ADOPTION OF EMERGING TECHNOLOGIES IN LAST MILE DELIVERY:

OPPORTUNITIES AND CHALLENGES A CASE OF STUDY OF JUMIA

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UGANDA CHRISTIAN UNIVERSITY

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DECLARATION

I, Umuhirewase Sandrine, hereby declare that this research report entitled "Adoption of Emerging Technologies in Last Mile Delivery: Opportunities and Challenges. A Case Study of Jumia" has never been submitted to any institution of higher learning for any award. Where other people's work has been used, proper references have been provided.

Signed: ..... Date: 12th September 2025

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APPROVAL

This is to certify that this research report entitled "Adoption of Emerging Technologies in Last Mile Delivery: Opportunities and Challenges. A Case Study of Jumia" has been under my supervision and is now ready for submission to the School of Business of Uganda Christian University with my approval.

Signed..... Date: 12/9/2025

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May God bless you all abundantly.

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LIST OF ACRONYMS

AI - Artificial Intelligence

IoT - Internet of Things

GPS - Global Positioning System

EDI - Electronic Data Interchange

ERP - Enterprise Resource Planning

KPI - Key Performance Indicator

ICT - Information and Communication Technology

DOI - Diffusion of Innovation

SPSS - Statistical Package for the Social Sciences

ABSTRACT

The study titled *"*Adoption of Emerging Technologies in Last-Mile Delivery: Opportunities and Challenges. A Case Study of Jumia*"* aimed to investigate how emerging technologies influence delivery speed and accuracy, reduce operational costs while improving efficiency, and enhance customer satisfaction in Jumia's last-mile delivery operations.

A descriptive cross-sectional research design was employed, utilizing a mixed-methods approach. Quantitative data were collected using structured questionnaires distributed to 80 selected employees, including delivery personnel and customer service representatives, to measure delivery outcomes and operational efficiency. Qualitative data were gathered through semi-structured interviews with operations and logistics staff to explore deeper their experience and perceptions of technology implementation. Probability (simple random) and non-probability (purposive) sampling were employed to realize representativeness and richness of data. Descriptive and inferential statistics were utilized for quantitative responses, and thematic content analysis for qualitative responses.

The findings proved that emerging technologies significantly improve delivery speed, accuracy, and operating efficiency at Jumia. Technologies such as real-time tracking, route optimization, and automation systems improved delivery reliability, minimized errors, and minimized delays. Cost-effectiveness was realized through reduced fuel consumption, lower customer service costs, and easier order processing. Besides, customer satisfaction was positively impacted via timely notifications, correct deliveries, enhanced communication, and transparency, leading to increased loyalty and trust. Generally, technology adoption was proven to be a major driver of competitiveness and performance in last-mile delivery.

Based on these findings, the study recommends that Jumia needs to keep investing in advanced technologies such as Artificial Intelligence (AI), Internet of Things (IoT), and predictive analytics in order to increasingly accelerate delivery speed, accuracy, and operational efficiency. The company should also utilize automated systems for warehouse and routing management, create centralized digital communication interfaces, and provide continuous training to staff on new emerging technologies.

CHAPTER ONE

1.0 Introduction

This study investigates the influence of emerging technologies on last-mile delivery. The chapter outlines the background of the study, the problem statement, specific objectives, research questions, significance, scope, and limitations.

1.1 Background of the study

New technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), blockchain, drones, and autonomous vehicles are revolutionizing logistics and e-commerce globally. The technologies enhance operation effectiveness through capacity to automate delivery operations, monitor in real-time, improve routes, increase package security, and make data-driven decisions (Andoni, 2019; Peppel, 2022). For example, IoT sensors enable the tracking of car performance and delivery conditions, while AI algorithms predict customers' preferences and delivery time slots, and finally, improve service efficiency and customer satisfaction. Blockchain technologies are driving supply chain transparency, and drones are revolutionizing delivery speed in areas where traditional transport infrastructure is limited**.**

These technologies have a very direct effect on last-mile delivery, i.e., the final point of the supply chain where the goods are delivered from distribution centers to consumers. Last-mile delivery is typically the most expensive and intricate segment of logistics, and its costs amount to over 50% of the overall cost of delivery (Kostrzewski, 2022). Consumer pressure to deliver faster, in a more transparent manner, and with higher reliability is compelling companies to introduce new, innovative technologies to remain competitive. Sophisticated technology capabilities lead to reduced delivery times, lower operational cost, improved traceability, and higher customer confidence and satisfaction key drivers of last-mile delivery performance.

In Uganda, the growth of online business platforms such as Jumia has increased the need for efficient last-mile delivery networks. Jumia has utilized innovation such as GPS route optimization, mobile money, and digital maps to propel solutions to issues such as urban traffic congestion, poorly developed road networks, scarcity of digital infrastructure, and failure to

address in peri-urban and rural areas (Moradi, 2023). With the use of such technologies, Jumia has increased the accuracy of deliveries, reduced operational costs, and enhanced customer satisfaction.

This research paper seeks to investigate the impact of emerging technologies on the last-mile delivery performance in Uganda, with Jumia as a case.

1.1.1Theoretical framework

This study is guided by **the Diffusion of Innovation (DOI) Theory** (Rogers, 2003), which explains how new technologies are adopted and spread within organizations and society. DOI posits that adoption depends on perceived relative advantage, compatibility, complexity, trialability, and observability of innovations. In the context of this study, emerging technologies (independent variable) represent innovations that logistics companies adopt to improve operational processes. The decision to adopt and effectively integrate these technologies influences the efficiency, reliability, and overall performance of last-mile delivery (dependent variable).

By applying the DOI theory, this study conceptualizes that companies such as Jumia adopt emerging technologies because they provide a relative advantage (faster delivery, cost reduction, enhanced tracking), compatibility with e-commerce operations, and observable benefits to customers. Successful adoption leads to improved last-mile delivery performance, reflected in reduced delivery times, increased delivery accuracy, lower costs, and enhanced customer satisfaction.

