

THESIS FOR THE DEGREE OF LICENTIATE OF PHILOSOPHY

Exploring Electric Truck Utilisation in Business Networks

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Abstract

The electrification of heavy-duty freight transport plays a central role in climate and industrial policy in Europe. Despite increasing regulatory pressure and technological progress, the adoption of electric trucks remains limited. This indicates that the challenge is not only technological but also lies in how electric trucks are utilised in real-world freight operations. This licentiate thesis examines electric truck utilisation as an operational and relational challenge embedded in business networks

Based on a qualitative study of Swedish freight transport, the thesis analyses how electric trucks are integrated into everyday operations at firm, relational, and network levels. The findings show that under current conditions, electric trucks require highly predictable transport missions, stable routes, and coordinated charging arrangements. Compared to diesel-based transport, this reduces operational flexibility and increases dependence on more detailed planning, access to infrastructure, and collaboration with various business partners.

Applying the Industrial Network Approach, the study shows how electric truck utilisation reshapes activities, resources, and actors within the business network. Charging infrastructure emerges as a critical resource, where access, ownership, and control directly influence economic viability and create new interdependencies among hauliers, transport buyers, intermediaries, energy actors, and vehicle manufacturers. Charging, in turn, becomes a central activity that needs to be coordinated for each vehicle and across actors sharing the same charging resources.

The thesis contributes to research on heavy-duty transport electrification by shifting attention from isolated barriers to the structural and relational conditions that set the terms for utilisation in practice. For industry, the findings highlight that successful electrification depends not only on vehicle performance, but on coordinated development of operations, charging resources, contractual arrangements, and collaboration across business networks.

Keywords: electric trucks; utilisation; freight transport; business networks; charging infrastructure

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Jonathan Stål

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1 Introduction

1.1 Electrification of Heavy-Duty Transport

Heavy-duty road freight transport plays a central role in the European economy and logistics system. In Sweden, road freight accounts for approximately 70 percent of inland freight tonne-kilometres, making it a backbone of industrial production, retail distribution, and export-oriented supply chains. At the same time, heavy-duty vehicles (HDVs) contribute disproportionately to greenhouse gas emissions. Although HDVs represent less than three percent of road vehicles, they account for roughly one quarter of road-transport CO₂ emissions in the European Union (European Commission, 2024). Due to high daily utilisation, long operating lifetimes, and demanding operational requirements, heavy-duty transport is often described as one of the most difficult segments to decarbonize (International Energy Agency, 2024).

Regulatory pressure on the sector has therefore increased significantly. The revised EU CO₂ standards for HDVs require a 45 percent reduction in fleet-average emissions by 2030 and a 90 percent reduction by 2040 (Regulation (EU) 2024/1610, 2024). Additional policy instruments, such as the introduction of the Second Emission Trading System (ETS2) from 2027, now including road transport missions, and the Alternative Fuels Infrastructure Regulation (AFIR), aim to increase the cost of fossil fuels while ensuring the availability of high-power charging infrastructure along key transport. In Sweden, these developments are reinforced through national initiatives such as Klimatklivet, investment grants, and the Fossilfritt Sverige roadmap, which targets a rapid increase in zero-emission heavy truck deployment (Fossilfritt Sverige, 2020).

Battery-electric trucks (BEVs) are seen as a central technological enabler of this regulatory vision, particularly in urban, regional, and short-haul freight operations. Vehicle manufacturers have accelerated their development efforts, and early commercial models are now available across several weight classes. Despite this progress, large-scale adoption remains limited, and the total cost of ownership remains higher than that of diesel counterparts (McKinsey & Company, 2025a). While registrations of electric heavy-duty vehicles have increased rapidly in relative terms, they still represent only a small fraction of new HDV sales in most European countries (ACEA, 2024). Even in early adopting markets such as Sweden and Norway, deployment remains concentrated in pilot projects and niche applications rather than widespread operational use.

This divergence between regulatory ambition, technological availability, and actual market uptake suggests that significant barriers remain. Importantly, these barriers appear not to be explained by vehicle technology alone.

1.2 From Diesel-Based Freight to Electrified Transport

Electrification of heavy-duty road freight is commonly presented as a technological substitution process, in which diesel-powered trucks are replaced by electric alternatives while the broader transport system remains largely unchanged. From this perspective, progress is assumed to depend primarily on vehicle performance, charging infrastructure availability, and cost reductions. Policy instruments, industrial roadmaps, and technology development programs largely reflect this view, emphasizing battery capacity, charging speed, and total cost of ownership as the central levers of change.

However, early experiences with battery-electric trucks suggest that their utilisation may depend on conditions that differ substantially from those of conventional diesel transport (Zhao et al., 2024). Operators and logistics actors increasingly report challenges related not only to vehicle range and charging times, but also to business-model uncertainty, customer acceptance and expectations, access to public charging infrastructure, and operational reliability (Konstantinou & Gkritza, 2023). These observations indicate that electrification may place new demands on how freight operations are organized and coordinated in practice.

In diesel-based transport operations, a high degree of operational flexibility has traditionally been taken for granted. Trucks can be reassigned between routes, refuelled almost anywhere, and substituted across tasks with limited planning. Electric trucks, by contrast, appear to require more predictable operations, closer alignment between routes and infrastructure, and tighter coordination between multiple parties involved in transport missions. This raises questions about how existing freight transport practices, developed under assumptions of flexibility and standardization, can accommodate electric vehicles without fundamental adjustments.

At the same time, the transition introduces new forms of uncertainty for actors across the freight transport network. Investments in electric trucks and charging infrastructure are characterized by high upfront costs, long payback periods, and limited possibilities for redeployment. Responsibility for managing these risks is not clearly defined, particularly when utilisation depends on resources and decisions controlled by multiple organizations. It therefore remains unclear how economic risks, operational constraints, and planning responsibilities are distributed among hauliers, transport buyers, intermediaries, energy providers, and vehicle manufacturers.

These developments suggest that electrification cannot be fully understood by focusing on individual firms or isolated technological components. Instead, electric truck utilisation appears to emerge from interactions among multiple actors, in different parts of the transport system, who must be aligned for operations to function (Dehkordi et al., 2024; Raoofi et al., 2024). Yet, how such coordination takes place in practice, what challenges arise in these interactions, and how actors adapt their relationships in response to electrification, remain insufficiently understood. Moreover, Dehkordi et al. (2024) highlight that the transition to electric

commercial vehicles is limited by the absence of viable business cases, pointing to the need for business models that reflect interdependencies across firms.

This indicates a need for empirical research that examines electric truck utilisation as it unfolds in real-world freight transport settings. Rather than treating electrification as a question of technical feasibility alone, there could be value in exploring how actors jointly manage new constraints, negotiate responsibilities, and adapt operational and business arrangements. Understanding these dynamics can be essential for explaining why electrification progresses unevenly across contexts and why some succeed in integrating electric trucks while others struggle to move beyond pilot initiatives.

1.3 Research Aim and Research Questions

The overall aim of this research is to explore how electric trucks are utilised in freight transport and to understand how this utilisation is shaped by interactions among actors in business networks. Rather than focusing on vehicle technology, the thesis examines how electric trucks are deployed, managed, and made viable through interactions among multiple actors, including hauliers, transport buyers, intermediaries, energy-related actors, and vehicle manufacturers. With basis in this aim, the thesis is guided by the following research questions:

RQ1: What are the challenges and opportunities faced by actors in the freight transport network regarding the utilisation of electric trucks?

This research question focuses on identifying and describing the key challenges and opportunities associated with electric truck utilisation as they are experienced by different actors in freight transport. Rather than treating these challenges as a fixed list of barriers, the question emphasizes how they arise in specific operational and organizational contexts.

RQ2: How do actors interact with their business partners to address these challenges and opportunities?

Building on the first question, this research question examines how actors respond to electrification-related challenges and opportunities through interaction with other actors in the business network. The focus is on how relationships are adapted through changes in resources, activities, and actors. By addressing these questions, the study aims to explore how electric truck utilisation is shaped by interaction rather than by isolated firm-level decisions.

1.4 Scope and Delimitations

This licentiate thesis focuses on the utilisation of battery-electric heavy-duty trucks in freight transport business networks. The scope of the study is defined along conceptual, empirical, and geographical dimensions.

Conceptually, the thesis examines electrification from an operational and organizational perspective. The primary interest lies in how electric trucks are deployed in everyday freight

transport operations and how their utilisation is shaped by coordination among multiple actors. The study therefore emphasizes business relationships, resource use, and activity coordination rather than technical performance characteristics of vehicles or infrastructure. Detailed analyses of, e.g., battery technology, vehicle engineering, or charger hardware design fall outside the scope of this work.

Moreover, the thesis does not aim to provide statistically representative results or predictive models of adoption rates. Instead, it seeks to develop insights into how electric trucks are made operationally viable in specific contexts. While optimization, cost modelling, and quantitative simulation are relevant to the broader research on electrification, these aspects are not the focus of this thesis. Additionally, the use of the word utilisation in this thesis is not limited to technical performance indicators such as fill rates or uptime. Rather, it refers to the extent to which electric trucks can be practically deployed and kept in productive use as operational resources, given constraints related to charging, planning, contracts, and coordination across actors.

Empirically, the thesis focuses on actors involved in the Swedish freight transport network. These include hauliers, transport buyers, transport intermediaries, energy-related actors, and European vehicle manufacturers. Geographically, Sweden provides a relevant empirical context due to its early adoption of heavy-duty electric trucks, strong policy support for transport electrification, and the presence of established truck manufacturers and logistics actors. Although international developments are referenced where relevant, no systematic cross-country comparison is undertaken within this thesis. The findings are therefore context-dependent and should be interpreted considering the institutional, infrastructural, and market conditions specific to Sweden.

Finally, this licentiate thesis represents an intermediate stage in a longer doctoral research process. As such, it lays the foundation for subsequent studies that may extend the results and analysis to additional contexts, methods, or theoretical contributions.

1.5 Structure of the Thesis

This licentiate thesis is structured as follows. Chapter 2 presents the theoretical framework, drawing on the Industrial Network Approach. Chapter 3 describes the research design and methodology, including data collection, case selection, and the analytical approach. Chapter 4 presents the empirical findings based on interviews with the various actors involved in the electrification of freight transport. Chapter 5 analyses the empirical material through the lens of the Industrial Network Approach, examining electrification across firm, relational, and network levels. Chapter 6 discusses the findings in relation to the theoretical framework and existing literature, with a particular focus on the key insights developed in this research. Finally, Chapter 7 concludes the thesis by summarising the main contributions, outlining implications for research and practice, and suggesting directions for future studies.

2 Theoretical Framework

This chapter outlines the theoretical framework used in the thesis. It introduces the Industrial Network Approach and its core concepts of actors, resources, and activities as the primary lens for understanding business relationships and networks. It is also complemented by systems theory to capture broader interdependencies. Finally, it concludes with a problem discussion, putting the theory into context with electrification.

2.1 The Industrial Network Approach and Business Relationships

The Industrial Network Approach (INA) provides a framework for understanding the interactions among actors, resources, and activities within business networks. It builds on the notion that no business operates as an island, but instead markets are seen as networks of interconnected firms (Håkansson & Snehota, 1989). In the work *Developing Relationships in Business Networks*, by Håkansson and Snehota (1995), they emphasize that the success of a business depends not only on its internal capabilities but also on its position and role within the larger network. These interactions are central to how value is created, shared, and sustained across interconnected entities.

Business relationships are a cornerstone of industrial markets, recognized for their central role in value creation and exchange (Ford et al., 2011). Studies based on the INA reveal that these relationships often extend beyond simple transactions, encompassing long-term, evolving interactions shaped by mutual adaptations and interdependencies between firms (Håkansson & Snehota, 1995).

A defining characteristic of business relationships is their embeddedness within a broader network of connected business relationships. Hence, business relationships do not exist in isolation but are influenced by, and in turn influence, the surrounding network. Changes in one relationship can impact others, shaping the behaviour of actors and the flow of resources within the network (Håkansson & Ford, 2002). Håkansson and Snehota (1995) highlight that business relationships are part of a larger network, and their development cannot be fully understood without considering their connections to other business relationships. This connectedness means that resources, activities, and actors are interconnected through relationships. Such embeddedness underscores the importance of analysing relationships not merely as dyadic exchanges but within the broader context of the network.

2.2 The ARA Model and a Scheme for Analysis

To analyse these complex and interconnected business relationships, Håkansson and Snehota (1995), building on Håkansson (1987), further developed the Activities-Resources-Actors (ARA) model. The model distinguishes three interrelated dimensions of business networks. Activities refer to the processes through which work is carried out and

coordinated across firms. Resources comprise both tangible and intangible assets that are used, combined, and developed through these activities. Actors are the individuals and organisations that perform activities, control resources, and engage in interaction with others.

Business relationships emerge as actors develop bonds by linking activities and tying resources together (Håkansson & Snehota, 1995). The ARA model thus highlights that interaction in business networks is inherently interdependent, where changes in one dimension are likely to affect the others. While the ARA model offers a strong conceptual foundation for analysing the content of business interaction, it does not in itself specify how business relationships unfold across different analytical levels or how changes at one level propagate to others. To address this, Håkansson and Snehota (1995) developed the scheme of analysis of business relationship development effects, which uses the ARA model by structuring the analysis across company, relationship, and network levels.

Figure 1 presents this scheme and serves as the analytical framework guiding this thesis. The scheme combines the three ARA dimensions with three analytical levels, resulting in nine interconnected analytical cells. At the company level, the scheme captures internal activity structures, resource collections, and organisational structures. At the relationship level, it focuses on activity links, resource ties, and actor bonds that develop through interaction between firms. At the network level, it highlights broader activity patterns, resource constellations, and webs of actors that emerge from multiple relationships. The scheme emphasises that development effects are shared and interdependent, where changes at one level may influence, and be influenced by, changes at other levels.

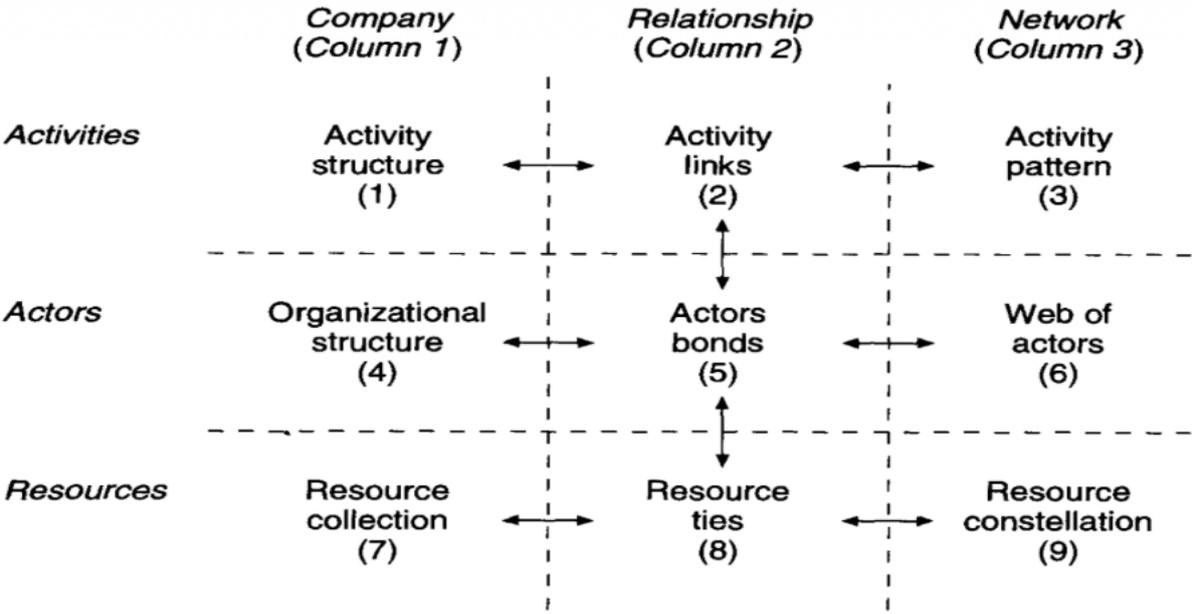


Figure 1: Scheme for analysis of business relationships development effects (Håkansson & Snehota, 1995, p. 45),

2.2.1 *Activities in Business Networks*

Activities are the operational and strategic processes through which resources are transformed, exchanged, or coordinated to achieve certain objectives. They encompass a wide range of actions, from product assembly and quality control to logistics planning, marketing campaigns, or after-sales support. Activities link actors and resources, channelling the flow of goods, information, and services throughout the network. These processes are not static but evolve as actors respond to technological shifts, competitive pressures, regulatory changes, or emerging market opportunities. Activity links represent the relationships between these processes, illustrating how one activity's output becomes another's input. As networks develop, activity links may be reconfigured, expanded, or refined to improve efficiency and create new value propositions (Håkansson & Snehota, 1995).

Activities are never undertaken in isolation. Bankvall (2014) emphasizes that the distinction between internal and external activities is often blurred in industrial settings, as activities are embedded in wider structures of interdependent tasks spanning multiple actors. From this perspective, activities gain their meaning and performance effects through their connections to other activities rather than through their individual characteristics. Importantly, activity interdependencies are not uniform but take different forms, depending on how activities are structured.

Activities also serve as the interface through which actors use and combine resources. Through activities, resources are activated, adapted, and brought into productive use, making activities a key mechanism for value in business networks. Hedvall et al. (2016) further highlight that activities are inherently context-dependent, where, how an activity is performed, coordinated, and valued depends on the specific operational, relational, and network context in which it is embedded. The same activity may therefore have different outcomes depending on surrounding activities, resources, and actors.

In the scheme of analysis of business relationships' development effects by Håkansson and Snehota (1995, p.45), activities represent how work is organized and coordinated within and across firms. At the company level, activities are captured as activity structures (cell 1), referring to how a firm internally organizes and performs its activities. Changes here affect efficiency, cost structures, and operational performance within the firm.

At the relationship level, activities are connected through activity links (cell 2). These describe how activities performed by different actors are coordinated or adapted to each other, such as the alignment of planning, production, or delivery activities across organizational boundaries. Changes in activity links directly affect the potential of a relationship by creating interdependence and coordination requirements.

At the network level, interconnected activity links form broader activity patterns (cell 3). These patterns reflect how activities are structured across multiple relationships in the network.

Changes in one relationship can therefore trigger indirect effects beyond the focal dyad, requiring adaptations by third parties and potentially affecting how activities are coordinated across the wider network.

2.2.2 *Actors in Business Networks*

Actors are individuals, firms, or others who engage in business relationships within a business network to pursue their various goals and interests. Rather than operating in isolation, they continuously shape and reshape the network by influencing which resources are utilised, how those resources are accessed and combined, and what activities are undertaken. Actors may be manufacturers, logistics providers, wholesalers, retailers, service firms, technology suppliers, or regulatory bodies. They are not simply reactive participants but instead, they actively negotiate roles, responsibilities, and exchange conditions. By making strategic choices such as forming alliances, selecting partners, or adapting to new market demands, actors determine the outline of the network itself. Actor bonds refer to the connections that develop between these participants over time, showcasing trust, shared norms, mutual understandings, and expectations that emerge from repeated interactions. (Håkansson & Snehota, 1995).

Actors cannot be understood as autonomous decision-makers acting independently of their surroundings. Instead, they are deeply embedded in networks of relationships that both enable and constrain their actions (Håkansson & Ford, 2002). While actors may seek to influence others through their relationships, they are simultaneously affected by those same relationships, resulting in a continuous interplay between control and dependence. Consequently, actors are defined less by their internal characteristics than by their position within the network, a position that emerges and evolves through ongoing interaction with other actors (Gadde et al., 2003). Strategic action therefore becomes an interactive and evolutionary process, where outcomes arise through negotiation, mutual adjustment, and learning across relationships rather than through centralized or single control (Håkansson & Ford, 2002).

