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# Assessing Supply Chain and Logistics Operations of Waste Management Companies

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## Abstract

*The research findings prove that majority of occupants in residential areas in the country are satisfy with the services provided by waste management companies and are willing to pay for improve service waste collections, and waste dustbins. The study concludes that educational level, number of dependents, gender of household, income, and the location of residents' influence household service satisfaction from solid waste management companies. These factors also influence the willingness to pay for improve service and dustbins. The research recommends that financing approaches to waste management call for governmental and municipal assemblies policy reforms in planning developmental infrastructural projects. The government in collaboration with solid waste management companies should invest more resources into the construction of recycling plants that will help in dealing more efficiently and effectively with solid waste disposal challenges.*

*Keywords: supply chain management (SCM), Supply Chain Integration, Quality Management, Supplier Relationship Management, Logistics Operations, Waste Management Companies*

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## 1.0 INTRODUCTION

The availability of products and the delivery of services by waste companies still has undulating challenges in the supply chain process. Competition among the topmost and emerging companies still continues as to the roles and responsibilities in waste handlers in the country. The award of contract by the state and districts assemblies to waste management companies requires workable knowledge of experience and availability of tools before the award of contracts to deserving companies. There are existing challenges in the waste lifting from homes and offices including availability of dustbins, trucks, motorized tricycles and others just to mention a few. The purpose of undertaking this research is to critically examine factors in supply chain strategies, processes, challenges and the finance models mechanisms for waste management companies' operations. Supply may be defined as the act or process of providing something or making available, often in response to buyers or customers requirement. It involves the transfer or flow of goods, services and information from one party (a supplier) to another (a customer). The supplier in this context is the waste management companies and the customer are their clients.

The concept of the supply chain therefore encompasses all organisations and activities associated with the flow and transformation of goods from the raw materials stage, through to the end user, as well as the associated information flows. Material and information flows both up and down the supply chain. Supply chain includes all those involved in organising and converting materials through the input stages (raw materials), conversion phase (work in progress) and outputs (finished products). The drivers of supply chain performance need to be managed to enhance the waste management organizations performance and output. These drivers are; Facilities, Inventory, Transportation, Information, Sourcing and pricing. Finance in an organisation is the management of money and includes activities such as investing, borrowing, lending, budgeting, saving, and forecasting for continuous growth and sustainability. Supply Chain Finance (SCF) are the practices, technologies, and tools which support organization financial process of an end-to-end supply chain. SCF offers cash flow solution that assist institution to free up their capital trapped in supply chains. This is a solution designed to benefit suppliers and buyers. Suppliers are paid early and buyers can extend their payments terms. This solution will allow waste management companies opportunities to receive, assistance from financial institutions to finance their working tools or equipment, and logistics needed for operations which would have locked up their working capital and

reduce the risk associated by the cancellation of contracts with central governments or agencies as prove of non-performance or ability to deliver services on time.

Waste are any unwanted substance, discarded after its primary use. The nature of the item or waste could be worthless, defective or of no value to the disposer. These wastes are normally materials, substances by product, eliminated naturally or discarded after no longer useful or of no value after its complete life cycle. Wastes are therefore unwanted substances that are of no use. Garbage mainly considered includes; wastes from houses - domestic waste, waste from schools, offices, municipal wastes, waste from industries and factories - industrial waste. (Lagerkvist, A., & Dahlén, L. 2019). The waste needs to move relocated to a dumping site hence the need for handlers by the waste management companies. The waste management companies render services to door-to-door household collection of waste to disposal site where the district assemblies take over in managing the dumpsites at the waste landfills. Most household are willing to pay for improved solid waste collection.

Supply Chain Finance defined as the arrangement whereby a buyer agrees to improve his supplier's invoices for financing by a bank or project sponsor or another financier. This research intends to evaluate factors that influence the demand of services from waste management companies. It intends to identify the factors and the financing process that lowers cost and improve the efficiency for service delivery between waste management companies and their customers. The significance and the contribution to knowledge is to developed a framework model that providing logistics solutions to existing challenges and improves their supply chain performance through the drivers.