1.2 Statement of the problem

In recent years, emerging technologies such as GPS-enabled real-time tracking, automated warehousing, drone deliveries, and AI-driven route optimization have revolutionized logistics and supply chain management across the globe. However, many companies in Uganda, including key e-commerce players like Jumia, still face significant challenges in fully integrating these technologies into their last-mile delivery processes. Despite the use of advanced logistics technologies by global companies such as Jumia, the domestic ecosystem has challenges ranging

from high infrastructure expenses, inadequate ICT infrastructure, inadequate access to capital, and regulation limitations (Kibira et al., 2021; Nakibuuka & Turyakira, 2022). This has resulted in underexploiting advanced delivery systems such as real-time tracking of packages, self-driving delivery trucks, and dynamic routing software, hence undermining the reliability, speed, and cost of the services (Sorochan, 2022; World Bank, 2021).

Additionally, the lack of technical training and digital literacy among the logistics personnel also hampers the efficiency of last-mile delivery operations. With the growing demand for quicker, more transparent, and convenient deliveries especially in urban and peri-urban areas businesses like Jumia are being increasingly put under pressure to get their last-mile logistics caught up in a bid to remain competitive. Therefore, there is a need to examine the current levels of technology adoption and their impacts on last-mile delivery, particularly in the operations of Jumia.

1.3 Specific objectives of the study

i. To investigate how using new technologies affect the speed and accuracy of deliveries at Jumia.

ii. To examine whether new technologies help Jumia reduce delivery costs and improve efficiency.

iii. To assess how the use of new technologies improves customer satisfaction in Jumia's last-mile delivery.

1.4 Research questions

i. How does the use of new technologies affect the speed and accuracy of deliveries at Jumia?

ii. Do new technologies help Jumia reduce delivery costs and improve operational efficiency?

iii. How does the use of new technologies improve customer satisfaction in Jumia's last-mile delivery?

1.5 Significance of the study

This study is of critical relevance to stakeholders like logistics companies, policymakers, and researchers. For logistics companies, the study brings to light the complexities of implementing next-generation technologies for last-mile delivery operations. Companies can plan more effectively for maximizing their operations, getting the goods faster, reducing the cost, and eventually pleasing customers more by discovering these opportunities and challenges.

For policymakers, the findings from the study can form the foundation for creating intelligent policies and regulations that can enable the adoption of advanced technology in the logistics sector. Through the regulation of the current legal and policy structures to correlate with advances in technology, policymakers can create an enabling environment that supports innovation, improves service delivery, and improves the overall efficiency of the logistics sector.

Additionally, scholars will benefit from the research as it adds to the field of technology adoption in logistics. It can further be utilized as a reference for subsequent studies, in this case, on the special issues and challenges that prevail in developing countries like Uganda. Generally speaking, the research can assist in contributing considerably to economic growth and development through efficient and technology-based logistics in Uganda.

1.6 Scope of the study

1.6.1 Subject scope

The study focused on logistics companies operating in Uganda, specifically examining Jumia as a case study.

1.6.2 Time scope

The research covered the period from 2020 to 2025, a timeframe marked by significant technological advancements and a growing e-commerce market in Uganda.

1.7 Limitations of the study

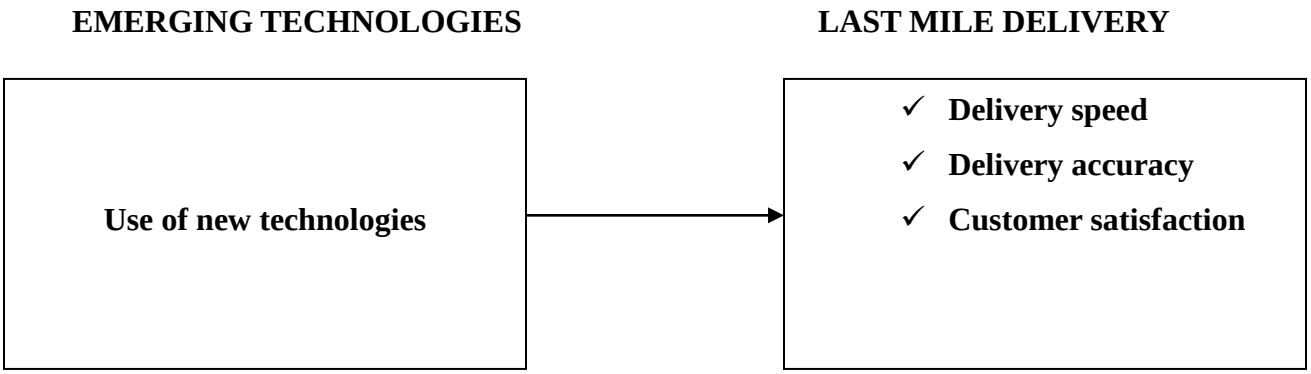
The study will be limited by several factors most likely to impact its process and results. Among the primary limitations is financial limitation, which may limit the scope of data collection processes such as traveling, printing, or procurement of necessary resources. Economic limitation may limit the number of samples or geographical area of the research.

The second likely limitation is resistance of the respondents to provide information freely due to confidentiality concerns. The respondents may be afraid that their responses would be traced back to them or against their companies, thus resulting in biased or partial information. This may affect the validity and reliability of research results.

Also, the pace of technological change is a threat. Since new technologies are being created and current ones continually keep evolving, then the research can fall behind and be no longer as up-to-date and current as it develops. This ever-changing environment may threaten to make long-term inferences or use the findings in future situations

1.8 Conceptual Framework

Figure 1: Conceptual framework



CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter overviews the literature that was studied in line with the study goals. The books to be reviewed were chosen, compared, and grouped under themes that have relevance to emerging technology and its impact on last-mile delivery in e-commerce business, with emphasis on Jumia. The discussion is structured into three parts: review of theory and concept, literature presentation on the study purpose, and synthesis of the reviewed work to identify areas that require filling. Work reviewed consists of books, scholarly journals, and research studies in an effort to provide insight into what has been done so far in this field.

2.1 Concept of Emerging Technologies

New digital technologies and software likely to transform business operations and customer interactions are referred to as emerging technologies (Rotolo et al., 2015). Artificial intelligence (AI), blockchain, drones, big data analytics, Internet of Things (IoT), and autonomous delivery vans are just a few of the emerging e-commerce and logistics technologies (Hofmann &Rüsch, 2017). They are being widely used to improve efficiency, reduce the cost of operation, and improve customer satisfaction in last-mile delivery (Sternberg & Andersson, 2014).

