



Implementation of Posti's Mail and Parcel Logistics System for the Modernization and Efficiency Enhancement of Nigerian Postal Services (NIPOST)

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Abstract

Postal services play a crucial role in global economies, driving growth and prosperity. This study investigated the Nigerian Postal Services (NIPOST) infrastructure to identify areas for improvement and proposed a framework for integrating electronic parcel machines (EPMs) to enhance customer experience, operational efficiency, and cost-effectiveness. Drawing inspiration from Finland's Posti, the research focused exclusively on logistics and parcel delivery, excluding other modernization aspects such as digital mail and financial services.

A mixed-methods approach was employed, combining qualitative and quantitative research. Semi-structured interviews were conducted with key stakeholders from NIPOST and Posti, while relevant documents were analyzed to provide context. Additionally, a survey was distributed to NIPOST customers in key Nigerian cities to assess awareness, interest, and preferences regarding EPMs.

The results indicated significant potential for EPMs to improve NIPOST's service delivery, with benefits including increased convenience, security, and customer satisfaction. The study developed a comprehensive roadmap for implementing EPMs, emphasizing scalability, performance measurement, and strategic placement. Ultimately, it was concluded that adopting EPMs could substantially enhance NIPOST's operational efficiency and customer service, positioning it more competitively in the evolving postal landscape.

Keywords/tags (subjects)

Nigerian Postal Services (NIPOST), Electronic Parcel Machines (EPMs), Customer Experience, Operational Efficiency, Cost-Effectiveness, Logistics Network, Last Mile Delivery, Parcel Delivery Efficiency, Technology Integration, Posti (Finland's Postal Service), E-commerce, Security, Strategic Placement, Performance Tracking and Consumer Satisfaction

For example, the confidentiality marking of the thesis appendix. See Project Reporting Instructions, Section 4.1.2.

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Glossary

1. **Last Mile Delivery:** The final step in the delivery process where a parcel is transported from a distribution center to the end recipient. This stage is crucial for customer satisfaction and often involves logistical challenges.
2. **Electronic Parcel Machines (EPMs):** Automated lockers that allow customers to collect and drop off parcels at their convenience. EPMs enhance delivery efficiency and customer satisfaction by providing flexible parcel retrieval options.
3. **NIPOST (Nigerian Postal Service):** The official postal service provider in Nigeria, responsible for mail and parcel delivery across the country.
4. **Posti:** The Finnish postal and logistics service company, known for its advanced infrastructure and successful integration of electronic parcel machines.
5. **Framework:** A structured plan or set of guidelines used to support the development and implementation of a project or system.
6. **Key Performance Indicators (KPIs):** Metrics used to evaluate the success of an organization or project in achieving its objectives. In postal services, KPIs might include delivery times, customer satisfaction rates, and operational costs.
7. **Pilot Projects:** Small-scale, preliminary studies conducted to evaluate the feasibility, time, cost, and adverse events involved in a research proposal, often used before a full-scale implementation.
8. **Logistics:** The detailed coordination and implementation of complex operations involving the movement of goods, services, or information from origin to destination.
9. **Internet of Things (IoT):** A network of physical devices embedded with sensors, software, and other technologies to connect and exchange data with other devices and systems over the internet.
10. **Automation:** The use of technology to perform tasks without human intervention, increasing efficiency and accuracy in operations.
11. **Predictive Analytics:** The use of statistical techniques and algorithms to analyze historical data and make predictions about future events or behaviors.
12. **Artificial Intelligence (AI):** The simulation of human intelligence processes by machines, particularly computer systems, which include learning, reasoning, and self-correction.

1 Introduction

The Nigerian Postal Service (NIPOST) has been an integral part of Nigeria's communication landscape since the first post office was established by British colonialists in 1852. "Initially a branch of the London General Post Office, it evolved into a full-fledged department in 1862, marking the beginning of structured postal services in Nigeria" (Nigerian Postal Service, 2024, para. 1).

Over the years, NIPOST has expanded its reach and services, adapting to the nation's changing needs. According to the Nigerian National Bureau of Statistics, there are over 12,000 employees and 2794 postal agencies and post offices in Nigeria; NIPOST has played a pivotal role in facilitating commerce, supporting social connections, and contributing to national development. Despite its extensive network and critical role, NIPOST has faced challenges in modernizing its operations to keep pace with the rapid growth of digital communication and e-commerce.

While Nigeria and Finland offer various package delivery options, Finland postal service is better when it comes to speed and security. Finnish road infrastructures allow for swift deliveries, often reaching destinations within a day. Security is also a strong point in Finland, with low crime rates and reliable tracking systems. In contrast, Nigerian parcel and package deliveries can be slower due to infrastructure limitations and may face a higher theft risk. However, Nigerian delivery services are more affordable.

The current state of deliveries in Nigeria presents a mixed picture. Private logistics companies have flourished because they offer swift and relatively secure delivery services across major cities, NIPOST which is the government own postal service offers slower deliveries and customers complain of lost items, thus they must improve their efficiency. Deliveries can be slow due to limited sorting infrastructure and a reliance on outdated methods. Security concerns are also present, with reports of occasional theft or misplaced packages. Despite these challenges, affordability remains a significant advantage for NIPOST, making it a preferred choice for price-conscious consumers, particularly in remote areas. This uneven landscape highlights the need for NIPOST to embrace technological advancements to compete effectively and improve the overall delivery experience for Nigerians.

Postal services are vital to global economies, fostering growth and prosperity for nations. This thesis investigates NIPOST's current infrastructure, identifying areas for improvement, and explores the potential integration of electronic parcel machines (EPMs) into the Nigerian Postal Services (NIPOST) logistics network, with a focus on customer experience, operational efficiency, and cost-effectiveness. Inspired by Finland's Posti, it also proposes a framework for integrating electronic parcel machines (EPMs) to enhance NIPOST's efficiency and customer satisfaction. The study does not cover other modernization aspects of postal services, such as digital mail services or financial services, because the primary aim is to address logistics challenges and improve parcel delivery efficiency.

1.1 Technological Innovation in Postal Services

Technological innovation is pivotal in the postal industry, with advancements like tracking systems, automation, predictive analysis, artificial intelligence (AI) and machine learning (ML), internet of things playing a significant role. These technologies are transforming service improvement, new product offerings, and meeting higher consumer expectations for quick processing and convenient delivery. Innovations such as automated sorting and PDAs for signature scanning have notably enhanced last-mile deliveries by adding value and security for consumers. (Patel & Patel, 2022, p. 2). Some of these technologies can already be seen in the postal sector in advanced countries, but postal sectors in developing countries rely on private logistics companies to bring this technology to the region.

Technology significantly enhances efficiency in the logistics and last-mile delivery industry. This section introduces the impact of tracking systems, automation, IoT, predictive analytics, machine learning (ML), and artificial intelligence (AI) on improving operational efficiency in the postal sector.

Tracking Systems

Technologies like RFID, GPS, and barcodes enable real-time tracking, providing end-to-end visibility of parcels. This improves transparency, customer communication, and operational control, reducing parcel loss or theft. Automated notifications keep senders and recipients informed, facilitating prompt issue resolution (Xu et al., 2016).

Automation

Automating manual processes such as parcel handling, sorting, and delivery increases efficiency and reduces labor costs. Parcel sorting machines equipped with barcode scanners or image recognition technology can sort parcels quickly and accurately. Automated routing and scheduling algorithms optimize delivery routes by considering parcel volumes, traffic conditions, and delivery time windows. Additionally, data entry and documentation automation improve accuracy and reduce administrative burdens (McKinsey & Company, 2020).

Predictive Analytics

Leveraging historical data and ML algorithms, predictive analytics can forecast demand patterns, parcel volumes, and delivery trends. For instance, AI in parcel lockers can predict with 96% accuracy which parcels will be picked up within 24 hours (Posti, 2021). Analyzing trends helps anticipate peak periods, optimize resource allocation, and mitigate potential delivery issues (Hofmann & Rüscher, 2017).

Artificial Intelligence (AI) and Machine Learning (ML)

AI has the capability to streamline processes like route planning, parcel sorting, and customer service. AI-driven chatbots and virtual assistants can manage customer inquiries, track parcels, and offer real-time updates, minimizing the need for human involvement and enhancing response times. ML algorithms continuously learn and adapt, resulting in more accurate predictions and personalized recommendations (Toorajipour et al., 2021).

Internet of Things (IoT)

IoT devices, including sensors and connected vehicles, track environmental factors, vehicle performance, and parcel conditions. Analysing this data can reduce fuel consumption, optimize delivery routes, and ensure the integrity of perishable goods. IoT also facilitates predictive maintenance of equipment and delivery vehicles, minimizing downtime and optimizing fleet efficiency (Ben-Daya et al., 2019).

1.2 Comparison between Nigeria and Finland postal services

For NIPOST to implement a system like Posti's Electronic Parcel Lockers (EPM) in Nigeria, careful consideration of several factors is essential. These factors include infrastructure, technology, logistics, and consumer behaviour. To ensure a smooth user experience and successful integration of EPMs into NIPOST's infrastructure, the following modifications should be considered:

Infrastructure Adaptation:

The infrastructure in Nigeria, including road networks and urban planning, significantly differs from Finland's. Adaptations must involve identifying suitable locations in densely populated areas such as commercial hubs and urban centers where foot traffic is high, and accessibility is relatively good. According to Giuffrida et al. (2016), a parcel locker should not be more than 3.5km away from the customer in urban areas. When the distance exceeds 3.5km, the customer no longer benefits from using EPMs. Ideal locations could include banks, given Nigeria's large network of 4,437 commercial bank branches (Abiodun, 2024). Bank premises offer security and high foot traffic, as many Nigerians visit banks daily to use ATMs and conduct transactions.

Power Supply:

According to World Economic Forum, (2023) Nigeria faces challenges with adequate and uninterrupted power supply, especially in rural and peri-urban areas with over 140 million people not having access to electricity which is about 70% of the population compared to Finland where 100% of the population has access to electricity according to (World Bank Open Data, n.d.). Therefore, for the successful implementation of EPMs, NIPOST would require solutions to ensure uninterrupted power supply for the EPMs operations. Options could include solar-powered lockers or backup power sources like generators or batteries.

Security Measures:

With a population of over 228 million people (Nigeria Population, 2024) and 83 million people living below the \$381 per year poverty line (World Bank Group, 2020), security is a major challenge.

Issues such as theft and vandalism are common. EPMs used in Nigeria would need to be enhanced with advanced locking mechanisms and surveillance systems to safeguard parcels and prevent unauthorized access.

Cultural and Socioeconomic Factors:

Consumer behavior and preferences in Nigeria differ from those in Finland. NIPOST would need to conduct thorough market research to understand the expectations, preferences, and challenges faced by Nigerian consumers regarding parcel delivery. According to the survey conducted for this thesis, the ideal target customers are the growing young population in urban areas like Lagos. It is also important to design user-friendly interfaces and ensure inclusivity.

Logistics and Distribution Network:

The large land size and population of Nigeria present logistical challenges for parcel delivery. NIPOST would need to integrate the EPMs into their established distribution network and collaborate with local partners such as banks, retail outlets, and courier services to optimize last-mile delivery.

Regulatory Compliance:

Implementing EPMs in Nigeria would require compliance with several regulatory frameworks such as Data Protection, Consent, Companies and Allied Matters Act 2020, and Taxation. NIPOST needs to engage with government agencies and policymakers to navigate the necessary regulatory frameworks and address all legal and licensing issues.

Public Awareness and Education:

According to Austin (2023), a successful product launch is critical. Building awareness and trust among Nigerian consumers about the benefits and security features of EPMs is crucial for adoption. Targeted marketing efforts, public education campaigns, and demonstrations of the system's functionality would help reduce concerns and encourage uptake.

1.3 Thesis Objective

This thesis aims to assess the feasibility and potential impact of integrating electronic parcel machines (EPMs) into NIPOST's logistics network. Drawing on the successful implementation of EPMs by Finland's Posti, the study will:

- Develop a detailed roadmap for implementing EPMs at NIPOST, including strategic placement, management, and maintenance.
- Establish key performance indicators (KPIs) to measure the success of EPM integration.
- Provide actionable recommendations for enhancing NIPOST's service quality and competitive positioning through EPM adoption.

1.4 Research Questions

The study examines the feasibility of implementing electronic parcel machines (EPMs) within the (NIPOST) network, investigating their impact on customer experience, operational efficiency, and cost-effectiveness. To guide the research, the following questions will be addressed:

- Considering potential security challenges, will electronic lockers improve customer convenience and satisfaction in Nigeria?
- How will the implementation of electronic parcel machines (EPMs) impact customer convenience and satisfaction within the NIPOST network?
- How can electronic lockers be strategically placed, managed, and maintained to optimize customer convenience, operational efficiency, and cost-effectiveness for NIPOST?

By addressing these sub-questions, this research would evaluate if the implementations of EPMs in NIPOST can improve customer experience by offering a more flexible pickup and delivery option, explore how EPMs can enhance parcel delivery compared to the traditional dispatch riders, establish strategies for optimal EPM placements, management and maintenance which can be measured against set KPIs, and to finally conclude if EPMs are a viable solution for NIPOST's current processes.

