A RESEARCH DISSERTATION SUBMITTED TO THE SCHOOL OF BUSINESS ON EVALUATING CLOSED LOOP SUPPLY CHAIN PRACTICES AND THEIR EFFECTIVENESS IN MINIMISING E-WASTE IN UGANDA

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UGANDA CHRISTIAN UNIVERSITY
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DECLARATION

I, Milly Nanfuka, testify that this dissertation is my individual work and has never been filed in any university or any other establishment to get a degree or any other academic achievement.

Signature: 

Name: Milly Nanfuka

Date: 23/4/2026

APPROVAL

This dissertation titled "Evaluating Closed Loop Supply Chain Practices and Their Effectiveness in Minimizing E-waste in Uganda." has been submitted for examination with the approval of the university supervisor.

Supervisor's Name: Mr. Muloosi Pascal

Signature: _____

Date: 23/01/2026

DEDICATION

I thank my family and myself in this dissertation because I was always supported, encouraged, and prayed by my family during my academic life. I would also like to praise myself on the persistence and faith in myself. This has been enabled by their motivation and faith in me.

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ABSTRACT

This paper investigated the adoption of Closed-Loop Supply Chain (CLSC) practices by the major stakeholders in Uganda and their impact on minimizing electronic waste (e-waste). The volume of e-waste is increasing rapidly worldwide, and developing nations such as Uganda are experiencing significant challenges because of the poor implementation of policies, the use of informal recycling, and inadequate technology (Jain et al., 2022; UCUDIR, 2016). The research was based on the Stakeholder Theory (Freeman, 1984) and determined the benefits of cooperation between manufacturers, recyclers, regulators, and consumers in implementing CLSC and enhancing waste management. This study employed descriptive cross-sectional research design where quantitative techniques were utilized in order to collect data of stakeholders in the sampled urban areas of Uganda. The results revealed that there is high consensus in the adoption of CLSC practices (Mean = 3.94). The most important activities were found to be recycling and collaboration with stakeholders. Correlation analysis revealed that there were strong positive relationships between CLSC practices and sustainable waste management results with recycling efficiency ($r = 0.8066$) and stakeholder collaboration ($r = 0.7182$). Findings of the regression showed that the CLSC practices are a significant predictor of sustainable waste management (0.7686, $p < .001$), with 49.5% of the variation in outcomes explained ($R 2 = 0.4951$).

The findings indicate that although CLSC activities are effective to enhance e-waste management in Uganda, their effectiveness largely depends on the coordination of the stakeholders and the recycling process in a highly informal society. The research concludes that increased collaboration between stakeholders, enhancements in policy implementation and infrastructure upgrading are the keys to developing sustainable e-waste management. The results provide a useful understanding to policymakers, practitioners and researchers who seek to promote successful CLSC adoption in developing nations.

CHAPTER ONE

1.0 INTRODUCTION

The article, "Evaluating Closed Loop Supply Chain Practices and their Effectiveness in Reducing E-Waste in Uganda, set out to deal with the increasing issue of electronic waste (e-waste) due to the high rate of digitalization and poor disposal frameworks. Their efforts, which were put in place in Uganda through policy frameworks, like the National Environment Act (2019) and E-Waste Management Policy (2012), still had gaps, which were increased by the lack of closed-loop supply chain (CLSC) adoption and the inefficiency of integrating and implementing these policies that led to ineffective e-waste management. Reuse, recycling, repurposing and refurbishing, were part of the CLSC practices that reintegrated the obsolete electronics into the supply-chain, reducing the environmental impact and increasing resource efficiency. Nevertheless, infrastructure gaps, partnerships of stakeholders, and evidence of CLSC effectiveness remained. This study was aimed at assessing the adoption and influence of CLSC practices in institutions and industries in Uganda with a study region of Kampala and urban centers around it, between August and December 2025. The study uses the Stakeholder Theory to inform policy and improve sustainable practices and add to a circular economy, solving the e-waste problem.

1.1 BACKGROUND OF THE STUDY

It was the fastest growing waste issue in the world as 50 million tons of e-waste were produced every year. In the same vein, according to the Global E-waste Monitor (2023), the amount of e-waste disposed of per year is more than 62 million metric tons, which is 1,000 laptops each second. E-waste or Electrical and Electronic Equipment was among the end-of-life products that had a great financial and environmental implication (Jain, Kumar, Mostofi, and Momeni, 2022). This was an unexpected and fast increasing type of waste due to large use of electronic products which have changed the way of life in the modern society. The number of e-waste produced in certain areas was set to grow by half in the next few years (Rehman et al., 2021). Much of this waste was poorly disposed of and this is dangerous to the environment and human health. In Africa, e-waste management was getting harder because of poor enforcement of the policy, absence of technological capabilities and informal recycling activities. Lots of African states are the servants. The export of e waste to developing countries through end-markets of used electronics in

developed countries, worsening the e waste issue (African Association of Entrepreneurs, 2020). Unofficial recycling processes, like open burning and crude dismantling, put workers and the community at risk of toxic chemicals, and pollute soil, water, and air. Although some efforts focused on enhancing reverse logistics and recycling had been made in such countries as Kenya, Nigeria, and South Africa, their coverage and success were limited (Academic Journals, 2016). Uganda was experiencing an increase in the demand of electrical and electronic equipment (EEE) as a result of the growth of digital and population. Nevertheless, the recycling system in the country was not developed, and there were not many official points of return, and stable waste collection options (Nakato, 2017). The law, such as the National Environment Act (2019), Waste Management Regulations (2020), and the E-Waste Management Policy (2012) to combat this problem failed to enforce them (African Association of Entrepreneurs, 2020). In Kiteezi landfill in Kampala, the processing of recyclable materials through reverse logistics was done in only 14% of the total material, and approximately 63% of the available recoverable material was disposed of (UCUDIR, 2016). The prominent place of informal workers in e-waste management and the lack of consumer awareness and coordination among institutions remained an obstacle to efficient e-waste management (Mwesigwa & Nabunya, 2022). As environmental and health hazards of e-waste increased worldwide and in Uganda the solutions to the problem required to be sustainable and not necessarily limited to traditional waste management. The implementation of Closed Loop Supply Chain (CLSC) practices was one such promising method. The practices were focused on product take-back, recycling, remanufacturing, and reverse logistics which reclaimed the end-of-life products in the production cycle (Guide & Van Wassenhove, 2009).. In developed nations, such approaches were highly adopted with strong regulations, infrastructure as well as the coordination of stakeholders that unitedly reduced the negative impacts of e waste. On the other hand, the application of these practices was minimal in Uganda, hence the need to consider their capabilities in eliminating e-waste and ensuring sustainability. This was due to poor policy implementation, insufficient infrastructure, and overdependence on informal recyclers (Nakato, 2017; UCUDIR, 2016). Therefore, this research was conducted to evaluate the importance of the deployment of Closed-Loop Supply Chain (CLSC) practices (IV) in reducing e-waste (DV) in Uganda by closing the gap between the current policies and the reality. Theoretical Framework Stakeholder theory In this research, the authors used the Stakeholder Theory (Freeman, 1984) that implied that organizations perform better when they satisfy all stakeholders, such as producers,

consumers, recyclers, regulators and the community. This theory in e-waste management highlighted collaboration and sharing of responsibility among stakeholders that enhanced CLSC practices. Stakeholder theory assumptions. 1.Stakeholders were interdependent. No individual player could be sustainable by itself and each stakeholder affected the results of others. CLSC practices (IV) required the cooperation between the producers, recyclers, regulators and consumers. With the lack of such interdependence, it was impossible to reduce e-waste (DV). 2. Organizations were required to make value to all stakeholders as opposed to shareholders. The measures used to determine success were the benefits that were provided to the different stakeholders, including the society, the environment, regulators and suppliers. The practices of CLSC (IV) generate environmental, social and economic value through the reduction of e-waste (DV) and enhance sustainability to all. 3. Performance was enhanced by stakeholder engagement. The more various stakeholders were included, the greater the organizational results. The efficiency of e-waste minimization (DV) was much better when stakeholders were actively involved in CLSC activities, including take-back schemes and recycling programs. 4. Stakeholders were not taken into consideration and this resulted in risks and inefficiencies. Failure to involve stakeholders would lead to conflicts, inefficiencies, and unsustainable results. Poor recycler performance (IV) and a weak enforcement system or indifference by consumers resulted in poor e-waste management performance (DV).