## 2.0 LITERATURE REVIEW

### 2.1 Supply Chain Management

Several authors have defined supply chain management. Simchi-Levi and Kaminsky (2000) define supply chain management as "the integration of key business processes among a network of interdependent suppliers, manufacturers, distribution centers, and retailers in order to improve the flow of goods, services, and information from original suppliers to final customers, with the objectives of reducing system-wide costs while maintaining required service levels". The Council of Supply Chain Management Professionals (CSCMP) (2004) defines SCM as: "SCM encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities, including coordination and collaboration with suppliers, intermediaries, third-party service providers, and customers". Cooper, Lambert, and Pagh (1997) define SCM as the management and integration of the entire set of business processes that provides products, services and information that add value for customers. Other definitions of supply chain management are offered in Table 1. Though these definitions differ slightly in wording, all communicate the importance of integration, communication and coordination between functions and organizations that will create value for the customer (Gillyard, 2003).

SCM is a discipline in the early stages of evolution (Gibson, Mentzer, & Cook, 2005). SCM gives a concrete form to the so called "business ecosystem idea" and provides a framework of processes for firms to engage in co-existence rather than competition (Bechtel & Jayaram, 1997). Consultants proposed the term and educators proposed the structure and theory for executing SCM. The term "supply chain management" first appeared in 1982 (Oliver & Webber). Around 1990, academics first described SCM from a theoretical point of view to clarify the difference from more traditional approaches and names (such as logistics), to managing material flow and the associated information flow (Cooper et al., 1997). The term supply chain management has grown in popularity over the past two decades, with much research being done on the topic (Ashish, 2007).

The concept of SCM has received increasing attention from academicians, consultants, and business manager's alike (Feldmann & Müller, 2003, Tan, Lyman & Wisner, 2002, Van Hoek, 1998). Many organizations have begun to recognize that SCM is the key to building sustainable competitive edge for their products and/or services in an increasingly crowded marketplace (Jones, 1998). The concept of SCM has been considered from different points of view in different bodies of literature (Croom et al., 2000) such as purchasing and supply management, logistics and transportation, operations management, marketing, organizational theory, and management information systems.

Tan, Kannan, Handfield & Ghosh (1999) attempted to link certain supply chain management practices with firm performance. In particular, they examined the effects of quality management; supply base management and customer relations practices on firm financial performance. They found that some aspects of quality management – use of performance data in quality management, management commitment to quality, involvement of quality department, and social responsibility of management -- all were positively related to firm performance (Gillyard, 2003). Managing the supply base was found to have a significant impact on firm growth but not on overall performance. The significance of supply chain management highlights the need for companies to actively manage their supply chain to maximize their performance. As Mentzer et al. (2001) said, a supply chain would exist whether a firm actively manages it or not. Boddy, Cahill, Charles, Fraser-Kraus, and Macbeth (1998) found that more than half of the respondents to their survey considered that their organizations had not been successful in implementing supply chain partnering; Spekman, Kamauff, and Myhr (1998), noted that 60% of supply chain alliances tended to fail. Deloitte Consulting survey reported that only 2% of North American manufacturers ranked their supply chains as world class although 91% of them ranked SCM as important to their firm's success (Thomas, 1999). It appears that while SCM is important to organizations; effective management of the supply chain does not yet appear to have been realized. Supplier relationship management

The Global Supply Chain Forum (GSCF), a group of non-competing firms and a team of academic researchers, defines supplier relationship management as “the supply chain management process that provides the structure for how relationships with suppliers are developed and maintained.” A team manages the supplier relationship management process with members from other functions as well as representatives from other companies in the supply chain. In other words, management activities in the supplier relationship management process are coordinated with inputs from purchasing, operations, logistics, finance, R&D, sales, and marketing functions. Through the cross- functional coordination, information from both the suppliers and customers are provided to the supplier relationship management activities (Wang, 2007).

The cost of materials as a percentage of sales has been estimated at approximately 53% for all types of manufacturing in the United States. These costs range from a low of 27% for tobacco products to a high of 83% for petroleum and coal products but most industries are in the 45 – 60% range (Stock, 2001). This amount of money spent represents a significant opportunity for companies to realize cost savings through better management of their supplier network. As part of the supplier relationship management process, close relationships are developed with a small set of key suppliers based on the value that they provide to the organization over time, and more traditional relationships are maintained with the others (Dyer, Dong & Wu, 1998).

Management identifies those suppliers and supplier groups to be targeted as part of the firm's business mission. Supplier relationship management teams work with key suppliers to tailor product and service agreements (PSA) to meet the organization's needs, as well as those of the selected suppliers. Standard PSAs are crafted for segments of other suppliers. Supplier relationship management is about developing and managing the PSAs. Teams work with key suppliers to improve processes, and eliminate demand variability and non-value-added activities. The goal is to develop PSAs that address the major business drivers of both the organization and the supplier.

