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A Blockchain Integrated Framework for Reverse Logistics of Electronic Waste in the Perspective of Bangladesh

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Abstract

Blockchain and reverse logistics enhance transparency and accountability among manufacturers, consumers, and recyclers. By ensuring centralized and traceable processes for e-waste collection and refurbishing, this approach decreases hazards to human health and the environment while facilitating sustainability. The research signifies that a blockchain-reliant reverse logistics system for e-waste from Bangladesh enhances productivity, traceability, and transparency by reliably tracing the flow of material through the product life cycle. Additionally, the study offers municipalities, organizations, and recyclers tangible steps to improve environmental and public health outcomes while facilitating incentive-driven collection, recycling, and recovery mechanisms. The existing reverse logistics frameworks to deal with the diverse and hazardous nature of e-waste smoothly arise from their dependence on complicated, dispersed infrastructure and lack of organized collection systems. The conventional approach's impact is further limited by the prevalence of informal recycling sectors that operate outside of acceptable and the environment, undermining sustainability, safety, and traceability. Survey questionnaires were employed for the analysis to identify an effective framework for reverse logistics. The findings illustrated that the limitations existing in reverse logistics can be addressed effectively by integrating blockchain. A blockchain-based reverse logistics framework was suggested in consideration of these findings for the purpose of improving productivity, traceability, and transparency across the reverse logistics process. By providing more transparency and structured handling of returned goods, this framework enables the mitigation of inefficiencies. The proposed blockchain-integrated framework thus appears to be beneficial for developing a reliable and sustainable reverse logistics system.

Keywords: Sustainability, Reverse logistics, Blockchain technology, E-waste Recovery, Framework, Transparency, Traceability.

1. Introduction

The rapid globalization of the worldwide economy and consumer appetite for new technology contributed to a remarkable rise in the production of electronic waste. Insufficient e-waste management occurs costly resources, contaminates the environment and causes significant health risks, particularly for the employed in the unorganized recycling sector, in Bangladesh and many other developing countries. The existing system's lack of accountability, traceability, and accessibility makes it difficult to develop an efficient and environmentally friendly e-waste reverse logistics system. The absence of an effective, applicable legal system and efficient tracking systems for e-waste from consumers to final processing facilities make it difficult to maintain people accountable and discourage stakeholders from utilizing part in a regulated reverse logistics chain (Agrawal et al., 2015)**.**

The initial concept associated with blockchain technology was to create a networked record database of electronic deals. The benefits of being initially introduced as the facilitator for the development of digital currency are now employed to reverse supply chains (RSC), because it facilitates confidential information cooperation, enhances direct interaction, and encourages reliability between all logistics and supply chain individuals (Muduli et al., 2023). Reverse shipping processes are more applicable while customers can return products that are defective or that have crossed the end of their effective lifespan while continuing to have warranty remaining on products (Safdar et al., 2020). Additionally, identifying the aspects that impact the effectiveness of material recovery and resource circularity, this approach enables the study of the issues, prospects, and executes reverse logistics. The study must focus on collecting numerical information associated to the performance of reverse logistics systems (Daramola et al., 2023). Blockchain-enabled reverse logistics can enhance accountabilities across the board, both for recyclers, manufacturers and customers alike. The integration of life cycle can also mean more efficient recycling and collection systems that minimize environmental and human health damage by improperly using e-waste. Reverse Logistics Process have helped to transform existing supply chains into sustainable ones via the implementation of adequate waste management procedures and amendment of environmental leakage.

Further, the paper proposes a blockchain-based reverse logistics model in the perspective of Bangladeshi e-waste that aims to provide operational efficiency, traceability, and accessibility along the electronic product life cycle. This is an advanced approach, wherein the system uses the power of blockchain technology and creates an unalterable record of your e-waste flows. It enables the establishment of incentives for the collection, recycling, and recovery of e-waste and thus contributes to a circular economy. It also offers actionable and pragmatic steps for organizations, municipalities, and recyclers to take to create effective, blockchain-enabled products that positively impact environmental and health outcomes.

2. Literature Review

2.1 Blockchain Technology

Blockchain provides better performance, transparency, verification and trust in fields like supply chain and sustainability. Kshetri, (2018) discussed how blockchain impacts important supply chain management criteria while constructing an outline that demonstrates how it benefits with cost, quality, speed, reliability, risk mitigation, sustainability, and flexibility Blockchain helps supply chain management become more sustainable by embedding environmental considerations in the core goals of SCM. The scoping review effectively illustrates the contribution of Blockchain's technological advancements to sustainable supply chain management, while also addressing research gaps to organise recent discoveries (Paliwal et al., 2020). Addressing this issue, Teng et al., (2025) analyzed how organizational, technological, and environmental factors affects the utilization of blockchain technology to establish a model for its adoption. Improve demand forecasting, optimize logistics, and improve data management through blockchain technology to reduce distribution costs and product shortages (Haque et al., 2022). Blockchain is better leveraged in pharmaceutical reverse logistics by ensuring that returnable pharmaceuticals can be analysed safely, their authenticity can be verified, and recalls can be processed much faster. While blockchain provides a real additional value of accessibility and security, the pharmaceutical supply chain is still hindered by safety concerns and slow adoption (Mallick et al., 2022). Furthermore, Shikder et al., (2022) assessed the role of blockchain in enhancing supply chain accessibility and presented recommendations for implementing blockchain technology.

