires which were administered manually to the respondents. The secondary data is acquired through related literatures, textbooks, management science journals, magazines, Newspapers etc.

3.6 Data collection Instrument

The research instrument used in the collection of data in this study is the questionnaire. In a bid to get the precise opinion, the questionnaire was designed in a way that enabled respondent to choose the most appropriate option out of the alternative

questions. The questionnaire was arranged in two sections; the first briefly captured the socio-demographical information of the respondents while the second part focused on questions bordering on the subject matter which is sustainability development and organizational effectiveness with consideration increase in output, cost of reduction, increase in sales volume and environmental pollution reduction as the indices of measurement. The questions in the questionnaire were close-ended and were also drafted in a simple, explicit and understandable language. Also, the questionnaire is structured in an anonymous form to avoid revelation of respondents' personal information and to enhance the data collection vital information from the officials of the selected plastic manufacturing firms in Rivers State.

3.7 Validity of the Research Instrument

The instrument used was developed by the researcher in accordance with the research topic; sustainability development and organizational profitability. The content validity of the instrument was determined by the experts in test and measurement who matched the variables of the instruments with the research questions in order to determine whether or not the instruments measured what they were supposed to measure.

The questionnaire was presented to an experienced supervisor and other experts in administration since this type of validity cannot be put into statistical test. They successfully assessed the instrument and made suggestions. The suggestions were taken care of and changes made where necessary. This idea was to make sure that questionnaire covered what it is supposed to cover. This makes the questionnaires to be deemed valid to be employed to collect data in the main study.

3.8 Reliability of Research Instrument

The reliability was determined through the test-retest reliability technique. In doing this, the research questionnaires were administered to twenty (20) respondents who were purposively selected from the respondents. After a period of two weeks, the same questionnaires were re-administered to the same respondents.

3.9 Administration of the Instrument

Preceding this stage, permission was obtained from the management of the each of the manufacturing firms to carry out the research. The instrument was administered personally by the researcher to the respondents in their work places during official hours.

3.10 Scoring of Research Instrument

The four - point Likert scale was used in scoring the items in the questionnaire as shown below:

SA	=	Strongly Agreed (4 points)
A	=	Agree (3 points)
D	=	Disagree (2 points)
SD	=	Strongly Disagree (1 point)

3.11 Method of Data Analysis:

For this research, data collected are screened, arranged, and presented in tables for proper analysis and quantification. The analyses of the returned questionnaires are done with simple descriptive analysis of frequency distribution, percentage and average. This is because of its simplicity, clarity and relevant to our data.

More so, this study utilized the statistical tool of Pearson Product Moment Correlation (PPMC) in which SPSS package of version 21 was used in analysing the data in order to

ascertain the relationship of the dependent and independent variables. Pearson Product Method Correlation is suitable in measuring the existence of a relationship among variables.

3.12 Statistical Measure:

Pearson Product Method Correlation Analysis was used to test the relationship using the Statistical Package Social Science (SPSS version 21).

3.13 Model Specification:

$$\frac{\sum xy - \sum x \sum y}{\sqrt{[n\sum x^2 - (\sum x)^2] [n\sum y^2 - (\sum y)^2]}}$$

Where:

r	=	Pearson Product Correlation
n	=	number of respondents
$\sum$	=	sum of the values of the square of y
$\sum xy$	=	sum of the value of x and y
Y	=	productivity
$\sum x$	=	sum of the value of x
$\sum y$	=	sum of the value of y
$(\sum)$	=	square of sum of the values of y
$\sum$	=	sum of the value of the square x
$(\sum)$	=	square of sum of the value of x

3.14 Decision Rule Regarding Testing of the Hypotheses

To accept or reject the null hypotheses, there was comparison between the computer-generated significance level which was either greater than or equal to the assumed stated P-value of 0.05 and 0.01 level of significance. The decision rule following the comparison was thus made as follows: Accept H_0 if P-value (0.00) $\geq$ Sig. (2 tailed), which implied no significance, Reject H_0 if P-value (0.00) $\leq$ Sig. (2 tailed), which implied there was significance Pearson Product Moment Correlation.