1.5 Delimitation of the study

The delimitation of this study focuses specifically on the logistics involved in implementing Electronic Parcel Machines (EPM) for NIPOST in Nigeria, rather than exploring other aspects of modernization such as digital payment systems, administrative reforms, or customer service enhancements. By narrowing the focus to logistics, the study aims to provide a detailed and actionable analysis of the challenges and solutions related to the physical distribution, location planning, power supply, and security measures necessary for the successful deployment of EPMs.

Logistics, as the core focus, includes examining the integration of EPMs into existing distribution networks, identifying optimal locations for parcel lockers, ensuring reliable power sources, and addressing security concerns related to parcel storage. This focus is chosen to manage the scope of the research effectively, making the study more feasible and ensuring that the findings are relevant and actionable for NIPOST's logistical improvements.

Other modernization aspects, while important, are excluded from this study to maintain clarity and depth in the logistical analysis. These intentional omissions are made to prevent the research from becoming too broad and to guarantee that the study's goals can be realistically accomplished with the available time and resources. (DiscoverPhDs, 2020; Researcher.Life, 2020).

2 Research Methodology

2.1 Mixed methods approach.

According to Hassan (2023) Mixed methods research utilizes both quantitative and qualitative research methods within a singular study to provide a thorough comprehension of the research issue. Also as stated in Brewer and Hunter (2006), using a single research method leaves untested rival hypotheses that often calls the validity of a study findings into question. Therefore, this thesis employs a mixed-methods approach to explore the feasibility and effectiveness of implementing electronic parcel lockers within NIPOST's logistics network. Mix methods research was defined by (Johnson et al. 2007, p. 123):

Mixed methods research is the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e. g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration.

According to Hassan (2023), mix method research is useful when the research problems require a deep understanding of context and subjective experience of participants. The methodology combines qualitative and quantitative data collection and analysis to understand the potential impact and optimal implementation strategies comprehensively. Hassan (2023), also noted that like every research method the mix method has its advantages and limitations, some of the advantages are the ability to provide a comprehensive understanding of the research problem, ability to use data to verify findings, flexibility, and its applicability to practical situations. Some limitations are the time-consuming nature, sampling bias and the difficulty in balancing both the quantitative and qualitative research method.

2.2 Qualitative Research: Semi-Structured Interviews & Document Analysis

In agreement with Adeoye-Olatunde and Olenik (2021), semi-structured interviews provide the autonomy to explore other ideas that may arise while maintaining focus on the primary subjects. Given the nature of the research question, understanding the individual experiences of company

representatives is crucial to avoid constraining the analytical framework (Galletta, 2013). Therefore, during this thesis, semi-structured interviews were conducted with key stakeholders from NIPOST and Posti. These interviews targeted:

- NIPOST Management and Operational Staff: To understand current challenges and customer needs.
- Posti Personnel: Involved in the implementation of their electronic locker system to learn from their experiences and best practices.

The interviews were conducted over a period of one month, each lasting approximately 45 minutes. The sessions were organized via online platforms like Microsoft Teams for Posti and WhatsApp calls for NIPOST. These interviews aimed to gather insights and make inferences on:

- Stakeholder Perspectives: Exploring attitudes towards implementing electronic lockers, including potential benefits and challenges for NIPOST's operations and customer service.
- Operational Integration: Investigating concerns regarding the integration of lockers with existing infrastructure, delivery routes, and staff workflows.
- Customer Needs: Understanding customer preferences for locker usage, including convenience, security, and accessibility.

These interviews provided essential qualitative data, offering insights into experiences, perceptions, and behaviors critical for the research (Adeoye-Olatunde and Olenik, 2021; Galletta, 2013), the method also allowed for flexibility in exploring topics in-depth while ensuring that all relevant areas were covered (Kvale, 2007).

Document Analysis

Document analysis, as defined by Glenn (2009), is a systematic method for reviewing and evaluating documents. Relevant documents from NIPOST and Posti, such as annual reports, strategic plans, and technical specifications related to parcel delivery and logistics, were analyzed. This approach allowed for the collection of empirical data, providing a background on current operations and strategic goals, and aiding in understanding the context and feasibility of implementing Elec-

tronic Parcel Machines (EPMs) (Glenn, 2009), Bowen (2009) notes that document analysis is valuable for corroborating and augmenting data collected through other methods, offering a richer and more nuanced understanding of the research problem.

The document analysis included:

- Annual Reports: To gain insights into the operational performance and strategic direction of both postal services.
- Strategic Plans: To understand the long-term goals and initiatives related to parcel delivery improvements.
- Technical Specifications: To review the technical details of the existing parcel delivery systems and proposed locker solutions.
- These documents were essential in providing a comprehensive understanding of the organizational context, operational capabilities, and strategic priorities of NIPOST and Posti, thus informing the feasibility and planning for the implementation of electronic parcel lockers (Glenn, 2009).

By combining the qualitative insights from interviews with the empirical data from document analysis, this research aimed to develop a robust framework for the successful integration of electronic parcel lockers within NIPOST's logistics network. This mixed-methods approach ensured a well-rounded understanding of both theoretical and practical aspects, facilitating informed decision-making and strategic planning (Adeoye-Olatunde and Olenik, 2021; Galletta, 2013; Glenn, 2009).

2.3 Sampling and Quantitative Data Collection

The aim of quantitative research is to obtain numerical data and uncover patterns in behavior, motivation, emotion, and cognition (Farnsworth, 2024). For this study, the implementation plans focused on key cities, including Lagos, Port Harcourt, and Abuja. The practice of sampling in statis-

tics and data analytics involves selecting a subset of data from a larger population or dataset (Narula, 2023). Random sampling methods were employed to secure a representative sample of stakeholders and prospective locker sites within NIPOST. Selecting a proper sample size improves the efficiency and practicality of the research.

Customer Survey

An online customer survey was conducted in Lagos, Port Harcourt, and Abuja targeting NIPOST customers to assess their:

- **Awareness and Interest in Electronic Parcel Lockers:** This included gauging customer awareness and understanding of electronic parcel lockers.
- **Preferred Delivery and Pickup Options:** Customers' preferred methods for parcel delivery and pickup were explored.
- **Attitudes Towards Security and Convenience of Lockers:** Customers' perceptions of the security and convenience of using electronic lockers were examined.

In addition, an analysis of historical NIPOST operational data, where available, was performed to understand current delivery times, processing efficiency, and customer satisfaction metrics in these selected cities.

During the data collection phase, an online survey was developed and distributed to NIPOST customers in Lagos, Port Harcourt, and Abuja. The survey explored several key areas:

- **Customer Awareness:** Gauging customer awareness and understanding of electronic parcel lockers.
- **Interest in Locker Usage:** Measuring customer interest in using electronic lockers for parcel pickup or delivery.
- **Delivery Preferences:** Exploring factors such as pickup location flexibility, security concerns, and potential impact on delivery speed.
- **Demographics:** Including demographic questions (age, location, etc.) to segment data and reveal variations in customer preferences.

According to Fullstory (2024), quantitative data is used when a researcher needs to quantify a problem and answer questions like “what,” “how many,” and “how often.” This thesis employed quantitative data collection targeted at NIPOST customers to get accurate information from their perspective.

Quantitative Data Analysis

Analysis of survey data commenced with a phase of descriptive statistical analysis, succeeded by a deeper examination, such as investigating causality and correlation, or generating classifications derived from the descriptive statistical analysis. (Quantitative Analysis — Jyväskylän Yliopiston Koppa, n.d.). The quantitative data collected during the research comprised survey responses from NIPOST customers. Survey data were analyzed using descriptive statistics to gauge overall trends and preferences, followed by inferential statistics to explore relationships between demographic factors and preferences.

Secondary Data

In addition to the primary data collected, relevant articles, reports, and industry publications were reviewed to address the theoretical framework of electronic parcel lockers and their role in modernizing postal delivery services.

By combining theoretical knowledge with practical insights from stakeholders and data analysis, the research offered a well-rounded framework for NIPOST to consider when implementing electronic parcel lockers for improved parcel delivery services. The mixed-methods approach used in the research provided a comprehensive understanding of the potential impact of electronic parcel lockers on NIPOST's operations (Schoonenboom & Johnson, 2017).

2.4 Literature Review

A literature review is described as a systematic way of collecting and synthesizing previous research (Baumeister & Leary, 1997; Tranfield, et al. 2003). This methodology is essential for understanding the current state of knowledge, identifying gaps, and contextualizing the study within the broader academic and industry discourse.

In this thesis, the literature review focused on the exploration of existing technologies, case studies, and theoretical frameworks relevant to electronic parcel lockers (EPMs) and their implementation in logistics networks. Key sources included academic journals, industry reports, and case studies that provided insights into the benefits, challenges, and best practices of EPMs globally. The literature review helped to:

- Understand the efficiency, security, and customer satisfaction associated with EPMs.
- Highlight successful implementations in various countries.
- Inform the development of the proposed framework for NIPOST.

According to Webster and Watson (2002), a well-conducted literature review not only summarizes existing knowledge but also identifies areas where further research is needed. This approach ensured that the study was grounded in the most relevant and up-to-date research available.

2.5 Framework Development

It is essential to establish a clear framework and performance metrics for the integration of Electronic Parcel Machines (EPMs) within the Nigerian Postal Service (NIPOST). This systematic method guarantees thorough planning and execution of all project aspects, preemptively tackling potential hurdles. Integration of performance metrics enables NIPOST to consistently evaluate the efficacy of EPMs, enabling data-driven adjustments to improve operational efficiency and customer contentment. Consolidating insights from various data outlets will formulate a guideline for implementing electronic parcel lockers in NIPOST's network. This framework will address:

- Scalability Strategy: Designing a phased implementation plan, considering location and future network expansion for lockers.

- **Performance Measurement:** Establishing key performance indicators (KPIs) to evaluate the effectiveness of the locker system, focusing on customer satisfaction.

Framework development is fundamental to project management because it establishes the methodologies, processes, tools, and templates necessary for effective project execution. A project management framework typically includes the project lifecycle, project control cycle, and the tools and templates required to navigate these cycles (ProjectManager.com, 2022). By providing a structured approach, a framework helps in managing complexity, ensuring that all aspects of the project are addressed systematically.

- **Project Needs Assessment:** One of the primary benefits of a project management framework is its ability to tailor processes to the specific needs of a project. This involves assessing factors such as complexity, scope, budget, and stakeholder expectations (Kerzner, 2017). A well-developed framework aligns these elements, ensuring that the project's requirements are met efficiently.
- **Flexibility and Adaptability:** Effective frameworks are adaptable, allowing project managers to customize processes according to the unique demands of their projects. This flexibility is crucial for accommodating changes and managing unforeseen challenges without compromising the project's structure and timelines (Scavetta, 2022; ProjectManager.com, 2022).
- **Enhanced Communication and Collaboration:** Frameworks facilitate better communication and collaboration among team members and stakeholders. By defining roles, responsibilities, and communication protocols, a framework ensures that all parties are aligned and engaged throughout the project lifecycle (Monday.com, 2022).
- **Improved Resource Management:** By mapping out the project's tasks, resources, and timelines, a framework helps in optimizing resource allocation and utilization. This not only enhances efficiency but also helps in mitigating risks associated with resource shortages or mismanagement (Kerzner, 2017).

3 Knowledge Base

This chapter provides an in-depth analysis of the theoretical foundations, benefits, challenges, and best practices related to Electronic Parcel Machines (EPMs) in the context of last mile delivery. It

synthesizes current literature and empirical findings to establish a comprehensive understanding of EPMs, their impact, and their potential applications.

3.1 Theoretical foundation

The rise of Electronic Parcel Machines (EPMs) has significantly transformed the last mile delivery landscape, addressing the increasing demand for efficiency and convenience in the e-commerce sector. The last mile delivery, which refers to the final step in the delivery process where a parcel is transported from a transportation hub to its destination, is often the most complex and costly segment of the supply chain (Gruenwald, 2020). The implementation of EPMs aims to mitigate these challenges by providing secure and accessible parcel lockers, thereby enhancing delivery efficiency and customer satisfaction (Upadhyay, 2023).

Electronic parcel lockers (EPMs) are an innovative solution in the logistics industry, designed to improve the efficiency of last-mile delivery. EPMs offer customers a convenient and secure way to receive parcels at their convenience, reducing the need for home deliveries and mitigating issues related to missed deliveries and package theft (Upadhyay, 2023). According to Upadhyay, smart lockers have revolutionized how items are stored and received, offering 24×7 access and safety.

One critical factor driving the adoption of EPMs is the decline in traditional mail due to the rise of digital communication methods. This shift has imposed financial pressures on postal services globally, compelling them to seek innovative solutions to remain competitive (Neuhaus et al., 2019). EPMs represent a strategic response to these pressures, enabling postal services to modernize their operations and meet the evolving expectations of digital-era consumers.

In Germany, the surge in online shopping during 2020 significantly increased parcel deliveries, especially for home deliveries (Gruenwald, 2020). This trend underscores the need for innovative solutions like EPMs to handle the growing demand for last-mile logistics. Gruenwald (2020) reports a 13% increase in the number of parcels shipped overall, with a notable 17% rise in B2C e-commerce shipments. Understanding these changes highlights the potential adaptation of similar technological advancements to meet the specific needs of the Nigerian Postal Service (NIPOST) and its customers (Gruenwald, 2020).