Researchers highlight the fact that the use of innovative technologies has transformed the way firms like Jumia interact with consumers and organize delivery operations (Mckinsey, 2016). For instance, artificial intelligence and predictive analytics enhance route planning and demand forecasting (Ivanov et al., 2019). Drones and autonomous cars are being explored as one viable solution to traffic congestion and last-mile delivery expense in cities (Boysen et al., 2021). Blockchain technology increases trust and transparency via secure transactions recording, and IoT allows the real-time monitoring of packages, enhancing customers' interaction with delivery firms (Kshetri, 2018).

2.2 Concept of Last-Mile Delivery

Last-mile delivery is the last step in the supply chain where products are transported from a distribution center to the end-buyer (Gevaers et al., 2014). Last-mile delivery is the most valuable and expensive e-commerce logistics component and accounts for more than 50% of shipping expenditure (Allen et al., 2017). The success of last-mile delivery directly affects customers' satisfaction, loyalty, and general e-commerce firms' competitiveness such as Jumia (Morganti et al., 2014).

Last-mile delivery problems, as highlighted by Lim et al. (2018), include traffic congestion, operational high cost, failure of delivery, and inefficiency in real-time tracking. To counteract such problems, companies heavily rely on innovative technologies that ensure visibility, velocity, and reliability of delivery (Ranieri et al., 2018). GPS-based system support technologies allow customers and companies to monitor the status of the parcel in real time, and AI-powered systems allow dynamic route optimization (Boysen et al., 2021).

There are a few crucial attributes that enable last-mile delivery to be efficient. They include the speed of delivery, accuracy and reliability, affordability of costs, and real-time visibility for both customers and businesses (Esper et al., 2020). New technologies have become the principal facilitators of these attributes by enabling more effective coordination, planning, and decision-making. For instance, Jumia mobile apps provide customers with real-time visibility signals and tracking information in order to instill confidence and transparency (Kawa, 2017).

Current readings posit that last-mile delivery today is not just the transportation of commodities but to deliver a better customer experience (Nguyen et al., 2019). This would put the use of next-generation technologies not only as a cost-saving effort but as a competitive tactic for e-commerce firms

2.3 New technologies and the speed and accuracy of deliveries

The integration of technology is widely recognized in research as a critical factor in enhancing logistics and delivery performance (Zhao et al., 2008; Flynn et al., 2010).This is similar to Lee (2000), who noted that it is a crucial part of successful logistics planning and control to have on-time access to demand, forecast, and replenishment data. Unlike the movement of physical products, which involves forward logistics, technological integration focuses on the backward flow of data and coordination, ensuring that delivery decisions are based on real-time, accurate information.

Technology adoption in delivery operations involves the use of digital systems that allow real-time communication, monitoring, and tracking across stakeholders, leading to improved delivery outcomes (Trkman, Indihar Štemberger, Jaklič &Groznik, 2007). These technologies include mobile applications, global positioning systems (GPS), warehouse management systems, and electronic data interchange, as well as more advanced platforms such as artificial intelligence (AI)-driven route optimization and automated scheduling (Pham, Nguyen, McDonald & Tran-Kieu, 2019; Lee & Ma, 2012).

Delivery performance depends not only on the presence of technology but also on how effectively information is shared. Information sharing can be both quantitative and qualitative, and both play significant roles in improving delivery outcomes. The quantity dimension refers to the extent to which critical data such as delivery status, estimated arrival times, or inventory levels is communicated across the delivery chain. The quality dimension refers to the accuracy, timeliness, adequacy, and reliability of the information shared

However, in a few instances, factors such as information reluctance, asymmetric access to data, and competing operating interests may decrease the efficiency of delivery technologies. Data can be viewed as the source of competitive advantage by certain organizations, and they may hold back revealing it fully, leading to inefficiencies (Li et al., 2006). In order to guarantee the highest speed and accuracy of deliveries, companies need to regard delivery-related information as a strategic asset in such a way that information flows in real time, with minimal delay and no distortion.

Kalakota and Robinson (2010) stressed that much improvement in delivery and logistics can be achieved by making technology part of business processes and ensuring free flow of information among parties. Lai et al. (2007) also captured technology integration as the process of putting in place information and communication tools to bring together delivery decisions and actions. Jayaram and Tan (2010) also found that technology integration has a positive effect on organizational performance, particularly in timeliness- and reliability-requiring domains.

2.4 How new technologies help Jumia reduce delivery costs and improve efficiency

Growing customer demands for prompt delivery, low costs, and order fulfillment guarantee are some of the key drivers driving Jumia towards emerging technologies. Customers currently demand shorter lead times, order tracking, and different delivery options. By leveraging technologies such as real-time tracking systems, automated order management, and digital platforms, Jumia achieves optimal visibility, responsiveness, and delivery accuracy. This alignment of customer needs enables the company to meet service expectations without optimizing inefficiencies that have a tendency to increase delivery costs (Fawcett et al., 2007).

The very competitive African online shopping market places pressure on Jumia to increase efficiency and reduce costs on a daily basis. Such rivals with products of the same kind but cheaper delivery costs place pressure on Jumia to embrace technology that enhances logistics and distribution efficiency. Route optimization software, such as digital payments and warehouse management software, enable timely delivery at lower costs. These innovations offer Jumia a competitive edge by improving the quality of service while maintaining the efficiency of operations (Lambert et al., 2016).

Jumia's business across various African countries creates challenges such as huge distances, infrastructural shortages, and market condition variability. Emerging technologies eradicate such challenges by optimizing processes, making communications better, and synchronizing processes geographically. Technologies such as mobile apps, automatic inventory control systems, and cloud computing platforms make it easier to synchronize processes, thus eradicating delays and preventing unnecessary expenses. This increases cost-effectiveness and consumer satisfaction in Jumia's large markets (Gereffi et al., 2005).

One of Jumia's key drivers of technology adoption is minimizing the cost of delivery and optimizing operating performance. Solutions such as automated warehouses, data-driven demand forecasting, and electronic proof-of-delivery solutions eliminate duplication, optimize inventory, and cut last-mile delivery costs. By combining real-time information across departments and taking advantage of economy of scale benefits, Jumia eliminates operating constraints, optimizes productivity, and improves profitability (Cagliano et al., 2020).

E-commerce logistics face vulnerability to traffic congestion, supply chain interruptions, or payment default. New technologies are employed by Jumia to develop resiliency as well as reduce exposure to costs associated with these risks. For example, digital platforms facilitate tracking of delivery performance, while mobile payment platforms reduce the risk of handling cash. Additionally, route optimization software maximizes the use of fuel and time, reducing costs while protecting against urban and rural delivery uncertainties (Ivanov, 2020).

