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An Assessment of the Influence of Reverse Logistics Practices on Solid Waste Disposal Management in Kisumu Town, Kenya

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Abstract:

Reverse logistics is a process that involves the implementation, control, and planning of cost-effective flow of raw materials, finished goods, and in-process inventory. It is the flow from the point of consumption to the point of origin to ensure effective disposal and recapturing of value. Reverse logistics is a new practice in developing countries such as Kenya, and as such, there is need to fully understand what it entails. Based on this, the main purpose of the study is to assess the influence of reverse logistics practices on solid waste disposal management in Kisumu Town, Kenya. The study was guided by three main objectives which are to examine the influence of backward flow of materials on solid waste disposal management; to determine the influence of producers' involvement on solid waste disposal management; and to establish value recovery opportunities in solid waste disposal management. The study utilized three theories which are Closed-loop supply chain theory (main theory), third-party logistics theory, and resource advantage theory. The study used descriptive survey design. Descriptive survey design was used. The target population of the study was 140 respondents consisting of representatives of supermarkets, garbage collecting organizations, employees of the county government, producers, and small-scale hotels. A stratified random sampling of 104 respondents was surveyed. Data was collected using questionnaires and interview guides. Quantitative data was analyzed using descriptive and inferential statistics, which includes measures of variability and central tendency. Qualitative data was analyzed using thematic analysis framework. Reliability was ensured using the Cronbach Alpha that had a value of 0.7. The validity of the instruments was determined by the supervisors of the institution. The findings of the study indicated that there has been a limited adoption of backward flow of materials as a reverse logistics practice, that producers are not fully involved in the implementation and practice of solid waste disposal management and that solid waste disposal management practices in Kisumu Town have not been fully used to exploit value recovery opportunities. The conclusion of the study was that there is need to increase the utilization of reverse logistics practices in Kisumu Town. Some of the recommendations that are provided in the study include the need to implement reverse logistics practices to reduce expenditures, increase profitability, improve efficiency, and promote environmental sustainability, there is need for collaboration of major stakeholders in solid waste disposal in providing training on waste handling and there is need in reducing garbage collection fees to ensure that it is affordable.

Keywords: *Extended producer responsibility, recycle, refurbish, environmental sustainability, product life cycle*

1. Introduction

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. Reverse logistics begins from the point of consumption to the point of origin. The main purpose of reverse logistics is to recapture, create value, or ensure proper disposal of waste (Dale et al., 2012). Sergio et al. (2006) defines reverse logistics as the process of planning, implementing and controlling the backward flows of raw materials, in-process inventory, packaging and finished goods, from a manufacturing, distribution, or use point, to a point of recovery or point of proper disposal. In simple terms, reverse logistics can be described as the flow of materials or information from the point of consumption to the point of origin. It includes the returns product, recycling, and material substitution, reuse of materials, repair, and re-manufacturing. The main purpose of reverse logistics is to recapture value or for proper disposal. It also helps in minimizing the expenditure costs. The business concept of reverse logistics has continued to attract increased attention mainly as a result of consciousness to issues with the environment and environmental laws, coupled with emerging awards and recognitions (Blumberg, 2005). It encompasses events in returns flows, initiated at customers point backwards, to suppliers and

manufacturers along the supply chain. Reverse logistics entails both service activities (re-use, mending/repair, restoring, re-manufacturing, or remodel of returned products from the end user) and the environmental component (Hoek& Harrison, 2007). Firms can become environmentally responsible through recycling, reusing and reducing the amount of materials used in the forward system. Reverse logistics can have different implications for businesses. While reverse logistics is mainly about returns management, it also involves disposal, gate keeping, and returns avoidance, among other factors in the after-market supply chain (Dyckhoff et al., 2013). Returns management has an impact on the competitive positioning of an organization. It creates the link between marketing and logistics. Therefore, firms that implement returns management can improve their internal integration efforts. Reverse logistics has an impact on how businesses relate with stakeholders. For example, a sustainable reverse logistics would eliminate fines from the government (Dyckhoff et al., 2013). Apart from this, it would improve the perception of the public. Reverse logistics improves profits for businesses. Through reverse logistics, businesses can identify ways of reusing, reselling, and recycling materials, and as such impacting the profit margin. Therefore, the implementation of reverse logistics in business is critical as will be highlighted in the study.