Germany experienced a significant increase in parcel deliveries, driven by the rise in online shopping during 2020. According to Gruenwald (2020), there was a 9% increase in parcels shipped within Germany, reflecting a global shift towards e-commerce. This surge highlights the need for innovative solutions like EPMs to handle the growing demand for last-mile logistics.

The success of EPMs heavily depends on their location. Kahr (2022) emphasizes that the placement of EPMs determines their usage by customers, as they need to be conveniently close to reduce travel time. Most customers prefer not to travel far to pick up parcels. In Nigeria, the logistics industry is dominated by delivery agents using motorcycles, offering direct doorstep deliveries, presenting both a challenge and a potential advantage over EPMs (Mirilla, 2022).

EPMs have proven effective in coping with the increased demand for last-mile logistics. Upadhyay (2023) discusses how smart lockers offer 24×7 access and safety, eliminating missed deliveries and package theft. These innovations can be adapted to meet the specific needs of NIPOST and its customers, providing a flexible and secure method for parcel collection.

In the context of Nigeria, the express parcel market is rapidly expanding, significantly impacting NIPOST's operations (Modupe et al., 2022). The study by Modupe et al. (2022) highlights the substantial impact of courier tracking systems on enhancing service quality within NIPOST. The government and NIPOST's administration should allocate additional resources towards developing courier tracking infrastructure to capitalize on innovations within the express parcel industry.

Finland's Posti provides a successful model of EPM implementation that can be leveraged to enhance NIPOST's efficiency and customer satisfaction. Posti's experience with electronic lockers demonstrates how EPMs can improve last-mile delivery by offering customers a convenient and secure method to collect parcels at their convenience (Posti, 2021). By analyzing Posti's implementation, this research aims to develop a roadmap for NIPOST, exploring how EPMs can enhance customer convenience and increase parcel security.

Like Posti, NIPOST must also develop comprehensive communication strategies to inform customers about the benefits and usage of EPMs (Lee & Whang, 2000). Educational campaigns, including instructional videos, brochures, and customer service support, are crucial for guiding users

through the process. Ensuring that customers understand how to use EPMs will increase their acceptance and satisfaction.

Effective collaboration with stakeholders, including logistics providers, technology partners, and regulatory bodies, is essential for the successful implementation of EPMs (Lee & Whang, 2000). For NIPOST, this would involve working closely with technology providers to ensure that the EPMs are well-integrated with existing systems and engaging with regulatory bodies to ensure compliance with relevant laws and standards. By fostering strong partnerships, NIPOST can leverage the expertise and resources of its stakeholders to enhance its delivery processes.

The theoretical foundation of EPMs is rooted in their ability to enhance last mile delivery by providing 24/7 access to parcels, reducing the likelihood of missed deliveries, and improving overall delivery security. According to Patel & Patel (2022), the adoption of digital technologies, including EPMs, is essential for postal and parcel firms aiming to achieve high performance in a competitive market. These technologies facilitate scalable solutions that cater to the growing demands of e-commerce, thus ensuring the sustainability of last mile logistics.

3.2 Benefits and challenges of EPMs

The deployment of EPMs offers several notable benefits. Firstly, they provide a secure and convenient solution for parcel collection, significantly reducing the risk of theft and missed deliveries. Customers can retrieve their packages at their convenience, which enhances overall satisfaction (Kahr, 2022). Additionally, EPMs can be strategically placed in high-traffic areas such as shopping centers, residential complexes, and transportation hubs, ensuring accessibility and convenience for users.

Furthermore, EPMs ease the burden on traditional customer support channels by integrating with digital platforms enabling customers to monitor their packages in real-time and receive automated notifications. This integration minimizes the need for direct customer service interactions, thereby streamlining operations and reducing operational costs (Liamputtong, 2020).

However, the implementation of EPMs also presents certain challenges. One significant challenge is the initial investment required for setting up the EPM infrastructure, including the cost of purchasing and installing the lockers, as well as integrating them with existing logistics systems. Additionally, the success of EPMs heavily depends on their location. They need to be conveniently situated to minimize the travel time for customers, as most prefer not to travel far to pick up their parcels (Mirilla, 2022).

Another challenge is ensuring the maintenance and security of the EPMs. Regular maintenance is necessary to keep the lockers functional and secure, which requires additional resources and personnel training. Furthermore, there are concerns regarding the potential impact of EPMs on traditional delivery jobs, as the increased use of lockers might reduce the demand for home deliveries, affecting the employment of delivery personnel.

3.3 Best practices from global implementations

Examining the global implementations of EPMs provides valuable insights into best practices that can be adapted for successful deployment in various contexts. One notable example is Posti, the leading delivery and fulfillment company in Finland, which has effectively integrated EPMs into its last mile delivery strategy since 2017 (Beilhammer & Beilhammer, 2022). Posti's approach includes strategic placement, continuous capacity expansion, and leveraging advanced logistics systems to enhance operational efficiency.

Posti's success with EPMs is attributed to several key factors. Firstly, they conduct thorough analyses to determine optimal locations for the lockers based on parcel delivery volumes and customer convenience. This strategic placement ensures high usage rates and customer satisfaction (Kultalahti, 2024). Additionally, Posti has invested in modernizing their infrastructure and integrating EPMs with their logistics systems, enabling seamless parcel tracking and timely deliveries.

The successful implementation of Electronic Parcel Machines (EPMs) within postal services like NIPOST also necessitates comprehensive workforce training. This training ensures that employees are proficient in operating EPMs, understand their functionalities, and can effectively assist customers. According to McKinsey & Company (n.d.), the training components should include.

- **Introduction to EPMs:** Employees need to understand the purpose, functionalities, and benefits of EPMs. This foundational knowledge ensures that all staff are aligned with the organizational goals of adopting this technology. Training should cover the theoretical underpinnings of EPMs, including their role in enhancing efficiency and customer satisfaction (Beer & Mulder, 2020; McKinsey & Company, n.d.).
- **Technical Training:** Detailed technical training is essential. This includes startup and shut-down protocols, troubleshooting common issues, and routine maintenance practices. Ensuring that employees are technically adept minimizes downtime and operational disruptions. Effective technical training programs often incorporate hands-on practice and simulations to build confidence and competence in handling EPMs (Beer & Mulder, 2020; UC Berkeley Labor Center, n.d.).
- **Customer Service Training:** Employees should receive training to improve their interpersonal skills, enabling them to assist customers with using EPMs and addressing inquiries effectively. Scenario-based training, including role-playing exercises, can enhance communication and problem-solving abilities, fostering a culture of professionalism and excellent customer service (Bacal, 2021; McKinsey & Company, n.d.).
- **Security Protocols and Fraud Prevention:** Training must cover security protocols to safeguard EPMs against potential threats, including fraud and tampering. Employees need to be vigilant and knowledgeable about the latest security measures and best practices. This training includes recognizing suspicious activities and understanding the procedures for reporting and handling security incidents (Smith & Brooks, 2019).
- **Operational Procedures and Policies:** Comprehensive training on operational procedures and policies is vital. This includes guidelines for parcel acceptance, transaction processing protocols, and adherence to organizational standards. Clear and detailed training materials and manuals should be provided to help employees navigate EPM operations effectively and confidently (McKinsey & Company, n.d.).
- **Continuous Learning and Feedback:** Promoting a culture of continuous learning and feedback is crucial for maintaining high standards of service and operational efficiency. Regular updates and refresher courses should be provided to keep employees informed about new features, best practices, and any changes in operational procedures. Feedback mechanisms allow employees to share their experiences and suggestions, fostering a dynamic and innovative work environment (Garvin, 2018; McKinsey & Company, n.d.).

- **Change Management Framework:** Implementing a change management framework can help ease employee apprehensions and encourage buy-in by highlighting the transformative potential of EPMs in improving productivity, job satisfaction, and service delivery. Effective change management includes clear communication, training support, and addressing any concerns or resistance to change (Kotter, 1996; McKinsey & Company, n.d.).

Another best practice according to Kultalahti (2024), is the implementation of robust security measures to protect the parcels and the lockers themselves. Posti employs advanced security technologies, including surveillance cameras and secure access controls, to safeguard the lockers from theft and vandalism. Furthermore, they have developed comprehensive maintenance programs to ensure the reliability and functionality of the lockers, which includes regular inspections and prompt repairs when necessary.

These best practices highlight the importance of strategic planning, infrastructure investment, and continuous improvement in the successful implementation of EPMs. By learning from global examples, organizations can develop effective strategies to deploy EPMs, thereby enhancing their last mile delivery operations and improving customer satisfaction.

3.4 Transformation of Postal Services in the Digital Age.

This chapter provides an in-depth analysis of the transformation of postal services in the digital age, emphasizing the critical role of electronic parcel lockers (EPMs) in last-mile delivery.

The Decline of Traditional Mail:

The once-steady stream of letters and bills carried by postal services is facing a digital drought. The surge of email, messaging apps, and online transactions has significantly reduced reliance on physical mail. This dramatic decline in volume, 30% or more from its peak, puts a financial strain on postal services globally. With mail revenue share hovering around 40% but the volume shrinking further, experts predict a bleak future for traditional mail with a potential 25-30% decline by 2025 compared to 2018. This harsh reality forces postal services to adapt strategies and embrace digital transformation to stay relevant in a world that increasingly communicates and conducts business online (Neuhaus et al., 2019).

Digital Era Challenges and Opportunities:

As Patel & Patel (2022) explain, the digital era presents three focal points for post and parcel firms aiming for high performance:

- **Embracing Technology:** Leveraging digital tools to optimize delivery processes and enhance customer experience.
- **Strategic Partnerships:** Forming alliances with tech companies to integrate advanced tracking and automation systems.
- **Customer-Centric Services:** Adapting services to meet the evolving demands of consumers who expect speed, transparency, and reliability in parcel deliveries.

E-Commerce and Internet Usage in Africa:

According to a report by Statista (2024), Internet usage in Africa has seen a remarkable transformation, with users surging to approximately 570 million by 2022, more than a twofold increase from 2015. Nigeria, Africa's most populous nation, leads in user count, boasting over 100 million internet users in 2022. Egypt and South Africa follow with 76 million and 41 million users, respectively. This surge is attributed mainly to enhanced telecommunications networks and the widespread adoption of mobile devices, which have significantly expanded access to the Internet across the continent. Consequently, this increased access has spurred a proliferation of digital activities and services, including social media engagement, e-commerce, and mobile banking solutions. However, Africa's digital landscape is still emerging and has yet to realize its full potential. Despite the growth in user numbers, internet penetration was recorded at about 43 percent in 2021, which lags the global average penetration rate of 66 percent. This indicates a substantial opportunity for growth in the digital sector within the continent.

Growth in the Express Parcel Market:

The express parcel market is proliferating in Nigeria, according to the findings of research carried out by Modupe et al. (2022). The study indicated that expansion in the express parcel sector significantly affects NIPOST's operations. The research highlighted the substantial impact of courier tracking systems on enhancing service quality within NIPOST. Consequently, the government and NIPOST's administration should allocate additional resources towards developing courier tracking infrastructure to capitalize on innovations within the express parcel industry. Furthermore, NIPOST's management should amplify its investment in Information Technology, as its expansion will likely bolster customer engagement and patronage. These strategic investments in technology are essential for NIPOST to remain competitive and responsive to the dynamic demands of the logistics and delivery market.

Electronic Parcel Lockers (EPMs):

Worldwide, electronic parcel lockers are gaining traction as a convenient and secure delivery option for online shoppers. According to Hyun et al. (2022), research indicates that parcel lockers are seen as a convenient, time-efficient option compared to standard home delivery methods, leading to higher adoption rates. The ease of access at any time and the flexibility in pickup are critical factors in their acceptance. Moreover, the simplicity of the locker system's interface and straightforward guidance are vital for user adoption, as complex operations can deter use. Additionally, ensuring user trust through transparent data handling and robust security protocols for the lockers is critical for widespread acceptance. Electronic lockers are widely regarded as a convenient method for package delivery, allowing users to retrieve their parcels at any time and reducing the incidence of missed deliveries. While opinions on the security of these lockers differ, implementing secure access protocols and proper maintenance can enhance trust. Moreover, the assurance of a dependable locker system, characterized by little to no downtime, is crucial in establishing user trust and promoting continued use.

Parcel Lockers and Delivery Efficiency:

Parcel lockers provide a convenient and flexible solution for package delivery, offering round-the-clock accessibility that surpasses the limitations of traditional delivery methods requiring a recipient's presence. This innovation significantly boosts delivery efficiency by addressing the common problem of missed deliveries when recipients are unavailable. As e-commerce grows, leading to a rise in parcel volumes and heightened consumer demands, retailers and logistics firms are embracing self-service technologies such as parcel lockers. These systems, also referred to as parcel kiosks, locker boxes, and automated or intelligent lockers, enable users to autonomously collect and return online purchases. Industry analysts have emphasized the favorable reception of parcel lockers by both consumers and businesses, noting improved service experiences for customers and performance enhancements that provide a competitive edge for businesses. (European Commission, 2012; IPC, 2014).

