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# Developing An Internal Third-Party Logistics (3PL) Solution: A Case Study At Lindab

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# Abstract

**Title:** Developing An Internal Third-Party Logistics (3PL) Solution: A Case Study At Lindab

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

**Problem Formulation:** Lindab Group's current internal buying structure applies a fixed percentage-based markup to internal product sales. This structure has resulted in suboptimal supply chain decisions among internal companies. Lindab is now exploring the establishment of an internal third-party logistics provider as a strategic alternative. This shift would replace the existing markup model with a service-based pricing approach, potentially reducing overall logistics costs and improving fairness across the group.

**Purpose:** The purpose of the thesis is to evaluate whether an implementation of an internal 3PL system would be beneficial for Lindab.

**Research Questions:**
RQ 1: What is the current distribution map of suppliers and deliveries throughout Lindab's warehouse in Grevie?
RQ 2: What are the key opportunities and challenges for Lindab in creating an internal 3PL?
RQ 3: Should Lindab move forward with establishing an internal 3PL?

**Methodology:** Given the exploratory nature of this study, which aims to assess the feasibility of implementing a 3PL solution within Lindab, a case study approach was chosen. This approach allowed for a detailed examination of the phenomenon within Lindab's existing operations. The study used a mixed-method strategy, combining both qualitative and quantitative data insights. Qualitative data was gathered through interviews with key stakeholders and quantitative from internal databases.

**Conclusion:** Given the potential benefits identified, such as improved cost transparency, reduced internal markups, improved logistics coordination and the opportunity for business units to focus on core activities, Lindab could gain significantly from an internal 3PL solution and is recommended to further investigate the phenomenon. Furthermore, the creation of a separate entity with a neutral position, seems to be a potential organizational structure to support this transformation. However, this recommendation is not without reservations. The added complexity, necessary structural change and risks associated with in-house development must be acknowledged. To succeed, Lindab needs to ensure strong internal alignment, consider parts of its cost-driven approach and improve systems for cost transparency and information sharing.

**Key Words:** *TPL, Critical success factors of third-party Logistics, Maturity model, Third-party logistics maturity model, Third-party logistics cost, Third-party logistics cost model, Third-party logistics opportunities, Third-party logistics challenges.*

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Our appreciation also goes to the fellow students in our master's thesis group for their constructive feedback and thoughtful discussions during peer review sessions. Your perspectives have helped us reflect critically and improve our work throughout the project. We also wish to acknowledge each other for a strong collaboration. The ability to share thoughts and challenge ideas together has been an important part of the process.

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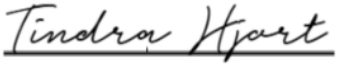
*Emil Johansson*
Lund, 2025-05-14



*Tindra Hjort*
Lund, 2025-05-14

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# List of Abbreviations

**AI:** Artificial intelligence

**AR:** Augmented Reality

**CMMI:** Capability Maturity Model Integration

**CSF:** Critical success factors

**DC:** Domestic central

**DL:** Domestic local

**EBIT:** Earnings Before Interest and Taxes

**GC:** Group central

**GW:** Grevie warehouse

**$HC_{hand}$:** Handling costs

**$HC_{hold}$ :** Holding cost

**IC:** Inventory cost

**IoT:** Internet of Things

**KPI:** Key performance indicator

**LC:** Logistics cost

**MC:** Moving cost

**MM:** Maturity Model

**SC:** Supply Chain

**3PL:** Third-party logistic

**3PL-SCMM:** 3PL Service Capability Maturity Model

**TC:** Transportation cost

**RC:** Rent cost

**RFID:** Radio Frequency Identification

**RQ:** Research question

**SP:** Smart Pallets

**WMS:** Warehouse management system

# 1. Introduction

*This chapter provides the foundation for the thesis project by introducing the subject area and offering an overview of the company in focus. It then presents the problem formulation, purpose and research questions, establishing the basis for the study. Finally, the chapter outlines the study's delimitations, target audience and report structure, guiding the reader through what follows.*

## 1.1 Background

Operations strive to deliver products that meet market demands. In the modern competitive landscape, success requires more than just an attractive price. Factors like quality, flexibility and other value-added attributes play a crucial role. The efficiency is not tied exclusively to internal operations but also depends on delivery reliability, lead times and customer contact among others (Berglund, 1997; Olhager, 2019). The pursuit of excellence across all parts of the supply chain (SC) has led to a global trend of outsourcing certain activities. While the concept of outsourcing dates back to 1791, it has become a widely adopted strategy, featuring as a key term in over 390,000 articles published between 2010 and 2021 (Pang et al., 2021). Some researchers argue that the COVID-19 pandemic, along with other major changes in recent years, has increased companies' willingness to outsource more activities or processes of their SCs (Sohn, 2022).