DATA PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS

4.1 Introduction

This section presents the analyses of the data collected for the study and the discussion of the findings. The data were presented using tables and analyzed using the methods of analysis as laid out in section three.

4.2 Presentation of Data

This section is basically designed to present, analyze and interpret the primary data obtained via the questionnaire which was administered to the respondents. These are shown in the table below:

Table: 4.2.1: Number of questionnaires administered and returned

No. of questionnaires administered	No. of questionnaires returned	Percentage of Questionnaire Returned
120	107	0.89

Source: Fieldwork, 2019

From the table, out of 120 copies of questionnaire administered, 107 representing 89% were successfully returned.

Table 4.2.2: Descriptive analysis on Waste Recycling

	Statement	Extent of Agreement					
		SA	A	UN	D	SD	Total
1.	Our firm ensures accessibility of the waste storage facility within the work premises and the environment surrounding our firm.	39 (36%)	53 (50%)	2 (2%)	7 (7%)	6 (5%)	107 (100%)
2.	Our firm implements policies on waste recycling to enhance procedures for sewage management systems.	49 (46%)	50 (47%)	-	8 (7%)	-	107 (100%)
3.	Waste recycling is part of our organization corporate social responsibility plan.	54 (50%)	34 (32%)	3 (3%)	2 (2%)	14 (13%)	107 (100%)
4.	Our firm focused on risk management plans and evaluations, with concern of the company's capacity to reduce customers' environmental impacts & decreasing their exposure to unhealthy substances.	39 (36%)	53 (50%)	2 (2%)	7 (7%)	6 (5%)	107 (100%)
	Total	181	190	7	24	26	428
	Proportion of N	45	47	2	6	7	107
	Percentage of Proportion	(42%)	(43%)	(2%)	(6%)	(7%)	(100%)

Source: Field survey 2019

Question 1 in table 4.2.2 above shows 39 representing 36% strongly agreed that accessibility of the waste storage facility within the work premises and the environment surrounding are applicable in their firm, 53 representing 50% agreed, 2 representing 2% were undecided and 7 representing 7% disagreed. With the proportion of 53% of agreement confirm that accessibility of the waste storage facility within the work premises and the environment surrounding are applicable in some manufacturing firms in Port Harcourt, Rivers State.

Question 2 out of 107 respondents, 49 representing 46% strongly agreed that their firm implements policies on waste recycling to enhance procedures for sewage management systems, 50 representing 47% agreed; none were undecided disagreed, 8 representing 7% disagreed and none strongly disagreed. With the proportion of 47% being the percentage of agreement it confirms that firm implements policies on waste recycling to enhance procedures for sewage management in some manufacturing firms in Port Harcourt, Rivers State.

Question 3 out of 107 respondents, 54 representing 50% strongly agreed that Waste recycling is part of our organization corporate social responsibility plan, 34 representing 32% agreed, 3 representing 3% were undecided, 2 representing 2% disagreed and 14 representing 13% strongly disagreed. With the proportion of 50% being the percentage of agreement it attest to the fact that waste recycling is part of our organization corporate social responsibility plan in some manufacturing firms in Port Harcourt, Rivers State.

Question 4; out of 107 respondents, a response variation of 39 representing 36% strongly agreed that their firm focused on risk management plans and evaluations, with concern of the company's capacity to reduce customers' environmental impacts and decreasing their exposure to unhealthy substances, 53 representing 50% agreed, 2 representing 2% were undecided, 7 representing 7% disagreed and 6 representing 5% strongly disagreed. With the proportion of 50% being the percentage of agreement it attest to the fact that their firm focused on risk management plans and evaluations, with concern of the company's capacity to reduce customers' environmental impacts and decreasing their exposure to unhealthy substances in some manufacturing firms in Port Harcourt, Rivers State.