In the scheme of analysis of business relationships' development effects by Håkansson and Snehota (1995, p.45), the actor dimension focuses on how organizations are structured and how they relate to each other. At the company level, organizational structures (cell 4) describe how firms allocate responsibilities, decision-making authority, and competencies internally. Changes at this level affect how firms can engage in and manage relationships.

At the relationship level, actor bonds (cell 5) capture the social, contractual, and strategic ties between actors. These bonds reflect mutual commitment, trust, and expectations, and they influence how willing actors are to invest, adapt, or share risks within a relationship. Changes in actor bonds often follow or reinforce changes in activities and resources.

At the network level, multiple actor bonds together form a web of actors (cell 6). This web reflects the broader configuration of roles, power relations, and dependencies in the network.

Changes in one relationship may alter positions or influence within the web, leading to indirect effects that extend beyond the focal actors.

2.2.3 *Resources in Business Networks*

Resources encompass both tangible and intangible assets that actors bring to and exchange within the network. Tangible resources may include raw materials, machinery, vehicles, and infrastructure, while intangible resources span knowledge, expertise, brand reputation, intellectual property, and technological capabilities. The value of these resources is not fixed but is dynamically affected by the context in which they are deployed and by the resource interaction between different actors and their assets. For instance, a piece of equipment gains greater value when complemented by a skilled workforce, reliable maintenance services, and compatible software systems. Resource ties are the connections that emerge as these assets are shared, combined, or transformed through collaborative arrangements. These ties enable the network to create synergies, support innovation, and adapt to changing conditions, ensuring that resources remain meaningful and useful rather than becoming obsolete or underutilised. (Håkansson & Snehota, 1995).

A basic assumption in INA is resource heterogeneity (Penrose, 1959), which points to that the value of resources is not given, rather, the value of resources is based on how they are combined with other resources. Resources are a key component of INA, offering insight into how value is created and exchanged within business networks. The concept of resource interaction highlights how resources gain value through their integration within a network. Baraldi et al. (2012) argue that the use of a resource is not fixed but changes as it is combined with other tangible and intangible resources, such as infrastructure and knowledge. These changes foster innovation to address new challenges and opportunities in the business network. Baraldi et al. (2024) extends this perspective, emphasizing that resource interaction evolves alongside technological advancements and changing network conditions. They argue that understanding how resources interact and adapt is central to fostering sustainable innovation and meeting demands.

Resource interfaces play a critical role in resource interaction, creating the interface between where resources connect and influence one another. These interfaces may be technical, such as compatibility between systems, or organizational, involving collaboration among network actors. Prenkert et al. (2019) describe heaviness as a factor that can hinder the reconfiguration of established resource combinations. Heaviness arises from significant investments and interdependencies within a network, making adaptation costly and complex. Nevertheless, resource interaction enables actors within the network to experiment with innovative combinations. Baraldi et al. (2024) highlight that such flexibility is central to addressing sustainability and operational challenges within evolving networks.

The utilisation and value of resources are inherently contextual, shaped by the specific configurations, interdependencies, and relationships within a network. Baraldi et al. (2024) note that resource interactions are influenced by historical configurations and evolving goals. Landqvist and Lind (2019) illustrate how entrepreneurial integrations within networks drive experimentation with new resource combinations. By integrating novel resources with established resources, networks can develop innovative configurations and adapt to changing conditions. Bocconcelli et al. (2020) emphasize the importance of understanding the context in which resources interact, as this is essential for ensuring that resources are utilised effectively to support sustainable and efficient development within networks.

In the scheme of analysis of business relationships' development effects by Håkanson and Snehota (1995, p.45), resources constitute the third dimension of the scheme and refer to both tangible and intangible assets used in business activities. At the company level, resource collections (cell 7) describe how a firm combines and utilises its internal resources, such as physical assets, competencies, and technologies. Changes in resource collections affect a firm's capabilities and economic potential.

At the relationship level, resources are connected through resource ties (cell 8). These ties arise when resources owned or controlled by different actors are adapted or combined across organizational boundaries. Resource ties can increase efficiency and value creation but also create dependence, as changes in one resource often require adjustments in connected resources.

At the network level, interconnected resource ties form resource constellations (cell 9). These constellations reflect how resources are combined across multiple actors and relationships in the network. Changes in a single relationship can therefore influence the wider constellation, potentially triggering broader adjustments as actors respond to new constraints or opportunities.

2.3 Relationships and Networks on System Theory View

While INA explains this thesis from a view on interaction and business relationships, systems theory offers a way for reasoning about openness, structure, and dynamics in the wider network where those interactions take place. Following De Boer and Andersen (2016), bringing systems theory into conversation with INA sharpens how we treat boundaries, openness, and iterations, and it surfaces missed opportunities for advancing INA concepts without displacing the relational focus. INA explains who connects to whom and how ties, bonds, and links are enacted. In contrast, systems theory explains why similar networks can behave differently as conditions change, where leverage is likely to be in rules, information flows, and goals, and how disturbances propagate or are contained across interfaces. Prenkert (2000) similarly argues that markets as networks can be understood on the basis of open systems theory, building on Katz and Kahn's (1966) foundational view of organizations as open systems.

In general, systems theory widens the lens from individual actors. It treats organizations and markets as open systems that draw in resources and information, transform them, and send results back into their surroundings (Golinelli & Gatti, 2001). The focus is on how elements are arranged, how they interact, and how the whole adapts over time. Boundaries are a choice, not a given, so part of the work is to decide what sits inside the system and what belongs to the environment, then to trace the exchanges across that boundary (Skyttner, 2006). Complex systems are composed of many heterogeneous elements whose properties and behaviours emerge from interaction rather than being fixed in isolation. Simon (1962) shows that many such systems are hierarchical and nearly decomposable, which means they are built from subsystems that are strongly linked internally but only loosely linked to others. This structure both stabilizes behaviour and shapes how change propagates across levels. Thinking in terms of coupling helps explain how changes spread through complex systems. Perrow's (1984) concept of tight coupling shows why small disruptions can quickly escalate when buffers are limited. In contrast, Orton and Weick's (1990) concept of loose coupling explains how flexibility, modularity, and partial independence can contain disturbances and allow systems to adapt without widespread disruption.

When system components become strongly interlinked and mutually dependent, prediction becomes difficult and local changes may trigger disproportionate, system-wide consequences, as Saurin and Gonzalez (2013) observed. A defining feature of such systems is the presence of ripple effects, where a change in one part inevitably propagates through interconnected elements, requiring that actors consider the broader network of interdependencies when initiating change (Raoufi et al., 2025). Thereby, system outcomes emerge from the interaction of all components rather than from isolated parts. For instance, the introduction of a new technology does not automatically lead to improvement unless it is accompanied by alignment across social and organizational dimensions (Carayon, 2006).

2.4 Problem Discussion

2.4.1 Changing Freight Network under Electrification

The heavy-duty freight sector is currently transforming as battery-electric HDVs begin to replace traditional diesel powertrains. While one might assume that this transition is simply about replacing engines and implementing charging infrastructure, systems research illustrates that interconnected infrastructures often do not allow for the isolated modification of individual components. A disruption in one layer can ripple through the entire system and create or worsen challenges that no single actor can address independently. Recent studies of Nordic pilot programs reinforce this, as delays in upgrading the power grid hinder the adoption of electric vehicles, queues at charging stations disrupt delivery schedules, and uncertainties surrounding electricity prices complicate forecasts of residual values (Raoufi et al., 2024; Gillström et al., 2024).

Electrification can therefore be understood as a complex transition involving numerous actors, interdependent variables, and multiple layers of infrastructure. Raofi et al. (2024) examine these system-level implications of electrifying road freight and find that new interdependencies emerge between operational planning, charging infrastructure, grid access, and logistics strategy. Their work illustrates how changes in one part of the freight system can create ripple effects elsewhere, complicating decision-making and coordination across organizational and infrastructure layers. Furthermore, Geels (2012) shows how innovations such as BEVs are shaped not only by technical development in niche environments but also by their interaction with established regimes, norms, practices, infrastructures, and actor roles that may resist or slow change. In such a system, technical sub-parts such as trucks, batteries, and chargers coexist with organizational routines, institutional logics, and human actors. The Industrial Network Approach highlights that these interactions are neither linear nor isolated, but rather tightly interwoven across system levels.

The electric truck is not an isolated resource but one embedded in a broader network of energy supply, charging infrastructure, digital routing platforms, and regulatory frameworks. A survey involving 250 European fleets conducted by Konstantinou and Gkritza (2023) reveals that the primary obstacle in this new landscape is not only the high cost of batteries, but rather the absence of suitable business models and partnerships. This underscores the difficulty actors face in sharing both risks and benefits within the emerging network. Furthermore, Dehkordi et al. (2024) emphasize that a narrow, firm-centric focus is insufficient, and a holistic perspective that acknowledges the interconnection of vehicles, energy assets, and data systems is necessary to create viable solutions.

Furthermore, Baines et al. (2017) emphasize that customers increasingly demand personalized, value-added transport services that extend beyond the vehicle itself. This suggests that the value of a truck is increasingly dependent upon its interaction with other resources such as charging infrastructure, fleet-management software, and adaptive scheduling. This argument aligns with the INA, which views resource value as emerging from interactions rather than existing inherently (Håkansson & Snehota, 1995). Systems research further illustrates how constraints such as limited range drive new forms of optimization, which in turn reshape energy demand and data flows (Raofi et al., 2024). Similarly, Gillström et al. (2024) emphasize that it is system-wide frictions rather than isolated technical failures that limit scalability. These insights underline the need for multi-actor collaboration across organizational and sectoral boundaries. For example, OEMs, logistics companies, energy providers, and digital platform operators must jointly design hub locations, manage megawatt-scale demand peaks, and synchronize fleet optimization with tariff structures (Shoman et al., 2023; Ray et al., 2023).

Research of the implementation of BEVs in Germany further shows that niche innovations such as BEVs diffuse only when regime routines and broader landscape-level rules evolve in coherence (Müller, 2024). This indicates that electrification requires not only technological

adoption but also institutional and organizational adaptation across the network. Similarly, Sujan et al. (2025) highlight that, unlike conventional diesel refuelling, BEV charging infrastructure must be co-optimized with vehicle deployment, operational demands, and grid capacity to achieve reliable and cost-effective freight operations.

2.4.2 Freight-network actors, resources, and activities in transition

Electrification brings a larger cast of counterparts into day-to-day coordination and reshapes incumbent roles. In Sweden's national Regional Electrified Freight Logistics (REEL) system demonstrator, more than 70 battery-electric HDVs operated across commercial flows with more than 40 actors that included transport buyers, hauliers, terminal and charging operators, power and grid companies, OEMs, authorities, and researchers. The composition of that shows how hauliers must now work with charge-point operators and distribution-system operators alongside shippers, OEMs, and digital-platform providers, while municipalities and regulatory bodies influence siting, access, and timing (CLOSER, 2024).

The electrification of freight transport introduces challenges and opportunities for resource utilisation within business networks. Unlike traditional diesel vehicles, electric trucks require adaptations that go beyond technological adjustments, extending to new configurations of business relationships. Electric trucks, as focal resources, face unique constraints, including limited range, charging infrastructure availability, and high initial purchase costs (Shoman et al., 2023). These constraints necessitate the effective coordination of resources, such as fleet management systems and shared charging networks. Gillström et al. (2024) and Raoofi et al. (2024) highlight the need to align strategic goals with operational realities to manage these limitations and maximize efficiency for electric trucks, indicating that resources need to be re-configured and coordinated across multiple actors and activities within the network in order to sustain operational efficiency.

Additionally, electrification changes how everyday activities link actors together. Route planning must be synchronized with the state of charge, charger availability, and driver-hours rules. Booking and queue management at public hubs become shared activities rather than firm-internal tasks. Long grid-connection lead times must be coordinated with vehicle delivery schedules and shipper contracts. System-dynamics studies show that adoption and charging rollout influence each other through feedback over multi-year horizons, so mistimed decisions on any side can propagate as under-utilised assets or constrained operations (Raoofi et al., 2024).

2.4.3 Research Motivation

Much of the recent academic work and industry reports frame heavy-duty electrification as a techno-economic optimization problem regarding how to size batteries and chargers, plan routes and schedules, and close the total-cost-of-ownership gap, rather than as a coordination problem across firms. Reviews and modelling papers focus on cost and operational optimization of electric trucks and charging networks, examples of this type of work focusing on

the techno-economic optimization problem are Engstrom et al. (2024) and Danielis et al. (2025).

However, other studies show that the challenge lies in coordination across interdependent actors. First, a study of BEV fleets finds that, alongside charging time and product availability, the absence of suitable business models and partnerships is among the most influential barriers, explicitly reframing adoption as a system-wide challenge rather than a purely technical one (Konstantinou & Gkritza, 2023). Moreover, Dehkordi et al. (2024) argue for a business model approach, emphasizing that the transition to electric commercial vehicles is hindered by the absence of proven business cases and that companies need to adopt a network view when designing their business models. Together, these findings motivate a network-oriented research focus to understand the electrification of freight transport.

3 Research Method

This chapter outlines the research design and methodological approach adopted in the study. It presents the industrial PhD research context, the qualitative case-based strategy, and the abductive logic guiding data collection and analysis. The chapter also explains how empirical material was generated and interpreted, providing transparency regarding the methodological choices underpinning the study.

3.1 Research Context: Industrial PhD Setting

This research was conducted within the Optimized Freight Transportation Solutions project, a collaborative initiative between Volvo Group and Chalmers University of Technology, funded by the Swedish FFI program (Strategic Vehicle Research and Innovation). The project focuses on developing optimized transport solutions for electrified heavy vehicle fleets.

The project comprises two interconnected PhD studies. One focuses on business networks, examining how electrification reshapes resource coordination, actor interaction, and operational practices in freight transport. The other focuses on optimization modelling, aiming to align mathematical planning models with real-world operational and business constraints. This thesis constitutes the business network-oriented research stream.

As an industrial PhD student, the role is positioned at the intersection of academic research and industrial practice. The research is conducted in close collaboration with supervisors at both Chalmers University of Technology and Volvo Group, allowing continuous interaction between the theoretical development and industrial relevance. This positioning provides access to ongoing developments within the industry while maintaining academic openness in analysis and interpretation.

The embedded nature of the research shares similarities with self-ethnographic approaches (Alvesson, 2003), as the researcher is situated within the organizational context being studied. This positioning enables deep contextual understanding of organizational dynamics, strategic considerations, and practical constraints related to the electrification of freight transport.

3.2 Research Strategy and Design

3.2.1 Case Study Approach

This research adopts a qualitative research strategy to explore the complex, interdependent, and evolving nature of electrified freight transport. Qualitative methods are well-suited for studying phenomena where technical, organizational, and relational elements are intertwined and where boundaries between actors and systems are not clearly defined (Yin, 1984). Exploratory case studies are therefore appropriate for capturing such complexity in an emerging research field.

A multiple case study design was employed (Aaboen et al., 2012), enabling comparison across different organizational contexts and actor positions within the freight transport network. This approach supports analytical generalization rather than statistical representation and is well established within industrial marketing and business network research (Halinen & Törnroos, 2005; Dubois & Araujo, 2004).

The use of multiple cases strengthens robustness by allowing recurring patterns and variations to be identified across settings (Eisenhardt & Graebner, 2007), while also supporting network-level analysis involving hauliers, transport buyers, intermediaries, energy actors, and OEMs.

Case selection was guided primarily by empirical relevance rather than representativeness. The starting point of the study was hauliers that had already begun electrifying their fleets, as these actors are among the first to face the operational, organisational, and relational challenges associated with electric truck utilisation. Given that hauliers with electric fleets are still relatively few, the study deliberately focused on early adopters to capture emerging practices and constraints at an early stage of the transition.

From these focal hauliers, the empirical scope was extended outward to include their business partners, such as transport buyers, intermediaries, energy actors, and OEMs. This network-oriented approach enabled in-depth analysis of how electric truck utilisation is organised through interaction and resource coordination across firm boundaries. At the same time, breadth was achieved by including multiple hauliers with different sizes, roles, and levels of electrification, allowing for comparison across cases and the identification of recurring patterns.

The study includes actors in different positions within the freight transport network, allowing analysis of how electrification is shaped by network embeddedness rather than isolated firm-level decisions. Following the logic of systematic combining (Dubois & Gadde, 2002), the empirical scope evolved during the research process as new insights emerged, and the theoretical focus was refined.

3.2.2 Abductive Research and Systematic Combining

This research applies an abductive approach through the method of systematic combining (Dubois & Gadde, 2002), which supports an iterative movement between empirical data, theoretical frameworks, case development, and emerging insights. Rather than following a linear inductive or deductive logic, systematic combining encourages flexibility and responsiveness throughout the research process. This approach is particularly suitable in the context of electrification, where technologies, actor roles, and system conditions are continuously evolving. As Bansal and Corley (2011) argue, theory-building in qualitative research should prioritize insight and practical relevance rather than simply filling predefined gaps in existing literature, which aligns well with this research approach.

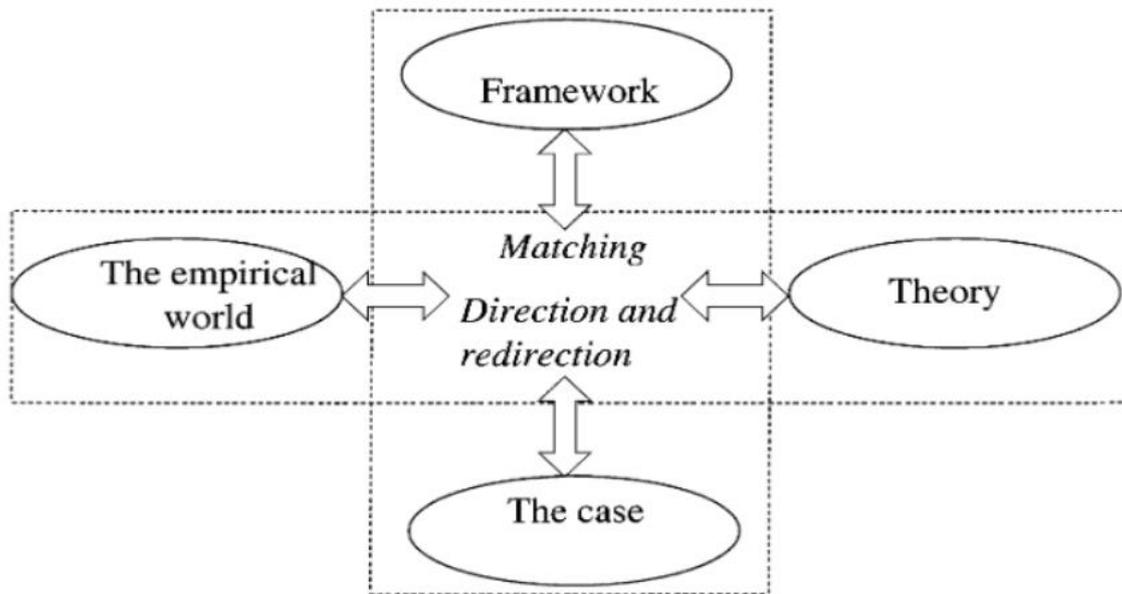


Figure 2: *Systematic Combining (Dubois and Gadde, 2002)*

Figure 2 illustrates the logic of systematic combining, highlighting the ongoing interplay between four core elements: the empirical world, the theoretical framework, the case, and emerging theory. Central to this process are the mechanisms of matching and direction and redirection, which guide the development of the study over time.

