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A case study of Roam Electric

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Abstract

This thesis investigates cost inefficiencies within the inbound logistics operations of Roam Electric, a Nairobi-based electric vehicle manufacturer. As Kenya's electric vehicle market expands, managing logistics costs becomes increasingly critical for local firms navigating infrastructural, regulatory and operational challenges. This research adopts a holistic single-case study approach and develops supply chain maps to visualize Roam's inbound logistics flows, supplier locations and cost structures to identify cost inefficiencies and propose actionable improvements. Empirical data was collected through interviews, archival company documentation and site observations during a two-month period on site. The analysis includes a detailed categorization and comparison of inbound logistics costs to identify the main cost drivers across shipments and transport modes. Cost inefficiencies were found in unstructured data tracking, supplier locations, customs clearance choices, payment processes and transportation practices. To address these issues, the study recommends organizing supply chain data systematically, reviewing and relocating suppliers where feasible, improving freight forwarding strategies, using "through bill of lading" shipments, developing a standardized quotation framework, streamlining payment processes, achieving greater economies of scale and strengthening planning to reduce reliance on air freight. The study contributes to both academic literature on supply chain management in emerging markets and provides practical insights for Roam and other firms operating in Kenya's EV sector.

Key words: Cost analysis, Electric vehicles, Emerging markets, Inbound logistics, Kenya, Strategic alignment, Supply chain management, Supply chain mapping

Contribution: This thesis has been a complete elaboration between the two authors. Each author has been involved in every part of the process and contributed equally.

Sammanfattning

Detta examensarbete undersöker kostnadsineffektivitet inom logistikflödet från leverantör till produktion hos Roam Electric. Roam är en Nairobi-baserad tillverkare av elmotorcyklar som är verksam på Kenyas växande elfordonsmarknad där en effektiv försörjningskedja är avgörande för att hantera infrastrukturella, regulatoriska och operativa utmaningar. Studien bygger på en holistisk enfallsstudie och inkluderar kartläggning av försörjningskedjan för att visualisera Roams logistiska flöden, leverantörernas geografiska placering och kostnadsstrukturer. Syftet är att identifiera ineffektiva områden och föreslå förbättringsåtgärder. Empirisk data har samlats in genom intervjuer, företagsdokumentation och observationer under en två månader lång fältstudie. Analysen omfattar en detaljerad kategorisering och jämförelse av logistikrelaterade kostnader för att identifiera centrala kostnadsdrivare kopplade till olika transportlösningar. Det identifierades ineffektiva metoder inom datahantering, placering av leverantörer, tullhantering, betalningsrutiner samt transportlösningar. För att hantera dessa problem rekommenderas en mer systematisk hantering av logistikdata, eventuell omlokalisering av leverantörer, förbättrade speditörssval, användning av "through bill of lading"-leveranser, standardiserade offertmallar, effektivare betalningsprocesser samt förbättrad planering för att minska flygfrakt. Studien bidrar till den akademiska litteraturen om supply chain management i tillväxtmarknader och ger praktiska insikter för Roam och andra aktörer inom Kenyas elfordonssektor.

Nyckelord: Elfordon, Försörjningskedja, Försörjningskedjekartläggning, Kenya, Kostnadsanalys, Logistikflöde, Strategi, Tillväxtmarknader

Bidrag: Detta examensarbete är resultatet av ett samarbete mellan författarna. Båda författarna har varit med i alla delar i processen och bidragit till lika delar.

Table of Contents

1. Introduction	10
1.1 Background	10
1.1 Problem formulation	10
1.2 Purpose	11
1.3 Research questions	11
1.4 Focus and limitations	11
1.5 Structure of thesis	12
2. Methodology	14
2.1 Research strategy	14
2.2 Research design	14
2.2.1 Case company	15
2.2.2 Unit of analysis	16
2.3 Data collection	16
2.3.1 Literature review	16
2.3.2 Interviews and workshops	16
2.3.3 Archival records and documentation	17
2.3.4 Observations and site visits	18
2.4 Data analysis and evaluation	18
2.4.1 Empirics	18
2.4.2 Analysis	19
2.4.3 Evaluation	19
2.5 Research quality	19
2.5.1 Reliability	20
2.5.2 Validity	20
2.6 Research ethics	20
3. Theoretical background	21
3.1 Kenyan EV market	21
3.1.1 Economic context	21
3.1.2 Transportation sector	22
3.1.3 Market development	22
3.1.4 Government policy and institutional landscape	23
3.1.5 Logistics landscape	24
3.2 Supply chain management and inbound logistics	25
3.2.1 Strategic alignment	25
3.2.2 Forecasting	27
3.2.3 Data management	27
3.2.4 Supply chain mapping	28
3.2.5 Inbound logistics	30
3.3 Cost analysis	37
3.3.1 Logistics cost analysis	37
3.3.2 Cost types within inbound logistics	38

3.4 Theoretical framework	41
4. Empirics	43
4.1 Roam's strategy within the Kenyan context	43
4.1.1 Business model and competitive strategy	43
4.1.2 Supply chain strategy	45
4.2 Roam's inbound logistics	47
4.2.1 The flow of goods	47
4.2.2 Ordering of components	49
4.2.3 Supplier network	50
4.2.4 Transport modes	51
4.2.5 Logistics partners	51
4.2.6 Customs clearance	53
4.3 Costs	54
4.3.1 Breakdown of invoices	55
4.3.2 Inbound logistics costs per shipment	59
4.3.3 Factors affecting costs	59
5. Analysis & Discussion	61
5.1 Strategic alignment in the Kenyan market	61
5.2 Inbound logistics	62
5.2.1 Structure of inbound logistics flows	62
5.2.2 Sourcing strategy and supplier network	63
5.2.3 Transport modes and modal choice	64
5.2.4 Role of logistics service providers	64
5.3 Supply chain maps	65
5.3.1 Inbound logistics flow	66
5.3.2 Supplier location	68
5.3.3 Cost mapping	69
5.4 Cost analysis	72
5.4.1 Cost categorization	72
5.4.2 Cost fluctuations and invoicing inconsistencies	75
5.4.3 Cost comparisons	76
5.5 Cost inefficiencies and potential improvements	79
5.5.1 Administration	79
5.5.2 Transportation	80
5.5.3 Customs clearance	84
5.5.4 Storage and handling	85
6. Evaluation	87
6.1 Administration	88
6.1.1 Data tracking	88
6.2 Transportation	88
6.2.1 Supplier location	88
6.2.2 Container returns	89
6.2.3 Ocean freight	89

6.2.4 Price structure in quotations	90
6.2.5 Air freight	90
6.3 Customs clearance	91
6.3.1 Clearing location	91
6.3.2 Local sourcing	92
6.4 Storage and handling	92
6.4.1 Payment processes	92
6.4.2 Economies of scale	93
6.5 Implementation plan of recommendations	94
6.6 Alignment with cost reduction goal	94
7. Conclusion	96
7.1 Answering the research objectives and research questions	96
7.2 Contributions	98
7.3 Limitations and future research	98
8. References	100
9. Appendix	109
9.1 Appendix A: Interview questions	109
9.1.1 Interview guide 1: Strategic level	109
9.1.2 Interview guide 2: Specialized level	109
9.2 Appendix B: Shipment data	112

List of Figures

Figure 1.1: Scope of the thesis in regards to Roam's supply chain.

Figure 2.1: Types of research designs for case studies.

Figure 3.1: The three main areas of the theoretical background.

Figure 3.2: Map of Africa, highlighting the location of Kenya in a darker shade.

Figure 3.3: Supply chain strategy's evolvement in parallel with product maturity.

Figure 3.4: Key dimensions regarding transport choice.

Figure 3.5: Visualization of the theoretical framework with the main areas together with the sub-parts of each section.

Figure 4.1: Roam Air, the electric motorcycle.

Figure 5.1. Map of key Kenyan locations within the flow of goods.

Figure 5.2: Mapping conventions and iconography.

Figure 5.3: Supply chain map of Roam's sea freight inbound logistics flow.

Figure 5.4: Supply chain map of Roam's air freight inbound logistics flow.

Figure 5.5: Supply chain map of the scattered locations of Roam's suppliers in China.

Figure 5.6: Supply chain map of the location of Roam's suppliers in India.

Figure 5.7: Supply chain map of the costs of a sea freight shipment from India in 2024.

Figure 5.8: Supply chain map of the costs of an air freight shipment from India in 2024.

Figure 5.9: Supply chain map of the costs of a sea freight shipment from China in 2024.

List of Tables

Table 2.1: The interviews conducted for the thesis.

Table 4.1: The shipments delivered during 2024 from which invoices have been made available to the writers by Roam.

Table 5.1: Cost categories and their corresponding cost items.

Table 5.2: Cost category shares as a percentage of total inbound logistics costs for sea freight shipments.

Table 5.3: Cost category shares as a percentage of total inbound logistics costs for air freight shipments.

Table 5.4: Average costs per transportation unit, represented by indexes.

Table 5.5: Average costs per supplier country and main shipment transport mode, represented by indexes.

Table 6.1: Evaluation of cost-saving recommendations.

Abbreviations

2PL - Second-party logistics provider
3PL - Third-party logistics
AI - Artificial intelligence
AEO - Authorized economic operator
AWB - Airway bill
BOL - Bill of lading
CAGR - Compound annual growth rate
CBM - Cubic meter
CKD kits - Completely knocked down kits
CPI - Corruption perceptions index
CRSP - Current retail selling prices
DDP - Delivery Duty Paid
ERP - Enterprise resource planning
EV - Electric vehicle
EXW - Ex Works
FCL - Full container load
FTL - Full truckload
GCPI - Global container port performance index
GDP - Gross domestic product
HS codes - Harmonized system codes
ICD - Inland container depot
ICE vehicle - Internal combustion engine vehicle
IDF - Import declaration form
Incoterms - International commercial terms
KEBS - Kenya Bureau of Standards
KES - Kenyan shillings
KPA - Kenya Ports Authority
KPI - Key performance indicator
KRA - Kenya Revenue Authority
LCL - Less than container load
LN112 - Legal Notice No. 112
LTL - Less than truckload
PVoC - Pre-export verification of conformity
RDL - Rail development levy
Roam - Roam Electric
SBU - Strategic business unit
TBL - Through bill of lading
TEU - Twenty-foot equivalent units
UCR - Unique consignment reference
VAT - Value-added tax
ZEV - Zero-emission vehicle

1. Introduction

The introduction section presents background information relevant to understanding the area studied, followed by a formulation of the problem, as well as the purpose and the research questions of the thesis. Thereafter, the introduction chapter describes the focus and limitations of the research questions, and ends with a description of the thesis structure.

1.1 Background

Kenya's electric vehicle, EV, market is clearly on the rise, with the government actively promoting adoption. By 2025, the country aims for 5% of all new vehicle sales to be electric. To support this transition, Kenya, which currently relies on EV imports, reduced the excise duty on fully electric vehicles from 20% to 10% (Ministry of Roads and Transport, 2021). In August of the same year, a government task force was established to develop an e-mobility policy aimed at positioning Kenya as an electric vehicle manufacturing hub. These initiatives signal governmental support for local EV production, creating an opportunity for a domestic electric motorcycle manufacturer to thrive.

Still, managing a supply chain in the Kenyan EV market remains complex due to challenges such as corruption, international trade issues and regulatory uncertainty (Transparency International, 2024; United Nations Environment Programme, 2023; Dalberg, 2022). Roam Electric, later referred to as Roam, is an electric vehicle manufacturer founded in 2017 by a group of Swedish entrepreneurs, with the aim of entering the Kenyan market. Although the company has successfully established its position in the market, they continue to struggle with understanding and managing the performance of their supply chain, particularly regarding costs within inbound logistics (Supplier Development Lead at Roam, 2025). Inbound logistics refers to “the design and operations of incoming material flows and the associated informational and financial flows” (Minner, 2019).

In the manufacturing industry, inbound logistics costs, including transportation and material handling expenses, constitute a significant share of total manufacturing expenditures. Studies show that these costs account for approximately 11% to 21% of the combined manufacturing and internal handling costs (Windmark and Andersson, 2015). Furthermore, it is found that freight expenses can stand for around 10% of the material costs (Ampuja and Pucci, 2024). These aspects underscore the importance of controlling inbound logistics costs to keep the total manufacturing costs at a sustainable level.

Given the high costs associated with inbound logistics and the challenges of managing a supply chain in East Africa, cost management is crucial to stay competitive, ensure financial stability, and support sustainable scaling (Al-Samawi, 2024).

1.1 Problem formulation

With Roam's focus on cost reduction to remain competitive in the growing Kenyan EV market, the company has recently begun to give greater attention to supply chain management. Until now, Roam has worked to improve sourcing, focusing on supplier selection and supplier strategy, with costs being an important deciding factor. As a natural next step, Roam desires to further explore inbound logistics by shifting attention to the costs incurred during the flow of goods from suppliers to Roam Park, the company's production facility (Supplier Development Lead at Roam, 2025). This

focus on cost aligns with Roam's future scaling strategy, and thus, cost reduction opportunities in inbound logistics are both of need and interest to investigate further. Furthermore, this area is of particular interest from a research perspective, as supply chain management in the Kenyan market remains relatively unexplored and is characterized by unique challenges. Gaining a deeper understanding of inbound logistics in this context and identifying opportunities to improve supply chain performance not only supports Roam's growth but also contributes with valuable insights to the broader academic knowledge on supply chain management in emerging markets.

1.2 Purpose

The purpose of this thesis is to provide an understanding of Roam's inbound logistics, identify cost inefficiencies and develop improvement suggestions in order to reduce the associated costs.

1.3 Research questions

In order to investigate cost reduction opportunities for Roam's inbound logistics, the following research questions, and if applicable, their research objectives or propositions, are:

R1. How is Roam's inbound logistics currently structured, including transportation flows, supplier locations and cost allocations?

- RO1. Map the current inbound logistic flows of the components making up Roam's electric motorcycles.
- RO2. Map the location of Roam's suppliers.
- RO3. Map the points where costs are incurred throughout the inbound logistic flow.

Based on the findings from the research objectives above, costs will be allocated to certain activities to understand which categories generate the highest costs, leading to a second research question:

R2. What cost inefficiencies exist within Roam's inbound logistics, taking into account their strategy and the conditions of the Kenyan market?

The identified cost inefficiencies are then utilized to develop feasible solutions in order to reduce Roam's inbound logistics costs:

R3. What recommendations can be given to address the identified inefficiencies and reduce costs?

1.4 Focus and limitations

This research is limited to the logistics of Roam's electric motorcycles, and thus only takes the components sourced for their motorcycles into consideration in the analysis. Furthermore, the logistics scope is limited to the inbound logistics of Roam, including all cost-generating activities from the point the sourced goods leave the supplier to their arrival at Roam Park in Nairobi for manufacturing and assembly. This scope is visualized in figure 1.1.



Figure 1.1. Scope of the thesis in regards to Roam's supply chain.

The activities included within this scope are transportation, storage, handling, customs clearance and associated administration. Thus, the costs analyzed are limited to transportation costs including freight costs for each mode of transport, material handling costs such as loading and quality inspections, customs clearance and tax fees, as well as storage costs for warehousing incoming materials before they are forwarded to the next destination in the flow. In addition, sourcing is considered as strategic sourcing decisions affect inbound logistics activities, such as transportation, and the associated costs. Inventory-related costs at Roam Park and inventory holding costs during transport are not included in the scope of the thesis due to limited data and Roam's desired focus. The choice of excluding these costs may risk sub-optimization of Roam's supply chain, but this issue is made clear throughout the thesis to ensure thorough understanding of its consequences and correct usage of the suggested improvements. Additionally, only the currently used freight companies and suppliers are analyzed and included in the proposed solutions.

Beyond the limitations mentioned above, the time limitation of 20 weeks for this thesis limits the scope and depth of the data collection as well as the breadth of the recommendations provided. To ensure a fair and relevant analysis, the collected data is cleaned and only shipment data from 2024 is included. Due to limited data availability, only two air freight shipments are included in the analysis. However, the primary focus is on the sea freight flow, which includes ten shipments from 2024. Air freight data serves as a complementary reference for comparison and further analysis. Additional limitations regarding the data are addressed when relevant to the discussion throughout the analysis section.

1.5 Structure of thesis

The structure of the thesis is divided into seven sections: 1. Introduction, 2. Methodology, 3. Theoretical Background 4. Empirics, 5. Analysis & Discussion, 6. Evaluation, 7. Conclusion. In the introduction, the problem together with relevant background are explained. Thereafter, the utilized methodology for the thesis is formulated, explaining aspects such as how empirical and theoretical information is collected, and how the theoretical concepts are applied to the problem formulation along with empirics to conduct the right analysis and recommendations for the problem. Following the methodology, the theoretical background is presented. This includes concepts, theories, and models that are necessary to understand the context in which the thesis is working within. The next chapter, empirics, presents the data and information gathered from the company, which serves as the base for the next chapter of analysis and discussion. This chapter combines empirics and theoretical information to provide insights and discussions. In the evaluation chapter, the recommended

solutions are assessed and described further. Lastly, the conclusion gives apparent answers to the research questions, and ends with recommendations for further research to be made based on the findings of the thesis.

2. Methodology

The methodology chapter describes the research strategy and design used to examine the research topics. The case company is also briefly presented to give an understanding of their operations, leading into the unit of analysis and the methods for data collection and analysis. This will help the reader understand the structure of the thesis. Lastly, to ensure research objectiveness, ethics and quality are discussed.

2.1 Research strategy

This study adopts a single-case study approach to investigate the case company's inbound logistics operations. The objective is to develop a comprehensive understanding of the inbound logistics flows and associated costs, identify inefficiencies and propose cost-reduction strategies.

The choice of research strategy depends on the research questions, the level of control the researchers have over the studied events, and whether the focus is on contemporary or historical phenomena (Yin, 2003). Case studies are particularly suitable for examining contemporary issues within their real-life context, especially when addressing "how" and "why" questions. This study aligns with these characteristics, as it seeks to explore how Roam's inbound logistics is structured and to develop an in-depth understanding rather than broad generalizations. Furthermore, the researchers have limited control over the logistics processes, as they are already in place and managed by the company. Instead of manipulating variables or conducting experiments, the study focuses on observing, analyzing and interpreting the existing logistics setup to identify inefficiencies. Given that the study is conducted within Roam's real-life business setting, data will be collected through interviews, observations, and company records. This further supports the use of case study as the most suitable research strategy.

Research strategies can be applied in exploratory, descriptive, explanatory, or problem-solving studies (Höst, Runeson and Regnell, 2006). Descriptive studies aim to characterize and describe how a process functions, while exploratory studies seek to develop a deeper understanding of a process. Explanatory studies focus on identifying causal relationships, whereas problem-solving studies aim to provide actionable solutions to an identified problem. This study primarily follows an exploratory approach, as it aims to gain an in-depth understanding of Roam's inbound logistics and identify inefficiencies. However, the final research question, which involves developing recommendations, incorporates elements of a problem-solving approach.

2.2 Research design

A research design is developed based on the research strategy to establish a clear link between the research strategy and the necessary data collection process. The research design serves as a logical plan that guides the study from the initial research questions to the final conclusions. The plan includes key steps, such as data collection and analysis, ensuring a structured and systematic approach throughout the research process. The primary purpose of the research design is to ensure that the collected evidence effectively addresses the research questions (Yin, 2003).

The case study design is determined based on Yin's (2003) 2x2 matrix of basic case study designs, illustrated in figure 2.1, which distinguishes between single- and multiple-case studies and between

holistic and embedded designs. A single-case study is appropriate when the study represents a unique case, as is the case in this study. In contrast, a multiple-case design is suitable when the study involves comparisons across multiple cases, such as different organizations. Case study designs can also vary in terms of the number of units of analysis. Even when a study focuses on a single organization, the analysis may include multiple areas or analysis units, in which case it is considered an embedded case study (Yin, 2003). However, this study examines only one case, the company of Roam, and focuses on a single phenomenon, Roam's inbound logistics. As no additional sub-units of analysis are included, the study design is classified as a holistic single-case study.

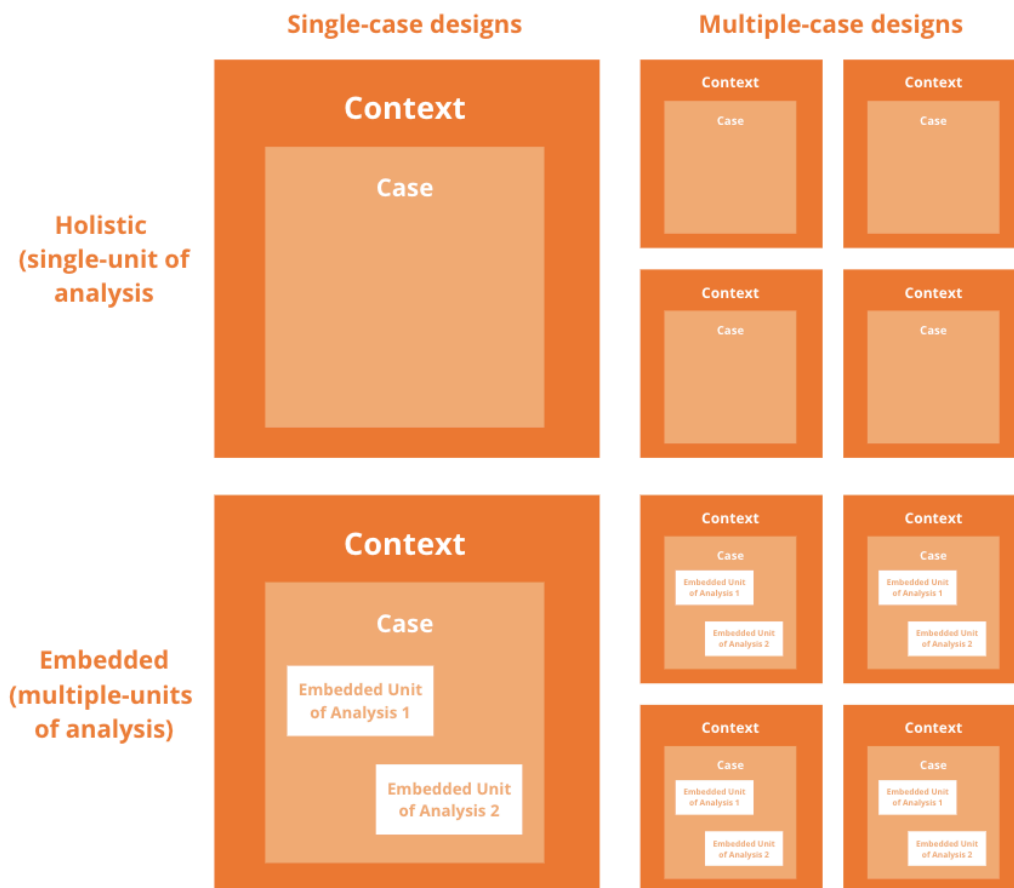


Figure 2.1. Types of research designs for case studies (Own illustration based on Yin, 2003).

For case studies, five key components of research design are particularly important: the study's research questions, its study propositions, the unit of analysis, the logic linking the data to the propositions and lastly, the criteria for interpreting the findings (Yin, 2003). The research questions and propositions have already been defined in section 1.4. The propositions, or research objectives, specify the aspects that should be examined to answer the research question (Yin, 2003). The remaining components of the research design will be further elaborated in the following sections.

2.2.1 Case company

The case study investigates inbound logistics and its inefficiencies within Roam, a start-up company within electric vehicle manufacturing, based in Nairobi in Kenya. Roam was founded in 2017 and specializes in providing electric mobility solutions, primarily electric motorcycles, known as Roam Air. Currently, Roam operates solely in Kenya but aims to expand across Africa. Beyond electric motorcycles, Roam has expanded its product portfolio to include electric buses for public

transportation, off-the-shelf charging and energy products, and tailored software applications designed for fleet owners, business operators, and financial institutions (Roam Electric, 2025a). However, these additional products and services fall outside the scope of this thesis.

2.2.2 Unit of analysis

The unit of analysis defines what is being investigated in the study, such as an individual, an organization or a process (Yin, 2003). It provides a structured focus that aligns the research with its objectives. In this case study, the unit of analysis is *Roam Electric's inbound logistics*, specifically the goods flow from suppliers to Roam Park in Nairobi. The analysis and evaluation are conducted from Roam's perspective, focusing on identifying cost inefficiencies and potential areas for improvement within the inbound logistics operations.

2.3 Data collection

Data is collected through a combination of interviews, literature reviews and observations.

2.3.1 Literature review

The literature review involves searching for and studying academic sources relevant to the thesis. Key topics include supply chain management, inbound logistics, the Kenyan EV market and cost analysis. The initial step involves conducting a broad search for academic journals using LUBsearch and Google Scholar. The most prominent terms from the research questions of the thesis, along with synonyms, were used in the literature portals to filter the publications (Hedbäck, 2025). The search keywords include for example “inbound logistics”, “cost analysis”, “supply chain mapping”, “cost allocation”, “Kenyan EV market”, “sourcing”, “transportation modes” and “supply chain strategy”.

Once relevant articles are identified, the literature review follows a structured process. The first step involves screening articles by reviewing their titles and abstracts to determine their relevance to the research topic. If an article appears useful, the next step involves skim reading with a focus on key sentences and sections to assess its applicability. Finally, articles deemed relevant, are deeper studied for a thorough understanding of chosen sections of the text. Throughout this process, reflections and notes are taken to document important points, citations, and potential connections to the study (Hedbäck, 2025).

2.3.2 Interviews and workshops

Interviews are conducted to collect both qualitative and quantitative data. One of the key strengths of interviews is their ability to directly target case-specific topics and provide insightful observations for the study (Yin, 2003). However, to limit biases, interview questions are carefully designed to ensure objectivity and neutrality. The unbiased and objective formulation of the questions is important to mitigate the risk of reflexivity, where the interviewee responds in a way they believe aligns with the interviewer's expectations (Yin, 2003).

Both more formal and informal interviews are conducted for different purposes in the thesis. In the early stages of the research, an open-ended approach is adopted to allow interviewees to respond freely and provide an in-depth understanding of relevant areas (Saunders et al., 2006). These early interviews are referred to as workshop sessions that involve open discussions to gather information

on Roam’s inbound logistics processes and gain a walkthrough of the supply chain. In addition, semi-structured interviews are conducted later in the research process. While not standardized, these interviews follow a guide outlining key questions and themes. The specific questions, their order, and the flow of the conversation may vary depending on the interviewee (Saunders et al., 2006). Various Roam employees are interviewed to ensure a comprehensive and unbiased perspective on the explored areas. These interviews cover topics such as Roam’s corporate and supply chain strategy, inbound logistics processes, and financial processes, with employees knowledgeable in each respective area. A consistent set of questions was used across multiple interviews to allow for cross-validation of responses and to enhance the reliability of qualitative data collected. Where possible, interview insights were further verified through supporting documentation provided by Roam. For the specific questions asked, see Appendix A. Each interviewee is referred to by their job title throughout the thesis to maintain anonymity. The Co-Founder & Chief Product Officer, from now on referred to as the CPO, is interviewed to provide a strategic perspective on the inbound logistics, which is further developed in the interview with the Supplier Development Lead. Both the Supplier Development Lead and the Supplier Development Engineer contribute with additional insights regarding supplier locations and sourcing strategies. The Logistics Manager, provides a comprehensive understanding of the inbound logistics, along with specific data regarding the logistics flows, freight forwarders and associated costs. Lastly, the Bill of Materials Engineer contributes with a more operational perspective and quantitative data for the research. The conducted interviews are presented in table 2.1 below. To enhance the reliability of the study, data collected from these interviews is corroborated with other sources where possible.

Table 2.1. The interviews conducted for the thesis.

Interviewee’s role at Roam	Interview date	Interview length
Co-founder & Chief Product Officer	2025-03-17	26 min
Logistics Manager	2025-03-17, 2025-03-19 (and informal workshops between 2025-02-04 and 2025-03-28)	47 min and 35 min respectively
Bill of Materials Engineer	2025-03-17	36 min
Supplier Development Engineer	2025-03-17	36 min
Supplier Development Lead	2025-03-19 (and informal workshops between 2025-02-04 and 2025-03-28)	42 min

2.3.3 Archival records and documentation

In addition to interview data, archival records of previous shipments and other administrative documents provided by the case company are utilized to collect quantitative data for analysis and to verify interview responses. These documents include supplier lists, packing lists and invoices from previous shipments and component specifications. The use of company documentation offers advantages such as stability and accessibility for repeated review. However, given the case

company's relatively low organizational maturity, potential gaps in documentation and selective bias must be carefully considered (Yin, 2003).

The documentation of previous shipments is scoped and limited to include only 2024 shipments to ensure a fair and representative depiction of the logistics and associated costs. This includes ten sea freight shipments from India and China in 2024, and two air freight shipments, one from India and one from the United Kingdom, UK. A list of all of Roam's suppliers in China, including their locations and the components they supply, is shared by the Logistics Manager to support the analysis of supplier locations. The shipment documentation in the form of packing lists and invoices is provided to the researchers via PDF files rather than dynamically through Roam's Enterprise Resource Planning, ERP, system. The reason for this is limited access to the system for external parties, which restricts and potentially biases the data used for research.

2.3.4 Observations and site visits

Field visits to the case company site, Roam Park, are frequently made throughout the two-month study period in Kenya. These visits provide opportunities for direct observations, ranging from informal to formal data collection activities. Observations focus on inbound logistics flows, component usage in production, and operational processes. For instance, factory visits provide a firsthand look at the components used in electric motorcycle production, offering a deeper understanding of the parts sourced from suppliers. Additionally, interactive workshops and physical meetings further support data collection. Such activities are particularly useful in the initial phase of the study to obtain an understanding of the empirical data and documents available, where research questions are refined based on empirical insights. These sessions also provide support in aligning the requirements for the master's thesis from Lund University with the goals and needs of the case company.

2.4 Data analysis and evaluation

The data analysis process follows a structure aimed to align with both Roam's wishes and the developed theoretical framework. However, the research methodology is iterative, meaning that the theoretical framework is modified, expanded or refined based on findings from the collected data. For example, new theoretical concepts are explored to address identified inefficiencies. This approach ensures that the analysis remains relevant and provides a comprehensive understanding of the case company and its inbound logistics.

Following the approach described by Miles, Huberman, and Saldana (2014), the data analysis is guided by three key activities: data condensation, data display, and drawing and verifying conclusions. This framework supports a structured and systematic method for qualitative analysis while allowing flexibility to adapt as new insights emerge during the research process.

2.4.1 Empirics

Before analyzing the collected data, it is structured and presented in section 4, the empirics. According to Miles et al. (2014), data condensation refers to the process of selecting, simplifying and organizing data into a more accessible format. In this thesis, the empirical data has been condensed and organized in accordance with the theoretical framework to ensure coherence across the thesis chapters and maintain a common thread throughout the thesis.