Table 4.2.3: Descriptive analysis on cost reduction

	Statement	Extent of Agreement					
		SA	A	UN	D	SD	Total
9.	Adequate waste recycling of by-products and residues such as condemned plastic, rubbers and polythene when aid in adding to the raw materials of the manufacturing firm and thereby reduces cost of raw material purchase.	39 (36%)	53 (50%)	2 (2%)	7 (7%)	6 (5%)	107 (100%)
10.	Waste recycling helps in saving cost for an organization like fines against environmental compliance.	21 (20%)	55 (51%)	5 (5%)	10 (9%)	16 (15%)	107 (100%)
11.	Implementation of policies on waste recycling by manufacturing firm can leads to energy efficiency and reduced operational cost.	39 (36%)	53 (50%)	2 (2%)	7 (7%)	6 (5%)	107 (100%)
12.	The existence of waste storage facilities designed for waste recycling can enhance maintenance cost reduction on raw materials.	44 (41%)	45 (42%)	5 (5%)	7 (7%)	6 (5%)	47 (100%)
	Total Proportion of N	143	206	14	31	34	428
	Percentage of Proportion	36 (34%)	52 (49%)	4 (4%)	8 (7%)	9 (8%)	107 (100%)

Source: Field survey 2019

The table shows the frequency of responses and their percentages on the cost reduction dimension. More so, question 9 shows that 39 representing 36% strongly agreed that adequate waste recycling of by-products and residues such as condemned plastic, rubbers and polythene when aid in adding to the raw materials of the manufacturing firm and thereby reduces cost of raw material purchase, 53 representing 50% agreed, 2 representing 2% were undecided, 7 representing 7% disagreed and 6 representing 5% strongly disagreed. Hence with 50% being the percentage of agreement from the description analysis confirms that adequate waste recycling of by-products and residues such as condemned plastic, rubbers and polythene when aid in adding to the raw materials of the manufacturing firm and thereby reduces cost of raw material purchase in manufacturing firms in Port Harcourt, Rivers State.

Question 10 shows that 21 representing 20% strongly agreed that waste recycling helps in saving cost for an organization like fines against environmental compliance, 55 representing

51% agreed, 5 representing 5% were undecided, 10 representing 9% disagreed and 16 representing 15% strongly disagreed. Hence with 51% being the percentage of agreement from the description analysis confirms that waste recycling helps in saving cost for an organization like fines against environmental compliance in manufacturing firms in Port Harcourt, Rivers State.

Question 11 shows that 39 representing 36% strongly agreed that implementation of policies on waste recycling by manufacturing firm can leads to energy efficiency and reduced operational cost, 53 representing 50% agreed, 2 representing 2% were undecided, 7 representing 7% disagreed and 6 representing 5% strongly disagreed. Hence with 50% being the percentage of agreement from the description analysis confirms that implementation of policies on waste recycling by manufacturing firm can leads to energy efficiency and reduced operational cost in manufacturing firms in Port Harcourt, Rivers State.

Question 12 shows that 44 representing 41% strongly agreed that the existence of waste storage facilities designed for waste recycling can enhance maintenance cost reduction on raw materials, 45 representing 42% agreed, 5 representing 5% were undecided, 7 representing 7% disagreed and 6 representing 5% strongly disagreed. Hence with 50% being the percentage of agreement from the description analysis confirms that the existence of waste storage facilities designed for waste recycling can enhance maintenance cost reduction on raw materials in manufacturing firms in Port Harcourt, Rivers State

Table 4.2.4 Hypothesis One: There is no relationship between waste recycling and cost reduction in manufacturing firms in Port Harcourt, Rivers State.

Descriptive Statistics

	Mean	Std. Deviation	N
waste recycling	4.0753	.71483	107
cost reduction	3.5146	.67029	107

Correlations

		waste recycling	cost reduction
waste recycling	Pearson Correlation	1	.572**
	Sig. (2-tailed)		.000
	N	107	107
cost reduction	Pearson Correlation	.572**	1
	Sig. (2-tailed)	.000	
	N	107	107

** . Correlation is significant at the 0.05 level (2-tailed).

The result, the Coefficient of Correlation (r) is 0.572. Based on the decision rule, there is strong positive correlation between waste recycling and cost reduction in manufacturing firms in Port Harcourt, Rivers State. The significance level is 0.000 which is below 0.05 ($p < 0.05$). Based on the decision rule for significant level, we reject the null hypothesis. Therefore, we conclude that, "There is a positive relationship between waste recycling and cost reduction in manufacturing firms in Port Harcourt, Rivers State."