In practice, systematic combining guided both data collection and analysis throughout the research process. Initial interviews were conducted with a broad exploratory focus to understand how electrification was experienced and managed across different organizational roles and contexts. As recurring patterns emerged, particularly concerning electric trucks as focal resources and the central role of charging infrastructure, the empirical focus was progressively refined. Subsequent interviews and case analyses were directed toward deepening understanding of these themes, while theoretical engagement with the Industrial Network Approach was revisited and adjusted in parallel. This iterative movement between theory and data shaped the final analytical structure of the thesis, which moves from firm-level operational adaptations toward relational and network-level interpretations of electrification

3.3 Data Collection

3.3.1 Primary Empirical Data: Interviews

The empirical material in this thesis is primarily based on semi-structured interviews with actors involved in the electrification of freight transport. In total, seven interviews were conducted with hauliers (3), transport buyers (2), transport intermediaries (1), and energy-related actors (1). The interviewees included CEOs, senior managers, and technical experts with direct responsibility for fleet operations, electrification strategies, and infrastructure development, ensuring access to both strategic and operational perspectives.

This interview material constitutes the main empirical foundation of the thesis and provides insight into how electric trucks are integrated into freight transport operations in practice. By engaging with key actors occupying different positions in the freight transport network, the interviews enable a detailed understanding of electrification from multiple perspectives, allowing for depth in the study. The case-based interview approach allowed for exploration of each actor's operational context, experiences, and challenges. Insights emerging from individual interviews were used to guide subsequent data collection, enabling the study to follow relevant themes and relationships as they appeared across cases.

Interviews focused on operational practices, planning routines, resource use, coordination challenges, and experiences related to electric truck utilisation. An interview guide (see appendix) was used to structure the conversations while allowing flexibility for participants to elaborate on issues they considered important. In line with Holloway and Jefferson (2008), the interviews emphasized concrete experiences and narratives rather than abstract opinions. All interviews were recorded, transcribed, and summarised, forming the basis for the empirical analysis.

In addition to interviews, observational data were collected to complement and contextualize the interviews. In one case, this included a site visit to a haulier operating an advanced electric fleet, where logistics operations and charging infrastructure were observed in practice. These observations enhance the contextual understanding and support the interpretation of interview material, rather than as standalone empirical evidence. These situational observations help move beyond first-order concepts of what actors say they do toward second-order insights into how activities and resources are configured in practice (Van Maanen, 1979).

3.3.2 Complementary Empirical Material: Bachelor Thesis Projects

Complementary empirical material was obtained through two bachelor thesis projects conducted under my supervision during spring 2025 (Helander et al., 2025; Brenden et al., 2025). Together, these projects involved 14 semi-structured interviews with hauliers.

While the interviews were conducted by the students, I was responsible for defining the research scope, developing the interview focus, and supervising the analysis. The material was used to support and develop the primary findings and identify recurring patterns across a broader set of actors. This data was not used for in-depth within-case analysis but served as complementary input to strengthen analytical robustness and breadth.

3.3.3 Industrial Access and Informal Interactions

In addition to formal interviews, the research benefited from ongoing informal interactions and internal meetings within the Volvo Group. These interactions provided contextual understanding of OEM perspectives, strategic considerations, and internal coordination challenges

related to electrification. Such material was used as background knowledge to inform case selection, interview design, and interpretation, rather than as standalone empirical evidence.

3.4 Data Analysis

The analysis followed an abductive logic in line with the method of systematic combining (Dubois & Gadde, 2002). Data collection and analysis were conducted in parallel through continuous interaction between empirical material, theoretical concepts, and emerging interpretations.

The initial phase of the research and analysis was exploratory. Early interviews were deliberately broad and aimed to capture how electrification was experienced and managed in practice, particularly from the perspective of hauliers. These interviews addressed operational conditions, planning routines, economic considerations, and interactions with customers, intermediaries, OEMs, and energy-related actors.

As recurring patterns emerged, the analytical focus was progressively refined toward how electric trucks function as a focal resource and how their integration depends on the coordination of resources across organizational boundaries. This refinement was guided by both the Industrial Network Approach and repeated empirical observations that electrification challenges were primarily relational and organizational rather than purely technical.

The empirical material was analysed through a case-based approach, where individual cases were examined in depth to develop narratives of how electrification was organized in specific contexts. These narratives captured how actors configured transport operations, created and adapted to charging infrastructure, negotiated contractual arrangements, and coordinated planning activities within their networks.

Rather than following a strict sequence of within-case and cross-case analysis, insights from different cases were continuously compared throughout the research process. Patterns identified in early cases informed subsequent data collection and interpretation, while later cases were used to refine and nuance emerging insights. Complementary material from supervised bachelor thesis projects was used to strengthen pattern recognition across a broader set of actors.

The analysis moved from empirical descriptions toward more abstract interpretation. Findings were first structured across firm, relational, and network levels, and subsequently integrated using the Scheme for the Analysis of Business Relationship Development Effects (Håkansson & Snehota, 1995).

Overall, the quality of the study builds on the iterative research process enabled by abductive research and systematic combining. By continuously moving back and forth between empirical material, theory, and emerging interpretations, the study allowed insights to develop progressively rather than being imposed from the start. Research questions and analytical focus were

refined over time in response to empirical observations, particularly as interviews revealed that utilisation challenges were more strongly linked to resource characteristics and interconnectedness across actors than initially anticipated. This abductive process strengthened the coherence of the analysis by ensuring that theoretical concepts were grounded in empirical material, while empirical interpretations were informed by established theory. The systematic documentation of interviews, detailed case narratives, and continuous comparison across cases further supported analytical transparency and credibility.

The industrial PhD context further supported research quality. Access to an OEM environment enabled continuous contextualisation and reflection on interview material, allowing empirical statements to be assessed for consistency and plausibility across cases. While not used as standalone empirical material, this access strengthened interpretation without compromising academic methods.

3.5 Use of AI-Based Tools in the Research Process

AI-based language models were used as a supportive tool during the research and writing process of this thesis. The primary purpose of these tools was to assist with structuring text, improving clarity and coherence, refining academic language, and supporting iterative rewriting of drafts.

Importantly, AI tools were not used to generate empirical material, conduct interviews, perform analysis, or make analytical or theoretical decisions. All empirical data collection, interpretation, and analytical reasoning remain the responsibility of the author. The theoretical framing, research design, analytical structure, and conclusions presented in this thesis are based on the author's independent judgment, grounded in empirical material and academic literature.

4 Empirical Material

This chapter presents the empirical material that forms the basis for the analysis. First, it introduces the hauliers as the focal actors in the study and presents case narratives that summarise how electrification is approached and enacted in their everyday operations. Second, it broadens the empirical scope by presenting key business partners.

4.1 Hauliers as Focal Actors in Electrification

Table 1 summarizes the hauliers that constitute the core empirical cases in this study and provides basic background information on each actor, including data source, fleet size, main customer segment, and electrification status. The table serves as an overview and reference point for the more detailed empirical descriptions of each haulier presented in the subsequent sections.

Table 1: Overview of interviewed hauliers

Haulier ID	Data Source	Fleet size	Customer Segment	Electrification Status
<i>Alpha</i>	Primary	Large	National distribution & part-load freight (incl. intermodal)	Established BEV fleet (≈ 30 BEVs)
<i>Bravo</i>	Primary	Small-medium	Regional distribution	Pilot-scale BEV deployment (3 BEVs)
<i>Charlie</i>	Primary	Medium-large	Regional distribution	Small BEV fleet (10 BEVs)
<i>Delta</i>	Secondary	Not applicable	Regional & national transport	Single BEV
<i>Echo</i>	Secondary	Medium	Distribution & long-haul	Single BEV
<i>Foxtrot</i>	Secondary	Medium-large	Regional distribution	Limited BEV use (leased vehicles)
<i>Golf</i>	Secondary	Small-medium	Food & timber / forestry distribution	No BEVs
<i>Hotel</i>	Secondary	Medium	Distribution & warehouse-focused logistics	Single BEV
<i>India</i>	Secondary	Small-medium	Mixed distribution (incl. hazardous goods)	Single BEV
<i>Julieta</i>	Secondary	Large	Distribution with integrated energy infrastructure	High BEV share ($\sim 50\%$ of fleet)
<i>Kilo</i>	Secondary	Large	Construction transport (crane, cement, aggregates)	No BEVs yet; identified potential flows
<i>Lima</i>	Secondary	Large	Urban & regional distribution (pallets/packages)	High BEV share ($\sim 50\%$); target full electrification
<i>Mike</i>	Secondary	Small-medium	General distribution	Small BEV fleet (heavy trucks & vans); expansion planned
<i>November</i>	Secondary	Small	Cold & frozen food distribution	No BEVs
<i>Oscar</i>	Secondary	Small	Construction transport	Single BEV
<i>Papa</i>	Secondary	Small	Construction & food/beverage distribution	No BEVs
<i>Quebec</i>	Secondary	Medium-large	Distribution & long-haul	Small BEV fleet (4 BEVs)

4.1.1 Haulier Alpha

Fleet Characteristics and Electrification Strategy

Haulier Alpha is one of Sweden's largest privately owned logistics companies, with around 850 employees and daily operations across the entire country. The company controls a fleet of approximately 450 trucks and supplements this with subcontracted vehicles. A key feature of its operations is the integration with rail, enabled through its sister company, which owns and operates several freight trains and around 500 rail wagons. This intermodal solution allows Haulier Alpha to shift long-haul traffic from road to rail, effectively replacing an estimated 50,000 truck journeys annually. As the CEO described:

“We more or less swap asphalt for rail in the long-distance segment. Because we run the trains ourselves, with our own drivers and planning, we keep control and avoid delays that often plague the rail system.”

Electrification is a central part of Haulier Alpha's sustainability strategy. The company has committed to being fossil-free by 2026, gradually phasing out diesel vehicles and replacing them with electric and gas alternatives. An early step was the purchase of 30 electric trucks in one order, largely driven by internal ambition but facilitated by a favourable OEM offer. As the CEO recalled:

“At first, it was very much our internal target that drove us. We wanted to take a leap and show that we were serious about electrification.”

Since then, customer demand has become an increasingly important driver. Large clients, including global industrial firms, have begun to request electric transport solutions, and Haulier Alpha has actively positioned itself to meet these expectations. In some procurement processes, the explicit inclusion of electric trucks has been stated as a requirement, whereas in other cases, the company has been able to proactively offer electric alternatives and secure a price premium. As the CEO explained:

“It costs a bit more, but for several of our customers it is valuable enough that they are prepared to pay.”

Operational Utilisation and Practices

Haulier Alpha deploys its electric fleet primarily in short-haul distribution and feeder services for rail terminals. These operations are relatively predictable and within range, making overnight depot charging sufficient. Longer routes have been tested, sometimes at the request of specific customers, but require reliance on external charging infrastructure and more complex planning.

The company relies heavily on OEM-provided digital planning tools to optimize routes for electric trucks. These tools integrate parameters such as weather, load, and topography to

predict range. Haulier Alpha has also conducted live trials with traffic planners and drivers to verify route feasibility. Still, the CEO acknowledged limitations:

“The key is to have trucks running the same routes every day. If one day they go west and another day east, it becomes much harder to plan.”

Economics and Cost Challenges

The economic dimension of electrification remains a central concern. Electric trucks are significantly more expensive to purchase, up to three times the cost of a comparable diesel vehicle at the time of investment. Even with state subsidies, the CEO noted:

“If a diesel truck costs one million and the electric costs four, the support of half a million only scratches the surface.”

Operating costs vary depending on charging arrangements. Depot charging at negotiated electricity rates can make utilisation cost-effective, but external charging is far more expensive, sometimes five times higher. This makes route planning critical to avoid unnecessary public charging. The CEO summarized:

“If you need to charge twice externally and once at home, the cost per kilometre rises sharply. But if you stay local, you can make the numbers work.”

Maintenance costs appear lower so far, due to fewer moving parts, but uncertainty remains about battery lifetime and second-hand value. *“We simply don’t know what the resale value will be,”* the CEO admitted, underscoring a concern widely shared among hauliers.

Customer Influence and Market Dynamics

Haulier Alpha underlined that customers are a decisive factor in electrification. Some large industrial clients explicitly demand fossil-free transport, and for them, electrification is a way to strengthen their sustainability profiles. Others, however, hesitate once the additional costs become visible. The CEO reflected:

“Our existing customers who were early adopters are now asking for more electric services. But I think some who were about to take the step have put it on hold, because of the cost.”

The company has, in some cases, delivered electric transport without explicit customer demand, absorbing higher costs to familiarize customers with the new technology. The CEO stated:

“We’ve put out electric trucks where customers didn’t ask for them, but once they got used to it, they were happy. It will be interesting to see how they react when the time comes to pay more for it.”

Collaboration and Infrastructure

Electrification has required Haulier Alpha to invest in depot charging infrastructure and service agreements with OEMs to ensure uptime. The company has also established agreements

with external charging providers, though costs remain high. Looking forward, the CEO sees potential for industry collaboration:

“We’ve talked with other hauliers about setting up shared fast-charging hubs and exchanging services. There’s a feeling that those of us going green are part of the same team.”

Future Outlook

Haulier Alpha expects electric trucks to play a central role in its fleet over the next 5 to 10 years, but only if range improves and charging becomes faster. *“If we can charge in 15 minutes instead of hours, then it’s a completely different game,”* the CEO remarked. For now, electrification is focused on predictable, shorter flows where vehicles return to base daily. For long-haul transport, gas remains a more practical complement. The company views its intermodal solution of combining electrified trucks with electric rail as its most competitive path toward fossil-free logistics.

4.1.2 Haulier Bravo

Fleet Characteristics and Electrification Strategy

Haulier Bravo is a family-owned transport company operating in Värmland, Sweden. The business is run by a slim management team, with the current CEO and his father as owners, supported by a small office staff. Despite its modest organizational structure, the company employs around 80 drivers and manages a fleet of approximately 40 trucks. The fleet composition illustrates its transitional energy strategy: around 30 diesel vehicles, eight biogas trucks, and three battery-electric trucks, all supplied by Scania.

The firm’s operations are centred on long-haul traffic in central Sweden, with significant flows toward Stockholm, Östergötland, and Småland. Locally, it runs industrial flows in Värmland, including shuttle services for pulp and paper companies. Much of its business is tied to the daily goods sector, where reliability and efficiency are of high importance.

Operational Utilisation and Practices

Bravo currently deploys its three electric trucks on carefully selected routes that fit their technical limitations. One electric truck runs daily between Värmland and Norrköping, a 230-240 km round trip. Another is a chip transport truck moving timber residues between a sawmill and a paper mill, around 30 km each way. This vehicle operates in two shifts Monday to Friday, plus extended shifts on weekends, making up to six trips per shift. The third electric truck is dedicated to short-range recurring route, transporting paper from a pulp mill to a nearby port terminal just 10 km away. This truck runs continuously, 24 hours a day, seven days a week.

Charging takes place both at company facilities and at infrastructure provided by their network partner, which co-owns a regional charging company. Bravo can thus access a network of 8 to 11 charging stations across Värmland. Some customer sites, such as in Norrköping, also provide charging for their contracted electric flows.

Decision-making and Risk-sharing

The company has long emphasized efficiency and innovation, following an internal philosophy of investing in high-capacity vehicles and sustainable technologies as a competitive advantage. However, the decision to purchase electric trucks was strongly tied to customer backing and longer-term contracts. According to the CEO, contracts for electric truck operations typically run around five years, longer than diesel contracts to reflect the higher risk and limited redeployment options for electric vehicles:

“It feels better in the stomach with longer contracts when it’s new technology. In the end, it still comes down to the job we do every day, but the risk is different with electric.”

The company finances its vehicles through bank loans, similar to diesel trucks. While subsidies and customer support have helped, the CEO stressed that fluctuating fuel and electricity prices strongly influence the cost-benefit balance. Early investments were based on electricity being cheaper than diesel, but recent diesel price reductions and higher electricity prices have undermined the economic case:

“When diesel was 22 SEK and electricity 3 SEK, the calculation looked very different. Today it’s the other way around. But we work long-term, we believe it will balance out again.”

Operational Challenges and Efficiency

Running a mixed fleet of diesel, gas, and electric trucks creates logistical inefficiencies. The CEO explained how the lack of uniform fuelling and charging options can force suboptimal operations:

“Say we load paper rolls in Gävle for Forshaga on a gas truck, and the same day need to move rolls to Oskarshamn. Because the gas truck can’t reach Oskarshamn, we unload it, return it empty, and send a diesel truck instead. That’s a big efficiency loss.”

The company is exploring digital solutions that could combine load weight, route topography, and driver schedules with charging optimization. This includes experimenting with external developers who use Bravo’s operational data for simulations.

Customer and Network Relationships

Bravo operates exclusively within a transport network with a connection to an intermediary, which supplies all customer flows and coordinates route allocations. The relationship is described as *“like a marriage,”* characterized by deep interdependence. The intermediary plays a central role in enabling electrification, both by aggregating customer demand and by investing in charging infrastructure.

Customer interest in electric transport varies, but Bravo highlighted that large industrial clients such as pulp and paper companies have shown stronger commitment than the daily goods sector, which the CEO had originally expected to lead. He reflected:

“I thought the food retail sector would be first. But in practice, it’s been big international industrial companies that have taken the lead.”

Bravo has also noted the importance of not *“selling the green shift twice,”* stressing transparency in how green transport is allocated and reported to customers.

Future Outlook

Looking forward, Bravo sees opportunities in longer-range electric trucks and fast-charging solutions. The CEO reflected on a conversation with Scania, contrasting two possible futures:

“Would you rather have 600 km range with one-hour charging, or 400 km range with 10-15 minutes charging? Honestly, the second is more interesting if the infrastructure is there.”

The company is also interested in potential innovations such as battery-equipped trailers, though technical challenges remain. More broadly, the CEO believes that electrification will lower efficiency in the short term, as mixed fleets create planning complexities, but that efficiency will return as infrastructure and digital tools catch up.

4.1.3 Haulier Charlie

Fleet Characteristics and Electrification Strategy

Haulier Charlie is a mid-sized transport operator based in Östergötland with approximately 125 trucks in active use. The company runs a broad mix of distribution and regional haulage services, including paper transport, pallet and parcel distribution, and construction-related assignments. Since 2018, the company has pursued a deliberate strategy of fossil-free transport. As the CEO explained:

“We haven’t bought a single fossil truck since 2018. It’s been LBG or electric only.”

By early 2025, more than half of the fleet was either electric or biogas powered. At the time of interview, the company operated four electric trucks, with two more arriving within weeks, and a prototype vehicle under trial in cooperation with an OEM. In addition, two smaller electric vans were entering service. This meant the company expected to operate around 10-11 electric vehicles by early 2025. The CEO framed this not only as a business decision but as part of identity:

“We try to be a bit ahead in everything. It helps win customers, but also it’s who we are. We want to over-deliver compared to what people expect.”

Charlie has taken a tailored approach to electrification, customizing each truck purchase to specific operational needs rather than treating BEVs as interchangeable with diesel. An example was the decision to exclude towing capacity on one Volvo FM truck.

“We only use the drag maybe twice a year. Why pay for that every day? Without the drag, we could go down to two motors and a smaller battery, which made the truck cheaper and lighter.”

This vehicle used a 360 kWh pack instead of 540 kWh, reducing both purchase price and operating costs while still matching the payload of a diesel equivalent due to the regulatory weight allowance for EVs. Such choices reflect a mindset of designing for utilisation, not maximum flexibility. As the CEO explained, electric trucks must be placed on “*the right job*” to make sense economically.