1.1. Statement of the Problem

Reverse logistics in developing countries such as Kenya is still in its earlier stages. Reverse logistics in these countries has mainly been characterized by low reprocessing which leads to low value addition (Alnuwairan, 2021). The need for this study is based on the fact that reverse logistics has not received the desired attention, and is mainly concentrated in the informal sector. The potential of reverse logistics is based on factors such as innovative materials handling, route optimization, and coordination that will help in solving the waste problem in urban areas (Kinobe et al., 2012). Despite the escalation of waste generation in developing countries, reverse logistics has continued to receive limited attention. An integrated approach that combines private, public, and community sectors will be essential in providing solutions for promoting proper waste management in developing countries. Failure to implement reverse logistics will not only contribute to global warming and environmental degradation, but also the depletion of the ozone layer (Dias & Junior, 2016). The government and businesses have a major role to play in promoting the utilization of reverse logistics. Kisumu is among one of the major cities in Kenya. Being an urban center, Kisumu has a large number of companies that dispose solid waste in different areas. Despite this, only a limited number of companies have implemented reverse logistics. This study is therefore aimed at advancing research in solid waste management and the implementation of reverse logistics. The study will address solid waste management in Kisumu and the influence of reverse logistics in the process. Further, the study will provide recommendations on the successful implementation of reverse logistics among businesses and producers in Kisumu to promote sustainability.

1.2. General Objective of the Study

The general objective of the study was to assess the influence of reverse logistics practices on solid waste disposal management in Kisumu town, Kenya.

1.3. Objectives of the Study

The study was guided by the following objectives;

- To examine the influence of backward flow of materials on solid waste disposal management
- To determine the influence of producers' involvement on solid waste disposal management
- To establish value recovery opportunities in solid waste disposal management.

1.4. Significance of the Study

The study has potential contributions to the knowledge of waste disposal management, while still adding value to the production process using the wastes. This can help in minimizing the production expenditure. The findings of this study will be useful to Kisumu Town and its residents, Juakali artisans, small-scale hotels and producers, and other large businesses as they will understand and adopt proper practices on waste disposal management. The government/policy makers will find it easier to lay down regulations on waste disposal management with the aim of keeping the town clean. Future researchers will also be able to find information from the findings of this study.

1.5. Scope of the Study

The study was carried out within Kisumu Town, in the western part of Kenya, Nyanza region. This is because Kisumu Town is one of the cities of Kenya that has been faced with the problem of solid waste management for many years. The focus of the study was on waste disposal management. The study looked at how the reverse logistics practices can be applied to help in waste disposal management in areas within the Kisumu Town. The study was done for a period of three months. Garbage collecting firms, producers, small-scale hotels, juakali artisans, and the County Government of Kisumu (environmental department) was consulted to give more information during the research process.

1.6. Limitations of the Study

Data collection process took place in some busy areas where respondents were busy. Therefore, getting their full attention was difficult. Accessing literature was also a challenge during the study. The whole process of collecting data and accessing literature involved financial expenses which were costly. The study had to be done within a stipulated time hence a population had to be sampled as opposed to questioning all the Kisumu town occupants. This limited the researcher in getting as much information as possible.

2. Literature Review

Products and materials could be sent back to the original manufacturer or other companies, provided it is in the same business chain and their activities consist of manufacturing. The returned products, materials and components can be resold directly, recycled, refurbished, re-manufactured or disposed of, Thierry, Salomon, Nunnen and Wassenhove (1995). Lambert (2008) observed that backward flow of materials involves a number of activities which include; processing returned merchandise due to damage, seasonal inventory, restock, salvage recalls, and excess inventory. It also includes recycling programs, hazardous material programs, obsolete equipment disposition, asset recovery, redesigning packaging to use less material, or reducing the energy and pollution from transportation are also important activities (Wisner & Stanley, 2007).