Technological advancements such as artificial intelligence (AI), Internet of Things (IoT), and big data analytics enable Jumia to reduce costs and improve efficiency. AI-based demand forecasting facilitates efficient inventory management, IoT sensors facilitate monitoring packages in real time, and data analytics inform scheduling decisions for deliveries. Through consolidation of these technologies, Jumia achieves real-time visibility, removes wastage in operations, and delivers products at a faster rate and at reduced cost (Chopra & Meindl, 2021).

2.5 How the use of new technologies improves customer satisfaction in Jumia's last-mile delivery.

Developing effective collaborative relationships with delivery partners is necessary to deliver on-time and reliable last-mile services. Open information exchange and coordination technologies employed by Jumia, its logistic suppliers, and consumers create trustworthiness and dependability. Collaborative systems allow joint planning of delivery schedules, prompt resolution of delays, and higher responsiveness to customer needs, all of which lead to higher levels of satisfaction (Lambert et al., 2016).

Transparency and control of the delivery network are needed to meet customers' expectations. By utilizing technologies such as GPS tracking, radio frequency identification (RFID), and bar code scanning, Jumia is able to provide customers with real-time locations of parcels. Transparency allows customers to have a better estimate of delivery time, respond to unforeseen detours, and be assured of service reliability, leading to increased satisfaction (Chopra & Meindl, 2021).

Last-mile delivery logistics are enhanced through standardizing, ensuring efficiency and consistency. Application of technologies that make processes smooth such as automated dispatch systems, standard performance measurement, and standardized delivery processes reduces delays and mistakes. It ensures consistency in the sense that the customer gets the order in good condition and on schedule, which creates confidence and satisfaction (Monczka et al., 2020).

Effective management of delivery partners using technology improves the quality of service. By utilizing digital channels to monitor performance, get feedback, and provide incentives, Jumia can create committed and stable delivery squads. Partner engagement using technology also allows for more rapid resolution of customer complaints and responsiveness to demand changes, thereby improving customer satisfaction directly (Handfield & Nichols, 2002).

Investments in advanced last-mile delivery technology significantly improve customer satisfaction. Route optimization software, automated warehouse management systems, and AI-driven demand forecasting technologies all improve efficiency and reduce delivery times. Further, cloud infrastructure and big data analytics enable personalized customer alertness,

dynamic delivery options, as well as improved problem-solving, all of which are reflected through higher satisfaction with Jumia's last-mile services (Cagliano et al., 2020).

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presented the methodology used in the study. It described the research design, population being studied, sample and sampling, methods of sampling, instruments and methods of data collection, data collection procedures, and methods of data analysis. The chapter also described the methods of measurement of the study variables based on the study objectives.

3.2 Research design

The study utilized a descriptive cross-sectional research design using both qualitative and quantitative approaches. The utilization of cross-sectional design was appropriate as data were collected from the respondents at a specific moment in time. The quantitative approach was used to answer the how much and how many questions and was concerned with establishing the correlation of emerging technologies and last-mile delivery performance at Jumia. The qualitative part enhanced this by exploring the respondents' subjective experience and perceptions regarding how new technologies influenced speed of delivery, cost, and customer satisfaction. This mixed-methods strategy provided a richer understanding of the research issue (Polit & Beck, 2004).

3.3 Study population

The study was conducted at Jumia Uganda, focusing on 100 employees directly involved in last-mile delivery operations. The target population consisted of delivery personnel, logistics and operations staff, and customer service representatives, since these categories of staff were knowledgeable about how emerging technologies impacted delivery performance and customer experience. The decision to focus on 100 employees was justified because it ensured adequate representation of the key departments involved in last-mile delivery, thereby capturing diverse perspectives on operational efficiency and customer satisfaction.

3.3.1 Sample size

Singh (2007) defined sample size as a finite part of a statistical population whose properties were used to make estimates about a population as a whole. For this research study, a cross-section of individuals was selected to draw research responses that gave a true picture of the research phenomena. With regard to the sample size, the researcher selected 80 employees as the sample of respondents from a population of 100 using Krejcie and Morgan (1970) table.

3.4 Sampling techniques and procedures

The study employed both probability and non-probability sampling techniques to ensure a balance between representativeness and information richness. Purposive sampling was used to select logistics and operations staff because they possessed specialized knowledge about technology adoption and delivery processes, making their input critical for achieving the study's objectives. On the other hand, simple random sampling was applied to delivery personnel and customer service representatives to provide each individual an equal chance of selection, thereby minimizing bias and ensuring fairness. This combination was justified because it allowed the study to capture in-depth insights from key informants while maintaining the statistical representativeness needed for reliable and generalizable findings.

3.5 Data collection methods

The study employed the mixed-methods approach where quantitative data were collected using structured questionnaires containing closed-ended questions to provide measurable data on speed of delivery, cost-effectiveness, and customer satisfaction, and qualitative data were collected using semi-structured interviews and open-ended questions to provide an understanding of employees' experiences and perceptions of utilizing new technologies in last-mile delivery (Creswell, 2018). In this study, quantitative method was first used and then the qualitative method so that elaborate study and interpretation of the statistical findings could be done.

3.5.1 Questionnaire method

Questionnaires were applied primarily for purposes of obtaining quantitative data. Questionnaires were created with the application of both closed-ended and Likert-scale questions to allow respondents to provide responses that were easy to statistically tabulate. Questionnaires

were cost- and time-effective due to their simplicity to administer and fill out (Amin, 2005). Questionnaires were distributed among the sample of employees selected from Jumia.

3.6 Data collection instruments

3.6.1 Questionnaires

Structured questionnaires with closed-ended questions were used to collect quantitative data from delivery personnel and customer service representatives.

3.6.2 Interview guide

An interview guide was used to collect qualitative data from logistics and operations staff. This instrument consisted of open-ended questions designed to explore how emerging technologies (such as GPS tracking, mobile applications, automated dispatch systems, and digital payment platforms) influenced last-mile delivery.

3.7 Procedure for data collection

Prior to primary data collection, an introductory meeting was held with Jumia management to explain the purpose of the study and to seek permission to conduct the research. An official introductory letter from Uganda Christian University was also presented to validate the researcher's intent. Once permission was granted, questionnaires were distributed to the selected respondents, while interviews were scheduled with purposively chosen staff. The questionnaires were collected after one week, while interview notes were compiled immediately after each session. All responses were carefully sorted, coded, and organized for analysis.