Operational Utilisation and Practices

Electric trucks are assigned to highly standardized routes. Predictability is critical for managing range and charging schedules. One electric truck shuttle between a local paper mill and the harbour, hauling approximately 200 tons of paper per day. It operates 200 to 240 km daily on a single charge, moving trailers back and forth in a repetitive cycle. Another truck covers a 150 to 220 km regional distribution circuit, delivering pallets and parcels across northern Östergötland and southern Sörmland. This circuit is nearly identical each week in distance and load, making it well-suited for BEV use. The CEO emphasized that BEVs cannot yet be used randomly or flexibly:

“It’s very static routes with electric trucks. We don’t dare to move them around. They’re designed for specific loops.”

When infrastructure becomes more reliable and widely available, the company hopes to expand into more dynamic deployment.

Operational Challenges and Weather Sensitivity

Despite careful planning, BEV operations are vulnerable to external conditions. The CEO recounted an example:

“We had our 64-ton electric with double trailers in a snowstorm. Normally, we reach Stockholm and back on one charge. That night, with slush and headwinds, we got only 100 km before the battery was down to 12%. It consumed 88% of the charge just to reach Järna.”

The vehicle, weighing 62 tons in those conditions, required roadside assistance to move only 300 meters to a charger. The CEO concluded:

“Slush drains insane amounts of energy. With diesel, you hardly notice, you just refuel. With electric, you don’t have that option.”

Such events underline how range variability adds risk and requires contingency planning.

Charging and Infrastructure

Charlie relies on a combination of depot charging, customer-provided charging, and public infrastructure, but the CEO was clear about the hierarchy:

“When we’re at home, with our own chargers, it’s fine. Public charging is a different story, more expensive, harder to rely on, and you risk waiting in line.”

The company has invested heavily in its own charging hub with a 2.4 MW battery storage on-site, a large-scale solar panel feeding directly into trucks and the grid, and Sweden's first megawatt charging system station, installed in early 2025. The investment has been so extensive that the CEO created a separate energy company to own and operate the charging hub, selling electricity to both the transport fleet and external users:

“It’s crazy money. But if we can’t manage our own energy, we won’t survive. So, we’ll own our fuel.”

This highlights how electrification blurs the line between transport and energy industries.

Economics and Policy Environment

From an economic perspective, the CEO stressed that electrification only works with customer support and stable contracts. Thin margins mean hauliers cannot absorb higher costs alone.

“Longer contracts are essential. Otherwise, we don’t know if we’ll still have the right jobs for an electric truck after three years.”

The company lobbied for simpler subsidy systems, noting that current grant applications (e.g. Klimatklivet) are barriers to smaller hauliers:

“It’s Mount Everest for a one- or two-truck operator. Paperwork and rules that don’t match reality. That slows electrification.”

Policy volatility was described as a major frustration. During a recent tax change on biogas, the company carried a cost disadvantage of 15-18 SEK per mile compared to competitors.

“We stuck our necks out and said we’d be fossil-free. Customers didn’t pay the difference, and we lost money. That can’t keep happening with electricity.”

Customer Relations

Customer demand has both driven adoption and created frustration. Early BEV purchases were made to satisfy clients wanting to showcase fossil-free transport, sometimes covering the extra costs. However, enthusiasm has cooled as inflation and interest rates rose:

“Two or three years ago, it was hyped. You could do anything if you had an electric truck. Today, customers aren’t ready to pay.”

Retailers and consumer-facing firms (e.g. food) remain most willing to engage, motivated by sustainability branding and upcoming EU CSRD reporting. Industrial clients such as paper mills or ports are more conservative.

Another challenge is delivery time windows. Strict schedules leave little room for charging breaks. The CEO argued for new logistics agreements that integrate charging needs:

“Give me fifteen hours instead of twelve, then I can charge and still deliver. Customers would even get cheaper transport. But if we stick to old rules, it won’t work.”

Driver Perspective

Contrary to early scepticism, drivers have embraced BEVs enthusiastically:

“Not a single driver is unhappy with an electric truck. They love them, smooth, quiet, always warm, always cold.”

The main frustration is waiting to charge, especially when a trip requires long fast-charging breaks. Still, EVs are seen as improving recruitment in a tight labour market.

Innovation and Future Outlook

The CEO sees electrification not only as a challenge but as a chance to redefine the business model where possibility exist to using trucks for vehicle-to-grid services in the future, offering 24/7 public charging at the company’s depot, and exploring electric trailers to share battery loads between truck and trailer. In the longer term, the company expects to phase out diesel and move to an all-electric fleet once range, weight, and infrastructure improve. As the CEO concludes:

“Give me a truck that runs 4.5 hours, charges 45 minutes, and runs another 4.5 with 64 tons. Then it’s game over for diesel.”

4.2 Additional Hauliers

4.2.1 Haulier Delta

Haulier Delta operates a mixed fleet and initially faced scepticism from drivers toward electric trucks. After the driving experience, attitudes shifted positively, with many drivers preferring BEVs. Haulier Delta emphasizes that a range of 600 to 700 kilometres is required to match diesel, while currently relying mostly on depot charging (around 70%), using public stations only when necessary. The company is critical of OEM digital services such as Volvo Connect, which they perceive as misaligned with operational needs.

Economically, Haulier Delta sees electrification as difficult without strong customer support. While maintenance costs appear lower, downtime is expensive. The first electric truck was purchased at the request of a customer who agreed to cover the additional cost. Customers typically pay energy costs through surcharges, but their strict delivery-time demands limit operational flexibility. Haulier Delta predicts that in ten years their fleet will be a mix of diesel, electric, and gas vehicles. They also caution that rapid electrification carries risks since vehicles are not yet sufficiently tested, and smaller hauliers may be disproportionately exposed.

4.2.2 Haulier Echo

Haulier Echo purchased its first BEV primarily to gain operational experience. OEM digital platforms were judged inadequate, though drivers became positive once they had tested BEVs. With profit margins as low as 0.5%, electrification is financially challenging. BEVs cost about

twice as much as diesel, and resale value uncertainty is a central concern. While diesel trucks are sold abroad after 10 years, there is currently no secondary market for BEVs.

Haulier Echo emphasizes that electrification is only feasible when customers share in the costs. Although customers express interest in BEV transport, they tend to push prices down, especially during downturns. Fuel and electricity costs are passed on via surcharges. Looking forward, Haulier Echo expects a mixed fleet including electric, HVO, gas, and hydrogen, with BEVs dominating city distribution. They stress the need for fast chargers and a clearer, long-term policy framework.

4.2.3 Haulier Foxtrot

Haulier Foxtrot reports strong driver preference for BEVs due to quieter operation and reliable performance. However, one-man hauliers in their network face unique challenges, including difficulties with charging at home, high investment costs, and reduced operational flexibility. Haulier Foxtrot itself would like to adopt more BEVs but insists that higher costs must be compensated in customer contracts.

Total cost of ownership remains difficult to assess because of volatile electricity prices and uncertain residual values. Leasing is used to reduce risks. Customers often ask about BEV services but tend to lose interest once additional costs are explained. Charging is usually paid by the haulier, although some larger customers contribute. Haulier Foxtrot notes a broader tension between customer demands for faster, cheaper deliveries and the operational limits of BEVs. They see BEVs as well-suited to regional distribution but consider gas more appropriate for long-haul.

4.2.4 Haulier Golf

Haulier Golf expresses strong internal willingness to electrify but highlights gaps in charging infrastructure. Charging downtime increases wage costs, and high upfront investments are considered too risky for smaller firms. Haulier Golf predicts consolidation in the industry, where larger firms will absorb smaller hauliers unable to electrify.

Customer willingness varies across sectors, where food customers are generally more supportive, and timber customers are less so due to the higher transport cost share of the final product. Short contracts are also a barrier, as they limit long-term investment security. Haulier Golf expects to operate a mixed fleet going forward and sees the need for reliable digital planning tools that integrate energy management, route scheduling, and eco-driving support.

4.2.5 Haulier Hotel

Haulier Hotel has adopted BEVs mainly through leasing to reduce exposure to uncertain residual values. Drivers are satisfied with the vehicle, and customer-provided charging has supported further adoption. Depot charging dominates, as public charging costs around twice as much.

Although BEV investment has led to higher transport prices, these are typically passed on to customers. Haulier Hotel points out that warehouses, their main customers, face limited consumer-facing sustainability pressures, making them less willing to pay premiums. They anticipate electrification will begin with last-mile delivery. Customers usually cover energy costs, but planning has become more complex with BEVs. In the future, Haulier Hotel expects a mixed fleet with BEVs capable of 600 to 700 km range.

4.2.6 *Haulier India*

Haulier India demonstrates strong internal motivation to electrify, though their early adoption was hampered by an under-dimensioned charging solution that required reinvestment. A key customer initiated their first BEV purchase, motivated by the desire to prove feasibility.

The company uses a fixed electricity contract (0,50 to 0,70 SEK/kWh), but TCO remains difficult to calculate because of variable loads. Most customers are unwilling to pay extra, particularly when diesel is cheap, and very few accept the costs of public charging. Haulier India expects half its fleet to be electric in the future but will retain alternative fuels due to restrictions on BEV use in hazardous goods transport.

4.2.7 *Haulier Juliett*

Haulier Juliett has electrified half of its fleet and sees BEVs as a valuable recruitment tool for drivers. The company is experimenting with digital platforms, building charging stations, investing in battery storage, and exploring vehicle-to-grid applications. Their long-term goal is to own their own fuel supply.

They report that 97% of adoption barriers are economic, as BEVs cost twice as much as diesel. OEM guarantees on residual value, payment plans, and battery warranties facilitated adoption. Contracts are typically three years, but Haulier Juliett prefers five for greater stability. Despite heavy marketing of their BEV services, they have not experienced significant demand growth. Customers often require fossil-free transport, however, and exclude non-compliant hauliers.

Haulier Juliett currently views BEVs as an economic burden unless diesel prices increase but expects stronger investment within two years and improved stability in three to four years.

4.2.8 *Haulier Kilo*

Haulier Kilo is a family-owned company with 32 trucks and 70 employees, supplemented by 100 to 150 subcontracted transports daily. Their main customer dominates operations, with irregular deliveries within a 200 km radius.

Electrification is considered possible only on specific routes where flows are predictable and charging could be installed at customer sites. However, electrification would increase costs by around 20%, which customers are unwilling to pay. Short transport contracts are a

major obstacle, since they do not align with the 8 to 10-year depreciation cycle of trucks. Leasing is complicated by the need for customized vehicles. Battery life and replacement costs are seen as highly uncertain, and subsidies are perceived as insufficient to close the investment gap.

4.2.9 Haulier Lima

Haulier Lima operates 140 trucks, half of which will be electric by 2025, with a goal of full electrification by 2027 using self-produced solar power. Their motivation is internal rather than customer driven. Drivers appreciate the improved working environment, and the company plans to use its fleet for grid frequency regulation.

The cost of BEVs remains the greatest challenge, with electric trucks two to three times more expensive than diesel. State subsidies, OEM financing, bank loans, and monthly support from their main forwarder have been crucial. Most contracts are three years, though they would prefer five to better justify investment. Haulier Lima intends to phase out diesel entirely, leaving customers to choose whether to accept higher-priced electric transport.

4.2.10 Haulier Mike

Haulier Mike employs about 100 people and operates 55 heavy trucks (two BEVs) and 20 vans (four BEVs). Their largest customer accounts for 90% of operations and requires that all vans be electric by 2027 and 30% of heavy trucks by 2030.

Light BEVs have worked well operationally and economically, with drivers expressing satisfaction. Heavy BEVs, however, are significantly more expensive and less reliable, with costs about three times that of diesel. Distribution distances are short, limiting savings. Current charging capacity is adequate, but the company is concerned about expansion, given that they rent their facilities. Leasing reduces residual value risk, and state subsidies offset part of the cost. Haulier Mike worries about rising vulnerability to technical failures as electrification expands.

4.2.11 Haulier November

Haulier November specializes in frozen and chilled food distribution with a small fleet of six diesel trucks serving a single customer. They prefer to own rather than lease trucks, trading them in every five to six years.

The lack of a second-hand market for BEVs is seen as a major barrier, leaving them dependent on OEMs. They identify range requirements of 600 to 1000 km to accommodate their distribution needs. Charging breaks would disrupt tightly scheduled deliveries, and there are concerns that refrigeration loads could drain BEV batteries. Extreme weather conditions are also suspected to reduce battery performance. Still, electric drivetrains are expected to lower maintenance needs.

4.2.12 Haulier Oscar

Haulier Oscar is family-owned with 20 trucks, including one BEV and four gas vehicles. They focus on heavy construction transport in an urban area and serve both repeat and one-off customers.

Their leased BEV has functioned well, with drivers reporting satisfaction. However, payload capacity is reduced, and the truck has experienced at least one breakdown due to charging failure. The purchase price is nearly double that of diesel. Customers, including municipalities, are often constrained by procurement rules and are unwilling to pay higher rates. Charging competition is a concern, but a fixed-price electricity contract shields them from volatility. The haulier stresses that customer willingness to pay is the real barrier, more than the purchase price itself.

4.2.13 Haulier Papa

Haulier Papa operates 22 trucks across both construction and distribution. They currently run only diesel and HVO. While positive toward BEVs in principle, they view them as too expensive, with investment costs nearly 2 MSEK higher than diesel.

Payload reductions are a concern, particularly in construction, where batteries could reduce carrying capacity by three tons. They stress that reliable depot charging is essential, but grid limitations could pose risks if multiple trucks are charged simultaneously. Customers are price-sensitive, and three-year contracts dominate. Haulier Papa foresees that electrification will depend entirely on what customers are willing to pay for.

4.2.14 Haulier Quebec

Haulier Quebec, based in Malmö, operates 148 trucks, including four BEVs. Their business spans both distribution and long-haul.

Customer willingness to pay is the main challenge, as electrification is only viable if nearly all shippers on shared loads demand it. They reject offset-based solutions, arguing that customers' goods must physically be transported fossil-free. BEVs are seen as more complex to order and specify compared to diesel. Electrification has been pursued primarily in response to two major customers who contracted dedicated flows. Haulier Quebec emphasizes that longer contracts are necessary to reduce the cost gap between EV and diesel transport.

4.3 Hauliers in Interaction with Business Partners

To extend the empirical scope beyond individual hauliers, Table 2 provides an overview of additional actors included in the study that interact with hauliers in the electrification of freight transport. The table summarizes key business partners in the network, including a transport intermediary, transport buyers, and an energy actor, and outlines their main roles in relation to electric truck utilisation. The table serves as a reference point for the empirical material presented in the subsequent sections.

Table 2: Overview of partners in the freight transport network

Actor ID	Data Source	Actor Type	Main Role in Network
<i>Romeo</i>	Primary	Transport Intermediary	Connects customers to hauliers
<i>Sierra</i>	Primary	Transport Buyer	Customer of BEVs
<i>Tango</i>	Primary	Transport Buyer	Customer and operator of BEVs
<i>Uniform</i>	Primary	Energy Partner	Energy solutions provider

4.3.1 *Transport Intermediary Romeo*

Company Background and Role in the Network

Transport Intermediary Romeo functions as a regional and national transport intermediary and organizer. The company does not own vehicles itself but is collectively owned by approximately 40 to 50 member hauliers. These members operate their own fleets, while Romeo manages the planning, coordination, and customer interface under a shared service brand.

The total fleet comprises around 230 trucks distributed across several business areas, including industrial goods, forestry transport, consumer products, and domestic distribution. Through centralized traffic planning, Romeo connects shippers, carriers, and infrastructure providers, enabling smaller hauliers to access larger, more stable contracts within a unified logistics framework.

Electrification Status

At the time of the interview, the fleet included around a dozen fully electric trucks and several plug-in hybrids, with additional units on order that would bring the share of electric vehicles close to ten percent by the end of 2024. The remaining fleet uses renewable fuels such as biogas and HVO. Vehicles are primarily sourced from the two major Nordic truck manufacturers, complemented by a few from other OEMs.

Romeo’s strategy is characterized by a pragmatic openness to multiple technologies, but management views BEVs as the dominant solution for most transport missions in the medium term.

Electrification Strategy

Romeo’s board decided early to take a proactive stance toward new transport technologies. Electrification was introduced around 2021, following strategic discussions that began already in 2019. The motivation was twofold: to maintain the company’s position as the most sustainable transport organization in its region, and to build practical experience with future-oriented technologies.

The first electric truck was deployed in collaboration with a key local customer, and subsequent trials confirmed that real-world performance often exceeded initial range and reliability expectations. This strengthened the company’s confidence in the potential of BEVs for an increasing share of operations.

Operating Pattern and Route Design

Romeo coordinates a wide variety of transport assignments, ranging from regular flows with long-term industrial customers to ad hoc domestic shipments. Electric trucks are used both for urban and regional distribution near depots and for short- to medium-distance linehaul between key hubs and customer facilities. On certain corridors, electric trucks operate full round-trip without intermediate charging, while others include planned top-ups at route locations such as partner depots or high-capacity charging stations. In newer long-distance flows, such as between central and coastal Sweden, the company combines charging at its own sites with charging at customer facilities.

Charging Infrastructure and Energy Subsidiary

Management repeatedly emphasized that charging infrastructure is the single most critical factor for successful electrification. To address this, Romeo has established a dedicated subsidiary responsible for building a network of public heavy-duty charging stations along key routes. Romeo holds a majority ownership stake in the subsidiary, alongside an energy partner and several haulier investors.

While the initial purpose was to secure Romeo's own operational needs, the subsidiary is structured as a commercially viable entity with public access. This dual approach, strategic and entrepreneurial, has allowed the firm both to reduce its dependency on external charging networks and to contribute to the broader regional transition toward electric transport.

Optimization Tools

As the share of BEVs increases, traditional manual planning tools become insufficient to handle the complexity of electric operations. To meet this challenge, Romeo entered a collaboration with a technology company to co-develop a real-time optimization system that integrates telematics, driver data, and route parameters. The system is designed to continuously adjust routes and charging sequences based on energy status, geography, and delivery priorities. At the time of interview, the software was in an early beta stage but already being used for data collection and simulation of live scenarios. The company expects that, once fully implemented, the system will enable multi-vehicle coordination and dynamic resource allocation across corridors, representing a significant shift from static route planning.

Customer Relations

Customer interest in electric transport has been consistently high across sectors. Industrial manufacturers, retail distributors, and large process industries have all shown willingness to participate in pilot projects and long-term electrification partnerships. Romeo observes that customers' flexibility in delivery windows and order patterns is an important enabler, as it allows for higher vehicle utilisation and better charging synchronization.

However, recent political changes in national fuel policies temporarily widened the cost gap between diesel and electric operations, slowing the economic attractiveness of new investments. Despite this, most customers remain committed to long-term sustainability targets and view electrification as strategically inevitable. Driver feedback has been strongly positive, with reports of smoother operations, lower noise levels, and overall improved working conditions.

Cost and Utilisation Strategy

Romeo's economic model for electrification is based on balancing high investment costs with lower operational expenses. To make the financial equation work, electric trucks must operate for extended hours and cover significant daily mileage. In some cases, BEVs are utilised nearly around the clock through alternating driver shifts, while others run single-day cycles depending on assignment density.

Maintenance costs have been lower than expected, with minimal technical issues reported so far. The primary cost sensitivity remains linked to the relative price of diesel and electricity, as well as the variability of site-based electricity tariffs. High utilisation and predictable charging schedules are thus essential to achieving profitability.

Collaboration

Strong partnerships underpin Romeo's electrification strategy. The company's ownership structure inherently fosters collaboration among hauliers, but the energy transition has expanded this network. Romeo's cooperation with an energy company within its charging subsidiary provides critical expertise in grid access, capacity planning, and energy pricing.

The firm also engages with multiple OEMs and calls for greater openness in vehicle data sharing, arguing that restrictive data policies limit the potential for advanced route optimization and predictive maintenance. In Romeo's view, more transparent data exchange would strengthen integration between hauliers, intermediaries, and manufacturers, creating mutual value across the transport network.

