REVERSE LOGISTICS PRACTICES AND ENVIRONMENTAL PERFORMANCE OF FOOD AND BEVERAGE MANUFACTURING FIRMS IN UGANDA

BY

WINFRED MBEKEKA

17/U/14778/GMSC/PE

A DISSERTATION SUBMITTED TO KYAMBOGO UNIVERSITY GRADUATE SCHOOL IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE IN PROCUREMENT AND SUPPLY CHAIN MANAGEMENT OF KYAMBOGO UNIVERSITY.

JULY, 2021

DECLARATION

I, **Mbekeka Winfred** hereby declare that this research work is my original endeavor and it does not incorporate without acknowledgement, any material previously submitted for award of a degree or any other academic award in any University and to the best of my knowledge, it does not contain any material previously published or written by another person.

Sign: ……. Date: …….

WINFRED MBEKEKA

17/U/14778/GMSC/PE

APPROVAL

This is to certify that this research work has been prepared and compiled by **Winfred Mbekeka** and it is done under our supervision.

Signature …….. Date … ……..….

DR. FRANCIS SSENNOGA

PRINCIPAL SUPERVISOR

Signature …….. Date … ……..….

DR. MAURICE MUKOKOMA NALWOGA

SECOND SUPERVISOR

DEDICATION

This research work is dedicated to my mother Miss Nakonde Jane and my friends Nahamya Josephine, Namawejje Rose and Mirembe Grace, my sister Nanyombi Dorothy and my brother Timothy Mbuga I appreciate you for being there for me and for the support rendered to me during the journey to my academic pursuance.

ACKNOWLEDGEMENT

I thank my supervisors Dr. Francis Ssennoga and Dr. Maurice Mukokoma Nalwoga for the guidance, mentoring and moral support that they rendered to me during the research work writing and for the sacrifice of their time. They positively responded and encouraged me a lot. Their patience, critical comments and constructive suggestions gave meaning to the ideas expressed in this research work. Dr. Francis Ssennoga, I appreciate you for taking your golden time to read each and every word of this research work and Dr Mukokoma whenever I read your remarks, they kept me going.

In addition, I thank Dr. Charles Ndandiko, Dr. Mathew Kalubanga and Mr. Nsibambi Vincent who supported me to ensure that I complete this research work and my Masters' degree.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

UIA	:	Uganda Investment authority
RL	:	Reverse Logistics
PET	:	Polyethylene terephthalate
PRI	:	Plastic Recycling Industries
NEMA:	:	National Environment Management Authority
SCOUL	:	Sugar Cooperation OF Uganda Limited
KCCA	:	Kampala City Council Authority
HDPE	:	High-density polyethylene
GIZ	:	German International Cooperation
REVLOG	:	The European Working Group on Reverse Logistics

ABSTRACT

Reverse Logistics is an issue that has gained a lot of attention, in fact, in the last decade, given the confluence of various situations. Reverse logistics is becoming an important initiative today, this is due to a number of factors for example, of all the products sold, an average of eight to twelve percent is returned. Among the key players in reverse logistics are manufacturing firms that play an integral role in implementing reverse logistic practices. With this understanding, the objectives of the study were: to examine the relationship between reverse logistics practices (Product collection practices and industrial waste management practices) and environmental performance, and the moderation effect of government policy on the relationship between reverse logistics practices and environmental performance of food and beverages firms in the Central region. The study used a cross sectional survey design; the population of the study included all food and manufacturing firms in the Central region (N=700). The study considered the Central region of Uganda because this is where most of food and beverage manufacturing firms are concentrated and thus providing a population where a proportionate sample could be derived. The sample size of the study involved 248 respondents which was obtained basing on the statistical table of Krejcie and Morgan (1970) table for determining the sample size. The study used quantitative data that was collected through a self-administered questionnaire designed to obtain specific responses for quantitative analysis. The Pearson correlations revealed a weak but statistically significant relationship between product collection practices, industrial waste management practices and environmental performance. This was evidenced with ($r=0.287$, $p<0.000$, $r=0.225$, $p<0.001$) respectively. The results of the regression analysis revealed that there was a direct relationship between product collection practices and environmental performance of food and beverage manufacturing firms. From the results, collection by third party proved to be the strongest predictor of the variations in environmental performance by 40.5% level of explanation while industrial waste management practices (remanufacturing, reusing, recycling) was not statistically significant to explain the variations with $p>0.650$, 0.338 and 0.211 which is greater than 5% level of significance. The moderating effect of government policy was found to have a statistically significant influence on the relationship between product collection practices and environment performance which is evidenced by $P<0.008$ being less than 0.05 level of significance. However, the moderating effect of government policy did not have a statistically significant influence on the relationship between industrial waste management practices and environmental performance with $P>0.476$ being greater than 0.05 level of significance. Therefore, the study recommends that food and beverage manufacturing firms should include reverse logistics in their strategic planning and create clear policies for it especially product collection by third party if they are to achieve greater improvement in environmental performance in terms of reduced pollutants, reduced wastes and emissions in to the atmosphere. The limitation of the study was that some respondents were not willing to commit their time to respond to the questionnaires due to stringent procedure instituted in manufacturing firms to alleviate the spread of the corona virus, and fears of the respondents contracting Covid-19.

CHAPTER ONE: INTRODUCTION

1.0 Introduction

Chapter one presents the background to the study, research questions, conceptual framework, and significance of the study and scope of the study.

1.1 Introduction

In Uganda, industries generate large proportions of solid wastes and waste water. The wastes are disposed into the environment leading to blockage of drainage channels. These have forced some of the giant companies to pro-act, by ensuring that solid waste is collected and taken for proper disposal. The main disposal methods embraced are recycling, remanufacturing and reusing of the plastic wastes. The plastic waste can be retained back for disposal through reverse logistics mechanism, a practice which is now days gaining momentum through some of the giant food and beverage manufacturers like Century bottling Company, Crown Beverages among others. It should be noted, that, it is not clear whether all foods and beverage firms are fully responsible for their plastic waste and as a result the study sought to evaluate the relationship between reverse logistics practices and environmental performance of food and beverage manufacturing firms in Uganda.

1.2 Background to the study

The background of the study was categorized into four perspectives namely; historical, theoretical, conceptual and contextual background as discussed below;

1.2.1 Historical review

Over the years there has been a repeat of events such as the energy crisis and prevailing consumerist behavior which encourages high demand especially for raw materials by individuals and organizations. This has led to diminishing sources of raw materials and hence the focus has been on conservation and use of recycled materials (Victor and John, 2009).

Environmental considerations have become a significant in purchasing (Min and Galle, 1997; Preuss, 2005).

Reverse logistics didn't catch much attention of the business world until the last decade. In early 90s, the Council of Logistics Management published two studies on reverse logistics. The first was written by J. R. Stock (1998) which systematically reported on how to set up and how to operate reverse logistics programs, his book also tried to discover the potential of reverse logistics. Rogers & Tibben-Lembke (1999) however, presented an extensive collection of various reverse logistics business statistics data categorized by industry types.

In this regard, reverse logistics practices have been around us for a long time (Fleischmann et al., 1997). According to Walden (2005), reverse logistics history can find its root from the American Civil War. Material shortages during World War II created a need to rebuild automobile parts and started a trend that continues until today. In fact, according to Rogers and Tibben-Lembke (2001), this had become a $36 billion business and 90 to 95 percent of all starters and alternators sold for replacement are remanufactured.

In 1991 the Federal Republic of Germany passed recycling ordinances in the environmental reverse flow and deployed mandatory recycling programs. In 2001, The European Union took this one step farther by establishing a goal of 50-65% recovery or recycling of packaging waste. The implication for the rest of the world is that they have to be compliant if they want to do business with the EU. In this case, reverse logistics has become an area that retailers and manufacturers cannot ignore, companies can see between 4%-30% of their products returned by customers and total UK retail returns have been valued around £6 billion per annum (Bernon and Cullen, 2007).

In Europe, America and Australia, an increasing number of organisations have voluntarily or mandatory engaged in end of life product management. These developments have a great impact on the environment and economic values (Geyer and Jackson, 2004). In East Africa, Khisa (2011) observed that regionally, parts of southern Africa, Kenya, Rwanda, Uganda and Tanzania are catching up in developing policies that aim at improving product reusability once it has gone through the complete supply chain. In the same line, some countries are specific in development of their systems of reverse logistics that is under the direct influence with government legislation (Samal, 2019).

As a result, increased deterioration of the environment has raised concerns amongst various researchers and academicians to investigate different strategies regarding the effectiveness of various environmental practices designed to meet the complex and conflicting environmental pressures from various sources in improving the competitiveness of firm (Fahimnia, Sarkis, and Davarzani, 2015).Therefore, much attention has been given to the ability of such practices in enabling firms to achieve adequate levels of environmental and economic performances (Yu, 2018).

As emphasized, by Agrawal, Singh, and Murtaza (2015), the implementation of reverse logistics as a strategic decision has gained significant attention amongst organisations due to its benefits to sustainability. Organisations need to evaluate and analyze the environmental and social performance in addition to their economic performance. Aitken and Harrison (2013) assert that tangible and intangible benefits can be attained by reverse logistics through recapturing value from used or returned products, rather than purchasing more raw materials and wasting manpower and time.

Theoretically, the study was guided by both the stakeholder theory and the institutional theory. Miles (2006) states that the organization itself should be thought of as grouping of stakeholders and the purpose of the organization should be to manage their interests, needs and viewpoints.

Moreover, in regard to the institutional theory, organizations have institutionalized reverse logistics practices because of internal and external pressures. In this regard, stakeholder analysis and Institutional theory for reverse logistic practices is relevant as there are views that not all reverse logistic practices are conducive for generating competitive advantages for enterprises and are necessary due to pressures from stakeholders (Günther and Scheibe, 2005).

1.2.2 Conceptual review

Conceptually, reverse logistics is the process of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal (Reverse Logistics Executive Council, 2007). Reverse logistics is an integrated network structure of activities involving aspects of collection, inspection, setting, pre-processing and the entire logistics and distribution (Srivastava, 2008).

According to Kopicki et al., (1993), the ultimate goal of the firm is resource reduction that includes minimization of materials used and minimization of wastes and energy saved through the production of more environmentally efficient products. In addition, Badenhorst (2016) spelt out that reverse logistics is a process that enables organizations to become more environmentally capable through recycling, reusing and reducing the amount of materials used. Reverse logistics practices can be viewed as reverse flow process such as reclaiming pallets and containers used to transport, receiving the customer returns, collecting containers, raw materials, scrap and spare parts processing defects in the product sales (Zhang, 2010). Thus,

the end goal is reducing resource use in such a way that waste is reduced and environment being conserved.

Reverse logistics starts with end-users from whom the used and returned products are collected, moved through acquisition at which stage the products are inspected and sorted into various groups (Rogers and Tibben-Lembke, 2001). It is a close the loop of a typical forward supply chain and includes reuse, remanufacturing and/or recycling of materials into new materials or other products with value in the market place (Sathiyagothai and Saravanan, 2017).Rogers and Tibben (2001) argued out that reverse logistics is more than reusing containers and recycling containers and recycling packaging materials. Redesigning packaging materials or reducing energy and pollution from transportation are important activities but might be better placed in the realm of green logistics if no goods or materials are being sent backward the activity is not reverse logistics activity

Environmental performance is defined as an organizations' capability to contribute to reduction in air and water pollution of solid waste and its ability to reduce consumption if harmful hazardous and toxic materials and frequency of environmental accidents (Zhu, Sarkis, and Lai, 2008). Jalaludin, Sulaiman, and Ahmad (2011) asserted that environmental performance measures may include; reduction in pollution emissions, reduction in use of water, reduction in use of energy, reduction in use of toxic inputs, reduction in use of paper, reduction of noise and reduction in the risk of severe accident and minimization of pollutants. Environmental performance of a firm may be assessed based on recycling, the use of alternative sources of energy and compliance with environmental rules and regulations. The study findings of Muma et al (2014), it was found that environmental performance is linked with reduced costs in environmental management, reduced waste emissions into the environment, reduced

complaints on environmental management and existence of environmental policies that are well communicated and followed.

In the study, environmental performance included minimization of pollutants, conserving resources, waste reduction, and energy conservation, marketing of safe products and reporting risks, among others (Epstein, 1996). It should be noted that, environmental performance indicator rankings indicate which countries are best addressing environmental challenges that every nation face. It goes beyond the aggregate scores and drilling down into the data to analyze performance by issue category, policy objectives, peer group and country offers even greater value for policy makers. This gives a comparative perspective that can assist in understanding the determinants of environmental progress and in refining policy choices (Conrad and Cassar, 2019). In this Case, environmental performance index is not suitable for the study as it measures performance at country level. Therefore, since this study is at firm level, environment performance was measured basing of individual perspectives.

1.2.3 Contextual review

The food and Beverage industries provide context for the study. Uganda's food and beverage industry has made great strides, with increased investments by local, regional and international companies. In the category of medium to large scale industries in the sector are sugar processing Industries like SCOUL, and manufacturers of alcoholic and non-alcoholic beverages. The rest of beverage industries are small scale. The soft/non- alcoholic drinks include carbonated drinks, fruit juices and squashes. The biggest soft drink producers are franchisers of big international companies Pepsi cola and Coca-cola producing carbonated drinks.

The giants through their partners such as Century bottling company and Crown Beverages have invested heavily in the country, with each seeking to be the leading producer of carbonated soft beverages, energy drinks and water. The alcoholic industries comprise of beer producing companies and spirit producing companies, for example Premier Distillers Ltd, Parambot Breweries Ltd and Real Distillers Ltd among others. Another growing sector in the drink category is the mineral water and the firms include Kiri Bottling, Wava water, Hema Beverages, N.C Beverages etc.

