

**THE IMPACT OF EMERGING TECHNOLOGIES ON LAST MILE DELIVERY OPERATIONS  
CASE OF STUDY: DALSEYH HILLBOM LYNN, UGANDA (DHL)**

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**A DISSERTATION SUBMITTED TO THE SCHOOL OF BUSINESS, IN PARTIAL  
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## DECLARATION

I, INGABIRE MARTHA, REG NO: J22B12/117 do hereby declare that "The impacts of emerging technology on last mile delivery" adoption on organizational performance. A case study of DHL. This research report has never been published by any other person and so is purely by myself with a close guidance of my academic supervisor.

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## APPROVAL.

This research report has been submitted by INGABIRE MARTHA, REG No: J22B12/117 with the approval of my academic supervisor.

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Date: ..... /06/2024

## DEDICATION

I dedicate this study report to God, my family, and my friends in appreciation of their love, concern, and support throughout my academic career. They gave me a strong drive to learn and made it simple for me to get a top-notch education. God be with you everyone.

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## ABSTRACT

The last mile delivery segment of logistics has witnessed a transformative evolution with the advent of emerging technologies. This dissertation explores the multifaceted impact of these technologies on last mile delivery operations, considering both the opportunities and challenges they present. Through a comprehensive review of literature, analysis of case studies, and empirical research, this study examines the adoption and integration of technologies such as autonomous vehicles, drones, robotics, and artificial intelligence in last mile delivery processes.

The research delves into the efficiency gains, cost savings, and environmental benefits facilitated by these technologies, as well as their implications for workforce dynamics and urban infrastructure. Furthermore, it investigates the regulatory frameworks and ethical considerations shaping the deployment of emerging technologies in last mile delivery. By synthesizing theoretical insights with real-world insights, this dissertation contributes to a deeper understanding of the complex interplay between technology, logistics, and society.

Ultimately, this study underscores the importance of strategic planning, collaboration, and adaptation in leveraging emerging technologies to optimize last mile delivery networks. It provides valuable insights and recommendations for industry stakeholders, policymakers, and researchers to navigate the dynamic landscape of modern logistics and harness the potential of technology-driven innovations for sustainable and efficient last mile delivery.

## LIST OF ACRONYMS

DHL **DALSEYH HILLBOM LYNN, UGANDA**

IOT INTERNET OF THINGS

IT INFORMATION TECHNOLOGY

AI ARTIFICAL INTELLIGENCE

E-COMMERCE ELECTRONIC COMMERCE

P2P PEER TO PEER

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# **CHAPTER ONE**

## **1.0 INTRODUCTION**

The study looks at how last-mile delivery operations are affected by developing technology. This chapter includes the study's background to study, problem statement, research objective, and specific goals, research Issues, The study's scope Importance of the research, expected issues, their resolution, and the specification of variables in practice.

## **1.1 BACKGROUND OF THE STUDY**

Technology is a broad concept that deals with use and knowledge of tools and crafts and how its use affects the ability to control and adapt to the social and physical environment. (Banta, July 2009, ) In the context of business, technology encompasses a wide range of tools, software, hardware, and systems that streamline operations, enhance communication, and drive innovation.

In the paper by (Jucha, (2021)) addresses technology developments in the delivery sector with an emphasis on effectiveness and client support. Route optimization, real-time tracking, autonomous sorting, mobile apps, contactless delivery, drones, autonomous cars, data analytics for demand forecasting, and cybersecurity measures are some of the examples of innovations.

Last mile delivery refers to the final leg of the delivery process, where goods are transported from a distribution center or hub to the end consumer's doorstep or desired location. (Puri, 2022)This stage of delivery has evolved significantly over time. In the past, last mile delivery was typically handled by individual couriers or postal workers who would manually deliver packages to each customer's address. These couriers would often navigate through busy city streets and face challenges such as traffic congestion, limited parking, and difficult-to-reach locations. However, with the advancement of technology and the rise of e-commerce, last mile delivery has undergone significant changes.

We explore the historical development of last-mile delivery, tracing its evolution from early methods of transportation to the innovative solutions and challenges faced in the contemporary era. By examining key milestones, trends, and shifts in priorities within supply chain management, we aim to provide a comprehensive understanding of how last-mile delivery has

evolved over time and its increasing importance in meeting the demands of today's dynamic marketplace.

Logistics, in its essence, is the management of the flow of goods and services from the point of origin to the point of consumption. It encompasses various activities such as transportation, warehousing, inventory management, packaging, and information management. The significance of logistics lies in its role as the backbone of global trade and commerce, facilitating the efficient movement of goods across supply chains, ultimately ensuring products reach consumers in a timely manner.

The evolution of technology in the logistics sector has been intertwined with the progression of human civilization. Early logistics operations relied heavily on manual labor and basic transportation methods, such as carts and pack animals. With the advent of civilization, civilizations began developing more sophisticated transportation methods, such as the invention of the wheel and the utilization of waterways for trade (mecalux, 2023).

The industrial revolution marked a significant turning point in logistics technology with the invention of the steam engine. Steam-powered locomotives and steamships revolutionized transportation, enabling goods to be transported over long distances more quickly and efficiently. Additionally, the introduction of the assembly line by Henry Ford in the early 20<sup>th</sup> century streamlined manufacturing processes, leading to increased production and the need for more efficient logistics management. (Sharma, 2020)

The emergence of computer technology in the mid-20<sup>th</sup> century brought about further advancements in logistics. Computerized inventory management systems enabled companies to track and manage inventory levels more effectively, reducing waste and improving efficiency in supply chain operations (Banta, July 2009, ).

In the contemporary landscape of logistics technology, digitalization, automation, and data analytics play pivotal roles in transforming traditional logistics practices. The integration of Internet of Things (IoT) sensors into logistics operations allows for real-time monitoring of shipments, enabling companies to track the location, condition, and status of goods throughout the supply chain (Mouha, 2021).

Block chain technology has emerged as a game-changer in supply chain transparency, providing a secure and transparent way to record and track transactions across multiple parties. By creating an immutable ledger of transactions, block chain technology enhances trust and accountability in supply chain management (Dutta, 2020).

Artificial intelligence (AI) algorithms have revolutionized logistics with predictive analytics capabilities. AI-powered systems analyze vast amounts of data to forecast demand, optimize route planning, and anticipate potential disruptions in supply chain operations, enabling companies to make data-driven decisions and improve efficiency (Ushakov, 2022).

Last-mile delivery, the final leg of the delivery process from distribution center to the end customer, has become increasingly important in urban logistics and e-commerce fulfillment. Advancements in logistics technology have enabled companies to optimize last-mile delivery operations through innovative solutions such as route optimization algorithms, real-time tracking systems, and customer engagement platforms.

Companies leverage technology to optimize delivery routes, minimize delivery times, and reduce transportation costs in the last mile. Real-time tracking systems provide customers with visibility into the status of their deliveries, enhancing transparency and customer satisfaction.

Additionally, companies utilize customer engagement platforms to communicate with customers, provide delivery updates, and gather feedback, further enhancing the overall delivery experience. (Jucha, (2021))

E-commerce's ascent (1990s–2000s) Last-mile delivery saw a major transformation in the 1990s and 2000s with the development of e-commerce. In order to properly fulfill consumer orders, online merchants like Amazon invented new logistics methods, which raised demand for deliveries that were quicker and more dependable. (Corejova, 2022)The global retail e-commerce sales have grown from 1.34 trillion in 2014 to 4.28 trillion in 2020. Further growth is expected, as experts predict sales of 6.39 trillion by 2024, amounting for almost 22% of total retail sales (Cramer-Flood, 2021).