Future Outlook

Romeo projects that around seventy percent of its operated fleet will be electrified by 2030, with the long-term potential reaching up to ninety percent as technology and infrastructure evolve. The remaining share will likely consist of alternative fuel vehicles used in specialized operations. Management expects charging infrastructure to become both a competitive advantage and a business in its own right, while the digital optimization system will transform operational coordination from vehicle-level management to integrated network planning.

The company's future trajectory is grounded in combining practical technological adoption with a collaborative, systems-oriented business model where electrification serves as both an operational and relational transformation of the network.

4.3.2 Transport Buyer Sierra

Company Background and Operations

Transport Buyer Sierra is a large Nordic pulp and paper producer with extensive transport operations across Sweden. The company relies entirely on external hauliers for both inbound and outbound flows, covering everything from roundwood transport from forest to mill, to transfers of by-products such as wood chips between sawmills and production sites. The interview respondents represented two key functions in their logistics area: operational transport management and transport development.

The operational function oversees daily flows, ensuring that transports follow plan and that materials reach the company's mills and customers efficiently. The development function focuses on future logistics capabilities, including sustainability initiatives and electrification. Both functions work closely with contracted hauliers and industry partners within *collaborative R&D projects*.

"We don't have our own trucks. The planning is largely handled by our transport partners, while we set the broader framework and volume plans."

Electrification Strategy

Electrification has become an increasingly important part of the company's sustainability agenda. Sierra is an active participant in two major national pilot programs for heavy-duty electric transport, one coordinated by a Swedish mobility innovation hub and another led by a forestry research institute. Across these projects, seven electric trucks currently operate, including the following types of usage: roundwood transports, chip transports between sawmills and mills, and short-range internal transports at mill and terminal sites.

Although electric transport still represents a small share of total flows, the company views its involvement as an important step in developing operational knowledge and supporting the broader transition within the forestry and logistics sectors.

"Compared to other participants in the project, we have a relatively large share of the vehicles running under our umbrella. That's a conscious choice as we want to learn."

Collaboration with Hauliers

Sierra's transports are carried out by a network of hauliers of varying sizes, from small regional operators to larger logistics groups. The company has long-term relationships with many of them and aims to work collaboratively to enable electrification.

One example is the installation of a charging station near one of the company's mills, built together with a local energy partner. The station is leased as a service rather than owned outright, allowing hauliers to access cost-effective charging during loading and unloading.

"Public charging is still too expensive and unreliable. By enabling charging at our sites, we can help our hauliers make the numbers work."

Sierra also engages in continuous dialogue with its hauliers about investment risks, vehicle utilisation, and contract structures. For now, the cost difference between diesel and electric transport is treated as part of Sierra's development investment, but the company expects new contract models to evolve as the market matures.

Operational Deployment and Infrastructure

The company primarily deploys BEVs where routes are predictable and distances manageable. This includes regional shuttles and recurring pendulum routes, where vehicles can charge while loading or unloading. Route flexibility is currently limited, and planning must account for both range and charging times.

"We can't use them randomly. Predictable routes and charging opportunities are key."

The company recognizes the challenges of public charging infrastructure, both in terms of cost and reliability and sees endpoint charging as essential to expanding electric operations.

Observations and Challenges

From Sierra's perspective, the long-term benefit of electrification lies in building competence and gathering operational experience and data to prepare for future regulatory and market shifts. Early engagement is also seen as a source of competitive advantage, positioning the company at the forefront of sustainable logistics development.

However, several challenges remain. Limited range and slow charging restrict the use of electric trucks on longer routes, while high electricity prices and the lack of reliable public charging infrastructure increase operational risk. Grid capacity and peak demand costs are anticipated bottlenecks as electrification scales, and uncertainty in policy frameworks and subsidy schemes adds further complexity to long-term planning. Despite these obstacles, driver feedback from pilot operations has been overwhelmingly positive, highlighting smoother performance, reduced noise, and a more comfortable working environment, leading many to conclude that:

"Once drivers have tried electric, they don't want to go back."

Future Outlook

Sierra expects electrification to expand gradually over the coming decade. The most likely progression will start with terminal and internal site operations, followed by short- and medium-distance flows where infrastructure and route stability make electrification feasible. Longer forest transports will likely continue to rely on alternative fuels until range and charging performance improve.

The company anticipates that electrification will also lead to changes in contract models (e.g., longer durations, shared investments in charging, and joint utilisation planning) and transport planning routines, requiring closer coordination between hauliers, customers, and OEMs.

“We’re building competence now so that when scale comes, we’re ready. The key will be collaboration, predictable operations, and the right charging setup.”

4.3.3 Transport Buyer & Logistics Operator Tango

Company Background

Transport Buyer Tango operates as the national logistics arm of one of Sweden’s largest foodservice and retail wholesalers. The group serves thousands of customers across the country, from small seasonal cafés and resort kitchens to large public catering units and private restaurant chains.

The organization is divided into a commercial entity, responsible for supplier and customer relations, and a logistics company, which manages the entire physical flow from warehouse to delivery. Its network consists of several large regional distribution centres supported by a network of cross-dock points for national coverage.

Each day, approximately 500 distribution vehicles operate under the company’s brand. Some are company-owned and driven by employed drivers, while others are operated by contracted hauliers or, in specific regions, by affiliated group companies. From a customer perspective, the operation appears seamless; vehicles, drivers, and services are unified under a single brand identity.

Sustainability and Energy Transition

Sustainability has long been a core part of the company’s ownership agenda. Transport emissions have been addressed systematically, first through a shift from diesel to renewable fuels and biogas, and more recently through a clear transition toward electrification.

The company no longer purchases diesel trucks, and all remaining fossil use is marginal, limited to rare contingencies. Including purchased transport, operations are reported as nearly fossil-free. The current energy strategy is diversified, combining biogas and electricity to secure flexibility and resilience.

Electrification is viewed as both a climate measure and an economic design challenge. Electric vehicles are more expensive to purchase, but the energy cost is significantly lower. The key to making the equation work lies in maximizing vehicle utilisation, ensuring each truck operates as many productive hours per day as possible.

“The vehicle costs twice as much, but the fuel is half the price. The only way to make it work is to use it more.”

Utilisation Strategy: One Truck, Two Missions

The company has redesigned its operations to increase utilisation across the full 24-hour cycle. Traditionally, most customers requested morning deliveries, particularly on Fridays, ahead

of the weekend peak. Through customer dialogue, the company has introduced off-peak and night deliveries, particularly for public-sector clients such as schools and hospitals.

This approach has enabled a new dual-mission model for BEVs where the same vehicle performs urban distribution during the day and linehaul transfers between sites during the evening and night. Charging takes place while loading or unloading at both ends, using dockside chargers.

“The same truck distributes food to restaurants in the morning, then runs a regional transfer at night. That’s how we make the math work.”

The operation follows a strong daily rhythm, with late-afternoon order intake, evening warehouse picking, night trunking, and morning distribution. Within this pattern, BEVs are assigned to predictable and repeatable loops, maximizing charging efficiency and range certainty.

Charging Infrastructure

The company considers charging infrastructure equally important as the vehicles themselves. Significant investments have been made in on-site charging at key logistics hubs, allowing trucks to charge directly at the dock during loading and unloading.

Because truck charging inlets are often placed in the cab area, a custom overhead charging arm was developed to reach vehicles backed into docks. Additional yard and parking chargers are installed to support longer dwell times and flexible planning.

As the BEV fleet expands, the company anticipates introducing smart charging prioritization to manage grid peaks, distributing power to vehicles with the most urgent departure times, while delaying non-critical charging to reduce cost. Battery storage has been evaluated, mainly for backup and peak shaving, but not yet implemented.

All facilities are leased yet purpose-built to the company’s specification. Charging projects are developed in coordination with landlords, insurers, and local grid operators, ensuring safety and regulatory compliance from the outset.

Route Selection

Electrification began in near-radius city distribution from the main hubs and has since expanded to short- and medium-distance linehaul routes where range and site charging are sufficient. Today, BEVs are deployed nationwide, though the company acknowledges that very long corridors remain unsuitable for current technology.

Assignment decisions are made by a central strategic planning team in collaboration with local site planners. BEVs are placed where they fit best and continue to operate those flows consistently, which simplifies planning and ensures reliability.

Collaboration with Partners

The company operates a hybrid model combining in-house vehicles and purchased transport. For external hauliers, renewable fuels are mandatory, with additional compensation available for BEV or biogas operations. In dense markets with stable volumes, the company prefers to run in-house, and in thinner corridors, transport is outsourced.

Access to charging is offered inside company gates for partners already present on-site, such as suppliers delivering goods. These users can connect to the charging system and pay cost-based electricity rates. The company emphasizes that the purpose is to enable partners' transition, not to build a separate electricity business.

The firm also maintains ongoing dialogue with several OEMs, providing feedback on performance and use cases, and regularly exchanges experiences with Nordic companies with similar operations.

Procurement and Market Dynamics

Public-sector tenders remain heavily price-weighted, but many now include sustainability scoring where electrified deliveries generate additional points. Early in the transition, this allowed the company to win contracts against slower competitors. Management expects this advantage to fade as electrification becomes a baseline requirement.

“Soon, you simply won't be allowed to bid unless you can deliver electrically.”

Despite the large investments, electrification has not led to higher customer prices. The firm credits its utilisation model and charging control for maintaining competitiveness.

Constraints and Risks

Two systemic constraints dominate the company's outlook. The first concerns grid capacity and lead times, as expanding electrical connections to logistics sites is often a slow process dependent on local network owners and regulatory procedures. This creates uncertainty for future growth and may, in time, require more advanced load management to handle peak power pricing and prioritize charging according to operational urgency. The second relates to electricity security and cost volatility. National discussions about energy availability, particularly during winter months, remain a latent risk factor in logistics planning, as temporary scarcity or price spikes could influence both operating costs and delivery reliability.

Weather conditions are regarded as manageable rather than prohibitive. While range is affected by temperature and road conditions, the company rejects the notion that northern climates are fundamentally unsuitable for electric transport. Instead, distance and infrastructure coverage are seen as the primary limitations.

Finally, residual value is not treated as a strategic concern. Vehicles are typically operated throughout their full technical life of eight to ten years and are expected to finance themselves during this period through high utilisation and stable operational performance.

Future Outlook

At the time of interview, the company operated around thirty-five electric trucks, covering both city distribution and medium-distance transfers. Continuous investments are ongoing as part of a rolling fleet renewal program.

Looking ahead, management expects steady but gradual expansion of electrification. Progress will depend on investment economics, grid connection timelines, and continued technology development. The company also anticipates a growing need for cross-actor charging collaboration, involving shippers, hauliers, and site operators.

“In the end, the equation works if the truck runs more hours per day. Lower energy cost pays for higher capex. That’s the core of our model.”

4.3.4 Energy Partner Uniform

When Energy Partner Uniform was established, its purpose was clear: electrification could not stop at the vehicle itself. There was a need for an actor capable of developing integrated solutions for charging, energy management, and circularity, and, above all, for helping customers take the leap toward electrified transport. The company focuses not on constructing public infrastructure, but on building digital and operational services around it, delivering complete private charging solutions that remain owned and managed by the customer.

With more than two decades of experience in the industry, the respondent, who currently works in the role of strategic product planner, described his own professional journey as reflecting the evolution of the organization. He had moved from IT and telematics, through connected fleet management systems, to electric buses and, ultimately, electric trucks. Describing himself as *“a telecom and IT person at heart,”* but added that the logic of connectivity is exactly what electrification is about.

Towards Electrification

The electrification journey began in the bus division in 2014, when the company decided to develop plug-in products. The first years were about convincing the market why electrification was needed and later came the challenge of how to implement it. When electric buses began operating, the focus shifted toward charging as he said:

“Selling an electric bus isn’t the hard part, the hard part is helping the customer charge it.”

When electric trucks were later introduced, the same logic was carried forward. To lower customer barriers, every vehicle was delivered with a ready-to-use charging solution, where you get a charger installed and ready. As he explains the logic behind it:

“Electrification is hard enough as it is, we need to remove decisions from the customer.”

The pandemic, however, halted plans to deliver connected chargers, and the first wave was shipped with simpler models of *“dumb chargers”* with limited capabilities, but able to make the basic functions that helped the customer make the decision.

Developing a Charging Service

When the heavy-duty platform was launched, the next step was taken. A new, truck-adapted charger was developed and connected to digital services, the first step toward what later became the Charging Management Service (CMS) and E-Mobility Service Provider (EMSP) offerings.

The private CMS service allows customers to manage and monitor their charging directly through the OEM's digital platform, while the public EMSP service provides access to charging across Europe through an app or RFID card. He explains the product as:

“What we sell isn't really chargers, but what we sell are solutions for managing charging.”

Today, CMS is used in over 20 markets and the public service in eight. The company describes itself as a development organization that designs and industrializes charging services in the same way others build vehicles.

Private, Shared, and Public Charging

Energy Partner Uniform divides its operations into two main areas: private and public charging.

The private side focuses on complete solutions, with hardware selection, installation, service contracts, and monitoring software. Customers own their chargers, but Uniform provides lists of “*approved chargers*” tested with the trucks. The public side operates a digital service for payment and access to external charging networks.

The respondent described the public market as “*layers upon layers*”, where behind each charging event stand several actors, such as operators (CPOs), payment platforms (EMSPs), and, in some cases, traditional oil companies that both build and own stations. He explains the situations as:

“The problem is that many don't want to let others in. Roaming exists, but the business model isn't settled. Some let us in, others price us out.”

Within this evolving system, hauliers are experimenting with three main approaches to organize their charging operations. The first is fully private charging, where companies invest in their own depot infrastructure to maintain complete control over costs, access, and uptime. This model suits larger hauliers with stable operations and predictable routes, offering maximum autonomy but requiring significant upfront investment.

A second approach is shared private charging, where several hauliers collaborate to build and operate a common facility. The respondent remarked “*Why build two when you can share one?*”, describing how such collaborations allow small and medium-sized operators to access high-capacity charging while reducing capital costs. These arrangements often emerge within local transport clusters or logistics hubs, where proximity and trust between operators make joint investments feasible.

The third and more hybrid model is semi-public charging, where a haulier's depot chargers are made available to others during idle hours, for example, daytime when their own fleet is in use. This practice allows hauliers to increase utilisation rates and generate additional revenue from existing assets. He notes:

“The more the charger is used, the better the economics. Connections and investments are expensive, so utilisation is everything.”

Challenges for Small Hauliers

For smaller hauliers, especially those with only one or two vehicles, electrification poses a greater challenge. Public charging is often 100 to 200% more expensive than depot charging, and modern batteries require much stronger grid connections than before. He notes:

“63 amps connection doesn't cut it anymore, but now we're talking 125 or more, and that's both expensive and hard to get.”

He believes the solution for small actors will be shared charging clusters where local collaborations of several hauliers co-invest in joint infrastructure. He describes the hauliers as:

“They're competitors, but also colleagues. It's impressive how clever they are at finding cost-effective solutions together.”

Future Outlook

Energy Partner Uniform approaches the future along two-time horizons. In the short term, the focus lies on refining existing charging services and enabling customers to manage shared charging arrangements more effectively. If you share your charger with a neighbour, you need to handle access and costs. They are building the system that makes that possible. These efforts aim to strengthen the foundation for collaboration among hauliers, supporting flexible use of charging infrastructure while maintaining clear administrative and financial control.

Over a longer horizon, development is directed toward vehicle-to-everything (V2X) technology, where vehicles can feed energy back to the grid or act as temporary energy storage units. The respondent described this as a clear example of technology push:

“No customer is asking for it yet, but the technology exists, and some love the idea.”

The charging market itself was portrayed as both exciting and chaotic. As explained:

“The ecosystem isn't ready, It's messy, with many layers and little profitability. Several players will go bankrupt before it stabilizes.”

Despite this turbulence, he identified clear parallels to the passenger car market, which he sees as roughly five years ahead in its development. He reflected:

“There, the products are ready, the infrastructure exists, and customers are used to it. We'll get there too, but it'll take time.”

Looking ahead, he expects consolidation as the market matures, with a small number of dominant players emerging, particularly in public charging. *“It won’t be a monopoly, but definitely an oligopoly.”*

Toward the end of the interview, the respondent reflected more broadly on the industry’s direction. He said:

“Everyone talks about ecosystems and business models, but in the end, the best product wins. And by product, I mean the whole package, the truck, the charging, the services, and the experience.”

He cited Tesla as a key inspiration:

“They’ve integrated everything. It’s brutally efficient. We’re trying to do the same, just in a much more complex world.”

5 Analysis

This chapter presents the analysis of electric truck utilisation. It first examines electrification at the firm, relational, and network levels, and then interprets these findings using the scheme for analysis of business relationships development effects to explain the broader implications for business relationships and business networks.

5.1 Introduction to Analysis

The analysis is structured to move from a first part of how different actors experience and manage electrification, across firm, relational, and network level. This is followed by an interpretation of this in relation to theory, showcasing how these changes reshape business relationships and the wider transport network. This stepwise logic reflects both the character of the empirical material and the theoretical emphasis within the Industrial Network Approach on analysing business interaction at multiple levels.

Electrification introduces new constraints, new dependencies, and new forms of collaboration across the transport system. These changes do not occur within a single firm, nor can they be understood solely through the operational adjustments made by hauliers. Instead, they emerge through interaction between hauliers and their customers, between transport intermediaries and infrastructure providers, and the energy system. The analysis therefore begins at the firm level, examining how hauliers organize, utilize, and adapt electric trucks within their own operations.

The second step is the relational level, where the focus shifts to dyadic relationships between hauliers and other key actors. Electrification introduces new interdependencies e.g. regarding charging access, delivery windows, contract length, cost-sharing, service guarantees, and data exchange, which all require coordination.

The analysis then expands to the network level, where multiple actors interact simultaneously and where changes in one relationship affect others. At this level, the introduction of BEVs influences the distribution of roles and responsibilities across the transport system, affect infrastructure development, and generates new forms of collaboration among energy firms, OEMs, transport buyers, hauliers, and intermediaries. This perspective makes visible how electrification influence and are influenced by interdependence across the network.

Finally, the chapter integrates these levels of analysis through the *Scheme for analysis of business relationships development effects* (Håkansson & Snehota, 1995, p. 45), which contribute conceptual interpretation of how activity links, resource ties, and actor bonds develop under electrification. The ARA-based analysis explicates increasing interdependences, coordination, and the organising effects that individual relationships have on the broader network. In doing so, it bridges the empirical findings with the theoretical understanding of business relationships and how these are connected in business networks.

5.2 Firm-Level Analysis

This section examines how electrification affects freight transport at the level of individual hauliers. The firm-level analysis focuses on how electric trucks are integrated into existing operations and how this integration reshapes internal activities, resource use, and strategic priorities. At this level, electric trucks are analysed as part of the hauliers' internal resource collections and activity structures. The firm-level perspective provides a foundation for understanding why electrification is feasible for some operators and challenging for others, and how internal capabilities and constraints influence subsequent relational and network-level.

5.2.1 *Strategic Direction*

Electrification is considered differently within each haulier's strategic direction. Some firms treat electrification as an extension of their corporate identity. Haulier Charlie, for example, frames the transition as central to who they are as a business, integrating sustainability, innovation, and early adoption into its strategy. Haulier Alpha links electrification to its intermodal strategy, positioning electric trucks as one component in a broader fossil-free logistics system. Haulier Juliett, Lima, and India similarly incorporate electrification into their long-term strategic vision rather than viewing it as a customer-driven obligation.