Connection of Stakeholder Theory to Variables. The independent variable (IV) in this research was Closed-Loop Supply Chain Practices that comprised of collection systems, reuse, refurbishment, recycling, and collaborating with stakeholders. The dependent variable (DV) was the reduction of e-waste which was assessed through the decrease of waste volumes, the rate of recycling, and good environmental results. The Stakeholder Theory assisted in clarifying how active participation and collaboration between stakeholders are likely to result in a successful implementation of CLSC practices, which ultimately will translate to improved e-waste management.

Knowledge Gap

Although Uganda implemented several policies and pilot projects to handle e-waste, CLSC practices remained poor, disorganized, and largely informal (Kyambadde, 2019; Academic Journals, 2016). Moreover, empirical evidence on the effectiveness of these practices in minimising e-waste was lacking. This gap highlighted the importance of rigorous research to assess

the adoption of CLSC, the challenges, and recommend feasible measures of sustainable e-waste management in Uganda.

1.2 STATEMENT OF THE PROBLEM

Ideally, the supply chain in Uganda would entail the adoption of CLSC best practices that include recycling, product refurbishment, product take-back programs and reverse logistics. Such integration would make sure that the electronic waste was safely returned to production systems. Good practices that are supported by good cooperation, laws and infrastructures would assist in curbing environmental degradation and promote a circular economy (Guide & Van Wassenhove, 2009). But this was not the case in Uganda. Although such policies as the E-Waste Management Policy (2012) and the National Environment Act (2019) existed, they were poorly enforced. The informal recyclers handled most e-waste via hazardous recycling techniques, including open burning and rough dismantling, which emitted toxic chemicals and damaged the environment (Nakato, 2017; Mwesigwa & Nabunya, 2022). In Kiteezi landfill, 14% of the recyclable waste was recycled in reverse logistics and about 63% of the recoverable e-waste was sent to landfills (UCUDIR, 2016). The amount of e-waste was increasing rapidly worldwide, with the Global E-Waste Monitor (2023) estimating now more than 62 million metric tons annually, or 1,000 laptops per second. Formal e-waste collection and recycling was however extremely underdeveloped in Uganda with few registered recyclers and a poor network. This scenario led to continued environmental damage, severe health conditions to communities involved in exposure to toxic recycling processes, and the wastage of precious resources such as gold, copper, and aluminum.. There are some small scale recycling and take-back schemes run by ICT companies, but they are small. Their effectiveness in the reduction of e-waste in Uganda was also little empirically-evidenced. The Gap: Although developed nations have demonstrated that CLSC practices would have a significant impact in reducing e-waste volumes and environmental risks (Guide & Van Wassenhove, 2009), Uganda had no clear evidence on the effectiveness of the practices that are currently in place to mitigate e-waste problems. The majority of studies concentrate on policy creation or waste management in general, which leaves a gap in the knowledge of the actual efficiency of CLSC implementation in Uganda. Thus, there was an urgent necessity to consider how the CLSC practices (IV) could be accepted, implemented, and enhanced to be effective to reduce e-waste (DV) in Uganda.

1.3 STUDY OBJECTIVES.

1.3.1 general objective

To assess the effectiveness of stakeholder-led implementation of Closed-Loop Supply Chain (CLSC) practices in reducing electronic waste in Uganda, based on Stakeholder Theory.

1.3.2 specific objectives

To investigate the existing practices of e-waste management via Closed-Loop Supply Chain (CLSC) among key players.

To determine the degree to which CLSC practices, which are actor-driven, helped to reduce e waste, it would be appropriate to use quantifiable indicators of success like recycling rates and reduction in waste.

To suggest feasible solutions to facilitate the cooperation between the actors involved in the CLSC adoption, to strengthen sustainable e-waste management.

1.4 RESEARCH QUESTIONS

What were the prevailing CLSC practices that were being used in the E-waste management in Uganda and the roles of the key stakeholders?

What was the effectiveness of stakeholder-led CLSC practices in reducing e-waste in Uganda?

What are the strategies suggested to improve the multi stakeholder cooperation to successfully adopt and manage e-waste in Uganda?

1.5 RESEARCH HYPOTHESES

H 0: CLSC had a very strong practice of e-waste in Uganda.

That (Stakeholder Theory implied that the collaboration between producers, recyclers, regulators, and consumers contributed to CLSC adoption, which resulted in reducing e-waste)

1.6 RATIONALE OF APPLYING STAKEHOLDER THEORY.

The Stakeholder Theory was the most suitable in this research because the e-waste management practices of CLSC in Uganda are characterized by a number of stakeholders. For example: The

design and quality of electronics were determined by the producers and importers, and this influence on end-of-life recyclability.

Consumers affected disposal behavior by repairing, reusing or disposing items in an unacceptable way.

Recyclers were crucial to resource recovery. Regulations, monitoring, and support of safe treatment of e-waste were given by government agencies and NGOs.

1.7 SIGNIFICANCE OF THE STUDY.

Policy Makers

The research was to present evidence based information to the regulators such as the National Environment Management Authority (NEMA) and the Ministry of ICT. It was meant to bring to light inconsistencies in the e-waste management systems in Uganda and inform policy formulations to encourage recycling, reverse logistics and tightening of waste laws.

Practitioners or Managers

The findings were to be used by manufacturers, importers and recyclers to determine the best practices in CLSC that enhanced efficiency, reduced costs and created sustainable business models. NGOs and donor agencies might have used the insights of the study to develop awareness programs in the community and engage stakeholders to work together.

Students and Researchers

This research was to be used by students to build up their knowledge regarding sustainable supply chains in developing nations, in Africa in particular. It may also be utilized in future studies on reverse logistics, sustainability and reduction of e-waste.

1.8 STUDY LIMITATIONS AND DELIMITATIONS.

1.8.1 study limitations.

Poor access to precise data: Lots of e-waste handlers particularly informal sector had no official documentation of their activities. This may impact the quality and completeness of the gathered data.

Time limitations: The research was to be done in a short academic time (August to December 2025), which limited thorough longitudinal examination.

Respondent willingness and bias: There may be some respondents, especially those in the private recycling companies or informal contexts, who will be reluctant to give sensitive information or give bias responses due to regulatory issues.

Technological and infrastructural constraints: The lack of uniformity in data collection processes by recycling organizations may pose a challenge in terms of consistency of collected information.