3.8 Data analysis

Data were organized systematically to ensure accurate and meaningful analysis. Quantitative data were first coded and entered into the Statistical Package for Social Sciences (SPSS) because it provided powerful tools for managing and analyzing large datasets. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to profile data patterns in a succinct way while inferential statistics, i.e., correlation and regression analysis, aided the computation of direction and strength of association between emerging technologies and last-mile delivery outcomes. This was important as it allowed the researcher to make informed conclusions about the impact of technological adoption.

Similarly, qualitative interview data was transcribed, coded into themes, and analyzed using thematic content analysis. This was appropriate as it provided them with in-depth insights, attitudes, and experiences of the respondents regarding the use of emerging technologies in increasing delivery speed, cost-saving, and customer satisfaction areas that would otherwise have been lost through quantitative analysis alone.

CHAPTER FOUR

DATA PRESENTATION AND INTERPRETATION OF FINDINGS

4.0 Introduction

This chapter summarizes using tables and describes the findings of the study on the impact of emerging technologies on Jumia's last-mile delivery. The data was gathered from 80 staff through questionnaires and senior management interviews. Presentation is based on study objectives.

4.1 Demographic characteristics of respondents

Table 1 below presents respondents' demographic characteristics, including gender, age, education level, department, and work experience at Jumia.

Table 1: Demographic characteristics of respondents

Item	Description	Frequency	Percentage (%)
Gender	Male	46	57.5
	Female	34	42.5
Age	21–30 years	36	45.0
	31–40 years	28	35.0
	41–50 years	10	12.5
	Above 50 years	6	7.5
Education Level	Certificate	8	10.0
	Diploma	16	20.0
	Degree	32	40.0
	Masters	12	15.0
	Others	12	15.0
Department	Administration/HRM	10	12.5
	Logistics & Delivery Operations	26	32.5
	Accounts & Finance	12	15.0
	Customer Service & Marketing	18	22.5
	Technology/ICT	14	17.5
Work Experience	Less than 1 year	10	12.5
	1–5 years	32	40.0
	6–10 years	26	32.5
	Above 10 years	12	15.0

Source:Primary data, 2025

The findings show that 57.5% of respondents were male, while 42.5% were female. Respondents were drawn from different age groups, with most (45%) aged 21–30 years, followed by 31–40 years (35%). The majority (40%) held a degree, while 20% had a diploma, and 15% each had master's degrees or other qualifications. In terms of departments, the largest group (32.5%) worked in Logistics & Delivery Operations, followed by Customer Service & Marketing (22.5%), Technology/ICT (17.5%), Accounts & Finance (15%), and Administration/HRM (12.5%). Regarding work experience, 40% had worked at Jumia for 1–5 years, 32.5% for 6–10 years, 15% for above 10 years, and 12.5% for less than 1 year. This diversity ensured a balanced view across roles, experiences, and departments.

4.2 Effect of emerging technologies on speed and accuracy of deliveries.

Table 2 presents respondents' views on how emerging technologies have influenced the speed and accuracy of last-mile deliveries at Jumia.

Table 2: Effect of emerging technologies on speed and accuracy

Statement	SA (5)	A (4)	NS (3)	D (2)	SD (1)
The use of new technologies has improved the speed of last-mile deliveries at Jumia.	30 (37.5%)	38 (47.5%)	4 (5.0%)	6 (7.5%)	2 (2.5%)
Emerging technologies (e.g., GPS tracking, route optimization tools) have enhanced delivery accuracy.	32 (40.0%)	36 (45.0%)	2 (2.5%)	8 (10.0%)	2 (2.5%)
Technology adoption has reduced cases of delayed or misplaced deliveries.	28 (35.0%)	40 (50.0%)	4 (5.0%)	6 (7.5%)	2 (2.5%)
Jumia's use of real-time tracking systems improves delivery time predictions to customers.	34 (42.5%)	36 (45.0%)	2 (2.5%)	6 (7.5%)	2 (2.5%)
Advanced technologies help Jumia quickly identify and resolve delivery challenges.	30 (37.5%)	38 (47.5%)	4 (5.0%)	6 (7.5%)	2 (2.5%)

Source:Primary data, 2025

The first statement shows that the use of new technologies has improved the speed of last-mile deliveries at Jumia**,** with a majority of respondents agreeing. Specifically, 37.5% strongly agreed and 47.5% agreed, representing a combined 85% who believe that technology adoption has enhanced delivery speed. Only a small proportion, 7.5% disagreed, 2.5% strongly disagreed, and 5.0% were neutral, indicating that most employees have a positive perception of technology's role in delivery speed improvement.

For the second statement, emerging technologies such as GPS tracking and route optimization tools have enhanced delivery accuracy**.** The responses show that 40.0% strongly agreed and 45.0% agreed, totaling 85% in favor, while only 10.0% disagreed, 2.5% strongly disagreed, and 2.5% remained neutral. This reflects a strong consensus that technological advancements have contributed significantly to accurate delivery operations.

The third statement reveals that technology adoption has reduced cases of delayed or misplaced deliveries**.** Here, 35.0% strongly agreed and 50.0% agreed, making up 85% of positive responses. Only 7.5% disagreed, 2.5% strongly disagreed, and 5.0% were neutral. This suggests that implementing modern technologies has helped minimize delivery errors and improved operational efficiency.

Lastly, the fourth and fifth statements show that real-time tracking systems improve delivery time predictions to customersand thatadvanced technologies help quickly identify and resolve delivery challenges**.** In both cases, 42.5% and 37.5% strongly agreed respectively, while 45.0% and 47.5% agreed. Minimal disagreement and neutrality levels across these statements indicate that real-time tracking and problem-solving technologies are highly valued in ensuring timely and accurate deliveries at Jumia.

4.3 Effect of emerging technologies on delivery costs and efficiency

Table 3 shows respondents' opinions on how emerging technologies have influenced delivery costs and operational efficiency.