It should be noted that the small-scale producers of fresh juice pack their products in polythene bags. The giant companies like Pepsi-cola and Coca-cola package their products in Polyethylene terephthalate (PET). The presence of many plastic irritants in the city and surrounding towns is a result of improper disposal of plastic waste (Asiimire, 2015). Indiscriminate disposal of waste, largely due to limited awareness and lack of adequate facilities have caused manmade floods in water channels within major towns especially Kampala. The drainage channels are usually blocked by common waste materials such as plastic bottles and polythene bags thus causing flooding. Plastic waste especially polythene is still a challenge in Uganda. In 2009, the government proposed a ban on plastic of 100 microns and below, however, government is struggling to implement this ban due to logistical challenges (National Environment Managment Authority , 2016).

According to the Uganda water and Environmental sector report (2018), sixty-six (66) industries were monitored countrywide and industries that contributed more to pollution of the water sources and other environmental systems were assessed. It was found out that compliance level to biochemical oxygen demand is lowest (25%) for food processing industries followed by sugar factories (30%) tannery (33%) an agro-processing (40%) and dairy industries (55%).

The most polluting industries on the other hand, beverage industries (88%) and fish processing (63%) discharge waste water that have been treated fairly adequately and are considered least polluting industries (Ministry of Water and Environment, 2013). It is against this background that the researcher is compelled to carry out a study on the influence of reverse logistics practices on environmental performance.

1.3 Statement of the problem

Reverse logistics has been found to play an important role in almost any manufacturing firms regardless of size of product and geographical reach of the firm. Reverse logistics is process that gives organizations economic advantage, improves material management, improves corporate image, and improves the green environment (Mandota, 2015).

In order, to conserve the environment, Food and Beverage firms such as Century Bottling Company, have considered embracing reverse logistics practices through product reuse, re-manufacturing, recycling and proper disposal of plastic waste (Okwoko, 2020). Through its initiative of the world without waste, it set up a subsidiary called Plastic Recycling Industries (PRI). PRI is now the largest plastic recycling business in Uganda, collecting about 14 tons of plastic daily, and ridding the environment of close to 400 tons of plastic per month (Kyanda, 2018).

However, despite the efforts put forward through reversing plastic waste for proper disposal, environmental performance is still in an alarming state as evidenced by the presence of plastic garbage that ends up in drainage channels, wetlands and manholes thus causing flooding (Kinobe Joel R, 2012). In this regard, the study sought to investigate the influence of reverse logistics practices on environmental performance considering food and beverage manufacturing firms in Uganda.

1.4 General study objective

The purpose of the study was to investigate the influence of reverse logistics practices on environmental performance of manufacturing firms in Uganda, considering the food and beverages manufacturing firms.

1.5 Study Objectives

1. To examine the effect product collection practices on environmental performance of food and beverages manufacturing firms in the Central region of Uganda.
2. To examine the effect of Industrial waste management practices on environmental performance of foods and beverage manufacturing firms in the Central region of Uganda.
3. To examine the moderation effect of government policy on the relationship between reverse logistics practices and environmental performance of foods and beverage manufacturing firms in the central region of Uganda.

1.6 Research questions

1. What is the effect of product collection practices on environmental performance of food and beverages manufacturing firms in the central region of Uganda?
2. What is the effect of Industrial waste management practices on environmental performance of food and beverages manufacturing firms in the Central region of Uganda?
3. What is the moderation effect of government policy on the relationship between reverse logistics practices and environmental performance of beverages manufacturing firms in the Central region of Uganda?

1.7 Scope of the study

The scope of the study included; the Subject scope and Geographical scope.

1.7.1 Subject scope

The study focused on the influence of reverse logistics practices on environmental performance of Food and Beverage manufacturing firms in the Central region of Uganda. The study also examined the influence of government policy on the relationship between reverse logistics practices and environmental performance.

1.7.2 Geographical scope

Most of the manufacturing firms are located in Kampala Business District which constitutes of 45% and Central region 21% of the total number established in the country (MoFPED, 2017). Still, Uganda Bureau of Standards report (2011), states that majority of manufacturing businesses are in Kampala region (32%), followed by the rest of the central region with (27%) of the total number of manufacturing firms country wide. Therefore, the study was conducted within the central region of Uganda.

1.8 Significance of the study

The study enables the researcher to establish whether Beverages firms embrace reverse logistics practices in order, to protect the environment from being polluted with plastic irritants.

The study findings may guide the policy makers under the procurement department to make right decisions as regards control of reverse logistics and their impact on the environment.

Organizations practicing reverse logistics have a lot to benefit as a result; apart from the many opportunities of growth that may come along. Organizations stand a chance of job creation, maintenance of climatic conditions and conservation of resources.

The study is a justification for firms to engage in reverse logistics practices as a strategy to improve both financial and environmental performance thereby moving towards sustainable growth which is one of the foundations of Ugandan Vision 2030.

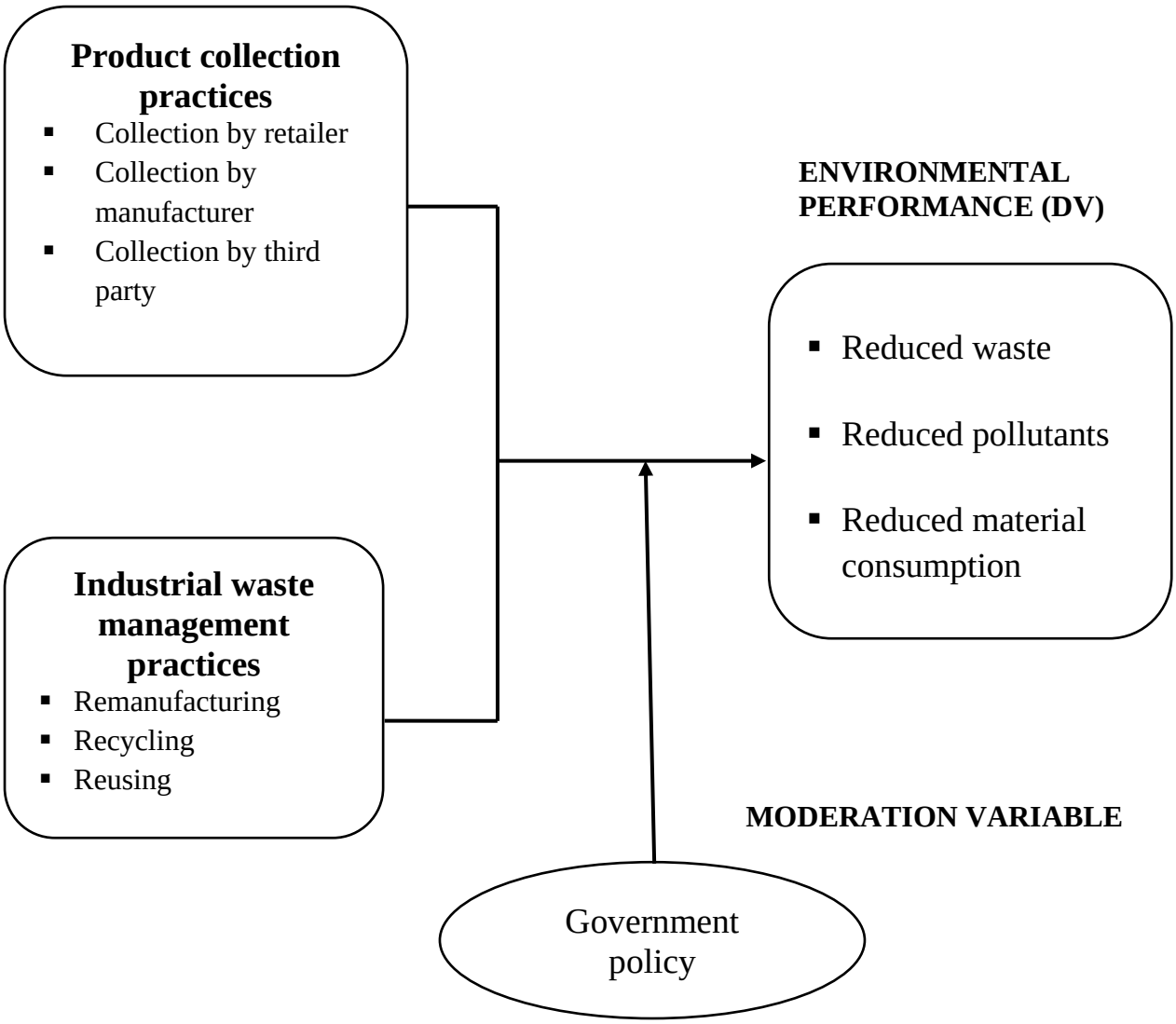
The study findings might shift environmental management focus from the statutory driven to business strategy driven which might shape firms' propensities to engage in environmental practices and have a greater impact on the natural environment management.

The study findings benefits scholars who would wish to conduct further investigations around this area of study.

1.9 Conceptual Frame Work

Figure 1 below, summarizes the predicted influence of reverse logistics practices on environmental performance. As illustrated in the conceptual framework, the study suggested that each of the two studied elements of reverse logistics practices (product collection practices and industrial waste management practices exert a positive influence on a firm's environmental performance and that such influence is dependent upon the prevailing government policy.

Figure 1: Conceptual Framework



Source: Based on earlier works of Sathlyagothal and Saravanan (2017), Alkathani et al (2021) and modified by the researcher 2021.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This section presents a review of the literature related to the study concepts and the research objectives. The literature in this study is reviewed by putting into consideration works that have been done by other scholars regarding the variables in the study; that is, reverse logistics practices and environmental performance and the underlying gaps in the literature that the study intended to fill are specified.

2.2 Theoretical review

The theoretical background of the study has been embedded in the learning literature to investigate the influence of reverse logistics on environmental performance of food and beverage firms in Uganda. The study was guided by two theories that is: the stakeholder theory and the institutional theory respectively. The sub-sections below provide a brief review of these theories.

2.2.1 Stakeholder theory

The central tenet of the stakeholder theory draws on the stakeholder concept. A stakeholder is any group or individual who can affect or is affected by the achievement of an organization's objectives (Freeman, 2016). Stakeholder theory suggests that companies produce externalities that affect many parties (stakeholders) which are both internal and external to the firm. Externalities often cause stakeholders to increase pressures on companies to reduce negative impacts and increase positive ones. Various categorizations have been used to group stakeholders and include direct or indirect, primary and secondary, or based on multiple dimensions of legitimacy, urgency, and power (Mitchell et al., 1997).

With respect to the environment, some stakeholders expect that firms will operate in ways that minimize externalities such as water pollution, solid waste disposal, forest cover depletion and

emission of environmentally harmful gases and assume greater responsibility to correct any effects that may occur (González-Torre et al., 2004).

Stakeholder theory suggests that if we adopt as a unit of analysis the relationships between a business, groups and individuals who affect or are affected by it, there is a better chance to effectively deal with three problems that is; the stakeholder perspective, business can be understood as a set of relationships among groups that have stake in the activities that make up the business (Jones, 1995). It is about how customers, suppliers, employees, financiers, communities and managers interact to jointly create and trade value. To understand a business is to know how these relationships work and change over time (Donaldson and Preston, 1995).

Stakeholder theory suggests that managing for stakeholders involves attending to the interests and well-being of stakeholders (González-Torre et al., 2004). In this regard, one of the fundamental issues in stakeholder theory is that how a firm treats its customers influences the attitudes and behavior of firm's employees and how firms behave towards communities in which it operates influences the attitudes and behavior of its suppliers and customers (Cording, Harrison, Hoskisson and Jonsen, 2014).

Stakeholder theory is introduced as an explanatory theory related to an association between reverse logistics practices and environmental performance. Stakeholder's theory expands further the range of perceived benefits that stimulate adoption of reverse logistics practices by organizations and corporations all over the world. In this case, the focus is to see how manufactures handle plastic irritants that are a result of their operations through Reverse logistics practices in order, to protect the external shareholders such as the environment.

The theory is criticized for its inadequately about to addressing the environment surrounding a firm (Key, 1999). The model suffers a problem of delimitation with the various levels not clearly defined. Stakeholders around the firm, especially those in the immediate business

environment and those in the broader environment, are somewhat confused.

Still, the theory shows only immediate stakeholders, it does not reflect the shareholders of the stakeholders, for instance the investors are also responsible to other people leaving the firm alone. In other words, the stakeholder is a network that may depend on the nature of the business. A customer may be accountable to the consumers and the consumer should be accountable to the customer. In fact, in future, the theory should consider discussing the impact of the shareholders to the firm. For instance, in the case of manufacturing companies dealing in beverages, the final consumer as a stakeholder should be added value to the firm.

2.2.2 The Institutional Theory

The institutional theory is concerned with the processes by which structures, routines, rules and norms become established as the guidelines for an acceptable behaviour. Organizations act in a way that fulfils both customer and legal requirement. Pressures from these two parties influence the adoption of environmentally responsible behavior (Laosirihongthong et al., 2013) As Carter, Smeltzer and Narasimhan (2000) observed, companies institutionalize reverse logistics practices due to fear of loss of their market share to competitors and awareness of the consequences of noncompliance with environmental priorities (Carter et al., 2000). This is over and above growing demand of customers and environmental societies for more environmentally friendly products. These challenges and pressures push firms to seriously consider environmental effects while doing their business.

Still, managerial decisions to accept environmental management initiatives maybe influenced by three institutional mechanisms: normative, coercive and imitative. Due to normative pressures, such as customer requirements, organizations are forced to conform to be perceived as more legitimate (Zhu et al., 2008). Several external stakeholders can also impose coercive pressures on companies, depending on their power. Government bodies may for instance affect

the adoption of environmental practices by firms by means of rigorous environmental regulation (Delmas, 2002). Managers may also institute environmental practices as a strategy to imitate and overtake competition whose environmental responsibility has earned them a competitive edge.

Therefore, the two theories above are relevant to the study in explaining the relationship between reverse logistic practices and environmental performance. Stakeholder analysis and Institutional theory for reverse logistic practices is especially pertinent as there are views that not all reverse logistic practices are conducive for generating competitive advantages for enterprises and are necessary due to pressures from stakeholders (Günther and Scheibe, 2005).