The primary reasons for outsourcing typically include reducing costs, accessing specialized expertise and skills, improving service quality and allowing organizations to focus on their core capabilities. Concerns about outsourcing often stem from the fear of losing control over critical operations (Becker, 2010; Lacity et al., 2016; Sohn, 2022). Additionally, outsourcing comes with various risks. These include suppliers not meeting expectations, limited transparency that may result in hiring unqualified suppliers and sensitive information being leaked. Furthermore, reliance on the outsourcing supplier can create a dependency, granting the supplier continuous negotiation leverage (Pang et al., 2021; Sohn, 2022).

Closing 2024, 87% of companies responsible for transporting goods report an increased reliance on outsourced logistics services (Long, 2024). Many companies tend to outsource some or all of their logistics functions to external parties, such as distribution and warehousing.. These external service providers are referred to as third-party logistics providers, most commonly abbreviated as 3PL (Olhager, 2019; Zhang et al., 2023).

Lindab is a leading ventilation company group in Europe. In northern Europe, Lindab also offers an extensive range of roof, wall and rainwater systems. Lindab develops, manufactures, markets and distributes products and systems through a network of interconnected companies with a sophisticated SC strategy. As logistics costs have risen close to 1.5 billion SEK, they are continuously working to improve logistics efficiency and implement cost-saving solutions across the group. Lindab is therefore interested in evaluating whether a company within the group can manage the majority of logistics operations on behalf of the others, acting as an internal 3PL.

## 1.2 Company Description

The company was first founded in 1956 in Småland, Sweden, then named AB Lidhults Plåtsindustri and acted as a sheet metal workshop. In 1969, the company was renamed to Lindab and the journey from a small workshop to an international listed company began (Lindab, 2023a). Today, Lindab Group owns and manages over 30 companies, all primarily operating within Europe. The group is present in 20 countries and has approximately 200 sites, with Sweden serving as one of the key markets. Lindab's core concept is to provide comprehensive ventilation solutions, ranging from large ventilation ducts near supply air fans to smaller ducts for individual rooms and everything in between.

Approximately 70% of its products relate to ventilation and are expected to reach 90% by 2027. See *Figure 1.1* for ventilation product examples. To meet customer demands more accurately, Lindab also sources components from nearly 2,300 external suppliers.


Figure 1.1: *Product offerings of ventilation systems at Lindab (Lindab, 2023b)*.

### *1.2.1 Group Supply Chain Overview*

Uniquely, Lindab owns the majority of its SC, which makes it vertically integrated. To illustrate the structure of the SC, a model has been developed, see *Figure 1.2*. Each building with a coloured dot represents one step in the SC, connected with a role and its associated tasks. In reality, a company or a single site can take on multiple roles. In *Figure 1.2*, the blue trucks represent transportation controlled by a Lindab company, while the yellow trucks indicate transport by external suppliers. The group operates without owning any trucks, instead relying on long-term contracted services.