2.2 Reverse Logistics

Reverse logistics is the method of returning goods to the supplier or manufacturer until they reach the endpoint for recycling, disposal, remanufacturing, repairs, or returns. Agrawal et al., (2015) highlighted the main concerns in reverse logistics, with an emphasis on the secondary market networks, adoption, execution, product return predicting, outsourcing, and resolution strategies. Implementing comprehensive return policies and aligning reverse logistics with business strategy improves productivity, customer satisfaction, and competitiveness (BODE et al., 2012). However, Ahmed et al., (2023) evaluated how improved efficiency and sustainability in reverse logistics can be accomplished by the combination of IoE and AI technology. Reverse logistics deployment promotes digitization as well as information sharing, which increases communication among internal and external stakeholders. Waqas, M., et al. (2018) identified the obstacles to Pakistan's adoption of reverse logistics, improve cooperation among stakeholders, and produce insightful data. Safdar et al., (2020) optimized reverse logistics to decrease expenditures and environmental impact while rising profitability and generating jobs. Additionally, Tajwar et al., (2022) utilized pharmaceutical reverse logistics assists in minimizing supply chain risks while boosting the alignment in supply and demand.

2.3 Blockchain Integrated with Reverse Logistics

Blockchain utilizes reverse logistics more effective and sustainable through enhanced transparency, simplifying procedures, and ensuring compliance. Muduli et al., (2023) explored that blockchain provides a potential to improve outcomes in the future, identify barriers and possibilities for sustainable cooperation, and optimize reverse logistics. In additionally addressed difficulties including confidentiality of information, scalability, the study examines the advantages, facilitators, risks, and difficulties of blockchain integration in the management of supply chains that focuses how blockchain can improve trust and traceability (Karakas et al., 2024). Xu et al., (2019) proposed methodology to several types of risks associated with supply chains, and the CA framework may effectively minimize vulnerabilities like replication, recycling, remarking, and excessive production. Blockchain technology simplifies reverse logistics in e-waste recycling through supplying immediate information tracking, IoT-enabled transparency, and symbol incentives controlled by digital contracts for long-term collaboration (Ping et al., 2024). Kumar et al., (2022) demonstrates that returned electronic items can be recycled, repaired, or reinvented as raw materials, establishing a circular economy and minimizing waste generated by landfills. Moreover, Research methods to improve tracking and develop a circular economy while utilizing technologies like IoT, blockchain, and AI to facilitate reverse logistics simpler and more efficient (Daramola et al., 2023). Chiou et al., (2012) provided insight that implementing reverse logistics is mainly determined by environmental standards, which emphasize the necessity for Taiwan to reinforce its regulations and enhance the refurbishment of e-waste in the electronics sector. Blockchain enhances electronics reverse logistics providing improved effectiveness, traceability, and transparency in the recycling, repair, and return systems.

3. Research Design and Methodology

3.1 Research Design

This research embraces a qualitative, conceptual paradigm leveraging supplementary data and exploratory surveys. As blockchain adoption in reverse logistics for electronic refuse remains nascent, especially in Bangladesh, a conceptual approach is fitting (Haque et al., 2022). The methodology permits extracting understandings from international instances, customizing them to Bangladesh's circumstances, and validating the envisioned framework through stakeholder viewpoints. Alternatively, initial experiences overseas together with exploratory interviews reveal blockchain shows promise to revolutionize e-waste reverse logistics in the nation by improving transparency, accountability, and profitability when appropriately implemented. The research process is carried out in two complementary stages.

3.1.1 Conceptual development

At the earliest stages, a comprehensive literature review and desk study were conducted. The purpose was to understand how global reverse logistics systems operate, the present predicament of e-waste management in Bangladesh, and how blockchain makes inroads across various parts of the supply chain. By harmonizing all of this information, the study puts forth four major weaknesses in Bangladesh's current e-waste reverse logistics system: lack of transparency, poor monitoring and control, informal rule, and informal power. Then, blockchain traits such as traceability, smart contracts, and token-based financial incentives are used to make up for these deficiencies. In this stage, the result is a conceptual framework driven by blockchain of a workable system with clear actors, process flows, and intervention points.

3.1.2 Exploratory Validation

The second phase of the operation aims to create a conceptual framework that is richer and more reliable by bringing in inputs from stakeholders who impact the real world. To this end, a short survey was given to consumers, informal collectors, recyclers, producers, and regulators. The survey found out their understanding of policies, their knowledge level on blockchain technology, how reliable consumers consider open systems overall, what kind of problems they expect will arise from this mode of working (because investment is irregular and subject to interference), and what measures are required or desired in order for them to reach their goals. Descriptive statistics and thematic grouping were used to analyze the results. This phase determines that the framework is not only theoretically sound but also practical in the setting of Bangladesh, taking into account the needs, fears and expectations of those living there. Together, these two stages provide a balanced design: the conceptual development ensures academic rigor and global relevance, while the exploratory validation anchors the framework in local reality.