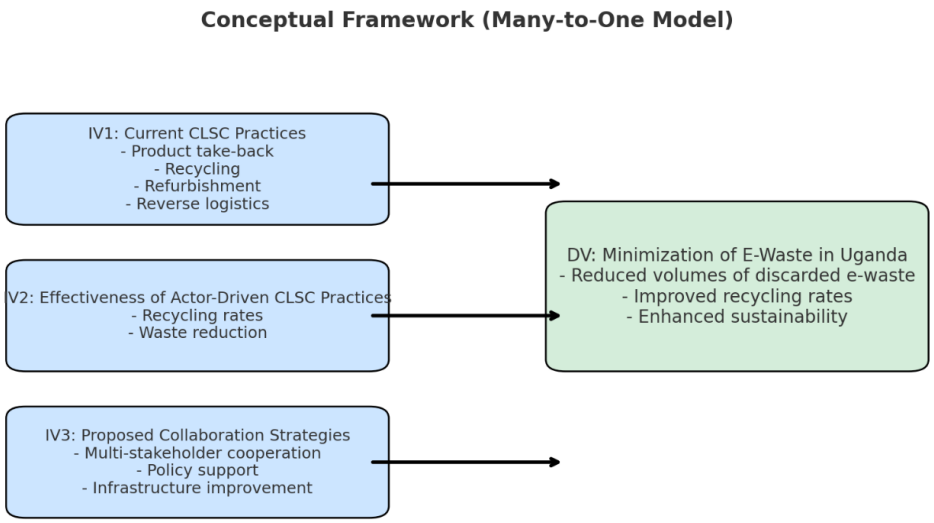
1.8.2 study limitations.

Geographical focus: The research was to focus on the urban centres like Kampala, Entebbe and Mukono which were major centres of e-waste production and management in Uganda.

Content scope: This study was focused on CLSC practices such as collection, reuse, refurbishment, recycling, and product take-back systems and their relation to the reduction in e-waste.

Institutional scope: The study involved major stakeholders such as the sampled recycling companies, personal organizations and government agencies dealing with e-waste regulation and management without considering the rural or less active areas in e-waste management. Temporal scope: The analysis was conducted on the developments and practices over the last decade (20152025) without examining previous events.

1.10 CONCEPTUAL FRAMEWORK



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The framework separates the IV into three dimensions Current CLSC practices such as product take back, Effectiveness of Actor Driven CLSC practices such as recycling rates, and proposed Collaboration strategies such as multi-stakeholder cooperation. These are in a bid to reduce E-waste in Uganda (DV).

CHAPTER TWO

LITERATURE REVIEW

2.0 INTRODUCTION

In this chapter, the review of literature on the practice of Closed-Loop Supply Chain (CLSC) and its relevance in the reduction of e-waste in Uganda has been done comprehensively. It does not contradict the research objectives of studying the existing CLSC practices in e-waste management, determining the effect of actor-based CLSC practices, and the propositions of effective strategies to improve stakeholder coordination. Although the available literature provides detailed accounts of the concepts of CLSC, there is still a considerable controversy on the differences in the practices in different socio-economic contexts. Therefore, the review does not just summarize the past research, but critically analyses the arguments used by the past researchers and points out some points of consistency, inconsistency, and methodological flaws. The chapter employs the global, regional, and local research to produce an insight that is applicable to the e-waste problem in Uganda.

2.1 KEY DEFINITIONS

Closed-Loop Supply Chain (CLSC). A Closed-Loop Supply Chain is a fusion of forward and reverse logistics (Guide & Van Wassenhove, 2009). Academics find that CLSC enhances recovery of resources, although some believe that its effectiveness is greatly dependent on regulatory pressure and market incentives rather than only technical abilities (Liu et al., 2021). This difference indicates that the effectiveness of CLSC in developed and developing countries is quite different, primarily because of the institutional strength difference.

E-Waste. Although Forti et al. (2020) offer the most widespread definition, critics believe that it does not take into account the socio-economic processes of informal recovery systems in low-income countries (Oteng-Ababio, 2021). This demonstrates some shortcomings in definition when used in Africa. Reverse Logistics. Rogers and Tibben-Lembke (1999) put emphasis on efficiency, yet subsequent researchers believe that reverse logistics in developing countries is not so much dictated by established structures as by informal ones (UNEP, 2021). This comparison brings out a disparity in the implementation of the classical models of logistics to informal e-waste economies. CLSC Recycling, Refurbishment, Repair, EPR and Collaboration.

Even though these ideas are familiar, empirical research has consistently reported a discrepancy between what is expected and what is practiced in Africa. To illustrate, EPR is in theory effective, yet failures during its implementation in the developing countries are still observed because of poor enforcement and producer lack of incentives (NEMA, 2019; Liu et al., 2021).

2.2 THEORETICAL REVIEW

2.2.1 stakeholder theory.

According to the Stakeholder Theory (Freeman, 1984), the value creation of an organization depends on the balancing of stakeholders. The theory highlights the need to bring manufacturers, recyclers, consumers, and regulators together to facilitate sustainable e-waste management in the context of CLSC (Freeman, Harrison, and Wicks, 2021). The critics however, state that the theory presupposes equal power, consistent interests and proper coordination between actors a situation that is hardly probable in developing countries (Donaldson and Preston, 1995). In the case of the e-waste system in Uganda, a particular example is the informal sector, which would control the collection but would not be part of the official policy (UNEP, 2021). This puts an imbalance of power that is not taken care of by Stakeholder Theory. Although the theory is a good analytical tool, its assumptions should be interpreted with caution in the context of Uganda. The existing theoretical-practical gap makes the necessity to examine the way that the real actors of CLSC implementation operate in Uganda.

2.3 CONCEPTUAL REVIEW

2.3.1 Objective One: to look at the existing CLSC practice in e-waste management among the critical players in Uganda.

The CLSC systems across the world include reverse logistics, take-backs, refurbishment, recycling and safe disposal. The developed nations such as Japan, Germany and Sweden have developed robust EPR systems that demand manufacturers to gather and reuse end-of-life goods leading to high recovery levels (Liu et al., 2021). Nevertheless, those scholars say that these large recovery rates do not reflect the informal waste exports that may distort the reported performance (Forti et al., 2020). This inconsistency implies that the global CLSC models that are frequently demonstrated as the ideal models might not imply the reality of the waste flow.

In Sub-Saharan Africa region, there exists a problem in the implementation of CLSCs because of the infrastructure gaps and lack of funds as well as poor enforcement mechanisms. Whereas Oteng-Ababio (2021) emphasizes the importance of informal collectors, who handle more than 80 percent of e-waste flow in such countries as Ghana and Kenya, UNEP (2021) notes that informal dismantling processes, such as open burning and acid leaching, are dangerous to the environment. The differences in opinion indicate that there is there academic disagreement, although some scholars believe that the informal sector is a great asset that can boost collection volumes, whereas others consider it to be a hindrance to sustainable and safe recycling. This discussion is critical because it defines whether Uganda adopts or formalizes the informal actors.

The CLSC system of Uganda replicates these trends at the region. More than 70 percent of e-waste is handled by informal collectors (UNEP, 2021), and formal recyclers such as EnviroServe Uganda work on an organized basis to salvage useful materials (EnviroServe, 2022). In spite of this contribution, formal recyclers are able to process only a big part of the estimated 17,000 tons of e-waste that is produced each year (Forti et al., 2020). Moreover, although the repair and refurbishment markets in Uganda contribute to the increase in the lifespan of products and the principles of the circular economy, the activities of the market are not properly controlled and do not protect the environment (Kwakyewah, 2022).

Though the available literature gives descriptive explanations of the CLSC environment in Uganda, it fails to give the adequate description of how various actors interact, how the values circulate between the formal and informal chains and the institutionalized constraints that define such interactions. This loophole restricts the comprehension of the existing CLSC performance in Uganda. This paper will seek to fill this gap by critically analyzing the role and relationship of key actors.

2.3.2 Objective Two: To determine how much the e-waste in Uganda is reduced due to actor-driven practices in CLSC.

The analysis of the actor-driven CLSC practices should be based on the evaluations of the measurable outcomes such as recycling rates, waste diversion, and the efficiency of the recovery process. According to international literature, in situations where different actors interact effectively, waste reduction can be achieved with a significant progress. As an illustration, the EPR-based systems have reached the 6080% recycling rates of some types of products in Japan,

South Korea, and Sweden (Liu et al., 2021). Nevertheless, other researchers note that these high rates are often due to a high level of regulation and well-funded conditions, which makes one doubt whether the results of this study can be applied to less developed countries (Govindan and Soleimani, 2017).