2.3 The effect of product collection practices on environmental performance

Many consumers of beverage products treat the used packaging material as after as garbage, and they do not know how to deal with it. This situation creates economic, social, and environmental problems for the community, which are concerns for the government, society, and product manufacturer.

Therefore, product manufacturers design reverse logistics practices of collection to ensure that the environment is not negatively affected by the poor disposal of the used products. Collection refers to a company obtaining custody of specific items which is an interesting component of reverse logistics (Pokharer and Matha 2012). The collection activity includes evaluation, product acquisition from the customers, inspection, and transportation of the product back to the recovery systems, such as remanufacturing, recycling, repairing, or reuse.

In this case, reverse logistics should not only involve networking and inventory management but should also incorporate product collection (Porkharel et al., 2009). Product collection practices include collection by the retailer, manufacturer and the third party as retrieved below;

2.3.1 Product collection by retailers and environmental performance

Wojanowski et al. (2007) proposed combining a collection of used products with retail activities. They determined that the main factor for an organization to be involved in the collection of used products is the net value that can be obtained from a returned product.

In relation to the above, enhancing customer convenience by reducing travel time and effort to return used products improves the efficiency of product returns. Thus, an adequate number of collection facilities need to be situated proximate to that of the customers.

Similarly, Malik et al. (2015) presented other techniques such as graph theory and matrix approach to determine possible locations for collection centers based on ten key factors, comparative significance, and its availabilities.

Still, in a study conducted by Hong and Yeh (2012), they compared collection by manufacturer, retailer and third party and found that collection by retailer is believed to be optimal when there are economies of scale otherwise, the collection by manufacturer becomes an optimal option (Atasu et al., 2013).

2.3.2 Product collection by manufacturer and environmental performance

Most of the beverage manufacturing firms in developing countries are not able to provide proper facilities for collection and disposal of product waste to whole population. In the urban centers of Uganda plastic waste is being dumped openly along roadsides. Open dumps are responsible for the blockage of drains, breeding of flies and spread of epidemic diseases (Kinobe, 2012).

Pokharel and Mutha (2009), emphasized that conventional system has to be set up such that products are received in the right time, in the right place, the right price and the right quantities. Therefore, this will lead to efficient, economically and environmentally sound remanufacturing

of products than the production of new products which saves on the costs of operation.

Musinguzi et al. (2015), in their study Practices, Concerns and Willingness to participate in solid waste management in two urban slums in central Uganda, found out that plastics collection and disposal practices observed among slum residents create difficulty for recollection, recycling and profitable reuse by recycling companies and individuals. The provision of incentives for separation and collection of plastics can ease their collection.

Additionally, some economic and legislation policies have been implemented to support the collection system and fail to improve the product return rate (Ullah and Sarkar, 2020). However, consumer awareness about the collection channel and their limited knowledge about the benefit of returning the product are an obstacle to the strategy. Therefore, consumers should be encouraged to return their used goods and need to be well-informed about the collection centers to make the collection process more viable and lucrative (Singhal et al., 2020).

2.3.3 Product collection by third party and environmental performance

Collection of solid waste has mainly been through the use of private contracted waste collectors who are contracted by the different sources for a fee. These move from door to door and have direct relationships with the individual clients. As cost pressures continue to rise in the competitive logistics industry, a growing number of third-party logistics providers have begun to explore the possibility of managing product returns in a more cost-efficient manner. However, few studies have addressed the problem of determining the number and location of repair facilities where returned products from retailers or end-customers were inspected, repaired, and refurbished for redistribution.

Cheng et al. (2010), stressed that companies that outsource their reverse logistic to third parties, their reverse logistics costs are reduced to 10% of the annual logistics costs. This is also classified by Rogers et al., (1999), in his study where he found out that all products in the

reverse flow must be collected and sorted before being sent on to their next destinations. The customer may return goods that have not yet reached their end life for service/repair or due to manufacture recall.

However, if goods reach their end of life, the customer may return the goods to the manufacturer for proper disposal or reclaim materials. Therefore, whether the goods in the reverse flow are coming from the end user or from another member of the distribution channel or the material in the reverse flow is a product or a packaging material. When goods enter the reverse flow from the end user, chances are that the goods may be defective goods, or, the end user may have claimed it was defective in order to be able to return it.

Findings from a research project aimed at efficient household solid waste collection and transportation in Kuwait studied by Koushki, Al-Duaij et al. (2004) showed seven private companies as the key contractors for the collection and transportation of solid waste to the landfill disposal sites by the municipality. These private companies have been in the business for over 10 years and their contracts are always renewed because the waste collection and disposal are done satisfactory.

In Pakistan, according to the Ministry of the Environment, about 54,850 tons of solid waste is being generated on daily basis in urban areas, less than 60 percent of this generated solid waste is being collected properly. According to the same department there is no city in Pakistan having proper waste collection and disposal system for municipal and hazardous wastes.

Still, in Rawalpindi city, solid waste was collected through the deployment of sweepers and sanitary crew (Rawalpindi Municipal Corporation report, 1997). These workers collected the solid waste from the streets with the help of wheel barrows and hand carts. Solid waste was being temporarily collected in containers/dumpsites from where it was transported by the help of collection vehicles and carried out to final disposal sites. It was also observed during field

visits that collection bins, number of containers and collection vehicles were not sufficient to maintain the city solid waste management system properly.

In relation to Uganda, reverse logistics of waste is taking course as a result of partnerships of the private enterprises. Collection of materials and products is done by informal low-income groups of individuals who collect and sort out paper, scrap metal, cardboards, polythene bags and plastics which they sell to private middlemen and plastic recycling companies (Kinobe, 2012).

2.4 The effect of industrial waste management practices on environmental performance

Waste management is the collection of all thrown away materials in order to recycle them and as a result decrease their effects on our health, our surroundings and the environment and enhance the quality of life. In this case, waste Management flows in a cycle: remanufacturing, recycling and product reuse. Through these steps a company can effectively and responsibly manage waste output and their positive effect they have on the environment (AL –Salem, 2009).

2.4.1 Remanufacturing practices and environmental performance

The focus of reverse logistics is on management of waste, recycling and recovery of parts or products (remanufacturing). Remanufacturing is the process where some components of the used products are disassembled, cleaned, reprocessed, inspected, and reassembled so that it can be used again (Atasu, Sarvary and Wassenhove, 2008).

Remanufacturing implies that used components are collected and transported to remanufacturing facilities and when necessary these are disassembled, checked, tested, cleaned, repaired and determined to be safe and fully functional for placing back on the market (Sundin, 2004).

Ovchinnikov et al. (2014) in their study suggested that in the majority of the cases, remanufacturing decreases both costs and energy conservation. Still in the study conducted by Sustainable Resource group (2012) revealed that remanufacturing can enhance organization's financial and environmental performance. Van Wassenhove and Zikopoulos (2010) argue out that due to the adoption of remanufacturing practices, environmental performance significantly increases, because the bottom line of reverse logistics practices is to reduce harmful effects on environment which do not only reduce solid waste but also improve efficiency of operations.

Additionally, Khan and Dong (2017) and Kaur et al. (2018), carried out a study in the context of Pakistan, it was revealed that due to adoption of remanufacturing activities, firm's financial performance greatly improved. Corbett and Kirsch (2009), argue out that, through remanufacturing firms can produce a large variety of products in the market within a short period of time. Remanufacturing practices enable manufacturing firms to achieve an efficient supply chain network that can save costs and deliver quality products to customers.

Muttimos (2014) conducted a study on the relationship between reverse logistics practices and organisation performance of manufacturing firms in Kenya, where increased organisation performance of manufacturing firms was found to be dependent on the increased adoption of remanufacturing. A remanufacturing company is driven by basically three incentives i.e. company market, legislation and environmental issues (Sundin, 2004).

The process of remanufacturing is valuable to remanufacturing firms in several ways. For one, remanufacturing firms are not required to produce new products from scratch. This means that there is an enormous cut down on the costs of generating raw materials to make new products.

In fact, the cost of raw materials for many such firms is reduced by over 70 per cent (Barnes, 2010). Since the consumers are expected to return used and faulty products to the remanufacturing firm, the process saves the firm almost all its transport costs.

Contrary to the above, it is not clear whether remanufacturing is a preferable option since it may lead to higher number of emissions derived from number of transports required in order to get the products to the remanufacture**.** In the study carried out by Asiimire (2015) the findings suggested that remanufacturing practices among the manufacturing firms was to a small extent being practiced among the firms due to inefficiencies exhibited in product warranty issues, training of employees on repair.

The institutional theory is relevant in a way that organizations with institutionalized reverse logistics practices fear to lose their market share to competitors and awareness of the consequences of non-compliance with environmental priorities (Carter et al., 2000).

2.4.2 Recycling practices and environmental performance

In these contemporary times, recycling of waste is a must say concept that acts as a lever in ensuring that waste related problems are avoided thus promotion of a healthy environment. Recycling is defined as the process to change waste, used or returned products into new products to prevent waste of potentially useful materials, reduce the consumption of fresh raw materials, reduce energy usage, and reduce air pollution (Baker, 2008).

Recycled materials can be converted into new products that can be consumed as paper, plastic and glass (Zhu et al., 2008). The difference between recycling and remanufacturing practices is that the recycled products are not usable and it is not a must that the finished product must be of the original form or utility. In other words, the materials from the products to be recycled become raw materials to produce other products (De brito, Dekker and Flapper, 2005). Recycling as well as reusing recycled materials proves to be advantageous for many reasons as it reduces the amount of waste sent to landfills, conserves natural resources, saves energy, reduces green gas emission and helps create new jobs (Ellram, 2006).

EL-Maghraby et al. (2010) emphasized that recycling requires significantly less energy, water

and other resources to recycle materials than to produce new materials. Also, Bwire (2015) emphasized that by recycling plastic materials, production time is reduced, which means less greenhouse gas emissions into the atmosphere and conservation of resources. This is in line with a study by Banar and Çokaygil (2009), in which recycling was found to have many strategic benefits including; reducing the consumption of fresh raw materials, reducing energy usage, and reducing air pollution.

Pumpinyo and Nitivattano (2013) commented that there had been continuous promotion of recycling practices to ensure sustainable growth by reducing the consumption of natural resources and lessening environmental burdens.

In the study carried out by Ochiri et al. (2015) on the effects of recycling strategy on firm performance. The study findings revealed that 94.9% of the respondents confirmed that recycling strategy is a significant factor influencing performance of publishing firms. Additionally, as products are recycled into new products, Olariu (2014) asserted that this could avoid further depletion of natural resources, reduce the amount of waste thrown away and lessen the need to build more facilities.

Recycled materials can also be converted into new products that can be consumed again such as paper, plastic, and glass (Zhu et al., 2008). To an individual firm, this translates to cost savings and new streams of income Blumberg, (2005), which should improve the profitability. While most recyclable materials are non-biodegradable, it goes without saying that recycling firms save the environment from potential deterioration (Fawcett, Vellenga and Truitt, 1995).

Contrary to this, Duzgun et al. (2019) argued out that comparing recycling with other reverse logistics options like reuse, remanufacturing among others, recycling requires most effort. It consumes and requires most resources and energy therefore, when selecting a reverse logistics option, industry practitioners should focus on options that require less effort, such as reusing,

repairing, instead of traditional recycling.

Morestill, Meyer et al. (2014) emphasized that in order to preserve the natural environment, it is important to implement recycling practices. Recycling is one of the tools used for plastic waste reduction, however, despite the efforts put forward to reduce plastic waste and prevent waste from polluting the environment, Matter et al. (2012) contended that reverse logistics chains are not organized and rely on recyclables collected from waste delivered by trucks and temporary garbage dumpsites. In consequence, waste that would have qualified for recycling ends up in dumpsites or never recovered. In Uganda, this is evidenced by the dumped plastic waste in drainage channels and manholes (Asiimire, 2015).

Nyerega (2015) research findings indicated that, common recycling practices is the return of used products and packaging to suppliers for recycling, however, creation of awareness to the public about recyclable products and documentation of recycling policy and a structured market incentive are less adhered to. Organizations may create awareness by putting the recycling labels of three arrows intertwining clockwise as a sign that the product or package should be recycled (Laosirihongthong et al., 2013).

The above literature is in line with the Stakeholder's theory whose focus is to see how manufacturers handle plastic irritants that are a result of their operations through reverse logistics practices in order, to protect the external shareholders that is the environment.

2.4.3 Product reuse practices and environmental performance

Hazen, Cegielski and Hanna (2011) pointed out that product or material can only be reused if its position in the supply chain is capable of moving in the reverse position. Reuse practices also reduces materials extraction, transportation thereby reducing operational costs (Alkaya and Demirer, 2015). According to Kopicki, Michael, and Legg (1993), reuse is any operation

by which products or components that are not waste are used again for the purpose for which they were conceived

Reuse as a practice of reverse logistics is one of the many approaches of adding value to waste thus leading to waste reduction in the environment (Kopicki et al., 1993). Reuse can be defined as salvage of product, after it has been discarded without being reduced to its material level (Parker, 2018). Reusing is economically beneficial as it saves cost of materials by reusing materials, earning revenue from recovered materials and lowering the cost of disposal, procurement, inventory, transportation and maintenance of new products (Duzgun, 2019).

More still, Cooper and Gutowski (2015) emphasized that recovered components through reusing practices financially save costs and environmentally avoid unwanted pollution. In fact, Carter and Ellram, (1998) emphasize that recycling, reusing and reducing defectives are reverse logistics practices purposed to remove environmentally hazardous products from customers.

The study findings of Nyerega (2015) suggested that the common reuse practices being adopted to a great extent by firms is returning of used products and packaging materials to the supplier. Contrary to this, the author further asserts that developing appropriate design for packaging materials and the use of renewable energy as source of energy were to a small extent being applied by manufacturing firms. In this regard, González-Torre, Adenso-Díaz, and Artiba (2004) emphasized that companies may become more environmentally efficient through activities such as recycling, reusing and reducing the amount of materials used.