## **1.2 STATEMENT OF THE PROBLEM**

The last-mile delivery landscape is considered a rapidly transforming thanks to a surge in innovative technologies. While DHL has made significant strides in optimizing logistics and efficiency (Moradi, 2023) a closer look reveals an underutilization of these advancements within their last-mile operations. This underutilization manifests in the limited adoption of solutions like advanced route optimization algorithms, real-time tracking enhancements, and autonomous vehicles. As a result, DHL isn't reaping the full benefits of these technologies, hindering their ability to achieve peak efficiency, customer satisfaction, and cost-effectiveness. This gap becomes even more critical when considering the evolving landscape of customer expectations and industry standards. DHL's current approach, while functional, risks falling behind competitors who are more aggressively embracing cutting-edge solutions. Additionally, the growing demand for faster, transparent, and sustainable deliveries further emphasizes the need for DHL to bridge this technological gap (Sorooshian, (2022)). To stay ahead, a comprehensive review and strategic integration of advanced technologies are crucial. By aligning their last-mile operations with the ever-changing demands of the logistics landscape, DHL can ensure they remain competitive and deliver exceptional customer experiences.

## **1.3 SPECIFIC OBJECTIVES OF THE STUDY**

- I. To examine the effectiveness of technology to last mile delivery
- II. To examine create measurements and key performance indicators (KPIs) to track the success of technology adoption initiatives and their effects on delivery efficiency.
- III. To examine the challenges that come with implementing technology in the companies

## **1.4 RESEARCH QUESTIONS**

- I. What are the effectiveness of technology to last mile delivery
- II. What create measurement and key performance indicators that will track the success of technology adoption initiatives and their effects on delivery efficiency at DHL?
- III. What are the challenges that come with implementing technology at DHL?

## 1.5 SIGNIFICANCE OF THE STUDY

In order to maintain competitiveness, improve customer happiness, and adjust to the ever-changing landscape of technology-driven logistics operations, the logistics industry must comprehend the complexities and difficulties associated with integrating developing technologies in last-mile delivery. In order to enable logistics stakeholders to make wise decisions and carefully apply cutting-edge technology for long-term success, this study aims to provide insightful information.

The study's conclusions can direct future investigations into developing technologies and last-mile delivery. It offers a foundation for investigating novel directions, improving current technology, and dealing with new problems.

The study supports the development of sustainable practices by assessing the environmental impact of developing technologies in last-mile delivery. By using this information, logistics companies may reduce their carbon footprint and promote environmental sustainability by implementing eco-friendly measures.

The study will help management and the workforce comprehend the abilities and know-how needed to adjust to last-mile delivery's technology advancements. In order to guarantee a seamless transition to technologically sophisticated procedures, this expertise is essential for workforce development and training programs.

Logistics companies may optimize last-mile delivery processes by studying the opportunities and challenges posed by developing technology. This can therefore result in increased customer satisfaction, decreased operating expenses, and higher efficiency.

Logistics firms, online retailers, and other industry participants will be able to use the study's practical insights to help them decide how best to incorporate cutting-edge technologies into last-mile delivery. This covers investment choices, operational optimizations, and strategic planning.

Companies may adjust their services to match changing customer expectations by knowing how customers view and interact with last-mile delivery services enhanced by developing

technologies. Better client happiness, loyalty, and a competitive advantage in the market may result from this.

## **1.6 SCOPE OF THE STUDY**

The scope of the study on the impact of emerging technologies on last-mile delivery in logistics encompassed several key dimensions, each aligned with the specific objectives and research questions outlined earlier.

### **1.6.1 GEOGRAPHICAL SCOPE**

The study focused on DHL a German logistics company providing international shipping and courier services but particularly DHL Kampala, Uganda which is located on Kampala Road, Mabirizi Complex Building, First Floor Room 03, and Kampala, Uganda.

### **1.6.2 TIME SCOPE**

The study covered the period between 2019 and 2024 as this was the period when the company had inefficiencies in the supply chain system.

## **1.7 LIMITATIONS OF THE STUDY**

It was difficult for the researcher to answer inquiries from respondents when they didn't actually know the answers. Giving people more likely scale questions to answer, where they can check the options at will and minimal information is required for the open-ended questions, can fix this problem.

Due to the fact that the researcher paid for transportation to and from the company, printing, stationery, binding, and other expenses, the researcher was limited by financial limitations. This was resolved by asking friends and family for money so she can complete the exercise.

One potential constraint could be the respondent's unwillingness to provide the researcher with the necessary information, as certain information may be confidential and they may choose not to share it with the researcher. We'll tried to persuade them that the data is solely intended for study and has no other use in order to resolve this.

## **CHAPTER TWO: Literature Review**

### **2.0 INTRODUCTION**

According to Ronald and William (2003), technology is a system of both simple and complete, electronic, hardware devices and informal communication chains or computer-based information systems that use hardware and software, internet, and other telecommunication networks that transform data resources into endless data of information products.

(Casella, 2022)The late 20th and early 21st centuries witnessed the rise of automation and information technology in logistics. Automated warehouses, robotic systems, and advanced material handling equipment streamlined operations and improved efficiency. Furthermore, the advent of computer systems and software facilitated the management of inventory, transportation planning, and supply chain coordination, leading to greater visibility and control over logistics processes.

The advent of the internet and e-commerce in the late 20th and early 21st centuries transformed last-mile delivery. E-commerce platforms and online marketplaces revolutionized retail, allowing consumers to shop for goods online and have them delivered directly to their doorsteps.

(Peppel M. R., 2022)Last-mile delivery became a critical focus for logistics companies and retailers, with a growing emphasis on speed, convenience, and customer experience.

Advancements in logistics technology, such as route optimization software, real-time tracking systems, and alternative delivery solutions (e.g., drones, autonomous vehicles), have further transformed last-mile delivery, enabling companies to optimize delivery routes, provide real-time tracking and visibility, and offer innovative delivery options to meet the evolving needs of customers. Consequently, manufacturing, logistics, and transportation systems are significantly impacted by technologies such as cyber-physical systems (CPS) and the Internet of Things (IoT).

(Kostrzewski, 2022)

## 2.1 THE EFFECTIVENESS OF TECHNOLOGY TO LAST MILE DELIVERY

Last-mile delivery, the final step in the logistics chain, plays a crucial role in customer satisfaction and business success. With the rise of e-commerce and consumer demand for fast and reliable deliveries, the effectiveness of last-mile delivery has become increasingly important. Technology has emerged as a powerful tool to optimize last-mile delivery processes, enhancing efficiency, accuracy, and customer experience. In this essay, we will explore the effectiveness of technology in last-mile delivery through seven key points.

According to (Koh L. Y., Consumer acceptance of the autonomous robot in last-mile delivery: A combined perspective of resource-matching, perceived risk and value theories. *Transportation Research Part A: Policy and Practice*, 2024), One of the primary benefits of technology in last-mile delivery is automation. Advanced algorithms and machine learning enables companies to optimize delivery routes, minimize delivery times, and reduce costs. Automated route planning software is able to track traffic patterns, weather conditions, and delivery windows to create the most efficient routes for drivers. These companies can achieve higher delivery densities, lower fuel consumption, and ultimately, faster deliveries. (Chen, 2021).

Technology provides real-time tracking and visibility throughout the delivery process, enabling both businesses and customers to monitor shipments accurately (Shukla, 2022). GPS tracking systems allow customers to track their deliveries in real-time, providing them with updates on the status and estimated time of arrival. Similarly, businesses can track their vehicles and monitor delivery progress to ensure timely and efficient service. (Kafle, 2023)Real-time visibility not only enhances customer satisfaction but also improves operational transparency and accountability. According to (Peppel M. S., 2024) delivery management platforms provide comprehensive solutions for managing last-mile delivery operations. These platforms integrate various functionalities such as order management, route optimization, driver dispatching, and customer communication into a single interface. Through centralized platforms, companies can streamline their delivery processes, improve coordination between stakeholders, and enhance overall efficiency. (Alverhed, 2024) Moreover, these platforms often offer customizable features and scalability, allowing businesses to adapt to changing requirements and scale their operations as needed.