The Sub-Saharan African studies show conflicting results at the regional level. According to Oteng-Ababio (2021), e-waste collection activities conducted in partnership with government in Ghana and Nigeria have resulted in informal dumping being reduced by 20-30%. Nonetheless, according to UNEP (2021), such enhancements are not sustainable since they can be easily destabilized as they are based on donor-funded initiatives rather than on institutions. Such contradiction underlines the necessity to distinguish between short-term project success and the transformation of the systems on the long-term basis.

The situation with the involvement of actors in Uganda is also quite complicated. The formal recyclers such as EnviroServe Uganda have collected more than 3,000 tons of e-waste since 2018 and 2022 demonstrating how effective organized recovery programs can be (EnviroServe, 2022). The repair and refurbishment specialists extend the life of ICT devices by another 2-4 years (Kadir & Jamaludin, 2020), thereby postponing the process of disposal and minimizing the production of e-waste. However, in spite of these good contributions, the recycling rate in Uganda is still less than 10, which means that the involvement of actors is not properly organized (Forti et al., 2020).

The Stakeholder Theory suggests that there should be better outcomes due to the coordinated efforts of manufacturers, consumers, recyclers, regulatory agencies and informal collectors (Freeman, 1984).

But the disjointed state of Uganda chain with informal players gathering most of the waste and having no linkage to formal recycling indicates an absence of alignment between the theory and practice. The absence of the empirical data of actor-specific contributions is another constraint on the determination of the performance by the scholars.

Therefore, literature describes various actors contributions to the CLSC in Uganda, but fails to quantify their comparative effectiveness, recoveries efficacy, and analyzes the coordination failures to reduce the overall impact. This paper is going to address these gaps through actor-specific analysis of CLSC contributions in Uganda.

2.3.3 OjectiveThree: To suggest how collaboration among the stakeholders can be advanced in order to achieve successful uptake of CLSC in Uganda.

The successful CLSC systems in the countries usually rely on the organized cooperation between manufacturers, buyers, re-users, and controllers. To give an example, Japan and Sweden engage all the actors in the process of collection, recycling, and reporting using the properly developed EPR systems (Tojo, 2004; Liu et al., 2021). Although such models exhibit good coordination, critics believe that such models are difficult to replicate in the developing countries because of the existence of strong institutions and high compliance cultures (OECD, 2020). This emphasizes the need to adapt to local situations instead of implementing policies that are directly transferred to the local settings.

Rwanda has a public-private collaboration in the e-waste recycling sector and South Africa has EPR-based take-back schemes that demonstrate that a well-organized structure can increase efficiency in collection (UNEP, 2021). Nevertheless, researchers also mention that African partnerships are usually undermined by bad governance, unreliable funding, and disputes between official and unofficial players (Oteng-Ababio, 2021). These contradictions point to the fact that it is not only that collaboration is necessary, but challenging.

These tensions are manifested in the CLSC environment of Uganda. The e-waste chain is controlled by informal collectors who are not included in the formal policy procedures (NEMA, 2019). Formal recyclers also operate under minimal contribution of informal networks and this results in parallel systems which reduce the overall efficiency. This is because manufacturers and importers hardly participate in take-back initiatives because of the low level of enforcement of the EPR principles (Forti et al., 2020). All these aspects will help in poor horizontal and vertical cooperation in the CLSC in Uganda.

Even though the literature is pointing to the potential of the use of such strategies as stakeholder forums, capacity-building programs, joint awareness campaigns, digital tracking tools and incentive-based schemes, there is no discussion on how these strategies can be successfully applied within the institutional setting of Uganda. In addition, there is also a major gap in the arguments

between scholars on whether informal actors need to be incorporated into formal systems or be regulated separately.

Existing sources outline the concept of fragmentation and fail to offer any concrete and Uganda-based approaches to enhance collaboration. This paper will therefore aim at filling this gap by offering practical policies that will resonate with the local dynamics, institutional capacities and socio-economic realities.

2.4 SUMMARY OF LITERATURE REVIEW AND RESEARCH GAP.

The chapter has discussed the evidence in the literature on the practices of CLSC, the effectiveness of actor-driven initiatives, and the idea of enhancing collaboration. The global CLSC systems have been developed; the countries across Africa have been mixed; and the practices in Uganda are still disjointed. Though the available literature provides valuable information, they are largely descriptive and do not touch on the complexity of the interactions of actors in Uganda.

Sharpened Research Gap

First, there is no empirical research on the role of particular actors (formal vs informal) in the CLSC system of Uganda.

2. The key performance indicators including recovery efficiency, waste diversion, and lessened accumulation of landfills are not measured in studies.

3. The academic community lacks discussion regarding the practical collaboration strategies that would be relevant to the socio-economic and regulatory situation in Uganda.

In this research paper, these gaps are filled, as it goes further to offer an actor-focused examination of the Ugandan CLSC system and formulate effective strategies to improve collaborative e-waste management.

CHAPTER THREE

METHODOLOGY

3.0 INTRODUCTION

This chapter described steps that informed the research on the analysis of closed-loop supply chain (CLSC) practices and how it can be used to minimize e-waste in Uganda. It described and justified the research design, study population, sample size and sampling method, data collection methods, research tools, definition of variables, data analysis plan, validity and reliability, ethical issues and study limitations. Every section was addressed with the required scholarly justification to demonstrate the research methodological soundness of a project in undergraduate research.

3.1 RESEARCH DESIGN

The type of research design adopted in this study was a quantitative descriptive cross-sectional study. The quantitative method was chosen since the research sought to quantify the level and efficiency of CLSC practices with numerical measurements of structured questionnaires. Quantitative designs are effective in situations where the aim is to collect standardized data that can be analyzed statistically to determine the relationship between variables (Creswell and Creswell, 2018). The cross-sectional nature suited well since the data was gathered in a single moment, which was effective in assessing existing CLSC practices and the collaboration of the stakeholders without the necessity of a long-term follow-up. Studies that investigated naturally occurring events required descriptive cross-sectional designs as they were recommended when both resources and time were limited to the researcher (Kothari, 2004). Therefore, this design was appropriate, feasible and aligned with the objectives of the study.

3.2 STUDY POPULATION

The research population entailed the major stakeholders in CLSC practices in the e-waste management system in Uganda. These included official recyclers, unofficial collectors, refurbishers, electronic manufacturing and importation, and government regulators. The break down was as follows

(Kothari, 2004).

Stakeholder Group	Estimated population	Source of justification
Formal recyclers	20	Licensed e-waste recycling firms registered under NEMA and NITA-U
Informal collectors/refurbishers	80	Kampala Capital City Authority informal sector estimates (Independent collectors, Repair technicians and refurbishers)
Manufacturers and importers	30	URA and company registers
Regulators (NEMA, NITA-U, KCCA)	30	Agencies responsible for environmental and e-waste regulation
Total	160	

The former 160 was also attributed to the breakdown of the population. This will answer the transparency issue raised by the supervisor.

3.3 SAMPLE SIZE DETERMINATION

The sample size was determined using Yamane's (1967) formula for finite populations:

$$n = \frac{N}{1 + N(e)^2}$$

Where:

- **n** = required sample size
- **N** = total population (160)
- **e** = margin of error

To obtain a manageable and statistically reliable sample, a margin of error of **10% (0.10)** was adopted.

$$n = \frac{160}{1 + 160(0.10)^2}$$

$$n = \frac{160}{1 + 160(0.01)}$$

$$n = \frac{160}{1 + 1.6}$$

$$n = \frac{160}{2.6}$$

$$n = 61.5$$

To improve representativeness and compensate for possible non-response, the figure was adjusted upward to 69 respondents.