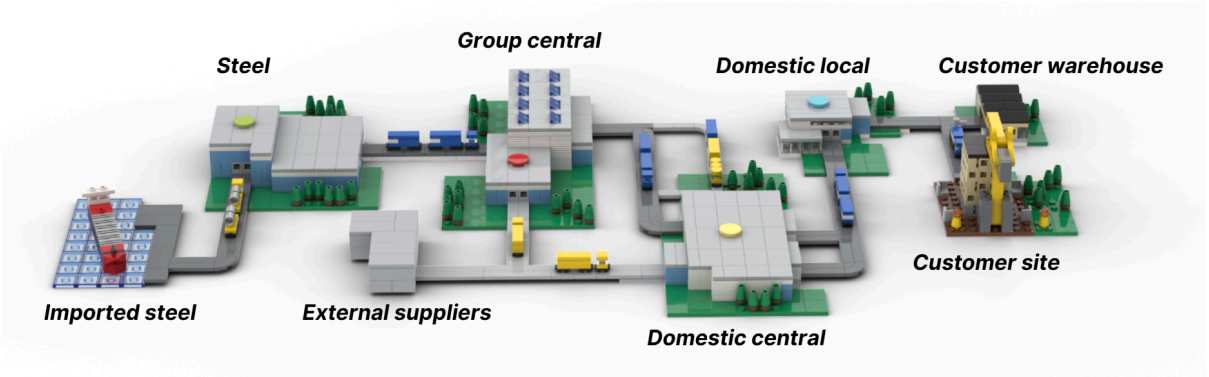


Figure 1.2: *Generic model of Lindab's SC.*

**Steel**
The SC begins with the importation and pre-processing of steel. The Lindab group imports over 220,000 tons of steel annually. The raw material is purchased by the green role named Steel. The group has only one site assigned to this role, which manages the central purchasing of steel for the entire group. This vital role requires expertise in demand planning, ensuring the best possible forecast accuracy. The site processes the raw steel into thinner and smaller raw materials called slitted coils, which are then transported downstream.

**Group central (GC)**
Next in the SC is the red building, a role held by a few sites within the group. These sites, known as Group Central (GC), specialize in the production of smaller product dimensions. Which is produced by using advanced and automated manufacturing. Additionally, GCs can store and handle large amounts of products.

**Domestic Central (DC)**
The yellow dot represents the sites called Domestic Central (DC). They produce large products like segmented bends and circular ducts, see *Figure 1.3*. There are around 40 sites assigned to this role.

Being more geographically scattered, they also serve as an important mid-sized storage unit for a country or local market, including warehousing for external vendors.

Segmented Bend Circular Duct

Figure 1.3: *Ventilation bend and duct*.

**Domestic local (DL)**
Furthest downstream, the blue dot represents the role of a Domestic Local (DL), assigned to over 100 sites. These sites act as walk-in stores and small warehouses, where customers can pick up finished goods or place orders directly to their warehouse or construction site. If the DL has the products in stock, they will be shipped from there. However, it is more common for shipments to come directly from the GC and DC.

**External supplier**
Connected to the GC and DC are the external suppliers, delivering traded goods and direct material. The reason behind delivering to both these centers is to ensure a one-stop-shop solution, so that the final delivery has all the requested parts in one delivery to customers.

### *1.2.2 Swedish Supply Chain Overview*

Sweden has one of the group's most well-established and intricate SC. The DL sites account for 30 locations across the country, as seen in *Figure 1.4*, and are owned by the sales company Lindab Sweden. What makes the Swedish market's SC unique is the use of five strategically located Hubs. These Hubs do not receive any orders themselves. Instead, they primarily serve as cross-docking terminals, with some capacity to store products. Their main role is to support regional deliveries by being positioned close to customers.

Another crucial location in Sweden for the northern European market is Grevie, where one of the GCs is seated, merged with Steel and the group's largest DC. The DC includes a warehouse (GW), which is equipped with an automated storage and retrieval system, featuring over 26,000 pallet locations. The steel site is owned by Lindab Steel, while the GC with its warehouse is currently managed by the production company Lindab Ventilation (Lindab, 2023b).

Lindab Sweden accounts for nearly 70% of the total sales volume for Lindab Ventilation, making them their largest customer. However, a significant portion of the sold products are not produced by Lindab Ventilation but instead resold from other suppliers. This highlights the complexity of the buying structure, as Lindab Ventilation sources products from other Lindab companies and external companies, and then resells them to Lindab Sweden. This often places Lindab Ventilation in the role of a middleman.