Other hauliers approach electrification with caution. Bravo moves forward when long-term contracts and customer commitments reduce risk. Golf, Papa, and Kilo view electrification largely as a response to customer willingness to pay and as a potential threat to smaller operators, who may be unable to manage the required investments.

This variation indicates that electrification is not only a technological transition but a change to the strategic core of the business, where hauliers differ in how strongly they choose to integrate the transition into their identity, investment horizon, and competitive positioning.

5.2.2 *Operational Reconfiguration*

A central observation across all hauliers is that electrification pushes operations toward greater repeatability and predictability. Electric trucks require carefully planned routes with limited variation, and this changes how hauliers design and execute their daily work.

Haulier Alpha illustrates this shift clearly. The company places its electric fleet almost exclusively on short-haul, repetitive distribution flows and feeder services to rail terminals, avoiding operational environments where routes vary from day to day. As the CEO noted, planning becomes significantly more complex if a truck operates in varying routes on different days. Haulier Bravo applies a similar logic, assigning its three electric trucks to recurring corridors, such as the daily Värmland-Norrköping route or a continuous flow between a pulp mill and a nearby port. These flows are highly repeatable, predictable in load, and tightly aligned with available charging infrastructure. Haulier Charlie takes this operational logic to its extreme. Under Charlie's model, each electric truck is designed for a specific loop, optimised in battery size,

motor configuration, and weight. BEVs are not moved between assignments, but each one is locked into a carefully constructed operational niche.

This reliance on predictable routes is mirrored among other hauliers. Operators such as Delta, Kilo, and Foxtrot describe BEVs as suitable only when flows are regular and distances controlled. In contrast, hauliers such as November, operating under tight delivery windows and long ranges, see few viable use cases for BEVs at present.

Altogether, these cases show that electrification reduces the flexibility traditionally associated with diesel operations. Instead, it requires a shift toward routinised, pre-defined transport tasks supported by closer coordination between planners, drivers, and by use of digital systems.

5.2.3 Charging Infrastructure

Electrification also moves energy management from a non-prioritized activity to a central organisational concern. While diesel refuelling is easy and available everywhere, charging is a strategic asset that must be designed, owned, and operated.

Haulier Alpha relies mainly on depot charging to ensure cost control and operational reliability. External charging is avoided because of significantly higher prices and uncertain availability. Haulier Bravo benefits from its network partners' regional charging infrastructure, which enables transport routes across Värmland. Haulier Charlie, however, demonstrates how far a haulier may need to go to gain control over its energy supply. Charlie has invested in a large-scale depot charging hub with solar power, on-site battery storage, and Sweden's first megawatt charging station. The investment was so substantial that the firm created a separate energy company to own and operate the facility.

Among other hauliers, the same logic applies. Some hauliers such as Hotel depend on customer-provided charging, and fixed-price electricity contracts (India, Oscar), or temporary solutions. Others, such as Golf and Papa, see charging infrastructure as the chief barrier to further electrification, since grid connections, power availability, and charging speed dictate what is operationally possible.

Across the cases, charging becomes a capability that differentiates hauliers. Firms that can invest in infrastructure gain more agency over route planning, cost control, and long-term electrification. Firms unable to do so, without suitable connections, remain locked into diesel dependence or limited pilot-scale electrification.

5.2.4 Economic Aspects

Electrification introduces a different economic model for hauliers, centred around high upfront investment, uncertain depreciation, unclear residual value. But also, lower operating costs, leading to a need to maximize utilisation.

Whereas diesel trucks have predictable resale markets and established cost trajectories, electric trucks, according to Alpha, Bravo, Charlie, Echo, Golf, Juliett, Mike, Oscar, cost two

to three times more and are currently perceived to have no clear second-hand market, even though regulations such as ETS2 could imply that it might change over time. The economic challenge is mainly concentrated at the moment of purchase, making hauliers more dependent on long-term contracts and customer co-financing. Firms such as Haulier Bravo explicitly require longer contract durations and long-term planning for electric operations to compensate for the greater risk and lower fleet flexibility. Haulier Charlie emphasises that electrification is only viable when customers support the higher costs and when the firm can place the vehicle on a loop that ensures consistent daily mileage.

Hauliers such as Kilo, Papa, and Quebec reinforce the same picture, expressing concern that typical three-year contracts do not match the 8–10-year depreciation cycles of electric trucks, making long-term investment unattractive. Energy price volatility further complicates the economic situation. Bravo, India, and Hotel all describe how fluctuations in electricity and diesel prices can reverse the cost advantage of BEVs from one year to the next. As a result, hauliers increasingly focus on high utilisation, where electric trucks must remain in motion for as many hours as possible to make the high capital cost economically sound, and explore options such as battery managements systems to reduce dependency on energy price volatility.

Taken together, electrification turns the haulier’s economic model into a more complex balance between contract structure, infrastructure control, risk-sharing with customers, and operational structure.

5.2.5 Drivers and Skills

Despite initial scepticism, drivers across nearly all cases quickly develop a preference for BEVs once they have tested them. Hauliers such as Bravo, Charlie, Delta, Foxtrot, Hotel, and Juliett report overwhelmingly positive feedback, emphasising comfort, reduced noise, and a smoother driving experience.

However, the drivers work becomes more constrained under electrification. BEVs require greater adherence to planned routes, tighter schedules, and careful energy management. Instances such as the winter range collapse experienced by Haulier Charlie illustrate how drivers must adapt to new forms of operational risk. The loss of autonomy, previously enabled by diesel’s refuelling convenience, is a recurring theme, particularly for long-haul drivers accustomed to flexible decision-making.

However, several hauliers, including Juliett and Charlie, also highlight BEVs as a recruitment advantage in a competitive labour market. Electrification therefore reshapes not only the tasks and routines of driving but also the attractiveness of the profession.

5.3 Relational-Level Analysis

Electrification not only affects how hauliers organize their internal operations but also how they interact with customers, intermediaries, energy providers, and vehicle manufacturers. This

section shifts the focus from individual firms to the relationships through which electric truck operations are planned, coordinated, and made economically viable. These relational dynamics are central to understanding when and how electric truck utilisation becomes feasible, as well as where it remains constrained across different contexts.

5.3.1 Changing Customer-Haulier Relationships

Electrification changes the economic and operational negotiation space between hauliers and their customers. Historically, diesel transport was characterized by price-driven procurement, service expectations, and limited operational discussion beyond delivery windows and service quality. Electrification disrupts this by requiring closer coordination, longer planning horizons, and shared responsibility for making operations viable.

For Haulier Alpha, large industrial customers increasingly request electrified transport solutions, and in several cases have made BEV capacity a prerequisite for procurement. This creates new forms of challenge: while customers become a primary driver of electrification, hauliers require their economic support to make investments feasible. Alpha has at times introduced electric trucks into customer operations without explicit demand, essentially pushing customers toward adoption. The company's ability to negotiate premiums or long-term contracts with these customers reflects how electrification turns the relationship into a more collaborative and long-term process.

Haulier Bravo experiences a similar shift. Electrification has required contract durations of around five years instead of the typical three, reflecting the challenges to find new transport contracts to run these trucks for, and higher investment risk. Longer commitments tie hauliers and customers closer together, making the relationship more durable but also more rigid. In some cases, customers contribute directly to charging infrastructure or guarantee certain volume of transport missions. Electrification therefore strengthens the relationships between haulier and customer, because both parties become mutually dependent on stable, predictable volumes.

Furthermore, electrification makes logistics planning more interdependent and information heavy. Several hauliers emphasise the need for transparent communication regarding delivery windows, route changes, load variations, and charging possibilities. Bravo stresses the importance of not selling "green" transport twice, implying that transparency between hauliers, intermediaries, and customers is essential to ensure that electrified services are not double-counted or misallocated. Charlie highlights how charging constraints must be integrated into customer agreements, where, without revising time windows, electrification is operationally unfeasible.

Other hauliers often struggle to convince customers to make such adjustments, especially when serving price-sensitive customers. This creates asymmetries where larger hauliers with

stronger networks can influence customer expectations, while smaller firms face inflexible requirements that limit electrification.

For several other hauliers, the same relationship logic appears. Delta, Echo, Foxtrot, Juliett, Mike, Oscar, and Quebec stress that electrification is only possible when customers explicitly agree to share the financial burden. Others, such as Papa and Kilo, have deferred electrification because customers are unwilling to pay for it. This showcases that electrification creates asymmetries where hauliers with close customer relationships can negotiate co-investment for development, while those with numerous price-sensitive customers face challenges.

Across cases, customer relationships evolve because of electrification from transactional price-based exchanges toward more collaborative arrangements involving shared planning, shared risk management, and in several cases, shared infrastructure. Electrification pushes customers and hauliers toward a stronger relationship.

5.3.2 *Transport Intermediaries as Coordinators*

For hauliers connected to intermediaries, electrification changes the nature of the contractual and operational linkages. Transport Intermediary Romeo offers a clear example. Romeo aggregates customer flows and aligns them with the hauliers in its network. In doing so, it becomes a critical actor in enabling electrification.

For Haulier Bravo, the intermediary is not just a commercial partner but a strategic one, described metaphorically as “*a marriage.*” Bravo’s ability to operate BEV flows depends on Romeo’s decisions about which routes are assigned, which customers are targeted for electrification, and where the intermediary invests in charging infrastructure. Romeo co-owns a regional charging company, allowing Bravo to access a network of 8 to 11 charging stations that would not be possible for the haulier to invest in for themselves. Electrification enhances the intermediary’s strategic position, where hauliers rely on it for stable flows, route matching, charging access, and customer alignment. Romeo’s decisions about the location where to electrify directly shape Bravo’s fleet development and utilisation model.

Through electrification, the intermediary-haulier dyad becomes more intensive, requiring more resources, information, and better strategic coordination than in diesel-based operations.

5.3.3 *New Relationships with Energy Actors*

A major relational shift brought by electrification is the involvement of energy firms as central partners in transport operations, compared to diesel-based transport systems, where energy actors are not involved in daily planning and coordination.

Energy Partner Uniform exemplifies this transformation. Operating both private and public charging services, Uniform designs digital charging solutions and manages charging networks that hauliers depend on. The development of private depot charging, shared charging clusters, and semi-public depot access entails a need for new relationships where the supply of

energy becomes intertwined with transport planning. For hauliers such as Charlie, the reluctance to rely on external charging led the firm to build its own energy company. This indicates that hauliers may not remain passive purchasers of energy, but that they can actively manage, negotiate, or even co-produce their charging systems to keep their costs for electricity and the grid connection as low as possible. This may also include possibilities to develop new revenue streams (e.g. frequency regulations services). Other hauliers confirm this interdependence between energy actors, for example, India, which relies on fixed-price electricity contracts to reduce volatility. Haulier Hotel depend on customer-provided charging, and Lima builds on its electrification strategy to further develop opportunities for frequency regulation, illustrating how electrification blurs boundaries between transport and energy.

This introduces new relationships, where hauliers must build ties to grid operators, charging providers, landlords, and energy specialists. Energy actors, previously excluded from this system, become involved in daily logistics, influencing operational viability, cost structures, and investments.

5.3.4 OEMs Extending Their Business Relationships

Electrification also reshapes hauliers' relationships with OEMs. Rather than acting primarily as vehicle suppliers and the core of the business exchange being vehicles, maintenance, and spare parts, OEMs become providers of digital tools, battery warranties, charging equipment, and data interfaces. This extends the content of the business relationships of the traditional OEM role.

Haulier Alpha relies on OEM digital planning tools to simulate BEV range under different conditions and validate operational feasibility. Bravo collaborates with OEMs on data-driven technological developments and has engaged with external developers to integrate BEV data into operational systems and transport planning. Charlie participates in prototype testing with one OEM and adjusts vehicle specifications collaboratively for battery capacity or towing capacity to create a customised fit for specific loops.

Other hauliers experience similar dynamics, Echo and Golf criticize existing OEM digital services as incomplete or misaligned with operational realities, highlighting that data openness and interoperability remain challenges. Multiple hauliers wish for more transparent vehicle data access to improve route optimisation and charging planning, indicating that electrification requires deeper digital integration between OEMs and hauliers.

OEM relationships thus shift from transactional toward long-term relationships centred on operational performance, digital information flow, and guaranteed fleet uptime.

5.3.5 *Customer-Energy Providers-Haulier Triads*

While dyadic relationships change significantly, some of the most noticeable effects occur in triads involving hauliers, their customers, and energy providers, where electrification often requires coordination across all three actors.

Transport Buyer Tango, operating a national foodservice and retail logistics network, collaborates closely with hauliers by providing on-site charging and enabling flexible delivery windows to maximise electric truck utilisation. Tango's dual-mission BEV operation with daytime distribution and nighttime transfers is possible only because charging is integrated into warehouse processes. Hauliers delivering into these terminals plug in at the dock, with Tango covering electricity costs at internal transfer rates. This embeds hauliers directly into the buyer's internal energy management system.

Transport Buyer Sierra, representing a large industrial actor, drives electrification by contracting dedicated BEV flows with hauliers and offering site-based charging infrastructure. Sierra encourages flexible deliveries and aligns its ordering processes to match energy constraints, showing how customers reshape their own logistics routines to enable hauliers' BEV operations.

Across the empirical material, hauliers repeatedly note that electrification is only successful when customers participate in operational redesign, adjusting time windows, installing charging, and accepting new planning constraints. Electrification pushes dyads toward triads because the haulier cannot align operations with customers without a relationship to the energy actors.

5.4 **Network-Level Analysis**

Electrification does not unfold evenly across the freight transport system but develops through interactions among multiple actors, infrastructures, and institutional conditions. This section extends the analysis to the network level, where the cumulative effects of firm-level adaptations and relational changes become visible. By analysing electrification at the network level, this section highlights how dependencies, bottlenecks, and coordination challenges emerge beyond individual relationships. It shows how the effects of many local decisions change the structure and functioning of the freight transport network.

5.4.1 *Electrification as a Network Challenge*

Across the cases, it becomes evident that electrification cannot be understood as a vehicle-level innovation. Instead, it operates as a system-level shift requiring coordination across energy supply, logistics planning, customer forecasting, infrastructure development, and policy frameworks.

In diesel-based systems, hauliers can act with a high degree of independence, with refuelling infrastructure that was abundant and standardised, time windows were negotiated without reference to energy supply, and operational disruptions could be handled through flexible

rerouting. Electrification disrupts this, showcasing the current reality of range limitations, charging times, grid connection constraints, and weather sensitivity, creating dependencies that spread outward across the network.

For Haulier Alpha, the viability of longer transport missions with electric trucks depends not only on vehicle performance but on whether external charging points exist at specific nodes in the transport system. For Haulier Bravo, successful BEV operations require coordination between the haulier, the intermediary Romeo, the customer, and the regional charging company. Haulier Charlie illustrates a well-developed internal solution to this dependency by developing its own energy company and charging hub, internalising parts of the energy system to ensure operational stability and reduce cost in the long-term perspective.

Across all hauliers, BEV deployment is feasible only in positions where charging infrastructure, customer transport flows, and planning routines intersect stably and predictably. Electrification thus reconfigures the network, narrowing the range of feasible routes and concentrating operations around energy-accessible corridors.

5.4.2 Shared Charging Infrastructure in the Network

In a diesel-based system, refuelling infrastructure is well-established. In an electrified system, charging infrastructure becomes a critical resource in the network, whose location, accessibility, and capacity shape economic and operational opportunities.

The cases show how charging becomes a shared dependency. Private charging at depots, semi-public depot sharing, shared charging clusters among hauliers, and regional charging networks managed by intermediaries or energy companies all function as nodes in the emerging BEV charging infrastructure. These nodes restructure the network by creating new points of convergence and new bottlenecks.

Energy Partner Uniform plays a central role in this development by creating layered charging solutions, with a start of private depot charging, moving into supporting shared depot access, and public services that act as infrastructural points within the network. Their charging management systems connect not only vehicles but also energy markets, grid constraints, and digital platforms. The relational interdependence observed at the dyadic level transforms into wider implications on the network level, where hauliers must align their operations with an infrastructure that is still under construction.

This infrastructural dependency creates several systemic changes. First, electrification introduces inflexibility where hauliers cannot easily deviate from planned routes without risking range and charging schedules. Second, it produces time rigidity, as charging times must align with customer time windows, dock handling, and shift patterns. Third, it increases the differences in the network as access to charging varies by region, actor, and customer relationship. The result is a transport network differentiated not only by flows but by energy availability and operational capabilities.

5.4.3 *Blurring of Business Network Boundaries*

Electrification also brings the freight transport network into direct interaction with the energy network.

Hauliers such as Charlie, with investments in megawatt charging, battery storage, and solar power show how transport firms increasingly operate as hybrid logistics and energy actors. Some hauliers use fixed electricity contracts to manage volatility (e.g., India), while others such as Hotel depend on customers to supply charging.

Transport Buyer Tango integrates energy management directly into its logistics operations by offering dockside BEV charging during loading and unloading. Transport Buyer Sierra aligns order patterns and delivery windows with charging. These examples show how electrification pulls energy considerations upstream into customer production systems and downstream into haulier operations.

Across cases, actors' express concerns about grid development lead times, peak power tariffs, and national electricity security. These issues were previously outside the domain of freight transport but now act as challenges to the freight network development. Electrification merges two previously distinct business networks, the freight transport network and the energy network, forcing alignment in planning, investment strategy, and capacity management.

5.4.4 *Intermediaries and Large Buyers*

Another structural effect of electrification concerns the actors in the network. When diesel trucks are used, market transactions and price competition play a dominant role in coordinating flows. Electrification shifts power toward actors who can coordinate infrastructure, demand, and investments.

Transport Intermediary Romeo exemplifies this shift. By combining flows, negotiating with customers, investing in charging infrastructure, and redistributing assignments across hauliers, Romeo imposes a form of network-level coordination that smaller hauliers cannot achieve alone. Haulier Bravo's electrification strategy is inseparable from the intermediary's strategic choices, reflecting how intermediaries become infrastructural coordinators in electrified networks.

Large buyers such as Sierra and Tango also get increasing influence. Their decisions to install charging, adjust delivery windows, prefer sustainable transport in procurement, and commit to longer contracts change what is required for actors within the network to remain competitive. The network thus develops toward more centralised coordination, reflecting a shift from decentralised flexibility to interdependent orchestration.

5.4.5 *Effects on Smaller Actors*

At the network level, electrification introduces inequality between actors of different sizes and capabilities. Larger hauliers such as Alpha and Lima can build charging hubs,

negotiate power contracts, and engage directly with OEMs and energy firms. Smaller hauliers such as Papa face higher exposure to investment risk, limited flexibility in route allocation, and fewer opportunities to influence infrastructure development.

Several smaller hauliers emphasise that electrification increases their vulnerability, where short contracts, high capital costs, uncertain residual values, and dependency on customers' willingness to pay create disadvantages. Many predict consolidation in the coming years, where larger firms buy or integrate smaller ones unable to electrify. This anticipated consolidation is not merely an economic projection but a network-level effect, reflecting how electrification redistributes capabilities across the network.

5.4.6 Increased Resource Dependences

Electrification reduces substitutability across the network. In a diesel system, trucks and drivers can be reassigned flexibly, subcontractors can be swapped rapidly, and routes can be allocated on short notice. In an electrified system, the routing constraints of BEVs, combined with charging infrastructure dependencies, create route-specific lock-in effects.

The cases illustrate this clearly. Haulier Charlie's BEVs are used for specific flows and are not moved between tasks. Haulier Bravo cannot redeploy a BEV across different flows without risking failure to the charging plan. Even large operators such as Alpha stress this.

The transport planning becomes more rigid, and actors are increasingly dependent on mutual planning routines. This creates a tension between the traditional flexibility of freight networks and the structural constraints introduced by electrification.