The COVID-19 pandemic has accelerated the adoption of contactless delivery solutions, further highlighting the importance of technology in last-mile delivery. (Koh L. Y., 2024) Contactless delivery options, such as doorstep delivery, self-service lockers, and drone delivery, minimize physical contact between drivers and customers, reducing the risk of transmission. Technology enables the seamless implementation of these solutions, ensuring safe and hygienic delivery experiences for both parties (Bergi, 2021). Contactless delivery not only addresses immediate health concerns but also sets a precedent for future delivery standards. Effective last-mile delivery relies on collaboration and integration between various stakeholders, including retailers, carriers, drivers, and customers. (Judijanto, 2024) Technology facilitates seamless collaboration through integration with existing systems and platforms. APIs (Application Programming Interfaces) enable different software applications to communicate and share data, allowing for the seamless exchange of information between stakeholders. By fostering collaboration and integration, technology promotes interoperability, efficiency, and service consistency across the delivery ecosystem. (Ko, 2020)

Technology-driven innovation is essential for the continuous improvement of last-mile delivery operations. As consumer preferences and market dynamics evolve, companies must innovate and adapt to stay competitive (Krishnan, 2024). Emerging technologies such as artificial intelligence, robotics, and block chain offer new opportunities to enhance last-mile delivery efficiency and customer experience. By investing in research and development, companies can stay ahead of the curve, drive innovation in the industry, and deliver value-added services to customers.

## 2.2 TECHNOLOGICAL TRENDS IN LAST MILE DELIVERY

Technological advancements have been reshaping last-mile delivery, optimizing routes, enhancing tracking capabilities, and introducing innovative delivery methods. Supply chain management has advanced significantly as a result of the convergence of digitalization, automation, and data analytics in the modern logistics technology environment. Modern advancements in artificial intelligence (AI), block chain technology, Internet of Things (IoT) sensors, and AI algorithms are revolutionizing old logistical methods and bringing forth increased cost-effectiveness, efficiency, and transparency.

Route optimization plays a crucial role in last-mile delivery efficiency. Several studies have explored algorithms and models for optimizing delivery routes to minimize costs, reduce delivery times, and improve resource utilization. (Jucha, (2021))

Literature suggests that heuristic algorithms, metaheuristic algorithms (such as genetic algorithms and simulated annealing), and mathematical optimization models (such as integer linear programming and vehicle routing problem formulations) are commonly used for route optimization in last-mile delivery.

Research has focused on developing algorithms that consider various constraints and factors, including traffic congestion, vehicle capacity, delivery time windows, customer preferences, and environmental concerns.

The Internet of Things (IoT) is basically like a system for connecting computer devices, mechanical and digital machines, objects, or individuals provided with a unique system (UIDs) and without transfer to transmit data over an ability human-to-human or computer-to-human relation. (Laghari, 2021) Sensors embedded in physical objects, allow them to collect and transmit data over the internet. The sensors are used to track shipments, monitor environmental conditions (such as temperature and humidity), and optimize fleet management. (Kostrzewski, 2022) Temperature sensors in refrigerated containers ensure that perishable goods remain within the required temperature range during transportation, reducing the risk of spoilage. (Mouha, 2021) GPS trackers enable real-time tracking of shipments, providing visibility into their location and estimated arrival time which improves logistics planning and customer service by reducing delivery delays.

Blockchain technology are shared and distributed data structures or ledgers that can securely store digital transactions without using a central point of authority. More importantly, block chains allow for the automated execution of smart contracts in peer-to-peer (P2P) networks [9] (Dutta, 2020). They can alternatively be seen as databases that permit multiple users to make changes in the ledger simultaneously, which can result in multiple chain versions. In logistics, block chain ensures supply chain transparency, traceability, and security by creating an immutable record of every transaction or event such as food companies use block chain to track the origin of ingredients and verify their authenticity, enhancing food safety and compliance with regulations. Retailers and manufacturers use block chain to trace the movement of products

throughout the supply chain, reducing the risk of counterfeit goods and improving product recall processes. (Andoni, 2019)

**Artificial Intelligence (AI)** Artificial intelligence (AI) is a broad area of computer science that makes machines function like a human brain. It is used to address issues that are difficult to clarify using traditional computational techniques. AI was first discovered in 1956 by John McCarthy but failed to achieve its objectives. (Abduljabbar, 2019) The algorithms analyze large volumes of data to identify patterns, trends, and anomalies, enabling predictive analytics and actionable insights. In logistics, AI is used for demand forecasting, route optimization, and predictive maintenance. AI-powered demand forecasting algorithms analyze historical sales data, market trends, and external factors (such as weather) to predict future demand with greater accuracy. This reduces inventory holding costs and stock outs. AI-driven route optimization software optimizes delivery routes based on factors like traffic conditions, vehicle capacity, and customer preferences, reducing fuel consumption and transportation costs. (Ushakov, 2022)

Last-mile delivery holds immense significance in urban logistics and e-commerce fulfillment, as it represents the final step in getting goods from a distribution center to the customer's doorstep. In urban areas, where population density is high and traffic congestion is common, efficient last-mile delivery is crucial for timely and cost-effective delivery. Moreover, in the context of e-commerce, where customers expect fast and convenient delivery options, optimizing the last mile is essential for enhancing customer satisfaction and retention.

In e-commerce fulfillment, last-mile delivery plays a critical role in shaping the customer experience and influencing purchasing decisions. Customers expect fast, reliable, and convenient delivery options, and the success of e-commerce companies is hinged on their ability to meet these expectations.

## 2.3 CHALLENGES IN IMPLEMENTING TECHNOLOGY TO LAST-MILE DELIVERY

The exponential growth of e-commerce, particularly evident during the COVID-19 pandemic, has intensified the challenges associated with last-mile deliveries. Defined as the final stage of the supply chain, last-mile delivery encounters complexities exacerbated by shifts in consumer behavior and rapid urbanization. These challenges manifest in congestion, prolonged delivery times, and sustainability concerns, as noted by (Alverhed, 2024).

While implementing technology in last-mile delivery offers numerous advantages, it also presents several hurdles that companies must navigate to realize its full potential. Chief among these challenges is the significant upfront investment required to adopt and integrate new technologies into existing delivery processes. This investment encompasses not only the acquisition of hardware like GPS trackers, handheld devices, or delivery drones but also the implementation of software solutions such as route optimization algorithms and customer tracking systems. (mohammad, 2023) highlights the critical role of these technologies in advancing logistics, particularly in urban areas.

Integrating new technology into the last-mile delivery ecosystem necessitates adjustments to established workflows and comprehensive employee training programs. Employees need time to familiarize themselves with new tools and systems, which may temporarily disrupt operations and productivity. To mitigate these disruptions, companies must invest in thorough training programs and provide ongoing support to facilitate smooth adoption.

Another formidable challenge lies in managing and maintaining the intricate technology infrastructure essential for efficient last-mile delivery. This includes ensuring the reliability and security of hardware and software systems, promptly addressing technical issues, and staying current with software updates. (Merchán, 2021)underscores the importance of regular maintenance and monitoring for delivery drones or autonomous vehicles to ensure optimal performance and safety. The relentless pace of technological innovation necessitates continuous evaluation and upgrading of technology solutions to remain competitive. However, this poses a challenge for businesses with limited resources or expertise in emerging technologies. Strategic planning and investment are essential for identifying technologies that offer the most significant benefits to last-mile delivery operations.

Moreover, the integration of technology introduces new cybersecurity risks that demand vigilant mitigation efforts. As delivery operations become increasingly reliant on interconnected devices and digital platforms, they become more susceptible to cyber threats such as data breaches or ransom ware attacks. Protecting sensitive customer information and ensuring the integrity of delivery systems require robust cybersecurity measures.

Additionally, cultural resistance to change within organizations can impede the successful implementation of technology in last-mile delivery. Employees may be hesitant to embrace new technologies due to fears of job displacement or uncertainty about the impact on their roles. Overcoming this resistance necessitates effective communication, leadership buy-in, and a clear articulation of the benefits that technology can bring to both the company and its employees.