Impact of Electronic Parcel Lockers:

Electronic parcel lockers have emerged as a significant innovation in last-mile delivery, addressing some of the most pressing challenges in the logistics sector. They offer a secure and convenient way for consumers to receive packages, which can lead to improved customer satisfaction. For logistics companies, parcel lockers can enhance efficiency by reducing the need for multiple delivery attempts, thus lowering operational costs and environmental impact through decreased fuel consumption and emissions. Furthermore, the centralized nature of parcel lockers can streamline the delivery process, potentially leading to faster delivery times and increased courier capacity. Integrating electronic parcel lockers can significantly impact service quality and customer satisfaction in the last-mile delivery sector. According to Nguyen et al. (2022) and Brunner et al. (2022), parcel lockers enhance the convenience and flexibility of package delivery by providing round-the-clock access, enabling customers to retrieve their parcels at their convenience. This significantly improves conventional home delivery services that necessitate the recipient's presence. Furthermore, lockers address the problem of undelivered packages due to the absence of the recipient, leading to a more streamlined delivery system for both delivery services and customers. Additionally, this system empowers customers with increased control over the collection of their packages, which may improve overall customer satisfaction.

Customer Satisfaction With Parcel Lockers:

According to a study by Lai et al. (2021), "This study investigated the determinants of customer satisfaction with parcel locker service. Five dimensions—tangibility, responsiveness, security, reliability, and timeliness—positively affect customer satisfaction. Among them, the path coefficient of timeliness was the strongest predictor, higher than the others. This factor plays the most crucial role in customer satisfaction of parcel locker services. People who use the parcel locker service attach great importance to timeliness." (Lai et al., 2021, p.29). Another study carried out by Ranjbari et al. (2023) discovered that "consolidating deliveries in a single secure location can reduce the time couriers spend delivering to a building and improve the e-commerce experience for users. From the user's perspective, lockers provide a secure, convenient, self-service means to receive packages. So, if they are in safe and accessible locations and are well-operated, they can become commonplace. Reduced dwell time at the curb increases parking turnover, which is especially valuable in urban core areas and adds to the network capacity without building new infrastructure. Moreover, by eliminating failed delivery attempts, lockers reduce delivery VMT and traffic congestion and emissions." Ranjbari et al. (2023)

4 Research

4.1 Introduction to NIPOST

NIPOST has been faced with much restructuring in the past few years to further meet consumer needs, according to (Adama, 2024, p. 1). The Federal Government's policy on privatization and commercialization, aimed at enhancing the performance of state enterprises, led to the strategic reform of the Nigeria Postal Service (NIPOST). This initiative sought to improve service delivery and productivity. Consequently, the National Council on Privatization endorsed the Postal Sector Reform, including the Restructuring and Modernization of NIPOST, on October 31st, 2017. The restructuring plan entails dividing NIPOST into independent subsidiaries focused on commercial success, with NIPOST retaining its fundamental postal service operations. This decentralisation created seven operational zones, seven commercial business units (CBUs), and 110 district offices for better customer proximity.

According to NIPOST (2024, "Commercial Business Unit" section), the commercial business unit encompasses Counters, EMS / Parcels, Emails, E-commerce and Logistics, Financial Services, workshops and Properties, and the Nigerian Postal Institute. This research focuses on three specific CBUs: EMS / Parcels, Mail, and E-commerce and Logistics.

According to (NIPOST 2024 "EMS/Parcels" section), NIPOST's EMS/PARCELS service provides domestic and international delivery options for documents and merchandise. EMS Parcel International offers express delivery with customs clearance for items up to 30kg globally. Domestically, EMS Parcel Domestic guarantees 24-hour delivery to over 600 post offices. Additional services include prepaid return shipping, branded packaging, and a budget-friendly option for non-urgent deliveries. They also cater to businesses by managing entire mailroom operations. Some of the promises of the EMS/Parcels, like budget-friendliness and the international delivery of documents and merchandise, are always fulfilled but lag in the remaining promises; according to (to Nelson, 2021, para. 6), NIPOST parcel delivery in Nigeria is a mixed bag. While the Ijesha office impresses with occasional free deliveries and friendly staff, the Akerele office was a nightmare. There are long wait times, unfriendly staff who bounced customers between offices, and mandatory extra fees, especially for international packages. Despite these delays and frustrations, customers felt comfortable receiving China-shipped items because they could hold the Chinese logistics company accountable, not NIPOST.

According to (NIPOST, 2024 "Mails" section), NIPOST offers various mail services beyond traditional letters. Businesses can rent Post Office Boxes or Private mailbags for frequent deliveries and secure storage. The Postcode Directory helps with faster mail routing using numbered codes. For high-volume mailings, NIPOST provides discounted Bulk Post options and can handle incoming and outgoing international mail. Additionally, they offer targeted marketing tools like Direct Mail and verification services. Customers can request pickup services for same-day local delivery or schedule special packages directly at their offices for convenience. Finally, the International Reply Coupon allows businesses to encourage responses from potential clients without prepaying postage.

According to (NIPOST, 2024 "E-commerce and Logistics" section), NIPOST's E-commerce and Logistics unit supports online businesses and national deliveries. They focus on e-commerce solutions for micro, small, and medium enterprises, aligning with the government's goals of promoting local

products and rural development. Their logistics services cover various goods, from household items to agricultural produce, offering cargo, haulage, linehaul, and warehousing options. Sadly, this CBU had its license to operate revoked. "The Corporate Affairs Commission (CAC) said it has revoked the certificates of incorporation of two subsidiary companies of the Nigeria Postal Service (NIPOST). The two companies are NIPOST Properties & Development Company Limited and NIPOST Transport & Logistics Company. According to the commission, the certificates of incorporation were "inappropriately procured"." (Akintaro, 2024, p. 1)

Overall, NIPOST as an organisation keeps developing its operations and undergoing different changes, from decentralization to strengthening its core operations to expanding its service operations; however, like every other organization, it faces challenges in the form of competition. NIPOST faces competition from private courier companies for faster delivery and broader service offerings. Another challenge is technology integration and advancements. NIPOST lacks modernized infrastructure and efficient technological integration for parcel tracking. Their online services lack good user experience and responsiveness, and they perform poorly at efficient parcel management (Nelson, 2021, para. 7). According to Nelson (2021) In 2019, a customer had an unfortunate experience with NIPOST after purchasing skincare products from AliExpress. The items were to be delivered to a post office near a school, but the parcel was delayed and reported lost in transit, arriving a month later than expected despite AliExpress's confirmation of the parcel's arrival in Benin, Edo state, Nigeria. The customer received the parcel on August 17th and had to pay an additional fee for cargo. The repeated trips to the post office and the extra costs led to much frustration. Since then, the customer has avoided using NIPOST due to their high prices, which do not compete with private logistics firms. Now, they prefer sending people or shopping locally to avoid such hassles. This shows that NIPOST needs to improve public perception by Improving trust and brand image through reliable and timely service delivery.

4.2 Public perception of NIPOST's services

The Nigerian Postal Service (NIPOST) facilitates communication, commerce, and connectivity across Nigeria. Understanding public perception of NIPOST's services is vital for improving service quality and meeting customer expectations. This chapter presents the results of a survey analysis aimed at gauging public perception towards NIPOST in Nigeria.

Research highlights the importance of public perception in shaping organizational success, especially in service-oriented industries. For instance, a survey by Medallia (2022) found that 64% of global consumers avoided a brand due to a bad experience in the past year, and 47% avoided a company because of its online reputation or negative social reviews. Positive perceptions are shown to increase customer satisfaction, loyalty, and trust. In postal services, factors such as delivery speed, reliability, customer service quality, and pricing influence public perception. External factors like technological advancements and competition from digital communication platforms also play a role.

To understand public perception of NIPOST, A survey was distributed to NIPOST customers in Lagos, Port Harcourt, and Abuja, targeting a diverse demographic to ensure comprehensive feedback, the survey included questions on customer awareness, interest in locker usage, and preferences regarding delivery and pickup options. It was conducted over two months, with a total of 155 respondents. The survey included responses from various ages, genders, locations, and socioeconomic backgrounds, capturing perceptions on delivery efficiency, staff professionalism, affordability, and accessibility. Survey data were analysed using descriptive statistics to gauge overall trends and preferences, followed by inferential statistics to explore relationships between demographic factors and preferences. Notably, 57.4% of respondents had never used NIPOST, with the largest group falling within the 14-25-year-old "Gen Z" demographic (1996-2010). According to McKinsey Explainers (2023), Gen Z is defined as people born between 1996 and 2010, shaped by the digital age, climate anxiety, a shifting financial landscape, and COVID-19.

Have you used NIPOST to send or receive parcel/package

155 responses

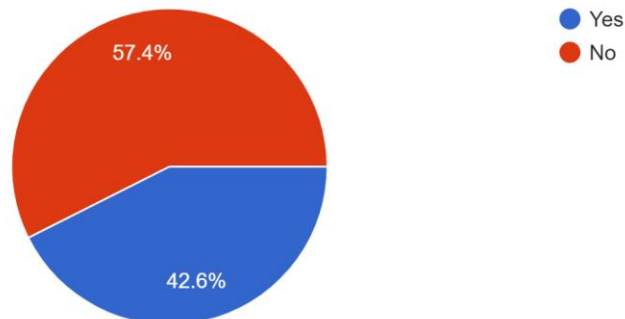


Figure 1: Nipost Usage

What age group do you belong to?

155 responses

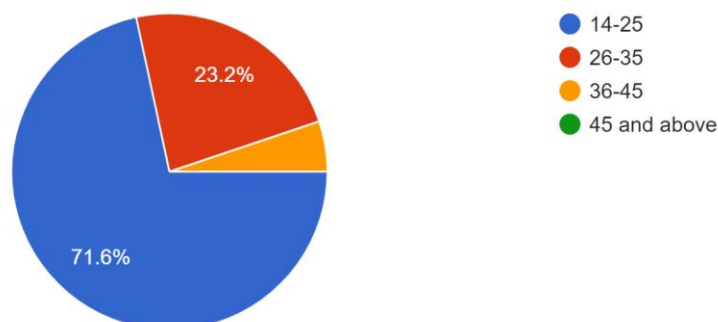


Figure 2: Age Group

Analysis of the survey data revealed mixed perceptions towards NIPOST's services. While some respondents praised the affordability of NIPOST's delivery services, most expressed dissatisfaction with long delivery times, reliability, and poor customer service experiences. Overall, perceptions varied based on factors such as geographic location and frequency of postal service usage. Statistical summaries and visual representations of the survey responses are provided in the figures below.

On a scale of 1 (very dissatisfied) to 5 (very satisfied), how satisfied are you with the current parcel/package delivery service in Nigeria?

155 responses

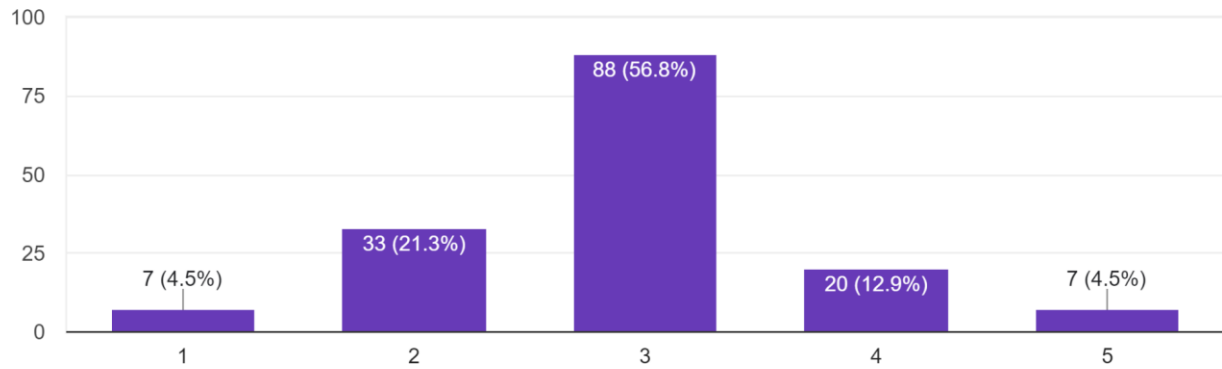


Figure 3: Scale of satisfaction with parcel services in Nigeria

Have you ever experienced difficulties or inconveniences when receiving your ordered package/parcels through traditional delivery services in Nigeria? (Please select all that apply)

155 responses

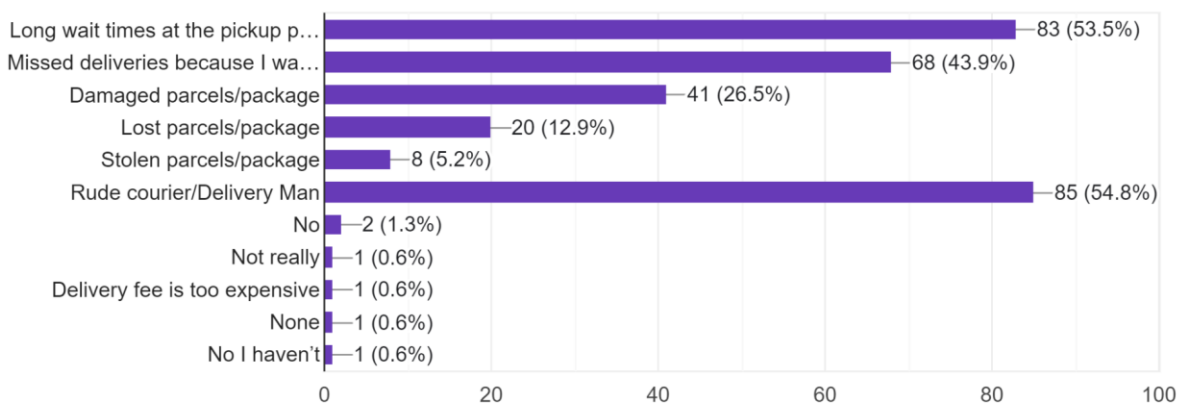


Figure 4: Difficulties and Inconveniences experienced in ordering or receiving parcels

With a median age of 18.4 (Statista n.d.) Nigeria is a country that has a growing, vibrant youth population, a lot of whom fall under the "Gen Z" category according to McKinsey Explained that

members of this generation care about ease of use: mobile pay, app-based services, and simple online transactions are significant, and brands have found major success by restructuring to suit Gen Z tastes.