5.4.7 Network-Wide Learning

Although electrification introduces constraints, it also creates new opportunities for collective learning. Several hauliers engage in knowledge exchange with customers, OEMs, energy companies, or peers. Charlie collaborates with an OEM on prototype testing. Alpha provides feedback through OEM digital platforms. Smaller hauliers benefit from availability to scale and knowledge by shared charging clusters or customer-supplied infrastructure.

Transport Buyers Tango and Sierra shares lessons internally across its group of companies and with partner hauliers. Energy Partner Uniform works alongside users to develop charging management systems that reflect operational realities.

Actors increasingly rely on each other to understand range variability, load effects, grid constraints, charging optimisation, and economic feasibility. Electrification thus improves network-level learning, collaboratively transitioning toward a greater extent of electrified transport

5.5 Analysis of the development effects of and on business relationships

The first part of the analysis showed how electrification changes operations of hauliers, their relationships with key partners, and the structure of the wider freight network. In this second analysis step, these findings are analysed using Figure 3, an adapted version of the *Scheme for analysis of business relationships development effects* (Håkansson & Snehota, 1995, p. 45), where resources form the analytical starting point.

Placing electric trucks as the focal resources at the centre of the analysis reflects the empirical reality that the introduction of battery-electric trucks and associated charging infrastructure is the primary trigger of change. These resources are first incorporated into hauliers’ internal resource collections, then linked across relationships, and finally combined into broader resource constellations at the network level. These resource changes in turn reshape activity structures and patterns, and impact on how actors are organised and connected.

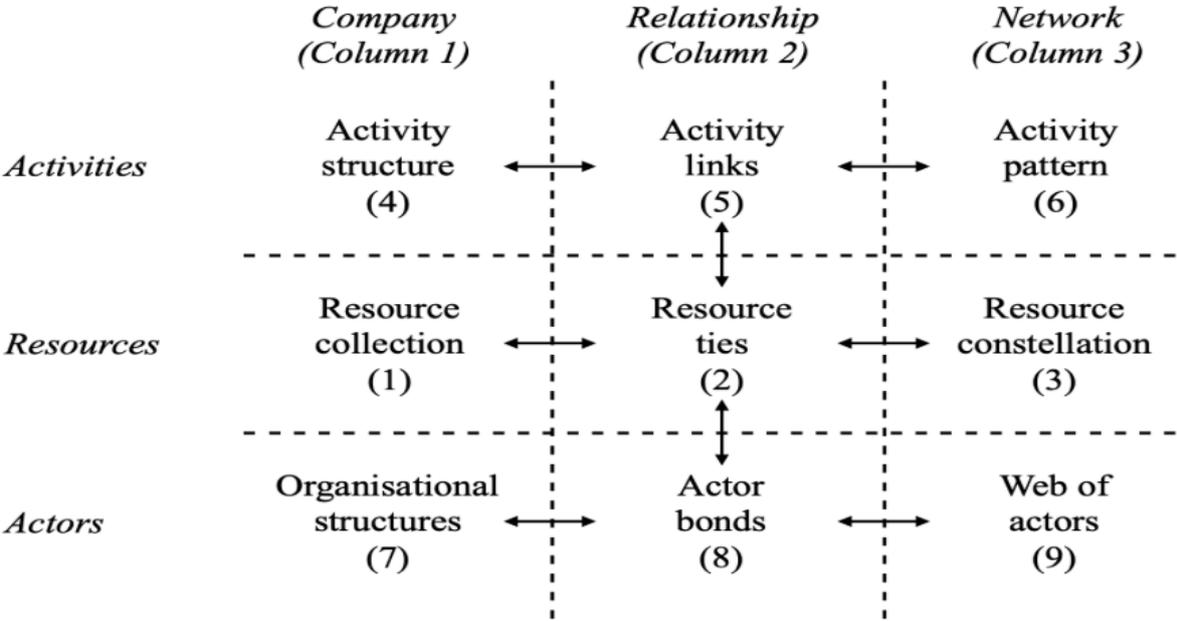


Figure 3: The author’s version of the scheme for analysis of business relationships development effects, based on (Håkansson & Snehota, 1995, p. 45)

5.5.1 Resource Collection (1)

At the company level, electrification alters the resource collection of hauliers. The fleet is no longer a set of diesel vehicles with features such as similar range, refuelling logic, and redeployment possibilities. Instead, hauliers may assemble mixed fleets of diesel, gas, hydrogen, and electric trucks with different technical characteristics, investments, and planning requirements.

As seen above, electric trucks are not simply added to an existing collection but are often chosen for tasks, with battery size, weight, and configuration adapted to a specific loop or corridor. This means the internal resource collection becomes more differentiated and specialised.

Investments in depot chargers, on-site solar, battery storage, and digital planning tools further extend the resource collection beyond the electric vehicles. Energy and data handling gradually become core internal resources alongside trucks, trailers, and drivers' competence.

In this sense, electrification changes what it means to be a haulier. The company's resource collection is no longer limited to trucks and depots but begins to resemble a resource collection that looks like a transport operator, an energy manager, and a digital systems user.

5.5.2 Resource Ties (2)

When new resources are connected across organisational boundaries in for example customer relationships they form resource ties. Electrification may deepen such ties between hauliers, customers, energy firms, intermediaries, and OEMs. The empirical material showed how charging infrastructure becomes increasingly shared between hauliers and their business partners, forming resource ties. Customers install chargers at terminals and mills that hauliers depend on, intermediaries co-own regional charging networks used by multiple firms, energy companies manage depot solutions that serve both a haulier and its partners, and OEMs provide batteries, software, and sometimes charging hardware linked by service agreements and data interfaces. In several cases, hauliers open their depots to external users, effectively turning internal assets into semi-public network resources.

These resource ties, on one hand, enable electrification by making high-cost assets accessible to more actors. On the other hand, they may create lock-in effects, where once a truck is technically and economically dependent on a specific charging solution or data platform, switching partners or reallocating flows becomes costly and complex. Now, with limited charging infrastructure, electrification thus strengthens resource ties and increases the mutual dependence between business partners in relationships.

One example is the relationship between Haulier Bravo and Transport Intermediary Romeo. Bravo's ability to operate its electric routes depends directly on Romeo's regional charging network. This resource tie includes both the physical infrastructure and the digital systems that allocate access. As Bravo's CEO put it, "*Without their chargers, we would not dare to put an electric truck on that route.*" The interdependence is different for both actors, where Bravo relies on Romeo to maintain access and availability, while Romeo relies on multiple hauliers to justify and finance the infrastructure. Through this tie, part of Bravo's resource collection is effectively located outside the firm and controlled by another actor.

A second example of resource ties is found in the site-based charging provided by Transport Buyer Tango. Their dock chargers become an integral extension of hauliers' operations, enabling dual-mission flows that would otherwise be infeasible. Drivers plug in during loading, making the customer's internal energy system part of the haulier's operational structure and thereby forming the resource tie. Tango's CEO explained, "*If they charge while we load, the truck leaves full every time. It's built into our rhythm.*"

Haulier Charlie presents a third form of resource tie by internal energy production. Charlie's depot, equipped with megawatt chargers, solar production, and BESS, functions as both an internal resource and a semi-public one. Other hauliers can access the charging hub, connecting their resources to Charlie's. As Charlie's CEO described, *"If we control our own energy, we can help others too, but they also become part of our ecosystem."* This extends Charlie's resource ties into the network while also reducing the challenges of hauliers who otherwise lack infrastructure.

5.5.3 Resource Constellations (3)

At the network level, interconnected resource ties form broader resource constellations. Under electrification, these constellations span both the freight transport system and the electricity system. The first part of the analysis highlighted how truck batteries, chargers, local grid connections, depots, terminals, solar installations, and digital platforms are combined in different ways across regions and flows forming the resource constellation. Certain corridors become adapted for electrification, where compatible vehicles, dense charging points, and customer infrastructure form a viable constellation. Other areas may remain dominated by diesel trucks or other solutions such as hydrogen etc. because resources are missing or poorly aligned.

In this view, electrification is less about individual BEVs and more about how heterogeneous resources are combined in the resource constellation. The network develops sub-sets of high electrification maturity, where resource constellations support intensive BEV use, and other areas of low maturity, where missing resources (such as grid capacity or customer charging) prevent adoption. Hauliers' decisions about where to place electric vehicles therefore both depend on and further reinforce these constellations and challenge the hauliers to handle situations wherein limited resources are available and thereby cope with incomplete resource constellations.

5.5.4 Activity Structures (4)

Resource changes feed changes directly into the activity layer of the network level. At the company level, hauliers reorganise their internal activity structures around the new resource collection. The first part of the analysis showed a clear move from flexible assignment of trucks to more recurring, pre-defined loops for BEVs. Planning routines evolve from day-to-day allocation toward long-term design of transport missions suitable for BEVs with fixed distances, loads, and time windows. Charging planning is integrated into the daily schedule, and new activities around energy monitoring, range planning, and software usage are introduced into the structure.

In other words, the internal activity structure becomes more tightly coupled to specific resource configurations, with the same battery type, charger setup, and route design repeated day after day. Diesel operations may still allow flexibility and last-minute reallocation, but BEV activities are built around stability and repetition. At the current state of

development, electrification therefore reduces internal flexibility and increases the importance of planning and control activities. Long term, development of battery technology, scale up of charging infrastructure etc., may change these conditions towards more similarities with traditional freight transport.

5.5.5 *Activity Links (5)*

At the relationship level, activities in different companies become linked. Electrification modifies these activity links in several ways. First, transport planning and energy planning must be coordinated. Loading and unloading activities are aligned with charging windows, terminal handling is rearranged to allow trucks to stand at docks long enough to charge, and maintenance schedules are adapted to battery health rather than traditional engine service. Second, procurement and contract activities become connected with operational planning. Negotiations about price and contract duration now include charging access, utilisation levels, and route stability as activity constraints. The nature of electric trucks and their changing activity links between actors allow for reconfigurations based of customers and hauliers needs, allowing for increased utilisation of electric trucks. Creating more possibilities and value to use the electric truck in their operations.

The empirical material showed that these linked activities often extend beyond dyads into triads, where the haulier's driving and charging activities, the customer's warehouse and ordering activities, and the energy provider's grid and pricing activities must be coordinated. Electrification thus complicates the pattern of activity links, with more activities between actors that must be aligned for a single transport flow to work.

For Haulier Bravo, electrification creates a strong activity link with Transport Intermediary Romeo. Romeo's allocation of transport flows must match the technical constraints of Bravo's electric trucks, including route length, charging opportunities, and load variation. Bravo's CEO noted, *"If they shift a flow to another customer last minute, we must check instantly if the truck can even make it."* The intermediary's planning activities therefore directly impact on Bravo's daily operational routines. Deviations from the transport planning carry greater risk, making the activity link more sensitive to change.

Transport Buyer Tango provides another example where warehouse activities are interconnected with hauliers' charging requirements. Charging is embedded into dock handling, making the timing of internal warehouse processes directly connected to the haulier's charging cycle. The traditional separation between warehouse operations and transport operations becomes blurred, creating an activity link that must be coordinated to maintain flow efficiency.

In the case of Haulier Charlie, collaboration with OEMs creates activity links based on the joint development of electric trucks. Charlie tests prototype vehicles and configures battery sizes to match specific transport routes. OEM engineers rely on Charlie's operational routines to gather performance data, while Charlie adapts scheduling and practices to support the

testing. As the CEO stated, “*They need real data, and we need trucks that actually fit our transport missions, so we adjust together.*”

5.5.6 *Activity Patterns (6)*

At the network level, the combination of changed activity links produces new activity patterns. Electrification alters the spatial and temporal structure of freight flows. Spatially, BEV operations cluster around locations where resource constellations are favourable, creating electrified corridors and hubs. Temporally, the pattern of activities changes as night deliveries, off-peak charging, and extended delivery windows become ways to increase utilisation and manage grid constraints. The previous pattern of transport, where refuelling could be slotted in almost anywhere, at any time, is replaced by a pattern where transport activities are tightly dependent on charging availability and planning. This implies that an increasing need for coordination regarding charging activities are developing, and the interconnectedness between actors and their respective activities become increasingly interdependent.

Once an electric flow has been stabilised around a certain corridor, with matching charging and delivery routines, it becomes difficult to relocate without redesigning the entire pattern. Electrification, therefore, gives parts of the network a more similar character to rail transport, with fixed lines and timetables, compared to the traditionally more flexible road transport system.

5.5.7 *Organisational Structures (7)*

In the actor’s layer, the company level is described in terms of organisational structure. Electrification requires new roles, competences, and decisions inside hauliers and other organisations. The first part of the analysis indicated that hauliers begin to appoint people responsible for electrification projects, energy management, or digital optimisation. Strategy work increasingly includes assessments of technology trajectories, policy support, and infrastructure development. Investment decisions about trucks are no longer isolated from decisions about depots, power supply, and IT systems.

In the organisational structure, electrification also increases differences between firms. Some hauliers integrate electrification into their core identity and governance, taking on more developmental roles and accepting higher risk. Others maintain traditional structures and treat BEVs as marginal experiments dependent on customer financing. The internal actor configuration of the firm, which decides, plans, and carries risk, thus becomes an important determinant of how far and how fast electrification can proceed.

5.5.8 *Actor Bonds (8)*

At the relationship level, the actor dimension concerns bonds between companies. Electrification tends to deepen these bonds between current business partners but also introduce new actor bonds. Longer contracts, joint investments in charging, and collaborative planning

create stronger and more stable commitments between hauliers and customers, between hauliers and intermediaries, and between hauliers and energy providers or OEMs. Shared risk around expensive and inflexible resources encourage more open communication, shared planning, and joint problem-solving.

At the same time, these stronger bonds also have a constraining side. The more a haulier's business is tied to a particular customer's flows, a specific intermediary's infrastructure, or a given OEM's digital software, the harder it becomes to redirect when market conditions change. Thereby, the connection between actor bonds and resource ties becomes of importance, where the development of actor bonds might be the first step for strengthened resource ties, leading to, in turn stronger actor bonds. Electrification reflects the nature of business relationships, where they enable new solutions but also limit the room for change once specific bonds and investments are in place.

The actor bond between Haulier Bravo and its major customers is showed through longer contract durations. Traditional three-year arrangements are replaced with five-year BEV contracts to balance investment risk. As Bravo's CEO described, *"It feels better in the stomach to know the truck has a use for five years."* This emotional statement reflects the relational weight of electrification, where the haulier's strategic risk is partially transferred to the customer, deepening the bond and reducing the possibility of switching partners.

The actor bonds between Transport Buyer Sierra and its hauliers are essential for enabling electrification. Because Sierra owns no trucks, BEV operations depend on strong relational commitment, joint problem-solving, and shared experimentation. These bonds show up in examples such as Sierra installing charging at its mill so hauliers can charge at their facility, reflecting a willingness to take part of the risk and adapt operations. As they note, *"By enabling charging at our sites, we can help our hauliers make the numbers work."* Electrification would not be feasible in these routes without these strengthened bonds, which transform a transactional customer-haulier link into a collaborative partnership.

A different kind of bond appears in Charlie's relationships with OEMs. Through joint problem-solving and prototype testing. Charlie and the OEM develop a bond built on shared developmental processes. Charlie's CEO described the relationship as, *"We push them, and they push us."*

5.5.9 *Web of Actors (9)*

Finally, at the network level, sets of actor bonds form a wider web of actors. Electrification redistributes roles and influence within this web. Actors who can combine transport volumes, capital, and infrastructure, such as large transport buyers, powerful intermediaries, and some hauliers with strong investment capacity, take on coordinating roles. They influence where charging is built, which flows are electrified, and which technical platforms are adopted. Energy

partners, previously peripheral to freight operations, become more central to the web of actors as partners.

Conversely, smaller hauliers or those with fragmented customer portfolios become more vulnerable. Their position in the web depends on whether stronger actors include them in electrified flows or leave them in segments where diesel remains dominant. The web of actors, therefore, becomes more interdependent with levels of influence, with key actors orchestrating electrification, while others become more dependent on decisions taken elsewhere in the network.

At the same time, the empirical material points to increased interaction and learning across the web. Pilot projects, joint development of digital tools, and collaborative infrastructure projects all contribute to a denser and more communicative network. Electrification thus both centralises control in certain situations and allows for more interaction and knowledge exchange.

6 Discussion

This chapter discusses the results of the thesis and reflects on the broader implications of electric truck utilisation. Based on the analysis, it elaborates on how electrification affects freight transport at organizational, relational, and system levels. The discussion relates the findings to prior research and further develops key insights emerging from the previous chapters.

6.1 Electrification as Resource Transformation

The analysis shows that the electrification of freight transport is best understood as a resource-driven network transformation rather than as a vehicle-level technological substitution. The introduction of battery-electric trucks represents the entry of a new focal resource into the transport system, but this resource cannot operate in isolation. This is in line with Raoofi's (2025) view of the electrification of heavy-duty trucks as a system transformation. Its utilisation depends on complementary resources such as charging infrastructure, grid capacity, digital planning tools, and competencies. Thus, the effects of electrification unfold through changes in resource collections within firms, resource ties across relationships, and new resource constellations at the network level.

This perspective helps understand why electrification creates such uneven outcomes across actors and routes. Where resources are aligned and mutually adapted, electric trucks become viable and even attractive, with favourable economic outcomes. Where resources are misaligned or missing, electrification remains limited or economically fragile. The findings thus challenge the simplified narratives of electrification as a technical substitution process and instead point to a need for coordinated and interdependent adaptation across actors in relation to this focal resource.

6.2 Deepening Relationships and New Interdependences

This thesis both confirms and extends insights from Brunner (2025) regarding the electrification of road freight transport. Brunner shows how electrification challenges hauliers' operational capabilities and highlights the importance of collaboration with intermediaries and OEMs, particularly for smaller hauliers that lack the resources to expand their business on their own. This thesis supports this observation but argues that collaboration can be extended from interactions around a focal haulier. Rather, electrification reorganizes freight transport around shared resources, which fundamentally changes business relationships.

From this perspective, the challenges of electrification do not primarily stem from a lack of technological readiness at the firm level, but from the need to align heterogeneous resources, such as vehicles, charging infrastructure, grid capacity, and data systems across organizational boundaries. Electric trucks are costly, inflexible, and tightly coupled to specific operating conditions, compared to diesel trucks, which makes the development of electric

trucks increasingly difficult. As a result, electrification pushes actors toward deeper interdependence, where access to critical resources depends on the quality and stability of business relationships.

Electrification thereby requires stronger actor bonds between transport operators and key partners such as transport buyers, intermediaries, energy providers, and OEMs. Relationships that were previously organized through relatively standardized and transactional arrangements increasingly require joint planning and coordination. This calls for stronger activity links, resource ties, and actor bonds.

This analysis suggests that electrification is not based on a single actor, but a set of interdependent resource constellations embedded in business networks. Electrification reshapes the freight transport network by drawing new actors, particularly energy-related actors and technology providers, into its core thereby increasing the complexity of coordination across previously separate domains.

6.3 Network Reorganization and System-Level Effects

At the network level, the effects of resource dependencies and relational adaptations lead to a reorganization of the freight transport system. Electrification does not happen evenly across the network but instead concentrates around specific corridors, hubs, and clusters where compatible resource constellations are in place. Such constellations typically combine access to charging infrastructure, stable transport volumes, supportive customers, and aligned planning routines. Where these conditions can be developed, electrification becomes operationally and economically viable, and where they do not, adoption remains limited or absent.

This pattern produces differentiated networks, in which some parts of the system reach high levels of electrification maturity while others continue to rely on diesel. From a systems perspective, electrification may therefore increase heterogeneity within the freight transport network rather than driving convergence toward a single dominant solution. The transition unfolds unevenly, shaped by local configurations of resources and relationships.