Performance reports are designed to measure the profit impact of individual suppliers as well as the firm's impact on the profitability of suppliers (Lambert, 2008). The supplier relationship management process has both strategic and operational elements. Croxton, Lambert, Rogers, and Garcia-Dastague (2001) have divided the process into two parts, the strategic process in which the firm establishes and strategically manages the process, and the operational process, which is the actualization of the process once it has been established.

## 2.2 Supply Chain Finance

Supply Chain Finance (SCF) provide a set of financial solution for buyers and suppliers. It allows suppliers to request for early payment of the invoices for the buyer to stabilize the supply chain while additionally improving their working capital. The buyer needs to send the invoice to the platform either using Enterprise Resource Planning (ERP) or SAP software or any technological tools link to their bank for confirmation of the invoice and payment will be followed. The buyer could also use it reserve for

payment on discount received from the supplier within the agreed payment days. The benefits to the buyer include; the stabilization of his working capital, the strength to optimize working capital and to generate positive cash effects from discounts receive. The supplier benefits include; reduce days outstanding and attractive financing rate. The risk then be transfer from the supplier to the buyer along flexible decision making.

Supply Chain Finance first introduced 30 years ago as a potentially innovative funding option for corporate and suppliers. It started as a confirmation for domestics' trade solution to finance working capital and evolved into supply chain finance few years later in the US and Europe. The most recent economic downturn internationally has forced corporate institution to facade series of pecuniary and monetarily viable difficulties that strongly increased supply chain financial risk, including bankruptcy or over-leveraging of debt. The mitigation and management of supply chain financial risk is becoming an increasingly important topic for both practitioners and academics leading to a developing area of study known as supply chain finance. There are two major perspectives related to the idea of managing finance across the supply chain. The first is a relatively short-term solution that serves as more of a "bridge" and that is, provided by financial institutions, focused on accounts payables and receivables. The second is more of a supply chain-oriented perspective – which may or may not involve a financial institution, focused on working capital optimization in terms of accounts payable, receivable, inventory, and asset management. These longer-term solutions focus on strategically managing financial implications across the supply chain.

The recent financial parody in Ghana has affected traditional way of doing business. Many businesses nearly collapsed, with some commercial banks taking over other banks. Some banks downgrade into savings and loans companies, others acquired by bigger banks. Some mutual stock exchange companies numbering 52 collapsed and credit unions touched. This lampoon caused heavily business warp and loose of capital by some Ghanaian business establishment. A major change is definitely going to occur in trade affecting supply chain finance. Supply Chain Finance now surpassed traditional trade finance in the emerging markets. The trend will accelerate over few years to come depending on targeted solutions provisions to buyers and suppliers.

The provision of platform to integrate suppliers and buyers will present opportunities for banks plus other non-financial intuitions to assist raising capitals. Buyers and Sellers' companies are all competing for loans or financial assistance to stay in business. The buyers will require or prefer 30 to 60 days maximum credit whilst the suppliers will also prefer instants payment or payment before delivery. Supply Chain Finance has emerged to bridge these conflicting interests, providing a range of financing and risk mitigations solutions designed to optimize working capital and liquidity in supply chains.

Sustainable waste management in any nation will depend on the approach utilize in solving its critical issues in waste collection by stakeholders. This essentially emanates from the implementation policy or framework right from the onset. The waste management framework should inculcate roles of each stakeholder and the critical success factors for waste management projects. The residential, commercial waste management companies and government agencies are key players in handling wastes being solid, liquid, or toxic. The introduction participation of private sectors in waste handlings over the past decade in Ghana has improved significantly the sanitation problems. The country now record success in improve health and sanitation conditions before the participation. A giant in the lead of waste management is ZOOMLION Ghana Limited, a private sector that took the country by surprise by going into waste management collection. This company was able to change the fortunes of Ghana engulf with filth, dissilting guitars and rivers and cleaning streets in the country. The company started by providing waste dustbins to residential and commercial entities with 240 liters dustbins for keeping refuse. The refuse lifted regularly from commercial and residential apartments and such entities are to pay monthly or weekly for services rendered.

The district assemblies and the central government were responsible for waste management in the country until the private sector participation. The government awarded the contract to giant in the waste collection services to hand dill all waste collection in the country especially door-to-door waste, cleaning of streets, and ceremonial grounds. The then government introduces the National Youth Employment Program (NYEP) where some youth employed under the company supervision to clean streets and markets centers. The government paid for the services through the company.