The findings suggest that NIPOST faces both challenges and opportunities with public perception. Positive perceptions can be leveraged to enhance brand reputation and attract more customers while addressing negative perceptions requires targeted interventions in service quality and customer experience. The factor contributing to positive perceptions is competitive pricing. On the other hand, issues such as package loss, delayed deliveries, inadequate customer support, timely delivery, and courteous staff contribute to negative perceptions. Strategies for addressing these challenges include investing in infrastructure, training staff, streamlining processes, and enhancing customer communication.

Electronic parcel machines, also known as automated or intelligent lockers, offer a promising solution to various challenges postal services like NIPOST face. According to TheCodeWork (2023), Electronic parcel machines enhance delivery security and reduce package loss. They safeguard parcels until collection, minimising theft, or damage risks. Advanced technologies like GPS, RFID, and AI algorithms aid logistics companies in tracking and minimising package misplacement. Firstly, they address package loss and delayed delivery issues by providing a secure and efficient means of storing and retrieving packages. These machines decentralise package storage and enable 24/7 access, reducing the risk of package loss or theft while expediting delivery. By offering a self-service option for package pickup and drop-off, electronic parcel machines also alleviate the strain on traditional customer support channels, thereby mitigating the issue of inadequate customer support. Integration with digital platforms allows customers to track their packages in real time and receive automated notifications, minimising the need for direct customer service interactions.

Furthermore, electronic parcel machines contribute to timely delivery by being strategically placed in convenient locations such as shopping centres, residential complexes, and transportation hubs. This accessibility ensures faster and more convenient package pickup for customers. Integration with advanced logistics systems and route optimisation algorithms further enhances efficiency, ensuring parcels are delivered to designated lockers promptly. While electronic parcel machines reduce the need for direct interaction with staff during package pickup or drop-off, staff presence

may still be required for maintenance and customer assistance. Therefore, investing in staff training programs focused on customer service and technical support becomes essential to ensure that staff members are courteous, knowledgeable, and responsive to customer needs.

As seen from the survey results, 78.7% of responders would be interested in using an electronic parcel machine, and the dominant reason from the people that responded no was majorly the distance needed to travel to pick up the package as opposed to the traditional doorstep delivery.

Would you be interested in using electronic parcel lockers as an alternative to traditional delivery methods?

155 responses

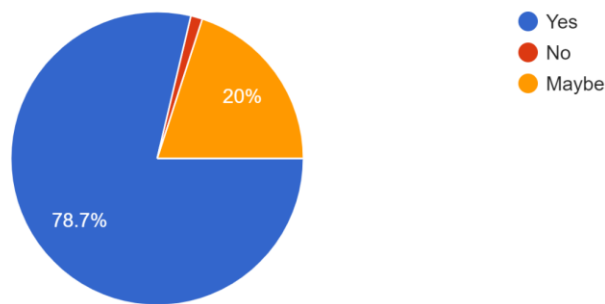


Figure 5: Interest in EPLs

In conclusion, the survey analysis sheds light on the complex nature of public perception towards NIPOST's services in Nigeria and how electronic parcel Lockers would improve its operations, thereby improving public perception. By understanding the factors that influence perception, NIPOST can identify opportunities for improvement and implement targeted strategies to enhance service quality and customer satisfaction. Addressing customer concerns and building on the organisation's strengths will be vital in shaping a positive perception of NIPOST in the public's minds.

4.3 NIPOST's Operational Analysis and Infrastructure Assessment

The Nigerian Postal Service (NIPOST) is an essential component of Nigeria's communication and logistics infrastructure. However, it faces significant challenges that impede its efficiency and service quality. This section delves into the primary infrastructural and operational issues within NIPOST, identifying key areas that require attention and improvement.

Infrastructure Challenges

NIPOST's infrastructure is marked by several deficiencies that affect its ability to provide timely and reliable postal services. The main challenges include inadequate power supply, poor road networks, and insufficient sorting centers. These issues collectively contribute to delays, increased costs, and reduced customer satisfaction.

- **Power Supply:** The inconsistent power supply in Nigeria is a critical challenge for NIPOST. This inconsistency hampers the operation of electronic systems crucial for sorting and tracking parcels. Frequent power outages disrupt workflows and lead to delays in processing and delivery, making it difficult to maintain reliable service standards (NIPOST Operations, n.d.).
- **Road Networks:** The condition of road infrastructure significantly impacts NIPOST's delivery capabilities. Many areas in Nigeria have poor road networks, which cause delays and increase vehicle maintenance costs. These poor road conditions make it difficult to ensure timely deliveries, particularly in rural and remote areas where infrastructure development is lagging (NIPOST Operations, n.d.).
- **Sorting Centers:** NIPOST's sorting centers are limited in number and heavily reliant on manual processes. This reliance on manual sorting not only slows down the processing of parcels but also increases the likelihood of human error, resulting in misplaced or lost items. The lack of adequate sorting facilities means that parcels often spend extended periods in transit, further exacerbating delays (NIPOST Operations, n.d.).
- **Security Concerns:** Security issues within NIPOST's operations present a significant challenge. Instances of theft and loss of parcels undermine public trust in the postal service. These security concerns are partly due to the outdated infrastructure that lacks modern

security measures and protocols, making it difficult to safeguard parcels throughout the delivery process (NIPOST Operations, n.d.).

Operational Challenges

NIPOST's operational processes are burdened by inefficiencies that hinder its ability to deliver high-quality services. These challenges include labor-intensive processes, lack of automation, and inadequate training for staff.

- **Labor-Intensive Processes:** Many of NIPOST's operational processes are labor-intensive and prone to inefficiencies. The heavy reliance on manual sorting, tracking, and administrative tasks slows down service delivery and increases the risk of errors. These outdated methods are not sustainable for handling the increasing volume of parcels in today's fast-paced logistics environment (NIPOST Operations, n.d.).
- **Lack of Automation:** The absence of automated systems for sorting and tracking parcels is a significant bottleneck in NIPOST's operations. Automation is crucial for enhancing accuracy, speed, and efficiency in postal services. Without it, NIPOST struggles to keep up with modern logistical demands, leading to delays and decreased customer satisfaction (NIPOST Operations, n.d.).
- **Inadequate Training:** Staff training is another critical area that requires improvement. Many NIPOST employees lack adequate training in modern postal and logistics operations. This skills gap affects their ability to efficiently manage tasks and adapt to new technologies, further contributing to operational inefficiencies and service delays (NIPOST Operations, n.d.).

These infrastructural and operational challenges significantly impact NIPOST's ability to provide efficient and reliable postal services. Addressing these issues is crucial for improving service delivery and customer satisfaction.

4.4 Overview of Posti's system

Posti is one of the leading delivery and fulfilment companies in Finland, Sweden, and the Baltics. The company ensures the smoothness of customers' everyday lives and business by offering a wide range of postal, logistics, freight, and eCommerce services. Posti has the widest network coverage in Finland, visiting around three million households and companies every weekday (About Posti - Posti, n.d.). This chapter provides an overview of Posti's strategic approach to the placement, management, and optimization of electronic lockers, along with insights into their impact on customer experience, operational efficiency, security measures, infrastructure modernization, and sustainable implementation.

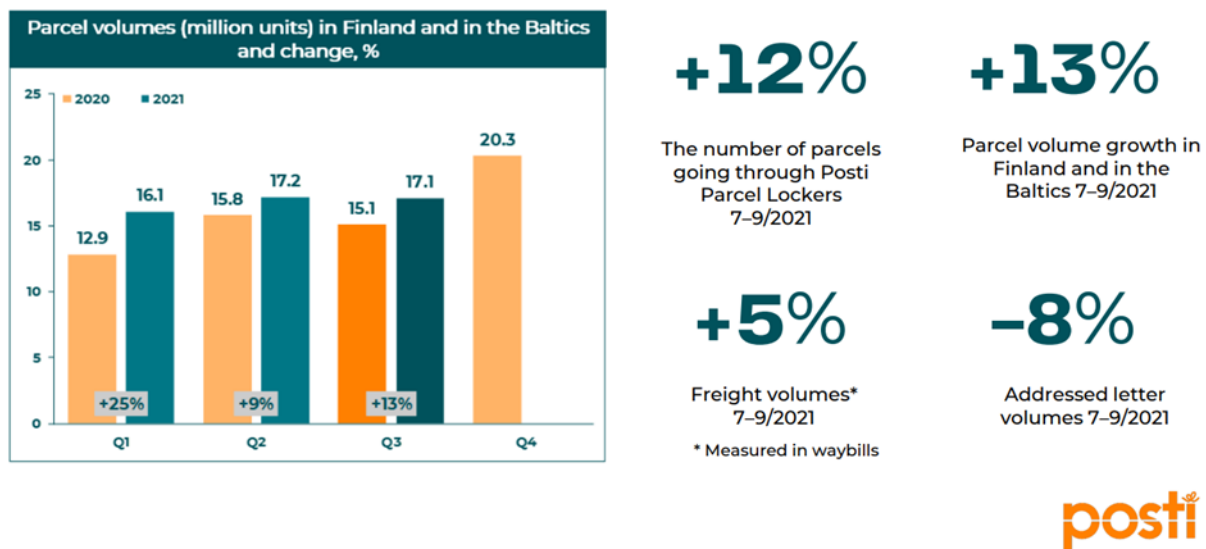


Figure 6: Posti in numbers

Posti has been using EPMs as part of its last-mile delivery strategy since 2017 according to Beilhammer and Beilhammer (2022), these parcel lockers have rapidly increased over the years to accommodate the increasing parcel volumes. Posti currently has 2,200 Parcel Lockers containing more than 130,000 individual lockers. Capacity has been significantly increased, and the number of Parcel Lockers increased by about 10-15 Parcel Lockers and hundreds of lockers per week (Posti's New Outdoor Parcel Lockers Have Been Developed in Co-operation with Finnish Technology Partners - Posti, 2021). These lockers are convenient and secure ways for customers to receive their parcels.

According to Kultalahti (2024), Posti determines where to place its EPMs based on several key factors. They include the need for increased capacity based on the number of parcels that are delivered to that area, preferences are given to locations that have wide opening hours and good accessibility which are majorly grocery stores. The management strategy focuses on ensuring sufficient parcel volumes, optimal capacity, reducing redirection rates and preplanning for volume growth during peak seasons. According to results of a study conducted by Posti, parcel lockers are the most popular delivery option in Finland, with 35% of Finns preferring this option. Delivery to PUDOs isn't far behind at 32%, with home delivery languishing at 10% (Ian, K., et al 2019). Within the organisation, decision regarding parcel locker placements is made by the service point net-working team altering going through the package routing data and considering principles such as proximity to the customers, capacity optimization, and strategic network development.

According to Kultalahti (2024), he mentioned that the introduction of parcel lockers has significantly improved Posti's customers experience in several ways including.

- **Convenience:** With EPMs customers are afforded the flexibility to pick up their parcels at any time which included evenings and weekends this convenience has been shown by data, according to Ian, K., et al (2019) parcel lockers are the most popular delivery option in Finland, with 35% of Finns preferring this option.
- **Increased Accessibility:** Posti has one of the densest parcel locker networks in the world with 85% of Finns having a Posti locker less than one Kilometre from their home (Ian, K., et al 2019).
- **Security:** Parcel lockers provide a secure location for parcel delivery; these lockers provide a secure location and eradicate the safety concern regarding parcel delivery in terms of parcel theft.
- **Innovation:** As an organisation Posti leverages artificial intelligence and machine learning to improve its parcel routing efficiency. "Popular parcel lockers cannot be expanded if they are in a limited space, such as inside a store. With artificial intelligence and machine learning, we can get a more accurate forecast of parcel locker capacity, which helps us route parcels to the parcel lockers chosen by recipients more often. In addition, more parcels can be made to fit into certain parcel lockers," (Posti, 2021)

- **Expanded Services:** Posti keeps expanding the use of EPMs, EPMs are not only used as parcel delivery and return points they are now used as recycling points, delivering rental devices and C2C trade.

In terms of security challenges, Posti has encountered little challenges with EPMs with incidents such as vandalism and break-ins. However, parcels are more secure in EPMs when compared to traditional delivery and pick-up options (Jarko, 2024), especially because the lockers are strategically placed in areas requested by customers which often include public places equipped with CCTV cameras, places with extended opening hours and expedited retrieval process.