Table 3: Effect of emerging technologies on delivery costs and efficiency

Statement	SA (5)	A (4)	NS (3)	D (2)	SD (1)
The use of technology reduces operational costs in last-mile delivery.	28 (35.0%)	40 (50.0%)	4 (5.0%)	6 (7.5%)	2 (2.5%)
Emerging technologies have reduced fuel and route planning costs for Jumia.	30 (37.5%)	38 (47.5%)	4 (5.0%)	6 (7.5%)	2 (2.5%)
Automation and digital systems improve efficiency in delivery operations.	32 (40.0%)	36 (45.0%)	4 (5.0%)	6 (7.5%)	2 (2.5%)
Integration of technology minimizes errors in order handling and processing.	30 (37.5%)	40 (50.0%)	4 (5.0%)	4 (5.0%)	2 (2.5%)
Technology adoption reduces the overall cost of customer service related to delivery queries.	26 (32.5%)	42 (52.5%)	4 (5.0%)	6 (7.5%)	2 (2.5%)

Source:Primary data, 2025

Table 3 results indicate that the use of technology has had a great effect on reducing the cost of operations in last-mile delivery. 35.0% of them strongly agreed and 50.0% agreed that technology reduces the cost of operations, which means that the majority of them recognize the cost-reducing advantages. The fewest of them, 7.5%, disagreed, and 2.5% strongly disagreed, reflecting minimal resistance to this argument. This implies that technology adoption has been effective in lowering the expenses associated with last-mile delivery operations.

Likewise, 47.5% agreed and 37.5% strongly agreed that emerging technologies have lowered fuel and route planning costs for Jumia. This evidence indicates that technology tools such as GPS tracking, route optimization software, and fuel management systems have helped achieve operational cost savings. It is only a small percentage of respondents who disagreed (7.5%) and strongly disagreed (2.5%) with this assertion, meaning that resistance to this notion is largely insignificant. The results also establish that automation and digital systems have increased

efficiency in delivery operations. Particularly, 40.0% of them agreed strongly and 45.0% agreed that this was true. This is to say that technology-enabled solutions such as computerized tracking, digital proof of delivery, and automated dispatch systems have improved speed of delivery and reduced the rate of human mistakes. Once more, few (7.5% disagreed and 2.5% strongly disagreed) disagreed with that.

Furthermore, the use of technology in delivery operations was reported to minimize errors in processing and handling. Most of the respondents (50.0%) agreed, while 37.5% strongly agreed that most of the respondents acknowledge the role of technology toward increased accuracy. This further implies that technologies like barcode scanning and order management systems have greatly impeded processing errors because not all respondents (5.0% disagreed and 2.5% strongly disagreed) agreed.

Technology uptake was also seen to reduce the overall cost of customer service for delivery queries. 52.5% and 32.5% strongly agreed that technology-enabled communication tools such as chatbots, automated SMS updates, and customer service panels help reduce customer inquiry-related costs. 7.5% and 2.5% disagreed and strongly disagreed, respectively, showing little disagreement to the concept.

4.4 Effect of emerging technologies on customer satisfaction

Table 4 presents respondents' views on how emerging technologies have improved customer satisfaction in last-mile delivery.

Table 4: Effect of emerging technologies on customer satisfaction

Statement	SA (5)	A (4)	NS (3)	D (2)	SD (1)
Real-time delivery tracking increases customer satisfaction.	32 (40.0%)	38 (47.5%)	4 (5.0%)	4 (5.0%)	2 (2.5%)
Digital platforms improve communication with customers during deliveries.	34 (42.5%)	36 (45.0%)	2 (2.5%)	6 (7.5%)	2 (2.5%)
Faster and more accurate deliveries improve customer trust in Jumia.	36 (45.0%)	34 (42.5%)	2 (2.5%)	6 (7.5%)	2 (2.5%)
Technology has improved customer feedback mechanisms.	30 (37.5%)	40 (50.0%)	2 (2.5%)	6 (7.5%)	2 (2.5%)
Timely notifications and transparency enabled by technology improve satisfaction.	32 (40.0%)	38 (47.5%)	4 (5.0%)	4 (5.0%)	2 (2.5%)

Source:Primary data, 2025

The results in Table 4 highlight the effect of emerging technologies on customer satisfaction at Jumia. For the statement *"Real-time delivery tracking increases customer satisfaction,"* most respondents agreed, with 40.0% strongly agreeing (SA) and 47.5% agreeing (A). Only a small proportion of respondents, 5.0%, were neutral (NS), while another 5.0% disagreed (D), and 2.5% strongly disagreed (SD). These findings indicate that real-time tracking systems play a significant role in enhancing customer satisfaction by allowing customers to monitor their orders conveniently.

Regarding the statement *"Digital platforms improve communication with customers during deliveries,"* 42.5% strongly agreed and 45.0% agreed, demonstrating a general consensus that digital platforms foster better communication during the delivery process. Only 2.5% were neutral, while 7.5% disagreed and 2.5% strongly disagreed. This suggests that the adoption of digital communication tools enables customers to stay informed and engaged, thereby improving their overall delivery experience.

The statement *"Faster and more accurate deliveries improve customer trust in Jumia"* also received strong support, with 45.0% strongly agreeing and 42.5% agreeing. A small proportion, 2.5%, remained neutral, while 7.5% disagreed and 2.5% strongly disagreed. These results imply that emerging technologies contribute significantly to improving delivery speed and accuracy, which strengthens customers' trust in the company's services.

On the statement *"Technology has improved customer feedback mechanisms,"* 37.5% strongly agreed and 50.0% agreed, showing the highest level of agreement among all statements. Meanwhile, 2.5% were neutral, 7.5% disagreed, and 2.5% strongly disagreed. This indicates that technology enables customers to provide feedback more easily, allowing the company to respond to their concerns promptly and improve service quality.

Lastly, for the statement *"Timely notifications and transparency enabled by technology improve satisfaction,"* 40.0% strongly agreed and 47.5% agreed, while 5.0% were neutral, 5.0% disagreed, and 2.5% strongly disagreed. These results emphasize that real-time notifications and

transparency in the delivery process significantly enhance customer satisfaction by keeping them informed about their orders at every stage.