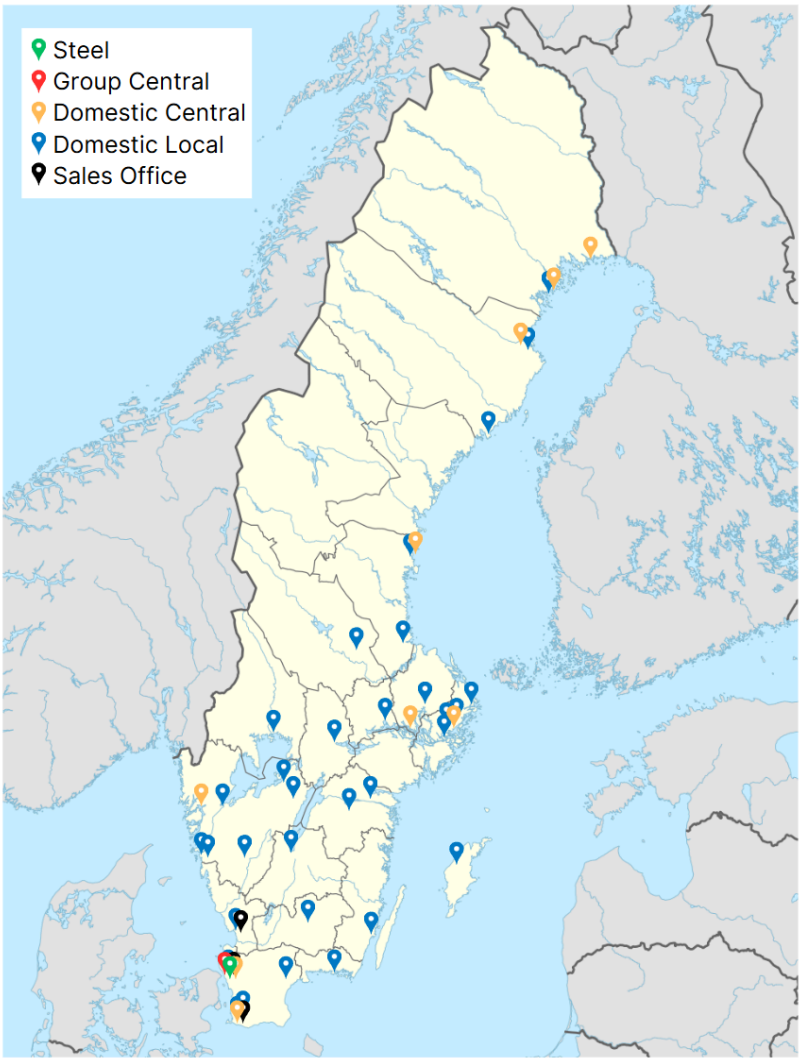


Figure 1.4: *Site map for Lindab in Sweden*.

Since Lindab Ventilation is the largest provider to the DL sites, countless transports are moving from the GC in Grevie. The DL sites offer many options for how customers can receive their products. Combined with the country's complex network of sites and functions, there are different types of transportation modes. *Table 1.1* shows a simplified breakdown of the four available modes of transportation. Each mode is selected based on multiple factors, such as product availability, route optimization, lead time or if the product is made to order. Note that these modes only apply when customers place an order with Lindab Sweden, which then places an order with Lindab Ventilation.

Table 1.1: *Transportation modes to customers*.

| Transportation mode | Description |
|---|---|
| VIA | Products are delivered from GW via DL and out to the customer. |
| HUB | Products are delivered from GW via Hub and out to the customer. |
| Direct | Products are delivered from GW directly to the customer. |
| Warehouse | Products are either picked up at DL or delivered to the customer from DL. |

## 1.3 Problem Formulation

Lindab group's current internal buying structure is not favourable. When Lindab Ventilation, acting as an intermediary, buys and sells internally, it generates unnecessarily high cost layers. These layers are partly based on the arm's length principle, where prices between related companies must be the same as if they were sold to an external party (Skatteverket, 2021). A fixed percentage-based markup is added to each sold product, now being somewhere between 11% and 12%. For example, this can lead to unfair pricing when products from one company are valued significantly higher than products from another company, despite the same handling costs. The markup has caused some internal companies to deliver directly to customers instead of via GW, making inefficient SC decisions.

Since GW is a key point in the SC, Lindab wants to maximize its potential and strategically leverage it to reduce overall logistics costs. To achieve this, they are considering establishing a 3PL provider within the group. As GW is owned by the production company Lindab Ventilation, a long-term solution would be to create a separate entity, fictively for this study called Lindab Logistics, that would take over GW and its logistics operations. This separation would enable dedicated focus on logistics while allowing Lindab Ventilation to concentrate on its core competencies, suggested as one reason why companies choose to engage in 3PL (Jean, 2024; Maloni and Carter, 2006). The vision is to develop Lindab Logistics to a level where it can offer its services to trade partners outside the group.

The 3PL solution will challenge the current buying structure, as Lindab Logistics would sell a service for handling companies' products instead of buying them. The price of the service is expected to be lower than the current markup when buying and more favourable for all companies involved. Making companies engage in the solution will not only reduce their costs but also generally create a more efficient logistics network and benefit the entire group. This solution may offer numerous benefits, but the key question is whether Lindab is prepared for it and if it can be economically justified.