The empirical section begins by outlining Roam's business model and its position within the Kenyan EV market, drawing on insights from interviews with Roam employees. Thereafter, the company's corporate and supply chain strategies are examined to better understand the context for improvements in the inbound logistics. This is followed by a detailed presentation of Roam's current inbound logistics structure and an examination of the associated costs. To enhance clarity, the empirical data is structured into subsections, enabling a systematic and concise presentation of key findings.

2.4.2 Analysis

The analysis involves interpreting the empirical data and drawing conclusions regarding Roam's inbound logistics operations. This stage corresponds to the data display and conclusion drawing phases outlined by Miles et al. (2014). The analysis begins by mapping the inbound logistics flows using supply chain maps to visualize the structure and characteristics of the supply chain. These maps support the identification of inefficiencies by highlighting bottlenecks, delays and cost drivers in the inbound logistics. These displays align with Miles et al.'s (2014) emphasis on the importance of matrices, networks and other graphics for facilitating deeper insights and comparisons.

The analysis continues with an exploration of the characteristics of Roam's inbound logistics structure and a detailed cost analysis, in which costs are categorized and mapped within the supply chain to enable comparisons and deeper analysis. This process not only contributes to identifying cost inefficiencies but also supports pattern coding (Miles et al., 2014), helping to extract themes and insights from the data. Through iterative cycles of interpretation and verification, the analysis builds a comprehensive understanding of Roam's inbound logistics and identifies areas of improvement, forming the basis for feasible and effective recommendations.

2.4.3 Evaluation

To determine the feasibility and potential impact of the proposed solutions, each improvement measure is evaluated based on its potential to reduce costs and lead time impact. Following the approach recommended by Miles et al. (2014), both qualitative and quantitative factors are considered to provide a balanced and well-supported assessment.

The ease of implementation is also evaluated to ensure that the proposed improvements are realistic and applicable to Roam's business environment. As Miles et al. (2014) highlight, drawing plausible and confirmable conclusions is essential in case study research. Accordingly, the proposed actions are assessed both in relation to the empirical data and with consideration of Roam's internal capabilities and business environment, ensuring they are both data-driven and practically feasible. The final step involves developing an implementation plan that outlines short-term and long-term actions for the improvement of Roam's inbound logistics.

2.5 Research quality

Ensuring high research quality is essential in conducting a credible research study. To establish the quality of an empirical research, four tests are commonly used. These include reliability as well as construct validity, internal validity and external validity (Yin, 2003). This section discusses research quality in terms of reliability and validity of the case study.

2.5.1 Reliability

For a study to be considered reliable, it needs to demonstrate that the methodology of the study is well-documented and can be replicated with consistent results and findings (Yin, 2003). To enhance reliability, all procedures followed in this study are clearly documented in detail. This includes the methods used for data collection, analysis, and evaluation, allowing for transparency and repeatability. By systematically documenting each step of the research processes, the study ensures that future researchers could follow the same approach and obtain comparable results.

2.5.2 Validity

A finding in a study is more likely to be trusted if it is supported by multiple sources of evidence. To improve credibility and minimize bias, this study employs triangulation as a methodological approach (Yin, 2003). Four different types of triangulation are discussed by Patton (1987), three of which are applied in this study. The first type is data triangulation, which involves collecting data from multiple sources, including interviews, archival documentation and direct observations. Secondly, theory triangulation is used, where different perspectives are looked into for the same data set, which corresponds to the usage of multiple sources for the theoretical background of the study. This ensures a broader and more nuanced interpretation. Lastly, observer triangulation, which involves having multiple observers analyzing the data to reduce individual biases and strengthen the reliability of interpretations, is applied in this study as two researchers are involved (Yin, 2003).

Three key validity tests are considered: construct validity, internal validity and external validity (Yin, 2003). Construct validity refers to “establishing correct operational measures for the concept being studied” (Yin, 2003). This is ensured by using multiple sources of evidence in the form of data triangulation and by involving key stakeholders at Roam to iteratively review all findings and a draft of the case study report. Additionally, a chain of evidence is maintained through logical argumentation supporting all findings and through thorough documentation. The second test, internal validity, is not relevant for exploratory studies and thus, not applicable to this case study. Lastly, external validity is defined as “establishing the domain to which a study’s findings can be generalized” (Yin, 2003). To ensure external validity, theoretical comparisons are made to assess whether the findings of the case study can be generalized beyond this unique case.

2.6 Research ethics

Ethical considerations are fundamental to ensuring integrity and accountability in research. Research ethics concern the behavior of researchers in relation to the rights and well-being of individuals affected by the study (Saunders et al., 2007). This study adheres to ethical principles, including protecting the interests of participants, ensuring voluntary participation based on informed consent, avoiding deception, and maintaining scientific integrity (Denscombe, 2010).

To uphold transparency and objectivity, all sources used in the study are accurately cited and the methodology is clearly described. Roam was fully informed about the terms of the study, and all interviewees were briefed on the research purpose before their participation. Moreover, no interviews were conducted without obtaining prior consent. These measures ensure that ethical considerations are upheld throughout the research process. For full transparency in the writing process, it should also be noted that the language model ChatGPT was used as a tool for grammatical corrections and sentence structuring throughout the writing.

3. Theoretical background

This section aims to give theoretical background to the subjects touched upon within this thesis. The subparts of the section consists of the (i) Kenyan EV market, (ii) Supply chain management and inbound logistics and (iii) Cost analysis. The Kenyan market is explored to give insights into the environment of a Kenyan manufacturer's challenges and opportunities in managing a supply chain. Moreover, concepts and theories within supply chain management and inbound logistics are presented to give the necessary knowledge for understanding the inbound logistics flows and the possible supply chain inefficiencies and recommendations. Finally, a section dedicated to cost analysis is introduced, covering relevant methods for handling inbound logistics costs. These areas are combined in the analysis to provide new insights to the case company as well as academia, visualized in figure 3.1.

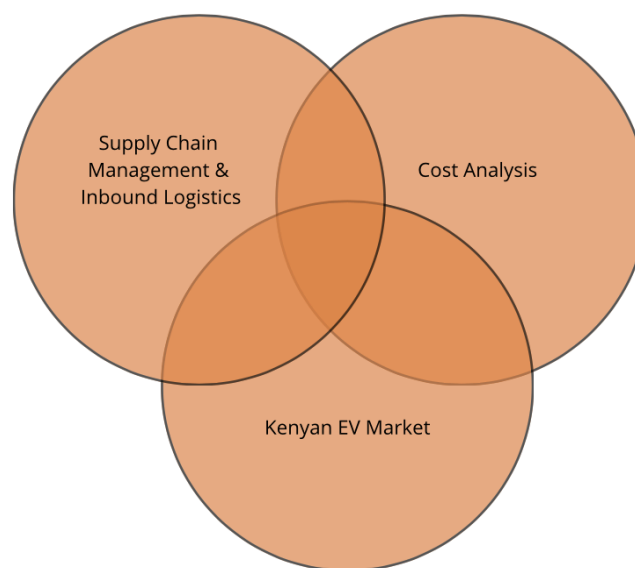


Figure 3.1. The three main areas of the theoretical background.

3.1 Kenyan EV market

3.1.1 Economic context

Kenya is one of the fastest growing economies in Sub-Saharan Africa with a gross domestic product, GDP, of approximately 108 billion US dollars, USD, in 2023 and annual growth rates of 4-6% over the past decade (World Bank, 2024). The national economy is relatively diversified, with agriculture, services and a growing industrial sector being the main contributors (Kenya National Bureau of Statistics, 2022). Nairobi, the capital city, is often referred to as “Silicon Savannah”, due to its expanding startup ecosystem and growing interest from international investors (Dutta et al., 2022; McCandless Farmer, 2024).

At the same time, various institutional challenges are reported. Kenya ranked 121 out of 180 countries on the Transparency International's Corruption Perceptions Index, CPI, which is a global ranking that measures how corrupt each country's public sector is perceived to be, according to experts and business people (Transparency International, 2024). The CPI includes aspects such as bribery, diversion of public funds, and officials using their public office for private gain

(Transparency International, 2025). The index has been used to describe challenges in governance, public procurement and customs clearance, which have consequences for sectors dependent on international supply chains and imported components (World Bank, 2023a). In addition, the dependency on imported goods has been noted to expose firms to fluctuations in exchange rates and variations in global shipping rates (World Bank, 2023b).

3.1.2 Transportation sector

Kenya's transportation sector constitutes over 10% of GDP and provides employment for a large segment of the population (Kenya National Bureau of Statistics, 2024). It is dominated by road transport, which accounts for more than 90% of passenger and freight transport, and is known to be highly informal (African Development Bank Group, 2021). The sector encompasses a wide range of vehicle types, including long-haul trucks, buses, minibuses known as matatus, and motorcycles known as boda bodas, which are particularly prevalent in both urban and rural areas (African Development Bank Group, 2021; Kenya National Bureau of Statistics, 2022). In 2022, over 1.2 million motorcycles were registered in Kenya, according to statistics from the National Transport and Safety Authority (Macharia, 2024).

The transportation sector is highly energy-intensive and reliant on fossil fuels, with transportation reported to account for over 72% of national petroleum consumption (World Bank, 2023a). Urban areas, such as Nairobi and Mombasa, face severe challenges related to high emissions, traffic congestion and air pollution (United Nations Environment Programme, 2023).

3.1.3 Market development

The EV market in Kenya is considered to be in an early stage, but has experienced significant growth in recent years. The African EV market is forecasted to grow at a compound annual growth rate, CAGR, of 15% between 2022 and 2027 (Dalberg and FMO Ventures Program, 2022). This growth has been linked to factors such as rising fuel prices, environmental concerns, access to renewable energy and increasing investment in sustainable transportation solutions (Dalberg, 2022). Kenya is one of the leading countries in Sub-Saharan Africa in terms of renewable energy production, with over 80% of its electricity generated from clean sources such as geothermal, hydro, and wind energy (Osani, 2021).

Particular attention has been given to electrification in the two- and three-wheeler segments, including boda bodas and tuk-tuks, which represent a significant part of daily transport both in urban and rural areas (Dalberg, 2022). Several studies have identified multiple benefits and the most immediate impact of EVs in this segment, such as lower operating costs, reduced maintenance requirements and reduced emissions (Dalberg, 2022).

Barriers to EV adoption have also been identified. These include the relatively high initial cost of EVs compared to internal combustion engine, ICE, vehicles, limited access to financing for informal transport operators, underdeveloped charging infrastructure and low public awareness of EV technology (Shell Foundation, 2022). According to UKAid's Manufacturing Africa program in 2021, the average price of a locally assembled ICE motorcycle was 1300 USD compared to 1800 USD for a locally assembled electric motorcycle (Dalberg, 2022). The informal nature of the transport sector in Kenya is also noted to complicate the adoption of formal financial models and

regulatory mechanisms, as many vehicles are operated by individuals or small cooperatives lacking access to formal credit systems (Dalberg, 2022).

3.1.4 Government policy and institutional landscape

The Kenyan government has introduced several policy initiatives related to electric mobility. The Draft National E-Mobility Policy outlines strategic objectives concerning local manufacturing, charging infrastructure, public awareness and various fiscal incentives, such as reductions in import duty and value-added tax, VAT, for EVs and their components (Ministry of Roads and Transport, 2024). The policy includes proposals such as sales targets for zero-emission vehicles, ZEVs, investment requirements for manufacturers and initiatives to build technical capacity. These include integration of e-mobility curriculum into university programs, support for research in battery technology and charging infrastructure and promotion of knowledge-sharing programmes (Ministry of Roads and Transport, 2024). The policy also includes fiscal measures, such as exemptions from import duty, excise duty and VAT for EV components as well as expedited importation processes (Ministry of Roads and Transport, 2024).

The importation of EV components is regulated through a set of regulatory procedures and fiscal policies intended to support the development of the local e-mobility ecosystem. Prior to shipment, all components must be inspected under the Pre-Export Verification of Conformity, PVoC, program, coordinated by the Kenya Bureau of Standards, KEBS. This process ensures that the products comply with national standards before entry into the country. To complete customs clearance, importers are required to submit several documents, including a commercial invoice, packing list, certificate of conformity, Import Declaration Form, IDF, and a valid tax compliance certificate (Wambugu et al., 2020).

The government has also introduced targeted tax reductions through Legal Notice No. 112, LN112, under the Tax Procedures Act, which applies to completely knocked down, CKD, kits used in local EV assembly (Government of Kenya, 2020). The regulation covers 14 components, such as handlebars, wiring harnesses and foot rests, which are eligible for a reduced import duty of 10% and importers meet specific criteria such as fulfilling quality standards and being tax compliant (Government of Kenya, 2020; Kimani, 2024). In contrast, fully assembled vehicles are subject to a standard 25% duty. Lithium-ion batteries, which are a critical component in EV production, and charging infrastructure equipment are taxed at a reduced 25% import duty (Kimani, 2024). Furthermore, electric motorcycles, bicycles, buses and lithium-ion batteries are zero-rated for VAT (Ambani, 2024) and excise duty exemptions apply to electric motorcycles (Wambugu et al., 2020). The customs clearance process is typically facilitated by licensed clearing agents who coordinate submissions to the Kenya Revenue Authority, KRA. This includes the declaration of goods, payment of applicable taxes and duties, and coordination of the physical release of goods following inspection (Wambugu et al., 2020).

Despite these support measures, Wambugu et al. (2020) highlights that the implementation of the policy initiatives has been slow and inconsistent. Although Kenya applies formal inspection standards, there is no dedicated regulatory framework specifically for EVs, resulting in uncertainty in classification, taxation and the customs process. Inconsistent interpretation of customs codes and EV standards has led to delays in clearance and unexpected import fees (Wambugu et al., 2020).

Kandia (2024a) also mentions that the KRA encounters significant challenges in accurately identifying and taxing EVs and EV components due to a limited understanding of Current Retail Selling Prices, CRSP, and Harmonized System, HS, codes. CRSP refers to the expected market price of a vehicle, while HS codes are standardized classifications used internationally to categorize products for taxation purposes. The KRA often applies a higher CRSP than what is stated on invoices resulting in inflated tax burdens for importers and complicating the financial viability of importing EV vehicles (Kandia, 2024a).

Furthermore, the overall EV policy environment in Kenya remains fragmented with limited institutional coordination. There is a lack of clearly defined technical standards, and implementation roadmaps are often unclear (Kandia, 2024a). According to Kandia (2024a), a gap exists between national policy goals and their practical implementation, particularly in infrastructure development and regulatory enforcement. Despite the aspirations of the policy, it falls short in addressing the financial and human resource capacity needs of county governments. While the national government may have sufficient staffing and resources, county governments often lack the necessary capacity (Kandia, 2024a).

3.1.5 Logistics landscape

The majority of EV components, including batteries, motors and controllers, are imported, primarily from Asia and Europe (International Energy Agency, 2022). These components typically enter Kenya through the port of Mombasa, which is known for congestion, bureaucratic delays and inconsistent customs processes (Wanyama, 2017). This congestion leads to increased costs for shippers and delays in cargo delivery. The primary factors influencing freight costs have been identified as fuel prices, non-tariff barriers, extended clearance times at ports and slow turnaround times (Kandia, 2024a). In the Global Container Port Performance Index, GCPI, Mombasa port ranked 326 out of 348 ports worldwide in 2022 (World Bank, 2023c). The port is the largest in Kenya and serves as a key gateway to neighbouring countries in the region, including Uganda, Rwanda, South Sudan and the Democratic Republic of Congo (Kandia, 2024b). A map of Africa, highlighting the location of Kenya using a darker shade, is illustrated in figure 3.2. The map also visualizes Kenya's coast, on which Mombasa port is located.



Figure 3.2. Map of Africa, highlighting the location of Kenya in a darker shade (Own illustration based on Encyclopædia Britannica, 2025).

3.2 Supply chain management and inbound logistics

3.2.1 Strategic alignment

A company's competitive strategy is defined by its customers' needs. It targets specific customer segments with the goal of offering products and services that effectively meet those needs (Chopra and Meindl, 2016). Competitive strategy is closely linked to supply chain strategy, which is understandable when considering the value chain of a typical organization. The value chain consists of five core functions essential to business success: new product development, marketing and sales, operations, distribution and service. These are supported by functions such as finance, accounting, information technology, and human resources. To successfully implement a competitive strategy, each function must develop its own strategy that defines what it aims to optimize (Chopra and Meindl, 2016). To achieve competitive advantage, the strategy for the operations, the supply chain strategy, outlines how a firm leverages its supply chain capabilities, such as cost efficiency, responsiveness and flexibility (Ismail and Sharifi, 2006). It also specifies how manufacturing, purchasing, marketing, and logistics collaborate to support the desired competitive strategy (Qi et al., 2011). The value chain framework emphasizes the interdependence of functional strategies, highlighting that each function plays a critical role in enabling the company to profitably meet customer needs (Chopra and Meindl, 2016).

For a company to succeed, its supply chain strategy must be aligned with its competitive strategy, a concept known as achieving strategic fit (Chopra and Meindl, 2016). Strategic fit ensures that the priorities set by the competitive strategy are supported by the supply chain capabilities developed through the supply chain strategy. This alignment is crucial when developing or refining a supply chain strategy or design. A company may fail if strategic fit is lacking, or if its supply chain design, processes and resources do not support the intended strategy. Without alignment, conflicts can arise either between different functional goals within the firm or across different stages of the supply chain (Chopra and Meindl, 2016). If a misalignment exists between supply chain capabilities and

customer needs, the company must either restructure the supply chain to better support the competitive strategy or adjust the competitive strategy to align with existing supply chain capabilities (Chopra and Meindl, 2016).

As a product progresses through its life cycle, both customer demand and supply dynamics change (Chopra and Meindl, 2016). In the introduction phase, demand is uncertain and limited to early adopters, while supply may be unreliable due to immature production technologies and supply chain processes. Over time, as the product matures, demand stabilizes, production becomes more efficient and the product may eventually become a commodity in a saturated market with predictable supply. To maintain strategic alignment, a company's supply chain strategy must adapt to these changing conditions. Early in the life cycle, when time-to-market is critical and profit margins are high, product availability is prioritized over cost efficiency. During this period, it is important for the supply chain to be responsive to meet fluctuating demand and uncertain supply. As the product matures, demand and supply become more predictable and price competition increases, making cost efficiency a key factor. Consequently, the supply chain must shift its focus from responsiveness to efficiency. This is illustrated in figure 3.3, highlighting how supply chain strategy should evolve in parallel with product maturity (Chopra and Meindl, 2016).

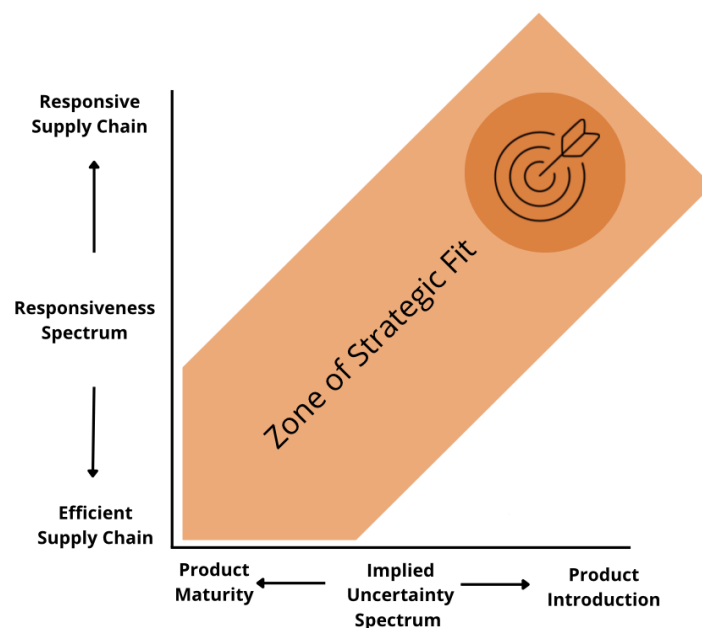


Figure 3.3. Supply chain strategy's evolution in parallel with product maturity.

Another key aspect related to strategic fit is its scope. The scope of strategic fit refers to the functions and stages within the supply chain that align their strategies toward a shared goal (Chopra and Meindl, 2016). With a narrow scope, individual functions tend to focus on optimizing their own performance, often resulting in misaligned actions that reduce overall supply chain value (Chopra and Meindl, 2016). For instance, inventory management might favor frequent small orders to reduce capital tied up in stock, while shipping aims for large batch orders to benefit from economies of scale. If one function optimizes without considering the broader supply chain, the result is suboptimization and reduced total supply chain performance. In contrast, when the scope is

broadened to include the entire supply chain, decisions are made based on their impact on total performance and thereby, enhancing overall supply chain profitability (Chopra and Meindl, 2016).

3.2.2 Forecasting

Forecasting is an important aid to effective and efficient planning. The concept of forecasting is about predicting the future as accurately as possible, given historical data and future information available. However, the difficulty of forecasting can differ depending on circumstance and planning horizon (i.e. one month, 6 months or 10 years) (Hyndman and Athanasopoulos, 2018).

Forecasting is a common task within a business and should be an integral part of the decision-making activities of management according to Hyndman and Athanasopoulos (2018). Forecasting can be used within several areas, sales forecasting being one of the main applications. Accurate sales forecasting has a crucial role in maintaining efficiency and competitiveness for a business. Underestimating demand can lead to lost sales, dissatisfied customers, and an advantage for competitors. On the other hand, overestimating demand can be costly, resulting in excessive inventory expenses, unnecessary production or storage capacity, forced price reductions, and missed opportunities to sell higher-margin products (Hillier and Lieberman, 2014).

3.2.3 Data management

Data management plays a central role in enabling coordination, visibility and control across the supply chain. It encompasses the processes of collecting, storing, processing and distributing data among various stakeholders, including suppliers, logistics providers and customers (Waller and Fawcett, 2013). The quality of supply chain data, measured in terms of accuracy, completeness, consistency and timeliness, is critical to effective planning and execution (Hazen et al., 2014).

Modern supply chains rely heavily on integrated information systems to support data-driven operations. Commonly used systems include ERP systems, Warehouse Management Systems and Transportation Management Systems, which enable the coordination of procurement, inventory and logistics operations. These systems facilitate shipment and inventory tracking by integrating data from multiple functions and locations (Christopher, 2016; Mangan et al., 2016).

While artificial intelligence, AI, is not typically responsible for tracking, it can contribute to analyzing the data generated by tracking technologies, such as barcodes and GPS-enabled devices. In that way, AI can support decision-making, identify patterns and flag exceptions in logistics flows (Min, 2010; Wamba and Akter, 2019). AI applications in supply chains are particularly valuable for forecasting demand, optimizing inventory levels and supporting predictive analytics (Min, 2010; Wamba and Akter, 2019).

Another key component of supply chain data management is the use of key performance indicators, KPIs, to monitor and evaluate supply chain performance. Common KPIs include delivery reliability, order cycle time, inventory turnover and logistics cost per unit (Gunasekaran et al., 2004). These metrics help companies assess operational efficiency, identify bottlenecks and support strategic improvements. The effectiveness of KPIs depends on the availability of accurate and timely data from operational systems (Yu et al., 2013).

3.2.4 Supply chain mapping

3.2.4.1 Definition and importance of mapping

As supply chains become more global and firms increasingly adopt outsourcing strategies, visualizing and managing supply chains has grown more complex. This complexity underscores the importance of presenting supply chain information in a clear, structured and easily shareable format for internal and external stakeholders (Gardner and Cooper, 2003).

A supply chain map visually represents the linkages and entities within a supply chain, along with information about its overall structure. The effectiveness of a supply chain map depends on its clarity, selectivity and ease of interpretation. While there is no universal standard for supply chain mapping, the maps commonly depict organizations, flows, facilities, and processes. They may also illustrate geographical relationships and include multiple businesses and supply chain processes (Gardner and Cooper, 2003).

A strategic supply chain map is distinguished by its alignment with corporate strategy, serving as a tool in the organization's strategic planning process to evaluate the supply chain structure. Strategic supply chain maps focus on the flow of goods, information and financial transactions across both upstream and downstream supply chain tiers. They often include KPIs such as volume, cost or lead time, providing a high level overview of processes. To maintain clarity, strategic supply chain maps may exclude non-critical entities, ensuring a more focused representation of essential supply chain components (Gardner and Cooper, 2003).

There are several strategic reasons for companies to develop supply chain maps. Firstly, such maps improve strategic planning by aligning corporate strategy with supply chain strategy. Additionally, they help identify potential bottlenecks and inefficiencies within the system, acting as a distributor of key information. For example, a map can quickly highlight critical suppliers and areas that require further investigation and monitoring. Mapping the supply chain can also facilitate supply chain redesign by revealing redundancies, overlaps and inefficiencies that may not be apparent when analyzing isolated segments. For example, visualizing multiple shipment routes may highlight excessive or inefficient transport flows (Gardner and Cooper, 2003).

Supply chain maps can also clarify channel dynamics by illustrating the relative importance of different supply chain members. This can be achieved by varying the size of symbols or the thickness of connecting lines to represent relative importance, power or strategic influence. Furthermore, the process of developing the map contributes to achieving a shared understanding among stakeholders, ensuring alignment on supply chain priorities (Gardner and Cooper, 2003).

Moreover, supply chain mapping improves communication across functions, processes and organizations, ensuring consistency in decision-making. It also serves as an educational tool for onboarding new employees or partners, allowing them to quickly understand their roles and contributions within the supply chain. Additionally, mapping supports monitoring of supply chain strategy by developing both a current-state and a proposed future-state map which enables firms to track their progress toward their goals. The data contained in these maps offer valuable insights for evaluating improvements at different transformation stages. Finally, a structured and standardized

supply chain mapping approach lays the foundation for continuous improvement, fostering long-term efficiency and adaptability (Gardner and Cooper, 2003).

3.2.4.2 Map conventions and attributes

Although there is no universal approach to supply chain mapping, there are standardized icons and symbols from academia, trade associations and other sources to use to ensure consistency and clarity. In order to make the supply chain map clear and understandable, conventions in supply chain mapping are very helpful. It could for example be how nodes and links are displayed depending on different characteristics. A link would be a movement, flow or a process and a node would be an organization, a value added process location or a strategic business unit, SBU. Furthermore, business processes linked between organizations can be color- or symbol-coded in order for the specific meaning of a link drawn in the supply chain map to be easily grasped. Mapping can be categorized based on three key attributes: geometry, perspective and implementation (Gardner and Cooper, 2003).

Geometry

Geometry defines the structural elements of a supply chain map, including the number of tiers, the degree of aggregation and spatial representation. The number of tiers represent sequential business units engaged in transactions leading to the final consumer, and can be described by direction and length. The direction can be categorized as supplier-oriented (upstream from the focal firm), customer-oriented (downstream toward the consumer), or industry-cyclical (both directions). The length is defined as the number of levels in each direction from the focal firm, not including the focal firm, and determines the complexity of the supply chain. For instance, a length of 3/2 signifies three tiers upstream and two tiers downstream from the focal firm. The degree of aggregation refers to the level of specificity within each tier and the geometric width of the supply chain map. A high degree of aggregation groups all organizations at a given tier into a single box, whereas a low degree of aggregation distinguishes specific organizations or categories at a given tier. For example, differentiating between broad firm categories while highlighting key players individually. For a strategic approach, the degree of aggregation should be quite high. The more generalized approach allows for viewing of many tiers in the supply chain in a meaningful way and understanding a broader perspective of the supply chain helps the firm be more competitive and innovative. The spatial attribute means if the map is geographically representative or not. Some supply chain maps depict the physical location of entities and transportation routes, while others focus solely on logical or process-based relationships (Gardner and Cooper, 2003).

Perspective

Perspective describes the viewpoint and scope of the supply chain map. The focal point can be firm-centric, focusing on a single company's perspective, or industry-centric, including a competitive set of firms. The scope determines the level of detail included, such as product breadth, supply chain perspective, process view depth and cycle view. Product breadth of maps may range from covering broad SBUs to detailed product- or component-level views. Supply chain perspective refers to if the map extends beyond logistics to include key business processes and underlie a broader view of supply chain management. Process view depth defines the number of key business processes that are represented in the map. Moreover, supply chain maps could either depict flows of

physical goods or be cyclic. A flow map follows raw materials to final consumers while a cyclic map includes returns, recycling and other feedback loops (Gardner and Cooper, 2003).

Type of implementation

The type of implementation indicates how the supply chain map will provide information and be distributed, covering aspects such as information density, database integration and delivery mode. Information density is the extent of information incorporated in the visual map. A strategic supply chain map typically highlights essential information, while an operational map may include more granular data. A map can also be integrated with corporate or supply chain databases, allowing for automated updates and real-time visualization adjustments. The delivery mode defines how the map is made available to the users and can be via web, paper or electronic. Paper is traditional, widely accepted and not platform dependent, but difficult and expensive to update and distribute. Electronic delivery mode, ranging from emailed files to interactive software, is more flexible and cost-effective for updates. Web-based platforms offer dynamic, real-time updates and enhanced user customization but may present security concerns (Gardner and Cooper, 2003).

3.2.4.3 Risks of mapping

Despite all the benefits of mapping an organization's supply chain, there are potential risks to consider. One key concern is the risk of revealing competitive information through supply chain maps. Companies must therefore be careful to ensure that they do not provide more data than necessary to channel partners or stakeholders. Critical information, such as component pricing or sensitive supplier relationships, should also be carefully controlled to prevent competitive disadvantages or channel conflicts (Gardner and Cooper, 2003).

Another risk is to include excessive detail in supply chain maps, contradicting the strategic purpose of the map. A strategic supply chain map should not extend to operational details as this can lead to unnecessary complexity. Instead, organizations should continually manage the level of detail to prevent data overload (Gardner and Cooper, 2003).

Additionally, supply chain mapping should be closely linked to strategic decision-making. Thus, an ineffective scope or lack of clear objectives can undermine the value of supply chain mapping. To maximize effectiveness, firms must define the map's scope, determine relevant variables and ensure alignment with strategic objectives. Organizations can either integrate mapping into the strategic planning process or conduct it separately (Gardner and Cooper, 2003).

3.2.5 Inbound logistics

The inbound logistics flows begin at the source of the material and end at the entrance of the factory (Takita and Leite, 2017). Processes within inbound logistics need to be efficient, but at the same time allow for flexibility and responsiveness to be able to adjust for disruptions in the supply chain. This is important for securing a steady and reliable supply for manufacturing and sales processes (Minner, 2019).

3.2.5.1 Sourcing

Sourcing strategies in supply chain management play a critical role in determining cost efficiency, flexibility and responsiveness. Sourcing decisions are influenced by various trade-offs, including

the choice between global and local sourcing, dual and single sourcing, outsourcing and in-house production as well as different cost structure considerations. These decisions are associated with strategic sourcing, and have a direct impact on the efficiency and structure of inbound logistics. Thus, understanding the trade-offs involved is crucial, given their significant impact on inbound logistics costs.