3.2 Research Philosophy

From a mixed standpoint that includes principles of both positivism and pragmatism, variety is necessary to grasp and build a practically working operating framework for blockchain e-waste backtracking in Bangladesh.

Interpretivism is relevant because the success of any new system is about the realities of how people embrace it. Furthermore, since most of the e-waste in Bangladesh is controlled in an informal sector, there should be an idea about how the consumers, recyclers and the collectors in the informal sector understand transparency, reward and responsibility. This exploratory survey helps capture these positions, as well as social and cultural factors that define adoption.

While pragmatism is just the opposite, i.e., research needs not only to understand perceptions but also to be practical. It guides the invention of a new blockchain-based framework to address such practical issues as incentive design, engagement of informal recyclers, and governmental surveillance (Teng et al., 2025). But thus, pragmatism guarantees that you have both a theoretically based and an operationally grounded framework.

The research also attempts to provide grounded understanding of the owner views while maintaining pragmatic research with the incorporation of interpretivism in a pragmatic way to balance both knowledge of other studies, such as the level of information in a supply chain in blockchains, so that an actionable model can be designed (Mallick et al., 2022).

3.3 Conceptual Framework Development

The conceptual framework of this study was linked with the findings of global blockchain applications and the realities of material flows of e-waste in Bangladesh. The initial stage involved an overview of studies on blockchain adoption in logistics and supply chains, classifying blockchain by its key elements, such as transparency, immutability, or usage of smart contracts (Agrawal et al., 2015). Simultaneously, literature on reverse logistics of e-waste was reviewed to know international practice and the national problem, which is determined by discontinuous control and the absence of an incentive mechanism based on informal recycling in Bangladesh. A comparison between best international practices and the Bangladeshi context showed particular gaps that needed addressing: a lack of traceability, little accountability, and inadequate involvement by major stakeholders. Against these frailties, firstly, blockchain functions were matched with reverse logistics needs for example, digital tokens considered as incentives for consumers, distributed ledgers for tracking collection and recycling, and smart contracts to enforce producer responsibility (Tajwar et al., 2022). Building on those findings, a blockchain-based conceptual model was created to depict the roles of consumers, collectors/recyclers, producers, and government agencies, and where specifically in the system blockchain could bring added value. This is an integrative process that guarantees the framework is not only theoretically sound but also well-grounded in practice, in that it gives a concrete map of how to improve e-waste reverse logistics in Bangladesh.

3.4 Data Sources

This study relied on both primary and secondary data to develop and validate the conceptual framework.

3.4.1 Primary Data

To bring local insights into the framework, a preliminary survey was carried out among consumers, informal collectors, recyclers, producers, and policymakers. Fifteen well-crafted questions captured attitudes towards awareness, blockchain applicability, challenges and incentives, and the responsibilities of stakeholders. By doing this we made certain that the framework was in line with the utter realities of e-waste management in Bangladesh.

3.4.2 Secondary Data

Theoretical foundation was provided for this study by a wide range of literature, including academic papers, reports, and case studies. For instance, it covered studies on blockchain in supply chains, reverse logistics frameworks, and global e-waste practices. It further examined policy documents, such as Bangladesh's "Hazardous Waste (E-waste) Management Rules, 2021," and international benchmarks like the Global E-waste Monitor. The analysis was done to understand the regulatory and practical landscape.

3.5 Sampling Strategy

The study utilizes a purposeful sample approach to obtain stakeholders at different stages of the chain directly engaged in the effective governance of e-waste. The participants were selected based on their different roles within the e-waste ecosystem, including consumers, informal collectors, recyclers, producers, and policymakers. This approach guarantees that the survey will obtain a wide range of views on the potential of this blockchain-driven system.

The population of 150 respondents was not regarded as a particularly small sample for broader self-report qualitative research that is to illuminate viewpoints rather than generate generalizable results (Teng et al., 2025).This sample size permits broad representation of the various stakeholders while keeping feasibility within the confines of this study.

By means of purposive sampling, this approach enables salient, pertinent findings that accord with the research problem under consideration and cherished aims of this framework of analysis.

3.6 Questionnaire Development

Drawing from the literature and the qualified blockchain framework, the survey questionnaire was prepared. It consists of 15 closed questions covering major themes, including stakeholder role, knowledge of e-waste regulations, knowledge of blockchain, expected efficiency improvements, and perceived barriers to adoption. The questions were grouped into four high-level categories.