It is estimated that the costs of backward flow of materials accounts for almost one percent of the total United States GDP. In addition, a recent survey of 125 product manufacturing firms estimated that 50-70 percent of companies' total potential revenue from the average product life cycle is unserved. Therefore, backward flow of materials from customers to producers should become an integral component of retailers' and manufacturers' profitability and competitive position (Moore, 2005).

In 2008, T-Mobile company, U.S.A reevaluated their waste strategies and decided that the company was ineffectively re-purposing cell phones. The company ended up increasing the amount of refurbishing done to existing phones by strategically working with suppliers to create a new product line of refurbished devices. The transition of units to from November 2009 to June 2011 led to a \$363 million in savings for T-Mobile. In addition, customer demand for refurbished phones rose, creating a new untapped market. Finally, their supplier acquisition cost savings amounted to \$25 million per year (Arnseth 2012). This study showed that implementing the backward flow of used materials from the customers to the producers can lead to bottom line profitability. A study conducted by Maruzen, (2011) in Japan on solid waste management and recycling technology states that all the reverse logistics activities are the responsibility of the manufacturing company, right from the point of end-of-life to the beginning of the second life. Japan has a very sophisticated garbage collection systems where bins are labelled differently according to the purpose they serve; there are bins for plastics, glasses, papers, inorganic, organic, the main reason for this is to provide easy time for selecting the recyclable and non-recyclable products during collection. Goods can be returned by the customers to the supplier when there is product quality defect, when the customer is not satisfied, or when the customer is returning the package after consuming the product, (Barsky and Ellinger, 2001; Gonzalez Torre, 2010). Backward flow of materials can help in reducing production costs since the manufacturer do not have to buy new materials to make the same product, as well as it has a positive impact on ecological and economical sustainability.

In Africa, a study is conducted by Ekhar Mandota (2015) on the backward flow of materials; a case study of Carlsberg, Malawi which is the only Coca-Cola franchisee in Malawi (Trade beat, 2014). Carlsberg Malawi adopted a backward flow of materials strategy to utilize economic advantages of used glass bottles and to ensure glass bottles are available for operations. It aspired to use the economic advantages of reverse logistics to bring down the retail price of both soft and alcoholic drinks (Carlsberg, 2011). As the world is shifting its focus from black to green logistics, companies in Africa are becoming inclined to comply with environmental policies for both corporate governance issues as well as profit maximizing motives. As a responsible organization Carlsberg Malawi embarked on reverse logistics to improve the green environment by collecting used bottles and water (Carlsberg, 2011). This has also improved Carlsberg Malawi's corporate image. Contrary, reverse logistics has not been effective and efficient at Carlsberg Malawi: the return of glass bottles from the downstream of supply chain has been slow and other glass bottles remain unreturned. This has led to shortages of glass bottles to support operations (Face of Malawi, 2012) To overcome this, Carlsberg Malawi had embarked on importing glass bottles which also increased the negative balance of payment faced by the Malawi government and the cost of importing glass bottles had increased with the devaluation and floating of Kwacha (Malawi currency). This study showed that the backward flow of used materials from customers to producers is significant in reducing sourcing cost and imports, and reducing inventory shortages