Contracting

Sourcing decisions are typically arranged with suppliers through supplier contracts along with payment terms. The contracts define the formal relationship between buyer and supplier, typically outlining responsibilities, delivery conditions and quality requirements (Chopra and Meindl, 2016). Incoterms, which stands for International Commercial Terms, are included in supplier contracts. These standardized terms define the responsibilities of the buyer and supplier in international trade, including who is accountable for organizing transportation and the point at which the risk of loss or damage transfers from seller to buyer. Incoterms also clarify which party is responsible for paying taxes, insurance, and duties. There are several types of Incoterms, with Ex Works, EXW and Delivered Duty Paid, DDP, representing two extremes. Under EXW, the buyer assumes full responsibility for the goods immediately upon collection from the supplier's premises, whereas under DDP, the supplier is responsible until the goods are delivered to the buyer (Heeswijk et al., 2019). In such cases, a single party may control the entire supply chain, which can offer benefits such as improved visibility and consistent security across the logistics process. For instance, the entire service can be managed as an integrated package by one provider, minimizing handovers and reducing the risk of custody issues. Ultimately, the choice of incoterms should align with the specific characteristics and requirements of the supply chain, as different terms are suited to different operational scenarios (Veenstra, 2019). Payment terms specify the timing and method of financial transactions between the parties, such as advance payment or payment within a set number of days after delivery (Novack et al., 2024).

Global versus local sourcing

Local sourcing refers to the procurement of goods or services from suppliers located geographically close to the production site or end customer. This approach can offer benefits such as reduced transportation costs, shorter lead times and increased responsiveness to demand fluctuations (Chopra and Meindl, 2016). Furthermore, local sourcing can simplify coordination of the supply chain and increase supply chain visibility (Adobor and McMullen, 2018). However, only using local suppliers may limit access to specialized resources or cost advantages that exist in other regions (Novack et al., 2024). Instead, global sourcing involves buying materials or services from international suppliers (Rodrigue, 2006). This strategy can allow the focal firm to access capacity or specialized capabilities that are not available locally as well as optimize procurement costs and choose the supplier in the world with the lowest component costs (Chopra and Meindl, 2016; Rodrigue, 2006). However, global sourcing also results in increased supply chain complexity, such as the need to manage longer lead times, fluctuating exchange rates, trade barriers and geopolitical risks (Grainger, 2011; Shih, 2020). Additionally, global supply chains are more exposed to disruptions such as pandemics or port congestion, which can impact delivery reliability and inventory planning (Shih, 2020).

Component price versus transport cost

Sourcing decisions are often guided by the trade-off between the unit price of goods and the associated transportation and handling costs (Novack et al., 2024). Although suppliers located further from the production site may offer lower unit prices, these potential savings can be outweighed by increased transportation expenses, longer lead times and higher inventory holding costs (Chopra and Meindl, 2016). In this context, total landed cost, which includes the purchase price along with all related logistics costs, serves as a more comprehensive metric for sourcing evaluation (Novack et al., 2024). A narrow focus on minimizing unit cost may lead to suboptimization if transportation costs and delivery performance are not considered (Chopra and Meindl, 2016).

Dual versus single sourcing

Single sourcing refers to relying on only one supplier for a specific material or service (Chopra and Meindl, 2016). This can be beneficial for volume discounts, closer supplier relationships and simplified logistics and quality control (Chopra and Meindl, 2016). However, it also increases dependency on a single supplier, making the buying firm more vulnerable to supply disruptions, price changes, or quality issues (Adobor and McMullen, 2018). In contrast, dual sourcing involves using two suppliers for the same component, potentially splitting volumes between them (Novack et al., 2024). This strategy can increase supply security and flexibility by providing a backup source in case of disruption while increasing competitiveness between suppliers (Novack et al., 2024). However, dual sourcing may lead to challenges regarding coordination and administration and reduced bargaining power due to lower order volumes per supplier (Chopra and Meindl, 2016). Thus, firms must carefully weigh the benefits of risk mitigation and building a resilient supply chain against the operational and financial costs of managing multiple supplier relationships (Chopra and Meindl, 2016).

Outsourcing versus in-house production

Another sourcing decision concerns whether to produce goods internally, i.e. in-house production, or to outsource them to external providers (Chopra and Meindl, 2016). Outsourcing is often used to leverage external expertise, reduce fixed capital investment and increase organizational flexibility (Feldmann and Olhager, 2019). However, outsourcing can lead to challenges such as loss of control over quality, increased dependency on suppliers and coordination difficulties (Chopra and Meindl, 2016). In contrast, in-house production offers greater control over operations, quality assurance and intellectual property protection (Feldmann et al., 2013). It may also facilitate integration with other business functions and improve responsiveness (Feldmann et al., 2013). Yet, in-house production requires significant investments of resources and may limit flexibility in adjusting to changing market conditions (Novack et al., 2024). These make-or-buy decisions are influenced by strategic, operational and cost considerations and are particularly relevant in industries facing frequent technological or demand changes (Chopra and Meindl, 2016; Novack et al., 2024).

3.2.5.2 Transport modes

A vital decision within inbound logistics is the choice of transport mode. In theory, there are four types of modes that are used within a typical supply chain, including sea, rail, road and air. Different modal choices are preferred depending on several aspects, which need to be analysed and prioritized to reach the most fitting alternative. Aspects that can be looked into include the value of

the goods being transported, the amount of tied up capital during transport, the delivery speed, the shipment size, and the cost per transport (Olhager, 2019). Figure 3.3 showcases each transport mode and where on the spectrum each is regarding each characteristic.

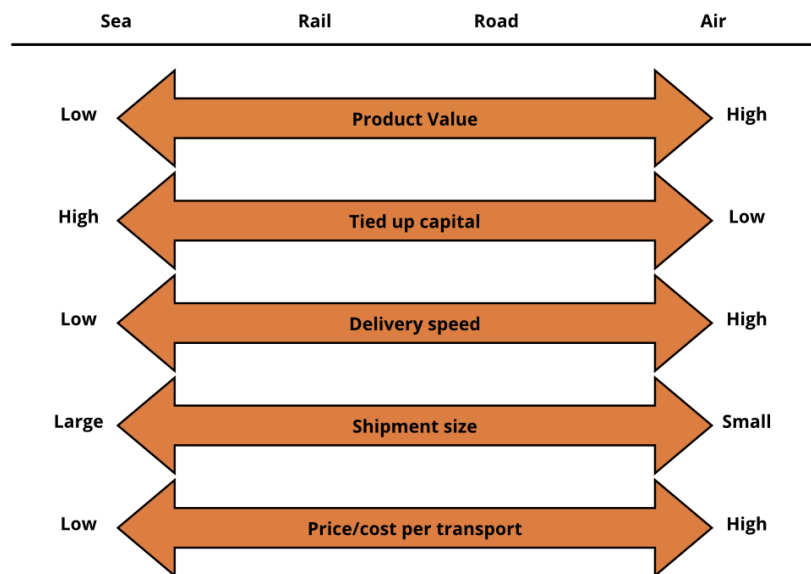


Figure 3.4. Key dimensions regarding transport choice (Own illustration based on Olhager, 2019).

Sea transport

One key mode of transport is sea freight, which plays a vital role in global trade. A fundamental element of this mode is the shipping container, designed to move goods efficiently across the world at minimal cost and complexity. Containers streamline logistics by eliminating the need for piece-by-piece handling in ports, significantly reducing handling costs. They also enhance efficiency by enabling faster loading and unloading, minimizing storage time, and accelerating the overall transportation process (Levinson, 2006). As shown in figure 3.3 above, sea freight is positioned on the left side, aligning with low product value, making it ideal for bulk goods and commodities with lower monetary worth, but also resulting in high tied-up capital, as longer transit times mean capital is tied up in inventory for extended periods. It is also associated with low delivery speed, since compared to other transport modes, sea freight has the longest transit times, and large shipment sizes, as ships can carry massive volumes. Lastly, sea freight is associated with low price or cost per transport, because it offers the lowest transportation cost per unit, making it cost-effective for large shipments. Different types of vessels are used in sea transport, varying in size and capacity. Some ships carry only a small number of containers, while others can transport a large quantity at once. The choice of vessel depends on factors such as cargo volume, shipping route, and port facilities (Rodrigue, 2024).

Road transport

Another key mode of transport is road freight, which is used for various goods transport. The advantages of this approach are numerous. It is ideal for small-scale shipments, allowing for efficient handling of orders without the need for large volumes of goods. The system can be easily adapted to meet the specific needs of individual customers, providing a more personalized service. The flexibility and adaptability of this system ensure that it can quickly adjust to changing requirements, such as re-routing or accommodating different delivery schedules. Additionally,

capacity can be increased by attaching additional loads or vehicles, optimizing the overall efficiency of the operation (Lumsden, 2007; Coyle et al., 2019).

Rail transport

Thirdly, rail transport is a common transport mode that may not compete directly in terms of cost or speed compared to other modes, but it provides a valuable balance between the two. Trains are often used to transport high-volume, low-value goods such as ore, steel, and coal over long distances, and they are frequently preferred for their environmental benefits (Lumsden, 2007). Different types of rail freight services cater to varying needs. Single-wagon load goods involve booking an entire wagon or parts of it for a specific shipper. Unit loads refer to the transportation of containers, swap bodies, or other large cargo units. Complete or full trains operate from one shipper to one receiver and are often integrated into production processes in industries such as automotive, paper, and mining, ensuring maximum capacity utilization and high fill rates. Block trains, on the other hand, allocate a specific number of wagons to serve industrial clients efficiently, optimizing the transportation process for large-scale shipments (Lumsden, 2007; Coyle et al., 2019).

Air transport

Lastly, goods can be transported by air freight. This is depicted to the far right in figure 3.3, showcasing low tied up capital because of the high delivery speed, and fitting for small shipment sizes as capacity of flights are usually limited. It also has a high price or cost per transport and is thus the most expensive transport mode in general. Air freight is transported using either passenger planes or specialized cargo aircraft, such as those operated by DHL and FedEx. It often requires special load carriers and involves high handling costs due to the need for reloading, particularly when using air freight containers. While strict security procedures at airports ensure safety, they can also slow down cargo handling, sometimes offsetting the speed advantages typically associated with air transport (Lumsden, 2007). Air freight is commonly used for transporting perishable goods such as flowers, fruits, and vegetables, which quickly lose value if not delivered promptly. It is also ideal for goods with news or time-sensitive value, like newspapers, that must reach their destination quickly. Express delivery services cater to items requiring fast transport to minimize idle capacity costs, such as spare parts. Additionally, high-value, high-capital-cost goods benefit from airfreight, as the transport cost is relatively small compared to the total product value. This mode of transport also reduces the risk of theft and product loss, making it a preferred choice for items like medicine (Lumsden, 2007; Coyle et al., 2019).

3.2.5.3 Transportation unit and order size

Aside from the selection of modes, it must be determined which transportation units and loading units to use. Transportation units can be defined as standardized structures or devices used for storing and moving goods efficiently. Containers are an example of a common transportation unit, which can be used across different modes of transport, such as ships, trains, and trucks. Their dimensions are commonly measured in twenty-foot equivalent units, TEUs, with one TEU equating to a volume of 38.5 m³, while standard containers typically measure 2 TEU. Their uniform structure simplifies handling, allowing quick loading and unloading with cranes. Additionally, their ability to be stacked optimizes space utilization on cargo vessels, making them essential for secure and organized global trade (Zijm et al., 2019).

Transportation units can be distinguished from smaller loading units, which handle goods in the form of boxes, crates, rees, barrels or bags, making them easier to handle. The most common form of loading unit are pallets, which allow for bundling of individual items and can be easily handled using devices such as forklift trucks, due to their standardized size (Zijm et al., 2019).

An important trade-off within transportation is the size of an order and inventory costs. For example, road deliveries are often distinguished between full truckload, FTL, and less-than-truckload, LTL. When deciding between these two, the transportation frequency is of importance, as more frequent deliveries require less inventory, and thus less inventory holding costs, but may not lead to FTLs. On the other hand, less frequent deliveries may lead to fully loaded trucks, and thus, fully utilize the capacity of the transportation mode. Such frequencies will however increase inventory costs, but is often solved through consolidation of LTL deliveries from multiple suppliers, thereby reducing overall inventory costs (Minner, 2019). A similar trade-off applies in containerized transport, where the terms less-than-container-load, LCL, and full-container-load, FCL, are used to describe whether or not the container is fully utilized (Maersk, 2023).

3.2.5.4 Intermodal transport

Within intermodal transport, having a standardized transportation unit is of great importance. Lumsden (2007) defines intermodal transport, also called combined transport, as the transfer of load carrier units from one mode to another during the journey between a sender and a receiver of the goods. This could, for example, involve transporting goods by sea, which are then unloaded from the ship and reloaded onto a truck or train for further delivery. This process relies on the unit load principle, which means transporting goods in standardized load units, such as containers, for as much of the journey as possible. Doing so helps to minimize handling costs and reduce transport time. For this system to function efficiently, transport modes must be compatible with these load units, and terminals must be equipped with the necessary handling infrastructure, such as gantry cranes, to facilitate quick and seamless transfers between modes (Lumsden, 2007).

3.2.5.5 Logistics structure

In transportation, deliveries can either go directly from a supplier to the consumption point or pass through a consolidation hub, where goods are stored, reorganized, and then forwarded. Direct delivery offers simpler coordination and reduces inventory for the buyer but may lead to underutilized transportation capacity if shipment volumes are too low for full truckloads. To optimize load efficiency, consolidation hubs can be used to combine smaller shipments into larger, more efficient loads. While this approach increases coordination and handling costs, it must be evaluated alongside transportation capacity utilization and overall logistics costs to determine the most suitable network for a given supply chain. A common approach is a hybrid system, in which suppliers with large shipment volumes that can fill full containers will be delivered directly to the destination, while smaller shipments will be consolidated and shipped jointly to the buyer (Heeswijk et al., 2019).

Warehouses are used to facilitate the movement of goods from supplier to end customer and can for example act like a consolidation centre. Roles of warehouses may differ, but are often related to the

speed of movement and inventory holding. Other than acting like a consolidation hub, they can function as cross-dock centres, where goods are transferred directly from the incoming vehicle to the outgoing one without being stored. Sortation centres are similar to cross-dock centres but also involve sorting goods for delivery to specific regions or customers upon arrival (Rushton et al., 2014).

3.2.5.6 Logistics service providers

Transport services are commonly outsourced through a 3PL provider that manages logistics operations to enhance efficiency and service quality (Selviaridis et al., 2008; McIvor, 2008). By entrusting logistics activities to these experts, businesses can achieve cost-effective solutions while improving productivity and overall supply chain performance (Selviaridis et al., 2008).

The main activities of 3PL providers typically include transportation, warehousing, freight forwarding, and, to a lesser extent, value-added services. Transportation services may involve shipment consolidation, carrier selection and evaluation, fleet management, returns handling (reverse logistics), and track-and-trace capabilities. Warehousing services often cover inventory management, cross-docking, order processing, and activities like relabelling or repackaging. Freight forwarding includes tasks such as customs brokerage, freight bill auditing, payment processing, and rate negotiation. Such parties are often called freight forwarders. In practice, the majority of outsourced logistics services focus on transport, warehousing, and administrative activities such as customs handling and freight forwarding. Meanwhile, the outsourcing of value-added services, such as procurement, manufacturing support, supplier management, product testing, or logistics information systems, remains relatively limited (Capgemini Consulting et al., 2016). This is often due to the perception that such services are either too strategically important to outsource or that 3PL providers lack the necessary expertise to deliver them effectively (Selviaridis and Spring, 2007).

Logistics service providers can be classified as either asset-oriented or activity-based, each with further subcategories. Asset-oriented providers are divided into asset-based and non-asset-based providers. Asset-based providers own the physical resources necessary to perform logistics services, such as vehicle fleets, terminals, handling equipment, and labor force. Such companies are often called second-party logistics providers, or 2PLs, defined as the actual carrier such as a shipping line or an airline. In contrast, non-asset-based providers do not own such infrastructure. Instead, they contract with carriers and distribution centers to secure capacity. These providers primarily offer management-oriented, brokerage, or information-based services (Coyle et al., 2017).

On the other hand, activity-based classifications focus on the specific services offered and can be divided into six categories (Coyle et al., 2017). Transport-based providers specialize in freight movement through one or more modes of transport and typically originate from traditional transportation companies. Such providers are typically shipping lines or airlines, who can partner with other 3PLs for the coordination of the border logistics operations. Distribution-based providers focus on warehousing and inventory management, often emerging from public or contract warehousing services. Forwarder-based providers, commonly known as freight forwarders, act as intermediaries in the logistics chain without owning any physical transportation assets. Instead, they coordinate the movement of goods on behalf of clients by liaising with multiple carriers. In addition

to managing international transportation, these providers often offer customs clearance services, a function referred to as customs brokerage. This service includes the preparation and submission of required documentation for imports and exports, representation of clients during customs inspections and assessments, facilitation of duty payments, and the organization of cargo release and final delivery after clearance is granted. Providers that focus specifically on customs clearance as a service are often called clearing agents (Elavarasi et al., 2023). Financial-based providers handle the monetary aspects of logistics, such as freight payment, rating, and accounting services. Information-based providers leverage IT systems and digital tools to offer solutions like cargo planning, routing, and transport or warehouse management systems. Consulting-based providers deliver strategic guidance and supply chain management expertise tailored to customer needs (Coyle et al., 2017).

Competitive tendering or bidding is an established method for selecting logistics service providers and involves inviting bids from service providers, taking advantage of the arising competition to secure the best contractual terms. Typically, the bids of the service providers are assessed based on predefined project requirements and evaluation criteria, and the service provider with the most favorable conditions is chosen. The method is beneficial in terms of cost-efficiency, as it encourages service providers to provide competitive pricing, which in turn can result in cost savings for the company in need of the service. However, it is argued that the focus on cost may jeopardize quality, as service providers may reduce standards in order to cut costs and be able to submit the lowest bid. Furthermore, the method for competitive tendering can be time-consuming and requires resources from both the bidding and the receiving company to fulfil the process (Issah and Dadzie, 2024).

3.3 Cost analysis

3.3.1 Logistics cost analysis

Logistics costs typically encompass several key components, including transportation, warehousing, order processing and customer service, administration, and inventory holding costs (Lambert et al., 1998). Given the complexity of supply chains, particularly in global markets, logistics expenses often account for a significant share of total supply chain costs. Research has indicated that these costs can range from 4% to over 30% of sales (Ballou, 1999). With an increasing number of companies outsourcing their products and services to international suppliers, it is essential to analyze and manage logistics cost components effectively to maintain profitability. Despite the importance of accurately assessing total logistics costs in global supply chains, existing methodologies remain limited. This is largely due to the intricate nature of global logistics systems and the wide range of cost factors that must be considered (Zeng and Rossetti, 2003).

To investigate further on this matter, Zeng and Rossetti (2003) have conducted a case study at a leading firm in the US aviation industry and its part supplier in Chengdu in China. Their work consisted of developing a framework for evaluating the logistics costs in global sourcing processes. To create this framework, one first important step was to classify the costs into categories based on the data gathered in the study. They chose to classify the logistics costs into six categories: transportation, inventory holding, administration, customs charges, risk and damage, and handling and packaging. Each cost category is then composed by a number of cost elements, specifying the costs involved even further. For example, transportation as a cost category contains freight charge, consolidation of goods, transfer, and pickup and delivery. These logistics costs categories are then

used as the basis for evaluation of the case company's supply chain and its associated costs (Zeng and Rosetti, 2003). Bokor (2010) also highlights identifying cost drivers, meaning factors that influence cost fluctuations within an organization, as essential for understanding and managing logistics costs in transport and supply chain operations. Moreover, Zeng and Rossetti (2003) mention the importance of understanding the percentages of logistics costs relative to the total costs, of which their developed method can aid in.

3.3.2 Cost types within inbound logistics

3.3.2.1 Customs clearance

Customs clearance is the formal process by which government authorities grant permission for goods to cross international borders, either through import or export. This process includes submitting the required documentation, paying relevant taxes and duties, and complying with the legal regulations of the destination or origin country (Elavarasi et al., 2023). The necessary documents vary depending on the situation, but can entail bills of lading, BOL, packing lists, or certificates of origin (Oni, 2023). Customs clearance is essential for maintaining national security, ensuring regulatory compliance and preventing the movement of restricted or prohibited items. Given the complexity and variability of regulations across countries, customs clearance can be a time-consuming and complicated task. As a result, businesses often rely on clearing agent or freight forwarders, specialists who navigate the procedural and legal requirements on their behalf (Elavarasi et al., 2023).

In the context of global inbound logistics, the efficiency of trade logistics, particularly customs clearance processes, plays a critical role. Complex, expensive, and bureaucratic procedures for moving goods across borders can significantly increase operational costs. These challenges are often exacerbated in countries with weak institutional oversight, where exporters may face issues such as bribery demands from customs officials (Gani, 2016). Corruption in these settings is commonly driven by inefficiencies in border control systems, which can prompt firms to seek faster alternatives through unofficial payments (Gani, 2016). Supporting this, Shepherd (2009) describes that when formal processes are slow or unreliable, businesses are more likely to resort to "speed money" to avoid delays and maintain workflow efficiency. In addition, a 2013 WTO report, *Aid for Trade and Value Chains in Transport and Logistics*, notes that transport and logistics providers are particularly vulnerable to so-called "hold-up" situations, instances where corrupt police, customs agents, or other authorities intentionally delay shipments to seek bribes. Such delays can be extremely costly, especially in time-sensitive supply chains, making firms more likely to comply with these corrupt demands to avoid financial loss (Shepherd, 2013).

A company operating a global supply chain may also be exposed to paying taxes and duties on all border crossing flows of goods. Such supply chains often involve suppliers, manufacturers, logistics hubs, and end-customers located in different countries. As goods move across multiple borders, often in the form of raw materials, components, and finished products, companies risk incurring cumulative taxes and duties at each stage. A key example is VAT, typically ranging from 15% to 25%, which can be charged multiple times throughout the supply chain. When products repeatedly cross borders during production and distribution, these VAT charges can significantly increase the overall cost of the final good (Veenstra, 2019).

3.3.2.2 Administration

Administrative costs within inbound logistics refer to the expenses associated with managing, coordinating and documenting the flow of goods. These costs include the preparation and handling of transport-related documents such as the BOL for sea freight and the air waybill, AWB, for air freight, which serve as legal evidence of shipping agreements and are required for customs clearance, insurance claims and cargo release (Rushton et al., 2014; Ballou, 1999). These documents must be carefully completed and distributed to relevant actors, including carriers, freight forwarders and customs authorities, often under time constraints (Rushton et al., 2014).

Administrative costs are also affected by the type of shipment arrangement. In a Through Bill of Lading, TBL, shipment, a single transport document covers the entire movement of goods from the origin to the final destination, even if multiple carriers or transport modes are involved (SCM EDU, 2023). This reduces administrative complexity as only one document and one point of coordination are required. In contrast, non-TBL shipments require separate documentation and handovers for each part of the journey, increasing the number of administrative tasks and the risk of coordination errors (Kenya Ships Agents Association, 2018). The type of shipment arrangements also differ in terms of container return processes. For TBL shipments, the empty container is typically returned to an inland container depot, ICD, near the final destination, which simplifies coordination and reduces domestic transport requirements. Non-TBL shipments, however, often require the empty container to be returned to the port of discharge, increasing the complexity of return logistics and the associated administrative coordination (Kenya Ships Agents Association, 2018).

Further administrative tasks include generating commercial invoices, packing lists and certificates of origin to accompany international shipments to comply with trade regulations and customs clearance (Mangan et al., 2016; Christopher, 2016). The accuracy and time of these documents are critical to avoid customs delays and penalties that increase overall logistics costs. Additionally, bank transactions related to international trade, such as letters of credit or advance payments, contribute to administrative overhead due to processing time, transaction fees and coordination with financial institutions (Monczka et al., 2020).

Another significant administrative task involves the coordination of procurement processes. This includes supplier communication, issuing requests for quotations and maintaining supplier databases. The administrative effort needed to manage supplier relations tends to rise with the number and geographical spread of suppliers (Monczka et al., 2020). As highlighted by Waters (2007), extensive administrative processes are often necessary to ensure that supplier capabilities align with required specifications, timelines and compliance regulations.

These administrative functions are often supported by logistics information systems, but still require significant manual input, especially in environments with limited digital integration (Christopher, 2016). Logistics information systems enable tracking and visibility of shipments, stakeholder communication and performance monitoring (Mangan et al., 2016). Investment in digital solutions represents a recurring administrative cost but is often necessary to coordinate global inbound logistics effectively (Langley et al., 2009).

Collectively, these tasks demand time, labor and system support, making administration a significant cost component in global logistics operations (Ballou, 1999).

3.3.2.3 Storage and handling

Storage and handling costs may occur at several points in a supply chain. Handling costs encompass the expenses associated with the physical movement and processing of goods, such as the loading and unloading of goods from the transport mode in use (Windmark and Andersson, 2016). Storage costs, on the other hand, entail costs associated with storing the goods throughout the supply chain (Rushton et al., 2014). Storage and handling costs often incur at warehouses. Rushton et al. (2014) note that warehousing typically accounts for 20-30% of total logistics costs, illustrating the significant financial impact of efficient handling and storage operations. The costs included in warehousing can vary depending on the role of the warehouse, but typical costs derived from past studies of warehousing operations include staffing costs, costs associated with the building such as rent or depreciation, building services such as heat and power, equipment costs, as well as costs for information technology systems (Rushton et al., 2014).

If a company's supply chain strategy involves consolidating shipments to maximize container or truck usage, there may incur additional handling and storage costs. For instance, when a shipment needs to wait at a consolidation point for other goods to arrive before forming a full load, storage fees may apply during this waiting period. Additionally, there can be costs associated with processing orders, particularly when combining multiple inventory items into a single shipment (Buffa, 1986).

In addition, Rushton et al. (2014) describes that there are often handling and storage costs associated with port terminals for sea freight. The charges incurred by terminal handling varies from port to port and depends on the type of cargo that is handled. It is common for ports to offer free periods of storage before the goods are loaded onto a ship or after unloading the goods from the vessel. However, if this period is exceeded, charges called demurrage or detention are added as a storage cost. When goods are transferred directly between a ship and a truck, or vice versa, it is known as direct delivery. Ports often offer discounted rates for this method, as it helps speed up vessel turnaround times. However, it requires careful coordination to ensure a steady flow of trucks is available throughout the process, so loading or unloading can continue without interruption until the ship is fully handled. Moreover, if the cargo requires special handling, such as operating cranes or lashing, there are separate tariffs for such services of which the buyer will be charged (Rushton et al., 2014).

3.3.2.4 Transportation

One main type of cost incurred within inbound logistics is transportation costs, which can be divided into fixed, variable and common overhead costs. Fixed costs of transport are expenses that remain constant regardless of shipment size, weight, or distance. Fixed costs include investments in vehicles, handling equipment, and information systems required for transport operations. Variable costs, on the other hand, fluctuate based on transport operations, such as cost per kilometer or cost per ton. Examples include fuel expenses, maintenance, and labor costs, particularly wages for drivers who play a crucial role in transportation efficiency. Lastly, common overhead costs are shared expenses that are distributed among all or selected shippers based on activity levels, such as

the number of shipments. Examples include terminal costs, management expenses, and administrative overhead related to coordinating transportation activities (Bowersox et al., 2010).

Factors that influence both fixed and variable costs of transportation can be identified as transport cost drivers. These include economies of scale, meaning that as shipment size increases, the cost per unit of weight decreases. Fixed costs such as loading and unloading, and invoicing, are then also spread over a larger volume of goods. Similarly, economies of distance entails that the variable and fixed costs are reduced as distance increases. Additionally, the efficiency of stowability within a transport carrier significantly impacts costs. When cargo is packed optimally, with minimal wasted space, the cost per weight unit decreases. Poor stowability leads to inefficient use of space, increasing overall transportation expenses. Moreover, transporting high-value or fragile goods comes with increased financial risks, making liability and risk of product damage a key cost driver. Insurance costs, special packaging, and extra handling precautions add to transport expenses. The more sensitive the cargo, the higher the costs associated with ensuring its safe delivery. Finally, when a vehicle returns from its destination to the point of origin without a full load, back-hauling movements create inefficiencies and higher costs (Bowersox et al., 2010).

3.4 Theoretical framework

The theoretical background presents information from three main areas, which together provide a basis for understanding how Roam can improve its inbound logistics by applying the theory on the empirical information gathered in the following section. The fields touched upon in the theoretical background combine supply chain management and inbound logistics, along with cost analysis, embedded in the context of the Kenyan EV market. These areas outline the theoretical framework, presented in figure 3.5 below, where the intersection between the three fields presents the area of analysis for this thesis.

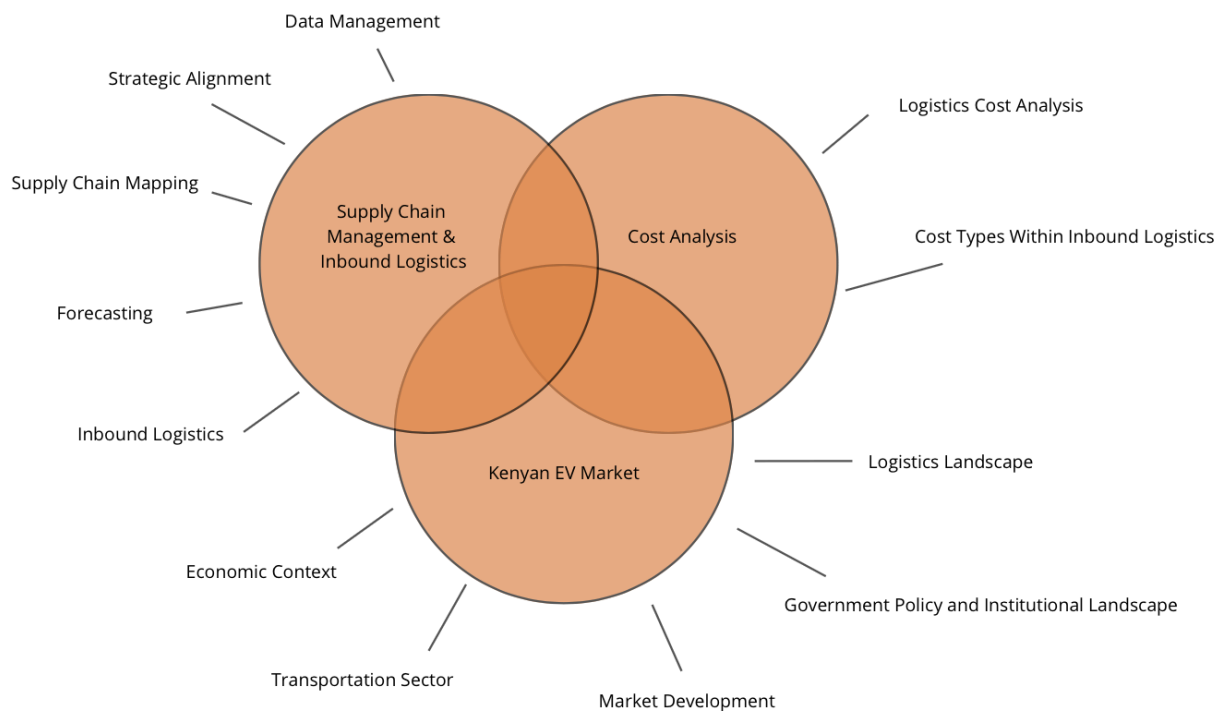


Figure 3.5. Visualization of the theoretical framework with the main areas together with the sub-parts of each section.