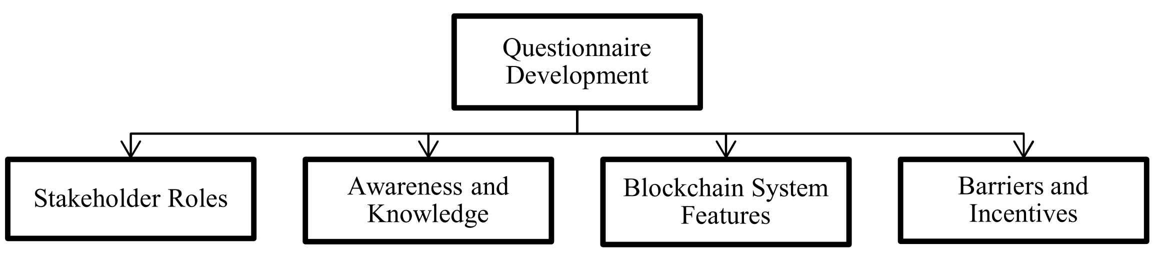


Figure 3.1: Questionnaire Development Groups

3.7 Data Collection Procedure

Over the course of two months, data was gathered using Google Forms for respondents with digital access and printed copies for those in the unorganized sector with less internet access. This strategy guaranteed inclusivity among various stakeholder groups, including legislators, recyclers, and consumers. The study's goals were explained to the participants, and their informed consent was acquired prior to their involvement. Responses were anonymized to preserve privacy, and confidentiality was guaranteed. Because of the survey's concise and simple design, even participants with little technical literacy were able to contribute insightful responses. To guarantee sample diversity and prevent prejudice against any specific group, the collection procedure was closely watched.

3.8 Research Flowchart

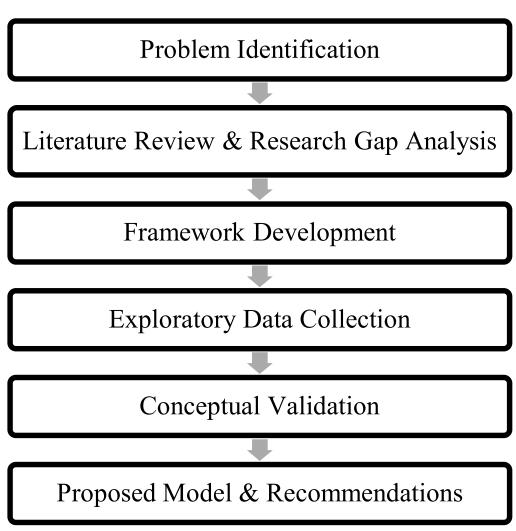


Figure 3.2: Steps involved in research

4. Analysis and Implementation

4.1 Existing Reverse Logistics Framework

Electronics reverse logistics is the process of dealing with electronics goods after a customer has used them. Forward logistics is all about making and delivering new products, while reverse logistics is all about managing the movement of products back across the supply chain from the user. This includes steps like collecting, inspecting, fixing, reusing, remanufacturing, recycling, and finally throwing away the item if it can't be recovered. The main goals of electronics reverse logistics are to get value back from devices that are returned or thrown away, cut down on e-waste, and make sure that dangerous parts are thrown away safely. It also helps the environment by using fewer raw materials, reducing production costs, and reducing pollution. It makes sure that electronics are from ending up in the trash; instead, they can be repaired and reused or safely recycled to get useful materials. This study relied on both primary and secondary data to develop and validate the conceptual framework.