The increase in migration urbanization continues to affect performance of these waste management's companies coupled with indiscriminate loitering in cities and towns. To eradicate this menace, the government through the waste management companies since 2018 introduced the distribution of 1,000,000 dustbins project whereby each household or streets will have a dustbin. This will sustain and improve previous efforts in waste handlings and collections. The districts assemblies and central government will pay for waste collection on the streets improving sanitation challenges and the households and commercial entities will pay for waste collection. This research will dive deeper into Supply Chain Finance of waste management companies' operations and willingness to pay for services. Project Finance (PF) is the process of financing infrastructure and industrial projects based upon the projected cash flows of the project rather than the balance sheets of the project sponsors. It involves non-recourse financing of the development and construction of a particular project in which lenders look to the revenue expected to be generated by the project for repayment of its loans and to the assets of the project as collateral for its loan rather than to the general credit of the project sponsor. Other theories define project financing as the creation of a legally independent project company, financed with equity from one or more sponsoring firms and non-recourse debt for investing in a capital asset.

The project company invests only in the particular project for which it is created and the project debt is structured without recourse to the sponsors (Nevitt and Fabozzi, 2000; Esty, 2004; Boardman, A. E., Greenberg, D. H., Vining, A. R., & Weimer, D. L. 2017; Delmon, J. 2017; Nicholas, J. M., & Steyn, H. 2017). The use of debt instruments such as bonds, loans and debentures serve as a source of funds for developmental projects (Lasa, Y. M., Takim, R., & Ahmad, N. 2018; Stowell, D. P. 2017). Equity instruments such as shares and venture capital investors serve as sources of funding for infrastructural and developmental projects (Boardman, A. E., Greenberg, D. H., Vining, A. R., & Weimer, D. L. 2017). Other specialized sources for funding projects are grants and crowd funding (Hope, O. K., & Vyas, D. 2017).

The economic criteria for appraisal comprise financial metrics decision-making, the criteria for investment appraisal, such as the Net Present Value (NPV), the Internal Rate of Return (IRR), the Return on Investment (ROI), and the Payback Period (PP), (Pasqual et al., 2013). These financial metrics are tools used in appraising the economic viability of projects (Nicholas, J. M., & Steyn, H. (2017). Payback period is the most common approach to project selection (Kivilä, J., Martinsuo, M., & Vuorinen, L. (2017). It considers how rapidly the project returns the initial investment in the project (Kerzner, H., & Kerzner, H. R. 2017). Although easy to understand, the payback method does not take into account the time value of money.

The use of Net Present Value (NPV) in industry for project valuation is also commonplace (Wiesemann et al. 2010), and it is endorsed as a theoretically correct decision criterion in corporate financial theory (Brealey, Myers and Allen 2011; Berk and DeMarzo, 2011). It is the difference between the present value of cash inflows and cash out flows over the period. The Internal Rate of Return (IRR) is used in place or in conjunction with the Net Present Value (NPV) and other criteria such as the payback or residual income for investment evaluation (Magni, C. A. 2015). IRR is the interest rate at which the net present value of all cash flows from a project equals zero. It is the breakeven point of a project Net Present Value (NPV). The NPV and IRR are two of the most important criteria for choosing among investment projects (Padilla et al, 2013). In many circumstances, investment projects are rank in the same order by both criteria –thus NPV and IRR. Li et al., (2013), considered NPV and IRR as indexes for evaluating the investment risk (Boardman, A. E., Greenberg, D. H., Vining, A. R., & Weimer, D. L. 2017). Sensitivity analyses of the Internal Rate of Return (IRR) in some economic situations provided some evidence. This is in support of the contention that the results of sensitivity analysis of Net Present Value (NPV) and Internal Rate of Return (IRR) may differ substantially (Percoco and Borgonov, 2012).

### 2.3 Development of the Study

The current trends and increasing growth of outsourced spend have contributed considerably to the need for and spread of solutions and programs that help to mitigate and better manage financial risk within and across the supply chain of waste management companies. One of the most important approaches is what is being termed Supply Chain Finance (SCF) (Gelsomino et al., 2016; Pfohl and Gomm, 2009; Wuttke et al., 2013a). SCF is an approach for two or more organizations in a supply chain, including external service provision to create value through means of planning, steering, and controlling the flow of financial resources on an inter-organizational level (Hofmann, 2005; Wuttke et al., 2013b). It involves

the inter-company optimization of financial flows with customers, suppliers and service providers to increase the value of the supply chain members (Pfohl and Gomm, 2009). According to Lamoureux and Evans (2011) supply chain financial solutions, processes, methods are design to improve the effectiveness of financial supply chains by preventing detrimental cost shifting and improving the visibility, availability, delivery and cost of cash for all global value chain partners. The benefits of the SCF approach include reduction of working capital, access to more funding at lower costs, risk reduction, as well as increase of trust, commitment, and profitability through the chain (Randall and Farris II, 2009).