2.5 The moderation effect of government policy on the relationship between reverse logistics practices and environmental performance

Mawditt et al. (2014) pointed out that one of the driving factor of reverse logistics practices is government regulations that call on manufactures to guarantee customer product quality which has a positive impact on the environment. While **i**n a closed-loop supply chain under

government regulation, the firms' decisions are unavoidably influenced by the government's policies. For example, when the government allocates subsidies to the remanufactured products produced by the manufacturers. Subsidy level will directly affect the manufacturing costs, and moreover the wholesale price, retail price, and the return rate directly. In contrast, the impact of government policy of subsidizing remanufactured products should embrace the environmental changes.

Government policies express the value of improving environmental performance without waste and damage to the owners, managers. This can also be taken as shared values of the stakeholders in relation to individual stakeholder groups power or position and according to internal and external orientation of a firm (Huscroft, Hazen, Hall, Skipper and Hanna, 2013). The same characteristics concerns reverse logistics as well (Thiruvasagam and Rajasekar, 2017). There is need for government engagement and industrial sector structuring of recycling practices for post-consumer products through public policies as a way of supporting cleaner technologies for production chains for PET bottles (Coelho and De Brito, 2012).

As a result, of government regulations imposed on environment in response to resource consumption and waste management, organizations make efforts to support ecological efficiency through recycling practices as established by government entities. This encourages development of reverse logistics channels by developing a system of financial incentives or penalties to increase demand for recyclables. Such strategies might result in development of more efficient reverse logistics channels, with less cost to the government, while also reducing environmental degradation which might occur due to improper disposal of waste (Wright, 2011).

Sustainability is usually motivated by legislative pressure, environmental conscience or economic gains (Johnson and Chertow, 2009). Rogers and Tibben-Lembke (2001), suggested

that firms practiced reverse logistics predominantly because of government regulations or pressure from environmental agencies and not for economic gains. Accordingly, Klapalová (2013) found out that firms which measure reverse logistics costs and have legal policies are more innovative in comparison to firms which do not measure reverse logistics costs. Recycling regulations put pressure on many manufactures and consumers, forcing them to produce and dispense off products in an environmentally responsible manner (Baldacci, Clements, Gupta and Cui, 2008).

Abdullah and Yaakub (2015) found out that, regulatory pressure and customer/stakeholder pressure have significant relationship with recycling practice adoption. According to the theory firms are coerced into confirming to the expectations of the society especially when under pressure from their stakeholders i.e. customers and government. Thus, when faced with regulatory pressure from government, firms feel pressure to adopt recycling practices in their operations. Therefore, reverse logistics operations can be increased by introducing new regulation or by improving the current existing legislation related to industrial waste and recycling.

Nyarega (2015) asserted that the reasons why companies are incorporating the reverse logistics system in their supply chain process are growing public concern about environment pollution, government regulations on product recycling and waste disposal, growing consumerization, and stiff competition. In the US policies with the aim of increasing recycling have been implemented.

Pumpinyo and Nitivattano (2013), stated that factors influencing the rate of collection from the source of waste are cooperation of NGOs, transportation costs, availability of skilled operations to do source separation and awareness of solid waste management problems and that lack of supportive government policy is a barrier to reverse logistics practices.

Accordingly, Osuga and Nogami (2015), revealed that organizations operating in line with local government and international standards and have policies for implementation of such standards face limited challenges and complaints related to environmental degradation.
The study carried out by Osuga (2015) reveals that firms adopting reuse practices do operate in line with local, governmental and international environmental standards and have in place policies for implementing such standards.

Additionally, Brazilian construction companies are interested in adopting aftermarket reverse logistic to reuse solid waste, reduce costs by reusing materials, and comply with government laws (Nunes, Mahler and Valle, 2009). In fact, what was once only a concern for some stakeholders has become mandatory for all producers, distributors, and consumers of products (Dias, Quelhas, Caiado and Domingos, 2017). Firms in emerging markets often lack incentives to comply with environmental rules due to weak governmental capacity for regulation (Russell and Vaughan, 2003) or strong lobbying and a lack of political will to enforce environmental regulations (Earn- hart, Khanna and Lyon, 2014; Lopez and Mitra, 2000). For instance, in a study conducted in India (Singh, Jain and Sharma, 2014), governmental pressure did not have any impact on proactive environmental behavior of firms.

In contrary, Delmas (2002) found out that governments play an important role in firms' decisions to adopt ISO 14001. In this regard, governments can act as a coercive force by sending a clear signal to their endorsement of ISO 14001. A firm can adopt various types of environmental management practices in response to institution pressures like government these can be based on environmental strategies of conformance that focus on complying with regulations and adopting standard industry practices or voluntary environmental strategies that seek to reduce the environmental impacts of operations beyond regulatory requirements (Sharma, 2000).

In a context where many emerging markets suffer from institutional voids the underdevelopment or absence of certain institutions (Khanna and Palepu, 2010). The impact of conventional institutional pressures on voluntary environmental management adoption is highly questionable. Latridis and Kesidou (2018) found that the lack of institutional pressures could lead to symbolic implementation of ISO 14001 unless there is a strong motive to differentiate from their competitors. Given that firms in many emerging markets engage in voluntary environmental management practices despite relatively weak pressures from external environmental forces, a focus on internal strategic pressures may provide an alternative explanation of voluntary environmental management adoption.

Environmental aspects and existing governmental regulations have motivated and induced producers and suppliers of products to take more responsibility of availing their products on the market. This as a result increased interest in reverse flows. The idea of reverse flow is caused by the product returns and recycling activities.

2.6 Research gap

Basing on the above literature, most researchers have conducted their studies of waste collection particularly solid waste from the community and environment by municipal authorities. However, this study focuses mainly on the collection of plastic wastes by manufacturing firms especially beverage manufacturing firms and through collection channels such as manufacturers themselves, retailers and hiring third parties or private companies.

Still, the study adds new literature to existing one showing how used products especially plastics are collected and find out what is the main channel of collecting plastic waste from the environment after use by the end users (consumers).

After broad assessment of the literature, it was revealed that most of the research has measured the economic and environmental performance of the collection system and rarely considered

the social aspects of performance. Besides, research on the grouping of all aspects is difficult to find because it makes the research model more complicated.

Moreover, Government legislation has been identified for example by Sharma et al. (2016) as an important factor in adopting remanufacturing in a developing country. In addition, a government's support regarding remanufacturing can either be a key driver for remanufacturing (Xiang and Ming, 2011), or a main barrier (Sharma et al., 2016). Therefore, there is a gap in identifying consequences of a developing country will face by not observing the regulations set by the government concerning reverse logistics practices and environmental performance.

As regards to recycling, various studies conducted by researchers in most countries about reverse logistics practices have focused more on recycling practices. This is where plastic wastes especially from manufacturing firms are collected and returned back to recycling facilities and turned into new packaging products again for the companies' products. However, for the case of Uganda, few firms are embracing recycling practices a reason why the study was conducted to find out the other reverse logistics practices undertaken and their effect on the environmental performance.

Still, the adoption of reverse logistics greatly improves environmental performance. This is because the bottom-line of reverse logistics practices is to reduce harmful effects on environment and use of recycling and remanufacturing technologies which do not only reduce solid waste but also increase the efficiency of operations (Zhang et al., 2018). However, this may not be true for the case of Uganda as most of the studies were conducted in developed manufacturing countries.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents and discusses the research design, study population, sample size and sampling techniques and procedure, data collection methods and instruments, the validity and reliability of data collection tools, the research procedure, data analysis and measurement of variables.

3.2 Research Design

Research design means the general plan or roadmap of how one goes about the research questions. It is a structure that helps to obtain answers to research questions (Cooper and Schindler, 2003). It serves to ensure that evidence is obtained to enable the researcher get the response to the initial question (Rowley, 2002).

For purposes of this study, the cross-sectional survey design was applied. A cross-sectional survey collects data to make inferences about a population of interest (universe) at one point in time (Cooper and Schindler, 2003). Cross-sectional surveys have been described as snapshots of the populations about which they gather data. Cross-sectional surveys have been used in previous studies dealing with reverse logistics including Serut (2013) and Nyarega (2015). Cross-sectional studies are popular because they have several benefits that make them useful to researchers for example, determining the level of a particular attribute, in a defined population at a particular point in time and determining the interrelationship between the variables under consideration among different firms in the study.

This research design was suitable for this study because it is an efficient way of collecting information from a selected number of respondents being targeted from a given population. The study adopted quantitative approaches to get deeper understanding of the underlying issues of reverse logistics practices.

3.3 Target Population

The population of the study included all Food and Beverage manufacturing firms in central region of Uganda. According to the UBOS report (2014), there are 700 Food and Beverages manufacturing firms in the Central region of Uganda. The study considered the Central region of Uganda because this is where most of the Food and Beverages manufacturing firms in various sectors are concentrated and thus providing a population where a proportionate sample could be derived. Beverages manufacturing firms generate a lot of waste materials.

3.4 Sample size

The target sample population size of 248 Food and Beverages firms was selected and determined basing on statistical table for identifying the sample size. The respondents included the general managers, executive directors, managing directors, and heads of departments such as; production managers, operation managers, procurement officers, store managers and other technical staff in the different firms. This sample was selected basing on the firms that employ reverse logistics practices. Morgan and Krejcie (1970) noted that when the population size is 700, a sample size of 248 should be considered.

3.5 Sampling techniques and procedure

Simple random sampling was applied by giving all the 248 Food and Beverage firms that adopted reverse logistics practices an equal chance of being selected. This technique was opted for because it is easy to assemble a sample and get a representative of the population for firms that are knowledgeable and have a long experience in reverse logistic practices.

3.6 Data collection instrument

Data for the study was obtained from primary sources where data was collected through the use of a structured questionnaire. The data collection method was questionnaires. Questionnaires were preferred since they are easy to analyze and save time in data collection

(Oso and Onen, 2011). The questionnaires were self-administered by the researcher through drop and pick techniques.

The questionnaire comprised of closed ended questions. It was sub-divided into six sections; the first part sought the respondents' characteristics, the second part sought the characteristics of the firm, the third part focused on the observations of the effect of product reuse practices on environmental performance of the firm, the fourth part contained questions of the effect of remanufacturing practices on environmental performance, the fifth part consisted of questions of the effect of industrial waste management practices on environmental performance, the sixth part contained questions on government policy and the last part focused on environmental performance (see Appendix 1).

3.7 Data Collection Procedures

The researcher sought permission from the respondents through the human resources department to conduct the study using an introductory letter from Kyambogo University. The researcher then issued the respondents questionnaires to fill at their convenience but within the research schedule. The questionnaires were then picked after one month for analysis.

3.8 Data control

3.8.1 Data validity

Validity of the research instruments was determined by calculation of the content validity index (CVI) where the rating for each instrument was carried out by two or more experts (Spring, 2003). Validity of the instruments was determined as shown in table 3.1 below, using the formula CVI = No. of items declared valid ⁄ Total no. of items on the instrument.

Table 3. 1: Content Validity Index (CVI) for the study variables

Variable	**No. of items declared valid**	**Total no. of items on the instrument**	**CVI**
Product collection practices	7	8	0.88
Industrial waste management practices	8	10	0.80
Government policy	4	5	0.80
Environmental performance	4	6	0.67

From table 3.1 above, it is clearly illustrated that the items that were included in the study were greater than the cutoff point of 0.50, as recommended by Nunally (1978), and these items were valid for the instrument to obtain findings for the study.

3.8.2 Reliability

The researcher also performed a reliability analysis by running a Cronbach's Alpha test to measure the internal consistency of the questionnaire. Reliability of 0.7 or higher was required for the pilot study before the instrument was administered for the research study.

To test the validity and reliability of the research instruments, a pilot study was conducted. Basson and Petrie (2007) define a pilot test as a trial run to check the validity and reliability of data collection instrument. According to Mugenda and Mugenda (2003), the number involved in the pilot test should not be large. A pretest sample of between 1% and 10% is good depending on the sample size. In this study, a total of 20 questionnaires were distributed using systematic random sampling and collected afterwards for analysis. Based on pilot test results some modifications were made with the questionnaires to increase understandability which increase response rate. The questionnaires were coded in SPSS version 21 and Cronbach's Alpha was computed and compared with the threshold value of 0.7 as illustrated in table 3.2 below.

Table 3. 2: Cronbach's Alpha statistics for the survey questionnaire

Reliability statistics for the survey questionnaire		
Measures	**Cronbach's Alpha**	**No. of items**
Environmental performance	.844	4
Product collection practices	.900	7
Industrial waste management practices	.877	8
Government policy	.827	4

As indicated in table 3.2 above, the Cronbach's Alpha test reveals that the instrument's internal consistency as 86% which is well above the acceptable value (70%). Thus, the research instrument is reliable and the findings with the conclusions in the study are acceptable.

3.9 Data analysis

Basing on the research objectives of the study, the study comprised of quantitative data which was analyzed using descriptive statistics of frequencies, percentages, mean and standard deviation. The quantitative data was collected inform of questionnaires and analyzed using the SPSS to generate descriptive, correlation and regression statistics that gave the researcher an idea on how to interpret the data. The questionnaires were first checked for accuracy, consistency and completeness. Thereafter, the data was edited, coded, classified and tabulated for ease of interpretation and further analysis.

Correlation statistics were utilized to assess the relationship between the dependent and independent variables. This was utilized to determine whether there could be a statistically significant relationship between the dependent and independent variables.

Regression analysis was conducted using multiple linear regression to analyze the effect of product collection practices on environmental performance and the effect of industrial waste

management practices on environmental performance. However, the moderation effect of government policy on the relationship between product collection practices and industrial waste management practices on environmental performance of food and beverages firms in central region of Uganda was analyzed by conducting a multiple regression analysis between the independent variables and the moderating variable of government policy using Ruben Geert van den Berg's procedure for testing the moderation effect.

But before conducting a multiple regression analysis, several assumptions were tested to check whether the variables were fit to run a regression analysis. The assumptions included; sample size being more than 20 records for each variable, absence of outliers in all variables, absence of multicollinearity and normal distribution of study variables. This was done by running a factor analysis diagnostic test for normality as shown in table 3.3.