Thus, the final sample size for the study is 69 respondents.

The use of Yamane's formula was appropriate because it provided a simplified method for calculating sample size in studies involving finite populations while maintaining acceptable precision levels.

3.3.1 Sample Distribution

Proportionate stratified sampling was used to allocate the 69 respondents across stakeholder categories. The formula applied was:

$$n_i = \frac{N_i}{N} \times n$$

Where:

- n_i= sample for each stratum
- N_i= population of each stratum
- N= total population (160)
- n= total sample size (69)

Calculations:

Formal recyclers

$$\frac{20}{160} \times 69 = 8.6 \approx 9$$

Informal collectors/refurbishers

$$\frac{80}{160} \times 69 = 34.5 \approx 35$$

Manufacturers and importers

$$\frac{30}{160} \times 69 = 12.9 \approx 13$$

Regulators

$$\frac{30}{160} \times 69 = 12.9 \approx 12$$

This sample size was seen as sufficient because it provides representativeness and keeps statistical power for quantitative analysis.

3.4 SAMPLING TECHNIQUES

A stratified random sampling technique was combined with a purposive sampling: Stratified random sampling (justified). This was applied to formal recyclers, informal collectors, refurbishers and manufacturers/importers. The divisions of the population were according to the type of stakeholder. The sampling error was mitigated by random sampling in each stratum, and more representativeness was achieved (Etikan & Bala, 2017).

The method was justified as the stakeholder groups were involved in the CLSC system in different capacities; therefore, stratification was a means of having a proportional representation of the various contributions made by the groups. Purposive sampling This was implemented on regulators (NEMA, NITA-U and KCCA). They possessed expert information pertaining to environmental control, data reporting and EPR deployment. Purposive sampling was also suitable in cases where the researcher needed data of people that possess specialized knowledge (Creswell & Poth, 2017).

3.5 DATA COLLECTION METHODS AND INSTRUMENTS.

3.5.1 Data Collection Method

The structured questionnaire was used to gather primary data. In quantitative studies, the rationale behind using questionnaires was that it enabled the researcher to receive standardized responses

which could be analyzed statistically. They minimized researcher bias too and are economical when dealing with large populations (Sekaran and Bougie, 2019).

3.5.2 Research Instrument

The questionnaire was in form of closed-ended questions with 5-point Likert scale. Sections included:

Part A: Demographics.

Section B: In practice: CLSC practices now.

Section C: Actor-driven CLSC practices effectiveness.

Section E: Strategy of collaboration with stakeholders.

The Likert scale was reasonable since it provided the opportunity to test attitudes, perceptions, and the degree of agreement in a uniform manner that could be tested statistically (Joshi et al., 2015).

3.6 OPERATIONALIZATION OF VARIABLES

Variable	Definition	Indicators	Measurement Scale	Aligned objective	Source
CLSC practices (IV)	Activities enabling recovery, reuse, recycling of electronic products, reverse logistics and safe disposal	Presence of reverse logistics, take back programs, repair /refurbishment activities, recycling capacity, hazardous	5-point Likert	Objective 1	Govindan &Soleimani (2017):Forti et al.(2020)

		waste handling			
E-Waste Minimisation (DV)	Reduction of e-waste entering landfills or informal recycling streams	Recovery efficiency, collection rates, landfill diversion, reduction in pollution incidents	5-point Likert	Objective 2	UNEP (2021): NEMA (2019)
Stakeholder Collaboration(intervening)	Strength of coordination among manufacturers, consumers, recyclers and regulators to support CLSC	Partnerships, cross actor coordination efforts, information sharing. joint intiatives, policy compliance	5-point Likert	Objective 3	Liu et al, (2021); Freeman (1984)

Dependent Variable: E-Waste Minimization. In this research, e-waste minimization was used as the dependent variable and it meant by minimizing the production of e-waste and enhancing the environmentally friendly waste management technologies by recycling, recovery, and appropriate disposal. Reduction in e-waste was a significant consequence of good closed-loop supply chain (CLSC) practices since it made sure that electronic products were reused, refurbished, or recycled rather than discarded in landfills (Kumar et al., 2019). The proper disposal of electronic waste was associated with environmental protection, recovery of resources as well as long-term sustainability in the waste management system. To empirically measure e-waste minimization, the operationalization of e-waste minimization was in terms of sustainable waste management indicators. The sustainability of waste management indicated the degree to which waste minimization, efficiency of recycling, protecting the environment, and retrieving resources had been realized by CLSC practices. In earlier research, sustainable waste management results were

typically employed as quantifiable metrics of waste minimization since they represented improvements in recycling performance, less environmental impact, and resource use (Gupta and Barua, 2018). Thus, sustainable waste management in the statistical analysis in Chapter Four was applied as a quantifiable outcome variable in the minimization of e-waste. This operationalization enabled the study to measure, quantitatively, the effect of enhancing practices of CLSC on wider sustainability implications of the e-waste management system. Measuring e-waste minimization based on sustainable waste management indicators was in line with empirical methods in environmental supply chain research where sustainability performance was applied to assess the results of waste reduction (Govindan and Hasanagic, 2018).

3.7 VALIDITY AND RELIABILITY

3.7.1 Validity

Expert review was used to determine content validity. The questionnaire was assessed by:

1. The academic supervisor who evaluated correspondence to the research objectives.

2. Two subject experts one in supply chain management, one in environmental management that analyzed the relevance, clarity and completeness of the questions. Researchers examined the adequacy of each item to reflect the constructs of CLSC practices, actor-driven effectiveness, and collaboration among the stakeholders. Products that seemed unclear, redundant or inconsistent were edited or eliminated. This validation by experts was crucial in ensuring that the variables were well represented, which was critical to content accuracy (Polit and Beck, 2017). Furthermore, the assurance was achieved by means of expert review performed by the research supervisor and two subject specialists in the field of supply chain management and their evaluation has proven whether the instrument was able to capture the concepts studied (Mugenda and Mugenda, 2019).

3.7.2 Reliability

Reliability testing on Pilots.

A pilot study with 10 respondents (not part of the study) was carried out to measure the instrument reliability. The respondents were chosen on the basis of when they were in the same stakeholder group so that they would be similar to the main sample. Pilot results were tested with the help of

Cronbach Alpha coefficient which was used to estimate internal consistency of questionnaire items.. Tavakol and Dennick (2011) interpreted the values of Cronbach Alpha as follows:

≥ .90 — Excellent

.80–.89 — Good

.70–.79 — Acceptable

< .70 — Poor, requires revision This study was to assume that an overall Alpha of 0.70 or more was acceptable meaning that items in each construct are able to measure the same underlying concept.

When any of the constructs registered an Alpha value of less than 0.70 then problematic items were revised to make them clear and consistent or dropped in order to increase reliability. In conclusion, the expertise reviews, theoretical background, pilot testing, and statistical analysis were combined to make sure that the instrument employed in the current study was valid and reliable. These enhanced procedures offered a solid methodological basis that could produce quality, reliable data that met the goals of the study.

3.7.3 Research Hypothesis

In quantitative studies, hypotheses were an accurate statement that can be tested regarding the relationship that is likely to exist between variables (Creswell, Creswell, 2018).

The study hypothesised the relationship between Closed Loop Supply Chain (CLSC) practices and e-waste minimisation based on the study objective and conceptual framework. The hypothesis of this study was as follows:

H0: Closed Loop Supply Chain (CLSC) practices and e-waste minimization had a significant relationship. Simple linear regression analysis was used to test this hypothesis by determining the extent to which CLSC practices were significant predictors of e-waste reduction outcomes among stakeholders in electronic waste management.