These findings resonate with system-oriented perspectives such as those developed by Raooft (2025) and Brunner (2025), which emphasize that transitions occur through interactions between multiple subsystems. Electrification emerges here as a system-level phenomenon, influenced by feedback loops between infrastructure development, operational practices, contractual arrangements, and different actor strategies. As the freight transport system becomes increasingly coupled to the energy system, individual actors may experience less autonomy but greater potential for integration and optimization at the system level.

Brunner (2025) similarly highlights that hauliers' adoption of heavy-duty electric trucks is a complex process. This thesis extends that insight by showing how such adoption

processes relate to the network level, producing varied outcomes rather than uniform system-wide transformation.

6.4 Implications for Transport Missions

Electrification alters the basic operating logic of road freight transport. Diesel-based systems have traditionally allowed high flexibility, where trucks could be reassigned across routes, refuelled almost anywhere, and absorb disturbances through ad hoc adjustments. Electric trucks challenge these conditions. BEV operations depend on repeatability, predictability, and stable planning horizons. Routes, loads, charging opportunities, and time windows must be tightly aligned, leading to a shift from flexible allocation toward predefined transport missions. Planning, charging, loading, and driving activities become more tightly coupled across firms and relationships.

This shift enables higher utilisation and efficiency under stable conditions, but at the cost of reduced substitutability and increased sensitivity to disturbances. Electrification therefore introduces tension between efficiency and flexibility, which is managed not primarily through technology, but through organizational and relational adaptations such as longer contracts, shared charging arrangements, and coordinated planning routines. An important secondary effect is that the increased planning intensity required by electric trucks may contribute to addressing the long-standing problem of empty and underutilised transport, as tighter coordination and predefined transport missions reduce the scope for unplanned, low-utilisation transportation.

This may change the conditions for what can practically be optimized in transport missions. Many constraints on electric truck utilisation are not purely technical, but relational and organizational. Access to charging, route stability, contract duration, and ownership of shared resources all shape what is feasible in practice. This implies that optimization models of transport planning must be grounded in this understanding. Without such grounding, optimization risks producing solutions that are technically feasible but organizationally unrealistic. From this perspective, qualitative network analysis provides a necessary foundation for defining relevant optimization problems.

6.5 Charging as a Resource and Activity

One of the central insights of this thesis is the role of charging infrastructure as a central and controlled resource. Unlike diesel refuelling, which is standardized, widely accessible, and largely decoupled from organizational arrangements, charging is location-specific, capacity-constrained, and embedded relational and interorganisational settings. Access to charging therefore becomes not only a technical prerequisite but a relational and ownership concern that affect the feasibility of electrification.

This observation resonates with Melander and Wallström (2022), who show that charging infrastructure functions as a shared and strategically controlled resource rather than a neutral background condition. Their work demonstrates that access to charging is often enabled through collaboration and long-term commitments, and that such arrangements simultaneously reduce individual investment risk while increasing interdependence between actors.

Charging resources are increasingly shared across organizational boundaries and embedded in customer sites, intermediary-led networks, or managed by energy companies. As Raoofi (2025) emphasizes from a systems perspective, charging infrastructure cannot be understood in isolation from the energy system, but it is directly affected by grid capacity, pricing mechanisms, and broader energy grid structures. Electrification therefore increases interdependence not only within the freight transport network but also between transport and energy systems, reinforcing the view of electrification as a system-level transition rather than a sector-specific technological shift.

Electrification may therefore be understood not merely as access to trucks and charging, but as a question of relationships across the business network. Electricity pricing and charging conditions are uneven in the transport network, impacting the total cost of ownership and adoption possibilities. These different conditions both reinforce differences between actors and enable new business models based on the sharing of charging resources.

6.6 Context Dependence

Large-scale operational studies from China provide a useful contrast to the findings of this thesis. Using data from more than 61,000 electric trucks, Zhao et al. (2024) show that electric trucks are, on average, significantly underutilised compared to diesel vehicles, despite extensive adoption and rapid infrastructure rollout. Their results indicate that multiple electric trucks are often required to replace the transport work of a single diesel truck. Importantly, this underutilisation is not primarily explained by vehicle performance, but by operational and organisational constraints such as charging access, route rigidity, scheduling practices, and mismatches between vehicles and infrastructure. This reinforces the view that utilisation challenges are system-level. At the same time, comparative evidence highlights strong context dependency in electric vehicle utilisation outcomes. He et al. (2019) shows that, already in the early stages of electrification, China achieved substantially higher economic and climate benefits than the United States and Germany, primarily because vehicles were more intensively and predictably used within supportive mobility and energy systems.

Other studies from the Chinese context show that high utilisation and economic viability can be achieved under specific organisational conditions. Chen et al. (2024) demonstrate that electric freight vehicles can perform competitively when embedded in tightly coordinated logistics and energy systems, characterised by centralised hubs, integrated charging and loading activities, and direct participation in electricity markets. Similarly, Wang et al. (2024) show that

centralised control over infrastructure and operations enables solutions such as battery swapping, intelligent scheduling, and time-of-use electricity pricing to improve utilisation and economic performance. These studies highlight charging and energy coordination as central operational bottlenecks, but also as leverage points when ownership and control are sufficiently centralised.

At the same time, these findings underline the strong context dependency of utilisation outcomes. Wang et al. (2024) further illustrate how transport utilisation can be improved by reconfiguring activities and sharing infrastructure across systems, for example, by integrating freight flows into passenger bus networks to unlock underutilised capacity. Such arrangements rely on high levels of central coordination, infrastructure ownership, and system integration, which differ markedly from the decentralised, relationship-driven freight transport network observed in Sweden. In contrast to the Chinese cases, the Swedish context is characterised by fragmented ownership, negotiated access to charging infrastructure, and utilisation shaped through interorganisational relationships rather than central control. Together, these studies reinforce the conclusion that electric truck utilisation cannot be understood independently of the institutional, organisational, and network contexts in which it unfolds.

7 Conclusions & Implications

This chapter concludes the thesis by summarizing the main findings and articulating their implications for theory and practice. It first revisits the research questions and summarizes how they have been addressed based on the empirical analysis. The chapter then discusses the theoretical implications for business network research and the practical implications for actors involved in the electrification of freight transport, with particular attention to industrial actors. Finally, the chapter outlines key limitations of the study and identifies directions for future research.

7.1 Answering Research Questions

The aim of this research was to explore how electric trucks are utilised in freight transport and to understand how this utilisation is shaped by interactions among actors in business networks. To address this aim, the study was guided by the following research questions:

RQ 1: What are the challenges and opportunities faced by actors in the freight transport network regarding the utilisation of electric trucks?

RQ 2: How do these actors interact with their business partners to address these challenges and opportunities?

The following sections summarise how these research questions have been addressed based on the empirical findings and analysis presented in this thesis.

7.1.1 Research Question 1

The findings show that the utilisation of electric trucks introduces a set of challenges and opportunities that extend well beyond vehicle performance and individual firm decisions. At their core, these challenges stem from the resource characteristics of electric trucks, which differ fundamentally from those of diesel vehicles and require new forms of coordination across the freight transport network.

The primary challenges relate to resource inflexibility and dependency. Electric trucks are characterized by limited range, charging time requirements, sensitivity to operating conditions, and high upfront investment costs. These characteristics reduce operational substitutability and flexibility, making it difficult to reassign vehicles across routes, customers, or time windows without careful planning. The availability, location, and ownership of charging infrastructure further constrain utilisation, while grid capacity, electricity pricing, and policy uncertainty introduce additional sources of risk. Together, these factors call for considering electrification as a system-level challenge rather than as an operational issue.

At the same time, electrification creates significant opportunities. When electric trucks are embedded in stable transport flows with predictable distances, volumes, and time windows, they can deliver lower operating costs, reduced emissions, and improved working

conditions for drivers. Electrification may also contribute benefits through higher utilisation, integrated charging during loading or unloading, and alignment with energy system dynamics such as off-peak charging. More broadly, electric trucks may become a driver for innovation in transport planning, energy management, and digital optimization.

Importantly, the study shows that these challenges and opportunities are not evenly distributed across actors. Hauliers with access to capital, infrastructure, and stable demand are better able to leverage electrification, while others become more dependent on network arrangements.

7.1.2 Research Question 2

The findings demonstrate that actors address the challenges and opportunities of electric truck utilisation primarily through intensified interaction and coordination with business partners, rather than through making adaptations within the firms. Electrification increases interdependence, making relationships a central mechanism for enabling operations.

Actors interact by developing stronger resource ties, particularly around charging infrastructure, energy supply, digital systems, and vehicle data. Charging resources are frequently shared, co-invested in, or embedded at customer or intermediary sites, transforming previously internal or peripheral assets into shared interorganizational resources. These arrangements allow expensive and inflexible resources to be utilised more efficiently, but they also create stronger relationships that deepen mutual dependence between partners.

Electrification also leads to tighter activity links. Transport planning becomes closely connected to customer ordering patterns, warehouse operations, energy management, and grid constraints. Activities such as loading, unloading, charging, routing, and scheduling are increasingly aligned across organizational boundaries. As a result, deviations and short-term reallocations become more difficult, and planning horizons need to be extended further into the future.

At the actor level, these resource ties and activity links are accompanied by stronger actor bonds. Longer contract durations, shared investment risk, and joint experimentation create more collaborative relationships. While these bonds enable electrification by reducing uncertainty and distributing risk, they also reduce substitutability and increase commitment to specific partners, infrastructures, and technological pathways.

Overall, the study shows that the electrification of heavy-duty vehicles is managed not through market-based transactions alone, but through relationships within business networks. Actors rely on trust, mutual adjustment, and coordinated development to align electric trucks with complementary resources and activities. In this sense, electrification emerges as a relational and networked process, where the ability to utilise electric trucks depends less on individual firm capabilities and more on the quality and structure of inter-organizational relationships.

7.2 Implications for Theory

This thesis contributes to theory by advancing a resource-centric and relational understanding of electrification in freight transport networks. Rather than conceptualising electric trucks primarily as technological developments or firm-level investments, the analysis demonstrates that electrification operates through resource interdependence, where the utilisation and value of electric trucks depend on how they are embedded in relationships and combined with other resources across organisational boundaries.

By placing resources at the analytical centre and applying the ARA framework, the thesis shows how changes in resource characteristics (e.g. range, charging time, grid dependence) trigger cascading effects on activity structures, activity links, actor bonds, and ultimately the configuration of the wider network. This contributes to existing Industrial Marketing and Purchasing (IMP) literature by illustrating how new resources can reorganise business networks (Baraldi et al., 2024; Bocconcelli et al., 2020; Gadde et al., 2012; Håkansson & Snehota, 1995).

In relation to prior work on electrification and sustainable transport, the thesis shifts attention away from isolated barriers or adoption drivers toward the relational mechanisms that enable or constrain utilisation. While earlier studies often focus on individual firms or technologies, this work demonstrates how electrification reshapes coordination, governance, and dependence patterns across multiple actors. In doing so, it complements other system-level perspectives on energy and transport transitions by suggesting how and why coordination challenges persist despite technological readiness.

7.3 Implications for Practice

As this research is conducted within an industrial PhD context, the findings have direct implications for Volvo, hauliers, and other actors involved in the development and operation of electric freight transport solutions. The results highlight that successful electrification depends on coordinated action across vehicle manufacturers, transport operators, customers, and energy actors.

First, the thesis shows that electrification cannot be addressed as a standalone vehicle or product challenge. The utilisation of electric trucks depends on charging access, energy management, planning routines, and contractual arrangements that extend far beyond the vehicle itself. For hauliers, this implies that electric trucks must be embedded in stable transport missions, long-term customer relationships, and predictable operating conditions to be economically viable. For Volvo, it means that its role in electrification is not limited to delivering technically capable trucks but increasingly involves engaging with the relational and infrastructural conditions under which those trucks can be effectively used in hauliers' day-to-day operations.

Second, the analysis highlights charging infrastructure as a strategic resource for both hauliers and manufacturers. How charging is owned, accessed, priced, and integrated into operations

significantly influences utilisation, risk exposure, and investment decisions. For hauliers, control over charging access becomes a key determinant of operational flexibility and cost stability, often requiring collaboration with customers, intermediaries, or energy partners. For Volvo, this underscores the importance of considering how vehicle offerings interact with charging systems, energy actors, and customers' operational realities, and points to opportunities to support new coordination mechanisms, service offerings, or partnership models that reduce uncertainty and enable stable electric operations.

Third, the findings indicate that data and planning tools become increasingly important as electrification progresses. Electric trucks introduce tighter operational constraints, which increase the value of predictive planning, optimisation, and system-level visibility. For hauliers, this raises the importance of digital tools that support route planning, charging coordination, and utilisation management across fleets and partners. For Volvo, ongoing development of digital services, fleet management tools, and data interfaces can therefore be seen as central to enabling utilisation, not merely as complementary add-ons to vehicle sales.

Overall, the thesis provides both Volvo and hauliers with a framework for understanding electrification as a network-level transformation. Value creation increasingly depends on orchestration, coordination, and long-term relational engagement rather than on transactional sales or isolated operational decisions. This creates opportunities for manufacturers and transport operators alike to identify, develop, and benefit from service-oriented offerings and collaborative business models that support effective electric truck utilisation across the freight transport network.

7.4 Limitations and Future Research

This thesis has several limitations that should be acknowledged. First, the study is based on qualitative case research within a specific national and institutional context. While this allows for rich, in-depth analysis of relational dynamics, it limits the ability to generalise findings across regions with different regulatory frameworks, market structures, or energy systems.

Second, the empirical focus is primarily on early and intermediate stages of electrification. As technologies, infrastructure, and policies evolve, some of the observed constraints may change. The analysis thereby captures a transitional moment rather than a mature electric freight system.

Building on these limitations, several directions for future research emerge. First, an important direction for future research is a comparative study of electric truck utilisation in different institutional and network contexts, with particular focus on Sweden and China. While this thesis has examined electric truck utilisation within Swedish freight transport business networks, recent research from China discussed in the previous chapter demonstrates large-scale deployment of battery-electric trucks under markedly different conditions in terms of

infrastructure density, ownership structures, and actor configurations. Comparing these two contexts offers a valuable opportunity to advance understanding of how utilisation emerges from different freight transport networks rather than from vehicle technology alone.

A comparative Sweden-China study would enable a deeper analysis of how freight transport networks are organised, how actor roles are configured, and how resources are combined into distinct resource constellations under different market and institutional settings. In China, electric truck adoption has progressed rapidly, supported by dense charging and battery-swapping infrastructure, strong coordination between transport operators, energy providers, and authorities, and platform-based approaches to fleet management. These conditions appear to enable higher levels of electric truck utilisation at scale, but they also imply different forms of dependence, coordination, and control within the network. From an Industrial Network Approach perspective, this raises important questions about how resource ties, activity links, and actor bonds are structured in Chinese freight transport systems.

Future research could therefore focus on mapping the Chinese freight transport network as a business network. Attention should be paid to how critical resources, such as charging infrastructure, battery systems, energy supply, digital platforms, and fleet management tools, are owned, accessed, and combined. Analysing these resource constellations would make it possible to understand how utilisation is enabled through interaction between resources rather than through isolated optimisation of individual assets

Additionally, recent industry reports further underline the relevance of the Chinese context. According to a McKinsey & Company report (2025b), more than 70% of European hauliers who are aware of Chinese electric truck manufacturers would consider purchasing vehicles from them at price parity or with a modest cost advantage. This suggests that electrification may not only reshape technological and infrastructural arrangements but also alter competitive dynamics and business network structures within European freight transport. Against this backdrop, future research should revisit how Nordic countries and the European Union are adopting zero-emission freight solutions. Such research could also contribute by proposing viable measures to improve adoption speed and effective utilisation as zero-emission vehicles are introduced at large scale across Europe.

Third, further research could deepen the integration between business network analysis and optimisation. By combining relational and interorganizational perspectives with mathematical modelling, future studies can explore what forms of optimisation may contribute to developing truck utilisation under different conditions. This could provide solutions grounded in real-world organizational constraints, thereby connecting two traditionally separated fields into a more coherent understanding of how technological capabilities are realized in actual operations.

Fourth, the governance of charging infrastructure represents a particularly promising direction for future research. As charging infrastructure becomes a critical and shared resource for electric freight transport, questions of ownership, access rights, pricing mechanisms, and responsibility for investment and operation become central to both utilisation and scalability. Unlike diesel refuelling, which is standardized and widely accessible, charging infrastructure is location-specific, capacity-constrained, and often embedded organisational and relational arrangements. Future research could examine how different governance models for charging infrastructure shape interdependences and coordination across freight transport networks. For example, depot charging, customer-owned charging at terminals, intermediary-led charging networks, and energy-company-operated public stations imply fundamentally different configurations of control, access, and pricing. Each model creates distinct incentives for utilisation, investment, and collaboration.

Finally, longitudinal studies would be valuable for capturing how actor roles, business relationships, and resource constellations evolve as electrification moves from early-stage adoption and pilot projects toward broader, large-scale adoption. As battery technology improves, charging infrastructure expands, and operational uncertainty decreases, some of the current constraints that shape electric truck utilisation, such as limited range, long charging times, and scarce charging access, are likely to diminish, creating new opportunities and challenges in the freight transport network.

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Appendix

Interview Guide: Hauliers with Electric Vehicles

Current Fleet and Operations

- Could you describe your current fleet?
- Number and types of vehicles (electric and diesel), number of drivers, and types of assignments.
- Can you describe a typical assignment in your operations?
- Do your routes follow predictable patterns, or are they more dynamic and variable?
- How do you integrate electric vehicles into your broader fleet operations?

Decision and Investment in Electric Vehicles

- When did you decide to invest in electric trucks, and what were the primary factors driving that decision?
- What were the main considerations or challenges you weighed before adopting electric vehicles?
- How does your company balance electric and diesel vehicles in terms of operational costs, maintenance needs, and reliability?

Usage and Optimization of Electric Fleet

- How are your electric trucks currently being used in your operations?
- What strategies or tools have you implemented to optimize their usage?
- For example, do you use route planning, charging schedules, or specific fleet management software?
- What methods have been most effective in reducing costs and maximizing efficiency?
- How do you manage charging and maintenance schedules to minimize downtime?
- What technical or operational challenges have you faced with electric trucks?
- Specifically, how do you handle range limitations?

New Operational Opportunities

- Has the adoption of electric trucks enabled new ways of operating, such as indoor loading/unloading or accessing restricted (e.g., green or quiet) zones?
- Are there other unique advantages you've noticed in using electric trucks compared to diesel?

Customer Insights and Market Needs

- How have your customers responded to your use of electric vehicles? What kind of feedback have you received?

- What specific customer needs or expectations influence your decisions around electric transport?
- Have particular customer segments reacted more positively to your electric fleet? If so, which ones?
- Have you faced challenges with customer acceptance of new technologies like electric trucks? How have you addressed these?

Future Development and Business Models

- How do you see the role of electric trucks evolving in your company over the next 5-10 years?
- Are you exploring new business models or revenue streams related to your electric fleet?
- What partnerships or collaborations do you consider critical for your electrification strategy?
- What types of services or support would you find most valuable in using electric trucks?

Expectations and Experiences

- What were your initial expectations before investing in electric trucks?
- How have those expectations shifted based on your experiences so far?
- Would you say that electric trucks have made your operations more profitable or less so?

Additional Questions to Explore (If Time Allows)

- How do you compare the profitability of electric trucks versus diesel in your operations?
- What role do tools (e.g., fleet management software, charging optimization tools) play in determining the profitability of your operations?
- Are profitable operations with electric trucks driven more by strategic management decisions or by specific tools and processes?
- How do you approach finding the most profitable use cases for electric trucks within your business?