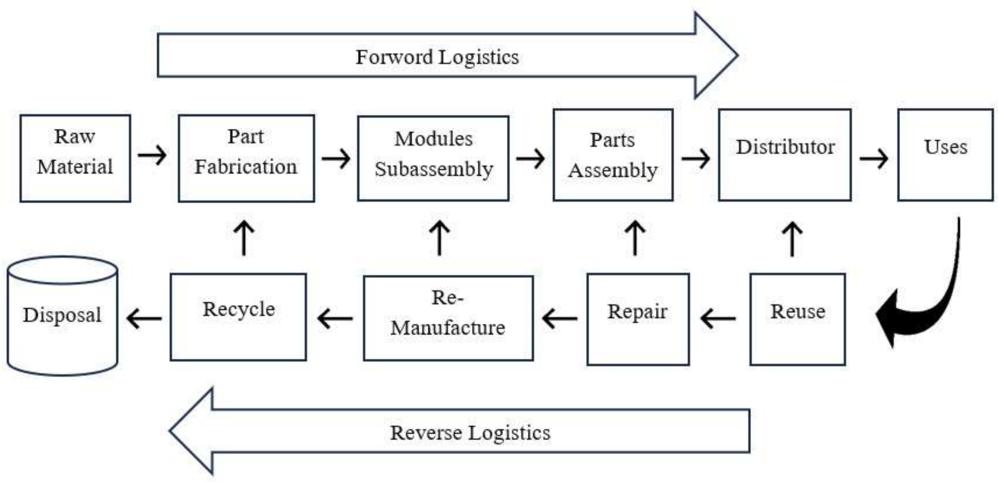


Figure 4.1: Existing Reverse Logistics Framework

4.1.1 Barriers of Existing Reverse Logistics Framework

Electronics reverse logistics operates through a system that seems to be facing some key crises that seriously limit its performance and ability to be useful. One of the major issues with the process is the absence of transparency throughout the entire chain of activities in returns, repair, refurbishment, and recycling of products (Daramola et al., 2023). The information flow is broken up by several parties, including manufacturers, retailers, carriers, and recyclers. This undermines dependability and results in misunderstandings, delays, and inefficiencies. Meanwhile, lack of coordination among these stakeholders is also another current major problem. In the absence of a centralized data system, each party is likely to maintain its own records (Ahmed et al., 2023). In reverse logistics, divergence information among stakeholders causes inconsistencies, communication breakdowns, and duplicate data, which leads to ineffective returns processing, higher operating expenses, and lower profits. Moreover, the existing system highly compromises the occurrence of illegal activities. The problems such as false warranty claims, counterfeiting of components that are mixed back into the supply chain, and e-waste that is disposed of incorrectly, which are caused by weak verification processes, make it very difficult to detect (Waqas et al., 2018). These illegal activities may lower the businesses' profits and tarnish their brand reputation, and in the long run, this would cause customer trust to decrease. Lack of transparency greatly affects customer satisfaction, loyalty, and future engagement. As part of the system, it is also struggling with regulations and sustainability issues. Without a proper tracking system, recycling, or legal disposal become very difficult if not impossible, thus, complying with environmental laws becomes even more challenging (Kshetri, 2018).

4.2 Survey Analysis

Table 4.1: Survey Result

No.	Question	Option	Result
1	What is your connection with e-waste?	Consumer	35%
		Collector	10%
		Recycler	9%
		Company Representative	20%
		Regulator	14%
		Others	12%
2	Do you know about Bangladesh's E-waste Management Rules 2021?	Yes	28%
		No	60%
		No Opinion	12%
3	How do you dispose of old or broken devices currently (phone, computer, appliance)?	Informal buyer	19%
		Keep at home	22%
		Trash	15%
		Return to shop/brand	18%
		Authorized recycler	13%
		Others	13%
4	Are you familiar with the concept of blockchain technology?	Yes	55%
		No	30%
		No Opinion	15%
5	Do you understand how blockchain can be used to trace and manage goods in a supply chain?	Yes	50%
		No	35%
		No Opinion	15%
6	Do you think a transparent and accessible system for e-waste would increase consumer satisfaction?	Yes	70%
		No	10%
		No Opinion	20%
7	Do you expect a blockchain-based system would improve e-waste management more effective in Bangladesh?	Yes	65%
		No	15%
		No Opinion	20%
8	Do you think a blockchain system could help formalize the informal e-waste recycling sector?	Yes	60%
		No	20%
		No Opinion	20%
9	Should manufacturers/producers be responsible for collection and recycling of their products (EPR)?	Yes	75%
		No	10%
		No Opinion	15%
10	In a blockchain system, who should primarily update an item's status?	Consumer	20%
		Collector	15%
		Transporter	10%
		Recycler	25%
		Government/DoE	15%
		Producer/PRO	15%
11	What are the major issues, you face for implementation?	Cost	23%
		Technical literacy	17%
		Resistance from informal sector	12%
		Data privacy	10%
		Weak enforcement	20%
		Lack of recyclers	16%
		Others	2%
12	If you were given a small reward or cashback, would you hand over e-waste to an authorized channel?	Yes	80%
		No	5%
		No Opinion	15%
13	Which components would be more beneficial to you?	Item tracking	31%
		Digital recycling certificate	15%
		Government monitoring dashboard	16%
		Consumer/collector incentives	20%
		Producer compliance tracking	18%
14	How likely are you to employ a simple mobile app or QR scan to return e-waste?	Yes	70%
		No	20%
		No Opinion	10%
15	What type of incentive would motivate you significantly?	Mobile wallet cashback	40%
		Discount voucher	25%
		Utility bill credit	20%

		Donation to a cause	5%
		None	5%
		Other	5%

4.3 Result Analysis

The data obtained from the survey questionnaire is represented in the form of a series of graphical representations. For single-choice questions such as "Yes", "No", or "No Opinion", the pie chart reflects the distribution of different opinions. On the other hand, for multiple-choice questions, it makes it easy to compare the number of selected options chosen by the respondents by presenting them as a bar chart. These graphs are here to illustrate the analysis method of this work.