3.8 DATA ANALYSIS

Data was analyzed using STATA. Each objective was shown in the tables along with detailed interpretation.

Objective	Data Analysis Method	Justification
Objective 1: Examine current CLSC practices	Descriptive statistics (frequencies, means)	Shows prevalence of practices and actor participation
Objective 2: Assess actor-driven CLSC effectiveness	Pearson correlation & simple linear regression	Measures strength and direction of relationships, and predicts e-waste reduction outcomes
Objective 3: Propose collaboration strategies	Simple linear regression analysis	To estimate the extent to which CLSC practices predict sustainable waste management outcomes and determine the explanatory power of the model (Creswell & Creswell, 2018).

Regression was justified because it helped determine the predictive influence of CLSC practices on e-waste reduction.

These techniques were valid because they were suitable for examining relationships between quantitative variables (Field, 2018)

3.9 DATA MANAGEMENT AND STORAGE.

The information was stored safely on a secured computer which was password-protected and the printed versions were stored in a locked cabinet. Six months of data were stored and then deleted, in accordance with ethical standards (Resnik, 2020).

3.10 ETHICAL CONSIDERATIONS

The research was to be conducted according to ethical guidelines by Uganda Christian University. The research participants were made aware of the research aim, guaranteed confidentiality and requested voluntary participation. Authority to gather data was granted by concerned institutions.

The participants were aware that they could drop out whenever they wanted without consequences (Resnick, 2020).

3.11 STUDY LIMITATIONS.

The research faced some difficulties such as a low attendance of informal actors, social desirability bias and time. To deal with these, the researcher used a straightforward language, flexible data collection times, and short questionnaires to enhance the accuracy of responses and participation.

CHAPTER FOUR

PRESENTATION, ANALYSIS AND INTERPRETATION OF FINDINGS

4.1 INTRODUCTION

The chapter is a presentation, analysis, and interpretation of the results of the 69 questionnaires that were filled and sent back by the respondents who participated in the e-waste management activities. The analysis is in a logical sequence. It begins with the response rate, continues with reliability test of the measurement scale, proceeds to descriptive statistics, mean comparison in the demographic groups, correlation analysis, regression analysis, multicollinearity diagnostics to conclude and summarize the results.

All the statistical analysis was performed in STATA. The findings are presented in tables and a description of the results.

4.2 RESPONSE RATE

Table 4.1 Response Rate

Category	Questionnaires Distributed	Questionnaires Returned	Response Rate (%)
Targeted respondents	77	69	89.6
Total	**77**	**69**	**89.6**

Source: Primary Data (2026)

Interpretation

Of 77 questionnaires that were sent out, 69 were filled and sent back. This presents a response rate of 89.6. This is extremely high in the case of survey research and is above the normal minimum of 50 percent in the case of social science research. Having a high response rate minimizes the non-response bias that causes the findings to be more dependable and representative. Thus, data obtained can be assured of statistical analysis and general conclusions in the context of the study.

The analysis of reliability through CRONBach alpha method was conducted (4.3.).

Cronbachs alpha was computed in order to ascertain the internal consistency of the five CLSC practice items.

4.3 RELIABILITY ANALYSIS (CRONBACH'S ALPHA)

To determine the internal consistency of the five CLSC practice items, Cronbach's alpha was calculated.

Table 4.2 Reliability Statistics

Scale	Number of Items	Cronbach's Alpha	Interpretation
CLSC Practices	5	0.7149	Acceptable

Source: Primary Data (2026)

Interpretation

The alpha coefficient of Cronbach is 0.7149 which is greater than the standard accepted minimum of 0.70. This shows that there is acceptable internal consistency of the five CLSC items.

The five items were used to measure the ability of CLSC practices to decrease e-waste, enhance resource recovery by recycling, enhance efficiency of recycling by collaboration, as well as environmental protection and sustainable waste management. According to the alpha coefficient, these items are correlated enough and they are used to measure the same underlying construct: CLSC effectiveness.

This implies that the items are reliable in measuring the same concept (CLSC effectiveness). Therefore the composite index (CLSC index) that has been developed based on an average of the five items is statistically justified.

4.4 DESCRIPTIVE STATISTICS OF MAIN VARIABLES

Table 4.3 Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
CLSC Index	69	3.94	0.61	1.6	5.0

Source: Primary Data (2026)

Interpretation

The general mean is 3.94 (out of 5 points of Likert scale) indicating that the respondents tend to believe that the practices in CLSC are well-practiced.

The value of standard deviation is 0.611, which indicates that the data distribution is moderate, with the majority of the responses being distributed around the levels of agreement.

The lowest score of 1.6 and the highest of 5.0 show that though the majority of the respondents indicated agreement, some respondents gave lower scores implying that there is some variation in the perceptions.

All in all, there is good perception of CLSC practices in the study area as shown by the descriptive results.

4.5 MEAN SCORES BY GENDER

Table 4.4 Mean CLSC Index by Gender

Gender	Mean	Std. Dev.	N
Female	3.90	0.64	51
Male	4.00	0.49	17
Total	**3.92**	**0.60**	**68**

Source: Primary Data (2026)

Interpretation

The mean score was a little bit higher (4.00) among male respondents than female respondents (3.90). Nevertheless, the disparity is not as significant (0.10 points), which means that there is not much difference in how gender groups perceive CLSC practices.

The standard deviation of males is lower (0.49) indicating a little more stable responses than the individuals of the female gender (0.64).

All in all, gender does not appear to have a great impact on the perceptions of CLSC effectiveness.

4.6 PEARSON CORRELATION ANALYSIS

Table 4.5 Correlation Matrix

Variable	CLSC Index	Recycling	Collaboration	Environment	Sustainable Waste
CLSC Index	1.000				
Recycling Improve	0.8066***	1.000			
Collaboration	0.7182***	0.4690***	1.000		
Environment Protect	0.3315*	0.1292	0.0291	1.000	
Sustainable Waste	0.7036***	0.4837***	0.4101**	0.1204	1.000

(*p < 0.05, **p < 0.01, ***p < 0.001)

Source: Primary Data (2026)

Interpretation

The correlation of CLSC index and sustainable waste management is highly positive ($r = 0.7036$, $p < 0.001$).

This implies that better sustainable waste management is associated with the improvement of CLSC practices.

The recycling operations demonstrate the closest correlation with CLSC index ($r = 0.8066$) meaning that recycling contributes significantly towards the overall CLSC performance.

There is also a positive strong relationship between collaboration and CLSC ($r = 0.7182$).

The environmental protection exhibits a low but statistically significant connection with CLSC ($r = 0.3315$).

On the whole, every significant relationship is positive, which proves that the relationship between stronger CLSC practices is related to the improved sustainability outcomes.

4.7 ANALYSIS OF REGRESSION AND TESTING OF HYPOTHESIS.

Sustainable waste management is employed in this study as the measure of operation of e-waste minimization which was indicated as the dependent variable in Chapter Three. The regression analysis hence looks at the predictive power of CLSC practices to sustainable waste management results as a measure of e-waste reduction.

A linear regression analysis was done to determine whether practices of CLSC are influential in predicting sustainable waste management.

Table 4.6 Regression Results

Variable	Coefficient (B)	Std. Error	t-value	p-value	95% CI
CLSC Index	0.7686	0.1098	7.00	0.000	0.548 – 0.989
Constant	0.8427	0.4136	2.04	0.047	0.012 – 1.674

Model Summary:

- $N = 52$
- $R^2 = 0.4951$

- F (1,50) = 49.03
- Prob > F = 0.000

Source: Primary Data (2026)

Interpretation

The model is statistically significant ($F = 49.03$, $p < 0.001$).