The theoretical chapters begin with an overview of the Kenyan EV market, outlining the context in which Roam operates. This section explores economic, logistical, institutional, and infrastructural aspects to provide a comprehensive understanding of the environment surrounding Roam. These subjects are examined with the aim to later be able to assess how the local market dynamics may influence Roam's supply chain operations and strategy. Following this, the section on supply chain management and inbound logistics introduces the importance of aligning supply chain strategy with the company's broader competitive objectives. Inbound logistics is also explored as a key component, alongside related concepts such as forecasting and supply chain mapping. These topics are described to enable better understanding of Roam's inbound material flows and how these can be visualized and analyzed. The final part of the theoretical framework focuses on cost analysis within logistics. This includes an overview of relevant cost analysis methods and a breakdown of different cost types found within inbound logistics. Together, these insights provide a foundation for identifying and evaluating cost drivers in Roam's inbound logistics operations.

4. Empirics

The following chapter provides the empirical data and information that has been collected in order to answer the research questions and their objectives or propositions. Firstly, Roam's business model and strategy in a Kenyan context is described, insights gathered from employees at Roam. Additionally, the supply chain strategy at Roam is presented in order to give a holistic understanding to the operations and configuration of the inbound logistics flow. Next, the empirical data associated with the elements of inbound logistics is presented, followed by a section covering the cost data that has been collected through available documents at Roam.

4.1 Roam's strategy within the Kenyan context

Roam's strategies and business model within the Kenyan context are explored to facilitate the analysis of strategic alignment between the competitive and supply chain strategy, as well as to evaluate the performance of the inbound logistics, identifying potential improvements in relation to company objectives.

4.1.1 Business model and competitive strategy

To provide context for Roam's inbound logistics and to clarify the company's goals, Roam's business model and strategy are examined within the Kenyan context. The idea behind Roam emerged from a recognized gap in the East African transport market. In recent years, fuel prices have risen significantly in Kenya and the broader East African region, while domestic electricity production in Kenya is at its peak with 92% generated from renewable sources and 20% of the electricity lost during night. The CPO and the other founders of Roam recognized this gap as an opportunity to implement electric vehicles (Co-founder & Chief Product Officer at Roam, 2025).

The CPO (2025) recognizes that one of the main barriers to EV adoption lies in the cost structure. Electric vehicles typically require a higher upfront investment compared to ICE vehicles. Unlike ICE vehicles where fuel is paid for during usage and spread out over time, EVs require a large initial investment for battery cells. This cost structure is particularly challenging in low-income markets. However, an interesting financial dynamic exists in East Africa and the broader Sub-Saharan region where vehicles are financed through lease-to-own models. Approximately 90% of motorcycles are financed with a typical structure that includes an upfront payment of approximately 255 USD, followed by daily payments of 3.6 USD over a period of 18 months. This system is well-suited to the economy of many users and has enabled wide adoption of motorcycles across different income segments (Co-founder & Chief of Product at Roam, 2025).

According to the CPO (2025), Roam's electric motorcycle model aligns with this financing culture by offering a product that lowers the user's daily cost by approximately 35% compared to conventional ICE motorcycles. Roam sells to financial institutions which in turn lease the motorcycles to individual drivers through financing models. The cost savings are realized immediately in contrast with buying electric cars in Sweden, where the return on investment may take up to 1.5 years according to the CPO (2025). The combination of high fuel prices and the available financing structure has allowed Roam to develop a feasible business model for e-mobility adjusted to the East African context. It supports Roam's ambition to lead the transition to electric transport in East Africa (Co-founder & Chief of Product at Roam, 2025). Yet, there is a difficult

balance to reduce the prices further. Initially, Roam priced its electric motorcycle, Roam Air, at 2000 USD, capturing early adopters. Currently, the price is reduced to 1850 USD (including the battery), but the aim is to decrease the price to 1500 USD which would place it only 50 USD above the cost of an equivalent ICE motorcycle. Achieving this price point is seen as a critical milestone, with the potential to unlock a significantly larger market (Co-founder & Chief of Product at Roam, 2025). The Roam Air is shown in figure 4.1, illustrating the design of the bike.



Figure 4.1. Roam Air, the electric motorcycle (Roam Electric, 2025b).

The CPO (2025) describes that the ICE motorcycle market in Kenya is typically divided into three segments: low-end models purchased with cash, mid-range models that are often financed and have a lifespan of 2-5 years and high-end models that are also purchased in cash. Roam targets the financed mid-range segment by offering a quality product that is durable enough to last the full financing period. Product reliability is crucial in this segment, as a breakdown during the repayment period could prevent the user repaying the loan. Thus, Roam seeks to balance affordability with sufficient quality to ensure long-term usability under everyday conditions (Co-founder & Chief of Product at Roam, 2025).

According to the CPO (2025), Roam currently holds a strong position in the Kenyan EV market, with an estimated 30-40% market share. The company competes primarily with a small number of other electric motorcycle providers, such as Spiro, ARC Ride, Ampersand, and indirectly the electric bicycle provider eBee (Supplier Development Lead at Roam, 2025). Most of the competitors operate on a battery-swapping model. In contrast, Roam believes in customer battery ownership and home-charging (Co-founder & Chief of Product at Roam, 2025). The Supplier Development Lead (2025) highlights that this strategy, combined with Roam's full ownership of their motorcycle and component design, give them a clear competitive advantage in terms of flexibility and in-house innovation. Roam's entire research and design process is internal, allowing them to iterate on design changes and solve technical issues without relying on communication with international suppliers. This contrasts with competitors who often depend on suppliers for design and prototyping (Supplier Development Lead at Roam, 2025).

4.1.2 Supply chain strategy

To build on Roam's competitive strategy, the company's supply chain strategy is examined in consideration of the Kenyan context. Roam's competitive edge lies in its full control of the supply chain and product design. Roam designs and sources every component, which, according to Supplier Development Lead (2025), sets it apart from many competitors who may only manage the final stages of the supply chain or import pre-designed products from external manufacturers. This allows for continuous improvement, cost control and tailored adoptions for the East African environment (Supplier Development Lead at Roam, 2025).

The CPO (2025) expresses that in terms of supply chain strategy, Roam's strategy has evolved significantly since its early stages. Many assume that Chinese products dominate the market in Kenya due to their affordability. However, the East African market is actually dominated by motorcycles imported from India, typically semi-high quality models based on 1980s designs. These bikes represent approximately 95% of the market. Roam differentiates itself by developing its own product design and maintaining control over production, giving the company greater flexibility and quality assurance. Furthermore, price sensitivity in the Kenyan market is extremely high, resulting in Roam working with margins of solely half a dollar per component. Although cost efficiency is Roam's highest priority, they do not compromise on quality. In some cases, Roam accepts higher costs or longer lead times in order to ensure the durability of components. These trade-offs are carefully evaluated. At the same time, Roam has stable demand which gives them a solid base to build their supply chain on. Over time, Roam has shifted from a reactive sourcing strategy to a more proactive and structured supply chain approach. The CPO describes how the company has developed a deeper understanding of its supply chain priorities, focusing increasingly on long-term stability and planning (Co-founder & Chief of Product at Roam, 2025).

The Supplier Development Lead (2025) shares that when product development and prototyping work for the electric motorcycle was conducted in 2021, Roam mainly relied on local suppliers and Indian manufacturers, while sourcing some electrical components from China. However, the suppliers from India delivered inconsistently, bad quality components and high costs compared to China. In comparison, Kenyan suppliers are expensive but deliver with good quality. In 2024, Roam therefore made a shift to sourcing from China to achieve stable supply, where the quality was good but cheaper. Nevertheless, the Kenyan government has made a push for localization and offers tax benefits under frameworks like LN112 for companies that localize components of their production. While Roam's long-term objective is to source as many components as possible locally in Kenya to reduce the complexity of the supply chain and acquire tax benefits, this is currently not feasible as cost minimization remains the top priority and Kenyan suppliers are not available for all necessary components (Supplier Development Lead at Roam, 2025).

Furthermore, Roam acknowledges the corruption in Kenya as a significant challenge for a company managing a supply chain in Kenya, particularly in customs and import procedures. Roam has taken a clear ethical stance, choosing to operate transparently and pay the correct taxes, duties and tariffs, rather than engaging in informal practices to expedite clearance. This ethical position is rooted in a long-term perspective, aiming to build trust and credibility in the market. However, it also results in short term operational challenges such as extended lead times and lower priority in customs clearance. These delays require thorough planning and forecasting to ensure continuity in

operations. For Roam, maintaining integrity in supply chain operations is not only a principle but also a strategic choice to avoid dependency on informal systems. As the CPO (2025) states: “If you start bribing, it never ends - so the solution is to never start”. This mindset reflects Roam’s strategic choice to avoid becoming entangled in corrupt systems, even when it poses short-term operational challenges (Co-founder & Chief of Product at Roam, 2025).

Despite the operational challenges of corruption, it also works as a competitive advantage for Roam because of their established presence in the market and internal policies. Roam has operated in Kenya for over seven years and has developed trust from the government and institutions receiving tax exemptions and smoother inspections of goods for example, as well as developed systems and local knowledge to navigate the complex regulatory and logistical landscapes. In contrast, new entrants to the market probably will face significant barriers (Co-founder & Chief of Product at Roam, 2025).

In navigating the Kenyan institutional environment, Roam has also benefited from certain government incentives and policies that support the development of the local EV market. For instance, electricity is subsidized resulting in lower energy costs. Additionally, the company is exempt from paying import duties on battery cells, which significantly reduces the overall inbound logistics costs (Co-founder & Chief of Product at Roam, 2025). However, the Supplier Development Lead notes that existing incentives from the Kenyan government are limited and that much more could be done. In Kenya, most of the progress in e-mobility is being driven by private sector initiatives. The political economy presents structural challenges where powerful families and politicians are involved in the fuel and ICE vehicle sectors and consequently, hold commercial interests that conflict with EV adoption. In addition, charging infrastructure remains underdeveloped due to limited funding which hinders widespread adoption of EVs (Supplier Development Lead at Roam, 2025).

In addition to local institutional challenges, the CPO (2025) acknowledges that Roam’s supply chain is influenced by external market forces, including global logistics disruptions, geopolitical tension and currency fluctuations. Roam pays in Kenyan shillings, KES, and USD. Roam has had to adapt by changing how they manage exchange rates and planning the payments differently. For example, they try to optimize the timing of payments to reduce the exchange rate burden (Co-founder & Chief of Product at Roam, 2025). Roam has opened an RMB account, i.e. an account in China’s currency system, to facilitate smoother transactions and reduce reliance on USD pricing where possible (Supplier Development Lead at Roam, 2025). Since many of Roam’s suppliers are located in China, they often pay in Chinese yuan which is a relatively stable currency. However, Roam remains indirectly exposed to global events that affect Chinese manufacturing and logistics. The CPO (2025) describes how international tensions, particularly trade relations involving the United States have had a ripple effect. Contrary to popular belief that China restricts exports during periods of geopolitical tension, Roam has experienced the opposite. During heightened trade friction or uncertainty, shipments intended for assembly in China are often delayed or cancelled, but not due to Chinese policy but because other countries stop exports to China. These disruptions underscore the vulnerability of globally integrated supply chains (Co-founder & Chief of Product at Roam, 2025). Roam’s supply chain is very dependent on China, but luckily Africa is in a good position with China and currently not affected by those trade uncertainties (Supplier Development Lead at Roam, 2025).

The CPO (2025) highlights that overall, the biggest challenge is still ensuring consistent access to high-quality components at the right place. He describes that Roam works on a very detailed level where each component and each supplier relationship matters. They have learned to plan more proactively, which has been key to creating stability in their supply chain despite all the external uncertainties. Ultimately, Roam's focus is on reducing costs. Over the last 1.5 years, Roam has succeeded in reducing its overall product cost by 47% by shifting suppliers from India to China, cleaning up internal corruption, renegotiating all supplier contracts and redesigning certain components to lower manufacturing cost. Inbound logistics currently account for approximately 6-10% of Roam's total product cost. This includes expenses related to freight, consolidation and loading and unloading, but excludes packaging, taxes, assembly and the component costs. Roam's goal is to reduce inbound logistics costs to 3-4%, assuming the total product cost is reduced to 1500 USD for a fully assembled motorcycle (Co-founder & Chief of Product at Roam, 2025).

Roam's sales goal is to sell 4000 motorcycles in 2025 (Co-founder & Chief of Product at Roam, 2025). Currently, Roam produces 10 motorcycles per day and a key challenge for them, like many startups, is the lack of economies of scale. Smaller production volumes limit purchasing power and negotiating leverage (Supplier Development Lead at Roam, 2025). The demand of Roam bikes is greater than what they supply, showing opportunities for scaling up production. However, before ramping up production volumes, Roam's goal is to make the production scheme even and achieve a routine in ordering, lead times and issue resolution. This scaling approach is intended to support long-term efficiency and quality assurance (Co-founder & Chief of Product at Roam, 2025). Still, the company remains highly dependent on its supply chain and is exposed to risks such as long lead times, limited capital and inflexible payment terms. For example, many suppliers require upfront payments which Roam is actively working to improve (Supplier Development Lead at Roam, 2025).

4.2 Roam's inbound logistics

4.2.1 The flow of goods

The layout of the inbound logistics flows depend on the country and supplier of origin, as well as the transport mode used. Sea freight, typically complemented by road and rail transport, is the most commonly used mode for Roam (Logistics Manager at Roam, 2025).

In China, goods from the various Chinese suppliers are transported by rail or road to Roam's largest supplier, for anonymity referred to as Supplier A, located in City K, where they are consolidated into a single container. The container is then transported by road to the port of Shenzhen, from which all of Roam's shipments from China are dispatched via ocean freight to the port of Mombasa. The sea freight takes approximately 21-28 days and accounts for the longest segment of the total lead time. At Mombasa port, the goods are handled and possibly cleared through customs, which takes up to three days. The container is then transported by rail to the Nairobi ICD. If customs clearance was not done at Mombasa port, it is conducted at the Nairobi ICD where the goods remain for a maximum of three days before being transported by road to Roam Park, located only two kilometers away. At Roam Park, the goods are unloaded and the empty container is returned either to the ICD or to Mombasa port, depending on whether the shipment is arranged as TBL or non-TBL. For non-TBL shipments, both customs clearance and container return must be done at

Mombasa port. For TBL shipments, clearance can be done either at Mombasa port or Nairobi ICD and the empty container is returned to the ICD. In total, the logistics flow from China to Roam Park takes between 23 and 37 days (Logistics Manager at Roam, 2025; Supplier Development Lead at Roam, 2025).

The logistics flow for shipments from India is similar. Roam sources components from two suppliers in India, referred to as Supplier C and D, which are both located in City L. Goods from Supplier D are transported by road to Supplier C, where all goods are consolidated into a single container. Similar as with the Chinese shipments, the container is transported by road and rail to Mundra port where the goods remain for one day for handling and export clearance before being shipped via ocean freight to Mombasa port, which takes approximately 14 days. From Mombasa, the inbound flow to Roam Park via Nairobi ICD is identical to that of the Chinese shipments. The lead time for Indian shipments by sea is in total between 23 and 30 days (Logistics Manager at Roam, 2025; Supplier Development Lead at Roam, 2025).

Orders via sea freight are typically shipped in 40-foot containers (Bill of Materials Engineer at Roam, 2025). However, when shipment volumes are lower, 20-foot containers are used instead. Roam aims to consolidate shipments whenever possible to maximize container utilization and ensure full use of 40-foot capacity (Logistics Manager at Roam, 2025). However, even with thorough consolidation planning, poor supplier reliability or unexpected disruptions can cause delays at the consolidation point, leading to failed consolidation efforts. As a result, containers may be shipped with lower utilization than originally intended (Logistics Manager at Roam, 2025).

The inbound logistics flow from the Kenyan suppliers to Roam is very simple. Since the suppliers are located close to Roam Park, the goods are easily transported by road in less than a day (Supplier Development Engineer at Roam, 2025).

Air freight is used for shipments from the UK as well as when there is a shortage of components or an urgent need for certain components. With air freight, goods are shipped in significantly smaller quantities and not in containers. Moreover, the goods from different suppliers are not consolidated into one shipment. A 3PL provider manages the entire transport process and depending on the 3PL and the supplier's location, the specific logistics flows and timelines may vary. Nevertheless, in general, goods from China and the UK are transported by road to the nearest airport via the freight forwarder's warehouse and then flown to Nairobi Airport, where customs clearance is conducted. Finally, the goods are transported by road to Roam Park via the freight forwarder's warehouse in Nairobi. The total lead time for air shipments from China is approximately 5-10 days and 9-16 days for those originating from the UK. For air shipments from India, the process follows a similar structure. However, the transport to and from the airports is conducted directly without in-transit storage at a freight forwarder's warehouse. The total lead time for air shipments from Supplier C is estimated at 6-9 days and from Supplier D 5-7 days (Logistics Manager at Roam, 2025).

The Logistics Manager (2025) states that she is the one with insight into all stages of the inbound logistics flow, while the other employees are only familiar with their own areas of responsibility. Furthermore, Roam does not actively track KPIs related to supply chain performance. The only metric currently monitored is the share of air freight used as Roam aims to reduce air freight to less than 30% of total annual import volume. In addition, the Logistics Manager informally tracks the

efficiency of freight forwarders by noting shipment delays and other related issues (Logistics Manager at Roam, 2025).

4.2.2 Ordering of components

Roam sources 254 unique items, with some being bought as unique components, and some being bought as modules formed by several components assembled at the supplier, treated as one entity (Bill of Materials Engineer at Roam, 2025).

As a general rule, components are reordered when inventory levels fall below 100 units, at which point a replenishment trigger is activated. However, since lead times vary across suppliers, reorder points are adjusted accordingly to ensure timely delivery for production needs. Although the company has some safety stock, Roam orders for consumption rather than for stock. Thus, air freight needs to be utilized in some cases where the components needed are not available in stock. Furthermore, ordering frequency remains flexible, as production volumes fluctuate week to week. Some weeks no bikes are manufactured, while some weeks production works at full capacity (Logistics Manager at Roam, 2025).

The typical process of placing a shipment order can be described using a recent example of a shipment from China, which usually begins with obtaining quotations from identified freight forwarders. Once the quotations are received, they are manually compared in order to find the most cost-efficient option. Once a quotation from a freight forwarder has been accepted, a batch order is raised in Roam's ERP system, Microsoft Dynamics. The order then goes through internal approval stages. For most Chinese suppliers, a 50% down payment is required before production begins, with the remaining balance cleared later. Production starts once the initial payment is made. After confirming the order, Roam contacts a freight forwarder to book a container. The supplier provides the estimated time of departure and estimated time of arrival, and coordination is maintained to arrange pickup and container loading, usually a process that takes a few days. Internally, the customs clearance payment is processed, and once completed, proof of payment is sent to the supplier to finalize the transaction (Logistics Manager at Roam, 2025).

Demand forecasting is an important activity to ensure that critical components are available at Roam Park when necessary (Supplier Development Engineer at Roam, 2025). According to the Logistics Manager (2025), the logistics team and the planning team work together to understand the quantity of bikes that needs to be produced on a monthly basis according to the forecasted demand. Moreover, Roam also uses forecasting to anticipate future component costs. This supports more informed price negotiations with suppliers and strengthens financial planning by allowing for better budgeting, cost control, and long-term procurement strategies (Bill of Materials Engineer at Roam, 2025). These forecasting methods are beneficial when planning for Roam's scaling of production (Logistics Manager at Roam, 2025).

Locally sourced components are delivered in small, frequent shipments. This is made possible by the short production and transportation lead times, typically no more than one week in total, which allows Roam to maintain minimal inventory levels while ensuring a steady supply (Supplier Development Engineer at Roam, 2025).

4.2.3 Supplier network

Roam currently has suppliers in China, India, Kenya and the UK. The majority of suppliers are currently based in China, following last year's strategic shift in sourcing from India due to the quality issues with Indian components and the comparatively lower costs offered by Chinese suppliers. Around 10% of the sourced components are sourced locally in Kenya, while the rest are sourced internationally (Supplier Development Lead at Roam, 2025; Logistics Manager at Roam, 2025).

In China, there are a number of main cities for procurement of motorcycle parts of which many components for Roam's bikes are sourced from. Suppliers in City A offer the cheapest motorcycle components, hence the company's goal is to maximize sourcing from that region. Thus, as new suppliers are explored, suppliers in City A are prioritized as long as they fulfil Roam's supplier requirements. Roam currently works with 16 suppliers in China (Logistics Manager at Roam, 2025).

Roam currently works with eight suppliers based in Kenya, all located within a 10–50 kilometre radius of Roam Park (Supplier Development Engineer at Roam, 2025; Supplier Development Lead at Roam, 2025). This close proximity significantly reduces transportation costs compared to international sourcing, to the extent that transport costs are often considered negligible when evaluating local suppliers. The short delivery distance is one of the key advantages of local procurement and supports Roam's ongoing strategy to increase sourcing within Kenya. International suppliers often offer lower component prices, but local sourcing tends to be more cost-effective in terms of logistics. Moreover, during negotiations or when resolving supplier-related issues, the ability to visit a local supplier directly is a major advantage compared to dealing with suppliers based in countries like China or India, both in terms of speed and cost (Supplier Development Engineer at Roam, 2025). However, not all components can be sourced locally, as suitable suppliers who meet all of Roam's requirements have not been identified for every part. This highlights why some components are still sourced internationally. Currently, Roam works with only two suppliers based in India after the shift in supplier strategy toward Chinese suppliers. One Roam Air component is sourced from the UK, from a supplier based in City M (Supplier Development Lead at Roam, 2025).

Each component is currently sourced from only one supplier, but the company is exploring the use of dual sourcing for components that are critical to ensure reliable supply. In the exploration of dual sourcing, Roam is interested in looking into suppliers located close to Shenzhen port, specifically in a city referred to as City K, which is supposedly an upcoming motorcycle hub (Supplier Development Lead at Roam, 2025).

Suppliers are selected based on competitive pricing, production lead times, quality, and reliability, with price and quality being the highest priorities. These criteria form part of Roam's supplier selection framework, which determines the supplier's initial approval. Following this initial acceptance, the supplier is required to deliver a sample batch of 100 components. To proceed, at least 80% of these parts must pass quality control checks based on the minimum standards necessary for the components to be compatible with the bike (Supplier Development Engineer at Roam, 2025).

4.2.4 Transport modes

Roam uses a combination of various transport modes, including road, rail, sea and air freight. As outlined in previous sections, the current transportation setup involves rail or road for transport across land, and air or sea freight for overseas shipments. There have been no alternative investigations into whether other transport modes are better suitable than the current transport setup, but because of the location of supplier countries China, India and the UK, it is necessary to utilize either sea or air freight to transport the goods across the ocean to Kenya (Logistics Manager at Roam, 2025; Supplier Development Lead at Roam, 2025).

The choice of transport mode for a shipment is largely determined by the freight forwarder, who recommends the most appropriate method based on the specific order request from Roam. This decision takes into account both the quantity of goods and the lead time required for delivery to Roam Park. While Roam generally prefers sea freight due to its cost-effectiveness, air freight becomes necessary when orders are placed too late to meet required delivery timelines. It may also be used during periods of sudden demand or when supplier reliability is low, leading to delayed dispatch. In such cases, air freight is often the only viable option to ensure timely arrival of components (Logistics Manager at Roam, 2025).

For international shipments from China, India or UK to Roam, the options are typically limited to either sea or air freight. However, for the journey from the supplier to the port of departure, different modes of transportation can be explored depending on the local context. Since Roam is not physically present in these countries, they rely heavily on the judgment and recommendations of their freight forwarders to select the most efficient and reliable transport method for that part of the supply chain (Logistics Manager at Roam, 2025).

Additionally, air freight is commonly used for sample shipments from China, where the small quantities involved make this method more practical. These shipments have increased following Roam's recent transition from Indian to Chinese suppliers, as samples from new suppliers are required to verify that their components meet Roam's quality and functionality standards. When shipments are LCL or below one cubic meter, CBM, and no sea freight departures are scheduled to depart soon, air freight can also be the more economical and efficient choice for urgent or low-volume deliveries. Nonetheless, Roam also makes an effort to consolidate shipments whenever possible. If time permits, shipments are held until a full container load can be achieved, helping to optimize shipping costs and reduce the number of individual shipments (Logistics Manager at Roam, 2025).

4.2.5 Logistics partners

Roam's inbound logistics involves several actors, including freight forwarders, clearing agents, and shipping- or airlines. Each type of actor plays a role at different stages of the logistics process, but all are essential to ensure the successful transportation of goods from the supplier to Roam Park (Logistics Manager at Roam, 2025).

Firstly, Roam uses freight forwarders to manage the logistics of shipping their components from international suppliers. They act as intermediaries between Roam and the transportation services needed to transport the goods from origin to destination. Additionally, they can act as clearing

agents in Kenya, responsible for aiding Roam in activities related to customs clearance. Shipment quotations from freight forwarders are typically based on spot rates rather than long-term contracts, as transportation costs fluctuate significantly throughout the year due to geopolitical factors and other supply chain disruptions. Roam can negotiate the prices for ocean freight, and are sometimes given a discount (Logistics Manager at Roam, 2025).

The freight forwarders work together with shipping lines, companies that own and operate the cargo ships and are responsible for physically transporting the goods across the ocean. Their cooperation is defined through a set of activities. For example, the freight forwarder books cargo space on a vessel operated by the shipping line on behalf of Roam. Regarding documentation, the forwarder prepares and sends the necessary documents to Roam, some of which are issued by the shipping line. Moreover, container pickup, loading, schedules, and transit updates require coordination between the freight forwarder and the shipping line. For air freight, the actor responsible for transporting the goods by airplane is called an airline. However, it is common for companies to provide both sea and air freight, and thus, the same companies can be used for both sea and air freight shipments at Roam (Logistics Manager at Roam, 2025).

The Logistics Manager (2025) states that building strong relationships with logistics partners is essential for Roam. A trusted partnership with a freight forwarder can provide critical support in situations involving payment delays or other logistical challenges. For example, Roam's strong relationship with Freight Forwarder A, anonymized because of confidentiality reasons, has proven beneficial in such circumstances. When payments cannot be made immediately, this freight forwarder demonstrates flexibility by covering costs on Roam's behalf and allowing for extended payment terms, sometimes up to two months, until Roam is able to settle the amount. This level of trust and cooperation helps ensure that shipments are not delayed due to temporary financial constraints (Logistics Manager at Roam, 2025).

When selecting a freight forwarder, Roam evaluates candidates based on a set of defined criteria. Key considerations include the overall cost, total lead time, customs clearance efficiency, and the forwarder's operational track record. Often, the decision involves balancing trade-offs between these factors. For example, one provider may offer faster transit times, but at a significantly higher cost. In such cases, the urgency of the shipment becomes the deciding factor. In most cases, the items are urgent due to limited stock availability, making faster, though more costly, options necessary. The length of time a company has been in business is also an important factor, as it reflects their experience and reliability in handling shipments. For customs clearance specifically, Roam exclusively works with clearing agents who hold Authorized Economic Operator, AEO, certification. The certification is given by the AEO programme, which is a partnership between the customs authority and the economic operators. This certification streamlines the clearance process, as it allows shipments to pass through without the need to open containers, reducing the risk of delays. However, Roam currently lacks a formal process for evaluating the performance of logistics partners after deliveries are completed (Logistics Manager at Roam, 2025).

Other than freight forwarders and shipping lines, which are directly involved with the transportation of goods, there are also important actors related to handling and administration activities in the inbound logistics. Once the cargo arrives in Kenya, it typically enters through the port of Mombasa, which is managed by the Kenya Ports Authority, KPA, a government body overseeing port

operations. Customs duties and taxes are managed by the KRA. For certain imports, Roam uses a government-issued exemption code provided by the Ministry of Energy, which allows them to reduce or eliminate specific import taxes for goods used in energy-related projects (Logistics Manager at Roam, 2025).

In addition, all imported goods must comply with national quality standards. KEBS is responsible for inspecting goods either in Nairobi or Mombasa, depending on where the container is cleared. These inspections are mandatory and ensure compliance with Kenyan regulations before the goods can be released and transported to Roam Park (Logistics Manager at Roam, 2025).

4.2.6 Customs clearance

Customs clearance is mandatory when transporting goods internationally. As mentioned by the CPO (2025), Roam is decisive with managing the clearance correctly and therefore handles customs clearance and import regulations according to established procedures depending on the mode of transport (Co-Founder & Chief Product Officer at Roam, 2025). The process involves a clearing agent who manages the declaration through the KRA system. Shipments arrive in Kenya either via sea or air, where the agent uses a BOL for sea shipments or an AWB for air freight. Once the declaration is submitted, the KRA system generates an entry form that Roam uses to process tax payments internally via their ERP system. The classification of goods, determined by the HS code, is used for the tax calculation. After the finance team approves and processes the payment, usually within one day, the payment slip is forwarded to the clearing agent who then finalizes the customs clearance and arranges for the release of goods (Logistics Manager at Roam, 2025).

Clearing for sea freight can be done either directly at Mombasa port or through the ICD in Nairobi, located close to Roam Park. Normally customs clearance takes a maximum of two days by air, and three to four days by sea. However, the Logistics Manager (2025) describes that clearing goods at Mombasa port usually experience delays up to five to seven days due to the high traffic with shipments to East Africa.

Similarly to the company's freight forwarders, Roam has been granted AEO status, which provides significant compliance advantages. AEO certification exempts Roam from standard physical inspections of imported goods, reducing opportunities for corruption and improving the predictability of customs processing. Despite this, challenges remain. Corruption at ports and customs offices continues to be the biggest issue. For example, the Logistics Manager (2025) describes that customs officials may intentionally delay shipments to incentivize informal payments which increase both storage and handling costs. Instead of handling shipments chronologically in the queue, shipments are prioritized if the customs official has been bribed (Logistics Manager at Roam, 2025).

Roam currently benefits from several exemptions and government subsidies. These include an exemption from PVoC inspections at the port of origin for imports certified by KEBS. Additionally, lithium-ion batteries are exempted. Roam is also working to fully implement a manufacturing license, which would significantly reduce import-related taxes. Under this license, the company would pay reduced IDF and Rail Development Levy, RDL, while being exempt from VAT and standard import duties (Logistics Manager at Roam, 2025).

Furthermore, as previously mentioned, Kenyan policy offers tax incentives for local sourcing and production. 13 of Roam’s components, such as the seat, wire harness etc, are applicable for the tax benefits under LN112 and can result in a 60% tax reduction. Since this would make local sourcing more cost efficient than international sourcing and simplify the supply chain, Roam is actively working towards localizing sourcing, and especially the 13 components that are eligible for these tax reductions. Roam has not yet started with supplier development for local suppliers (Supplier Development Lead at Roam, 2025). However, Roam is tracking the progress of localization implementation for each component to monitor the developments over time (Supplier Development Engineer at Roam, 2025).