## 1.4 Purpose Statement and Research Questions

The purpose of the thesis is to evaluate whether an implementation of an internal 3PL system would be beneficial for Lindab. To address the objectives of this thesis, the following research questions (RQs) will be explored:

**RQ 1: What is the current distribution map of suppliers and deliveries throughout GW?**
The first RQ aims to map the current logistical flow through GW. It seeks to establish a comprehensive understanding of the SC, identifying key suppliers, product flows and delivery patterns. This analysis will help find which products and companies to focus on and serve as a foundation for identifying areas of improvement.

**RQ 2: What are the key opportunities and challenges for Lindab in creating an internal 3PL?**
The second RQ examines the feasibility of establishing an internal 3PL solution at Lindab, focusing on identifying the most important aspects of the solution. The question is also there to address any gap in having an internal 3PL compared to an external one.

**RQ 3: Should Lindab pursue establishing an internal 3PL?**
The final RQ is addressed through evaluating the potential benefits of an internal 3PL for Lindab. Based on the findings from RQ1 and RQ2, the assessment will focus on capabilities and costs. Depending on the results, a recommendation will be made on whether Lindab should invest further time and resources in exploring the solution.

## 1.5 Delimitations

Given the Lindab Group's size, number of companies, geographical distribution and operational reach, it is necessary to define a clear scope for this study. The scope should be reasonable, yet significant enough to make informed decisions and contribute to the research field. GW is a strategic location used in the SCs of multiple countries where Lindab operates. However, since its primary use is for the Swedish market, this study will focus on analysing a possible development of a 3PL solution for GW in Sweden. There is a vision to make the 3PL a large-scale operation and extend the service to the entire group. However, starting on a small scale is necessary to balance the depth of analysis with the available time frame. To limit the study further:

- It is reasonable for this thesis to emphasize Lindab's ventilation segment, due to the large proportion of ventilation products and their expected growth.
- The solution will propose that Lindab Logistics overtake operations at GW, meaning the assessment will be based on the logistics operations of Lindab Ventilation. This eliminates the need for initial investments to establish the 3PL.
- The key perspectives of the assessment will be current and potential capabilities, as well as associated costs.

## 1.6 Relevance

The primary objective is to analyse and give useful feedback on possible opportunities for the Lindab group and its affiliated companies through adjustments of their SC structure. In addition to Lindab, other networks of companies may find the results valuable when making similar decisions. Organizations looking for guidance on selecting an appropriate 3PL, as well as those considering the possibility of introducing a 3PL provider, may find relevant insights within this thesis. Academia may find value in case-specific results and research in rather unexplored areas.

The usage of 3PL is a fast-growing approach for companies to focus on their core business (Becker, 2010; Lacity et al., 2016; Sohn, 2022). The number of published academic journal papers on 3PL grew considerably during the period of 2008-2020, suggesting that the interest in 3PL usage might be experiencing growth. However, it should be noted that more recent publication trends are not accounted for. Furthermore, only 18% of the published papers during this period concerned the network level, where company groups are included and 13% included a case study (Premkumar, 2020), leaving the subject for this thesis quite unexplored. Almost all papers published regarding 3PL describe outsourcing to external companies outside of a company or company group. The concept of internal 3PL has been mentioned at least once at the Johnsson & Johnsson company in the early 2000s (Armbruster, 2005). Besides this article, no other mention of the concepts have been found.

## 1.7 Non-disclosure Agreement

Throughout the report, all numbers related to Lindab have been altered due to confidentiality and company policies. Wherever possible, calculated potential benefits and similar figures have been adjusted using the same ratios as the original values, so that the proportional benefits remain accurate. The authors acknowledge that this reduces transparency and may affect the perceived credibility of the results. This limitation is important to consider when interpreting the results.

## 1.8 Thesis Outline

The outline of the thesis report is presented through a brief content description for each thesis chapter. The outline is presented in *Table 1.2* below.