The value of R 2 of 0.4951 indicates that the CLSC practices can explain about 49.5 percent of the variation in sustainable waste management. This is a considerable percentage in the social science studies.

The regression coefficient of CLSC index ($B = 0.7686$) is positive, and is very significant ($p = 0.001$).

This implies that sustainable waste management, other things being equal, is likely to grow by approximately 0.77 units as CLSC practices go up by one unit.

Hypothesis Testing

H 1: CLSC practices have a positive effect on sustainable waste management.

Given the positive coefficient and that it is statistically significant ($p < 0.001$) this hypothesis is accepted.

4.8 VARIANCE INFLATION FACTOR (MULTICOLLINEARITY TEST)

Multicollinearity is not a problem as the model had a single predictor. Nevertheless, the correlation levels were less than critical values ($r < 0.90$), which proved that there are no multicollinearity issues.

4.9 SUMMARY OF FINDINGS

The response rate of the study was high at 89.6 and this guarantees the validity of the research. A test of reliability revealed that there was acceptable internal consistency (= 0.7149). The descriptive statistics revealed that respondents are generally in agreement that the practices of CLSC are effective (Mean = 3.94). The difference in gender was insignificant. Correlation analysis showed that there were strong positive relationships between CLSC practices and sustainable waste management especially in recycling and collaboration. The regression analysis proved that CLSC practices are significant predictors of sustainable waste management, as it explains almost half (49.5) of the variations of sustainable waste management. In this way, the hypothesis according to which CLSC practices have a positive impact on sustainable waste management was accepted.

CHAPTER FIVE

DISCUSSION, CONCLUSION AND IMPLICATIONS

5.0 INTRODUCTION

This chapter explains the research findings as compared to the research objectives, hypotheses, and literature available. The discussion is structured around major themes, such as demographic characteristics and response rate, perceptions of Closed-Loop Supply Chain (CLSC) practices, relationships and predictive power of CLSC practices, and hypothesis testing. At the end of the chapter, there is a summary of the key findings and their implications to theory and practice, specifically to the Ugandan context.

5.1 DISCUSSION

Although the results have valuable information on the effectiveness of CLSC practices, they are to be discussed with regard to a few methodological shortcomings. First, the research design of the study was the cross-sectional research design, which implied that data were collected at one time. According to Creswell and Creswell (2018), cross-sectional studies can be used to determine relationships but do not prove long-term causal effects. Consequently, although the findings suggest that there is a significant correlation between CLSC practices and sustainable waste management, longitudinal studies would be required to see how these relations change over time, especially in a dynamic and emerging system like the e-waste industry in Uganda.

Second, regression model employed in the research had a single key predictor variable which was CLSC practices. The model used to explain almost half of the variation in the sustainable waste management outcomes but other context-specific factors are especially significant in Uganda. To illustrate, the laxity in enforcing environmental laws, inadequate recycling facilities, monetary issues, and insufficient awareness among the population are the key factors influencing e-waste (Forti et al., 2020; UNEP, 2021). These structural conditions can facilitate or limit performance of CLSC practices.

Third, the research was based mainly on the self-reported perceptions of the stakeholders in the e-waste management system. Although such responses can be helpful, perceptual data can also cause

bias in responding (Bryman, 2021). In the Ugandan case where formal data systems are still in their infancy, it is typical to use perception-based data, but studies in future need to triangulate results on the basis of administrative or observational data.

The recognition of these limitations will enhance the interpretation of findings as it will frame within methodological and contextual realities.

5.1.1 Demographic Profile and Response rate.

The response rate of the study is very high at 89.6 percent, which is very high in the case of survey-based research. Bryman (2021) notes that above 70 percent response rate will make non-response bias minimal. The high response rate in the Ugandan context could indicate the ever-growing publicity of the issue of e-waste, at least in urban and peri-urban centres like Mukono and Kampala, where the consumption and disposal of electronics are on a rapid increase.

The population distribution was equal in the distribution of the stakeholders in terms of the formal recyclers, informal collectors, manufacturers, and regulators. This heterogeneity is especially relevant in Uganda where the e-waste system relies heavily on informal actors who are at the core of collection and recycling.

In the light of the Stakeholder Theory (Freeman, 1984), these results are a strong confirmation of the notion that sustainable results are developed in a co-creation approach amid interactions between various actors possessing varying interests and power levels. Informal collectors in Uganda are usually unregulated but are essential in the recovery of materials. This is why effective CLSC implementation requires the inclusion of stakeholders.

The results thus build on Stakeholder Theory by showing that in developing economies, stakeholder networks are not merely interdependent but also asymmetrical, with non-formal actors disproportionately playing major roles despite having little official recognition (Freeman et al., 2021).

5.1.2 Attitudes towards Closed-Loop Supply Chain Practices.

Descriptive results showed that the mean score (M = 3.94) was high, indicating that the respondents are relatively in agreement that CLSC practices are being practiced and they are working. Testing of reliability gave Cronbach alpha of 0.7149 which affirms the acceptable internal consistency (Tavakol and Dennick, 2011).

Recycling and collaboration were especially highlighted by the respondents as the enabling factors of sustainable waste management. This is consistent with the current literature that recognizes recycling, reverse logistics, and stakeholder coordination as the elements of CLSC (Guide and Van Wassenhove, 2009; Govindan and Soleimani, 2017).

Nevertheless, the situation in Uganda can be used to understand why these specific factors are more salient. Recycling is more apparent and commonly used since it is economically motivated-informal collectors and small-scale recyclers rely on recovered materials as a source of income. More developed CLSC, on the contrary, product redesign or formal take-back systems, are less developed because of less technological capacity and poor enforcement of Extended Producer Responsibility (UNEP, 2021).

The moderate difference in the responses also indicates inconsistent application in institutions. This is an indication of structural fragmentation of the waste management system in Uganda, where there is a parallel operation of both formal and informal sectors with little integration (NEMA, 2019).

Stakeholder Theory perspective The results indicate that there is a partial convergence of stakeholder interests. Although actors are aware of the importance of CLSC practices, there is still much transactional collaboration, as opposed to strategic collaboration, which restrains the full realization of shared value. This streamlines the theory by demonstrating that stakeholder engagement is not enough but the quality and design of interactions is as well instrumental in sustainability outcomes.

5.1.3 Relationships and Predictive Power.

The correlation analysis showed that CLSC practices have strong positive correlations with sustainable waste management results, especially recycling (r = 0.8066) and collaboration (r =

0.7182). These findings validate the argument that operational elements of CLSC particularly material recovery and coordination are the key elements to performance.

Further, regression analysis revealed that sustainable waste management is significantly predicted by CLSC practices ($B = 0.7686$, $p < .001$), which explain 49.5% of the variation ($R2 = 0.4951$). This is a significant explanatory power (Field, 2018).

These results align with international research showing that organized CLSC systems have a positive impact on the environment (Liu et al., 2021). Nonetheless, the situation in Uganda is an interesting case: the CLSC does not receive strong regulatory support in developed countries, but in Uganda, the legal system is more market-oriented and organized informally.

That is why cooperation and recycles are revealed as leading predictors they are the most possible and immediately positive actions under the current limitations.

Viewed through the prism of the Stakeholder Theory, the solid predictive correlation attests to the fact that stakeholder action taken in a coordinated manner results in quantifiable environmental outcomes (Freeman, 1984). The findings, however, also expand the theory by demonstrating that within resource-constrained environments, effectiveness is less reliant on formal structures and more on adaptive and informal coordination processes among actors.