4.3 Costs

In order to gather information about the type of costs along with the size of the costs associated with Roam’s inbound logistics, invoices from shipments delivered during 2024 have been investigated. Each shipment is associated with three to seven invoices from different parties involved with the inbound transportation of the goods. These invoices vary in terms of associated shipment size, the type of goods being shipped, the freight forwarder handling the shipment, shipping and delivery dates, as well as the supplier and their country of origin. The shipments that have been collected and analysed are presented in table 4.1 below together with relevant information about each shipment. Note that the main transport mode is associated with the shipping to cross the ocean, which is what differs most shipments from one another.

Table 4.1. The shipments delivered during 2024 from which invoices have been made available to the writers by Roam.

Shipment	Main transport mode	Origin country	Supplier	Transportation /loading unit	Arrival date
A	Sea freight	China	Supplier A	20ft container	2024-08-28
B	Sea freight	China	Supplier A	40ft container	2024-01-28
C	Sea freight	China	Supplier A	40ft container	2024-12-05
D	Sea freight	China	Supplier B	40ft container	2024-08-31
E	Sea freight	India	Supplier C	40ft container	2024-02-07
F	Sea freight	India	Supplier C	40ft container	2024-09-09
G	Sea freight	India	Supplier C	40ft container	2024-01-10
H	Sea freight	India	Supplier C	40ft container	2024-08-18
I	Sea freight	India	Supplier C	20ft container	2024-09-22
J	Sea freight	India	Supplier C	40ft container	2024-01-28
K	Air freight	India	Supplier C	1 pallet	2024-12-10 (posting date*)

L	Air freight	UK	Supplier E	1 piece**	2024-08-10 (posting date*)
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**Posting date is defined by the date in which the order appears in Roam's financial records.*

*** Unknown what type of transportation unit a piece is defined as.*

4.3.1 Breakdown of invoices

The invoices break down costs inconsistently and vary depending on the sender. The following section provides an overview of invoices from the different senders and summarizes the typical cost types included, in order to illustrate the types of charges associated with inbound logistics.

4.3.1.1 Invoices from port authorities

For all arrived shipments during 2024, an invoice from KPA is received by Roam. When goods are imported into Kenya using sea freight, all or some of the following costs are included in the KPA invoice.

- **Shore handling Import 20' FCL - ICDN** or **Shore handling Import 40' FCL - ICDN**: A charge for handling a 20' or 40' container from Mombasa port to the ICD in Nairobi.
- **Shore handling Import 20' IMDG Cont- ICD** or **Shore handling Import 40' IMDG Cont - ICD**: A charge for handling hazardous goods in a 20' or 40' container from the port to Nairobi ICD. IMDG stands for International Maritime Dangerous Goods.
- **Freight Charge 20' Ft 0-30 Tons NTBL**: Freight charge for transport between Mombasa and Nairobi ICD for a 20' container weighing 0-30 tons, non-TBL.
- **Freight Charge 20' FCL-0-30Tons IMDG-R** or **Freight Charge 40' FCL-0-30 Tons IMDG-R**: Freight charge for transport between Mombasa and Nairobi ICD for a 20' or 40' container with 0-30 tons of dangerous goods, non-TBL.
- **Freight Charge 40' Ft-Local -NTBL-ICDN**: Freight charge for transport between Mombasa and Nairobi ICD for a 40' container, non-TBL.
- **Wharfage Import 20' FCL Container** or **Wharfage Import 40' FCL Container**: A fee for using the port's wharf to load or unload a 20' or 40' container.
- **IMCO charge**: A surcharge for handling dangerous goods, 10% of sum of *Wharfage Import [...]*, *Shore handling Import [...]*, and *Freight Charge [...]*.
- **Storage charges**: A fee for storing containers at the port beyond the free storage period.
- **Re-marshalling**: A charge for rearranging or repositioning a container within the port or terminal when needed (e.g., to access another container). Occurs after the free storage period.
- **Output tax**: A government-imposed tax on services provided by the port authority. Charged as 16 % of the sum of all other KPA costs.

4.3.4.2 Invoices from freight forwarders

In addition to invoices from KPA, Roam also receives invoices from its freight forwarders. Throughout 2024, the company primarily relied on Freight Forwarder A, anonymized for confidentiality reasons, as its main freight forwarder for sea transportation. Thus, the following costs commonly appear on invoices related to sea freight services handled by this freight forwarder.

- **Agency Fee:** A fee charged by forwarders and clearing agents for arranging and handling a shipment.
- **Documentation & verification:** Charges for preparing and processing the required shipping documents and verifying the charges for shipping the container.
- **Disbursement@3%:** A charge by the forwarders to the client to pay duty and tax charges for a shipment on behalf of the client. The charge amount is 3% of the total value of the payments being made by the freight forwarder on behalf of the client.
- **IDF processing:** A service fee charged by the freight forwarder or customs agent for handling the preparation, submission, and processing of the IDF.
- **Transport - ICD & return of empty:** Freight charge from Nairobi ICD to Roam Park and back to Nairobi ICD (TBL) or from Nairobi ICD to Roam Park to Mombasa (non-TBL).
- **VAT:** VAT applied at a rate of 16%, which is the standard VAT rate in Kenya. Charged on the total cost of freight forwarding services provided above.
- **Taxes:** General taxes.
- **Port charges:** Charges imposed by the port authorities for using their facilities.
- **UCR Fee:** A charge for assigning and processing the Unique Consignment Reference, UCR, which is required for tracking and clearing shipments through customs.
- **Anti-counterfeit permit fee:** A charge for verifying that imported goods comply with anti-counterfeit regulations.
- **Clearance Facilitation:** Fee associated with customs clearance and processing of import and export documents.
- **Handling charges:** A fee for physically handling goods within a terminal, warehouse, or storage facility.
- **Exemption Code:** A charge placed to facilitate the process of tax exemption for battery shipments.
- **Detention charges or Detention Charges - Export:** Detention charge is applied when the container has not been returned to the carrier at the designated location within the three free days. If TBL, it has to be returned to Nairobi ICD, and if non-TBL, it has to be returned to Mombasa.
- **Bank Charges:** Fees related to banking transactions that the freight forwarder pays on our behalf. Only added if there is a detention charge.

In addition to the fees presented above, the charge for the actual ocean freight may appear either as a standalone item on a separate invoice or as part of a consolidated invoice that includes additional shipping-related costs. This depends on which party is responsible for the ocean transportation, which is typically the freight forwarder, shipping line, or the supplier. Historically, the supplier was responsible for managing the shipment all the way to Roam Park (Logistics Manager at Roam, 2025). As a result, most supplier invoices from previous years feature broad cost categories such as "Packing & Freight", "Freight & Shipping", or "Freight & Insurance". Exactly what these cost categories entail is ambiguous, but can include all or some of the following: the transportation charges from supplier to destination port, ocean freight from origin port to destination port, packing charges at the supplier, or insurance charges during transportation. However, as Roam has evolved its procurement and cost strategy, it has brought more logistics control in-house. The supplier is now less involved in organizing the shipment, while Roam takes a more active role in selecting freight forwarders and shipping lines that offer the most cost-effective solutions (Logistics Manager

at Roam, 2025). As a result, the majority of shipments are conducted under Ex Works terms, evident in the shipment documents available. This strategic shift has led to invoices with more detailed and itemized cost structures. Instead of bundled freight charges, the ocean freight is now often clearly specified as:

- **O/F or Ocean Freight - Export or Ocean Freight - Export:** Charge for the actual ocean freight, paid to the responsible freight forwarder or shipping line.

In some cases, additional freight costs for the inland haulage to the origin port are included in the charge for ocean freight described above. In other cases, there is a separate cost item for the transportation on land in the country of origin named as:

- **Origin charges:** The charges of transporting the container from the supplier to the port of origin.

An additional charge concerning Pre-Export Verification of Conformity has been associated with shipments arriving early 2024, but Roam is exempted from paying this charge currently due to institutional trust. The definition of this cost item is as follows:

- **PVoC (Pre-Export of Conformity):** Ensures that products comply with local regulations before they leave the exporting country.

Depending on the freight forwarder, the breakdown of the charges for sea freight shipments may involve other cost items than presented above. Thus, to showcase possible similarities and differences between the invoices, an example cost breakdown for one of Roam's shipments during 2024, with similar cost items but under different labels, is presented below.

- **THC - Export:** A fee charged for handling containers at the export terminal, including loading and unloading from the vessel, stacking, and movement within the terminal. THC stands for terminal handling charge.
- **Export Serenity - Export:** A service fee related to additional protection or enhanced customer service during the export process. This may include insurance, tracking, or issue resolution, depending on the freight forwarder's service offerings.
- **BL Fee - Export:** A charge for the issuance or verification of the BOL, the official shipping document that serves as a contract and receipt for the cargo.
- **Collect Handling - Export:** A fee for processing export shipments where the payment for freight is collected at the destination rather than prepaid.
- **Surrender/Telex Charges - Export:** A fee for electronically transferring the BOL (Telex Release), allowing the consignee to receive goods without a paper BOL.
- **Bank Transfer - Export:** A fee covering the cost of international or domestic bank transfers related to the payment of export services.
- **IHC - Export:** Inland haulage charges related to the transport of goods to the port of loading, typically via road or rail.
- **Custom Clearance - Export:** A fee for processing and obtaining clearance from customs authorities to allow the goods to be exported legally and compliantly.

- ***Lashing/Fumigatic - Export:*** Charges for securing cargo within the container using ropes or straps (lashing) and for fumigating cargo or containers to meet pest control or quarantine requirements.
- ***Dry Port Charges - Export:*** Fees incurred when using an inland container depot (dry port) instead of a seaport for cargo handling and customs processing.
- ***Roll Over Charges - Export:*** A penalty when a container misses its scheduled vessel and must be rescheduled for a later departure.

4.3.1.3 Invoices from shipping lines

In addition to port authorities and freight forwarders, Roam receives invoices from shipping lines for their shipment orders. These charges are often associated with handling costs, container maintenance costs, or administrative costs. For shipping lines used by Roam, the following cost items are common to find in shipment invoices at Roam.

- ***Container protect essential* or *Container service charge* or *Container maintenance charge at destination* or *Container cleaning fee* or *Container handling fee* or *Container clean fee* or *Container maintenance* or *Equipment container:*** Charge for maintaining and handling containers at the port or terminal, coverage against container damage and cleaning when the container is returned.
- ***Port Security Service - Import* or *Destinat.Terminal-Intl Ship&Port facility Security:*** Covers the cost of security measures at the port of arrival. This fee is typically applied to ensure compliance with international security regulations and to maintain a secure environment for cargo handling.
- ***Terminal Handling Service - Destination* or *Terminal handl. ch destination* or *Destination terminal handling:*** Charges related to unloading, stacking, and moving the container within the terminal at the destination port.
- ***Documentation fee - Destination:*** Covers administrative costs for processing shipping documents at the destination (e.g. BOL).
- ***Import service:*** A general charge for various import-related services, such as customs paperwork and cargo handling (for processing an import shipment).
- ***Container deposit charges* or *container deposit:*** A refundable security deposit charged by the shipping line to ensure the container is returned on time and in good condition. The amount is reimbursed upon verification that the container has been returned without damage or delay.
- ***Delivery order* or *DO Fee - with 16% VAT:*** A fee for issuing the Delivery Order, a document which authorizes Roam to collect the cargo at the destination. This fee includes 16% VAT, as per local tax regulations in Kenya.

4.3.1.4 Invoices for air freight

For air freight, the breakdown of the charges are simpler, leading to fewer cost types compared to invoices associated with sea freight. These cost types still vary depending on the freight forwarder, but to showcase how services may be broken into cost items for air freight, invoices from an example shipment can be presented. This given shipment was shipped involving two different freight forwarders, in which one of them is Freight Forwarder A mentioned in the previous section, 4.3.4.2 *Invoices from freight forwarders*. Thus, some charges are the same as for sea freight

shipments using the same freight forwarder, including *Agency Fee, Documentation, Verification, IDF processing, Disbursement@3%, Transport, Handling charges, Clearance facilitation* and *VAT*. Additional charges for this shipment, given by the second freight forwarder involved, include the following:

- ***Air freight:*** The charge for the actual air transportation of goods from the origin airport to the destination airport.
- ***AWB/DTC/AMS:*** Combined charge for AWB, Destination Terminal Charge and Automated Manifest System. AWB is a document issued by an airline or freight forwarder that serves as a receipt for the goods and the contract of carriage. DTC Destination Terminal Charge, DTC, is a fee assessed at the destination airport for handling and processing the cargo upon arrival. Automated Manifest System, AMS, is associated with the U.S. Customs requirement where shipment details must be electronically submitted in advance, which may require a compliance fee. However, this is only applicable for U.S.-bound cargo, and thus, Roam is not charged for AMS.
- ***Custom clearance:*** A service charge for preparing and submitting the necessary documentation to facilitate export or import through customs authorities.
- ***THC (Terminal handling charge):*** A fee imposed for the handling of containers and cargo at the terminal, covering loading, unloading, stacking, and movement within the terminal.
- ***Transportation:*** Fee for transportation of goods to the loading airport.
- ***Bank Fee:*** Charges related to financial transactions associated with the shipment.

4.3.2 Inbound logistics costs per shipment

In order to understand which type of shipments have the largest costs, data regarding the total inbound logistics costs for each shipment has been collected, together with the weight and the value of the shipped goods in each respective shipment. This data is presented in table A.1 in Appendix B. The total inbound logistics cost for each shipment is gathered from the invoices belonging to each shipment. All the costs incurred in the invoices for a shipment can be added, giving the number provided in the column for *Total inbound logistics shipment cost*. Exact numerical values have been replaced with ranges to preserve confidentiality. The weight of the shipment as well as the value of the goods being shipped can be found in the invoices as well. This data can later be used in the analysis section to understand what type of shipments incur the most costs and provide insights into the type of shipments which Roam should focus on in order to reduce costs.

4.3.3 Factors affecting costs

The Logistics Manager (2025) notes that one of the most significant sources of cost fluctuation in Roam's inbound logistics process is ocean freight. Ocean freight prices can vary considerably depending on the geopolitical situation and weather conditions. For example, if severe storms are projected along the shipping route, vessels may face delays or require detours, which can increase both transit time and shipping costs. Freight charges are often projected in advance based on expected weather conditions, meaning uncertainties in the climate can directly influence pricing before the ship even departs (Logistics Manager at Roam, 2025).

The Logistics Manager (2025) explains that in terms of external economic factors, several elements impact the cost of inbound logistics. Firstly, currency exchange rates play a major role, especially

since quotations from freight forwarders can be given in either USD or KES. Fluctuations in the exchange rate can therefore cause significant variation in final shipping costs. Import taxes and duties are relatively stable but are subject to annual adjustments, often influenced by local political decisions or changes in trade policy (Logistics Manager at Roam, 2025).

5. Analysis & Discussion

This section combines information from the theoretical framework and the empirical findings to discuss and conclude new insights regarding Roam's inbound logistics. The concept of strategic alignment within the Kenyan market is first explored to provide a foundation for assessing Roam's supply chain. Thereafter, addressing the research objectives related to the first research question, several supply chain maps are presented and described in detail. Furthermore, Roam's inbound logistics are examined using concepts from the theoretical background to develop a more comprehensive understanding. The cost data presented in the empirics is analysed and categorized according to suggested methods in the theoretical background, and cost items with large cost amounts are explored. This cost analysis forms the basis for identifying cost inefficiencies, which are then presented with suggested improvements.

5.1 Strategic alignment in the Kenyan market

As discussed in section 3.2.1 *Strategic alignment*, it is essential to link a company's competitive strategy to the needs of the target market segment and align it with the supply chain strategy. According to the findings in 3.1 *Kenyan EV market*, Kenya has abundant renewable energy sources, a high demand for two-wheelers and a growing EV market. Furthermore, section 4.1 *Roam's strategy within the Kenyan context*, highlights that the Kenyan market is highly price-sensitive. These factors align with Roam's competitive strategy of offering a product tailored to the Kenyan context, namely an affordable electric motorcycle designed with sufficient quality and durability to withstand the country's terrain. Furthermore, Roam produces the motorcycles in-house as outlined in section 4.1.2 *Supply chain strategy*. Although this approach reduces organizational flexibility and increases fixed capital investment compared to outsourcing, as discussed in section 3.2.5.1 *Sourcing*, it aligns well with Roam's strategy given that design control is a core part of their unique selling proposition and local production is supported by government incentives.

However, the Kenyan EV market also presents several challenges as outlined in section 3.1 *Kenyan EV market*. These include the informality of the market, limited access to financing, high levels of corruption and poor implementation of governmental EV incentives. Roam addresses these challenges through various measures, as discussed in section 4.1 *Roam's strategy within the Kenyan context*, such as offering the Roam Air under a lease-to-own model to better match the financial capabilities of its users. Additionally, Roam takes advantage of the high entry barriers and complexity of the market by being an established player in the market. This has helped the company gain trust and benefit from the implementation of tax exemptions and regulatory advantages. To further mitigate the issues regarding corruption, Roam has adopted a clear stance on acting ethically to avoid being tangled in corruption.

Nonetheless, corruption remains a significant challenge. This is evident in the research data, where there for example are inconsistencies in invoices, such as varying cost types and amounts across shipments. This may suggest irregularities that possibly can be due to corrupt actions by stakeholders. For instance, port workers that may hold goods longer to incur additional storage costs as described in section 3.3.2.1 *Customs clearance*. However, these suspicions are difficult to confirm due to the disorganized data and limited transparency regarding supply chain costs. These factors have complicated the research process and hindered a complete comprehensive understanding and analysis of the research questions.

To achieve strategic fit, the supply chain strategy must also align with the competitive strategy to avoid suboptimization. One key factor in choosing a suitable supply chain strategy is the product life cycle. Earlier, Roam faced several challenges, such as a lack of secure component supply due to unreliable and low-quality suppliers in India, inexperience in the complex regulatory environment in Kenya and unstructured internal processes, as concluded from section 4.1.2 *Supply chain strategy*. This corresponds to the introduction phase, where a responsive supply chain is recommended to accommodate the fluctuating demand and uncertain supply as described in 3.2.1 *Strategic alignment*. However, Roam did not fully implement a responsive strategy. Instead, the company aimed to minimize costs by keeping inventory low and relied on just-in-time ordering, which made product availability uncertain. Nonetheless, Roam has demonstrated some responsiveness by using air freight to meet unexpected demand. As the product has matured, Roam's position within the zone of strategic fit has moved from a more responsive to a more efficient supply chain strategy, illustrated in figure 3.3. According to section 4.1.2 *Supply chain strategy*, demand has now stabilized and Roam has replaced unreliable suppliers with Chinese ones, identifying one reliable supplier per component. Given the high price sensitivity in the Kenyan market, this transition toward a cost-efficient supply chain aligns well with market demands. The supply chain priorities are also in line with Roam's competitive strategy of minimizing costs without compromising on quality. In addition, the scope of the strategic fit must be considered according to section 3.2.1 *Strategic alignment*. This identified appropriate supply chain strategy and a broadened scope is considered when evaluating inefficiencies in Roam's inbound logistics and exploring potential recommendations.

5.2 Inbound logistics

5.2.1 Structure of inbound logistics flows

Inbound logistics flows, as described in section 3.2.5 *Inbound logistics*, range from the origin of materials to their arrival at the production facility. To be effective, these flows must not only be efficient but also adaptable to disruptions. Roam's inbound logistics demonstrates a multi-layered structure shaped by supplier geography, transport mode, and customs procedures. By comparing Roam's logistics setup with theoretical principles, several insights can be drawn.

Roam's logistics flows are highly intermodal, especially for shipments coming from China and India. These flows incorporate road, rail, and sea freight to move goods from the supplier locations to Roam Park in Kenya. This combination of transport modes aligns closely with the definition of intermodal transport described in section 3.2.5.4 *Intermodal transport*, in which standardized container use also is emphasized to facilitate transitions between modes. The use of standardized 2 TEU containers in Roam's operations supports this concept. However, as mentioned in section 4.2.1 *The flow of goods*, there are instances of underutilization of the containers due to supplier delays. Such underutilization increases per-unit transport costs and diminishes economies of scale. This problem highlights the limitations of Roam's intermodal transport structure, lacking flexibility when transitioning from road to sea freight due to reliance on fixed departing schedules and standardized containers.

Based on the description of the inbound logistics flows in section 4.2.1 *The flow of goods*, a map can be drawn to showcase the geographic points in Kenya of which goods pass through. The main

locations are Mombasa port, Nairobi ICD and Roam Park, visualized in figure 5.1 to facilitate understanding of the domestic movement of goods.



Figure 5.1. Map of key Kenyan locations within the flow of goods.

5.2.2 Sourcing strategy and supplier network

Roam's sourcing strategy and supplier network are analyzed, as supplier selection and their locations directly impact inbound logistics activities, especially transportation and related costs. Roam's sourcing strategy reflects primarily a global sourcing model, with the majority of components sourced from China, a small share coming from India, and selected items from the UK. This aligns with the theoretical view explained in section 3.2.5.1 *Sourcing*, namely using global sourcing as a method for accessing specialized capabilities and cost advantages that are unavailable locally. Roam's shift from Indian to Chinese suppliers demonstrates the company's focus on component reliability and cost efficiency. While global suppliers may deliver better performance in such aspects, international sourcing also leads to increased logistical complexity, longer lead times and vulnerability to global disruptions, important aspects highlighted in section 3.2.5.1 *Sourcing* on global supply chains. Thus, Roam's strategic decision to actively expand their sourcing from Kenya is justified in order to avoid such challenges. This approach supports the theoretical advantages of local sourcing, including lower transport costs, shorter lead times, and simplified coordination.

Additionally, Roam's sourcing decisions show an awareness of the trade-off between unit cost and logistics cost, discussed in section 3.2.5.1 *Sourcing*. While Chinese suppliers offer lower unit prices, the higher transport costs and longer lead times increase the total inbound logistics cost. On the contrary, Kenyan suppliers may have higher unit prices but are less expensive overall due to negligible transport costs.

Roam currently follows a single sourcing model for each component, where only one supplier is used per part. While this simplifies coordination and enables volume-based pricing, it also makes Roam more exposed to risks such as quality failures or supply shortages. As these risks are recognized by Roam, they are currently exploring dual sourcing for critical components to improve

supply reliability. This aligns with literature in section 3.2.5.1 *Sourcing*, arguing that dual sourcing enhances flexibility and reduces supply risk, although it may introduce other complexities and reduce bargaining power.

5.2.3 Transport modes and modal choice

As mentioned in section 3.2.5.2 *Transport modes*, the selection of transport modes is a strategic decision within inbound logistics, impacting delivery speed, cost, tied-up capital, and responsiveness. Each mode has distinct characteristics, and supply chain theory emphasizes aligning transport mode with the value and urgency of goods. Roam's transport decisions can be analyzed based on these theoretical concepts.

Roam primarily relies on sea freight for international shipments from China and India. This aligns with theoretical expectations regarding sea freight offering the lowest transportation cost per unit, benefiting Roam from a cost perspective. Rail and road transport are also integral parts of Roam's intermodal logistics chain, specifically in the supplier origin country and in East Africa. When sea freight shipments are too slow for urgent deliveries, Roam uses air freight from the UK, India, and occasionally China. This choice corresponds with air freight's theoretical characteristics, including high cost, low shipment size, fast delivery, and low tied-up capital. In addition to occasions when lead times cannot be met with sea freight, air freight is used when sourcing small volumes, such as samples from new Chinese suppliers. This reflects an understanding of the trade-offs outlined in section 3.2.5.2 *Transport modes*.

While Roam can make the choice between shipping by air or sea, the company's reliance on freight forwarders to determine the most suitable transport mode reveals a partial outsourcing of decision-making regarding transport mode. This can be deemed efficient particularly in supplier countries where Roam lacks direct presence, but it may also limit visibility and control. Moreover, the recent shift in responsibilities between Roam and its suppliers can be associated with changes in incoterms, described in section 3.2.5.1 *Sourcing*. Previously, suppliers managed the transportation of goods to Roam Park, which can be more closely related to DDP terms. However, as Roam has taken greater ownership over this process, they show closer association with Ex Works terms, giving the company more control over transportation decisions and costs.

Roam transports by using both FCLs and LCLs depending on if they are able to fully utilize their containers or not. Occasionally, delays at the supplier lead to failed consolidations, resulting in LCLs and thus higher transport costs per unit. However, Roam's aim is to consolidate deliveries to achieve FCLs and avoid LCLs where possible, which aligns with theory in section 3.2.5.3 *Transportation unit and order size* on how to optimize the usage of transportation units. The usage of FCLs would lead to Roam being able to utilize economies of scale, mentioned as an important concept in supply chain theory. High stowability, presented in section 3.3.2.4 *Transportation*, is also important for maximizing the usage of Roam's containers to reach a lower transport cost per unit.

5.2.4 Role of logistics service providers

Logistics service providers are integrated across all stages in Roam's inbound logistics, making them essential partners. Included in Roam's logistics service provider network are freight forwarders, shipping lines, airlines, and clearing agents, each fulfilling distinct roles across the

logistics process. These can be distinguished using the asset-based versus non-asset based classifications outlined in section 3.2.5.6 *Logistics service providers*. The freight forwarders used by Roam such as Freight Forwarder A operate as non-asset-based 3PLs, coordinating shipments on Roam's behalf and often acting as clearing agents as an additional service. Their responsibilities correspond with those described in theory, including customs brokerage, document management, and shipment planning. The actual transportation is handled by the shipping lines and airlines partnering with Roam, representing asset-based providers, or 2PLs, that own and operate the physical infrastructure required to move goods across borders.

Other than asset-based classifications, these logistics service providers can be distinguished using the activity-based classifications outlined in section 3.2.5.6 *Logistics service providers*, of which forwarder-based, transport-based, and customs-focused providers are clear classifications found in Roam's case. Freight forwarders are classified as forwarder-based providers, shipping lines and airlines can be matched with the definition of transport-based providers, and lastly, clearing agents can be seen as a customs-focused provider.

5.3 Supply chain maps

To gain a broader and deeper understanding of Roam's inbound logistics and to facilitate interpretation and analysis, strategic supply chain maps have been developed. As presented in section 3.2.4 *Supply chain mapping*, focus is thereby on the flow of goods and financial transactions across the supply chain, providing a high-level overview of the processes. Based on the collected data via interviews, workshops and shipment invoices, three types of supply chain maps are developed: one for logistical flows (see section 5.3.1), one for supplier locations (see section 5.3.2) and one for cost mapping (see section 5.3.3). The logistical flow map illustrates the flow of goods from suppliers to Roam Park, distinguishing flows from India, China, Kenya and the UK, as well as the transport modes used. The cost mapping maps where and what costs occur along the inbound logistics flow to help identify potential inefficiencies. Finally, the supplier location map visualizes the geographic location and spread of suppliers in China and India to support further analysis. Mentioned in section 3.2.4.3 *Risks of mapping*, there is a risk of revealing competitive information to other parties through these maps, and thus, aspects such as the names of the suppliers are kept confidential.

To keep the supply chain map strategic, the corporate strategy is considered to ensure alignment with the overall business objectives. As concluded from the empirical findings, Roam aims for a cost-efficient strategy with sufficient quality to ensure that the motorcycle endures the financing period. Consequently, the trade-off involves prioritizing cost minimization, sometimes at the expense of longer lead times. Furthermore, the strategic supply chain maps exclude non-critical entities to maintain focus on the most relevant supply chain components, in line with the importance of avoiding excessive detail as discussed in section 3.2.4.3 *Risks of mapping*. Therefore only KPIs are included, such as cost, lead time and transport mode.

Certain mapping design standards are established prior to developing the maps to ensure consistency and clarity. Since the scope of this thesis concerns the logistics from the supplier to the focal firm Roam, the supply chain maps are supplier-oriented and focus on the upstream flow. They extend four tiers upstream from the focal firm, with each tier represented by nodes in the maps. The

degree of aggregation is relatively high to maintain a strategic approach, with only major suppliers represented individually in the logistics flow maps, while the remaining suppliers are grouped into a single node. Moreover, the more important suppliers are represented with larger symbols to reflect their relative significance in the supply chain. Due to limited data on air freight shipments and their lesser relevance to the thesis, the logistical flows of air freight are mapped with a higher degree of aggregation compared to sea freight. The supplier location maps are spatially representative, whereas the other maps focus solely on logical and process-based relationships. The supply chain maps are firm-centric from Roam's perspective, with a product breadth defined by the contents of a container, following a container's physical flow through the inbound logistics as Roam always orders one container at a time.

Since Roam lacks a structured system for tracking data, the supply chain maps are not automatically updated through data integration. Instead the maps will be made available to Roam via the web platform Mural to facilitate dynamic updates. Additionally, electronic files as well as printed versions of the final maps developed for this thesis will be provided to serve as educational and inspirational tools for visualization in the office, as recommended in section 3.2.4 *Supply chain mapping*.

5.3.1 Inbound logistics flow

Two separate maps are developed to visualize the inbound logistics flow. One of the maps illustrates the flow of a container transported by sea freight, including road and rail transport to and from sea ports. The other illustrates the flow of a shipment transported by air freight, including road transport between the airports.



Figure 5.2. Mapping conventions and iconography.

In the maps, links between nodes are illustrated with arrows indicating the direction of flow. Nodes are differentiated by shape and color based on their characteristics. Suppliers are shown as beige diamond-shaped squares, ports as orange upside-down triangles, the Nairobi ICD as a light orange hexagon and Roam is represented by the company logo. As suggested in section 3.2.4.1 *Definition and importance of mapping*, the size of the supplier icons reflects the relative importance of the suppliers. In the air freight map, light orange circles are used to depict the shipping agents' warehouses. To improve clarity, each map includes titles indicating the supplier country, supplier name, the logistics flow and the focal firm, Roam. The total lead time is also displayed below the supplier country's name.

In addition to the total lead time, each transport segment between nodes includes details on lead time and distance, abbreviated as *LT* and *D* respectively, while the nodes specify the time spent at each location, abbreviated as *T*. Icons representing the transport modes are also added to facilitate

quicker interpretation. However, for the air freight flow, only the total lead time is included due to the lack of detailed data and because the specific times between nodes depend on the used 3PL provider and are less relevant, as they cannot be influenced by Roam. The mapping conventions and iconography are summarized in figure 5.2.