4.3 Discussion of Finding

Based on the objective of the study, the following finding were from the analysis of the hypothesis; hypothesis 1 shows the Coefficient of Correlation (r) is 0.572. Based on the decision rule, there is strong positive correlation between waste recycling and cost reduction in manufacturing firms in Port Harcourt, Rivers State.. The significance level is 0.000 which is below 0.05 ($p < 0.05$). Based on the decision rule for significant level, we reject the null hypothesis. Therefore, we conclude that, "There is a positive relationship between waste recycling and cost reduction in manufacturing firms in Port Harcourt, Rivers State. The findings is supported Tzschentke et al. (2004) that the prime motive behind introducing environmental initiatives is in particular the rising costs for water, energy and waste disposal led many businesses to look for alternatives. Hence operational measures of recycling are for example recycling systems, using recycled materials, installing water-saving devices, using low energy light bulbs, energy-conservation measures such as insulation or solar-powered water heating systems and absorbing recycled raw materials for production to minimise cost of operations. Also, Pearse and Crocker (2013) found that companies perform well when they obey environmental issues, and they also avoid paying unnecessary fines and penalties."

4.4 Conclusion

The environmental menace such as air and water pollution, indiscriminate dumping of manufacturing by-product etc which are caused by business activities could be destructive to communities, while businesses continue to increase wealth, continuing to view sustainability with one-dimensional lens escalates environmental and social issues. Hence, manufacturing firms interested in addressing the sustainability agenda to improve their performance will need to build a sustainability culture-centered mindset. This can be effectively done by adopting and ensuring that waste plastic, papers and many other renewable materials are recycle for new production as this method is believe to bring about reduction of environmental pollution, increase in sales volume, operational cost reduction and increase in output. More so, recycling assist in reduction of pollution caused by waste, it help reduces the need for raw materials so that the rainforests can be preserved.

According to IDEM Fact Sheet, (2010) producing recycled white paper creates 74% less air pollution and 35% less water pollution than producing paper from virgin fibers, using recycled cans instead of extracting ore to make aluminum cans produces 95% less air pollution and 97% less water pollution. Recycling and remanufacturing are 194 times more effective in reducing greenhouse gas emissions than land filling and virgin manufacturing. To fully realize the benefits of recycling, three elements should be considered; collection, manufacturing, and buying recycled (IDEM Fact Sheet, 2010). Recycling involves; collecting, sorting and processing materials that would otherwise become waste, remanufacturing recycled materials into new products and purchasing products made from recycled materials. Hence, firms operating in this industry must be able to make effective use of these green opportunities to transfer the original environmental pressures into a competitive advantage, improve corporation image, develop new market segments, expand into new markets, and maximize benefits.

4.5 Recommendations

The following recommendations are outline to business organizations that desire sustainability to the environment it operate and to governments for the overall benefits of her citizens.

Firstly, business firms especially manufacturing firms on the need to carryout thorough recycling of used materials by customers for the purpose of reducing cost of acquisition of raw materials for production and by way of pollution reduction helps in maintaining their corporate image to the environments. Also to it will help them to measure output of production, increase in volume of sales. Hence, production/operations managers, financial managers, marketing managers should arrived at concrete decision making and implementation of waste recycling to control organizational resources in order to attain sustainability development and maintaining effectiveness in the organizations. As such make provisions of recycle bin at strategic location within/outside their environment of operation and create an awareness of such adding incentive to customers who will dump used bottles of their product in order to aid them in recycling.

Subsequently, government should make used of this study as a guide to formulate and implement policies that restrict manufacturing firms dumping debris of used materials from their factory in other to reduce environmental pollution. Government should through this study monitor and placed high fine payment for any manufacturing found guilty of the offence.

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