## 2.4 METRICS AND KEY PERFORMANCE INDICATORS (KPIs) TO MONITOR THE EFFECTIVENESS AND IMPACT OF TECHNOLOGY ON DELIVERY EFFICIENCY

Establishing metrics and key performance indicators (KPIs) is pivotal for gauging the effectiveness and impact of technology adoption efforts on last-mile delivery efficiency. These metrics should provide insights into various aspects of the delivery process and facilitate tracking progress towards enhancing efficiency (Alverhed, 2024). Without clear metrics and KPIs, it's challenging for companies to assess the impact of technology adoption on last-mile delivery efficiency. By establishing relevant metrics, businesses can effectively monitor their progress and identify areas for improvement.

Measuring the variance between estimated and actual delivery times is crucial. This KPI evaluates the accuracy of delivery time predictions enabled by technologies like route optimization algorithms and real-time tracking systems. Comparing delivery times before and after technology implementation allows for an assessment of efficiency improvements, with a lower variance indicating enhanced planning and execution in last-mile delivery. Tracking the

variance between estimated and actual delivery times provides tangible evidence of how technology adoption impacts delivery accuracy and efficiency. By reducing this variance, companies demonstrate improved planning and execution, leading to more reliable delivery services (mohammad, 2023).

Accurate order fulfillment is paramount for customer satisfaction and operational efficiency. Technology solutions such as automation in inventory management and order processing enable companies to monitor order accuracy. On-time delivery is a critical KPI reflecting delivery efficiency, with the percentage of successful first-attempt deliveries serving as a key indicator. A higher success rate signifies effective technology utilization in overcoming obstacles and ensuring timely deliveries. Accurate order fulfillment is crucial for maintaining customer satisfaction and optimizing operational efficiency. By leveraging technology solutions, companies can streamline inventory management and order processing, leading to higher rates of on-time delivery and improved customer experiences (puri, 2022).

Cost savings are a significant outcome of technology adoption in delivery processes. Monitoring the cost per delivery and cost per mile traveled allows for an assessment of the financial impact of technology implementation. Optimizing routes and leveraging technology solutions like GPS tracking and route optimization software help reduce delivery costs per mile, enhancing efficiency and profitability. Cost savings are a key driver of technology adoption in last-mile delivery. By monitoring costs per delivery and per mile, companies can evaluate the financial benefits of technology implementation, including reduced fuel consumption and labor costs (puri, 2022).

For transportation and logistics businesses, tracking driver productivity is essential for optimizing delivery efficiency. Monitoring the utilization rate of delivery drivers and vehicle performance metrics such as fuel efficiency and maintenance costs enables businesses to optimize fleet performance and minimize disruptions in last-mile delivery operations. Maximizing driver productivity and vehicle performance is essential for achieving efficient last-mile delivery. By leveraging technology solutions, companies can optimize resource utilization, reduce operational costs, and enhance overall delivery efficiency (Merchán, 2021).

Ultimately, the effectiveness of technology adoption efforts should translate into improved customer satisfaction and retention. Gathering feedback from customers regarding their last-mile

delivery experience through surveys, feedback mechanisms, and Net Promoter Score (NPS) helps assess whether technology enhancements positively impact the overall delivery experience. Positive feedback and high satisfaction scores indicate that technology-enabled last-mile delivery processes are meeting or exceeding customer expectations, thus reinforcing the benefits of technology adoption in enhancing delivery efficiency. Customer satisfaction is a critical measure of the success of technology adoption in last-mile delivery. By collecting feedback and monitoring satisfaction metrics, companies can ensure that technology-enabled processes align with customer expectations and contribute to long-term customer loyalty and retention (maisano, 2018).

# **CHAPTER THREE: Methodology**

## **3.0 INTRODUCTION**

This chapter mostly addresses the techniques and protocols that were be used by the research to get the necessary data. Additionally, this chapter covers the study region, sample design, data collecting source, data collection tools, data collection techniques, and tool validation and dependability, research variables, data processing, methods for interpretation and analysis, ethical considerations, and study limitations.

This chapter presents the methodology, which should be used in carrying out the study, which includes the research design, study population, sample size determination, sample selection, sources of data, data collection instruments, validity & reliability and ethical consideration.

## **3.1 RESEARCH DESIGN**

This study has employed a descriptive research design in order to collect data required to answer the research questions. This provides the researcher with a clear picture about how IT impact on supply chain at DHL The basic reason for using descriptive study design is because not so much is known about the situation at hand to comprehend the nature of and describe the characteristics of variables of interest in situations thus fit for such kind of study given that little empirical research has been carried out on IT According to (McLeod, 2008),a research design is "the overall plan or structure of the study that serves as a guide in collecting and analyzing data."

The study employed a cross-sectional research approach which can allow to study, multiple variables at the same time for example age, gender and level of education as well as other performance indicators. The study also incorporated both qualitative and quantitative data collection methods in order to achieve the desired results. This design facilitated the manipulation of study variables to derive insights of the study.

### **3.2 AREA OF STUDY**

The study population refers to the specific group of individuals or elements from which data is collected and analyzed in a research study. The study will be carried out At Kampala Road, Mabirizi Complex Building, First Floor Room 03, and Kampala, Uganda.

### **3.3 SAMPLE SIZE**

DHL is a wide company in over 200 countries with over 600,000 employees overall. The study will focus on the employees in Uganda with the number of respondents where the Sample Size =  $N / (1 + N * e^2)$

N= population size

e= margin of error

The total population of employees of DHL Kampala road are 30 employees and the researcher will purposively select respondents including Managers, Officers and other support staff. The research will use a sample size of 30 respondents that will be selected from the population above.

### **3.4 SAMPLES DESIGN AND PROCEDURE**

Sampling design can be divided into two main categories, probability, and non-probability sampling. In probability sampling, every person in the target population (either random or representative) has an equal chance of being selected for the sample. (Lanz, 2019) To be more precise, the researcher employed purposive sampling along with a nonprobability sampling approach. This was because the people that were recognized had an edge over others in light of the questions that were posed, and they assisted the researcher in providing the best answers possible because the researcher already had some background details on their studies and the activities they carry out as part of DHL initiatives.

### **3.4.1PURPOSIVE SAMPLING**

The procurement, production, research and development, and operations department heads will be Purposively Sampled for the qualitative data. This approach will be taken since the purposively selected individuals are assumed to have vast knowledge of the subject. The researcher is eager to learn more from people who are knowledgeable and experienced in last mile delivery-related matters. The respondents will be recorded and the data will later be transcribed for purposes of the research report.

### **3.4.2RANDOM SAMPLING**

These other respondents including all staff will be selected randomly without bias and each will have chance is being selected. Aiming to produce a representative sample that accurately reflects the characteristics of the population from which it will be drawn. The researcher will use to come up the exact number of people to respond to the questionnaire for quantitative data.

### **3.4.3 SOURCES OF DATA**

Primary and secondary sources has both provide data for the collection. Using specially created questionnaires, the primary data will be gathered from the sample population that was determined in table I above. The maintained organization's internal records are another source of secondary data, such enhanced by information taken from journals, newspapers, websites, books on procurement, and other library-accessible sources.

## **3.5 DATA COLLECTION INSTRUMENTS**

Data collection instruments are tools used to collect data and record during research. The researcher will use a questionnaire guide to collect necessary information for the study.

Collecting data involves using a certain method of inquiry to establish facts in instances when the knowledge that is already accessible is sufficient. There will be in-depth interviews with the project officer, field officers, local council representatives, community organizers, and lastly the children and teenagers to get the needed data. The rationale for conducting in-depth interviews was to facilitate a greater level of engagement between the researcher and the respondents, so yielding more information. Data was later transcribed after the interview was recorded.

The researcher obtained a letter of authorization to carry out the study from Uganda Christian University's Research Ethics Committee. The researcher informed DHL that she had been assigned to perform a study in their company with an introductory letter from the School of Business at Uganda Christian University. These letters were submitted in order to move on with and carry out the research.