Table 3. 3: Factor analysis of the study variables and factor loadings

VARIABLES AND THEIR MEASURES	**Factor loadings**
Product collection practices	
Some of the firm's waste products are collected by the retailers	0.744
Waste collection through retailers has tremendously contributed to waste reduction	0.835
The firm's waste products are collected by manufacturers to save on costs of operation	0.729
Waste collected by retailers is used as a raw material for making other products and this leads to low consumption for virgin materials	0.785
Collection of waste products by manufacturers has contributed to reduction in waste accumulation	0.883
The major waste collection channel of the firm's waste products is third party providers	0.845
Product collection practices minimize environmental risks and hazzards	0.805

Industrial waste management practices	
Remanufacturing practices minimizes environmental risks and hazards	0.740
Remanufacturing contributes more to waste reduction than recycling and reusing of products	0.728
Remanufacturing practices reduce solid waste and improves efficiency of operations	0.760
Reuse practices reduce material extraction, transportation as well as operational costs	0.780
Our firm embraces recycling practices in order to reduce the amount of waste sent to landfills	0.833
Recycled materials can be converted into new products that can be consumed as plastic and glass	0.839
Recycling practices save the environment from potential deterioration	0.831
Industrial waste management practices have significantly contributed to environmental performance	0.711
Government policy	
As a result of compliance to government policy, the firm faces limited challenges and complaints related to environmental degradation	0.744
Government policies positively affect the relationship between reverse logistics practices and environmental performance	0.887
Government policies negatively affect the relationship between reverse logistics practices and environmental performance	0.854
The firm's adoption of reverse logistics practices is as a result of regulatory pressure from the government	0.814

Environmental performance	
The firm deposits minimal waste on land	0.825
Waste of the firm are biodegradable	0.890
The firm uses minimal non-renewable inputs and materials	0.908
Wastes by the firm poses minimal environmental risks and hazards	0.724

Table 3.3 above, indicates the measures of items under study whose factor loadings were as shown in the table. This implies that items whose factor loadings were below 0.7 were excluded and not included for further analysis.

3.9.1 Measurement of variables

Measurement of variables was conducted using both nominal and ordinal scales. The researcher used Nominal scale when classifying values of a variable into different categories that were used as identifiers since all variables were measured at the nominal level (SOS, 2005). Whereas Ordinal scale was used to determine who had more or less of the characteristics being studied. This allowed the researcher to investigate how and why some items were ranked higher than others with respect to the phenomenon being examined.

The study had three study variables of reverse logistics practices as the independent variable, environmental performance as the dependent variable and Government policy as a moderating variable. Reverse logistics practices were operationalized by product collection practices and industrial waste management practices. The responses to the questionnaires were arranged on a 5 Likert scale of strongly disagree, disagree, not sure, agree and strongly agree respectively.

Environmental performance was operationalized by the volume of wastes, reduced pollutants and reduction in energy and material consumption. The responses to the questionnaires were arranged on a 5 Likert scale of strongly disagree, disagree, not sure, agree and strongly agree

respectively. This allowed the researcher to assess the performance of the environment when reverse logistics practices are being practiced by the Food and Beverages manufacturing firms in Central region of Uganda.

Government policy as a moderating variable, was also measured on a 5 Likert scale of strongly disagree, disagree, not sure, agree and strongly agree. This was used to establish the moderation effect of Government policy on the relationship between reverse logistics practices and environmental performance.

3.10 Ethical considerations

An introduction letter approval from Graduate School of Kyambogo in quest for permission to continue with data collection was obtained. Data was collected from the sample respondents through questionnaires and the respondents were not required to write their names. The result of the study was to be used for academic purposes only and the response of the participant was fully confidential. The information that the respondents gave was analyzed without any change by the researcher. Furthermore, the work that is used in this research as a base for this study is cited appropriately as the researcher respects the work of previous studies.

CHAPTER FOUR: PRESENTATION, ANALYSIS AND INTERPRETATION OF FINDINGS

4.1 Introduction

This chapter gives the presentation of the analyzed data and the findings obtained from the primary data that was assembled from the respondents. The findings are presented in percentages and frequency distributions, mean and standard deviations. In order, to check for accuracy, consistency and completeness, all questions that had been responded were cross-checked to ensure that they were done well.

4.2 Response Rate

The researcher targeted different sections of food and beverage manufacturing firms in the central region of Uganda that are largely involved in matters of reverse logistics practices. The response of the questionnaires that were delivered and completed by the respondents was 200 out of 248. This represented 80.6% response which was considered a satisfactory representation of the whole population.

4.3 Descriptive statistics results of respondents' characteristics

The characteristics of respondents included sex of respondents, position held in the company and education level of respondents as shown in table 4.1 below.

Table 4. 1: Characteristics of respondents

	Categories	**Frequency**	**Percentage**
Sex of respondents	Male	65	32.5
	Female	135	67.5
Position held in the Company	General manager	6	3.0
	Executive director	1	0.5
	Managing director	7	3.5
	Head of department	152	76.0
	Others	34	17.0
Education level of respondents	Masters	27	13.5
	Bachelors	143	71.5
	Diploma	29	14.5
	Certificate	1	0.5
	Others	0	0.0

Source: Based on primary data

Table 4.1 above, indicates that most of the respondents were females that comprised a percent of 67.5% compared to the males that comprised of 32.5%. The majority of the respondents were among the heads of departments in production, stores, operations, sales and distribution comprising of 76.0% as their position that they hold in those firms. These were followed by other staff that included store managers, operations staff and production managers with a percentage of 17.0 while the executive directors comprised of 0.5%. This means the researcher was able to see only one executive director of Harris International Beverages in Kawempe. The other executive directors were not easy to access them as most of the time they were in meetings while others were scared of seeing visitors because of the Covid-19 pandemic during the period of data collection.

It was still observed that many of the respondents hold bachelor's degree in procurement and logistics, marketing and others in business related courses. These comprised of 71.5% thus, being the right people to collect information as the area of study was familiar with their level of understanding and knowledge. This made the process of data collection easily conducted without much hardship. This implies that they had knowledge and skills about reverse logistics practices.

4.3.1 Descriptive statistics of firm characteristics

The respondents were requested to tick the most appropriate answer and the responses were as follows as shown in table 4.2 below.

Table 4. 2: Responses of firm characteristics

	Categories	**Frequency**	**Percentage**
Sub-sector of the firm	Food	10	5.0
	Beverages	35	17.5
	Foods and beverages	155	77.5
Age of the firm	Less than year	1	0.5
	2 years	2	1.0
	3 years	7	3.5
	4 years	15	7.5
	More than 5 years	175	87.5
Number of employees	Less than 50 employees	4	2.0
	50 employees	4	2.0
	Between 50-100 employees	39	19.5
	Over 100 employees	153	76.5

Source: Based on primary data n=200

Information contained in Table 4.2 above, indicates that 155 (77.5%) of the firms were in the foods and beverages sector which constituted the majority of the study sample due to high number of firms engaged in the business line. A list of all firms is contained in Appendix II. The least number of firms sampled were in the food sector only 10 (5%). With the information obtained from food and beverage firms it was enough to explain the effect of reverse logistics practices on environment performance.

Most of the firms that were visited majority of them (175, representing 87.5%) had been in business for more than 5 years and above. This implies that these firms have enough knowledge and experience concerning the study. There was only 1 (0.5%) firm that had stayed in business for less than a year.

These firms are large scale since they employ 100 and more employees who comprised of 153 (76.5%) while the rest employ 50 employees and less than 100 employees.

4.4 Reverse logistics practices

To achieve the objective of the relationship between product collection practices, industrial waste management practices and environmental performance together with the moderation effect of Government policy. The means and standard deviations of the study variables were computed on the basis of a five point Likert scale where 1= Strongly disagree and 5= Strongly agree.

4.4.1 Product collection practices and environmental performance among food and beverages firms in the central region of Uganda

Under this study variable respondents were asked to either agree or disagree with the product collection practices that are under taken in their firms. The descriptive statistics showing the percentages, mean and standard deviation results are shown in table 4.3 below;

Table 4. 3: Descriptive results for product collection practices.

	SD A	DA	NS	A	SA	Mean	Std. Dev
	Percentages						
Some of the firm's waste products are collected by retailers	56.5	6.0	5.5	24.5	7.5	2.20	1.49
Waste collection through retailers has tremendously contributed to waste reduction.	9.5	41.0	19.5	22.5	7.5	2.78	1.13
Waste collected by retailers is used as a raw material for making other products and this leads to low consumption of virgin materials	29.0	14.5	9.0	24.5	23.0	2.98	1.58
The firm's waste products are collected by manufacturers to save on costs of operation	9.5	22.0	14.5	35.5	19.0	3.32	1.27
Collection of waste products by manufacturers has contributed to reduction in waste accumulation	8.0	22.0	14.0	35.5	20.5	3.19	1.14
The major waste collection channel of the firm's waste products is third party providers	35.0	24.0	9.5	23.0	8.5	3.06	1.01
Product collection practices minimize environmental risks and hazards	6.0	18.0	7.0	38.0	31.0	3.50	1.26

Source: Field Data (2021) n=200

From the findings in table 4.3, it shows that some food and beverages manufacturing firms in central region of Uganda disagreed that their waste products are collected by retailers with only 32% in agreement while 62.5% disagreed with a mean of 2.20 and standard deviation of 1.49. Still other firms disagreed that waste collection through retailers tremendously contributed to waste reduction where only 30% were in agreement and 50.5% disagreed with a mean of 2.78 and standard deviation of 1.13. With waste collected by retailers being used as a raw material for making other products leading to low consumption of virgin materials, 43.5% of the respondents disagreed while 47.5% agreed with a mean of 2.98 and standard deviation of 1.58. However, 54.5% of the respondents were in agreement that their firms' waste products are collected by manufacturers to save on costs of operation while 31.5% disagreed with a mean of 3.32 and standard deviation of 1.27. Still, 56% of the respondents were in agreement that collection of waste products by manufacturers contributes to reduction in waste accumulation while 30% were in disagreement with a mean of 3.19 and standard deviation of 1.14. In addition to that, 59% of the respondents disagreed that their major waste collection channel of waste products is third party providers and only 31.5% were in agreement with a mean of 3.06 and standard deviation of 1.01. Finally, 69% of the respondents agreed that product collection practices minimize environmental risks and hazards while only 24% were in disagreement with a mean of 3.50 and standard deviation of 1.26.

From the analysis undertaken in table 4.3 above, it's clear that most firms' waste products in the central region are collected by manufacturers other than retailers or third parties. However, there are still some gaps as some of the respondents reached were not sure of the responses meaning that some of the food and beverages firms don't practice product collection practices.

4.4.2 Industrial waste management practices and environmental performance among food and beverages firms in the central region of Uganda

Under this study variable respondents were asked to either agree or disagree with industrial waste management practices that are under taken in their firms. The descriptive statistics showing the percentages, mean and standard deviation results are shown in table 4.4 below.

Table 4. 4: Descriptive statistics for industrial waste management practices

	SD A	DA	NS	A	SA	Mean	Std. Dev
	Percentages						
Remanufacturing practices minimizes environmental risks and hazards	19.0	7.0	0	29.5	44.5	3.65	1.55
Remanufacturing contributes more to waste reduction than recycling and reusing of products	5.0	27.5	7.5	39.5	20.5	3.57	1.52
Remanufacturing practices reduce solid waste and improves efficiency of operations	5.5	22.0	7.5	34.5	31.5	3.61	1.53
Reuse practices reduce material extraction, transportation as well as operational costs	18.5	15.5	6.5	44.5	15.0	3.46	1.12
Our firm embraces recycling practices in order to reduce the amount of waste sent to landfills	26.0	15.0	10.0	38.5	10.5	3.25	1.14
Recycled materials can be converted into new products that can be consumed as plastic and glass	23.5	20.0	5.0	26.0	25.5	3.47	1.21
Recycling practices save the environment from potential deterioration	15.5	18.5	4.0	30.0	32.0	3.68	1.22
Industrial waste management practices have significantly contributed to environmental performance	11.5	23.5	9.0	30.5	25.5	3.50	1.20

Source: Field Data (2021) n=200

From the findings in table 4.4 above, it was revealed that 74% of the respondents agreed that remanufacturing practices minimize environmental risks and hazards while only 26% disagreed with a mean of 3.65 and standard deviation of 1.55. 60% of the respondents also were in agreement that remanufacturing contributes more to waste reduction than recycling and reusing of products and 32.5% disagreed with a mean of 3.57 and standard deviation of 1.52. Still, 66% of the respondents agreed that remanufacturing practices reduce solid waste and improve efficiency of operations while only 27.5% disagreed with a mean of 3.61 and standard deviation of 1.53. In addition, 59.5% of the respondents agreed that reuse practices reduce material extraction and 34% were in disagreement with a mean of 3.46 and standard deviation of 1.12. Further still, 49% of the respondents also agreed that their firms embrace recycling practices in order to reduce the amount of waste sent to landfills and 41% disagreed with a mean of 3.25 and standard deviation of 1.14. 51.5% of the respondents still, agreed that recycled materials can be converted into new products that can be consumed as plastic and glass while 43.5% disagreed with a mean of 3.47 and standard deviation of 1.21. This is also supported 62% of respondents that agreed that recycling practices save the environment from potential deterioration and 34% disagreed with a mean of 3.68 and standard deviation of 1.22. Finally, 56% of the respondents agreed that industrial waste management practices significantly contribute to environmental performance while 35% disagreed with a mean of 3.50 and standard deviation of 1.20.

From the findings above, it's evident that majority of food and beverage manufacturing firms that were visited were in agreement that industrial waste management practices have an influence on environmental performance. However, there are still some firms where the respondents were not sure of the existence of industrial waste management practices in their firms and their influence on environmental performance. This shows that some of the firms don't embrace industrial waste management practices in their operations.

4.4.3 Government policy and reverse logistics practices among food and beverages firms in the central region of Uganda

Under this study variable respondents were asked to either agree or disagree with the intervention of Government policy on the relationship between reverse logistics practices and environmental performance. The descriptive statistics showing the percentages, mean and standard deviation results are shown in table 4.5 below.