Accordingly, CLSC in Uganda is a hybrid system, formal intentions of policy execution and informal execution, which determine its overall performance

5.1.4 Hypotheses

The hypothesis of the study was that CLSC practices have a positive impact on sustainable waste management. The outcome was a positive and statistically significant impact ($p < .001$), which made it possible to accept the hypothesis.

This result concurs with previous literature that associates reverse logistics and recycling systems with enhanced environmental performance (Guide & Van Wassenhove, 2009; Singh and Trivedi, 2022).

Nevertheless, the study is innovative as it offers empirical data on such relations in the Ugandan context as this has remained under-investigated.

Notably, the results reveal that despite the lack of a well-established regulatory framework, stakeholder-oriented CLSC practices can yield significant sustainability results. This supports Stakeholder Theory as it focuses on the idea that it is collective responsibility and interaction, and not formal control, that drives environmental performance.

5.2 CONCLUSION

The research investigated how the Closed-Loop Supply Chain practices could help to enhance sustainable waste management in the e-waste system in Uganda. The results indicate that CLSC practices are not just acknowledged but also play an important role in enhanced recycling, reclaiming resources, and environmental sustainability.

The findings have validated that CLSC practices positively impact strongly, which justifies a significant percentage of differences in waste management outcomes. The results obtain solid evidence of Stakeholder Theory and can show that sustainability can be realized by harmonized efforts of various actors.

But within the Ugandan setting, the structural issues are weak regulation, poor infrastructure and the prevalence of informal actors that shape the collaboration between stakeholders. Consequently, the performance of CLSCs is reliant on formal policy structures and informal working networks.

The methodological shortcomings of the study such as the cross-sectional nature and the use of perceptual information are also mentioned. The substantial longitudinal designs and other variables including policy enforcement and technological capacity should be included in future research.

Finally, CLSC practices present the possible way of solving the problem of e-waste in Uganda. To maximize their effects, however, it will be necessary:

Increased interlocking of formal and informal actors.

Improved regulatory enforcement Infrastructure investments on recycling. Improved stakeholder coordination processes.

By focusing on these aspects, Uganda will be able to reinforce its shift to a more sustainable and circular e-waste management system.

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APPENDICIES

QUESTIONNAIRE

UGANDA CHRISTIAN UNIVERSITY

School of Business and Administration

Department of Procurement and Logistics Management

RESEARCH QUESTIONNAIRE

Title: *Evaluating Closed-Loop Supply Chain Practices and Their Effectiveness in Minimizing E-Waste in Uganda*

Researcher: *Milly Nanfuka (S23B12/040)*

Supervisor: *Mr. Muloosi Pascal*

Duration: *September – December 2025*

Introduction

Dear Respondent,

I am a student in Uganda Christian University undertaking Bachelor Degree in Procurement and Logistics Management. I am carrying out research on how the Closed-Loop Supply Chain (CLSC) practices can be used to reduce e-waste (electronic waste) in Uganda.

The reason why you have been chosen to take part in this study is due to your participation or awareness regarding e-waste management. The data that you present will remain confidential and will not be applied in any other way other than academic. Please answer the most relevant answer or just shorten in response to the necessary question.

Thank you for your cooperation.

1.SECTION A: DEMOGRAPHIC INFORMATION

(Please tick ✓the correct option)

1. **Gender:** ☐ Male ☐ Female
2. **Age group:** ☐ 18–25 ☐ 26–35 ☐ 36–45 ☐ 46 and above
3. **Role in e-waste management:** ☐ Manufacturer ☐ Recycler ☐ Regulator ☐ Consumer ☐ Other _____
4. **Years of experience:** ☐ Less than 1 year ☐ 1–3 years ☐ 4–6 years ☐ More than 6 years
5. **Type of organization:** ☐ Public ☐ Private ☐ NGO ☐ Informal Sector

2.SECTION B: SIMPLE CLSC ACTIVITIES

(Objective 1: To examine the current CLSC practices used in e-waste management in Uganda)

No	Activity	Yes	No
B1	We collect old or broken electronic items	☐	☐
B2	We repair electronic devices	☐	☐
B3	We refurbish devices for resale	☐	☐
B4	We recycle electronic waste	☐	☐
B5	We safely dispose of dangerous e-waste parts	☐	☐
B6	We run or participate in an e-waste take-back program	☐	☐
B7	We educate the public on safe e-waste disposal	☐	☐

2. B8: WHO MOSTLY HANDLES E-WASTE

B8. Who mostly handles e-waste in your area? (Tick all that apply)

☐ Informal collectors (street collectors, technicians)

☐ Formal recycling companies

☐ Manufacturers / Importers

☐ Government agencies (NEMA, KCCA, NITA-U)

☐ NGOs / Community groups

☐ Not sure

3.SECTION C: EFFECTIVENESS OF CLSC PRACTICES

(Objective 2: To assess how CLSC practices contribute to minimizing e-waste in Uganda)

No.	Statement	1	2	3	4	5
C1	CLSC practices have reduced the amount of e-waste generated.	☐	☐	☐	☐	☐
C2	Recycling activities have improved resource recovery and minimized pollution.	☐	☐	☐	☐	☐
C3	Collaboration among stakeholders has improved recycling efficiency.	☐	☐	☐	☐	☐
C4	CLSC practices have enhanced environmental protection.	☐	☐	☐	☐	☐

C5The adoption of CLSC practices has promoted sustainable waste management

☐ ☐ ☐ ☐ ☐

SECTION C2: PERFORMANCE MEASURES

C6. How much e-waste do you handle per month?

☐ 0–50 kg ☐ 51–200 kg ☐ 201–500 kg ☐ Above 500 kg

C7. What percentage of collected e-waste is recycled or recovered?

☐ 0–20% ☐ 21–40% ☐ 41–60% ☐ 61–80% ☐ 81–100%

C8. How often do you repair/refurbish devices?

☐ Never ☐ Occasionally ☐ Monthly ☐ Weekly ☐ Daily

C9. How many devices were refurbished last month?

☐ None ☐ 1–20 ☐ 21–50 ☐ 51–100 ☐ Above 100

4.SECTION D: STAKEHOLDER COLLABORATION

(Objective 3: To identify strategies for improving collaboration among stakeholders in CLSC adoption)

No.	Statement	1	2	3	4	5
D1	Stakeholders (manufacturers, recyclers, regulators, and consumers) collaborate effectively to manage e-waste.	☐	☐	☐	☐	☐
D2	The government provides enough support to encourage collaboration.	☐	☐	☐	☐	☐
D3	Partnerships between public and private sectors are effective in e-waste management.	☐	☐	☐	☐	☐
D4	There is proper coordination and communication among stakeholders in the e-waste sector.	☐	☐	☐	☐	☐
D5	Awareness campaigns encourage people to return or recycle electronic waste.	☐	☐	☐	☐	☐

SECTION D2: BARRIERS TO STAKEHOLDER COLLABORATION

D6. There is conflict between formal and informal actors 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

D7. Government enforcement of e-waste regulations is weak 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

D8. Manufacturers/importers do not actively support take-back 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

D9. Lack of funding limits collaboration 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

D10. Stakeholders rarely share information 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

D3. Stakeholder Theory Alignment Items

D11. All stakeholders depend on each other for effective e-waste management 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

D12. Failure of one actor affects the entire CLSC system 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

D13. My organization shares information with other actors 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

5.SECTION E: OPEN-ENDED QUESTIONS

1. What are the biggest challenges faced in managing e-waste in Uganda?

2. How can collaboration among stakeholders be improved to manage e-waste better?

3. What practical strategies do you recommend for strengthening CLSC practices in Uganda?

Thank you for your participation!

Your responses will contribute to improving e-waste management and promoting sustainability in Uganda.