### **3.6 QUESTIONNAIRE GUIDE**

Questionnaire involved the researcher formulating a set of questions on the study's subject and providing them to participants to complete online, offline, or orally, or digitally. Because this approach is user-friendly and reasonably priced, it is convenient for researchers.

Both closed-ended and open-ended questionnaires will be used in the study as a fundamental method of data collection. Researchers utilize both closed-ended and open-ended questionnaires because they provide for easy access to respondents and can span a broad geographic range via questionnaires more than with any other technique.

A questionnaire is a research instrument that consists of a set of questions or other types of prompts that aims to collect information from a respondent. A research questionnaire is typically a mix of close-ended questions and open-ended questions. (scribbr, 2021 )

### **3.7 DATA ANALYSIS**

Descriptive statistics was used to summarize and modify the data acquired since they guarantee correctness, completeness, sufficiency, and reliability and allow the researcher to properly characterize measurements using a limited number of indices.

This happened after data had been collected, the researcher had to analyze data and present it. It was done manually. It was done using pie charts, graphs, tables, figures, or diagrams. The data was presented according to the study objectives.

### **3.8 ETHICAL CONSIDERATION**

The management of DHL has given the researcher complete information and authority to conduct the study. To allay any suspicions, the researcher will obtain an introduction letter from the institution. After that, the researcher will keep choosing respondents, set up times for delivering surveys, picking them up, and scheduling interviews. The researcher will guarantee the respondents' privacy about the information they submit and promise not to share it with outside parties.

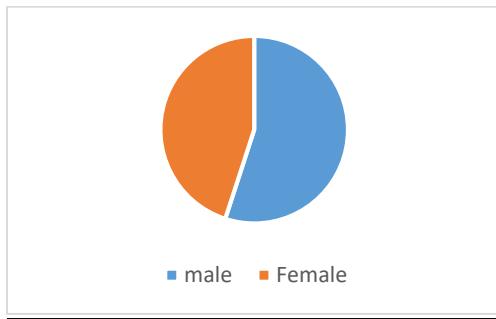
## CHAPTER FOUR

### 4.0 INTRODUCTION

This chapter deals with data presentation, interpretation and analysis of the study. It has two main parts: the first part is demography of the respondents; the second part consist of data collected from the respondents through questionnaires. In order to address the research questions and hypothesis, 30 questionnaires were prepared and distributed to DHL employees, out of these questionnaires 20 were filled and returned and no questionnaires were discarded due to missing data.

### 4.1 FINDINGS ON BIO DATA OF THE RESPONDENTS

GENDER	FREQUENCY	PERCENTAGE
Male	11	55
Female	9	45
TOTAL	20	100

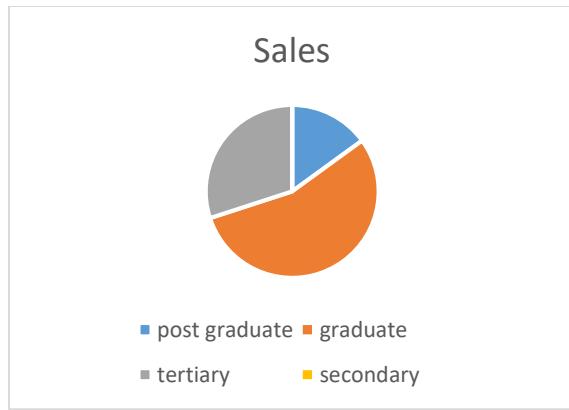


Source: primary source of data

From the information provided on findings on the respondents' gender, the distribution of respondents according to their gender was equal. The males were 11(55%) and so were the females 9 (45%) This means that there is gender equality and sensitivity through women emancipation, instigation, and empowerment in DHL.

#### 4.1.1 ACADEMIC QUALIFICATIONS

Academic qualifications	Frequency	Percentage
Post graduate	3	15
Graduate	11	55
Tertiary	6	30
Secondary	0	
Total	20	100

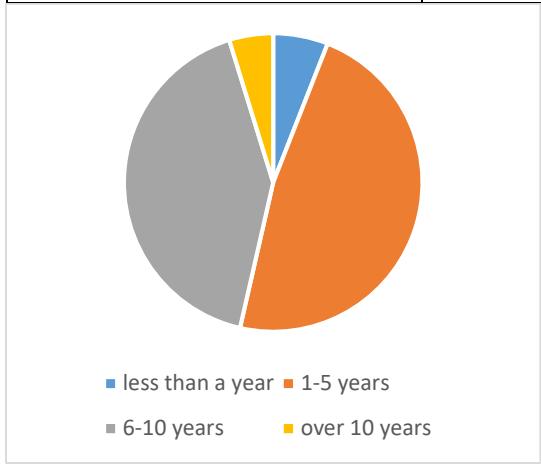


Source: primary source of data

From the information shown above on academic qualifications of respondents, it is clear that respondents at post graduate level are 3(15%), graduate level are 11(55%) and tertiary are 6(30%). The implication is that DHL hires for competency in that knowledgeable and skillful people are taken in to avail the best of their abilities and produce quality output since they have experience and are good at what they do. It also shows a high level of hiring for diversity in that people at all levels are taken up to ensure productivity and efficiency at the workplace besides having internship practice ongoing within DHL.

#### 4.1.2 YEARS OF SERVICE

YEARS	FREQUENCY	PERCENTAGE
less than a year	1	5
1-5 years	8	40
6-10 years	7	35
Over 10 years	4	20
total	20	100



Source: primary source of data

From the information analyzed and presented on findings on years of experiences that respondents have in, there is a vivid picture of years spent working in the organization unlike others. For instance, less than a year has 1(5%), 1-5 years has 8(40%), 6 – 10 years has 7(35%), over 10 years has 3(10%), as shown on the chart. This information shows the experience most of the respondents have from working at DHL

#### 4.1.2 DEPARTMENTS THAT WERE ABLE TO RESPOND

During the course of the research there were a wide range of respondents from many departments as follows; operations, human resource, customer service, finance, accounts, imports, sale department, data processing customs and clearing, IT department. These departments participated in the collection of the data in this research study

## 4.2 FINDINGS ON THE CHALLENGES FACED WHILE USING TECHNOLOGY IN LAST MILE DELIVERY

Below are responses from respondents in relation to the challenges faced while using technology to enhance service delivery in DHL. It is categorized in A=Agree, S/A=Strongly Agree, D/A=Don't Agree, and N/S= Not Sure.

	CHALLENGES	A	S/A	D/A	N/S
A	Data security and privacy concerns can hinder trust and confidence needed for efficient technology-driven deliveries.	65%	30%	5%	0
B	Technical issues and downtime (e.g., system glitches, failures) can disrupt delivery operations.	30%	65%	5%	0
C	Using technology raises ethical concerns related to privacy, transparency, and fairness in delivery practices.	55%	30%	15%	0
D	Using technology raises ethical concerns related to privacy, transparency, and fairness in delivery practices.	25%	75%	0	0

Basing on the above analysis and presented data on findings on challenges encountered while using technology to enhance last mile delivery, it is clear that the majority of the respondents agreed to the challenges encountered while using technology whereas a minority disagreed and were not sure. In relation to the above information, the challenges faced while using technology to enhance service delivery in DHL were measured in responses of agree, strongly agree, disagree, and not sure as elaborated below.