Table 4. 5: Descriptive statistics for government policy

	SDA	DA	NS	A	SA	Mean	Std. Dev
	Percentages						
As a result of compliance to government policy, the firm faces limited challenges and complaints related to environmental degradation	5.5	30.5	7.5	38.5	18.0	3.33	1.24
Government policies positively affect the relationship between reverse logistics and environmental performance	3.0	29.5	5.0	26.5	36.0	3.46	1.43
Government policies negatively affect the relationship between reverse logistics and environmental performance	31.5	39.5	5.0	19.0	5.0	2.80	0.97
The firm's adoption of reverse logistics practices is as a result of regulatory pressure from the government	22.0	31.5	6.5	26.5	13.5	2.97	1.35

Source: Field Data (2021) n=200

According to table 4.5 above, the findings revealed that 56.5% of the respondents agreed that firms face limited challenges and complaints related to environmental degradation as a result of government policy while 36% disagreed with a mean of 3.33 and standard deviation of 1.24. In addition, 62.5% agreed that government policies positively affect the relationship between reverse logistics and environmental performance while 32.5% disagreed with a mean of 3.46 and standard deviation of 1.43. However, 71% of the respondents disagreed that government policies negatively affect the relationship between reverse logistics and environmental performance and only 24% agreed with a mean of 2.80 and standard deviation of 0.97. Finally, 53.5% of the respondents still disagreed that adoption of reverse logistics practices is as a result of regulatory pressure from the government while 40% agreed with a mean of 2.97 and standard deviation of 1.35.

Still the findings in table 4.5 above, indicate that the intervention of government policy as a moderation effect between the relationship of reverse logistics practices and environmental performance in these firms was agreed by the respondents to have an influence while other respondents disagreed the negative influence of government influence on the relationship between reverse logistics practices and environmental performance.

4.5 Environmental Performance

Under this study variable respondents were asked to either agree or disagree with the following observations on environmental performance of the firms. The statistics showing the percentages, mean and standard deviation results are shown in table 4.6 below.

Table 4. 6: Descriptive statistics for environmental performance

	SDA	DA	NS	A	SA	Mean	Std. Dev
	Percentages						
The firm deposits minimal waste on land	34.5	6.5	8.0	23.0	28.0	3.04	1.68
Waste of the firm are biodegradable	18.0	37.0	5.5	22.0	17.5	3.09	1.23
The firm uses minimal non-renewable inputs and materials	21.5	35.5	3.5	29.5	10.0	2.67	1.35
Wastes by the firm poses minimal environmental risks and hazards	24.5	30.0	10.0	23.0	12.5	2.69	1.39

Source: Field Data (2021) n=200

From table 4.6 above, the findings revealed that 51% of the respondents agreed that their firms deposit minimal waste on land while 41% disagreed with a mean of 3.04 and standard deviation of 1.68. However, 55% of respondents disagreed that wastes of their firms are biodegradable and 39.5% agreed with a mean of 3.09 and standard deviation of 1.23. Still, 57% of the respondents disagreed that their firms use minimal non-renewable inputs and materials and 39.5% agreed with a mean of 2.67 and standard deviation of 1.35. Finally, 54.5% of the respondents disagreed that wastes by the firm poses minimal environmental risks and hazards while 35.5% agreed with a mean of 2.69 and a standard deviation of 1.39. This is represented by the mean score of 2.69.

4.6 Multiple Regression analysis

The study also utilized the multiple linear regressions to determine the influence of the independent and the moderation variable on the dependent variable included in the study. But before the regression was conducted several assumptions were considered such as computing

the means of the study variables to control multicollinearity issues that would distort the results. Tests for normality were also conducted to ensure that data was normally distributed. It was also important to include in the model variables that had reasonable correlation.

Table 4.7:Prediction model for product collection practices and environmental performance

Model		R	R Square		Adjusted R Square	Std. Error of the Estimate	
1		.388[a]	.150		.137	1.06378	
Model			Unstandardized Coefficients		Standardized Coefficients	t	Sig.
			B	Std. Error	Beta		
1	(Constant)		1.814	.260		6.975	.000
	Collection by retailers		.123	.094	.130	1.309	.192
	Collection by manufacturers		-.183	.111	-.172	-1.651	.100
	Collection by third party		.462	.113	.405	4.086	.000

a. Predictors: (Constant), Collection by retailers, Collection by manufacturers, Collection by third party

b. Dependent Variable: Environmental performance

$P \leq 0.05$

Source: Primary data 2021

Table 4.7 above shows adjusted R^2 of 0.150 suggesting that collection by retailers, collection by manufacturers and collection by third party all predict 15% of the variance in environmental performance among food and beverages manufacturing firms in the central region of Uganda.

The standardized coefficient results reveal that collection by third party (Beta= 0.405, t=4.086, Sig. = 0.000) is the strongest predictor with 40.5% in explaining the variations in environmental performance in the central region. However, collection by retailers is not statistically significant with (Beta= 0.130, t= 1.309, Sig. = 0.192) which explains only 13% variations in environmental performance in the central region and finally collection by manufacturers is also not statistically significant with (Beta= -0.172, t= -1.651, Sig. = 0.100) that explains only 17.2% variations in environmental performance.

Therefore, this implies that if food and beverage manufacturing firms are to improve environmental performance their efforts need to be invested in collection by third parties more because it proved to be a stronger predictor than collection by retailers and manufacturers which were not even statistically significant being greater than 5% level of significance.

Table 4.8: Prediction model for industrial waste management practices and environmental performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.204[a]	.042	.027	1.12977

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.096	.311		6.730	.000
	Remanufacturing practices	.043	.094	.040	0.455	.650
	Reusing practices	.091	.095	.089	0.961	.338
	Recycling practices	.116	.093	.112	1.255	.211

a. Predictors: (Constant), Remanufacturing practices, Reusing practices, Recycling practices

b. Dependent Variable: Environmental performance

$P \leq 0.05$

Source: Primary data 2021

Table 4.8 above shows adjusted R^2 of 0.027 suggesting that remanufacturing practices, reusing practices and recycling practices all predict only 2.7% of the variance in environmental performance among food and beverages manufacturing firms in the central region of Uganda.

The standardized coefficient results reveal that recycling practices (Beta= 0.112, t=1.255, Sig. = 0.211) is the strongest predictor with 11.2% in explaining the variations in environmental performance in the central region though not statistically significant being greater than 5% level of significance. In addition, reusing practices is also not statistically significant with (Beta= 0.089, t= 0.961, Sig. = 0.338) which explains only 8.9% variations in environmental performance in the central region and finally remanufacturing practices still not statistically significant with (Beta= 0.040, t=0.455, Sig. = 0.650) that explains only 4.0% variations in environmental performance.

This implies that industrial waste management practices are not statistically significant in explaining the variations in environmental performance of food and beverages manufacturing firms in the central region of Uganda being greater than 5% level of significance. Thus, if food and beverage manufacturing firms are to improve environmental performance their efforts need to be invested in product collection practices especially collection by third parties. This is because industrial waste management practices (remanufacturing, reusing and recycling) proved to be weaker predictors and not even statistically significant being greater than 5% level of significance.

4.6.1 Analyzing the moderation effect of government policy on the relationship between product collection practices and environmental performance

The multiple regression analysis was utilized to examine the moderation effect of government policy on the relationship between product collection practices and environmental performance of food and beverage manufacturing firms in the central region of Uganda.

Table 4.9: Prediction model for moderation effect of government policy on the relationship between product collection practices and environmental performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
2	.316[b]	.100	.086	1.09486

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
2	(Constant)	-.195	.836		-.233	.816
	Product collection practices	.761	.270	.840	2.814	.005
	Government policy	.990	.280	.798	3.531	.001
	Product collection practices x government policy	-.225	.083	-1.175	-2.698	.008

a. Predictors: (Constant), Product collection practices, Government policy, Product collection practices x Government policy

b. Dependent Variable: Environmental performance

P≤ 0.05

Source: Primary data 2021

From the multiple regression model obtained in table 4.8 above, Government policy is positively related to the relationship between product collection practices and environmental performance. This implies product collection practices would increase by 0.990 which is 99%-unit increase in minimizing environmental risks and hazards. Thus, government policy predicts the relationship between product collection practices and environmental performance by 79.8% coefficient. This is explained by 76.1% in table 4.8 above.

Therefore, there is a statistically significant influence of government policy on the relationship between product collection practices and environmental performance which is evidenced by P<0.008 being less than 0.05 level of significance. This implies that Food and beverage firms in the central region should follow government policies when embracing product collection practices in minimizing environmental risks and hazards.

4.6.2 Analyzing the moderation effect of government policy on the relationship between industrial waste management practices and environmental performance

The multiple regression analysis was utilized to examine the moderating effect of government policy on the relationship between industrial waste management practices and environmental performance of food and beverage manufacturing firms in the central region.

Table 4.10: Prediction model for moderation effect of government policy on the relationship between industrial waste management practices and environmental performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
2	.322[b]	.104	.090	1.09266

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
2	(Constant)	2.112	.731		2.890	.004
	Government policy	.057	.249	.046	0.228	.820
	Industrial waste management practices	.036	.220	.040	0.162	.872
	Industrial waste management practices x government policy	.050	.070	.253	0.714	.476

a. Predictors: (Constant), Remanufacturing practices, Reusing practices, Recycling practices

b. Dependent Variable: Environmental performance

$P \leq 0.05$

Source: Primary data 2021

From the regression model obtained in table 4.9 above, Government policy is positively related to the relationship between industrial waste management practices and environmental performance. This implies that industrial waste management practices would increase by 0.057 which is 5.7%- unit increase in minimizing environmental risks and hazards. Thus, government policy predicts the relationship between industrial waste management practices and

environmental performance by only 4.6 % coefficient. This is explained by 3.6% in table 4.9 above.

Therefore, there is no statistically significant influence of government policy on the relationship between industrial waste management practices and environmental performance which is evidenced by P>0.476 being greater than 0.05 level of significance. This implies that government guidelines do not have a significant influence when instituting industrial waste management practices in minimizing environmental risks and hazards.

CHAPTER FIVE: SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary, conclusion and recommendations of the study on reverse logistics practices and environmental performance of food and beverage firms in the Central region of Uganda. The chapter presents the summary based on the study findings, conclusion, recommendations and areas for further study.

5.2 Summary of the study findings

The study findings revealed that the firms' waste products in the central region are collected majorly by manufacturers with an average of 55.3% of the respondents were in agreement that their firm's waste products are collected by manufacturers to save on costs of operation and also collection of waste products by manufacturers contributes to reduction in waste accumulation. Still, majority of the respondents were in agreement that industrial waste management practices (remanufacturing, reusing, and recycling) have an influence on minimizing the risks and hazards in the environment. Additionally, as regards to government policy as a moderating factor, the findings show that 62.5% of the respondents agreed that government policies positively affect the relationship between reverse logistics practices and environmental performance and 71% of the respondents disagreed that government policies negatively affect the relationship between reverse logistics practices and environmental performance.

Basing on the multiple regression analysis that was conducted, the study findings revealed that product collection practices explain 13.7% of the variations in environmental performance in model. However, collection by third party is the strongest predictor with 40.5% being statistically significant with (Beta=-0.405, sig=0.000) in the model. Still, industrial waste

management practices (remanufacturing, reusing, and recycling) explain only 2.7% of the variations in environment performance. From the analysis, it is not statistically significant with (Beta=0.040, 0.089, 0.112, sig=0.650, 0.330, 0.211) respectively being greater than significance level of 0.05.

Therefore, there is a direct relationship between product collection practices with environmental performance which implies that if food and beverage manufacturing firms are to improve environmental performance their efforts need to be invested in product collection practices more especially collection by third party that proved the strongest predictor.

The moderation effect of government policy when combined with product collection practices and industrial waste management practices. The results revealed there is a statistically significant influence of government policy on the relationship between product collection practices and environmental performance which is evidenced by $P<0.008$ being less than 0.05 level of significance. However, there is no statistically significant influence of government policy on the relationship between industrial waste management practices and environmental performance which is evidenced by $P>0.476$ being greater than 0.05 level of significance.

5.3 Discussion of findings

Under this section the study findings are being explained in relation to the literature reviewed and find out whether the study findings are in line with what other previous researchers investigated.

5.3.1 The effect of product collection practices on environmental performance of food and beverage firms in the central region

The study findings on the multiple regression model of product collection practices with environmental performance as the dependent variable. Results revealed that collection by third

party was statistically significant with P<0.000 being less than 5% level of significance. Still, the Pearson correlation values illustrate that product collection practices (r=.287, P<0.000). This is in line with Cheng et al. (2010), who stressed that companies that outsource their reverse logistic to third parties, their reverse logistics costs are reduced to 10% of the annual logistics costs. This is also classified by Rogers et al., (1999), in his study where he found out that all products in the reverse flow must be collected and sorted before being sent on to their next destinations. The customer may return goods that have not yet reached their end life for service/repair or due to manufacture recall.

Still, findings from a research project aimed at efficient household solid waste collection and transportation in Kuwait studied by Koushki, Al-Duaij et al. (2004) showed seven private companies as the key contractors for the collection and transportation of solid waste to the landfill disposal sites by the municipality. These private companies have been in the business for over 10 years and their contracts are always renewed because the waste collection and disposal are done satisfactory.

In addition, in Rawalpindi city, solid waste was collected through the deployment of sweepers and sanitary crew (Rawalpindi Municipal Corporation report, 1997). These workers collected the solid waste from the streets with the help of wheel barrows and hand carts. Solid waste was being temporarily collected in containers/dumpsites from where it was transported by the help of collection vehicles and carried out to final disposal sites. It was also observed during field visits that collection bins, number of containers and collection vehicles were not sufficient to maintain the city solid waste management system properly.