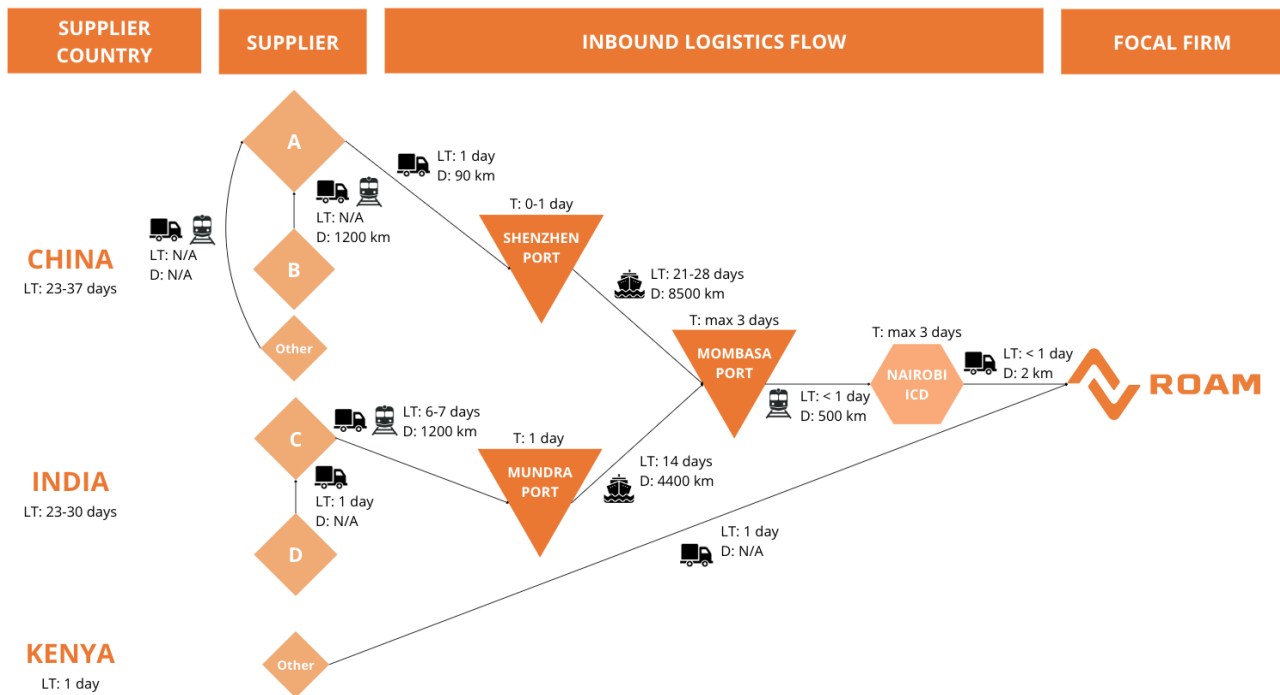


Figure 5.3. Supply chain map of Roam's sea freight inbound logistics flow.

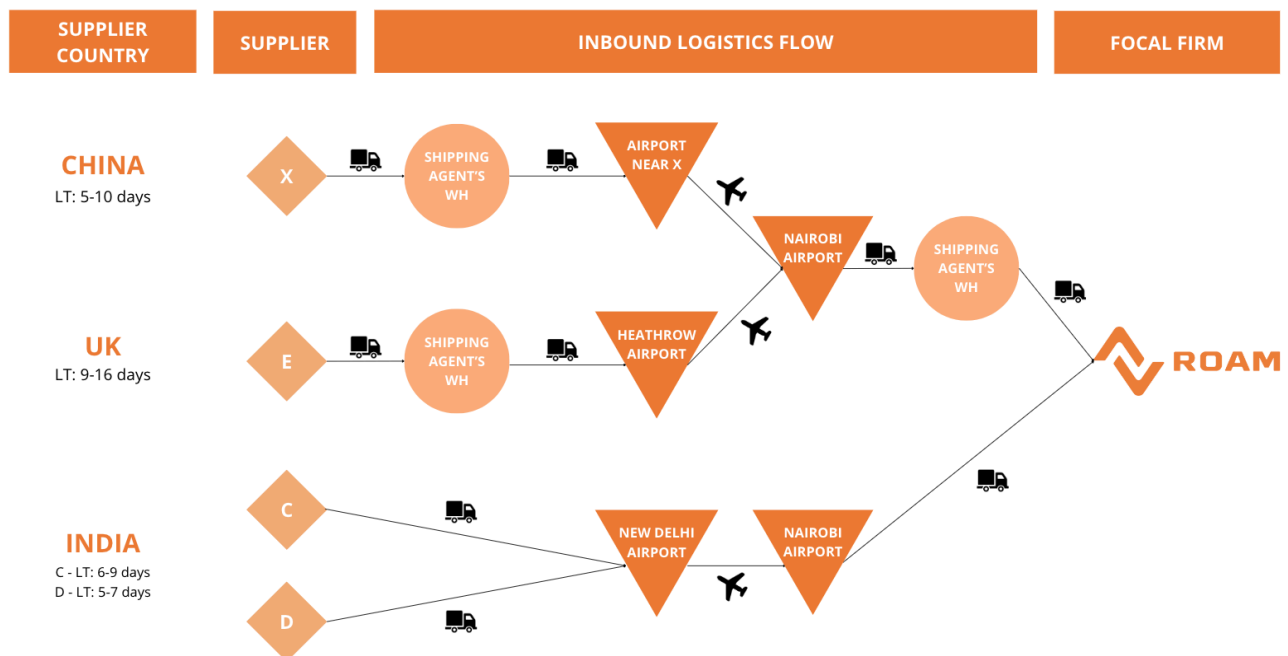


Figure 5.4. Supply chain map of Roam's air freight inbound logistics flow.

As concluded from the supply chain maps illustrated in figure 5.3 and 5.4, domestic flows from Kenyan suppliers are simpler than the international flows. The geographic proximity allows for deliveries by road in less than a day. This contrasts with Roam's global inbound flows and supports the theoretical advantages of local sourcing, including reduced complexity and improved

responsiveness as explained in section 3.2.5.1 *Sourcing*. However, Roam's domestic flows represent solely 10% of the total inbound volume, limiting their impact on the overall logistics. Moreover, air freight generally provides shorter lead times and a less complex supply chain compared to sea freight. However, it is less optimized in terms of volume efficiency, as shipments are not consolidated and goods are transported in significantly smaller quantities as learned in section 3.2.5.2 *Transport modes*. Note that supplier X in figure 5.4 represents any Chinese supplier as their air freight inbound logistics flows are the identical.

5.3.2 Supplier location

Mapping the location of suppliers helps visualize their geographical distribution and contributes to the analysis of potential inefficiencies and areas for improvement. These maps are spatial and include each city in which suppliers are located, along with the number of suppliers in that given city marked in beige diamond-shaped symbols, similar to the logistics flows maps. Additionally, the sea port used for export in each country is mapped out with an orange upside-down triangle, contributing to an understanding of the distance between suppliers and the export port. The exact location of the suppliers along with the name of the cities and the suppliers are kept confidential by request of Roam. The map showcasing the scattered locations of the Chinese suppliers is presented in figure 5.5.

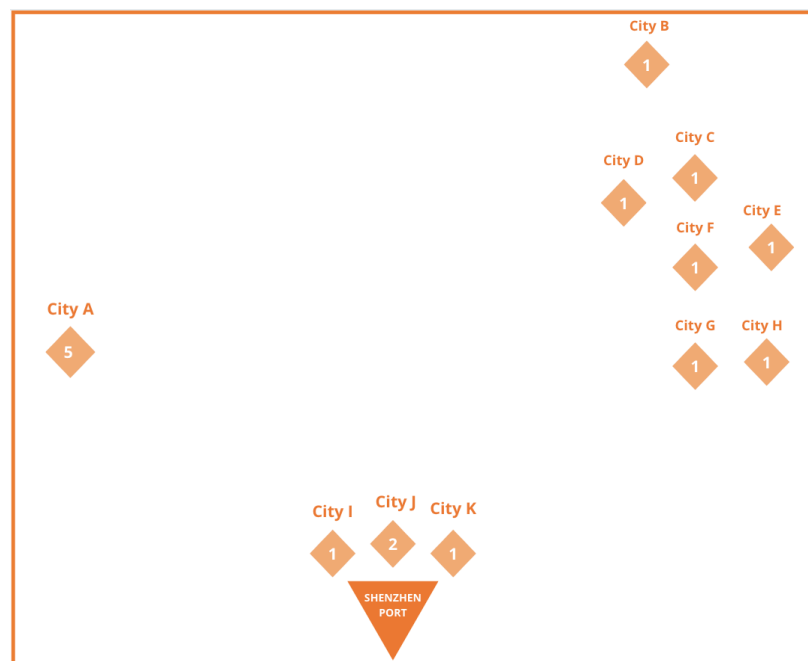


Figure 5.5. Supply chain map of the scattered locations of Roam's suppliers in China.

Five of Roam's 16 suppliers in China are located in City A, four are located in cities near Shenzhen port (City I, J, and K) and the remaining suppliers are spread across various cities in eastern China. Supplier A, the supplier where shipments are consolidated, is located in City K, relatively close to Shenzhen port. It is evident that Roam has initiated a strategy to cluster suppliers in City A to reduce inland transport costs. Additionally, the suppliers near the port also contribute to lowering the transportation costs. However, overall, the Chinese suppliers are still relatively scattered around the country.

Nevertheless, to avoid sub-optimization of the supply chain, it is essential to evaluate the trade-off between component costs and transport costs as described in section 3.2.5.1 *Sourcing*. While some cities may offer suppliers with lower component costs or higher quality, they may be located far from the port or other suppliers, resulting in increased inland transport costs. In contrast, cities close to the port might not offer the same component quality or cost advantages. Therefore, a comprehensive analysis comparing component costs and supplier quality with transport costs should be conducted to support the optimal suppliers.

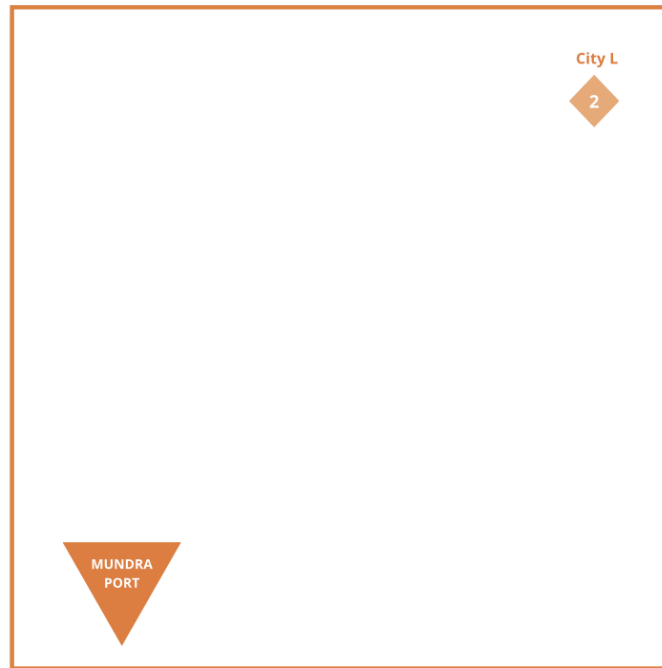


Figure 5.6. Supply chain map of the locations of Roam's suppliers in India.

The map of Indian suppliers, illustrated in figure 5.6, is less complex as Roam has only two suppliers in India, which both are located in City L, approximately 1200 kilometers from Mundra port.

No maps have been developed for the location of suppliers in the UK and Kenya, as there is only one supplier in the UK whose goods are transported directly to the nearest airport and the Kenyan suppliers are located close to Roam Park and are not within the scope or focus of this thesis.

5.3.3 Cost mapping

Cost mapping has been applied to the inbound logistics flow for each supplier country and transport mode. The various types of charges from example shipments are mapped along the logistics flow at the specific points where the cost-incurring activities occur. This approach generates a clearer understanding of the costs associated with inbound logistics and serves as a foundation for the categorization and analysis of costs presented in section 5.4 *Cost analysis*.

Three cost maps have been developed based on example shipments from 2024: one for a sea freight shipment from India, one for an air freight shipment from India and one for a sea freight shipment from China. Due to limited data availability, no cost map has been created for an air freight

shipment from China. Neither has a shipment from the UK been mapped since the corresponding invoice lacks a detailed cost breakdown.

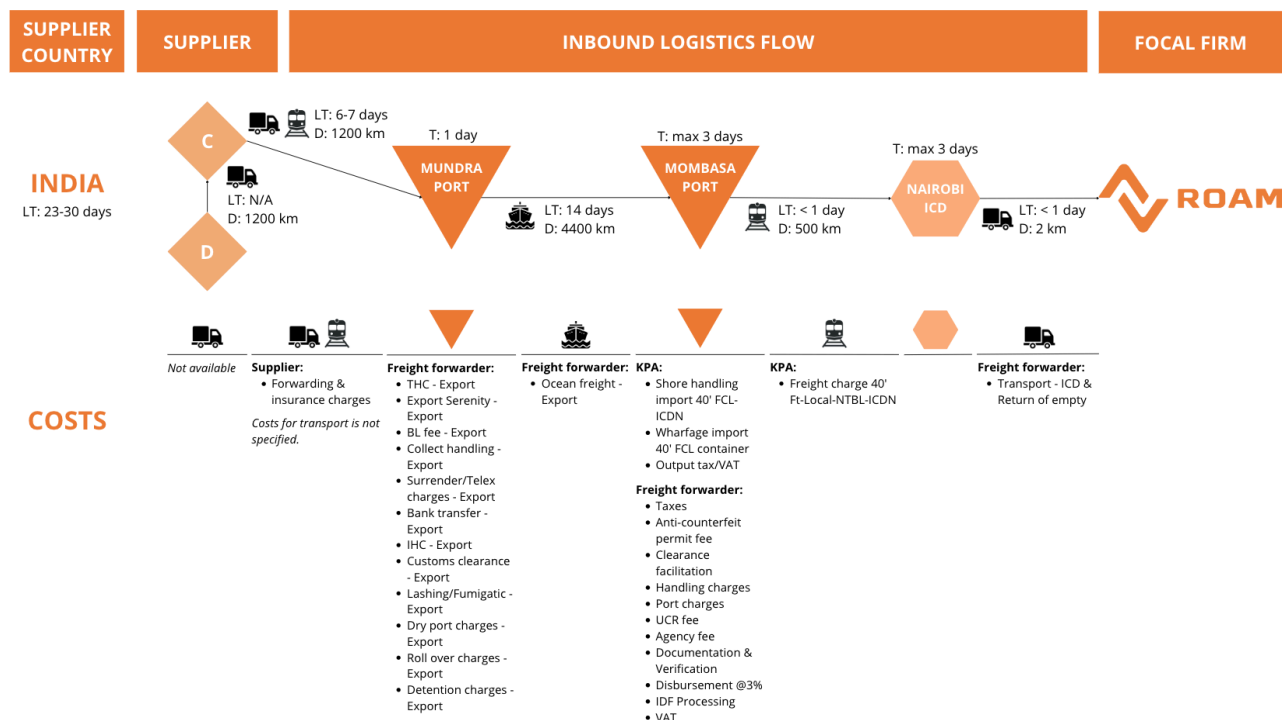


Figure 5.7. Supply chain map of the costs of a sea freight shipment from India in 2024.

The example shipment from India is transported as a non-TBL shipment in a 2 TEU container, as illustrated in figure 5.7. In general, the costs associated with the shipment include transport from the consolidation supplier to Mundra port, export and handling charges at Mundra, ocean freight costs from Mundra to the port of Mombasa and handling charges at Mombasa. Additional costs incurred at Mombasa include customs clearance, duties and taxes, and freight forwarder fees. Following clearance, Roam is charged for transport from the port of Mombasa to the Nairobi ICD and subsequently from the ICD to Roam Park. As the shipment is non-TBL, the empty container must then be returned to Mombasa port, resulting in additional domestic transport costs. As shown in the cost map in figure 5.6, Roam was also charged detention fees due to delays at Mundra port. In addition, delays in Roam's internal payment process resulted in disbursement costs at Mombasa port. Finally, no cost is specified for the transport to Mundra within India, nor for the transport between the supplier and the consolidation point, due to a lack of available data. This highlights Roam's current lack of structure in data collection related to shipments.

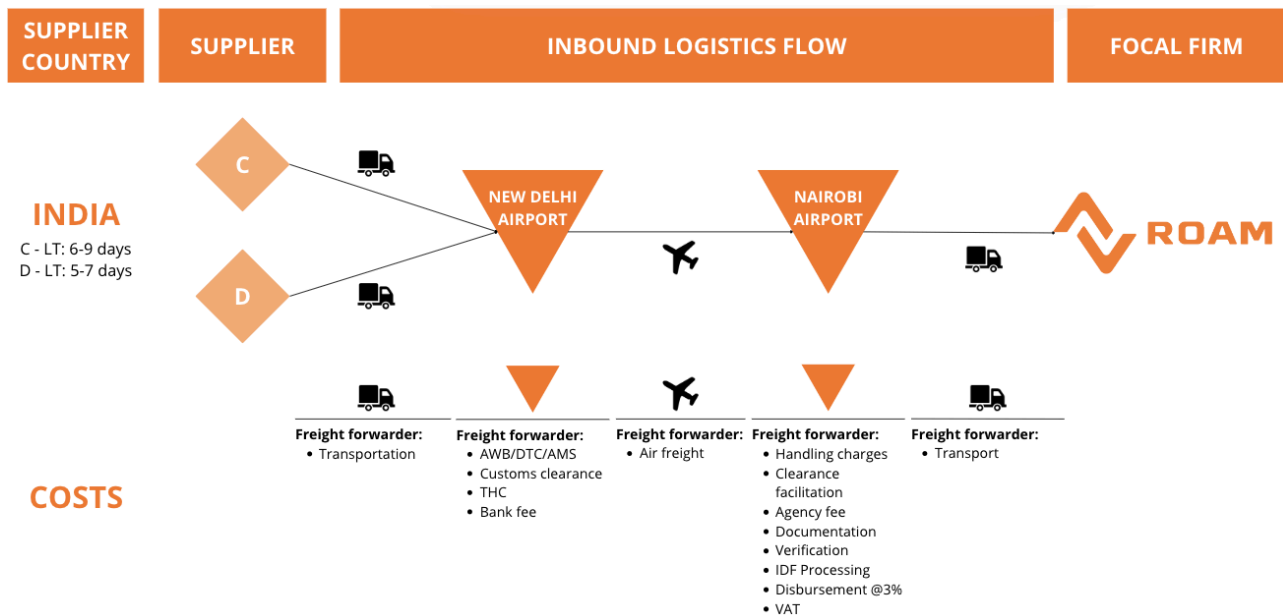


Figure 5.8. Supply chain map of the costs of an air freight shipment from India in 2024.

The example shipment transported by air from India, illustrated in figure 5.8, follows a similar structure to the sea freight shipment. However, the cost breakdown is less detailed. In addition to transport costs, export and customs clearance costs, air freight and handling charges, the shipment also incurred disbursement costs. This further highlights the impact of delayed payment processes at Roam.

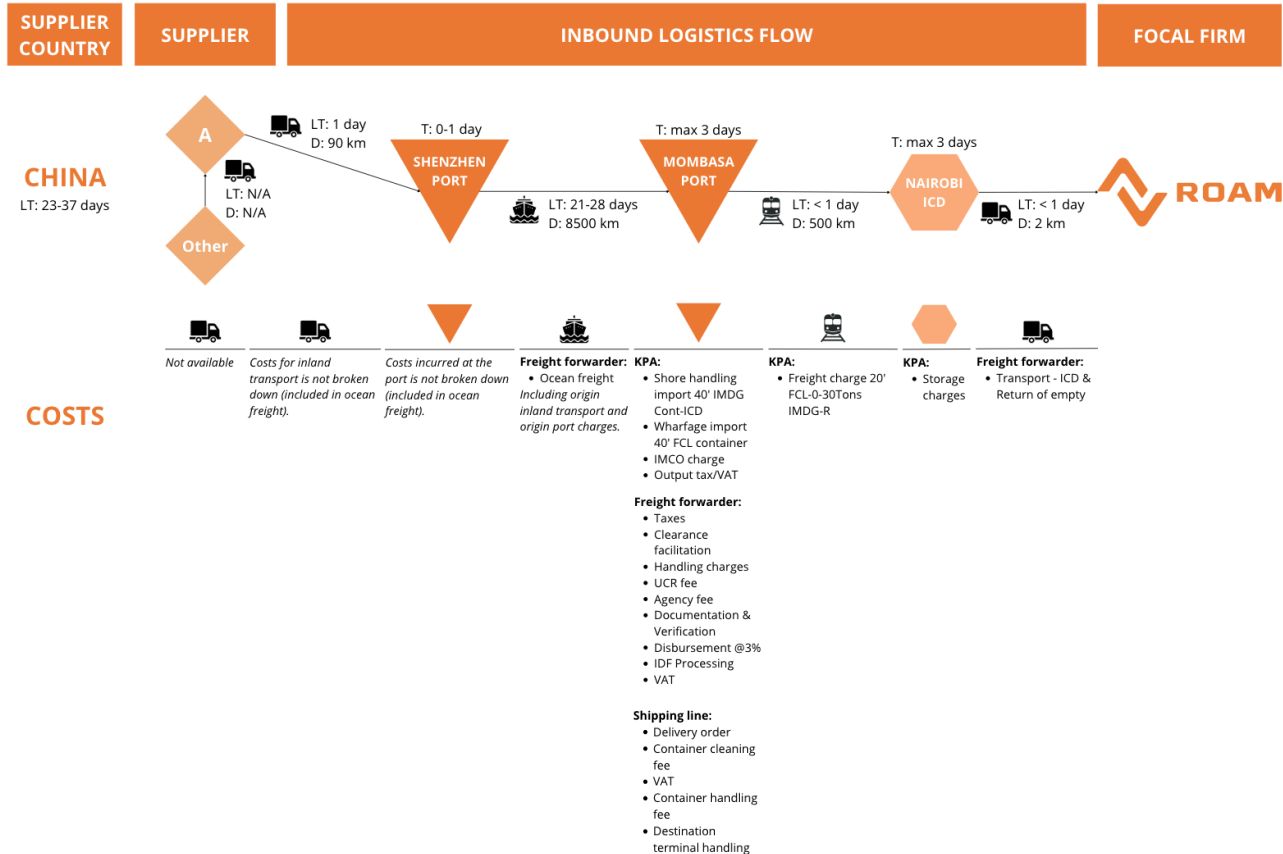


Figure 5.9. Supply chain map of the costs of a sea freight shipment from China in 2024.

Lastly, the shipment from China, illustrated in figure 5.9, contains dangerous goods and is also transported as a non-TBL shipment in a 2 TEU container. The overall cost structure is similar to that of the sea freight shipment from India. However, additional charges are incurred due to the dangerous goods transport, such as an IMCO charge. Once again, the cost map reveals a lack of structured data and detailed cost breakdowns, particularly regarding inland transportation within China, for which no specific costs are available. Due to the non-TBL arrangement, additional freight charges are incurred for transport from Mombasa to the Nairobi ICD and the cost of returning the empty container is higher compared to TBL shipments, as the container must be returned to Mombasa instead of the Nairobi ICD. As with the Indian shipment, disbursement costs and extra storage charges arise due to delays in Roam's internal payment process. The cost map further illustrates the large number of charges incurred at the port of Mombasa, which may contribute to oversights or delayed payments, given the complexity and volume of fees processed at that point.

5.4 Cost analysis

5.4.1 Cost categorization

As mentioned in section 3.3 *Cost analysis*, it is important to analyze the costs within inbound logistics. One cost analysis method mentioned in section 3.3.1 *Logistics cost analysis* is a classification into cost categories. This helps to understand the type of costs that are related to the inbound logistics of a shipment, as each cost item is classified according to a specified category. Each category thus has several cost elements within, showcasing how the classifications are defined based on the scope of the cost elements. By analysing the definitions of each cost element found in the shipment invoices presented in section 4.3.1 *Breakdown of invoices*, along with theory on typical inbound logistics activities and how they can be classified into separate groups from section 3.3 *Cost analysis*, four main cost categories have been developed.

The first category is defined as *Transportation*, and is related to expenses incurred in the physical movement of goods from one location to another across various modes such as road, rail, air, or sea. This includes freight charges, inland haulage, ocean freight, air freight, and the return of empty containers. The second category combines costs related to the physical handling and temporary storage of goods at terminals, ports, or warehouses, thus named *Storage & handling*. It captures the movement of cargo within a facility and charges linked to space utilization or special handling. Next is a category named *Customs clearance*, including costs incurred in the documentation, inspection, and regulatory compliance process required to import or export goods across borders. This category also includes service fees charged by clearing agents for communicating with government authorities. The last category is named *Administration*, covering costs related to financial transactions, documentation, and coordination tasks performed to support logistics operations during shipping. These are often charged by freight forwarders or agents who manage documentation, disbursements, and banking procedures on behalf of shippers or consignees. The categories along with their exact cost elements collected from the shipment invoices are presented in Table 5.1.

Table 5.1. Cost categories and their corresponding cost items. Some cost items are given general labels to simplify the table (e.g. Container charges, Terminal handling service, Freight charge [...], Shore handling [...], Detention charges etc).

Category	Cost item	Fixed/Variable
Transportation	Freight charge [...]	Fixed per container size
	Transport - ICD & return of empty	Variable
	Ocean freight	Variable
	Transportation	_*
	Air freight	_*
	IHC - Export	Fixed per container size
	Origin charges	Variable
	Detention charges	Variable
Storage & handling	Shore handling [...]	Fixed per container size
	Re-marshalling	Fixed per container size
	Handling charges	Fixed
	IMCO charge	Variable (10%)
	Container charges	Variable
	Terminal handling service	Variable
	Lashing/fumigatic - export	Fixed per container size
	THC	Fixed per container size
	Roll over charges	_*
	Export Serenity - Export	Fixed
	Storage charges	Variable (x USD/day)
	Wharfage Import [...]	Fixed per container size
	Port charges	_*
	Port security services	Fixed
	Dry port charges	Fixed per container size
Customs clearance	IDF processing	Fixed
	Clearance facilitation	Fixed
	UCR Fee	_*
	Custom Clearance - Export	Fixed per container size
	Custom clearance	_*

	Anti-counterfeit permit fee	-*
	Import service	-*
	Taxes/VAT	Variable (16%)
	PVoC	-*
	Exemption Code	-*
Administration	Bank charges	-*
	Bank transfer - Export	Fixed
	Bank Fee - Export	Fixed
	Disbursement@3%	Variable (3%)
	Collect Handling - Export	Fixed
	Documentation & verification	-*
	Documentation fee - Destination	Fixed (per BOL)
	BL Fee - Export	Fixed (per BOL)
	Surrender/Telex Charges - Export	Fixed
	Delivery order or DO Fee - with 16% VAT	-*
	AWB/DTC/AMS (air)	-*
	Agency Fee	-*

* *Not enough data available to draw any conclusion.*

In addition to the categories and their corresponding cost items, table 5.1 presents whether the cost items are fixed or variable, and if applicable, specifies the aspects that define the cost size. Because of the limited transparency in the activities included in each cost item and the inconsistency in the type of cost items included in the shipment invoices, the majority of the cost elements are difficult to analyse in terms of cost fluctuations. However, there are some cost items which are more explicit and consistent in terms of their cost size throughout the invoices, which also makes it simpler to comprehend their corresponding cost drivers. For example, the cost item *Freight charge [...]* and *Shore handling [...]*, given in the KPA invoices, are presented in table 5.1 as fixed costs per container size. Thus, a clear cost driver for these items is the size of the container, giving different fixed costs depending on if the container is 1 TEU or 2 TEU. Other cost items defined as fixed in table 5.1 have a pre-set cost per shipment, or per BOL for administration cost items such as *Documentation fee - Destination*.

On the other hand, some costs in table 5.1 are presented as variable costs, fluctuating based on different factors. Included as variable costs are for example *Origin charges*, which fluctuate depending on the supplier, or *Storage charges*, which are set at a fixed price per day, but increase along with the number of days in storage while waiting for Roam's payment to be received so that the cargo can be released. Moreover, *IMCO charge*, which is only applicable for the shipments

containing dangerous goods, is set at 10% of the KPA invoice cost items (*Shore handling [...]*, *Freight charge [...]*, *Wharfage Import [...]*), thus dependent on the size of these cost items and their cost drivers. Other percentage-based variable costs in the table below include *Disbursement@3%*, varying depending on the total value of duties or taxes the forwarder pays on Roam's behalf, or *VAT* at 16%, fluctuating based on the total cost of services. *Container charges* and *Terminal handling charges* are generalized cost items in which specific invoice fees regarding container handling and terminal handling, respectively, have been merged into these cost items to simplify the cost breakdown. These two cost items are also defined as variable, varying depending on the freight forwarder and the type of services they have chosen to include regarding terminal and container handling in invoices. Moreover, *Detention charges* depend on how late the container is returned, increasing in cost size with later returns. As a result, this charge is also variable. Lastly, *Transport - ICD & return of empty* and *Ocean freight* are concluded to be variable costs. *Ocean freight* fluctuates based on the geopolitical situation and weather conditions, as discussed in 4.3.3 *Factors affecting costs*, while the size of *Transport - ICD & return of empty* differs depending on if the shipment is TBL or non-TBL.

The cost items in table 5.1 not identified as either fixed or variable have too little information available to conclude anything regarding their cost behavior. Without consistent patterns across invoices or additional clarification from freight forwarders, it is not possible to determine whether these costs behave in a fixed or variable manner. Therefore, they remain undefined within the current scope of analysis and should be monitored in future shipments to establish a clearer classification.

5.4.2 Cost fluctuations and invoicing inconsistencies

A general comparison of the invoices for different shipments reveals a lack of standardized cost breakdown. While some line items are consistently named and structured across different invoices, others reflect similar charges under varying descriptions. In some cases, specific cost items appear only on certain types of shipments or with particular freight partners, further highlighting the inconsistency in invoice formatting and terminology. Furthermore, the cost amounts listed on invoices received from freight forwarders and shipping lines can vary significantly between shipments. Thus, it is difficult to draw firm conclusions about the typical value of specific cost items. Some of this variation can be explained by differences in container size, in which shipments using similar-sized containers often incur similar costs for items that are charged at a fixed rate per container. However, even among shipments using the same container size, the cost of identical line items can still differ. One contributing factor may be fluctuating exchange rates, affecting the charges of the cost items depending on when the order is placed within the year. This is especially applicable to invoices from Freight Forwarder A in which the rates are given in KES. For example, Freight Forwarder A's invoices for a shipment that arrived 2024-09-22 are converted using an exchange rate of 129.2 KES per USD, while the same forwarder's invoices for a shipment which arrived 2024-10-01 are converted using an exchange rate of 160.23 KES per USD. Every investigated shipment during 2024 uses Freight Forwarder A as a freight forwarder and is paid in KES, thus making the exchange rate an important factor in the total inbound logistics cost for a shipment. Furthermore, while many freight forwarders list cost items that appear comparable, such as documentation fees or terminal handling, they may include different services under these labels. As a result, the scope of what is included can vary, leading to higher or lower charges based on the

level of service provided. Unfortunately, the specific details of what each freight forwarder or shipping line includes in a given cost item are often not disclosed, which limits the ability to make in-depth comparisons beyond the cost item's name and its total charge.