Posti has also seen a positive impact in route optimization since the introduction of EPMs, most of which has been reduced cost and enhancing efficiency, there specific analysis on locker placement on route optimization is research that is ongoing but the changes in delivery operations and planning strategies reflect that locker infrastructure helps to streamline last-mile logistics (Jarko, 2024). Therefore, the integration of EPMs aligns with Posti's modernization goals and technology integration efforts, helping them cater to the increasing consumer preference for convenient and flexible parcel delivery options. The modernisation drive has helped network expansion, infrastructure upgrades and improved service accessibility thereby contributing to the overall seamless parcel delivery experience.

According to Kultalahti (2024), like every organisation, Posti is also focused on growth and has developed a phased implementation plan for future network expansion guided by strategic considerations including projected volume growth, customer proximity and reducing redirection rate. By leveraging data-driven insights and local knowledge, Posti aims to keep refining its network to meet customer needs effectively. Some KPIs used to measure the effectiveness of the lockers are self-service rates, unit costs of parcels, customer satisfaction scores, redirection rates and utilization rates. There have been improvements in customer satisfaction, operational efficiency, and cost reduction since the implementation of the lockers in 2017 reflecting the system's success over time.

EPMs represent a worldwide shift in parcel delivery services offering convenience, efficacy and security tailored to meet modern consumer preferences and e-commerce growth. Posti's strategic

development of lockers, the use of AI and Machine learning for optimizing delivery routes forecasting parcel locker capacity and prioritizing customer satisfaction, by ensuring seamless and satisfactory delivery experience for all stakeholders using EPMs and modern technology, Posti keeps setting new standards in the postal and logistics industry making them the perfect example for emulation by NIPOST.

5 Results

5.1 Implementing a System Similar to Posti's EPM in Nigeria

For NIPOST to successfully implement a system like Posti's Electronic Parcel Lockers (EPM) in Nigeria, careful consideration of several critical factors is essential. According to Kultalahti (2024), these factors include infrastructure, technology, logistics, consumer behavior, and regulatory compliance. To ensure a smooth user experience and the successful integration of EPMs into NIPOST's infrastructure, the following modifications and tailored solutions should be considered:

Infrastructure Adaptation

The infrastructure in Nigeria, including road networks and urban planning, significantly differs from Finland's. Adaptations must involve identifying suitable locations in densely populated areas such as commercial hubs and urban centers where foot traffic is high, and accessibility is relatively good. According to Giuffrida et al. (2016), a parcel locker should not be more than 3.5 km away from the customer in urban areas. When the distance exceeds 3.5 km, the customer no longer benefits from using EPMs. Ideal locations could include banks, given Nigeria's extensive network of 4,437 commercial bank branches (Abiodun, 2024). Bank premises offer security and high foot traffic, as many Nigerians visit banks daily for ATM use and transactions.

Power Supply

Nigeria faces significant challenges with reliable and uninterrupted power supply, particularly in rural and peri-urban areas. Over 140 million people, or about 70% of the population, lack access to electricity (World Economic Forum, 2023). For the successful implementation of EPMs, NIPOST

would require solutions to ensure continuous power supply for their operations. Options could include solar-powered lockers or backup power sources like generators or batteries.

Security Measures

With a population of over 228 million people (Nigeria Population, 2024) and 83 million living below the poverty line (World Bank Group, 2020), security is a major challenge. Issues such as theft and vandalism are common. EPMs used in Nigeria would need to be enhanced with advanced locking mechanisms and surveillance systems to safeguard parcels and prevent unauthorized access.

Cultural and Socioeconomic Factors

Consumer behavior and preferences in Nigeria differ from those in Finland. NIPOST would need to conduct thorough market research to understand the expectations, preferences, and challenges faced by Nigerian consumers regarding parcel delivery. According to the survey conducted for this thesis, the ideal target customers are the growing young population in urban areas like Lagos. It is important to design user-friendly interfaces and ensure inclusivity to cater to this demographic.

Logistics and Distribution Network

Nigeria's large land size and population present logistical challenges for parcel delivery. Integrating EPMs into NIPOST's established distribution network and collaborating with local partners such as banks, retail outlets, and courier services is crucial for optimizing last-mile delivery.

Regulatory Compliance

Implementing EPMs in Nigeria requires compliance with several regulatory frameworks, including Data Protection, Consent, Companies and Allied Matters Act 2020, and Taxation. NIPOST needs to engage with government agencies and policymakers to navigate the necessary regulatory frameworks and address all legal and licensing issues.

Public Awareness and Education

Building awareness and trust among Nigerian consumers about the benefits and security features of EPMs is crucial for adoption. According to Austin (2023), a successful product launch is critical. Targeted marketing efforts, public education campaigns, and demonstrations of the system's functionality would help reduce concerns and encourage uptake.

5.2 Role of Performance Metrics

Performance metrics are essential tools for monitoring and evaluating the progress of a project. They provide quantitative data that help project managers make informed decisions and ensure that the project stays on track.

- **Tracking Progress:** Performance metrics enable project managers to track the progress of various tasks and milestones. This helps in identifying any deviations from the planned schedule and implementing corrective actions promptly (ProjectManager.com, 2022).
- **Evaluating Efficiency:** Metrics such as customer satisfaction score (CAST) and return on investment (ROI) are used to evaluate the efficiency of resource utilization and the satisfaction of the users. These metrics provide insights into areas where improvements can be made to enhance overall project performance (Scavetta, 2022).
- **Risk Management:** Performance metrics play a crucial role in risk management by highlighting potential risks early in the project lifecycle. By monitoring key performance indicators (KPIs), project managers can anticipate issues and develop mitigation strategies to prevent them from escalating (Kerzner, 2017).
- **Stakeholder Communication:** Regular reporting of performance metrics keeps stakeholders informed about the project's status. This transparency builds trust and ensures that stakeholders are aware of any challenges and the steps being taken to address them (Monday.com, 2022).

Key Performance Indicators (KPIs) are crucial for evaluating the success of implementing Electronic Parcel Machines (EPMs). They provide measurable values that reflect how effectively an organization is achieving its business objectives. According to the balanced scorecard theory by Kaplan and Norton (1996), KPIs help organizations align business activities to the vision and strategy of the organization, improve internal and external communications, and monitor organizational performance against strategic goals (Mohamed, 2014).

According to Kultalahti (2024), by tracking the following Key KPIs for EPM Implementation, NIPOST can adjust its strategies, optimize resources, and ensure efficient and effective delivery services.

- **Customer Satisfaction Score (CSAT):** Customer satisfaction can be measured through surveys or feedback forms, assessing aspects like convenience, perceived security, and ease of use of EPMs. High customer satisfaction scores indicate positive user experience and acceptance of the new technology (Kaplan & Norton, 1996).
- **Utilization Rate:** Monitoring the percentage of lockers used helps gauge the popularity and effectiveness of EPMs in meeting customer needs. A high utilization rate suggests that customers are frequently using the lockers, indicating their success and utility (Bourne et al., 2003).
- **Average Transaction Time:** Tracking the time, it takes for customers to complete a transaction using the lockers can identify areas for process improvement. Shorter transaction times are indicative of efficient and user-friendly processes (Parmenter, 2015).
- **Reduction in Delivery Time:** Comparing delivery times through lockers with traditional methods can measure efficiency gains. A significant reduction in delivery times would demonstrate improved operational efficiency due to EPM implementation (Bourne et al., 2003).
- **Parcel Redirection Rate:** Monitoring the frequency of parcel redirection can indicate operational smoothness. Lower redirection rates suggest that parcels are being delivered to the correct locations more consistently (Parmenter, 2015).
- **Error Rate:** Tracking errors such as misrouted parcels and system malfunctions helps identify and fix issues. A low error rate indicates a reliable and accurate system (Kaplan & Norton, 1996).
- **Dwell Time:** Measuring how long it takes for customers to pick up parcels can assess locker convenience. Shorter dwell times suggest that customers can retrieve their parcels quickly and easily (Parmenter, 2015).
- **Operational Downtime:** Monitoring locker downtime is crucial for maintaining high availability. Less downtime means the lockers are operational and accessible to customers more often, indicating a well-maintained system (Bourne et al., 2003).

- **Return on Investment (ROI):** Analyzing costs and savings associated with EPMs can determine their financial effectiveness. A positive ROI indicates that the benefits of the lockers outweigh the costs, justifying the investment (Kaplan & Norton, 1996).

These KPIs will help measure progress towards achieving NIPOST's goals of enhanced customer satisfaction, improved operational efficiency, and reduced costs. Furthermore, developing a comprehensive EPM implementation framework will provide structure and flexibility, while incorporating performance metrics allows NIPOST to monitor progress, manage risks, and ensure stakeholder alignment. By combining a strong framework with performance metrics, NIPOST can establish a foundation for successful EPM integration and deliver value to all stakeholders.

5.3 Process Optimization

The current parcel delivery process at the Nigerian Postal Service (NIPOST) highlights several areas that need optimization to enhance efficiency and reliability. When a customer drops off a parcel at a NIPOST branch, postal staff check for proper packaging and labelling, followed by manual recording of relevant information. This manual process can be time-consuming and prone to human error, underscoring the need for automated systems to streamline these initial stages. The parcel is then assigned a tracking number or barcode for identification and tracking purposes. However, the manual assignment of tracking numbers can lead to delays and inaccuracies, which are critical issues that could be addressed by implementing automated scanning and data entry systems. These technologies can significantly reduce the chances of errors and speed up the process, ensuring that parcels are correctly identified and tracked from the outset.

In the subsequent stages, parcels are sorted and processed at a distribution centre where they are manually sorted based on destination and delivery method. This manual sorting process is labour-intensive and susceptible to mistakes, which can result in misrouted parcels and further delays. Introducing automated sorting systems, such as conveyor belts with integrated barcode scanners, could enhance the accuracy and speed of parcel sorting, thus improving overall efficiency. Once sorted, parcels are loaded onto delivery vehicles according to the riders' routes and schedules. The optimization of delivery routes through advanced algorithms and machine learning techniques can ensure that parcels are delivered in the most efficient manner possible, reducing transit times and

operational costs. By optimizing routes, NIPOST can also improve delivery speed and customer satisfaction.

Postal carriers then deliver the parcels either to the nearest post office or directly to the recipient's address. Throughout this process, it is crucial for customers to receive timely updates on their parcels via SMS, email, or online tracking portals. However, as noted, inefficiencies in this communication process often led to parcels being lost, damaged, or stolen. Enhancing the tracking and notification system with real-time updates and ensuring consistent communication can greatly improve the customer experience and trust in NIPOST's services.

To optimize the parcel delivery process of the Nigerian Postal Service (NIPOST) before integrating Electronic Parcel Machines (EPMs), several key strategies should be considered. These strategies include process mapping and analysis, route optimization, enhanced security measures, customer engagement and education, and collaboration with stakeholders. Each of these strategies is supported by scientific literature, highlighting their importance and effectiveness in improving logistics and service quality.

Process mapping is a critical step in identifying inefficiencies within the logistics chain. By providing a visual representation of the entire delivery process, NIPOST can pinpoint bottlenecks and redundancies that hinder operational efficiency. Keller and Pyzdek (2010) emphasize the value of process mapping in improving operational workflows. They suggest that detailed process maps enable organizations to understand their processes better and identify areas for improvement. Applying this to NIPOST, process mapping can reveal specific stages where delays or errors frequently occur, allowing for targeted interventions.

Optimizing delivery routes is essential for reducing transit times and operational costs. Advanced algorithms and machine learning techniques have been shown to significantly enhance route planning. Wang et al. (2018) discuss how route optimization algorithms can lead to faster and more cost-effective deliveries. By implementing such technologies, NIPOST can minimize the distance travelled and time spent on deliveries, which is crucial for maintaining efficiency and reducing costs. This approach not only improves delivery speed but also enhances the overall customer experience by ensuring timely deliveries.

Implementing robust security measures is vital for safeguarding parcels and maintaining customer trust. Electronic parcel lockers (EPMs) offer secure delivery solutions that reduce the risk of theft and loss. Jara et al. (2016) highlights the importance of secure delivery systems in enhancing customer confidence. By integrating advanced security protocols, such as secure access codes and surveillance systems, NIPOST can ensure that parcels are protected throughout the delivery process. This will be particularly important once EPMs are introduced, as it will provide customers with peace of mind regarding the safety of their packages.

Engaging with customers and educating them about new delivery methods is essential for successful adoption. Bitner et al. (2000) argue that well-informed customers are more likely to utilize new technologies and services effectively. For NIPOST, this means developing comprehensive communication strategies to inform customers about the benefits and usage of EPMs. Educational campaigns can include instructional videos, brochures, and customer service support to guide users through the process. Ensuring that customers understand how to use EPMs will increase their acceptance and satisfaction.

Effective collaboration with stakeholders, including logistics providers, technology partners, and regulatory bodies, is crucial for the successful implementation of EPMs. Lee and Whang (2000) discuss the importance of collaborative strategies in creating more efficient and integrated service delivery systems. For NIPOST, this involves working closely with technology providers to ensure that the EPMs are well-integrated with existing systems and engaging with regulatory bodies to ensure compliance with relevant laws and standards. By fostering strong partnerships, NIPOST can leverage the expertise and resources of its stakeholders to enhance its delivery processes.