In relation to Uganda, reverse logistics of waste is taking course as a result of partnerships of the private enterprises. Collection of materials and products is done by informal low-income groups of individuals who collect and sort out paper, scrap metal, cardboards, polythene bags

and plastics which they sell to private middlemen and plastic recycling companies (Kinobe, 2012).

5.3.2 The effect of industrial waste management practices on environmental performance of food and beverage firms in central region

Industrial waste management practices (remanufacturing, reusing, and recycling) explain only 2.7% of the variations in environment performance. From the analysis, it is not statistically significant with (Beta=0.040, 0.089, 0.112, sig=0.650, 0.330, 0.211) respectively being greater than significance level of 0.05. The Pearson correlations indicate that industrial waste management practices (r=.225, P<0.001) have a weak but positive correlation with environmental performance. This implies that industrial waste management practices undertaken by food and beverage manufacturing firms in the central region of Uganda have an influence on environmental performance though not that strong.

The findings are in line with the study carried out by Asiimire (2015), that suggested that remanufacturing practices among the manufacturing firms was to a small extent being practiced among the firms due to inefficiencies exhibited in product warranty issues, training of employees on repair.

Still, Pumpinyo and Nitivattano (2013) commented that there has been continuous promotion of recycling practices to ensure sustainable growth by reducing the consumption of natural resources and lessening environmental burdens. Additionally, as products are recycled into new products, Olariu (2014) asserts that this could avoid further depletion of natural resources, reduce the amount of waste thrown away and lessen the need to build more facilities.

However, despite the efforts put forward to reduce plastic waste and prevent waste from polluting the environment, Matter et al. (2012) contended that reverse logistics chains are not organized and rely on recyclables collected from waste delivered by trucks and temporary

garbage dumpsites. In consequence, waste that would have qualified for recycling ends up in dumpsites or never recovered. In Uganda, this is evidenced by the dumped plastic waste in drainage channels and manholes (Asiimire, 2015).

5.3.3 The moderation effect of government policy on the relationship between product collection practices and environmental performance of food and beverage firms in Central region

From the regression model, Government policy was statistically significant on the relationship between product collection practices and environmental performance which is evidenced by P<0.008 being less than 0.05 level of significance. This implies that Food and beverage firms in the central region of Uganda should follow government guidelines when instituting product collection practices especially collection by third party in minimizing environmental risks and hazards. This is in line with Pumpinyo and Nitivattano (2013), stated that factors influencing the rate of collection from the source of waste are cooperation of NGOs, transportation costs, availability of skilled operations to do source separation and awareness of solid waste management problems and that lack of supportive government policy is a barrier to reverse logistics practices.

Accordingly, Osuga and Nogami (2015), revealed that organizations operating in line with local government and international standards and have policies for implementation of such standards face limited challenges and complaints related to environmental degradation. Still, some economic and legislation policies have been implemented to support the collection system and fail to improve the product return rate (Ullah and Sarkar, 2020). However, consumer awareness about the collection channel and their limited knowledge about the benefit of returning the product are an obstacle to the strategy.

Therefore, consumers should be encouraged to return their used goods and need to be well-informed about the collection centers to make the collection process more viable and lucrative (Singhal et al., 2020).

5.3.4 The moderation effect of government policy on the relationship between industrial waste management practices and environmental performance of food and beverage firms in Central region

The study findings revealed that, there is no statistically significant influence of government policy on the relationship between industrial waste management practices and environmental performance which is evidenced by P>0.476 being greater than 0.05 level of significance. This implies that Government policy in the central region of Uganda has a statistically insignificant influence on the relationship between industrial waste management practices and environmental performance.

In relation to the above findings, Abdullah and Yaakub (2015) found out that, regulatory pressure and customer/stakeholder pressure have significant relationship with recycling practice adoption. According to the theory firms are coerced into confirming to the expectations of the society especially when under pressure from their stakeholders that is customers and government. Thus, when faced with regulatory pressure from government, firms feel pressure to adopt recycling practices in their operations. Therefore, recycling operations can be increased by introducing new regulation or by improving the current existing legislation related to industrial waste and recycling.

Recycling regulations put pressure on many manufactures and consumers, forcing them to produce and dispense off products in an environmentally responsible manner (Baldacci, Clements, Gupta and Cui, 2008). Therefore, there is need for government engagement and industrial sector structuring of recycling practices for post-consumer products through public

policies as a way of supporting cleaner technologies for production chains for PET bottles (Coelho and De Brito, 2012).

And as a result, of government regulations imposed on environment in response to resource consumption and waste management, organizations make efforts to support ecological efficiency through recycling practices as established by government entities. This encourages development of reverse logistics channels by developing a system of financial incentives or penalties to increase demand for recyclables.

Such strategies might result in development of more efficient reverse logistics channels, with less cost to the government, while also reducing environmental degradation which might occur due to improper disposal of waste (Wright, 2011).

5.4 Conclusion

The study examined the influence of reverse logistic practices on environmental performance of food and beverage manufacturing firms in Uganda. The study still studied the different dimensions of reverse logistic practices and the moderating effect of government policy on the relationship between reverse logistic practices and environmental performance.

The study adopted a cross sectional research design to address issues in the study. Using a structured questionnaire data was collected from food and beverage manufacturing firms using simple random sampling method to provide an equal of being selected and included in the study. In the study analysis was done at different levels starting with the descriptive statistics followed by correlations and thereafter regression analysis was also conducted.

All the relationships tested were found to be weak but statistically significant relationship ($P<0.000$) with environmental performance, implying that there existed a weak though positive relationship between reverse logistic practices and environmental performance. The multiple

regression analysis revealed that collection by third party was a stronger predictor of the variations in environment performance by 40.5% than industrial waste management practices (remanufacturing, reusing, recycling) which were found not to be statistically significant (P>0.650,0.338, 0.211) respectively being greater than the level of significance at 0.05.

The moderating effect of government policy had a statistically significant influence on the relationship between product collection practices and environmental performance which is evidenced by P<0.008 being less than 0.05 level of significance. However, the moderating effect of government policy had no statistically significant influence on the relationship between industrial waste management practices and environmental performance (P>0.476) being greater than the 5% level of significance.

Conclusion can therefore be made that Food and beverage firms in the Central region should follow government guidelines when instituting product collection practices in minimizing environmental risks and hazards. Still, food and beverage manufacturing firms should invest more efforts in product collection practices especially collection by third party that proved to be the strongest predictor in explaining the variations in environmental performance.

5.4 Limitations to the study

The major limitation of this work was that the study focused on reverse logistics practices in one country, which is why it may not be able to be generalized for all systems and countries. The responses collected from the urban population left out the contributions from the rural settings from whom more responses could have been identified (or a totally different set of response).

The study focused on beverage and food manufacturing firms mainly those located in the central region yet there could be other manufacturing firms in the other regions of the country.

Those manufacturing firms in the other regions have not been considered in this study therefore, the results obtained from the study do not represent those manufacturing firms in other regions.

The findings indicate a unique state of the central region which may not represent all the food and beverage manufacturing in Uganda. This is because Uganda has various manufacturing firms across the country as it's a government initiative for creation of employment opportunities.

Some of the questionnaires that were provided during the process of data collection were not returned. And also, the questionnaires that were returned some items were not selected and returned them not filled in.

5.5 Recommendations

As regards to the findings that revealed that most of the firms do practice reverse logistics practices but on a small scale thus, manufacturing firms should adopt reverse logistics since it is important for manufacturers, government agencies, policy makers, managers and researchers by highlighting a number of issue that act as barriers to implementation of reverse logistic practices among food and beverage manufacturing firms in Central region. This is in line with stakeholder's theory utilized in the study.

Still, as findings revealed that adoption of reverse logistic practices was low, food and beverage manufacturing firms should include reverse logistics in their strategic planning and create clear policies for it especially product collection by third party together with government policy, if they are to achieve greater improvement in environmental performance in terms of reduced pollutants, reduced wastes and emissions in to the atmosphere.

The study further recommends that the government and all stakeholders in the manufacturing sector should carry out public awareness campaigns on the importance of environmental conservation as it would encourage firms to become active drivers towards the implementation of reverse logistic practices.

5.6 Areas for further research

Further still, study may be conducted under investigating the moderating effect of firm policy on the relationship between reverse logistic practices and environment performance of manufacturing firms. Still, it would be interesting if a study is undertaken on examining the mediating effect of stakeholder's theory between reverse logistics and environmental performance.

REFERENCES

Abdullah N, and Yaakub S, (2015). The pressure for reverse logistics Adoption among manufacturer in Malaysia. *A journal of Business and Accounting*.

Agrawal, S., Singh, R. K., & Murtaza, Q. (2015). A literature review and perspectives in reverse logistics.Resources, Conservation and Recycling

Aitken, J., & Harrison, A. (2013). Supply governance structures for reverse logistics systems. *International Journal of Operations and Production Management.* https://doi.org/10.1108/IJOPM-10-2011-0362

Alkaya, E., & Demirer, G. N. (2015). Water recycling and reuse in soft drink/beverage industry: A case study for sustainable industrial water management in Turkey. Resources, Conservation and Recycling. https://doi.org/10.1016/j.resconrec.2015.08.011

Asiimire, S. (2015). Plastic Waste Is Chocking Kampala City. New Vision.

Atasu, A., Sarvary, M., & Wassenhove, L. N. V. (2008). Remanufacturing as a marketing strategy. Management Science. https://doi.org/10.1287/mnsc.1080.0893

Baker, J. (2008). New technology and possible advances in energy storage. Energy Policy. https://doi.org/10.1016/j.enpol.2008.09.040

Baldacci, E., Clements, B., Gupta, S., & Cui, Q. (2008). Social Spending, Human Capital, and Growth in Developing Countries. World Development. https://doi.org/10.1016/j.worlddev.2007.08.003

Banar, M., & Çokaygil, Z. (2009). A life cycle comparison of alternative cheese packages. Clean - Soil, Air, Water. https://doi.org/10.1002/clen.200700185

Barnes, B. R. (2010). The Hawthorne Effect in community trials in developing countries. *International Journal of Social Research Methodology.* https://doi.org/10.1080/13645570903269096

Basson, L., & Petrie, J. G. (2007). An integrated approach for the consideration of uncertainty in

decision making supported by Life Cycle Assessment. Environmental Modelling and Software. https://doi.org/10.1016/j.envsoft.2005.07.026

Bernon, M., & Cullen, J. (2007). An integrated approach to managing reverse logistics. *International Journal of Logistics Research and Applications.* https://doi.org/10.1080/13675560600717763

Blumberg, K. (2005). Tourism destination marketing - A tool for destination management? A case study from Nelson/Tasman Region, New Zealand. *Asia Pacific Journal of Tourism Research.* https://doi.org/10.1080/1094166042000330218

Carter, J. R., Smeltzer, L. R., & Narasimhan, R. (2000). Human resource management within purchasing management: Its relationship to total quality management success. *Journal of Supply Chain Management*. https://doi.org/10.1111/j.1745-493X.2000.tb00077.x

Coelho, A., & De Brito, J. (2012). Influence of construction and demolition waste management on the environmental impact of buildings. Waste Management. https://doi.org/10.1016/j.wasman.2011.11.011

Conrad, E., & Cassar, L. F. (2019). The Environmental Performance Index. In Routledge Handbook of Sustainability Indicators. https://doi.org/10.4324/9781315561103-19

Cooper, D. R., & Schindler, P. S. (2003). Cooper Schindler 2006. Business.

Cooper D, and Gutowski T,G, (2015). The environmental impacts of reuse. Journal of industrial ecology.

Cording, M., Harrison, J. S., Hoskisson, R. E., & Jonsen, K. (2014). Walking the talk: A multistakeholder exploration of organizational authenticity, employee productivity, and post-merger performance. Academy of Management Perspectives. https://doi.org/10.5465/amp.2013.0002

Cronbach, L. J. (1951). Coefficient Alpha and the Internal Structure of Tests. 16, 297-334.

de Brito, M. P., Dekker, R., & Flapper, S. D. P. (2005). Reverse Logistics: A Review of Case Studies. https://doi.org/10.1007/978-3-642-17020-1_13

Delmas, M. A. (2002). Innovating against European rigidities institutional environment and dynamic capabilities. *Journal of High Technology Management Research*. https://doi.org/10.1016/S1047-8310(01)00047-5

Dias, J. H. O., Quelhas, O. L. G., Caiado, R. G. G., & Domingos, M. L. C. (2017). Social Responsibility Management in Brazilian Companies - An empirical study. Espacios.