4.5. Summary of challenges and opportunities from open-ended responses and interviews

Theme	Challenges identified	Opportunities highlighted
Resources and infrastructure	- Limited funding for operations and innovations - Inadequate technological infrastructure - Lack of modern equipment and facilities	- Potential for donor support and government funding - Availability of affordable technological solutions
Skills and capacity	- Limited technical expertise among staff - Insufficient training opportunities - High turnover affecting knowledge retention	- Capacity building through training programs - Staff development workshops and continuous learning initiatives
Policy and regulation	- Bureaucratic procedures delaying approvals - Complex regulatory requirements - Lack of clear operational guidelines	- Policy reforms aimed at digitization and efficiency - Simplified regulatory frameworks under discussion
Market and competition	- Increasing competition from new entrants - Market fluctuations affecting revenues	- Growing market demand for services and products - Opportunity to innovate and diversify offerings
Stakeholder engagement	- Limited collaboration with external partners - Weak communication between internal and external stakeholders	- Building partnerships with NGOs, private firms, and government agencies - Strengthening community and stakeholder relationships
Technology adoption	- Resistance to change among some staff - Underutilization of existing technologies	- Advancements in digital tools for efficiency and customer satisfaction - E-commerce and mobile technology adoption opportunities

CHAPTER FIVE

DISCUSSION OF FINDINGS, SUMMARY, CONCLUSION ANDRECOMMENDATIONS

5.0 Introduction

This chapter summarizes all findings presented in chapter four according to the research objectives, draws conclusions, provides recommendations, and proposes areas for further research.

5.1 Discussion of findings

5.1.1 Effect of emerging technologies on speed and accuracy of deliveries

The findings revealed that there is a significant positive impact of emerging technologies on the speed and accuracy of last-mile deliveries at Jumia. The majority of the respondents agreed that technologies such as GPS tracking, route optimization software, and real-time tracking systems have considerably enhanced delivery performance. These results agree with Christopher (2016), who explained that using technology in logistics makes deliveries faster, more efficient, and improves customer experience.

Similarly, the ability of new technologies to support real-time tracking of deliveries matches Akter et al. (2020), who noted that digital systems help companies follow delivery routes, reduce mistakes, and act quickly when problems arise. Real-time visibility helps companies predict delays, change delivery routes when needed, and provide more reliable services. This aligns with lean delivery ideas in logistics, where accuracy and quick responses are key to success.

The findings also support Dablanc et al. (2017), who said that route optimization systems reduce travel distance and fuel use, leading to faster and more accurate deliveries. Jumia's use of such technology reflects current trends in last-mile delivery, where speed and precision are critical for success.

5.1.2 Effect of emerging technologies on delivery costs and efficiency

Findings on operation cost and delivery effectiveness are as expected in alignment with literature that emphasizes cost effectiveness benefits of technology utilization in logistics. Every respondent concurred in uniformity that technologies such as automation, GPS, and online platforms reduce operation cost, reduce fuel use, and reduce the cost of customer care. These findings corroborate Marcucci et al.'s (2018) position, where they underscored that emerging technologies reduce the cost of transportation, improve route selection, and improve labor productivity for city deliveries.

According to the research, the use of automation and digital platforms improves operations. This agrees with Lim et al.'s (2018) idea that digitalization reduces human errors, latency, and wastage. For example, Jumia utilizes automated order processing, electronic proof of delivery, and real-time tracking in compliance with global best practices to improve last-mile delivery.

Similarly, the findings are in agreement with Ghobakhloo's (2020) view that technology promotes transparency, keeps processes coordinated automatically, and allows easy flow of information in logistics. The study further shows that utilisation of digital communication tools cuts customer service costs, supporting Winkenbach et al.'s (2019) argument that customer service is more cost-effective and efficient using digital tools.

5.1.3 Effect of emerging technologies on customer satisfaction

The findings of the research explained that emerging technologies have significantly contributed to improving customer satisfaction with the last-mile delivery of Jumia. The respondents were of the same view that real-time tracking of the delivery, real-time information, and accurate deliveries improved customer confidence and trust, and customer loyalty. This concurs with the view of Esper et al. (2020), who posited that real-time visibility strengthens customers' confidence by reducing uncertainty and enhancing the transparency of the delivery process.

It also supports the contention of Lasi et al. (2014), who asserted that computerized notification and web interfaces improve customer communication, which is timely and precise, and transmits information regarding delivery and augments satisfaction levels.Customers in Jumia are immediately notified of delivery status, removing fear and increasing their overall experience.

Furthermore, the study identifies that technology-enabled delivery precision builds trust among customers. This is concurring with the finding by Chen et al. (2017), which revealed that efficient delivery performance is a central determinant of customer loyalty in e-commerce logistics. Improved feedback mechanisms also enable the gathering of customers' experiences, resolution of complaints in real time, and implementation of service improvements, as noted by Singh et al. (2019).

Lastly, it is revealed through the findings that on-time notifications, technology openness, and effective communication facilitated by technology all together result in greater customer satisfaction, reiterating the central role of technology adoption in facilitating superior customer service performance in e-commerce logistics.

5.2 Summary of findings

The study validated that emerging technologies make a considerable contribution to last-mile delivery performance at Jumia through improved delivery speed, accuracy, affordability, and customer satisfaction. The respondents were in unison that real-time tracking, route planning, and automation systems enhance operational reliability, reduce errors, and lower delivery delays.

Research further underscored that technology adoption is key to helping reduce the cost of last-mile delivery operations, predominantly by enhancing fuel efficiency, minimizing errors, and lowering customer care costs. Computerized systems and automation also improved efficiency since they accelerated order processing and eliminated the time delays of human intervention.

Finally, the results supported that emerging technologies simplify customer satisfaction by facilitating real-time tracking, prompt alerts, improved communication channels, and accurate delivery. Customers benefit from increased transparency, faster response, and increased confidence in Jumia's delivery system, supporting the pivot role of technology in simplifying customer-focused logistics solutions.

5.3 Conclusions

It. concluded finally that emerging technologies have a revolutionary effect on Jumia's last-mile delivery. Adoption of technology has a significant impact towards accelerating delivery, improving precision, making operations easy, reducing costs, and delighting customers. Real-time tracking, automation, and web portals assist in mapping routes, reducing operational risks, and providing more credible delivery.

In addition, savings that are achieved through the implementation of technology boost the use of resources and efficiency of operations while enhanced customer communication and transparency build trust and loyalty. All these findings in total highlight the strategic significance of technology-based innovations to enhance the efficiency of last-mile delivery in Uganda's e-commerce industry.

5.4 Recommendations

Based on the research, Jumia must invest in emerging technology like Artificial Intelligence (AI), the Internet of Things (IoT), and predictive analytics. These technologies can help improve real-time tracking, providing more accurate deliveries, and ensuring smoother operations.