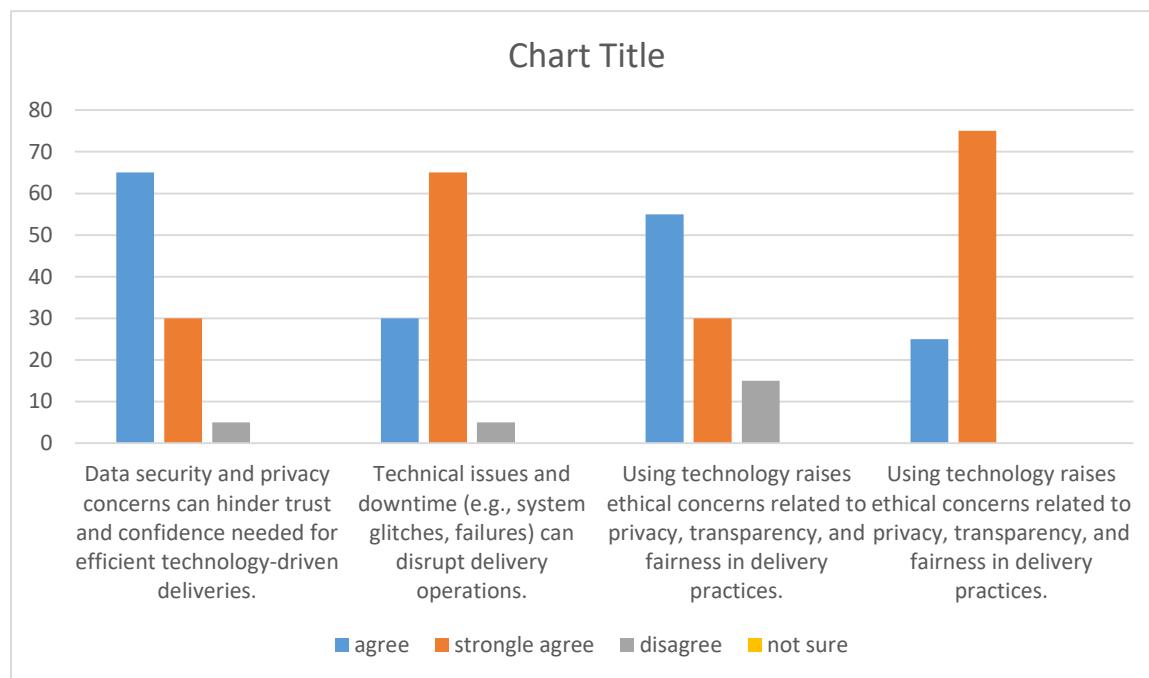
It was revealed that 65% of the respondents agreed, and 30% strongly agreed 5% of the respondents disagreed that data security and privacy is a challenge.

While 30% strongly agreed while 65% strongly agreed and 5% disagreed of technical issues and downtime being another challenge.

55% of the respondents agreed 30% who strongly agreed and 15% disagreed that using technology raises ethical concerns related to privacy, transparency, and fairness in delivery practices.

In addition, 25% of the respondents agreed, 75% strongly agreed that inadequate knowledge or training on operating different technological tools used in deliveries can be a barrier.

This indicates that the employees in DHL require regular sensitization and training on aspects of technology so as to eradicate the levels at which challenges are encountered. With proper and regular sensitization and training of employees, more efficiency and productivity in the service delivery bit will be increased and achieved effectively since the required skills and knowledge will be availed in abundance at the employees' exposure.



#### 4.3 FINDINGS ON THE EFFECTIVENESS OF TECHNOLOGY IN LAST MILE DELIVERY

	CATEGORIES	A	S/A	D/A	N/S
A	Route optimization using algorithms with GPS tracking and real-time data can significantly reduce delivery times.	65%	15%	15%	5%
B	Automation and optimization tools can help reduce labor costs, fuel expenses, and vehicle wear and tear.	35%	20%	45%	0
C	Technology allows customers to track deliveries and offers flexible delivery options, improving their experience.	30%	70%	0	0

D	Technology adoption has the potential to reduce the carbon footprint of last-mile delivery operations.	90%	5%	0	5%
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The data collected above shows that in relation to the effectiveness encountered while using technology in service delivery at DHL, below are some of the responses based on agreement parameters of agree, strongly agree, disagree, and not sure.

It was revealed that 65% of the respondents agreed to 15% strongly agreed 15% of the total respondents and 5% not sure on the notion of Route optimization using algorithms with GPS tracking and real-time data can significantly reduce delivery times.

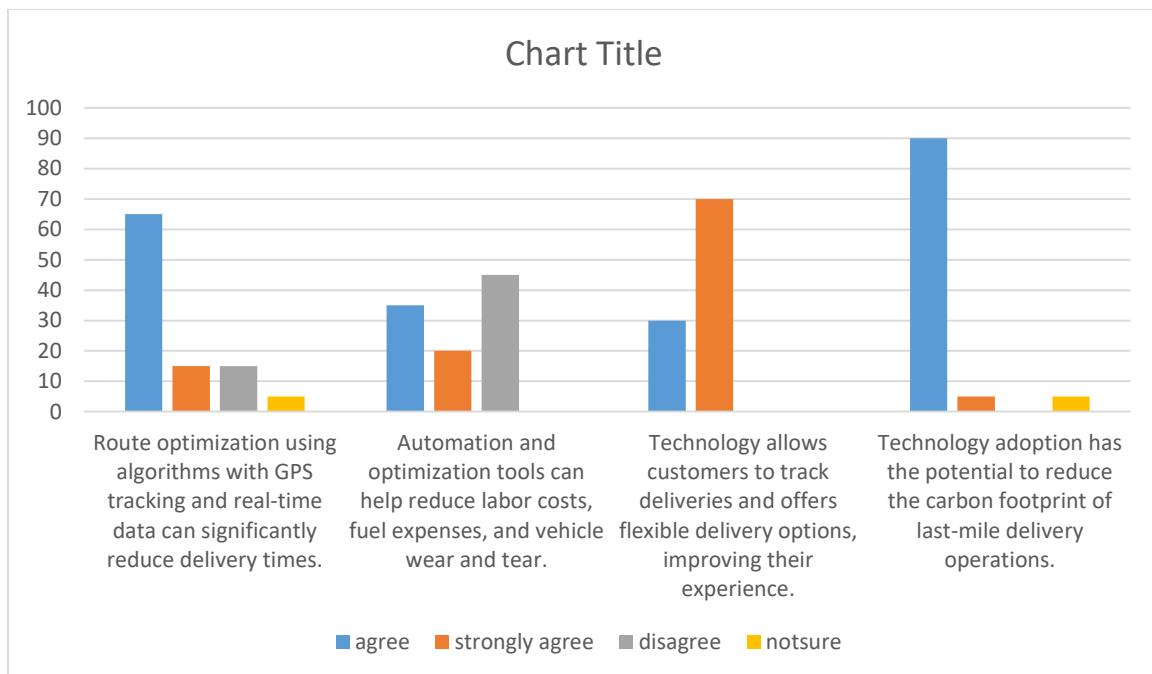
In addition, 35% of the respondents, 20% strongly agreed, 45% disagreed and 0% were not sure. 17% of the respondents agreed that Automation and optimization tools can help reduce labor costs, fuel expenses, and vehicle wear and tear.

Furthermore, 30% Technology allows customers to track deliveries and offers flexible delivery options, improving their experience. 70% strongly agreed, 0 % disagreed and 0% were not sure.

90% of the respondents agreed, 5% strongly agreed, 0% disagreed and 0% were not sure accepted that Technology adoption has the potential to reduce the carbon footprint of last-mile delivery operations.

The implication is that the respondents were strongly adhering to technological usage in service delivery but rather opted for manual means other than automated ones as per the results.

Technology adherence and usage should be considered more so as to enhance productivity and efficiency thus improving performance operationally and strategically while eradicating absenteeism from work since technology offers opportunities of virtual working.