Donaldson, T., & Preston, L. E. (1995). The stakeholder theory of the corporation: concepts, evidence, and implications. Academy of Management Review. https://doi.org/10.5465/amr.1995.9503271992

Ellram, L. M. (2006). The implementation of target costing in the United States: Theory versus practice. Journal of Supply Chain Management. https://doi.org/10.1111/j.1745-493X.2006.04201003.x

Epstein, M. J. (1996). Improving environmental management with full environmental cost accounting. Environmental Quality Management.

https://doi.org/10.1002/tqem.3310060104

Fahimnia, B., Sarkis, J., & Davarzani, H. (2015). Green supply chain management: A review and bibliometric analysis. *International Journal of Production Economics*. https://doi.org/10.1016/j.ijpe.2015.01.003

Fawcett, S. E., Vellenga, D. B., & Truitt, L. J. (1995). An Evaluation of Logistics and Transportation Professional Organizations, Programs, and Publications. *Journal of Business Logistics.*

Fleischmann, M., Bloemhof-Ruwaard, J. M., Dekker, R., Van Der Laan, E., Van Nunen, J. A. E. E., & Van Wassenhove, L. N. (1997). Quantitative models for reverse logistics: *A review. European Journal of Operational Research.* https://doi.org/10.1016/S0377-2217(97)00230-0

Frazao, M. F., De Carvalho, M. A., & De Carvalho, J. C. (2018). Systematically finding opportunities for product reuse the case of PET bottles. 2017 International Conference on Engineering, Technology and Innovation: Engineering, Technology and Innovation Management Beyond 2020: New Challenges, New Approaches, ICE/ITMC 2017 - Proceedings. https://doi.org/10.1109/ICE.2017.8280044

Freeman, R. E. (2016). A Stakeholder Theory of the Modern Corporation. In The Corporation and Its Stakeholders. https://doi.org/10.3138/9781442673496-009

Geyer, R., & Jackson, T. (2004). Supply loops and their constraints: The Industrial ecology of recycling and reuse. California Management Review. https://doi.org/10.2307/41166210

González-Torre, P. L., Adenso-Díaz, B., & Artiba, H. (2004). Environmental and reverse logistics policies in European bottling and packaging firms. *International Journal of*

Production Economics. https://doi.org/10.1016/S0925-5273(03)00181-6

Günther, E., & Scheibe, L. (2005). The hurdles analysis as an instrument for improving environmental value chain management. Progress in Industrial Ecology. https://doi.org/10.1504/PIE.2005.006780

Hazen, B. T., Cegielski, C., & Hanna, J. B. (2011). Diffusion of green supply chain management: Examining perceived quality of green reverse logistics. *International Journal of Logistics Management*. https://doi.org/10.1108/09574091111181372

Huscroft, J. R., Hazen, B. T., Hall, D. J., Skipper, J. B., & Hanna, J. B. (2013). Reverse logistics: Past research, current management issues, and future directions. *The International Journal of Logistics Managemen*t. https://doi.org/10.1108/IJLM-04-2012-0024

Jalaludin, D., Sulaiman, M., & Ahmad, N. N. N. (2011). Understanding environmental management accounting (EMA) adoption: A new institutional sociology perspective. Social Responsibility Journal. https://doi.org/10.1108/17471111111175128

Johnson, J., & Chertow, M. (2009). Climate stabilization wedges in action: A systems approach to energy sustainability for Hawaii Island. Environmental Science and Technology. https://doi.org/10.1021/es801700a

Jones, T. M. (1995). Instrumental stakeholder theory: a synthesis of ethics and economics. Academy of Management Review. https://doi.org/10.5465/amr.1995.9507312924

Key, S. (1999). Toward a new theory of the firm: A critique of stakeholder "theory." Management Decision. https://doi.org/10.1108/00251749910269366

Kinobe, J. R., Niwagaba, C. B., Gebresenbet, G., Komakech, A. J., & Vinnerås, B. (2015).

Mapping out the solid waste generation and collection models: The case of Kampala City. *Journal of the Air and Waste Management Association.* https://doi.org/10.1080/10962247.2014.984818

Klapalová, A. (2013). Issues of corporate social responsibility web site communication of metal industry companies. METAL 2013 - 22nd International Conference on Metallurgy and Materials, Conference Proceedings.

Kopicki, R., Michael, J., & Legg, L. (1993). Reuse and Recycling — Reverse Logistics Opportunities. Transportation Journal.

Kyanda, R (2018).Coca Cola recycling tonnes of Uganda's plastic waste.thelocal.ug

Krejcie, V, R, & Morgan. (1970). Determining Sample Size for Research Activities.

Laosirihongthong, T., Adebanjo, D., & Choon Tan, K. (2013). Green supply chain management practices and performance. Industrial Management & Data Systems. https://doi.org/10.1108/IMDS-04-2013-0164

Mandota E, (2015) : The impact of reverse logistics on supply chain performance in Malawi Manufacturing Firms.

Mawditt, I., Foster, S., Gray, A., Read, S., McGale, P., Darby, S., … York, N. (2014). The Swiss standard for comfort , efficiency and value preservation What is Minergie ? Passive House +. https://doi.org/10.1093/rpd/nct278

Meyer et al. (2014). Climate Change 2014. In Climate Change 2014 Synthesis Report. https://doi.org/10.1046/j.1365-2559.2002.1340a.x

Ministry of Water and Environment. (2013). Water and Environment Sector Performance

Report 2013. MWE Report,Republic of Uganda.

Mitchell, R. K., Agle, B. R., & Wood, D. J. (1997). Toward a theory of stakeholder identification and salience: Defining the principle of who and what really counts. Academy of Management Review. https://doi.org/10.5465/AMR.1997.9711022105

MoFPED. (2017). The National Strategy for Private Sector Development. Boosting Investor Confidence for Enterprise Development and Industrialization. Retrieved from http://www.psfuganda.org/new/images/downloads/psfu platform for action 2012.pdf

Morgan, D., & Krejcie, R. (1970). Sample Size Determination Using Krejcie and Morgan Table. Kenya Projects Organization (KENPRO).

National Environment Managment Authority (NEMA). (2016). National State of the Environment Report for Uganda 2014. National State of Environment Report. https://doi.org/10.1016/j.disopt.2009.05.002

Nunnaly 1978. (2013). Coefficient alpha: Interpret with caution. *Europe's Journal of Psychology*. https://doi.org/10.5964/ejop.v9i4.65

Nunes, K. R. A., Mahler, C. F., & Valle, R. A. (2009). Reverse logistics in the Brazilian construction industry. *Journal of Environmental Management.* https://doi.org/10.1016/j.jenvman.2008.05.026

Okwoko P,(2020).Drowning in plastic-The state of plastic waste recycling in Uganda.www.takatakaplastics.com

Olariu, C. (2014). Autogenic process change in modern deltas: Lessons for the ancient. In From Depositional Systems to Sedimentary Successions on the Norwegian Continental Margin (Vol. 9781118920, pp. 149–166). https://doi.org/10.1002/9781118920435.ch7

Osuga V, Muma B, Nyariki B, Ndungu M. Reuse, Remanufacturing and Environmental Performance: Analysis of Timber Processing Firms in Nakuru County. Science Innovation. Vol. 3, No. 3, 2015, pp. 32-38. doi: 10.11648/j.si.20150303.11

Parker, L. (2018). We made plastic. We depend on it. Now we're drowning in it. National Geographic.

Rogers, D. S., & Tibben-Lembke, R. (2001) An examination of reverse logistics practices. *Journal of Business Logistics*.. https://doi.org/10.1002/j.2158-1592.2001.tb00007.x

Rowley, J. (2002). Using case studies in research. Management Research News. https://doi.org/10.1108/01409170210782990

Samal, S. K. (2019). Logistics and supply chain management. *International Journal of Psychosocial Rehabilitation*. https://doi.org/10.37200/IJPR/V23I6/PR190779

Sekaran, U., & Bougie, R. (2010). Research Methods for Business; A skill Building Approach.

Sathiyagothai, B and Saravanan, S ,(2017) . Reverse logistics in food processing Industries in India : *International Journal of Economic Mnagement* cience.https//doi.org//10.4172/2162-6359.10000408

Spring, M. (2003). Knowledge management in extended operations networks. *Journal of Knowledge Management*. https://doi.org/10.1108/13673270310492921

Sundin, E. (2004). Product and process design for successful remanufacturing. In Science And Technology.

Thiruvasagam, G., & Rajasekar, D. (2017). A study on the utilized constructs of reverse logistics process implementing towards degrees of logistics operations. *International*

Journal of Civil Engineering and Technology.

UBOS. (2011). Uganda bureau of statistics Report on the Census of Business Establishments 2010/11. (256), 1–169.

Van Wassenhove, L. N., & Zikopoulos, C. (2010). On the effect of quality overestimation in remanufacturing. *International Journal of Production Research.* https://doi.org/10.1080/00207540903150585

Visser, H. M., van Goor, A. R., Visser, H. M., & van Goor, A. R. (2020). Recycling and reverse logistics. In Logistics: Principles and Practice. https://doi.org/10.4324/9781003021780-15

Wright, H. (2011). Understanding green infrastructure: The development of a contested concept in England. Local Environment. https://doi.org/10.1080/13549839.2011.631993

Yu, Z. (2018). The Impact of Reverse Logistics on Operational Performance. *American Journal of Mechanical and Industrial Engineering*. https://doi.org/10.11648/j.ajmie.20180305.14

Zhu, Q., Sarkis, J., & Lai, K. hung. (2008). Confirmation of a measurement model for green supply chain management practices implementation. *International Journal of Production Economics.* https://doi.org/10.1016/j.ijpe.2006.11.029

APPENDINCES

APPENDIX I: QUESTIONNAIRE

REVERSE LOGISTICS PRACTICES AND ENVIRONMENTAL PERFORMANCE

I am Winfred Mbekeka a student pursuing the degree of Master of Science in Procurement and Supply Chain Management at Kyambogo University. This survey is intended to investigate the effect of reverse logistics practices on environmental performance of foods and beverage firms in Uganda. The purpose of the study is purely academic and the information given will be treated with the highest degree of confidentiality. I therefore, request for your time and provide me with the necessary information as requested here in. Thank you for accepting to participate in this survey and your response is highly appreciated.

SECTION A: RESPONDENT'S CHARACTERISTICS

(Tick the most appropriate answer)

1) What is your sex?

1. Male ☐
2. Female ☐

2) Position held in the Company

1. General Manager ☐
2. Executive director ☐
3. Managing director ☐
4. Head of department ☐
5. Others (specify)……...

3) What is your highest level of education qualification?

1. Masters ☐
2. Bachelors ☐
3. Diploma ☐
4. Certificate ☐
5. Others (specify)…….

SECTION B: FIRM'S CHARACTERISTICS (Tick the most appropriate answer)

4) Which sub-sector does your firm operate in?

1. Food ☐
2. Beverages ☐
3. Food and Beverages ☐

5) Number of years in existence (Age of the firm)

1. Less than one year ☐
2. 2 years ☐
3. 3 years ☐
4. 4 years ☐
5. More than 5 years ☐

6) Number of employees in the firm

1. less than 50 employees ☐
2. 50 employees ☐
3. Between 50 – 100 employees ☐
4. Over 100 employees ☐

SECTION C: PRODUCT COLLECTION PRACTICES

Indicate the extent to which you agree or disagree with the following observations on product collection practices of the firm. Use a scale of 5-Strongly agree, 4-Agree, 3-Not sure, 2-Disagree, 1-Strongly disagree.

	SDA	DA	NS	A	SA
S**cale**	1	2	3	4	5
Some of the firm's waste products are collected by the retailers.					
Waste collection through retailers has tremendously contributed to waste reduction.					
The firm's waste products are collected by manufacturers to save on costs of operation.					
Our firm puts in place collection facilities near its customers for collection and disposal of waste products.					
Waste collected by retailers is used as a raw material for making other products and this has contributed to low consumption of virgin materials.					
Collection of waste products by manufactures has contributed to reduction in waste accumulation.					
The major waste collection channel of the firms' waste products is third party providers.					
Product collection practices minimize environmental risks and hazards.					

SECTION D: INDUSTRIAL WASTE MANAGEMENT PRACTICES

Indicate the extent to which you agree or disagree with the following observations on industrial waste management practices in the firm. Use a scale of 5-Strongly agree, 4-Agree, 3-Not sure, 2-Disagree, 1-Strongly disagree.

	SDA	DA	NS	A	SA
Scale	1	2	3	4	5
Remanufacturing practices minimizes environmental risks and hazards.					
Remanufacturing contributes more to waste reduction than recycling and reusing of products.					
Remanufacturing practices reduce solid waste and improves efficiency of operations.					
Our firm packages products in reused packaging materials					
Reusing of products is more effective than recycling as regards to environmental performance.					
Reuse practices reduce material extraction, transportation as well as operational costs.					
Our firm embraces recycling practices in order to reduce the amount of waste sent to landfills.					
Recycled materials can be converted into new products that can be consumed as plastic and glass.					
Recycling practices save the environment from potential deterioration.					
Industrial waste management practices have significantly contributed to environmental performance.					

SECTION D: Government policy

Indicate the extent to which you agree or disagree with the following observation on government policy. Use a scale of 5-Strongly agree, 4-Agree, 3-Not sure, 2-Disagree, 1-Strongly disagree.

	SDA	DA	NS	A	SA
S**cale**	1	2	3	4	5
The firms' decision on reverse logistics practices is influenced by government policies.					
As a result of compliance to government policy, the firm faces limited challenges and complaints related to environmental degradation.					
Government policies positively affect the relationship between reverse logistics practices and environmental performance.					
Government policies negatively affect the relationship between reverse logistics practices and environmental performance					
The firm's adoption of reverse logistics practices is as a result of regulatory pressure from the government.					

SECTION E: Environmental performance

Indicate the extent to which you agree or disagree with the following observation on environmental performance of a firm. Use a scale of 5-Strongly agree, 4-Agree, 3-Not sure, 2-Disagree, 1-Strongly disagree.

	SDA	DA	NS	A	SA
S**cale**	1	2	3	4	5
The firm deposits minimal waste on land					
Waste of the firm are biodegradable.					
The firm uses minimal non-renewable inputs and materials.					
Packaging materials used by the firm have minimal environmental threats.					
Wastes by the firm poses minimal environmental risks and hazards					
As a result of embracing reverse logistics practices, environment performance has significantly improved.					

THANK YOU FOR YOUR CO-OPERATION

APPENDIX II: KREJCIE & MORGAN TABLE FOR DETERMINING SAMPLE SIZE

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	181	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384

Note: “N” is population size

“S” is sample size.

APPENDIX III: LETTER OF INTRODUCTION

KYAMBOGO UNIVERSITY

P. O. BOX 1 KYAMBOGO
Tel: 041 - 4286792 Fax: 256-41-220464
Website: www.kyu.ac.ug

Office of the Dean, Graduate School

14th September, 2020

To Whom It May Concern

RE: LETTER OF INTRODUCTION

Dear Sir/Madam,

This is to introduce **Ms. Mbekeka Winfred** Registration Number **17/U/14778/GMSC/PE** who is a student at Kyambogo University in School of Management and Entrepreneurship.

She intends to carry out research on **"Reverse Logistics Practices and Environmental Performance of Food and Beverage Manufacturing Firms in Uganda"** as partial fulfillment of the requirements for the award of Masters in Procurement and Supply Chain Management .

We therefore kindly request you to grant her permission to carry out this study in your institution.

Any assistance accorded to her will be highly appreciated.

Yours sincerely,

Assoc. Prof. Muhamud N. Wambede
DEAN, GRADUATE SCHOOL