In Kenya, the backward flow of materials from the customers to suppliers has also been embraced majorly in the informal sector. Being one of the developing countries in Africa, there is still no clear strategy on the reverse logistics sector. Since reverse logistics is a growing area in Kenya there is need to study its impact on the supply chain to provide stakeholders and decision makers with information, they require to determine whether: the adoption of reverse logistics is helping achieve enterprise objectives, and whether or not to adopt RL as part of their supply chain. (Moturi, 2013). Even so, there are some businesses in Kenya like the Kenpoly who collect used plastics for recycling. In Kisumu town the street families are also one of the players in reverse logistics, in that they help in collecting plastics and reselling them to various manufacturers for recycling. There are also bins placed along the streets for waste disposal, they are classified differently like in the case of Japan to help in easy retrieval of materials that can be recycled and the ones that are to be fully disposed. Companies can become more environmentally efficient through recycling and reusing the materials used by the customers. They can also reduce the amount of materials used in the forward flow so that fewer materials flow back and hence reuse of materials is possible and recycling is facilitated with fewer materials going at a waste (Carter and Ellram, 1998). Since the companies are the ones to play the major roles after the products have been consumed, they have to lay down a workable strategy for managing their products right from the point of production to the end-of life of the product. The involvement of suppliers and manufacturers also help in curbing waste management in the areas where their products are used. Kivinen (2002), suggests that, different service providers should have different concepts of reverse logistics, for example some companies may speak of recycling of goods which may only consist of the sophisticated features of reverse logistics.

3. Methodology

3.1. Study Design

The study adopted a descriptive survey design. A descriptive research was used to describe characteristics or behavior of sample population. It is aimed at casting light on current issues through a process of data collection that enables them to describe the situation more completely than was possible without employing this method (Fox and Bayat, 2007).

3.2. Sample Size and Sample Technique

Respondents	Target Population	Sampled	Sampling Technique
Supermarkets (Managers)	7	5	Purposive
Garbage Collecting organizations (Directors)	3	2	Purposive
Employees of the County Government of Kisumu	30	23	Purposive
Producers	30	22	Purposive
Small-scale Hotels	70	52	Purposive
Total	140	104	

Table 1: Sample Size
Source: Based on Sampling

3.3. Research Instruments

The study applied the use of primary data. Structured interviews and questionnaires were the instruments that were used during the study. Questionnaires were used to get firsthand information from the respondents and interviews were used to get responses in the language that the respondents best understand.

4. Data Analysis

Quantitative data was analyzed using descriptive analysis. Qualitative data was analyzed through thematic analysis to determine the trends and opinions from the participants.

4.1. Findings of the Study (Figurative, Tabulation, % Are Key in Presentation of Findings)

Statement	N	Minimum	Maximum	Mean	Std. Deviation
To what extent does your organization practice reverse logistics?	96	1	4	2.36	.942
How likely your organization will need repair services from a third party?	96	2	4	2.55	.857
How likely will your organization need recycling-oriented services from third party?	96	1	4	1.55	.916
How likely will your organization need reuse-oriented recovery services from third party?	96	1	4	1.86	1.072
How likely will your organization need waste disposal management services?	96	1	4	3.54	.845
To what extent can customer demand for take back influence end of life returns in your organization?	96	1	3	1.35	.649
To what extent can special destruction needed for some products influence end of life returns in your organization?	96	1	2	1.15	.355
end of life returns	96	1	4	1.76	.937
packaging returns	96	1	4	2.08	1.023
warranty returns	96	1	4	1.93	1.126
product recalls	96	1	4	1.70	.651
sales related returns	96	1	4	1.74	1.018
Community services	96	1	4	3.14	1.130
External services, outside the organizations control	96	1	4	2.71	1.383
Separate reverse channel under organization's responsibility.	96	1	4	1.49	.846
Repair, refurbish, re-manufacturer for produce use	96	1	4	3.04	1.045
Harvest for parts reuse	96	1	5	2.05	1.387
Landfill	96	1	5	2.87	1.283
Incineration	96	1	4	1.63	1.078
Clean or re-use as is in similar marketable.	96	1	11	2.28	2.643

Table 2: Frequency Distribution and Descriptive Statistics for Backward Flow of Materials in Waste Disposal Management in Kisumu Town
Source: Survey Data (2021)