The objective of every business establishment is for profit optimization being either a public or private sector. Public private partnership project establishments are to generate revenue for operational cost and returns on capital investment for project sponsor or shareholders. Waste management companies needs to run their operations including collection, logistics, and disposal at refuse dumpsite for continuous treatment and recycling of wastes. The waste management companies will need to provide a collection and disposal services at the lowest possible operational net cost to its clients. Its needs to provide reliable continuous services optimize recovery and recycling of valuable resources. It works needs to meets environmental regulating policies and international standards in handling waste collection.

In related development, there must be a clear understanding between the central government, district assemblies and the privates waste management companies about each stakeholder's roles to the approach of sustainable waste management in Ghana. The initial responsibility of waste management and sanitation problems lies with the central government until private sector participation. The government responsibility included regulations and guidelines, preventable environmental diseases and managing sanitation challenges. The government took the bold step of outsourcing such services to the private sectors and it has yielded positive results over a decade in sanitation problems in Ghana. The government then has to pay the services of this private waste management for sustainable programs. Delay in payments from services rendered will affect the performance and operations of the waste collectors. The private companies handing residential apartment wastes will needs to generate its targeted revenue from its clients. Failure to pay or irregular payments still affects their operations.

### 3.0 RESEARCH METHODOLOGY

The research methodology adopted for this paper combines three different methodologies. Firstly, to define the basic model, it involves the use of Discovery Oriented Approach (Kohli & Jaworski 1990; Menon et al. 1999) to create a preliminary methodology and to complement the literature investigation with discussions in small groups of professionals from academy and industry, directly involved with the area. Secondly, it is complemented with an additional step that involves pre-testing the methodology by submitting it to a group of potential respondents and integrating the obtained knowledge to the preliminary methodology (FORZA, 2002). Finally, it is also supported by Lewis (1998) iterative triangulation. It employs systematic iterations between literature review, case evidence and intuition based on the researcher experience and judgement. Therefore, according to the research methodology adopted for this study, three stages were necessary for the development of the evaluating methodology;

- Stage 1: development of the preliminary methodology based on an extensive review of diverse, relevant literature (Preliminary Methodology);
- Stage 2: development of the adjusted methodology from academy and industry perspectives (Adjusted Methodology), and
- Stage 3: development of the methodology for evaluating companies' adherence degree to a conceptual model of SCM by integrating knowledge obtained from the illustration application (Evaluating Methodology). The methodology is better detailed during the development of each stage, in next section.

#### 3.1 Development of the Evaluating Methodology

In this section are detailed all the necessary stages for constructing the methodology for evaluating companies' adherence degree to a conceptual model of SCM.

### 2.1.1 Development of the Preliminary Methodology

Based on The Global Supply Chain Forum SCM definition, on conceptual model of Supply Chain Management and basic SCM initiatives & practices, the methodology establishes eleven-analysis referential axis. The first nine analysis referential axes are related to key business processes and it should identify weather the company manages and integrates them within first tier key customers and first tier key suppliers. Key business processes proposed by Cooper et al. (1997); Lambert et al. (1998 a); Croxton, et al. (2001), are:

- Customer Relationship Management;
- Customer Service Management;
- Demand Management;
- Order Fulfilment
- Manufacturing Flow Management;
- Supplier Relationship Management;
- Product Development and Commercialization, and Returns Management;

In order to eliminate a possible source of confusion Returns Management process was separated in Returns Management from customers and Returns Management to suppliers. The tenth analysis referential axis is related to horizontal supply chain structure and should identify weather the company monitors the management of key business processes beyond first tier of key suppliers and first tier of key customers. The eleventh analysis referential axis is related to SCM initiatives & practices and should identify weather the company uses or intend to use these initiatives & practices to support business processes management. A defined number of requirements were associated to each analysis referential axis. From the analysis of each requirement in each one of the referential axis it is possible to establish the company's adherence degree to the conceptual model of SCM. It is important to note that the core of the methodology is related to the integration of key business processes. Requirements associated to the analysis referential axis related to key business processes Key business processes definitions, objectives and strategic and operational sub-processes stated in literature (Croxton et al. 2001, Lambert 2004, Bowersox & Closs 2001, Christopher 2001 and Lambert et al.1998b) were detailed, analyzed, and translated into evaluating parameters or requirements using the language of industrial environment. One hundred requirements were identified for key business processes. These requirements were submitted to a selected group of constituted