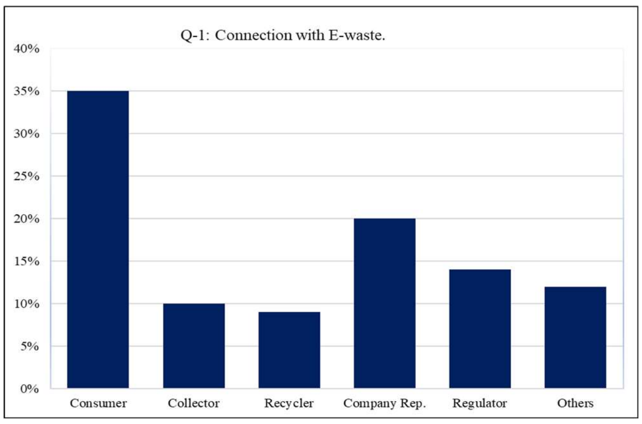


Figure 4.2: Response Percentage of Question 1

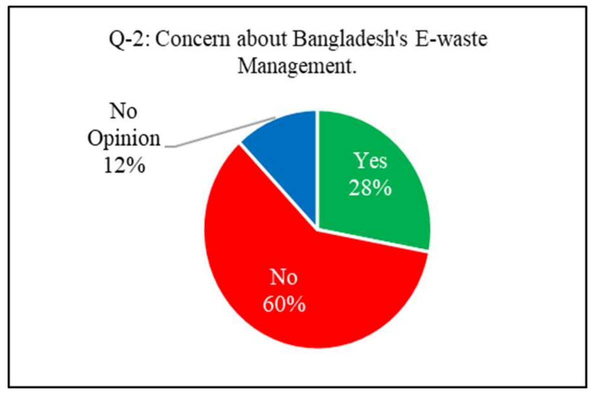


Figure 4.3: Response Percentage of Question 2

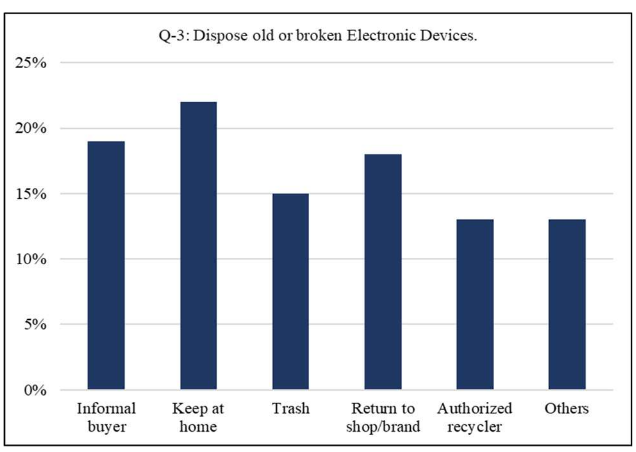


Figure 4.4: Response Percentage of Question 3

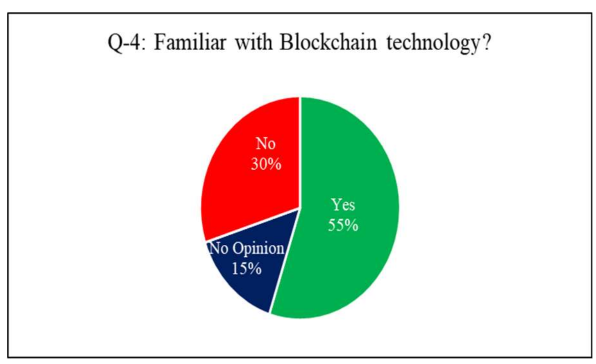
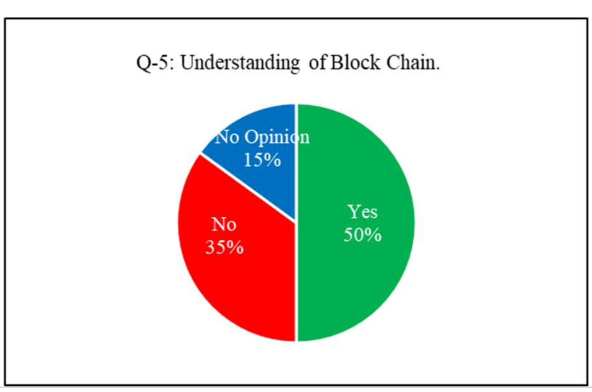