Producer Involvement in Solid Waste Disposal Management	Mean (M)	Standard Deviation (SD)
To what level are you likely to use the following methods of waste disposal management in your organization?		
• Aerobic composting	4.70	0.448
• Incineration	4.56	0.721
• Dumpsite	4.32	0.521
How likely is your organization able to create initiatives to recycle, reuse and dispose wastes at the source of generation?	4.85	0.252
How likely is your organization able to sell recyclable to manufacturers who use the same materials to make new products?	4.87	0.315
How likely is your organization able to dispose recyclables to a landfill?	4.74	0.415
To what level is your organization likely to need services form extended producer responsibility organizations?	4.78	0.425
To what extent do you agree with the following statements?	4.04	0.525
• Recycling helps in conserving the environment		
• Recycling reduces the amount of wastes that goes to landfill		
• Disposing wastes in a landfill harms the environment.		

Table 3: Producer Involvement in Solid Waste Disposal Management

Source: Survey Data (2021)

Opportunities to Recover Value	Mean (M)	Standard Deviation (SD)
How likely is your organization likely to source materials from the following areas?		
• Landfills	4.851	0.224
• Manufacturers	4.525	0.225
• Waste pickers	4.850	0.311
To what extent are you likely to apply the following revenue logistics practices in your organization, in order to recover value for your products?		
• Recycling	4.90	0.315
• Re-manufacturing	4.750	0.152
• Re - Using	4.720	0.797
• Re-furbishing	4.795	0.158
• Sourcing for parts and reselling	3.410	0.797
To what level do you think reverse logistics is of importance economically?	3.33	0.15
To what level do you think revenue logistics is of importance environmentally?	4.459	0.238
To what level is your venture likely to be able to provide affordable products?	4.851	0.224

Table 4: Opportunities to Recover Value

Source: Survey Data (2021)

Disposal Location	Frequency	Percentage
Dumpsite	5	10%
Roadside	14	26%
Busted septic tank	8	15%
Pit latrines	6	12%
Drainage systems	10	19%
We do not dispose	9	18%
Total	52	100

Table 5: Location of Waste Disposal

Source: Survey Data (2021)

Disposal method	Frequency	Percentage
Dumpsite	14	27%
Burning	3	5%
Landfills	25	48%
Within the surrounding	10	20%
Total	52	100%

Table 6: Waste Disposal Methods

Source: Survey Data (2021)

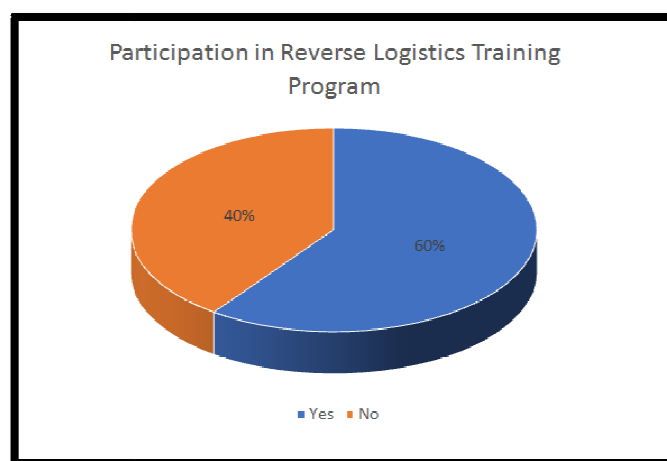


Figure 1: Would You Participate In Reverse Logistics Practices Training Program

5. Discussions of the Study Findings

The findings of the study indicate that supermarkets, garbage collecting organizations, the county government of Kisumu, producers, and small-scale hotels rarely practiced reverse logistics. Majority of the respondents indicated that they need repair services from a third party. However, the respondents did not see the need for recycling-oriented services from third parties. The findings indicated that the respondents do not need reuse-oriented recovery services from third parties. The respondents indicated that they need waste disposal services. Further, the findings indicated that mandatory take back did not influence end of life returns. It was also indicated that special destruction needed for some products influence the end-of-life returns. The findings indicated that compliance with legislation on mandatory take back did not influence end of life returns, packaging returns, warranty returns, product recalls, and sales related returns. Concerning the use of reverse logistics channels to get various units back, the findings indicated that the respondents use community services as a reverse logistics channel to get various units back. However, they also use external services. The findings also indicated that repair, refurbish, remanufacture, and landfills are important as a final disposition option for returns.