### 3.2 Preliminary Methodology

This research will use the Internet as the main setting for the research. The Internet provides advantages over traditional settings since it enables researcher to access a respondent pool beyond their physical reach. This research will use tools freely available on the Internet such as Google forms and email to gather sufficient information for the study. Participants in this research will be chosen randomly from a pool of qualified candidates. The research will focus on managers of operations. The research sample size will be 100 respondents. This sample size is sufficient for the purposes of this research. The respondents will need to agree to participate voluntarily before the commencement of the study.

### 3.3 Adjusted Methodology

This research use interviews and surveys to collect data from the 100 respondents. The interview is used in the pilot study to fine-tune the questions, while surveys will also be used to collect data on the actual research exercise. Surveys are effective ways of collecting information from remote respondents since their approach is simple to understand. The survey involves a number of questions that are geared towards collecting the important information. The use of surveys is limited by the lack of contact with the respondent and thus increasing the risk of poor responses since clarification is not available. To remedy this limitation, the research will contact each of the respondents in the middle of the research exercise

to ask whether there are any clarifications needed. The questions selected for the survey are guided by the variables described above. These variables are instrumental to the quantitative nature of the research. They present an adequate guide to the research intended approach to resolving the problem.

#### 4.0 DATA ANALYSIS

The researcher initially did a qualitative study where the sampled respondents indicated their preference for the perception of measuring quality service delivery from waste management companies. The tangibility, intangibility, reliability, responsiveness, assurance, and empathy considered. The sampled interview results replicated into structured questionnaire for easy interpretation. The research question one sought to determine the mode and frequency of the waste collection and disposal. First, respondents asked to indicate how they dispose of their refuse and the details of their responses as provided in Table 4.

Table 4: Disposing off Residential Refuse from Respondents

Waste disposal	Frequency	Percent
Door collection from a contractor	1155	72.6
Tricycles collectors	318	20.0
District assemblies' containers	42	2.6
Sharing with my neighbours dustbin	75	4.7
Total	1590	100

Source: Field survey, 2019

The data in Table 4 reveals that 1155 (72.6%) of the respondents dispose of their refuse through door collection from a contractor, 318 (20.0%) through tricycles collectors and 42 (2.6%) dispose their refuse by using the district assemblies' containers. The remaining 75 (4.7%) of the respondents indicated that they dispose of their refuse by sharing with their neighbours dustbin. It can be deduced that majority of the respondents 92.6 % dispose of their refuse through the logistics provided by door-to-door collection from service providers. This assured the researcher that the targeted population for the research achieved. The finding supports the work of Oduro-Kwarteng (2011) and Oduro-Appiah, K., Afful, A., Kotey, V., & de Vries, N. (2019), who concluded that the most residents use door-to-door mode collection service from logistics provided by service providers for disposal of their refuse.

The follow up questions was if the respondents have signed any contract with the service providers for waste collection. The reason was to determine the agreed or perceive measurement of service level agreements use to determine performance. Key Performance indicators should be agreeable and to prevent biasness on each other. It serves as a check against performance and empathy. The details of their responses as presented in Table 5.

Table 5: Respondents View on Signing Contract with Service Providers

Response	Frequency	Percent
Yes	949	58.6
No	671	41.4
Total	1620	100

Source: Field survey, 2019.

The data in Table 5 reveals that as many as 949 (58.6%) of the respondents claimed they have signed contracts with waste management companies to dispose of their refuse which have effect on supply chain value additions for effective implementation. The remaining 671 (41.4%) responded in the negative. A deduction from the above is that the majority of the respondents have signed contracts with their service providers to dispose refuse. This indicates that performance measurement can be check for terms and condition of service provision. It also confirms similar research findings by Adam, M. N. (2018) on comparative Study of Waste Management and Building Permit in the Accra Metropolitan Assembly (AMA) as his (Doctoral dissertation, University of Ghana).