In conclusion, optimizing NIPOST's parcel delivery process before integrating Electronic Parcel Machines (EPMs) involves several strategic steps. Process mapping and analysis help identify inefficiencies, while route optimization reduces transit times and costs. Enhanced security measures safeguard parcels, and customer engagement ensures successful adoption of new technologies. Finally, collaboration with stakeholders ensures a smooth and compliant integration process. By implementing these strategies, NIPOST can improve its operational efficiency, enhance service quality, and successfully transition to a more modern and effective parcel delivery system.

| | Parcel Acceptance | Sorting and Processing | Routing and Distribution |
|------------------------------|---|--|---|
| Bottlenecks | Long queues and delays at postal offices during peak hours. | Overcrowded sorting facilities and limited capacity for parcel processing. | Inefficient route planning and suboptimal allocation of delivery routes. |
| Inefficiencies | Manual data entry processes leading to errors and delays in parcel processing. | Manual sorting processes leading to misrouted parcels and increased handling times. | Lack of real-time tracking and monitoring systems leading to delays and missed deliveries. |
| Areas for Improvement | Implement electronic data capture systems for faster and more accurate parcel acceptance. Introduce self-service kiosks or online portals for customers to pre-register parcels before dropping them off. | Invest in automated sorting technology to improve efficiency and accuracy. Optimize warehouse layout and workflow to streamline parcel processing and minimize congestion. | Implement route optimization software to plan more efficient delivery routes. Equip postal carriers with handheld devices for real-time tracking and communication. Introduce dynamic routing capabilities to adapt to changing conditions and optimize delivery schedules. |

Figure 7: Nipost parcel delivery strategy analysis 1

| | Last-Mile Delivery | Customer Communication and Feedback | Parcel Security |
|------------------------------|---|--|--|
| Bottlenecks | Limited accessibility to remote or hard-to-reach areas, resulting in delayed deliveries. | Lack of effective communication channels for parcel tracking and status updates. | Vulnerabilities in parcel handling and storage leading to theft or damage. |
| Inefficiencies | Manual paperwork and documentation processes slowing down delivery operations. | Limited customer support and response times to inquiries and complaints. | Inadequate security measures and monitoring systems at postal facilities. |
| Areas for Improvement | Explore innovative delivery solutions such as drone or bike delivery for faster and more flexible last-mile delivery. Digitize delivery documentation and automate proof of delivery processes to reduce paperwork and administrative burden. | Enhance customer communication channels, such as SMS notifications and email alerts, to provide real-time updates on parcel status. Invest in customer service training for staff to improve responsiveness and resolution of customer issues. | Strengthen parcel security protocols and implement surveillance cameras and access control systems to prevent theft and unauthorized access. Conduct regular audits and inspections of postal facilities to ensure compliance with security standards. |

Figure 8: NIPOST parcel delivery strategy analysis 2

A thorough examination of the existing parcel delivery procedures offers insights into potential bottlenecks and inefficiencies, thereby providing valuable directions for enhancement (Figures 7 and 8). This analysis draws upon data gotten from (Frank, 2024). Furthermore, additional research has the potential to strengthen the effectiveness of these proposed strategies within the context of my thesis.

5.4 Framework for the Introduction of Electronic Parcel Lockers by NIPOST

According to Li and Zhu (2009), Launching new products is a typical approach employed by numerous companies to sustain their core competencies and market position. However, this strategy often presents a significant challenge, as it can be both expensive and fraught with risk. also Cannon (2005) says that a recent analysis suggests that a staggering 97% of newly conceived products or designs fail to make a successful debut in the marketplace. This highlights the significant challenges that innovators face in bringing their ideas to fruition and succeeding in a competitive market. It underscores the importance of thorough market research, strategic planning, resilience in the product development process and the importance of following a framework.

The suggested framework that NIPOST can use for the launch of the EPMs was developed by (BrainKraft, 2023) according to BrainKraft (2023), the BrainKraft Product Launch Framework™ encompasses the full life cycle of a product launch. It helps to organize the launch team, define launch objectives, understand the market environment, and communicate a unique value proposition, develop a product launch strategy, and prepare companies, partners, and market.

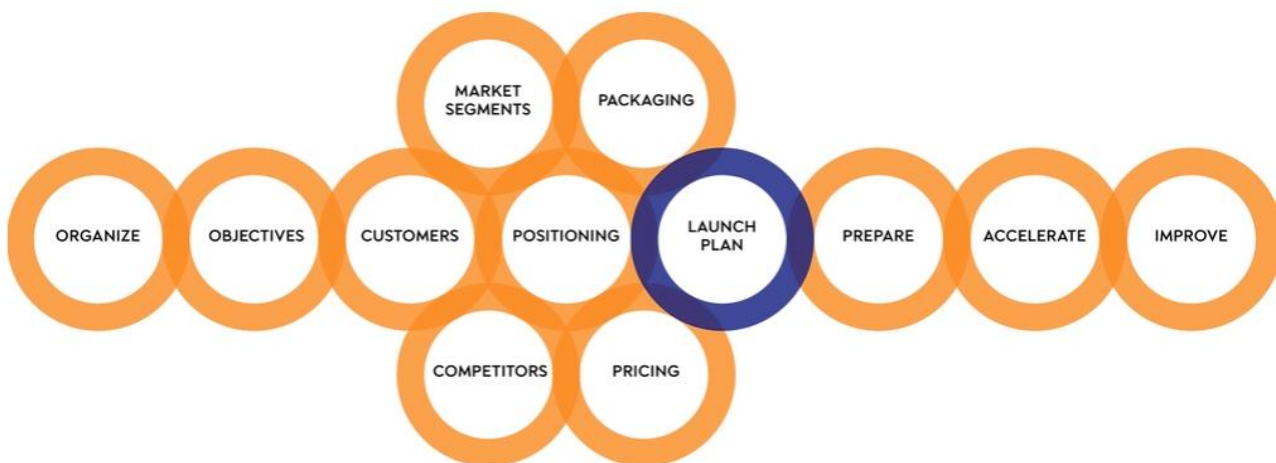


Figure 9: Brainkraft Framework

For NIPOST to successfully launch the Electronic Parcel Machine (EPM), the company should follow a structured product launch strategy by BrainKraft (2023), ensuring each stage is carefully executed. In the ORGANIZE stage, NIPOST should mobilize a dedicated launch team, clearly assigning roles and responsibilities while establishing a robust set of collaboration tools. A specific launch

tier should also be designated. During the OBJECTIVES stage, NIPOST must define the parameters of launch success with clear, measurable objectives, such as increasing customer acquisition, retention, and market share, with precise metrics and timeframes. In the CUSTOMERS stage, it is essential to define buyer personas that accurately represent the target audience for the EPM, understanding their needs and preferences. The MARKET SEGMENTS stage involves identifying the most promising market segments based on strategic alignment and segment characteristics, while also documenting the purchasing behavior and decision-making processes of these segments. In the COMPETITORS stage, NIPOST should identify likely competitors within these market segments to better position the EPM against them. The POSITIONING stage requires developing a compelling message that captures potential customers' attention within 10 seconds, leveraging the BrainKraft positioning framework. For the PRICING stage, NIPOST should set a price based on the target customers' willingness to pay, ensuring it reflects the perceived value of the EPM. The LAUNCH PLAN stage involves formulating a comprehensive strategy informed by the objectives and market insights, ensuring flexibility to adapt to market dynamics. During the PREPARE stage, NIPOST must ensure organizational readiness, focusing on capabilities rather than the sheer volume of deliverables, which includes training staff and refining internal processes. In the ACCELERATE stage, monitoring the launch performance through predefined KPIs and making necessary adjustments will help achieve the launch objectives. Finally, in the IMPROVE stage, NIPOST should reflect on the launch's performance, identifying lessons learned and areas for improvement to enhance future product launches.

5.5 Roadmap for the Introduction of Electronic Parcel Lockers by NIPOST

Roadmaps are based on a product, technology, and product-technology (Kappel 2001), a roadmap is important for planning for product launch. For the introduction of electronic parcel machines by NIPOST a roadmap consisting of five different phases of implementation was developed over the course of the research. The roadmap was prepared after an intensive analysis of literatures about the implementation of EPMs by other postal services.

Phase 1 is the planning and research phase it, it the initial stage NIPOST would go through to identify if the EPMs are needed in the Nigerian market, how feasible their integration would be for NIPOST's current situation and identifying the possible manufacturing or sourcing plans for this

parcel machine. According to Phaal et al. (2004) the most important consideration for the road mapping process is the planning phase.



Figure 10: Phase 1

During the planning phase NIPOST would need to conduct market research to better understand their customer base, they need to analyse their parcel volumes and identify the areas where they always have high volumes this would help them identify potential locations for locker installations. They also need to evaluate the financial viability of the implementation of EPMs and engage with the appropriate stakeholders seeking feedback and gathering input to ensure that the EPMs meet the diverse needs of the Nigerian market. Finally, they need to identify potential suppliers for the EPMs and send out RFQs to start the purchasing process of the EPMs.

The second phase in the roadmap is the design and development phase, Montgomery (1999) says that product design plays an important role in the efficiency and effectiveness of every product which directly impacts the overall organizational structure. During the design and development phase, NIPOST would work with the selected vendor to design and customize an EPM fit for the Nigerian market considering the electricity and security challenge, according to Ramdas (2018) it takes a long time to get a product good enough for the real world, and a pilot program would help

to find out if there is a market for the designed EPMs. Ramdas (2018) also advises that starting with a minimum viable product (MVP), collecting data, and making changes till the product is ready for full launch helps to create an incredible product. After pilot program planning, NIPOST would need to integrate the locker with their existing systems and train their staffs on the usage of the EPMs.



Figure 11: Phase 2

The major aim of the design and development phase is to help NIPOST design EPMs fit for the Nigerian market, select pilot locations, and plan the logistics involved in installing the EPMs, integrate EPM management software with existing systems, develop customer interfaces for the EMP usage, train staffs on the usage and develop customer education materials.

The third phase is when the pilot would be implemented. This would involve the installation, testing and quality assurance, customer rollout and monitoring and feedback according to Ramdas (2018). The pilot implementation is the first step to building a relationship with the customer and it helps to ensure a grand market entry.



Figure 12: Phase 3

During this phase the already supplied lockers should be installed at the pilot locations, checked to ensure that all the technical and operational systems function correctly, test the locker software and interfaces addressing any issue that may come up during the checks, launching and marketing campaign to inform the customers about the new services which would be accompanied with incentives like promotions to encourage customer use. After the product start functioning NIPOST would need to monitor the usage and performance metric gathering customer feedback and make appropriate adjustments based on the feedback.



Figure 13: Phase 4

According to Duflo (2004), evaluations seek to answer the question “How would individuals who benefited from the program have fared in the absence of the program?”. The aim of the evaluation phase is to reflect on the pilot phase which would involve analysing the EPMs results to assess the performance and customer satisfaction, identify areas for improvement and implement the necessary changes. After the evaluation the next step for NIPOST is to develop a scaling plan to add the lockers to the additional locations prioritizing based on demand, logistical considerations, and strategic importance. According to Wadhwa et al. (2017), Inter-organizational collaboration helps to develop ambidexterity that leads to better performance NIPOST would need to explore partnerships with retail businesses and e-commerce platforms to increase the EPM’s usage, collaboration with the government or private sector to support the expansion of the EPMs and finally allocate resources for the continued maintenance and support.

The final phase is the full implementation and optimization of the EPMs which would involve a nationwide rollout, continuous improvement, marketing and customer engagement and performance monitoring. Timar (2023) defined product optimization as the process of introducing incremental improvements and tweaks to a product to create more value for the customers and boost their satisfaction. After a successful piloting testing, NIPOST can proceed to implementing EPMs at

prioritized locations across the country ensuring consistent service standards and operational efficiency, regularly update the software and hardware to enhance functionality and security, conduct more marketing campaigns to increase awareness and adoption of the EPMs in the new locations and finally track and monitor the KPIs. During the optimization process NIPOST might need to make small changes to suit the new market those changes are necessary because they would help make the EPMs the perfect solution for the market.



Figure 14: Phase 5

6 Conclusion

This thesis proposed a detailed and strategic framework for the implementation of EPMs by NIPOST, informed by the successful practices observed in Posti's operations. By addressing market research, digital transformation, network integration, regulatory compliance, and public awareness, NIPOST can effectively implement EPMs to improve its service delivery. Moreover, by focusing on building a strong brand presence among younger Nigerians, NIPOST can ensure sustained relevance and growth in the dynamic logistics industry.

6.1 Summary of findings

The thesis aimed to develop a comprehensive framework for the implementation of Electronic Parcel Machines (EPMs) by NIPOST. The primary objectives were to analyze how EPMs can help NIPOST enhance customer convenience, increase parcel security, and to suggest How NIPOST can evaluate the success of the EPM implementation. The theoretical foundation of this thesis was grounded in the essence and concept of implementing EPMs, using Posti as a case study. It examined the impact of EPMs on the efficiency of Posti's mail and parcel delivery process, with the goal of identifying best practices that could be emulated by NIPOST.

A detailed overview of both Posti's and NIPOST's mail and parcel logistics systems was provided, highlighting their respective strengths and challenges. Based on this analysis, an effective framework was developed for NIPOST to implement EPMs, taking into consideration the unique demographic, security, and infrastructural factors relevant to Nigeria. Additionally, an analysis of public perception regarding NIPOST and EPMs was conducted, emphasizing the importance of customer acceptance for the successful adoption of this technology.