The findings of the questionnaires in the study are consistent with the findings from the interview with garbage collectors. The findings indicated that garbage collectors offer waste disposal services such as transportation, recycling, and separation of wastes among others. The garbage collectors indicated that they collect waste from commercial establishments and public/private institutions. They also collect waste from households, even though households were not involved in the study.

The findings of the study indicate that there are gaps in the utilization of backward flow of materials as a reverse logistics strategy for improving solid waste disposal management. These findings are consistent with findings from other studies. The findings of this study concur with the study carried out by Lambert (2008) on backward flow of materials which involved activities such as processing returned merchandise due to damage or product recalls. This is a form of recycling. In Japan, manufacturers believed that the backward flow of materials helped in reducing production costs since they did not have to buy entirely new materials to make the same product (Ferronato&Torretta, 2019). The findings from other studies showed that backward flow of materials had a significant effect on waste disposal management as indicated in the literature review.

The current study found out that there was no backward flow of materials on waste disposal management practices as there are no recycling plants in Kisumu. As a result, most solid wastes were scattered in heaps over residential places giving a bad image to the residential areas.

Kisumu Town therefore tries to manage waste through collection and disposing. However, reverse logistics activities involving the recycling and re-use is a neglected process. A well-managed reverse logistics program should thus be implemented in Kisumu Town. The implementation of backward flow of materials as a reverse logistics practice will not only reduce expenditures, but also increase profits, promote environmental sustainability, and promote efficiency. It will be beneficial to manufacturers and industries that produce large amounts of waste.

The findings of the study indicated that the respondents used aerobic composting as a method of solid waste disposal management. They also used dumpsites and incineration. However, incineration and aerobic composting are only

used by a few producers. This is an indication that the respondents have established a method for managing their solid wastes.

The respondents indicated that they are able to create initiatives for recycling, reuse, and disposal of wastes at the source generation. However, majority of the respondents are yet to create these initiatives. Respondents that have made an attempt to create initiatives involved experts in innovations and experiments. The findings of the study indicated that the respondents could sell recyclables to manufacturers who use the same materials to make new products. However, there are limited organizations to purchase the recyclables. The respondents indicate that organizations that sell recyclables increase their profits. The findings indicated that recycling helps in conserving the environment. Findings also indicated that recycling reduces the amount of wastes that goes to the landfills and disposing waste in landfills harms the environment. This proves the effectiveness of reverse logistics.

The findings from the questionnaire are consistent with the findings from interviews conducted among garbage collectors and small-scale hotels. The respondents indicated that they offer recycling services. This is evident by the fact that some producers in Kisumu Town purchase recyclables to manufacture new products. The respondents indicated that they have limited infrastructure for waste collection. This proves that producers are yet to develop effective infrastructure for recycling and reusing waste. The respondents also indicated that only a few manufacturers source for recyclable waste from them. Respondents from small-scale hotels indicated that they do not sell their recyclables. Most of these manufacturers are Jua Kali Artisans, civil society groups, and community-based groups. Kwams Ltd is an example of such an organization in Kisumu Town.

The findings of the study further indicate that producers are not highly involved in the implementation of reverse logistics practices. It was also revealed that a majority of the producers have not established effective solid waste management practices.