They also have to utilize automation systems to accept orders, organize warehouses, and route planning. It will save them capital and shorten the delivery times. Creating one master digital communication platform will also make delivery process more transparent and inform customers more.

Jumia ought to provide recurrent training for employees to allow them to understand how to use emerging technologies, read data, and work with automated systems. The experienced employees will be more confident, have fewer issues when operating the technology, and improve on delivery performance.

The company ought to also work closely with technology companies, logistics companies, and policymakers to formulate comprehensive digital solutions and simple regulations that allow smooth e-commerce transactions within Uganda.

Lastly, Jumia ought to utilize performance monitoring systems with accurate key performance indicators (KPIs) like delivery speed, price, and customer satisfaction. This will allow the

company to assess how effectively the technology is operating and enhance decision-making for continuous improvement.

5.5 Areas for further research

The study recommends further research into how the role of upcoming technologies such as blockchain, drones, and autonomous vehicles influences the transformation of last-mile delivery efficiency and transparency in Uganda.

In addition, comparative studies must be conducted to investigate how technology adoption for last-mile delivery differs among various e-commerce firms and logistics operators in Uganda.

Finally, future research can explore the convergence of technology adoption, green logistics, and sustainability practices to identify how eco-friendly innovations can facilitate operational efficiency while reducing environmental footprints in last-mile delivery networks.

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QUESTIONNAIRE FOR STAFF OF JUMIA

Researcher: Umuhirewase Sandrine

Study Topic: EMERGING TECHNOLOGIES AND THEIR IMPACT ON LAST-MILE DELIVERY: A CASE STUDY OF JUMIA

Dear Sir/Madam,

You have been selected to participate in this study. The information collected shall be purely for academic purposes and treated with the highest level of confidentiality. Your cooperation will be highly appreciated.

SECTION A: BIO DATA

Please tick the most appropriate answer.

1. Gender:
   ☐ Male ☐ Female

2. Age:
   ☐ 21–30 years ☐ 31–40 years ☐ 41–50 years ☐ Above 50 years

3. Highest level of education:
   ☐ Certificate ☐ Diploma ☐ Degree ☐ Masters ☐ Others (specify):
   _____

4. Department:
   ☐ Administration/HRM ☐ Logistics & Delivery Operations ☐ Accounts & Finance
   ☐ Customer Service & Marketing ☐ Technology/ICT

5. Period worked at Jumia:
   ☐ Less than 1 year ☐ 1–5 years ☐ 6–10 years ☐ Above 10 years

SECTION B: EFFECT OF EMERGING TECHNOLOGIES ON SPEED AND ACCURACY OF DELIVERIES

Rate your agreement: 5 = Strongly Agree, 4 = Agree, 3 = Not Sure, 2 = Disagree, 1 = Strongly Disagree

S/N	Statement	5	4	3	2	1
1	The use of new technologies has improved the speed of last-mile deliveries at Jumia.	☐	☐	☐	☐	☐
2	Emerging technologies (e.g., GPS tracking, route optimization tools) have enhanced delivery accuracy.	☐	☐	☐	☐	☐
3	Technology adoption has reduced cases of delayed or misplaced deliveries.	☐	☐	☐	☐	☐
4	Jumia's use of real-time tracking systems improves delivery time predictions to customers.	☐	☐	☐	☐	☐
5	Advanced technologies help Jumia quickly identify and resolve delivery challenges.	☐	☐	☐	☐	☐

Other ways emerging technologies improve delivery speed and accuracy:

_____

_____

SECTION C: EFFECT OF EMERGING TECHNOLOGIES ON DELIVERY COSTS AND EFFICIENCY

S/N	Statement	5	4	3	2	1
1	The use of technology reduces operational costs in last-mile delivery.	☐	☐	☐	☐	☐
2	Emerging technologies have reduced fuel and route planning costs for Jumia.	☐	☐	☐	☐	☐
3	Automation and digital systems improve efficiency in delivery operations.	☐	☐	☐	☐	☐
4	The integration of technology minimizes errors in order handling and processing.	☐	☐	☐	☐	☐
5	Technology adoption reduces the overall cost of customer service related to delivery queries.	☐	☐	☐	☐	☐

Other ways emerging technologies reduce delivery costs and improve efficiency:

_____

_____

SECTION D: EFFECT OF EMERGING TECHNOLOGIES ON CUSTOMER SATISFACTION

S/N	Statement	5	4	3	2	1
1	Real-time delivery tracking increases customer satisfaction.	☐	☐	☐	☐	☐
2	The use of digital platforms improves communication with customers during deliveries.	☐	☐	☐	☐	☐
3	Faster and more accurate deliveries improve customer trust in Jumia.	☐	☐	☐	☐	☐
4	The use of emerging technologies has improved customer feedback mechanisms.	☐	☐	☐	☐	☐
5	Customers are more satisfied due to timely notifications and transparency enabled by technology.	☐	☐	☐	☐	☐

Other ways emerging technologies improve customer satisfaction:

_____

_____

List the challenges and opportunities of adopting emerging technologies on last mail delivery

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Thank you for your cooperation.

INTERVIEW GUIDE FOR TOP MANAGEMENT OF JUMIA

Section A:

Introduction

1. Tell me about yourself (gender, age, education level).

2. What position do you hold in Jumia?

3. How long have you worked with Jumia?

Section B: Effect of Emerging Technologies on speed and accuracy of deliveries

4. How have emerging technologies improved the speed and accuracy of Jumia's last-mile deliveries?

5. Can you provide specific examples of technologies (e.g., GPS, drones, mobile apps) that have enhanced order tracking and delivery accuracy?

6. How do these technologies help in resolving delivery challenges (e.g., delays, wrong addresses)?

Section C: Effect of Emerging Technologies on delivery costs and efficiency

7. How has technology adoption contributed to reducing Jumia's delivery costs?

8. In what ways do new technologies improve operational efficiency in last-mile delivery?

9. Can you give examples of specific technologies that have helped optimize resources (e.g., vehicles, fuel, staff)?

Section D: Effect of Emerging Technologies on customer satisfaction

10. How has the use of technology improved customer satisfaction with Jumia's last-mile delivery?

11. What role do customer notifications, real-time tracking, and digital communication platforms play in building customer trust?

12. Can you share examples where technology-based solutions helped improve customer feedback or complaints handling?

Thank you for your cooperation.