Figure 4.5: Response Percentage of Question 4



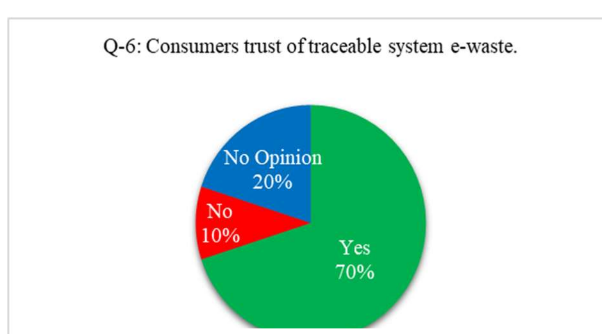


Figure 4.7: Response Percentage of Question 6

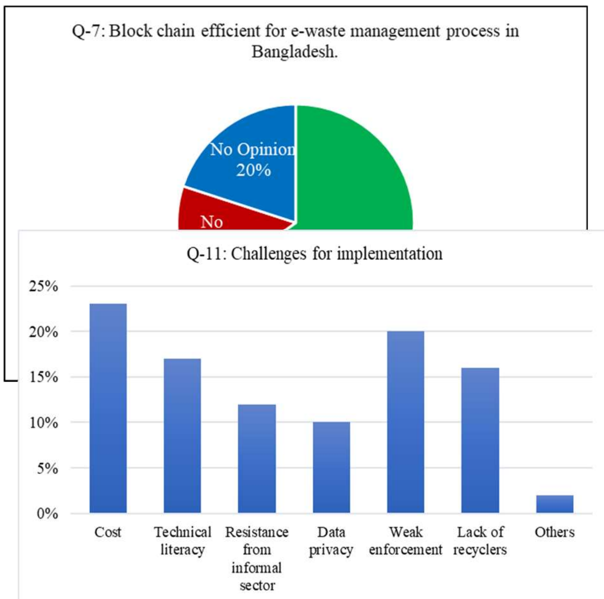


Figure 4.10: Response Percentage of Question 11

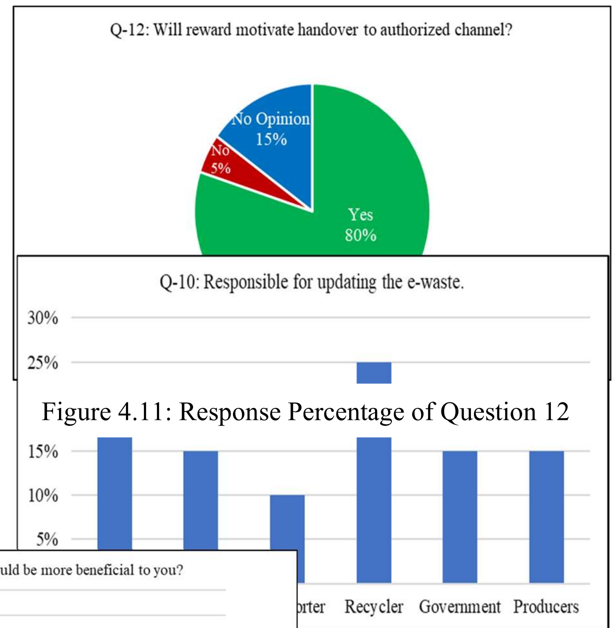


Figure 4.11: Response Percentage of Question 12

ercentage of Question 10

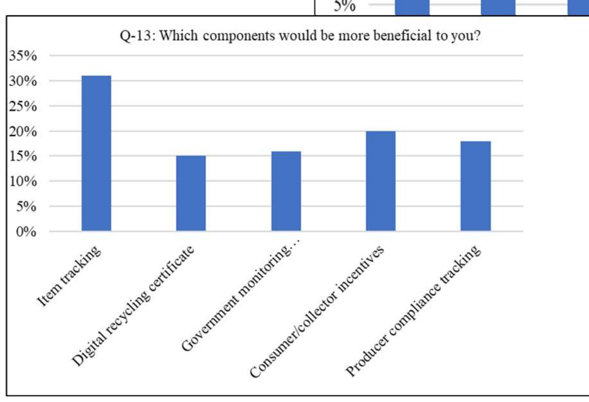


Figure 4.12: Response Percentage of Question 13

4.4 Proposed Reverse Logistics Framework

The conceptual framework shows how blockchain is associated with electronics reverse logistics. The process begins when a consumer return used or inefficient electronic devices. These products then proceed to a collecting stage, which is the initial step in assisting the flow of products for further processing. It starts with customers returning items and then goes through an inspection to check their condition, usability, and potential for recovery. Based on the results, products are put into different groups: those that can be fixed are fixed and put back into use, those that can be reused are renewed, those that can be recycled are processed to get valuable materials, and those that can't be fixed are sent to safe disposal. The unique thing about this framework is that it uses blockchain technology, which makes sure that the whole process is open and accountable. Blockchain keeps an unchangeable record of each transaction, which stops tampering and builds trust among all parties involved. Smart contracts make sure that rules are followed and transactions are made automatically. A traceability dashboard shows you what's happening with your products in real time, from the time they are returned to the time they are sold. This model combines reverse logistics with blockchain to help recover resources more efficiently, cut down on e-waste pollution, promote sustainability, and build consumer trust through practices that can be verified.