5.4.3 Cost comparisons

Costs per cost category

To identify opportunities for cost reduction in Roam's inbound logistics, it is essential to analyze the relative size of each logistics cost category. While most cost items in the sea or air freight invoices are presented on a per-shipment level, and thus on a per-container level since each shipment is maximum one full container, such unit-level comparisons may not accurately reflect the magnitude of the costs due to variations in shipment weight and the value of the goods. Therefore, to enable a fair and meaningful comparison across shipments of different scales, table 5.2 and 5.3 below presents the average cost per kilogram of goods and cost per dollar value of goods in percentages of the total average cost per kg and per value of goods respectively, for each cost category. The exact cost sizes are not presented due to confidentiality reasons. The percentages show which cost category stands for the largest portion of the inbound logistics costs based on their cost size in proportion to the other categories' cost sizes. Table 5.2 presents the percentages for sea freight, and table 5.3 presents the same metrics for air freight. Since the sea freight data is based on ten shipments, while air freight data is only based on two shipments, it is important to consider the validity of the numbers. The averages for sea freight shipments may give a more accurate view of the cost distribution across Roam's inbound logistics compared to air freight shipments because of the difference in the number of shipment invoices for each mode.

Table 5.2. Cost category shares as a percentage of total inbound logistics costs for sea freight shipments.

Category	Share of total cost per kg of goods (%)	Share of total cost per dollar value of goods (%)
Transportation	84.73%	85.11%
Storage & handling	9.71%	9.29%
Customs clearance	3.36%	2.96%
Administration	2.20%	2.64%
<i>Total</i>	100%	100%

The data in the table clearly identifies *Transportation* as the dominant cost driver within Roam's inbound logistics. Transportation costs account for 84.73% of the total average cost per kilogram and 85.11% per dollar value of goods, highlighting its significant impact on overall shipment expenses. This underscores transportation as the most immediate and strategic opportunity for cost reduction across the supply chain. *Storage & handling*, on the other hand, is relatively modest in comparison, representing only 9.71% of costs per kilogram and 9.29% per dollar value. *Customs clearance* and *administration* contribute the smallest shares to the total logistics cost, with 3.36% and 2.20% per kilogram, and 2.96% and 2.64% per dollar value, respectively. These lower percentages suggest that while there may be clear cost saving opportunities in these areas, they offer

limited potential for significant cost reduction compared to categories such as transportation. In summary, transportation is the clear priority for cost reduction efforts, while storage, customs clearance, and administrative costs appear to have a comparatively minor impact on total inbound logistics spendings for sea freight shipments.

Table 5.3. Cost category shares as a percentage of total inbound logistics costs for air freight shipments.

Category	Share of total cost per kg of goods (%)	Share of total cost per dollar value of goods (%)
Transportation	70.35%	60.72%
Storage & handling	2.87%	3.80%
Customs clearance	12.78%	16.93%
Administration	14.00%	18.55%
<i>Total</i>	100%	100%

Similarly to sea freight shipments, *Transportation* as a category represents the largest share of the total inbound logistics costs for air freight shipments, both in terms of average cost per kg of goods and per value of goods. Transportation accounts for 70.35% of the total average cost per kg and 60.72% per dollar value of goods. Although still dominant, its share is somewhat lower compared to sea freight, where it exceeds 84% in both metrics, indicating that other categories play a more substantial role in air freight.

Administration and *Customs clearance* costs seem to be significantly more prominent in air freight logistics than in sea freight. *Administration* represents 14.00% of total cost per kg and 18.55% of cost per value, the second highest cost category in those metrics. This suggests that air freight shipments may involve more complex financial processing, documentation, or agency coordination, making administration a more significant cost driver. *Customs clearance* also plays a larger role for air than in sea freight, accounting for 12.78% of the cost per kg and 16.93% per value. This elevated share may reflect stricter customs protocols or faster processing needs associated with air cargo, as well as potentially higher declared values per unit weight for air shipments.

In contrast, *Storage & handling* remains the smallest cost category in both metrics, only 2.87% of total cost per kg and 3.80% of cost per value. Thus, its relative impact remains minor for air freight, which is similar to sea freight, suggesting that storage costs are low.

Costs per transportation unit

In addition to understanding how the costs are distributed among activities within Roam's inbound logistics, it is also of interest to understand whether certain transportation units drive costs more than others. Therefore, table 5.4 presents different transportation units and their costs relative to one another. By Roam's request to keep the actual costs confidential, each cost metric is given an index, where the lowest cost is given a baseline index of 1, and the rest are expressed with a value relative to this baseline index.

Table 5.4. Average costs per transportation unit, represented by indexes.

Transportation unit	Average cost per kg of goods (\$ - Index	Average cost per value of goods (\$) - Index
2 TEU (sea)	1.00	1.00
1 TEU (sea)	1.37	2.20
Pallet (air)	12.08	15.58

The indexed cost data in the table highlights clear differences in cost efficiency between transportation units. Using the 2 TEU container as the baseline (index = 1.00), the 1 TEU container is shown to be 37% more expensive per kilogram of goods and 120% more expensive per dollar value of goods. This suggests that utilizing full 2 TEU containers is significantly more cost-effective and should be prioritized when possible to maximize shipment efficiency. Meanwhile, air transport via pallet is considerably more expensive, with cost indexes of 12.08 per kg and 15.58 per dollar value, making it over 12 times and nearly 16 times more costly than using 2 TEU in sea freight in their respective metrics. This indicates that air shipments should be used only when speed or product sensitivity justifies the added cost, and highlights a clear area for potential cost savings by shifting suitable cargo from air to sea freight where feasible.

Costs per supplier country and transport mode

Based on the costs given in the invoices, it is also possible to look into how shipments originating from different supplier countries vary. Thus, table 5.5 presents the costs, represented by indexes once again, separated by supplier country and main transport mode (sea or air). Shipments from both China and India can utilize both air and sea freight, while UK shipments are solely transported through air. Thus, only the possible modes in combination with supplier country are showcased in this table.

Table 5.5. Average costs per supplier country and main shipment transport mode, represented by indexes.

Supplier country	Main transport mode	Average cost per kg of goods (\$) - Index	Average cost per value of goods (\$) - Index
China	Sea freight	1.00	1.00
China	Air freight	N/A*	N/A*
India	Sea freight	1.88	24.50
India	Air freight	16.55	254.00
UK	Air freight	6.86	17.50

* No invoices for China air freight shipments were provided by Roam.

The data in the table highlights the cost-efficiency differences between air freight and sea freight, as well as between geographic origins. Overall, these patterns suggest that supplier location and

transport mode are major cost determinants. It is evident that air freight is substantially more expensive across all geographies. Air shipments from India are the most costly, with indexes of 16.55 per kg and 254.00 per dollar value, making them over 16 times and 254 times more expensive than Chinese sea freight in weight and value terms respectively. Air freight from the UK also shows high cost indexes, 6.86 and 17.50 respectively, reinforcing the broader trend that air transport is the more expensive option compared to sea freight. The indexes showcase the importance of prioritizing sea freight, particularly from China, for less costly shipments. Sea freight from India, while more economical than air, still incurs significantly higher costs than sea freight shipments from China, with 1.88 times higher per kg and 24.5 times higher per dollar value.

It is important to note that the air freight data for the UK and India are each based on a single shipment, which means the resulting indexes reflect the cost characteristics of that specific case. While this limits the ability to generalize with certainty, the figures still provide a useful indication of broader cost patterns and can serve as a reference point when comparing the relative costs of sea and air freight shipments.

5.5 Cost inefficiencies and potential improvements

Based on the analysis of Roam's inbound logistics, as well as the cost analysis and comparisons, several cost inefficiencies and potential improvements have been identified. These are presented in the following section. The identified inefficiencies and suggested improvements are structured according to the cost categories outlined in section 5.4.1 *Cost categorization*: administration, transportation, customs clearance and storage and handling.

5.5.1 Administration

According to section 5.4.3 *Cost comparisons*, administrative activities account for 2.20% of the total average cost per kilogram of goods for sea freight shipments and 14% for air freight. While administration does not represent the largest share of inbound logistics costs, inefficiencies in this area often lead to additional expenses in other cost categories. Therefore, it is beneficial to look into improvements for Roam in this area.

5.5.1.1 Data tracking

The first identified issue within Roam's supply chain management in terms of administration is the lack of structured data tracking and the limited understanding of supply chain processes and associated costs among the employees. As concluded from section 4.2.1 *The flow of goods*, most employees are only familiar with their own areas of responsibility and no one has a holistic or comprehensive understanding of the entire supply chain. As a result, many issues risk falling through the cracks, as they are often assumed to be handled by others. Currently, only the Logistics Manager has insight into all stages of the inbound logistics flow, making the supply chain heavily dependent on her. This dependency not only reduces operational efficiency but also creates risks when she is unavailable or if she would leave the organization. Furthermore, as Roam does not actively track KPIs related to supply chain performance, it becomes difficult for the company to assess the health of the supply chain as underscored in section 3.2.3 *Data Management*.

Improving the organization of supply chain data would not only solve this immediate issue but also facilitate identifying other bottlenecks and prevent that other inefficiencies emerge. As part of this

thesis, the structure of existing data has already been improved by cleaning historical shipment data and the associated costs, as well as visualizing the inbound logistics flows through strategic supply chain maps. As concluded in section 3.2.4 *Supply Chain Mapping*, strategic supply chain maps are valuable tools for distributing key information, identifying potential bottlenecks and supporting strategic decision-making. To address the issue of employees being familiar only with their own responsibilities, resulting in a lack of holistic understanding of the supply chain, the maps contribute to creating a shared understanding among employees and stakeholders. In turn, this supports strategic alignment between the corporate and supply chain strategies. Roam specifically requested physical copies of the supply chain maps to be displayed in the office to achieve easy access during ongoing projects. Moreover, visualizing the inbound logistics information in supply chain maps also helps mitigate the risk of internal corruption. As discussed in section 3.1 *Kenyan EV market* and section 4.1 *Roam's strategy in the Kenyan market*, corruption is a significant challenge for companies operating in Kenya. Making supply chain data, actions and decisions transparent and accessible across the organization reduces opportunities for corruption within the company.

By keeping the supply chain maps consistently updated also contributes to improved data structure. However, for a more permanent and scalable solution, integrating the maps with data systems would allow updates to be done automatically as mentioned in 3.2.4 *Supply Chain Mapping* and 3.3.2.2 *Administration*. Automation reduces the need for time-consuming manual data entry and improves real-time data accuracy. For example, various data tools exist that can extract information from shipping documents and integration with freight forwarders' systems can streamline the tracking and verification of shipments as highlighted in section 3.3.2.2 *Administration*. However, due to the current inconsistent and unstructured format of the data, integration is not yet feasible. With scaling and new technology in mind, AI could be leveraged to decipher the data and automatically structure it as mentioned in section 3.2.3 *Data Management*, although this approach requires further investigation which is out of scope for this thesis. Tracking KPIs in a structured manner is also crucial for the continuous improvement of supply chain management and for assessing the supply chain performance as highlighted in section 3.2.3 *Data Management*. Since cost efficiency is Roam's priority, KPIs regarding costs are the most important.

5.5.2 Transportation

Transportation costs represent the largest share of Roam's inbound logistics expenses, accounting for 84.73% of the total average cost per kilogram of goods for sea freight shipments and 70.35% for air freight, as shown in section 5.4.3 *Cost comparisons*. Accordingly, the greatest number of inefficiencies and potential improvements have been identified within this cost category. These are presented in the following section.

5.5.2.1 Supplier location

Although Roam has initiated strategies for selecting sourcing locations, the supplier location mapping in section 5.3.2 *Supplier location* indicates that there is still room for improvement. Already, Roam is working to find suitable suppliers in China and move sourcing from India due to the concerns about lower component quality and higher costs as described in section 4.1.2 *Supply chain strategy*. With the two remaining suppliers in India, it is advantageous that both are located in the same city as this allows for easy consolidation at Supplier C without leading to significant

transport costs between the suppliers. However, the long distance from Supplier C to Mundra port results in longer lead times and increased transport costs. Given that Chinese suppliers generally offer higher quality and lower transportation costs, there are few strategic benefits of maintaining suppliers in India. Keeping the suppliers in India could be beneficial to improve supply chain resilience by spreading supply risk across multiple countries as highlighted in section 3.2.5.1 *Sourcing*. However, this is only beneficial in the case of dual sourcing, when the same component is sourced from more than one supplier. Since Roam currently sources each component from a single supplier, disruptions in China would still affect the supply chain even if Indian suppliers were retained. However, single sourcing is beneficial for obtaining volume discounts, as described in section 3.2.5.1 *Sourcing*, particularly since Roam currently produces at low volumes and would need to place very small orders with a dual sourcing setup. Additionally, as noted in 3.2.5.1 *Sourcing*, single sourcing enables companies to build strong supplier relationships and simplifies the logistics, which is an important advantage for Roam given the existing complexity of their supply chain. Therefore, in the long term, Roam is recommended to phase out its remaining suppliers in India as the current setup offers no significant advantages in terms of cost, lead time or quality which are Roam's priorities. However, it is important that the transition is only implemented when reliable, high-quality suppliers have been found.

Furthermore, the supplier in the UK only supplies one single component and leads to excessive air freight, which increases the total transport costs significantly. Therefore, it is recommended for Roam to replace the UK supplier and search for another competent supplier either locally or closer to the other suppliers in China that can supply that component since that would simplify the supply chain and reduce the costs.

To avoid suboptimization as described in section 3.2.5.1 *Sourcing*, the trade-off between component price and transport costs need to be considered. Therefore, before changing suppliers it is important to compare the component unit cost of the supplier compared to the transport cost to Roam Park from that supplier. Also, to ensure that the component quality of the supplier is sufficient to be durable for the entire leasing period which is explained as a priority in section 4.1.1 *Business model and competitive strategy*. There is also a trade-off between the benefits and challenges of global versus local sourcing which impacts transportation costs. However, this is further discussed in section 5.5.3.2 *Local sourcing*.

Lastly, even when suppliers are located within the same country, their geographic location should be optimized to minimize inland transport costs. This is particularly important given that Roam consolidates all orders at a designated supplier, meaning that components from various suppliers must first be transported to the consolidation point before being shipped to Roam. This adds extra inland transport cost. Currently, Roam's Chinese suppliers are relatively well-positioned with several located in the same city, known as a motorcycle manufacturing hub, and others located near Shenzhen ports or across eastern China as illustrated in section 5.3.2 *Supplier location*. It is recommended that Roam continue prioritizing suppliers located near the consolidation supplier, provided they meet the company's quality requirements. Additionally, selecting suppliers close to the port could further reduce inland transport costs. However, given the consolidation process, the location of the consolidation suppliers becomes more critical than the proximity of individual suppliers to the port. Therefore, the optimal setup would be to select a consolidation supplier located near Shenzhen port and thereby minimize total inland transport costs before international

shipping. The location of the local suppliers is less important as Roam states that transport costs within Kenya are negligible due to the proximity of all suppliers to Roam Park, as noted in section 4.2.3 *Supplier network*.

5.5.2.2 Container returns

Another identified inefficiency regarding transportation is the detention charges, as well as the high costs associated with the container transport within Kenya. As described in section 4.3.4.2 *Invoices from freight forwarders*, detention charges arise when an empty container is not returned to the designated location within three days. In addition, bank charges are incurred if the freight forwarder pays the detention charges on Roam's behalf. Both of these cost types can be entirely avoided through better planning and more efficient logistics. According to section 4.2.1 *The flow of goods*, empty containers are returned to the Nairobi ICD for TBL shipments and to the port of Mombasa for non-TBL shipments. The analysis of the invoices in section 5.4.1 *Cost categorization* shows that domestic transport costs are higher for non-TBL shipments, as the containers must be returned to Mombasa, compared to TBL shipments. Theory in section 3.3.2.5 *Transportation* highlights the costs incurred of back-hauling movements, which are higher in the case of non-TBL where empty containers need to be transported further compared to TBL. Moreover, it is easier to predict that containers are returned on time with TBL shipments, since the Nairobi ICD is located near Roam Park and in turn leads to fewer risks of supply chain disruptions. Therefore, it is recommended that Roam use only TBL shipments as this would reduce domestic transportation costs and eliminate both detention and bank charges through the improved logistical efficiency.

5.5.2.3 Ocean freight

The major cost driver in transportation, as well as in the total inbound logistics costs, is ocean freight. Based on the collected invoice data compared in section 5.4.3 *Cost comparisons*, approximately 84.73% of the total inbound logistics costs for sea freight shipments are connected to ocean freight charges. While ocean freight is an unavoidable cost, there is potential for cost reduction. Nearly all of Roam's sea freight shipments were handled by Freight Forwarder A, as indicated by the investigated invoices. This is likely due to them offering comparatively lower prices. However this cannot be confirmed, as the quotations provided by different freight forwarders are highly inconsistent and difficult to compare as noted in section 4.3.1 *Breakdown of invoices*. Furthermore, Roam has only explored a limited number of freight forwarders, which suggests that potentially more cost-effective alternatives may exist.

Thus, it is recommended that Roam expands its pool of freight forwarders and implements a competitive tendering process to enable transparent comparison and negotiation of rates and services. This approach would not only incentivize better pricing and service levels through competition, but also reduce dependency on a single provider and thereby mitigate risks related to service quality, corruption, and operational disruptions.

5.5.2.4 Price structure in quotations

As discussed in section 5.4.2 *Cost fluctuations and invoicing inconsistencies*, the cost breakdowns within quotations received from logistics service providers are currently unstandardized. This makes it challenging to compare freight forwarders and identify the most cost-effective option for a given shipment. To address this issue, it would be beneficial to develop a standardized quotation

framework, which would provide a clear structure for how freight forwarders should present their pricing. This framework would be based on an analysis of the specific activities and services that freight forwarders typically charge for and would include all relevant cost components in a transparent and logical format. Logistics service providers could then easily fill in their pricing using this structure, allowing Roam to make direct comparisons between different quotations. Ultimately, this would enable Roam to select the provider that offers the required services at the most competitive price.

The standardized quotation framework can be structured by dividing the total cost into clearly defined categories, such as the categories according to the table in section 5.4.1 *Cost categorization* which includes transportation charges, handling and storage fees, customs clearance, and administration. Each category can then have predefined subcomponents. For instance, transportation can be broken down to showcase the cost for each mode if several modes are included, along with the distance each covers. Moreover, KPIs such as lead times can be included to provide further clarity and provide visibility into the performance and service of each freight forwarder.

5.5.2.5 Air freight

As concluded in section 5.4.3 *Cost comparisons*, using air freight is significantly more expensive per kilogram of transported goods than sea freight for Roam's shipments. For instance, shipments from India transported by air are, on average, nearly nine times more costly per kilogram compared to those transported by sea. According to section 3.2.5.2 *Transport modes*, air freight is typically suited for high-value products with small shipment sizes, where high delivery speed and low tied-up capital are critical. However, this mode of transport incurs the highest cost per transport unit and does not align with Roam's cost-efficient strategy.

As outlined in section 4.2.1 *The flow of goods*, Roam has set a target to limit air freight usage to a maximum of 30% of the total annual import volume. To support this goal and the broader cost-reduction strategy, it is recommended that Roam prioritize sea freight which offers the lowest cost per transport unit and accommodates larger shipment sizes, despite the longer lead times and increased inventory holding costs. As discussed in section 5.5.2.1 *Supplier location*, replacing the UK-based supplier will contribute to reducing reliance on air freight. In addition, air freight is currently primarily used for urgent deliveries and sample shipments when evaluating new suppliers. The continued use of air freight for initial sample shipments is justified, as ensuring component quality remains one of Roam's top priorities, as highlighted in section 4.1.2 *Supply chain strategy*. However, as Roam's supplier base matures and stabilizes, dependence on air freight is expected to decrease naturally. Urgent air shipments are often a result of poor planning and coordination or of receiving defective components from low-quality suppliers. As supplier reliability improves and cross-functional coordination is strengthened, the need for urgent shipments should decline. Improved forecasting and cross-functional collaboration are therefore essential, as underscored in section 3.2.2 *Forecasting*. Tools such as the developed supply chain maps can facilitate this by enhancing visibility and employee understanding of supply chain flows. Moreover, when dual sourcing with local suppliers is implemented, urgent deliveries can be fulfilled locally and thereby avoiding the need for expensive air freight.

Furthermore, Roam may benefit from evaluating the possibility of maintaining higher safety stock levels to reduce the frequency of urgent air freight. This would require assessing the trade-off between inventory holding costs and the costs associated with emergency shipments. As inventory costs are outside of the scope of this thesis, this trade-off is recommended to be investigated in further research. Although air freight cannot be entirely eliminated and doing so may not be optimal, Roam can significantly reduce inbound logistics costs by limiting the use of air freight to strategically justified cases.

5.5.3 Customs clearance

As discussed, customs clearance is a complex aspect for international shipments to Kenya. According to section 5.4.3 *Cost comparisons*, customs clearance charges account for 3.36% of the total average cost per kilogram of goods for sea freight shipments and 12.78% for air freight. Despite representing a smaller share of overall inbound logistics costs compared to transportation, there are notable inefficiencies in this area. Addressing these could lead not only to cost reductions but also to shorter lead times.

5.5.3.1 Clearing location

One of the problems mentioned within Roam's inbound logistics is time-consuming customs clearance, prolonging the total lead time for a shipment to arrive at Roam Park. This is especially applicable in Mombasa port in Kenya, a major entry point for goods arriving from various countries as underlined in section 3.1.5 *Logistics landscape*. Described in section 4.2.6 *Customs clearance*, the high traffic at this port contributes to delays, as a large volume of containers must be processed and cleared through customs simultaneously. However, by using TBL, mentioned as a recommendation in section 5.5.2.2 *Container returns*, Roam can have its containers cleared at the Nairobi ICD instead. Since Nairobi ICD handles a lower volume of containers, clearance is generally faster and more efficient compared to clearance in Mombasa port. Especially, considering Mombasa port's low ranking in the GCPI as noted in section 3.1.5 *Logistics landscape*.

Although reducing the inbound logistics lead time is not a priority for Roam, it remains beneficial as the recommendation does not result in any negative impact on costs or quality. In urgent scenarios, where air freight is currently used due to the long duration of sea freight, the reduced lead time may make sea freight a more viable and cost-effective option. Consequently, Roam should aim to clear as many shipments as possible through the Nairobi ICD to minimize delays and reduce lead times.

5.5.3.2 Local sourcing

One of the cost drivers is the taxation on imported components. While taxes are generally non-negotiable, government incentives for local sourcing offer tax reductions making local sourcing an opportunity to reduce the inbound logistics costs. With the current global sourcing setup, Roam gains access to capacity and specialized capabilities that are not available locally, while also optimizing procurement costs, as highlighted in section 3.2.5.1 *Sourcing* and 4.2.3 *Supplier network*. As described in section 4.2.3 *Supplier network*, Kenyan suppliers currently lack the capability to produce many of the required Roam components and are more expensive compared to Chinese suppliers. However, as noted in both section 3.1.4 *Government policy and institutional landscape* and confirmed in section 4.1.2 *Supply chain strategy*, the Kenyan government has

introduced incentives for local production, including tax exemptions on 13 of the components required for the Roam Air. As highlighted in section 3.2.5.1 *Sourcing*, local sourcing could also simplify the supply chain, reduce lead times significantly, and avoid the consequences of fluctuations in exchange rates, trade dynamics and geopolitical risks. This is particularly relevant for trade with China, which according to the CPO at Roam poses a risk even though Africa has not been significantly impacted yet. Furthermore, as noted by the Supplier Development Engineer at Roam, building strong relationships with local suppliers is easier as they are able to meet in person and speak the same language.

However, given that cost minimization and quality are Roam's current top priorities, it is recommended that the company begin sourcing the 13 components eligible for tax exemptions locally to reduce costs, while continuing to source the remaining components from China where the total landed cost remains lower. In alignment with Roam's long-term objectives of focusing on stability and planning, as emphasized by the CPO in section 4.1.2 *Supply chain strategy*, it is further recommended that Roam consider adopting dual sourcing in the future using local suppliers. This would mean sourcing components both from China and local suppliers, which would lead to greater flexibility and thereby build a more resilient supply chain. However, the initial step is to find suitable local suppliers for the components eligible for tax exemptions and thereafter expand to dual sourcing.

5.5.4 Storage and handling

The share of costs related to storage and handling varies significantly depending on whether the shipment is transported by sea or air. According to section 5.4.3 *Cost comparisons*, storage and handling costs account for 9.71% of the total average cost per kilogram of goods for sea freight shipments, compared to only 2.87% for air freight. Identified inefficiencies and potential improvements within this cost category are presented in the following section.

5.5.4.1 Payment processes

As concluded in section 4.3.4.2 *Invoices from freight forwarders*, disbursement costs arise when freight forwarders pay duties and taxes on behalf of Roam due to delayed payment by the company. These charges are applied when Roam has not paid the required customs fees in time. In addition, storage costs are charged by port authorities when containers remain at the port beyond the free storage period. As discussed in sections 3.3.2.1 *Customs clearance and administration* and 4.1.2 *Supply chain strategy*, extended storage times can sometimes be associated with corruption among port workers, who may intentionally delay clearance. Another common cause is delayed payment from Roam, which prevents goods from being cleared and released from the port.

For both extended storage and disbursement, the underlying issue is the inefficiency of Roam's internal payment processes. To avoid unnecessary disbursement and storage charges, it is recommended that Roam streamline these processes. One proposed measure is to involve the finance team earlier in the procurement process by clearly communicating when an order is placed, its expected arrival time at the port and the timing of associated payments. As in other areas of Roam's supply chain, improved planning and forecasting is essential to ensure timely payments and prevent avoidable costs.

5.5.4.2 Economies of scale

As discussed in section 3.2.5.3 *Transportation unit and order size*, different transportation units are suitable for different types of orders and the choice of transportation unit and order size involves a trade-off between maximizing container utilization and minimizing inventory costs.

According to section 5.4.3 *Cost comparisons*, transporting goods in a 2 TEU container by sea is, on average, approximately 27% cheaper per kilogram of goods than using a 1 TEU container. When comparing cost per value of goods, transporting in 2 TEU containers is approximately 55% cheaper than 1 TEU. In contrast, using pallets shipped via air freight is on average 12 times more expensive per kilogram and nearly 16 times more expensive per value of goods than shipping in a 2 TEU container by sea. Based on these findings, it is recommended that Roam strive to use FCL 2 TEU containers whenever possible. Doing so would reduce handling costs, maximize shipping capacity and lower total transportation costs by allowing for fewer but larger orders, as highlighted in section 3.2.5.3 *Transportation unit and order size*. However, this recommendation's maximized cost reduction depends on full container utilization and efficient stowability, which is currently difficult to achieve due to the unstructured and ad hoc consolidation process. Consolidation is managed by a designated supplier when multiple orders arrive, but the process lacks systematic coordination. While improving the consolidation process is beyond the scope of this thesis, it is an area worth exploring in future research.

Nevertheless, the cost data in table 5.4 in section 5.4.3 *Cost comparisons* is based on Roam's current container utilization. Thus, even with LCL containers, using 2 TEU containers still proves to be more cost-efficient on average than using 1 TEU containers. Air freight, using smaller pallet units, is excluded from consideration due to its significantly higher costs, as discussed in section 5.5.2.5 *Air freight costs*. Moreover, placing larger orders and utilizing FCL 2 TEU containers and thereby potentially increasing inventory levels could in turn help reduce the need for urgent air shipments and improve overall supply chain resilience. However, the trade-off between increased inventory holding costs and the savings from lower logistics costs should be further investigated. Since inventory-related costs are outside the scope of this thesis, this is suggested as a topic for future research.

6. Evaluation

This section will evaluate the proposed solutions in chapter 5 based on different factors. They will be examined based on cost savings opportunities through quantitative analysis, their ease of implementation, and the lead time impact the solutions may lead to. Based on these analyses, the most feasible improvement suggestions will be presented along with an implementation plan with short term and long term perspectives.

The evaluation of the recommendations is based on three criteria: cost reduction, lead time impact and level of implementation effort. The results are summarized in table 6.1. The scale for cost reduction varies across recommendations due to limited data availability or feasibility. In cases where an exact cost reduction cannot be determined, the value is marked as N/A, i.e. not applicable, in the table. Where applicable, cost reduction percentages are specified by country or unit. Lead time impact is expressed as the estimated increase or decrease in days per shipment. The level of implementation effort is categorized as low, moderate or high and is later used to assess whether a recommendation is suitable for short-term or long-term implementation. The categorization is based on factors such as internal resource demands, external coordination with other parties, technical complexity, disruption risk to existing operations, and the timeframe required for full implementation of the recommendation.

Table 6.1. Evaluation of cost-saving recommendations.

Area of recommendation	Estimated cost reduction	Lead time impact (days)	Implementation effort
Data tracking	N/A	N/A	Moderate
Supplier location	UK → China: 85% per kg India → China: 47% per kg	UK → China: +7-28 days India → China: +0-7 days	Moderate
Container returns	74% of domestic container transport + e.g. 5.8% reduction of detention and bank charges	N/A	Low
Ocean freight	N/A	N/A	High
Price structure in quotations	N/A	N/A	Moderate
Air freight	India: 89% per kg China: N/A	China: +13-32 days India: +14-25 days	Moderate - High
Clearing location	N/A	-5-7 days	Low
Local sourcing	60% tax reduction on eligible components	- 4-36 days	High
Payment processes	3.3% per shipment	-1-7 days	Low
Economies of scale	1 TEU → 2 TEU: 27% per kg	N/A	Moderate

6.1 Administration

6.1.1 Data tracking

The recommendation regarding an improved structure of the company's supply chain data is difficult to quantify in terms of cost savings, as it does not target a specific cost item or result in a directly visible reduction in expenses. Instead, its value lies in enabling more data driven decision-making, improving visibility across the supply chain, and supporting other cost reduction initiatives. In terms of lead time reduction, the impact is also indirect, but improved data structure can contribute to faster identification of bottlenecks and more efficient planning.

The implementation effort for this recommendation is assessed as moderate. The process of organizing and mapping the supply chain data can be relatively straightforward, considering that this thesis provides supply chain maps which outline key actors, flows, and data points of relevance. These maps facilitate a clearer understanding of the type of information that needs to be collected and how it should be organized. However, further development, such as integrating new software, AI tools, or other data management technologies may require more time, technical expertise, and change management to ensure successful integration and adoption across the organization. While the process of structuring and collecting relevant data may require significant time and resources, the long-term benefits of improved decision-making, operational efficiency, and scalability are substantial.

6.2 Transportation

6.2.1 Supplier location

When evaluating the recommendation to change supplier locations, it is not possible to quantify the potential cost reduction related to inland transport between suppliers within China due to the lack of available data. However, by replacing the UK-based supplier and sourcing the component supplied from that supplier from a supplier in China instead, the total inbound logistics cost per kilogram of goods can be reduced by approximately 85% on average of that component, as concluded from table 5.5 in section 5.4.3 *Cost comparisons*, representing a significant improvement. In the longer term, replacing the Indian suppliers with Chinese suppliers is estimated to reduce the total inbound logistics cost per kilogram of goods by approximately 47% on average for sea freight shipments. These changes would therefore have a substantial impact on overall inbound logistics costs. It should be noted, however, that these estimates are based on the assumption that the replacement shipments incur the same costs as the current average shipments from China.