The thesis underscored the significance of introducing EPMs to improve operational efficiency and customer satisfaction. Key performance indicators (KPIs) were identified to measure the success of the EPM implementation, ensuring that the goals of enhanced convenience and security are met. To gather practical insights, research was carried out through surveys targeting customers and semi structured interviews with Frank (2024) from NIPOST and Kultalahti (2024) from Posti. This research provided valuable information on existing processes, consumer preferences, innovation capacity, and the usability of EPMs. The data collected informed the development of a tailored framework designed to ensure the successful implementation of EPMs at NIPOST.

To answer the first research question, the study found that electronic lockers significantly improve customer convenience and satisfaction by providing flexible and secure parcel pickup options. Regarding the second question, the strategic placement and maintenance of lockers were identified as critical for optimizing operational efficiency and cost-effectiveness.

Based on the comprehensive research and analysis, several crucial steps were recommended for NIPOST to successfully integrate EPMs into its mail and parcel delivery processes. Firstly, conducting thorough market research is essential to understand the needs and preferences of Nigerian customers, as well as to assess the competitive landscape. Secondly, NIPOST must transition from analogue methods to digital solutions, embracing modern technology to streamline operations and enhance service delivery. Thirdly, integrating EPMs into NIPOST's existing logistics network is vital to leverage existing infrastructure and optimize resource utilization. Regulatory compliance is another critical factor, requiring NIPOST to ensure that the implementation of EPMs adheres to all relevant laws and regulations. Lastly, building awareness and trust among Nigerians is paramount. NIPOST should engage in targeted marketing and communication efforts to educate the public about the benefits of EPMs and to foster a positive perception of the new technology.

While the primary focus of the framework is on improving the efficiency of NIPOST's delivery processes, it is also crucial for NIPOST to enhance its brand presence among Nigeria's younger, tech-savvy generation. By aligning its services with the expectations and preferences of this demographic, NIPOST can increase its relevance and competitiveness in the modern market.

6.2 Discussion on the feasibility of EPM integration in NIPOST

Addressing Key Differences for Successful Implementation

To implement a system like Posti's EPMs, NIPOST must address several key differences, each requiring tailored solutions:

Cultural Differences

The diverse landscape of Nigeria influences consumer preferences, attitudes, and behaviors towards parcel delivery methods. Technological advancements, trust in new technology, security concerns, and convenience expectations vary among different demographic groups. The major concerns would come from the safety and security of parcels, especially in areas with high rates of theft. NIPOST needs to conduct extensive market research to understand these cultural nuances and consumer behaviors, implement public awareness campaigns to educate about the benefits of

electronic lockers, emphasize security and convenience using practical examples, and provide user-friendly interfaces with multilingual support.

Infrastructure Challenges

The lack of adequate power supply, good road networks, and sufficient sorting centers can impact the installation, usability, and overall effectiveness of EPMs. Adaptations to the locker designs should accommodate local infrastructural challenges. For example, Posti's EPMs without LCD screens that run on battery power and send signals to the control center when the battery is low could ensure continuous operations. Initially deploying EPMs in urban centers with better infrastructure, such as Lagos, particularly in areas like Yaba (known as the Silicon Valley of Africa), Ikeja, Lekki, Ikoyi, and Victoria Island, is recommended.

Operational Differences

The logistics and distribution network in Nigeria is less developed and more fragmented compared to Finland. This makes coordinating deliveries and managing locker operations efficiently a challenging task. Creating purposeful partnerships with banks, which have a large branch spread in Lagos, local courier services that dominate the last-mile delivery market, retail outlets, and other private postal agencies is crucial. Implementing a robust tracking and monitoring system using data, AI, and machine learning to manage parcel flow and optimize operational efficiency is also important.

By addressing these considerations and designing the system to meet the needs of the Nigerian market, EPMs have the potential to revolutionize parcel delivery services, offering efficiency, reliability, and convenience to consumers.

6.3 Recommendations for implementation and future research directions

While the framework and roadmap lay a strong groundwork, they might not be enough for NIPOST to smoothly introduce Automated Parcel Machines (APMs) into the Nigerian market. That's why there's a strong push for further research to propel the initiative forward. At this juncture, it's not just a suggestion but a necessity for NIPOST to dive deeper into market research. This means finding parcel lockers that truly match the specific needs and quirks of the Nigerian market, especially when it comes to security and ensuring reliable power supply.

Additionally, to really drive innovation and adaptation, it's recommended that NIPOST investigates pilot testing in communities that are more tech-savvy, like university campuses where students are known for being early adopters of new tech. These pilot tests aren't just about trying things out; they're crucial learning opportunities that allow NIPOST to fine-tune their strategies based on real feedback and insights.

To give their brand a modern makeover, NIPOST should embrace digital transformation. This involves everything from giving their website a fresh look to developing a user-friendly mobile app that caters to the evolving preferences of today's consumers. And let's not forget about the importance of a well-crafted marketing campaign, especially one that targets the younger generation the driving force behind the booming e-commerce scene.

Furthermore, to really get a comprehensive understanding of the market and stay ahead of the competition, it's a good idea for the author to reach out and interview other last-mile delivery companies operating in Nigeria. These conversations can provide valuable insights into what customers want and how other companies are meeting those needs. By fostering this culture of collaboration and knowledge-sharing, NIPOST can gain valuable intel that informs their strategies and ultimately improves their services and customer experiences.

6.4 Reliability and Ethics review

This thesis rests upon a meticulously constructed theoretical framework, meticulously crafted through a diligent exploration of a rich tapestry of academic resources. Scholarly articles, peer-reviewed journals, and a comprehensive review of the existing literature formed the cornerstone of

this endeavour. To ensure the reliability and credibility of the references, a diverse array of credible sources was consulted. Authoritative online databases, electronic books, and scholarly search engines like Google Scholar and Theseus were instrumental in this process. The digital library of JAMK University of Applied Sciences, Janet Finna, further enriched the reference pool, lending additional weight to the study's foundation. Notably, this work adheres stringently to the established standards for thesis structure and ethical conduct as outlined by JAMK University of Applied Sciences.

To transcend theoretical understanding and delve into the realm of practical application, a multifaceted data collection methodology was employed, encompassing both qualitative and quantitative approaches. The quantitative facet of the research utilized a survey instrument designed to capture the experiences of a broad spectrum of Nigerian citizens. This survey was disseminated to individuals of various age groups and professions, encompassing both those who send and receive parcels regularly. To gain invaluable internal insights, qualitative data collection was employed through interviews with staff members from both Posti and NIPOST. These interviews provided a unique perspective on the inner workings of the respective postal organizations. While the response rate from NIPOST staff was lower than initially anticipated, the data gathered from all participating entities is of sound quality.

It is acknowledged that the demographic characteristics of the survey respondents played a significant role in shaping the findings of this study. The diverse ages, locations, and socioeconomic backgrounds of the participants ensured a comprehensive perspective on the perceptions and preferences related to NIPOST services. This demographic diversity enhances the reliability and generalizability of the results, providing a robust foundation for the study's conclusions.

Sample Size and Generalizability: The number of survey respondents, while adequate for initial insights, is not large enough to generalize the findings to the entire population of Lagos. The sample size may not capture the full diversity of opinions and experiences across different demographic and socioeconomic groups.

Geographical Scope: The study is primarily focused on Lagos, which, while being Nigeria's largest city, may not represent the conditions and challenges faced by other regions in the country. Differences in infrastructure, economic activity, and customer behaviour across regions can influence the applicability of the findings.

Temporal Limitations: The study provides a snapshot based on data collected at a specific point in time. Changes in market dynamics, technology adoption rates, and NIPOST's operational improvements over time could impact the relevance of the findings.

Reliability of Self-Reported Data: The research depends on data provided by survey participants themselves, which may be influenced by biases such as social desirability bias, recall bias, and non-response bias. These biases have the potential to impact the accuracy and dependability of the responses.

Scope of Technological Assessment: While the study evaluates the readiness of NIPOST's infrastructure for EPM implementation, it may not encompass all technical and logistical challenges. Further detailed technical assessments and pilot testing are recommended to fully understand the operational intricacies.

Despite these limitations, the study provides valuable insights into the potential for transforming NIPOST's last-mile delivery through the implementation of electronic parcel lockers. By addressing the identified challenges and leveraging global best practices, NIPOST can enhance its service delivery and better meet the needs of its customers.

The ethical dimensions of the study were paramount throughout the data collection process. Participants in the survey were empowered to withhold responses to any questions that caused discomfort, reflecting the study's unwavering commitment to ethical research principles. These principles prioritize respect for individual dignity and the safeguarding of personal privacy.

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Appendices

Appendix 1. Survery for NIPOST

Parcel Locker Integration Survey

We are always looking for ways to improve your delivery service exprience in Nigeria. This short survey asks about a new delivery option called an electronic parcel locker and your experience with traditional deliveries.

What is a Parcel Locker?

Imagine a secure cabinet with individual compartments. When you order something online, the courier can deliver it to the locker instead of your home. You'll receive a code via SMS or email to open your designated locker compartment and collect your parcel at your convenience. (See Image below)

Please Note: Parcel/Packages doesn't include food items.

Informed Consent and Data Management: Your Participation Matters

Thank you for participating in our survey! Your insights are valuable to us. Before you proceed, we want to ensure that you understand how your data will be managed. Please read the following information carefully:

Purpose of Data Collection:

The purpose of this survey is to gather information related to Parcel locker integration in Nigeria. I am writing my thesis on the implementation and integration of parcel lockers in Nigeria .

Your responses will contribute to development of my thesis.

Data Collection Methods:

We collect data through this online survey. Your answers will be recorded and stored securely.

No personally identifiable information (PII) will be linked to your responses.

Data Storage and Security:

Your survey responses will be stored on secure servers hosted by Google.

We use encryption to protect your data during transmission and storage.

Anonymization and Confidentiality:

Your responses will remain anonymous. We will not associate your name or contact details with your answers.

Only authorized researchers will have access to the aggregated data.

Data Retention Period:

We will retain your survey data for 1 year for research and analysis purposes.

After this period, all data will be securely deleted.

Participant Rights:

You have the right to access your survey responses upon request.

If you wish to withdraw your consent or have any concerns, please contact me at Bankoleabdulaz-eez@gmail.com

Opt-Out Option:

Participation in this survey is voluntary. You can choose to exit the survey at any time without providing any reason.

By continuing with this survey, you acknowledge that you have read and understood the above information. Your participation is greatly appreciated!

1 Gender

Male

Female

Prefer not to say

2 What age group do you belong to?

14-25

26-35

36-45

45 and above

3 Where in Nigeria do you live

Lagos

Abuja

Port-Harcourt

Other:

4 Occupation

Student

Unemployed

Employed

Retired

Other:

- 5 On a scale of 1 (very dissatisfied) to 5 (very satisfied), how satisfied are you with the current parcel/package delivery service in Nigeria?

1 (very dissatisfied)

1

2

3

4

5

5 (very satisfied)

- 6 Have you ever experienced difficulties or inconveniences when receiving your ordered package/parcels through traditional delivery services in Nigeria? (Please select all that apply)

Long wait times at the pickup point

Missed deliveries because I wasn't home.

Damaged parcels/package

Lost parcels/package

Stolen parcels/package

Rude courier/Delivery Man

Other:

- 7 How often do you receive parcels/packages through delivery services in Nigeria?

Weekly

Monthly

A few times a year

Rarely

- 8 Have you ever encountered issues such as lost or damaged parcels/packages when using traditional delivery services in Nigeria?

Yes

No

We're exploring a new option called an electronic parcel locker. Imagine a secure cabinet with individual compartments at convenient locations like grocery stores or gas stations. Parcels can be delivered there, and you'd receive a code to pick them up at your convenience.

9 Would you be interested in using electronic parcel lockers as an alternative to traditional delivery methods?

Yes

No

Maybe

If your answer to the previous question is no or maybe, can you kindly tell why?

10 What factors would influence your decision to use electronic parcel lockers? (Select all that apply)

Secure storage for my packages

24/7 access for pick-up

Convenient locations (e.g., shopping malls, gas stations, hostels, supermarkets)

SMS or email notification for parcel arrival

Cost-effectiveness compared to traditional delivery.

Other:

11 How important is security and convenience to you when receiving parcels?

Security is more important.

Convenience is more important.

Both are equally important.

12 Do you think electronic parcel lockers would improve the efficiency of parcel delivery in Nigeria?

Yes

No

Maybe

If your answer to the previous question is no or maybe, can you kindly tell why?

13 Are you concerned about the cost of using electronic parcel lockers compared to doorstep delivery services?

No

Yes

14 How do you feel about the idea of picking up parcels from the nearest grocery store, mall, hostel, or designated pickup location, rather than having them delivered to your doorstep, especially considering that it could potentially be a cheaper option?

I do not like to stress; I would prefer doorstep delivery even if it's more expensive.

I would be open to picking up parcels from a convenient location if it's cheaper (Money saver).

Neutral (Depending on my mood)

15 Have you used NIPOST to send or receive parcel/package?

Yes

No

If your answer to the previous question is no, can you kindly tell why?

16 If NIPOST had parcel lockers close to you, would you used them?

Yes

No

Other:

17 Do you have any additional comments or suggestions related to NIPOST services or parcel lockers?

Appendix 2. Title of the Appendix