#### 4.4 FINDINGS ON THE FACTORS IN MEASURING THE SUCCESS OF TECHNOLOGY ADOPTION INITIATIVES IN LAST MILE DELIVERY

S/N	CATEGORIES	V/I	I	S/I	N/I
A	Track user adoption rate by monitoring logins, usage frequency, and training completion.	65%	25%	5%	5%
B	Measure the time and resources saved (e.g., number of deliveries completed per hour) compared to previous methods.	65%	30%	5%	0
C	Conduct feedback sessions to gauge user satisfaction with the new technology.	50%	50%	0	0
D	Evaluate the Return on Investment (ROI) of the technology adoption initiative by comparing the benefits gained against the costs incurred.	65%	30%	0	5%
E	Analyze data generated by the technology to identify inefficiencies, optimize processes, and make informed strategic decisions.	85%	15%	0	0

The data collected above shows factors in measuring the success of technology adoption initiatives in last mile delivery at DHL, below are some of the responses based on agreement parameters of very important, important, somewhat important, and not important

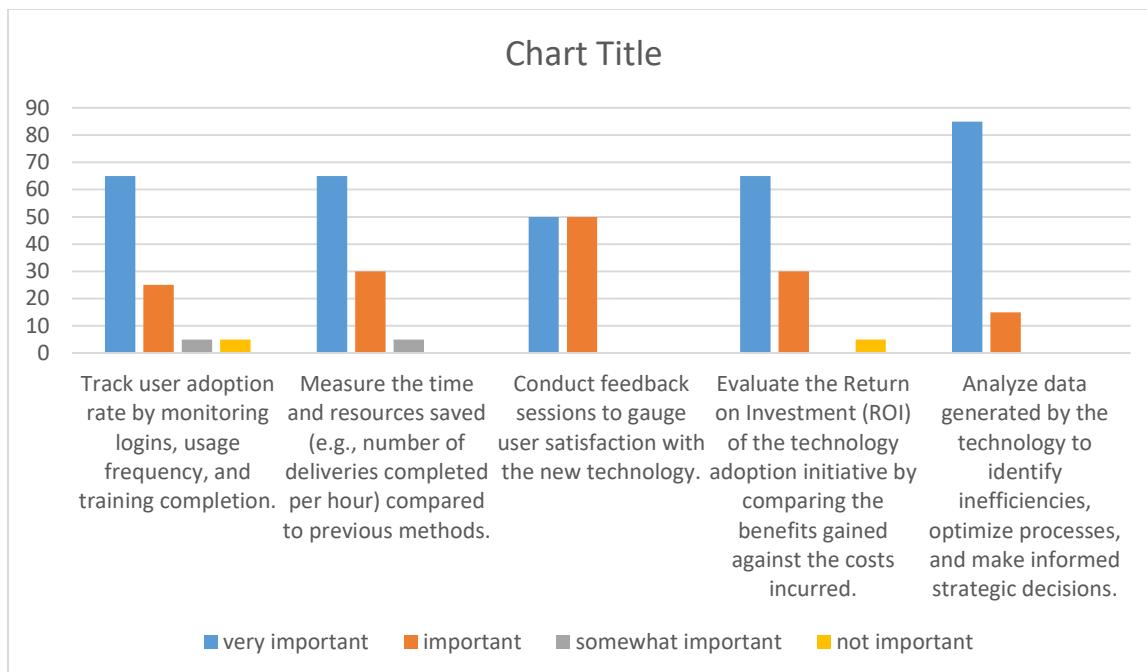
The study exposed that 65% of the respondents very important to track user adoption rate by monitoring logins, usage frequency, and training completion and 25% found it important. 5% of the respondents somewhat important to track user adoption rate by monitoring logins, usage frequency, and training completion delivery, 0% not important.

65% very important and 30% found measure the time and resources saved (e.g., number of deliveries completed per hour) compared to previous methods very important. 5% of the respondents agreed that measuring the time and resources saved (e.g., number of deliveries completed per hour) compared to previous methods somewhat important.

50% found very important, 50% important and 0% somewhat important and 0% not important that Conduct feedback sessions to gauge user satisfaction with the new technology.

In addition, 65% of the respondents found it very important evaluate the Return on Investment (ROI) of the technology adoption initiative by comparing the benefits gained against the costs incurred. 30% found it important, 0% somewhat important and 5% found it not important.

Furthermore, 85% of the respondents found that analyze data generated by the technology to identify inefficiencies, optimize processes, and make informed strategic decisions, 15% found it important, 0% somewhat important and 0% found it not important . The implication from the above responses is that there is a great possibility and potential of technology improving service delivery despite the fact that is a complex kind of relationship. Technology can improve accuracy, improve efficiency, increase convenience, customer satisfaction, and personalization if adequately adhered to in the delivery of services since the relationship is a promising one.



#### 4.4 ADDITIONAL INFORMATION ACQUIRED

4.4.1Qn: "In case there is any other challenges, measurements and key performance indicators (Kpi's) to track the success of technology adoption initiatives and the effectiveness of technology on delivery efficiency at DHL apart from those mentioned above." Some of the respondents had extra information to add to the research and here are some of the answers.

Some of the challenges that that respondents added on some remarks such as; network fluctuations being a problem. The respondents stated that the network fluctuations a challenges that DHL faces since the network connections are beyond control this becomes a challenges in taking the proper and accurate data collection.

One other challenge that was mentioned by the respondents at DHL was that all frequent training of the technology becomes costly for the organization to maintain and have to incur a lot of expenses to educate the new employees on how the technology works late alone adopting it.

On the other hand some of the other things that were identified as how effectiveness of technology on last mile delivery is that it has been more cost and time saving for the organization and has produced more environmental awareness. This has created more sustainable practices and more environmental awareness at DHL. Technology has also improved on the efficiency of the workers at DHL which has gradually shown the adoption rate of technology to change showing process and progress.

## **CHAPTER FIVE**

### **SUMMARY OF THE FINDINGS, CONCLUSION AND RECOMMENDATIONS**

#### **5.0 Introduction**

This chapter presents a summary of the study findings, conclusion of the topic, recommendations and areas for further research on the effect of the adoption of technology on an organization's last mile delivery

#### **5.1 SUMMARY OF THE STUDY FINDINGS**

The study was done to analyze the effect of the adoption of emerging technology on last mile delivery operations of DHL. The research was guided by three specific objectives that focused on certain aspects associated with the use of technology within organizations. These aspects included the effectiveness of technology to last mile delivery such as DHL Uganda. Those aspects were used while referring to DHL as a case study for the research. The specific objectives included I. To examine the effectiveness of technology to last mile delivery, to examine create measurements and key performance indicators (KPIs) to track the success of technology adoption initiatives and their effects on delivery efficiency and to examine the challenges that come with implementing technology in the companies. The study findings with regards to those objectives are summarized below;

#### **5.2 THE FINDINGS OF THE CHALLENGES FACED WHILE USING TECHNOLOGY ON LAST MILE DELIVERY OPERATIONS DHL.**

It was revealed that 65% of the respondents agreed, and 30% strongly agreed that data security and privacy is a challenge. This is in agreement with (Tawalbeh, 2020) who exposes the bit that complex services require trust and confidence to efficiently get the delivery done with the help of technology. 30% of the respondents agreed, 65% strongly agreed while 5% disagreed and 0% were not sure of technical issues and downtime being another challenge. (Boggs, 2009) emphasizes that technology requires sustained investment and strong alignment with systemic

changes. Failure to deal with technical issues and systems poses a very big gap and challenge thus being in agreement with the above scholar. Furthermore, 55% of the respondents agreed that using technology raises ethical concerns related to privacy, transparency, and fairness in delivery practices with 30% who strongly agreed and 15% disagreed. (Gregory, 2019) kept in mind that in the world of business, last mile delivery is the basis for which strategic businesses develop associations within their environment and much more so planned for a new competitive edge. The fact that not everyone in DHL was adapting to the new trends in competitiveness posed a hindrance and highlighted a strong agreement that user adoption and training became a big challenge if not planned for adequately. 25 % of the respondents agreed to inadequate knowledge or training on operating different technological tools used in deliveries can be a barrier being a challenge, 75% strongly agreed, 0% disagreed and 0% were not sure (Harahap, 2019) categorizes last mile delivery. All these categories require monetary terms to be effectively and efficiently done and adhered to which may either positively or negatively affect the cost and return on investments of the business. In agreement with the scholar, it brought about negative impacts for instance more costs were incurred in integrating different systems.