Regarding lead time effects, replacing the UK-based supplier with a Chinese supplier and thereby switching to sea freight would increase the lead time by approximately 7-28 days, primarily due to the change in transport mode. In contrast, replacing the Indian suppliers with Chinese suppliers is expected to have minimal impact on lead times. For sea freight shipments, the lead time would remain unchanged or increase by a maximum of 7 days. These lead time estimates are based on findings concluded in the supply chain maps in section 5.3.1 *Inbound logistics flow*. For the inland transportation within China, the impact on lead time cannot be determined due to the lack of available data. Although lead times may increase as a result of this recommendation, the trade-off is

considered acceptable as cost-efficiency is Roam's key priority, as concluded in section 5.1 *Strategic alignment in the Kenyan market*.

The level of implementation effort of this recommendation is considered to be moderate, as it requires effort to identify new, competent suppliers that meet all of Roam's requirements prior to making any supplier changes. While replacing all suppliers may require significant effort as a high-level strategic sourcing decision, Roam has already initiated this work and has an established process in place, which allows for supplier changes to be carried out gradually. As a result, Roam's inbound logistics can benefit significantly in terms of cost and lead times.

6.2.2 Container returns

As previously mentioned, focusing on TBL shipments would eliminate both detention charges and bank charges from the invoices. This would result in a direct reduction in inbound logistics costs per shipment. Detention charges are variable costs as shown in table 5.1 and depend on how late the container is returned at the designated location. For example, in shipment B seen in table A1 in Appendix, detention charges account for 5.7% of the total inbound logistics cost, illustrating the potential cost savings achievable through TBL. While bank charges represent only 0.1% of the total cost, their elimination may have a limited impact on individual shipments. However, when accumulated across multiple shipments, this reduction could contribute to more noticeable long term savings. Apart from the reductions in detention and bank charges, returning the container to the Nairobi ICD instead of the port of Mombasa results in a 74% cost reduction for container transport from the ICD to Roam Park and for the return of the empty container.

Returning the container at the Nairobi ICD instead of the port of Mombasa does not noticeably affect the lead time for the shipment to reach Roam Park. However, the time required to return the empty container is reduced due to fewer delays, although this reduction cannot be quantified with the available data. Furthermore, by using TBL shipments and changing the clearing location, the lead time is affected as a result. However, that consequence is the primary focus in section 6.3.1 *Clearing location*, thus explained in more detail there.

The effort required from Roam to implement this recommendation is low. The responsible employee simply needs to indicate the preference for using TBL for sea freight shipments and request a corresponding quotation. Following this, it is the responsibility of the freight forwarder and clearing agent to coordinate and fulfill the request accordingly.

6.2.3 Ocean freight

By exploring alternative freight forwarders and introducing a competitive tendering process, Roam has the potential to reduce its inbound logistics costs. However, accurately estimating the extent of these savings is difficult. The actual cost reduction will depend on whether newly identified freight forwarders offer more competitive rates than current providers. Furthermore, the highly variable nature of ocean freight pricing, driven by external factors, makes it difficult to quantify the impact of this initiative with certainty. Nevertheless, introducing a competitive tendering process among potential new freight forwarders is expected to result in the most cost-efficient option, thereby supporting Roam in reducing its logistics expenses, specifically within ocean freight. In addition, while the primary objective is cost reduction, this initiative also enables Roam to evaluate other

KPIs, such as lead times, reliability and service quality. As a result, the company may benefit from both financial and operational improvements.

This recommendation is assessed as challenging to implement, as it requires a comprehensive effort to identify and evaluate new freight forwarders that align with Roam's specific requirements. The tendering process also demands internal resources for planning, preparation of evaluation criteria, communication with potential providers, and final selection. Thus, the implementation process would require careful planning and sufficient resources for it to be beneficial long-term.

6.2.4 Price structure in quotations

The development of a standardized quotation framework in order to reach a general cost breakdown in invoices is difficult to analyze in terms of immediate cost savings. However, in the longer run it should reduce overall logistics costs by enabling comparison between logistics service providers, allowing Roam to choose the most cost efficient provider for a given shipment. While the framework does not directly reduce costs, it enhances transparency and standardization in the sourcing process. This in turn enables more informed decision-making, improved negotiation leverage, and a reduced risk of hidden or unexpected charges. As a result, the financial benefits of the framework are realized gradually through more efficient supplier selection and improved cost control.

In terms of time savings, the current setup, where the Logistics Manager receives and manually compares quotations from each freight forwarder, is time-consuming due to the inconsistencies in cost elements and breakdowns. The developed quotation framework should be able to speed up this process by ensuring that all quotations follow a uniform structure, making them easier to review side by side. This will as a result reduce the administrative burden and shorten the time required to select a freight forwarder.

Regarding the level of implementation effort, this recommendation is assessed to be moderate. While such a framework would be quite simple to develop through this thesis' analysis of typical cost items included in invoices, it is also important to consider how logistics service providers may perceive this change. Implementing the framework would require freight forwarders to adjust their current pricing structure and quotation format, which may meet some resistance if it involves altering established internal systems or templates. To minimize the barrier to adoption and increase acceptance, the framework should be developed along with the logistics providers. This would ensure that the framework captures all the necessary cost components and covers the range of services that providers may offer. Along with increasing the chances of acceptance, this would also foster stronger working relationships between Roam and its logistics partners.

6.2.5 Air freight

Air freight is significantly more expensive than sea freight. Due to the limited data availability on air freight shipments, a fair cost comparison can only be made for shipments from India, where data is available for both transport modes. As concluded from table 5.5 in section 5.4.3 *Cost comparisons*, switching from air to sea freight for Indian shipments could reduce the total inbound logistics cost per kilogram of goods by approximately 89% on average.

In terms of lead time, switching to sea freight will naturally result in longer delivery times, which thereby require improved forecasting and planning to ensure demand is met on time. For Chinese shipments, the lead time is expected to increase by 13-32 days per shipment and for Indian shipments by 14-25 days per shipment. However, as previously discussed, this is considered an acceptable trade-off considering Roam's cost-efficient strategy.

Regarding implementation efforts, it is difficult to eliminate air freight entirely, as Roam needs the flexibility to order sample shipments by air and respond to urgent situations. However, achieving Roam's goal of limiting air freight to a maximum of 30% of total import volume is considered moderately difficult. With improved planning and coordination and by discontinuing the use of the UK-based supplier, Roam should be able to reach this target.

6.3 Customs clearance

6.3.1 Clearing location

Next is the evaluation regarding the recommendation to clear the containers at the Nairobi ICD rather than at Mombasa port. From a quantitative perspective, it is not possible to evaluate the solution in terms of cost reduction. Since clearing the goods in Nairobi ICD is associated with using TBL, it can be concluded that the costs in general will be reduced along with this decision as presented in section 6.2.2 *Container returns*, but it is not possible to quantify exactly the cost impact connected to the actual clearing location.

However, it is clear that conducting the clearance in Nairobi ICD has an impact on the lead time reduction, which can be quantified according to the number of days the lead time is reduced by. This is found in section 4.2.6 *Customs clearance*, where it is mentioned that the clearance in Mombasa can delay the lead time by five to seven days. Given that total lead times from China range between 23 to 37 days, and from India between 23 to 30 days, this delay accounts for up to 30% depending on the origin. Thus, such a delay can have a significant impact on the efficiency of Roam's inbound logistics. Additionally, choosing to clear goods at the Nairobi ICD instead of in Mombasa does not result in higher inbound logistics costs. This means that there is no trade-off between cost and lead time, allowing Roam to improve the efficiency of their inbound logistics without increasing expenses. As a result, prioritizing clearance at Nairobi ICD is a practical and beneficial strategy for streamlining their supply chain. Still, it is important to consider the corrupt practices within customs clearance discussed in section 4.1.2 *Supply chain strategy* in regards to lead time. Since Roam has chosen to not engage in such practices, the company must adopt a more proactive and strategic approach to supply chain management regardless of clearing location. This includes building in buffers for clearance times, strengthening supplier relationships, and developing contingency plans to mitigate delays. Although such an approach may appear inefficient in the short term, it supports the company's commitment to long-term resilience and sustainability.

Choosing not to participate in corrupt practices means that Roam must take a more proactive and strategic approach to supply chain management. This includes building in buffers for clearance times, strengthening supplier relationships, and developing contingency plans to mitigate delays. Although such an approach may appear inefficient in the short term, it supports the company's commitment to long-term resilience and sustainability.

Regarding implementation, this recommendation is evaluated as low required effort. It primarily involves an internal decision by Roam to select Nairobi ICD as the preferred customs clearance location. Once decided, this choice simply needs to be communicated to the relevant contact within the logistics partner responsible for managing transportation and customs clearance in Kenya. Since it does not require changes to infrastructure or contracts, the adjustment can be implemented quickly, potentially within a single shipment cycle, making it a low effort improvement to Roam's inbound logistics process.

6.3.2 Local sourcing

In terms of cost reduction, the savings from tax exemptions through local sourcing can be quantified. Specifically, sourcing the 13 eligible components locally would result in a 60% reduction in applicable taxes based on the presented taxations in section 4.2.6 *Customs clearance*. While local transport costs are expected to be significantly lower due to the short and simple transport routes, the overall cost impact cannot be fully assessed as data on local transport costs and component prices are unavailable and fall outside the scope of this thesis. However, it is expected that local component prices may be higher. Still, it is beneficial to continue working towards local sourcing. This would help Roam be prepared if the government introduces further incentives for local production or restrictions on imports. It also improves supply chain resilience by enabling dual sourcing, where both local and international suppliers can be used.

Lead times are expected to decrease substantially with local sourcing, ranging from a minimum decrease of 4 days compared to the lead times of the fastest international air freight shipments, up to 36 days compared to the lead times of certain international sea freight shipments.

In terms of implementation, switching to local suppliers can be challenging. Roam notes that the necessary technical competence and production capabilities for key components are not yet fully developed in Kenya, and that supplier development initiatives have so far been limited. Nonetheless, Roam has initiated efforts toward local sourcing and is already working with eight local suppliers, which indicates that progress is being made. As a strategic sourcing decision, this initiative requires active involvement from the relevant sourcing employees at Roam to fully realize the potential benefits for inbound logistics described above.

6.4 Storage and handling

6.4.1 Payment processes

By streamlining Roam's payment processes, both disbursement costs and storage costs can potentially be avoided. As shown in section 4.3 *Costs*, disbursement costs are charged at 3% of the total value of the payments made by the freight forwarder on behalf of the client. Thus, it is a variable fee, and in practice, it accounts for an average of 0.3% of the total inbound logistics cost per shipment. While this is a relatively small percentage, it represents a recurring and avoidable expense. Storage costs, on the other hand, are also variable but calculated based on a fixed daily fee. Invoice data shows that the size of the storage fee primarily depends on the container size. Shipments in 2 TEU containers incur daily storage fees that are 43% more expensive compared to 1 TEU container storage fees. This is reasonable considering that larger containers occupy more space and may require more handling and maintenance as a result of their size. On average, storage costs

represent 3% of the total inbound logistics cost, making it a more significant cost component than disbursement fees. Thus, paying the freight forwarder in time through better forecasting and coordination between the supply chain team and the finance team can minimize or eliminate these costs. Although this may require a tighter internal process than what Roam currently has, the potential savings and efficiency gains can make it an attractive initiative.

In terms of lead time reductions, the extra days in storage will be removed as a result of correctly timed payments. The invoices showcase varying days of extra storage when such a cost item appears on the invoice, ranging from 1 to 7 days. This can be compared to the total lead times from China and India, which ranges from 23 to 37 days and 23 to 30 days respectively, excluding extra storage days at the terminal. Thus, avoiding these storage delays could reduce the total lead time by approximately 3-30% for shipments from China and 3-23% for shipments from India, depending on the number of storage days incurred.

The implementation of this recommendation is considered relatively easy. Unlike the recommendation in section 6.8 *Price structure in quotations*, for example, which involves coordination with external parties, this initiative depends solely on improving internal processes and communication. While it does require enhanced planning and forecasting, basic measures such as shared schedules, internal reminders, or automated alerts for upcoming payments could significantly reduce delays. Given its low resource requirements, this solution provides an efficient way to reduce avoidable costs.

6.4.2 Economies of scale

As mentioned when presenting the recommendation, utilizing 2 TEU containers instead of 1 TEU containers or smaller transportation units such as pallets would directly reduce inbound logistics costs. The total cost savings are as presented in section 5.5.3.1 *Economies of scale*, namely that it is 27% cheaper per kilogram and 55% cheaper per value of goods when transporting in 2 TEU containers compared to shipping in a 1 TEU. Even smaller transportation units such as pallets are proved to be significantly more expensive than utilizing containers, specifically 12 times more expensive per kilogram and 16 times more expensive per value of goods compared to a container with the size of 2 TEU. Thus, maximizing the use of 2 TEU containers whenever possible will directly contribute to reducing the total inbound logistics costs.

While leveraging economies of scale provides a clear cost advantage, the impact on lead times is less certain. It is reasonable to assume that larger containers, such as 2 TEU units, may require more specialized handling equipment and processes at terminals, potentially increasing handling times. In contrast, smaller transportation units like pallets are generally easier and faster to manage, which could reduce handling time. As a result, the total lead time for shipments using larger containers may, in some cases, be longer than for smaller units. However, this assumption requires further investigation to determine the true impact on lead times as it in reality depends on multiple factors.

This recommendation is considered moderately easy to implement. To maximize the financial benefits of using 2 TEU containers, the containers must be filled as efficiently as possible which requires effective consolidation of goods at designated consolidation points. However, Roam has indicated that it is often difficult to determine when components will be completed and ready for

shipment. This uncertainty makes it challenging to plan and time container departures to ensure maximum utilization. Additionally, shortages of critical components at Roam Park may create pressure to ship goods as soon as they are available, leaving little room to wait for additional items to consolidate. These challenges may limit Roam's ability to consistently fill 2 TEU containers and as a result reduce the potential to fully leverage economies of scale.

6.5 Implementation plan of recommendations

Based on the evaluation of the proposed recommendations, an implementation plan has been developed to outline the intended timeline for each recommendation. Implementing all changes simultaneously is neither beneficial nor feasible, as it could disrupt Roam's supply chain operations, make it difficult to assess the individual impact of each measure and exceed the organization's implementation capacity. The plan is therefore divided into three phases: short term, where recommendations are to be implemented within one month; medium term, to be achieved within six months; and long term, to be completed within two years. The timing of each recommendation is primarily based on the evaluated level of implementation effort. However, all recommendations may be initiated earlier while the defined timeline refers to when each recommendation is expected to be fully implemented.

In the short term, Roam should streamline their payment processes to avoid unnecessary costs. The company should also switch fully to TBL shipments and thereby clearing goods and returning containers at the Nairobi ICD rather than Mombasa, which is expected to reduce detention charges and lower domestic transport costs.

In the medium term, Roam should improve the structure of supply chain data. Initial progress has already been made through the development of supply chain maps, but within six months the goal is to automate data tracking further. In addition, supplier locations should be improved by consolidating sourcing within China in an efficient way, replacing the current UK-based supplier and phasing out suppliers in India. The quotation framework for freight forwarders should also be formalized and adopted to facilitate comparability and transparency. Economies of scale should be utilized by maximizing the use of 2 TEU containers instead of 1 TEU to reduce transport cost per unit.

In the long term, Roam should implement local sourcing for the 13 components eligible for tax exemptions and establish dual sourcing strategies to strengthen supply chain resilience. Furthermore, competitive tendering should be applied consistently to secure the most cost-effective freight forwarding services for ocean freight. Finally, air freight should be minimized through improved planning and forecasting.

6.6 Alignment with cost reduction goal

Together, the proposed recommendations offer substantial potential for reducing Roam's inbound logistics costs from the current 6-10% of total product cost. As outlined in section 4.1.2 *Supply chain strategy*, the target is to reduce the inbound logistics costs to 3-4%, which represents a reduction of 46-68% when also accounting for the targeted decrease in product cost. While it is unlikely that all initiatives combined will reduce costs entirely to the target range based on the quantitative and qualitative cost evaluations above, the cumulative effect is expected to result in a

significant reduction, narrowing the gap considerably. However, the final outcome will depend on the consistency of implementation along with Roam's ability to manage trade-offs, sustain internal coordination, and respond to external factors such as supplier reliability, market conditions, and regulatory developments.

7. Conclusion

The concluding chapter summarizes the findings of the thesis, with answers to the research questions and objectives. In addition, this section discusses theoretical and practical contributions, along with limitations and suggestions for future research.

7.1 Answering the research objectives and research questions

The aim of the study was to identify cost inefficiencies within Roam's inbound logistics and to develop improvement suggestions to reduce associated costs. The thesis is guided by three research questions, along with research objectives when necessary. The first research question, R1, is written as: *How is Roam's inbound logistics currently structured, including transportation flows and cost allocations?* To address this question, three research objectives were formulated:

- RO1: Map the current inbound logistic flows of the components making up Roam's electric motorcycles.
- RO2: Map the location of Roam's suppliers.
- RO3: Map the points where costs are incurred throughout the inbound logistics flow.

For RO1, the findings are presented through visual supply chain maps developed in section 5.3.1 *Inbound logistics flow*, illustrating the inbound logistics flows from each origin country to Roam Park, distinguished by transport modes. Regarding RO2, a geographical supplier map was created in section 5.3.2 *Supplier location* to provide insight into supplier locations. This map supported the understanding of upstream transport flows, specifically the flows within the origin countries of the suppliers, as these affect the other inbound logistics activities. Lastly, RO3 is fulfilled in section 5.3.3 *Cost mapping* where three cost maps are presented, displaying cost-incurring points along the logistics chain based on actual data from example shipments. These mappings offer an overview of Roam's inbound logistics structure, highlighting the complexity of multi-modal transportation and variation in cost occurrences.

The maps from R1 provided insights into the cost structure of Roam's inbound logistics, serving as a foundation for identifying the activities that contribute the most to overall costs. Supported by this analysis, the second research question, R2, could be addressed: *What cost inefficiencies exist within Roam's inbound logistics, taking into account their strategy and the conditions of the Kenyan market?* A cost analysis was conducted based on real shipment data, where cost items were classified into four main categories of inbound logistics activities, namely transportation, handling and storage, customs clearance, and administration. The findings revealed that transportation costs represent the largest share of Roam's inbound logistics expenses, followed by storage and handling as the second largest category. Customs clearance and administration constitute a smaller proportion, but still contribute to avoidable costs.

By comparing theoretical concepts with the empirical information gathered at Roam, several inefficiencies were identified within each category. In transportation, high ocean freight costs were observed, possibly due to Roam's reliance on a single freight forwarder, which limits competitive pricing and negotiation leverage. Additionally, a single supplier located in the UK requires frequent and costly air freight shipments, a transport mode which significantly increases per-unit transport

costs compared to sea freight. It was also observed that Roam faces inefficiencies related to delays in container returns, which contributes to additional detention fees.

Regarding handling inefficiencies, Roam misses opportunities linked to economies of scale. The company is not consistently utilizing 2 TEU containers, which are significantly more cost-efficient compared to smaller transportation units. Furthermore, the absence of a standardized structure for freight quotations makes it difficult to compare offers from different service providers. This lack of transparency reduces Roam's ability to make cost-effective decisions when selecting logistics partners.

Regarding customs clearance inefficiencies, clearing containers at the port of Mombasa instead of Nairobi ICD was shown to be associated with longer lead times and higher inland transport costs. Additionally, the analysis revealed that Roam is not fully capitalizing on available tax exemptions associated with local sourcing. Administrative inefficiencies were also identified, particularly regarding disorganized supply chain data and a heavy reliance on the Logistics manager for end-to-end process knowledge. Moreover, expenses reflecting internal coordination issues such as delayed payment processes were also noticed.

Given these inefficiencies, it is clear that there are structural, operational and procedural gaps in Roam's current inbound logistics setup. The identified challenges within Roam's inbound logistics could be used as a basis for developing recommendations in order to reduce associated costs. This task is defined in the third research question, R3: *What recommendations can be given to address the identified inefficiencies and reduce costs?*. The recommendations are listed in chapter 5, provided in line with each identified issue. The importance of aligning these changes so that the supply chain setup aligns with the overall company strategy, thus achieving strategic fit, is also highlighted. In short, the recommendations are as follows:

- Improve data tracking
- Phase out the suppliers in the UK and India and improve location of Chinese suppliers
- Use only TBL shipments
- Explore a pool of freight forwarders and implement competitive tendering
- Develop a standardized quotation framework
- Limit the use of air freight
- Clear containers at the Nairobi ICD rather than at Mombasa port
- Source tax-exempted components locally in Kenya
- Streamline internal payment processes
- Maximize the use of FTL 2 TEU containers

In chapter 6, each recommendation is evaluated quantitatively and qualitatively to showcase its potential for cost savings and where applicable, lead time reduction. The required effort for implementing each suggestion is also assessed, taking into account factors such as complexity and resource needs. Finally, each recommendation is assigned a suggested implementation timeline based on its relative ease of execution, categorized as short-term, medium-term, and long-term. While some recommendations offer immediate and measurable cost savings, others provide benefits that are more difficult to quantify. The level of implementation effort was also shown to vary across

recommendations. Combined, the proposed measures provide Roam with a set of actionable improvements that have the potential to significantly reduce inbound logistics costs if implemented.

7.2 Contributions

This thesis contributes to the theoretical understanding of supply chain management in the context of Kenya by linking common emerging market challenges, such as corruption, logistical constraints, international trade complexities and regulatory uncertainty, to their impact on supply chain operations. While previous literature has addressed these issues separately, limited research has explored how they interact and affect supply chain performance in practice. This study helps fill that gap by examining how inbound logistics are managed by a Kenyan company. It identifies strategies to address the associated challenges and reduce inbound logistics costs, contributing to a more resilient and cost-efficient supply chain.

Furthermore, supply chain management theory often assumes the availability of complete and accurate data, which is rarely the case in practice, particularly in emerging markets. This thesis demonstrates how relevant conclusions can still be drawn using limited and imperfect data, offering practical guidance for decision-making. Lastly, the thesis applies established supply chain theories to a real-world case of a Kenyan EV manufacturing company, showing how theoretical concepts can be adapted and implemented in a practical business context.

In addition to its theoretical contributions, the thesis provides practical value to the case company. It offers Roam an improved understanding of their inbound logistics as well as insights into how their corporate strategy affects the supply chain and the involved trade-offs. The thesis highlights the risk of suboptimization and provides a tool for organizing supply chain data in the form of supply chain maps. This supports an understanding among employees regarding the structure of the inbound logistics and the company's supply chain objectives. Moreover, the study identifies cost inefficiencies in Roam's inbound logistics and provides actionable recommendations to reduce costs, along with guidance on how and when to implement them. These findings may also benefit other manufacturing companies in Kenya by offering insights into how inbound logistics can be managed more effectively in similar contexts. As part of the practical deliverables, Roam receives this final report, visual supply chain maps of inbound logistics flows, associated costs and supplier locations. In addition, Roam gains access to the data extracted from the shipment invoices, which provides detailed insights into their actual logistics costs.

7.3 Limitations and future research

The thesis focuses on developing an understanding of Roam's inbound logistics, identifying cost inefficiencies and proposing relevant recommendations to reduce costs. Due to the priorities of the case company and limitations in time and data availability, the analysis is limited to the cost-generating activities from the point that the sourced goods leave the supplier to their arrival at Roam Park. Inventory holding costs and consolidation transport costs at the origin are excluded from the scope.

Given these limitations, there are several opportunities for future research to build on the findings of the study. While the thesis provides an overview of Roam's inbound logistics and identifies key inefficiencies, future research could elaborate on the proposed recommendations. For example,

regarding data tracking, further research could investigate which supply chain KPIs to monitor and how technologies such as AI can be used to automate data collection and analysis. To address the high ocean freight costs, future studies could include a comparative analysis of available freight forwarders in Kenya to identify the most suitable and cost-effective alternatives. Additionally, with further available data, a more detailed analysis of air freight could be conducted to explore how its usage can be reduced through improved forecasting and planning. One possible approach is to apply a sales and operations planning, S&OP, framework. A broader analysis could also be conducted to evaluate the trade-off between component prices and transportation costs, with a focus on optimizing consolidation strategies and maximizing container utilization to achieve full economies of scale. Another relevant area for further investigation is the logistics of working with local suppliers, including how supplier development can be managed to meet quality and capacity requirements. Finally, future research could expand the scope to include inventory costs and examine how the proposed recommendations are influenced by the trade-off between inventory levels and shipment frequency.

With access to more comprehensive and detailed data, the analysis could be further quantified. Nonetheless, the study provides valuable insights into cost-efficient inbound logistics in Kenya, both for the case company and for the academics.

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9. Appendix

9.1 Appendix A: Interview questions

9.1.1 Interview guide 1: Strategic level

Strategy

1. Considering you are a start-up/scale-up in quite early maturity, what has your overall strategy been in the past and has it changed? Short-term/long-term?
2. What has been and is your current supply chain strategy? Short-term/long-term? How does it align with the corporate strategy?
3. How has your supply chain evolved as the company has grown?
4. What are your current prioritizations and how do you balance them against one another? Cost, lead times, supplier relationships, quality, customer relationships etc.
5. What is your target for the number of sold bikes?
6. What do you see as opportunities and challenges for a start-up managing a supply chain?
7. What are the needs of your customers, e.g. quantity, lead time, variety, service level, price and innovation?

Position in the Kenyan EV market

1. What is Roam's position in the Kenyan EV market? Do you have a lot of competitors?
2. What is your competitive edge?
3. Who are your customers? B2C or B2B?
4. What do you think of the Kenyan EV market? What opportunities do you see there?
5. Are there any government incentives or policies that impact your cost structure/Kenyan EV market?
6. How dependent is Roam's supply chain on external market forces (e.g., global supply chain disruptions, currency fluctuations)?
7. Are there partnerships or collaborations in the local EV ecosystem that support your supply chain?

Costs

1. What are your total costs and how big a share of that is inbound logistics costs?
2. Do you have any target costs that you want to reach?
3. Do you have any goal for cost reduction (e.g. reduction with a certain percentage)?
4. Do you have any target costs for the supply chain, specifically inbound logistics?
5. How has the cost structure changed as Roam has scaled operations?

9.1.2 Interview guide 2: Specialized level

Inbound logistics in general

1. How many different components do you source?
2. How many suppliers do you have?
3. What factors influence which suppliers are used for sourcing components?
4. Can you describe the process of placing a shipment order and the payment process for it?
5. How often do you order and how do you decide on order quantities?

6. How do you decide between 20ft and 40ft containers?
7. Do you currently work with forecasting (i.e. demand forecasting)? If yes, how?

Problem areas

1. What problems/bottlenecks do you see in the current inbound logistics setup?
2. What are the main cost types in the inbound logistics?
3. Are there any costs that are remarkably higher than others?
4. Any specific costs that you want to reduce?
5. How does Roam handle supply chain disruptions, such as customs delays or transportation issues?
6. How do delays typically impact production schedules?
7. Have there been specific logistical challenges in sourcing from international vs. local suppliers?
8. Are there specific routes that consistently pose challenges?
9. How do inbound logistics issues impact daily production schedules?
10. How often do you experience stock shortages due to inbound logistics delays?
11. Do you track key performance indicators (KPIs) for inbound logistics? If so, what are they?
12. How do you prioritize problem-solving in inbound logistics (e.g., cost reduction vs. speed vs. reliability)?
13. What measures are taken to ensure critical components are always available?

Freight forwarders

1. Who are the different actors involved in the inbound logistics (shipping lines, shipping agents etc)?
2. How many 3PLs/freight forwarders are you involved with?
3. What are your relationships with the freight forwarders?
4. What requirements are used to choose between different freight forwarders?
5. How do you evaluate the performance of your freight forwarders?
6. What contract models do you use with your freight forwarders (spot rates vs. long-term contracts)?
7. How do you negotiate freight rates, and what are the key factors influencing these negotiations?
8. Are there any challenges in getting reliable freight forwarding services in Kenya?
9. How do you handle freight forwarder delays or service failures?
10. What would you like to be included in a standardized quotation framework? What is important to know?

Transport modes

1. How do you choose between the different transport modes for a certain shipment?
2. When is air freight used over sea freight considering it's often a more expensive alternative?
3. Are there seasonal variations that impact transportation decisions?
4. What factors influence the choice of consolidation vs. direct shipments?

Customs clearance

1. How do you handle customs clearance and import regulations?
2. What are the most common customs-related challenges Roam faces?

3. How much time does customs clearance usually take?
4. Are there any recent policy changes that have impacted customs processes for Roam?
5. What subsidies do Roam currently get from the government? Is it possible to receive more subsidies?
6. What compliance challenges exist with battery imports or hazardous material regulations?
7. How much is the lead time reduced by choosing to do the clearance at Nairobi ICD instead of Mombasa port?

Suppliers and localization

1. How have you decided on the location of different suppliers?
2. What cities have generally higher component costs?
3. What is the tradeoff between component costs and transport costs from suppliers?
4. What percentage of components are sourced locally vs. internationally?
5. Have you considered nearshoring or alternative suppliers to reduce logistics costs?

Costs

1. Have you implemented any cost-saving initiatives, such as lean manufacturing or supplier negotiations?
2. What are the main cost drivers in Roam's inbound logistics?
3. Has Roam considered alternative transportation modes to reduce costs or improve efficiency?
4. Are there opportunities for consolidating shipments to optimize costs?
5. How do you track and monitor inbound logistics costs? (e.g., per shipment, per quarter, per supplier?)
6. What are the biggest cost fluctuations in the inbound logistics process, and why?
7. What external factors (e.g., fuel prices, import taxes, currency exchange rates) impact inbound logistics costs the most?

9.2 Appendix B: Shipment data

Table A.1. The total inbound logistics costs, the weight and the value of the shipped goods of each shipment being investigated.

Origin country	Shipment	TBL/non-TBL	Total inbound logistics shipment cost (\$) - range	Weight of shipment (kg)	Value of shipped goods (\$)
China	A	non-TBL	< \$5,000	6 386,0	<i>n/a*</i>
	B	non-TBL	\$5,000–\$10,000	10 797,0	418 200,0
	C	non-TBL	< \$5,000	10 317,0	264 007,6
	D	TBL	< \$5,000	5 213,5	<i>n/a*</i>
India	E	TBL	\$5,000–\$10,000	10 728,0	23 899,9
	F	non-TBL	\$5,000–\$10,000	8 744,0	22 488,1
	G	TBL	> \$10,000	5 520,0	42 137,5
	H	non-TBL	> \$10,000	8 743,5	30 473,7
	I	non-TBL	\$5,000–\$10,000	3 690,0	9 779,3
	J	non-TBL	> \$10,000	9 108,0	29 652
	K	N/A**	< \$5,000	61,0	190,56
UK	L	N/A**	< \$5,000	89,4	1 706,8

**The value of the goods contained in the shipment is not provided in the documents available.*

*** TBL is not applicable for air freight shipments.*