Table 6: Respondents View Logistics Equipment for service provisions

Source: Field Survey, 2019

The focus on this question was to help the researcher to understand the logistics equipment's used in delivery of service to clients. 59.4% indicate the use of compaction truck for lifting solid waste from residential homes, which suggest most of the service providers are in the capacity to deliver best services. An average cost of the compaction truck imported and cleared is \$ 80,000 or GHc 400,000 per truck. The next in use is the motorized tricycles 26.5% and surprisingly this seems to be the initial set up for most of the service providers and averagely cost GHc 6,000 with 1.2cc per truck. Other equipment is Bola Taxi 35%, mostly 3 tons tipping truck averaging costing GHc 25,000 with 3.0cc engine. Push cart the cheapest of the equipment requires no fuel usage and mostly used in the low-income residential areas. The negative effects are the easy to steal and challenge of an individual pushing it despite the overweight. Moreover, 1315 (81.2%) of the respondents are satisfied with services provisions from the waste management companies whilst 305 (18.8%) disagreed. It can be concluded that majority of the respondents are satisfied with the services of their refuse waste collectors (Guerrini, A., Carvalho, P., Romano, G., Marques, R. C., & Leardini, C. 2017; Lupo, T., & Cusumano, M. 2018; Yescombe, E. R. 2018; Spoann, V., Fujiwara, T., Seng, B., Lay, C., & Yim, M. 2019).

Logistics Equipment used in waste collection	Frequency	Percentage
Compaction truck	906	59.4
Bola Taxi	54	3.5
Tricycles	405	26.5
Push Cart	34	2.2
Not sure	127	8.4
TOTAL	1,526	100

Respondents who indicated that they are satisfied with their service providers' services were asked to rate satisfaction of the services delivered. The details of their responses as represented in Table 7.

Table 7: Satisfaction Level of Service Delivered

Satisfaction Rate	Frequency	Percent
Slightly satisfied	144	11.2
Moderately satisfied	666	51.7
Very satisfied	452	35.1
Extremely satisfied	26	2.0
Total	1288	100

Source: Field survey, 2019.

It is clear from Table 7 that, out of the total respondents who were satisfied with their service providers, 144 (11.2%) stated that they are slightly satisfied while 666 (51.7%) of the respondents were moderately satisfied. Moreover, 452 (35.1%) of them were very satisfied with the services of their waste collectors whilst 26 (2.0%) of them stated that they are extremely satisfied. By implication, majority of the respondents are moderately satisfied with the services of their waste collectors.

In all 88.8%, of the selected population are satisfied with the work performance of the waste management companies. Their expression of satisfaction includes reliability, responsiveness, and assurance from their clients to customer satisfaction hence no need changing their service providers. This confirms findings from similar research work by Boateng, K. S., Agyei-Baffour, P., Boateng, D., Rockson, G. N. K., Mensah, K. A., & Edusei, A. K. (2019), and Edusei, A. K. (2019), on household willingness

to pay for improved solid waste management services in four major metropolitan cities in Ghana because of satisfaction.

Again, respondents asked to indicate which aspect of the services they like about their waste collectors. The details of the responses as represented in Table 8.

Table 8: Aspect of Service you like About Your Solid Waste Collectors

Satisfaction Rate	Frequency	Percent
Regular and timely lifting	885	70.9
Prompt feedback	56	4.5
Moderate fee charging	307	24.6
Total	1248	100

Source: Field survey, 2019.

It could be seen from Table 8 that 885 (70.9%) of the respondents revealed that their solid waste collectors are regular and timely lifting and 56 (4.5%) of the respondents indicated that their solid waste collectors provide prompt feedback. The remaining 307 (24.6%) of the respondents indicated that they like their solid waste collectors because of their moderate charges. It can be concluded that majority of the respondents are very confident in the waste management service providers as prove of similar findings from Akhtar, S., Ahmad, A. S., Qureshi, M. I., & Shahraz, S. 2017; Guibrinet L. 2019; Almazán-Casali S., Alfaro J.F., Sikra S. 2019.

The selected respondents were asked how often their solid waste collectors pick their refuse for disposal. Table 9 shows the outcome that emerged from their responses.

Table 9: Frequency of Waste Collection

Frequency	Frequency	Percent %
Once a week	1086	67.0
Twice in a month	5	0.3
Twice in a week	434	26.8
Whenever I call	4	0.2
Once in a month	76	4.7
Daily	4	0.2
Once in two weeks	4	0.2
Not consistent	4	0.2
	2	0.1
Not specific	1	0.1
One or more days		
Total	1620	100

Source: Field survey, 2019.