The findings of this study are in line with findings from other studies. The findings concur with a study conducted by World Bank (2019), which showed that in African developing countries, some of the solid wastes generated were not collected and the collected wastes were always disposed in uncontrolled dumpsites or were openly burnt which resulted into environmental pollution. In Hong Kong, the Environmental Protection Department (EPD) introduced a mandatory producer responsibility on solid waste disposal management which is contrary to the systems in the African developing countries. The findings from other studies showed that the producer involvement in solid waste disposal management had a significant effect on waste disposal management. For instance, a study on producer involvement by European Commission (2014) stated that Producer Responsibility Organizations helped in financing the collection and treatment of the product until its end-of-life by collecting fees from the producers. It was realized that once producers release goods into the market for use, they do not make any initiative to collect the used packaging materials, dispose, recycle or reuse them. It is important that producers help their customers with solid waste collection for complete disposal or recycling purposes. The involvement of producers in solid waste disposal management will reduce expenditures, increase profits, promote environmental sustainability, and promote efficiency. It will ensure that producers collaborate with other stakeholders in implementing reverse logistics practices as producers are among the major players in solid waste disposal management.

The findings of the study concerning value recovery opportunities indicated that the respondents are likely to source materials from landfills and garbage collectors. The findings indicated that the respondents are likely to apply recycling, remanufacturing, refurbishing, and reuse as logistics practices for recovering value. The limited organizations that have implemented these practices have increased their revenue. The findings of the study indicated that reverse logistics practices are important in the conservation of the environment. This is an indication of the positive effects of value recovery opportunities in solid waste disposal management services.

The findings of the questionnaires are consistent with the findings from interviews. The respondents that were involved in the interviews indicated that they do not offer incineration and composting, which are value recovery opportunities. The respondents indicated that most industries handle their waste, and this is an indication of the implementation of value recovery services. The respondents indicated that there is limited infrastructure for implementing value recovery opportunities. The respondents also indicated that only a few manufacturers purchase recyclables, and this is an indication that value recovery opportunities have not been fully exploited in Kisumu Town. The respondents also indicated that they do not have value recovery programs and dispose their waste completely. The respondents in the interviews also indicated that their waste is not sold. This indicates the underutilization of value recovery opportunities.

The findings of the study are consistent with findings from other studies. The findings of this study concur with a study carried out by ILO (2001) in Harare and Bulawayo on value recovery from solid waste materials. People directly earned a living from informal waste recovery which is a relatively low-skill occupation with free entry and low capital investment. The findings of this study within Kisumu town show that recovery of value from solid waste materials was being practiced by a small informal sector unlike the formal sector which felt that value recovery venture would be costly and would consume a lot of time, yet they needed to focus on the main purpose of the organizations. Recycling serves in various purposes such as making the environment conducive, aids in the conservation of materials by creating new products from the old waste products, it also aids in the reduction of solid wastes disposal in the landfills. It reduces the disruption of raw materials and damage being done to the natural resources leaving the earth to be a better place for future generation.

Though some advancement is being made in implementing value recovery opportunities in Kisumu Town, they are not effective. The challenge is to identify and put into practice effective and unhazardous methods of waste disposal management with the aim of recycling, reusing, remanufacturing or complete disposal. Recycling and composting are an

accessible way to empower communities, generate income and provide an excellent opportunity for initiating waste minimization programs.

5.1. Conclusions

Based on the findings, the study concluded that proper backward flow of materials was not being practiced within Kisumu town. Producers concentrated much on the production process than on waste disposal management of the product once it was consumed. Value recovery activities were mainly being practiced in the informal sectors within Kisumu town. The formal sectors focused much on the main purpose of the organization. Value recovery activities were mainly being practiced in the informal sectors within Kisumu town. The formal sectors focused much on the main purpose of the organization. There is limited implementation of reverse logistics practices in Kisumu Town and there are no effective training programs or institutions that focus on reverse logistics practices in Kisumu Town. This has reduced the level of awareness.

5.2. Recommendations

The study recommends that the management of supermarkets, garbage collecting organizations, producers, small-scale hotels, and county government institutions consider the implementation of reverse logistics practices to reduce expenditures, increase profitability, improve efficiency, and promote environmental sustainability. The county government, non-governmental organizations, and community stakeholders should also provide training on waste handling, waste segregation, waste storage, waste treatment and waste disposal methods.

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