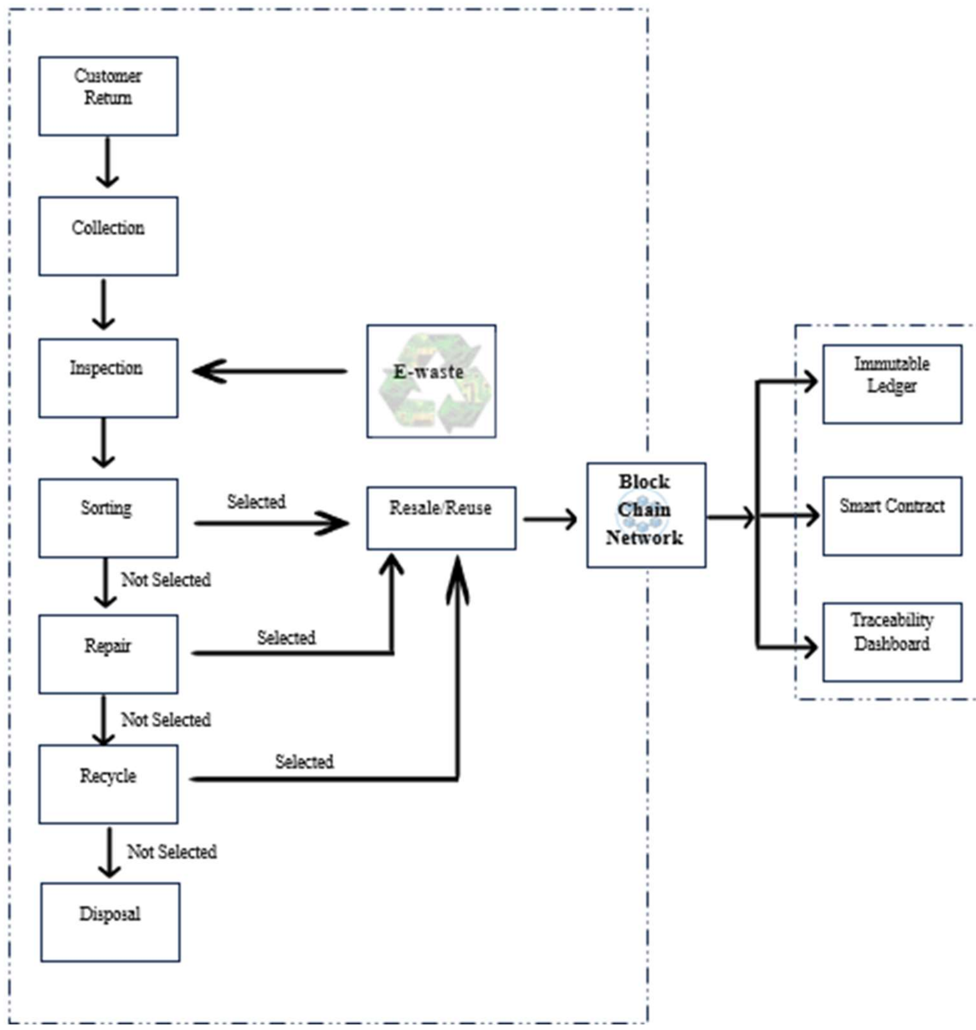


Figure 4.13: Proposed Reverse Logistics Framework

4.4.1 Strength of Proposed Reverse Logistics Framework

The block chain application in electronics reverse logistics area is the main driver of substantial advantages that, in a direct manner, could solve the problems in the current re-utilization structure. One of the points most emphasized is 'end-to-end transparency'; that is, using block chain, transparency becomes possible within the whole network. Block chain is a ledger accessible and open to every individual having detailed transactional information about the item, from its origination to when it is disassembled, cleaned, and recycled or resold again (Nandi, 2019). As all stake-holders involved have full access to the same installed data, the denials of the conflicts cause less frequent occurrences, and responsibilities are heightened, while the traceability aspect also becomes more reliable significantly. It can be said that since records are immutable, there is no altering, hence all the involved parties can easily trust the accuracy of the provided information regardless of the time (Muduli et al., 2023)**.** The idea of trust is where manufacturers, retailers, logistics companies, recyclers, and consumers all become beneficiaries of a block chain environment. Moreover, fraud activities are less likely due to the nature of block chain technology regarding easy exposure of counterfeit components, fraudulent warranty claims, and illegal e-waste dumping (Xu et al., 2019). The use of smart contracts becomes instrumental for operational efficiency that practically automate the necessary activities such as warranty validation, payment, recycling notifications, etc. (Agrawal et al., 2015). By reducing paperwork, delays, and human errors, smart contracts create the overall reverse logistics process faster and effective while cutting the administrative costs paid at the same time. The customers are provided with the means to trace their products in real-time from the very moment of receipt, and clear updates are also communicated to them about repairs, refunds, or recycling statuses represents more transparency and create satisfaction. Moreover, block chain also helps a lot with regulatory compliance and is a big support in the sustainability efforts. Its highly secure and hack-proof process records provide unambiguous evidence of compliance, which helps companies to not only meet regulations but also support sustainability goals (Ping et al., 2024).

5. Conclusion

The focus of this study is the prospective connection of blockchain and reverse logistics to address the growing problem of electronic waste in Bangladesh in particular. Demand is rising with the pace of technological innovation, and e-waste is swiftly increasing and reverse logistics solutions aren't able to keep up with it. In general, and without any legal supervision, the recycling of e-waste takes place in informal channels presenting known questions of efficiency, safety, and environmental sustainability.

This study took a qualitative, conceptual approach that used ideas stemming from exploratory survey data and information from secondary sources to analyze ongoing issues. The participants were from the consumer, recycler, manufacturer, and regulatory groupings which provided a comprehensive view of level of awareness, challenges and prospects for enabling more sustainable systems as stakeholders. The results were quite shocking: while stakeholders were clearly motivated to engage - once transparency and sufficient incentives were created, awareness of e-waste regulations was astonishingly low, and formal recycling pathways were only used rarely.

Taking these issues in consideration, the blockchain-based reverse logistics model proposed in this research appears to provide great promise. While smart contracts could provide ease of process for things such as warranty service validation, payments and compliance, blockchain technology could also provide data integrity, visibility and reliability throughout the supply chain. However, as the survey data indicated, there are many practical rewards.

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