The data in Table 9 reveals 1086 (67.0%) respondents stated that the waste management companies lift their solid wastes for disposal once in a week. A sign of clean environmental management practice, (Annepu, R., & Themelis, N. J. 2013; Francis Xavier, M. K., Millar, D., & Tanguo, J. 2018). Again, 5 (0.3%) of respondents' waste was collected for disposal twice in a month. Still from the table, about 434 (26.8%) indicated that their waste was collected for disposal twice in a week. Also, 4 (0.2%) had their waste collected whenever they call them, daily, once in two weeks and not consistent respectively. About 76 (4.7%) of the respondents said their waste was collected for disposal once in a month. It implies their waste will overflow, get rotten and produce bad scent and this affirms Abraham, E. M., Martin, A. M., & Cofie, O. (2018), statement that in such situations solid waste are indiscriminately dumped into gutters, drains and roadside. Only 2 (0.1%) had their waste collected for disposal at irregular intervals. Definitely,

1 (0.1%) of the respondents indicated that their waste collectors collect their waste for disposal for one or more days. In all more than two thirds of the respondents, prefer their waste to lift once in a week, which confirms the followed-up questions and the research work by Abraham, E. M., Martin, A. M., & Cofie, O. (2018) and Francis Xavier, M. K., Millar, D., & Tanguo, J. (2018).

## 5.0 CONCLUSIONS

The aim was to assess the Supply Chain Finance of waste management companies' operations and to develop a conceptual framework that will help in their capital project. This was a cross sectional survey research using structured interviews and questionnaires. Almost all residential households in the middle and high-income use the services of solid waste management collection. Tobit regression econometric model and Statistical Packages for Science and Solution (SPSS) version 21.0 was the software used for the data analysis. The total respondents for the quantitative research work were 1620 and 40 interviews for qualitative. Frequency tables, Pie and bar charts, were use in presenting the data. Conclusions from relevant related literature were capture along to authenticate the findings of the study.

The findings indicate that as many as 751 (50.95%) of the respondents claimed their dustbin was given to them by the waste collector whilst 226 (14.6%) of the respondents indicated otherwise that they acquired from other sources. This implies that slightly more than half of the respondent received their dustbin from the solid waste management companies. Further findings from the waste management companies indicates, the 240 liters dustbins were not given for free but sold to them and payments was spread alongside the monthly user charges.

The study investigates those respondents who claimed that they did not receive dustbin from waste collector. The study proceeded to find out which container did they used to store their solid waste. The outcome from the study revealed that, most of the respondent who were not given free dustbins used the 240-liter dustbins 324 (39.37%), and 120 liters with 298 (36.21%), purchased at a similar rate their counterparts paid. This result indicates that the predominant solid waste container for most of the respondent were 240- and 120-liter bin.

The study examines respondent given and willingness to pay for dustbin. The findings indicate that, 479 (72.03%) of the respondents responded that they pay between GH¢ 1 – 50 for their waste including the cost of the dustbins 63 (9.47%) of them pay between GH¢51 – 100 and 84 (12.63%) of them pay between GH¢ 101 – 150. Again, 30 (4.51%) of the respondents indicated that they pay between GH¢ 151 – 200 for their dustbin, 4(0.6%) of them pay between GH¢ 201 – 250 and 3 (0.45%) of the respondents also pay between GH¢ 251 – 300. Furthermore, 2 (0.3%) of the respondents revealed that they pay above GH¢ 300. The differences in their payments depend on the regions and the location of the residents. Upper class or high-classified residents pay more than the middle- and lower-income communities.

The findings observed that, 1,370 (94.68%) of the respondent's finance option for payment of their household or apartment generated solid waste was through their user charges, 46 (3.18%) through subsidy from the district assembly and 20 (1.38%) through taxes. It concludes that majority of the respondent's finance option for their household or apartment is user charges.

Other findings from the examination whether their current financing option was effective in payment, reveals that as many as 1,211 (87.37%) of the respondents claimed their current financing option are effective whilst 175 (12.63%) of the respondents indicated otherwise that their current financing option are ineffective. This implies that more than four-fifth of the respondent posited that their financing option was effective for them.

The findings from respondent whether their current financing option has effect on service for them reveals that, 834 (62.47%) claimed their current financing option has effect on service whilst 501 (37.53%) of the respondents indicated otherwise that their current financing option has no effect on service. This implies that more than two-third of the respondent posited that their financing option has effect on service. This also confirms from the Tobit regression model in testing for the goodness of fit, using Pseudo R2. The Tobit regression gave a Pseudo R2 of 0.6671. As the value of the calculated R2 result approaches 1, the explanatory power of the model increases by 0.67. The estimated R2 is 66.71% suggesting that approximately 67% of the variation in payment for solid waste collection/management explained by the explanatory variables of willingness to pay for improve service as customers of the solid waste management sees the financing option to be effective for them.

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