### **5.3 FINDINGS ON THE EFFECTIVENESS OF TECHNOLOGY ON LASTMILEDELIVERY OPERATIONS AT DHL**

It was revealed that 65% of the respondents agreed to route optimization using algorithms with GPS tracking and real time data can significantly reduce delivery time and 15% strongly agreed 3% disagreed ad 5% were not sure (Žunic, 2020) In agreement with the above scholar, existence of automation proves a relationship between technology and last delivery. 35% of the respondents agreed automation and optimizing tools can help reduce labor cost, fuel expenses and vehicle wear and tear in last mile delivery, 20% strongly agreed, 45% disagreed and 0% were not sure. Technology has contributed and continues to contribute to enhanced performance and performance in of last mile delivery (Burke, 2002)In agreement with the scholars cited, digital transformation is proof that technology and last mile delivery bear a relation based on the outcome which is performance. In addition, 30% of the respondents agreed that technology allows customers to track deliveries and offers flexible delivery options, improving their experience delivery, 70% strongly agreed, 0% disagreed and 0% were not sure. In agreement

with rapid growth brought by IT transforms generations in the way they do things. This generation prefers so much branding, personalization, and customization in which technology enables service providers to personalize and customize their offerings according to individual customer preferences. Customer or client data and analytics help in understanding customer behavior, needs, and preferences. 90% of the respondents agreed to technology adoption has potential to reduce the carbon footprint of last mile delivery, 5% strongly agreed, 0% disagreed and 0% were not sure. In agreement (MARIKI, 2021) with technology is vital for process. This improves environmental support, and ability to improve the environment and enhances collaboration between organizations that promotes a green environment leading to better delivery.

#### **5.4 FINDINGS ON THE FACTORS IN MEASURING THE SUCCESS OF TECHNOLOGY ADOPTION INITIATIVES LAST MILE DELIVERY AT DHL**

It was revealed that 65% of the respondents found it very important tracking user adoption rate by monitoring logins usage frequency and training completion and 25% found it important 5% found it somewhat important and 5% not important. In agreement (Froehlich, 2007) with who discovered that at mobile phone, has been adopted faster than any other provides rich qualitative accounts of device usage and human on user experience, we surveyed users after they completed DHL. 65% of the total respondents agreed it very important measure the time and resource saved compared to previous methods, 30% found it important, and 5% found it somewhat important.

In addition, 50% of the respondents agreed conduct feedback sessions to gauge user satisfaction with the new technology as a very important measure to competitive advantage being a benefit, 50% found it important, 0% disagreed and 0% were not sure. In agreement with (Uzir, 2021) when technology is used in the last mile delivery of services, it can be very useful to all employees at DHL. This gives an upper hand to be ahead of competitors since the employees are electronically sensitized and vital information is easily shared with automation in place.

Furthermore, 65% of the respondents agreed that evaluating the return on investment of the technology adoption initiative by comparing the benefits gained against the costs incurred, 30% found it important and 0% found it somewhat important and 5% found it as not important. In agreement with (Lucas Jr, 1999) return from specific programs, projects and new initiatives standard cost–benefit techniques to assess large investments. Those notes were later compared

and matched against the ... This leads to increased goal and target achievement that comes as a result of mutual trust, rapport, and understanding among employees.

## 5.5 SUMMARY OF FINDINGS

The first goal, which looked at the difficulties in adopting technology for last-mile delivery at DHL, revealed that most respondents—65% of the total—agreed that there were difficulties in utilizing technology to improve last-mile delivery. Of all respondents, 75% strongly agreed and 15% disagreed with the difficulties encountered when utilizing technology to improve last-mile delivery. It may be inferred that a majority of the total respondents were aware of the challenges and their consequences, including but not limited to technological problems, insufficient expertise, and higher expenses. The survey, which looked at how effective technology is in last-mile delivery at DHL, revealed that 90% of respondents overall agreed that technology is effective in last-mile delivery at DHL, while 5% strongly agreed and were unsure. This suggested and demonstrated that the responders had knowledge of the benefits and efficiency of last-mile delivery. Enhanced productivity, increased customer happiness, a competitive edge, etc. are some of these advantages. The study's goal was to look into the benefits of technology use in DHL's service delivery. Out of all the respondents, 77% felt that it was important to track the rate at which technology is used when it comes to last-mile delivery at DHL, while 23% disagreed. This implies that the participants have a comprehensive comprehension of the standards required to evaluate the efficacy of technological adoption programs for last-mile delivery.

## **5.6 RECOMMENDATIONS**

In light of the study's conclusions, the researcher advised businesses to think about potential solutions for problems that could arise from implementing technology and related practices. For example, educating staff members on the value and use of IT techniques prior to their adoption might help overcome resistance to change. That would allow the businesses to reap the complete rewards of implementing technological techniques, such as enhanced performance effectiveness and greater stakeholder transparency, among many other advantages.

## **APPENDIX**

### **CONSENT FORM**

Dear Sir/Madam,

My name is..... A student of Uganda Christian University School of Business. I am conducting a study on the "Impact of Emerging Technology on Last Mile Delivery Operations"

The answers you give will be strictly confidential and will be used strictly for academic purposes.

I agree/ disagree to participate in this study

### **BIO DATA**

1. Gender

- a) Male
- b) Female

2. Academic qualifications

- a) Post graduate
- b) Graduate
- c) Tertiary
- d) Secondary

Others.....

3. Years of service in the organization

- a) Less than 1 year
- b) 1-5 years
- c) 6-10 years
- d) Over 10 years

4. Department in which you work

.....

**INSTRUCTIONS:** Please rate your level of agreement with the following statements regarding challenges of using technology in last-mile delivery. Select one option for each statement.

Tick appropriately A=Agree, S/A=Strongly Agree, D/A= Don't Agree, N/S= Not sure.

	CHALLENGES	A	S/A	D/A	N/S
A	Data security and privacy concerns can hinder trust and confidence needed for efficient technology-driven deliveries.				
B	Technical issues and downtime (e.g., system glitches, failures) can disrupt delivery operations.				
C	Using technology raises ethical concerns related to privacy, transparency, and fairness in delivery practices.				
D	Inadequate knowledge or training on operating different technological tools used in deliveries can be a barrier.				

**INSTRUCTIONS:** Please rate your level of agreement with the following statements regarding the effectiveness of technology in last-mile delivery. Select one option for each statement.

Tick appropriately, A=Agree, S/A=Strongly Agree, D/A= Don't Agree, N/S=Not Sure.

	CATEGORIES	A	S/A	D/A	N/S

A	Route optimization using algorithms with GPS tracking and real-time data can significantly reduce delivery times.				
B	Automation and optimization tools can help reduce labor costs, fuel expenses, and vehicle wear and tear.				
C	Technology allows customers to track deliveries and offers flexible delivery options, improving their experience.				
D	Technology adoption has the potential to reduce the carbon footprint of last-mile delivery operations.				

**INSTRUCTIONS:** Please rate the importance of the following factors in measuring the success of technology adoption initiatives in last-mile delivery.

Select one option for each statement. V/I=Very Important, I= Important, S/I=Somewhat Important, N/I=Not Important)

S/N	CATEGORIES	V/I	I	S/I	N/I
A	Track user adoption rate by monitoring logins, usage frequency, and training completion.				
B	Measure the time and resources saved (e.g., number of deliveries completed per hour) compared to previous methods.				
C	Conduct feedback sessions to gauge user satisfaction with the new technology.				
D	Evaluate the Return on Investment (ROI) of the technology adoption initiative by comparing the benefits gained against the costs incurred.				
E	Analyze data generated by the technology to identify inefficiencies, optimize processes, and make informed strategic decisions.				

F) In case there is any other challenges, measurements and key performance indicators (Kpi's) to track the success of technology adoption initiatives and the effectiveness of technology on delivery efficiency at DHL apart from those mentioned above.

Please Specify:

.....

.....

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.....

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