Table 1.2: *The structure of the report and content of each chapter.*

| **Chapter** | **Content** |
|---|---|
| *Chapter 1:* Introduction | An introduction and general relevant background to the thesis project. Including company description, problem formulation, purpose statement, RQs, delimitations and relevance. |
| *Chapter 2:* Methodology | A description of the approach and strategies used to answer the RQs with established research practices. Including research design and quality. |
| *Chapter 3:* Literature Review | A compilation of previous research on the thesis subject. |
| *Chapter 4:* Developing the Maturity Model | A thorough description of how the used framework was developed and how it is connected to the literature review. |
| *Chapter 5:* Empirical Data | A presentation of obtained data relevant to conclusions and evaluation of theoretical concepts in practice. Including collected data from interviews, a mapping of Lindab's current logistic flows and data used for the business case. |
| *Chapter 6:* Results and Analysis | Evaluation of the findings, assessing how effectively they address the objectives and align with existing literature. Including considerations for the recommendations to Lindab. |
| *Chapter 7:* Discussion | Discussion about the limitations of the thesis. |
| *Chapter 8:* Conclusion | A final conclusion for each RQ and research contribution. |

# 2. Methodology

*This section outlines the relevant methods for successfully conducting the thesis and addressing the research questions effectively. Included subparts are the research design and method, which explain the thesis procedure and research quality, addressing validity and reliability.*

## 2.1 Research Strategy and Design

Edmondson and McManus (2007) argue that management research theory can be placed on a spectrum from nascent to mature. Nascent theory suggests answers to new questions in emerging areas of research, while mature theory uses well-developed models and constructs studied over a considerable time by multiple researchers. In between these theories are intermediate theory that presents initial assumptions and constructs relating to existing literature (Edmondson and McManus, 2007). The study aims to assess Lindab's current logistics operations and how they would perform if they were a 3PL provider. Studies on 3PL performance and evaluation focus on companies that are formally recognized as 3PL providers, rather than those considering establishing one. However, a significant connection between the two areas suggests an intermediate position on the spectrum.

The aim is to explore the possibility of implementing a 3PL solution, making an assessment based on some key aspects, where definite results are not a must. According to Sreejesh et al. (2014), an exploratory research design is preferable in this matter, aiming to analyze the current situation, deepen understanding of the topic and uncover new insights (Stebbins, 2001; Swaraj, 2019). Unlike experimental research, which follows a more structured design in a controlled environment, exploratory research stays more unstructured and adaptable, allowing researchers to investigate phenomena in a more open-minded manner (Swaraj, 2019).

As the purpose of exploratory research is to investigate a specific phenomenon, it seeks to learn as much as possible between two variables, the dependent and independent variables (Singh, 2021). The dependent variable in this case could be logistical performance metrics, such as cost savings, while the independent variable is the 3PL solution. The independent variable is introduced to assess its impact, which is then reflected in changes to the dependent variable (Singh, 2021). Exploratory research adapts several methods. Literature reviews can be used to identify gaps and formulate hypotheses (Swaraj, 2019). Usually large volumes of data are collected as it has to be analyzed from many different perspectives, to find any possible relationship between the two variables. Interviews with field experts help the researcher gain insights in the subject and its various facts (Swaraj, 2019).

### *2.1.1 Research Method*

A research method aims to guide researchers in the search for necessary answers to the proposed research problem (Saunders et al., 2019). Based on three suggestions of research methods by Dresch et al. (2015), the case study method is determined to be the most suitable approach for this study compared to action research and design science research. Action research shares many similarities with case studies, but one key difference lies in its practical application. Unlike case studies, action research involves conducting research through active interventions aimed at improving a situation while studying it (Dresch et al., 2015). This design science research method is not applied, as the primary objective is not to develop or design a new artifact (Dresch et al., 2015).

Case studies focus on exploration and theory building based on observations and case analysis, which is highly applicable for exploratory research (Singh, 2021). Although theory building for this case will indirectly be based on existing theories, it will still contribute by addressing an area that has not been widely explored.

A case study is a detailed examination, which may not provide reliable information enough for a generalized result (Denzin and Lincoln, 2018; Dreasch et al., 2015; Rogo, 2024; Voss et al., 2002), but may work well in early stages of investigating a new theory due to its hypothesis (Denzin and Lincoln, 2018). While a successful case study could confirm Lindab's ambition to implement a 3PL solution on a broader scale, the unique nature of case studies means that success in one context does not guarantee success in another. Other challenges associated with case studies include highly time-consuming and the difficulty of maintaining relevance throughout the course of the research. The relevancy can relate to choosing appropriate candidates to interview or ensuring significant data (Voss et al., 2002). Eisenhart and Graebner (2007) say theoretical sampling is key to tackle these challenges. Rather than being chosen randomly or for representativeness, data sources are firmly selected based on their potential. In single case studies, this implies that the selection of cases should be based on high suitability in terms of extreme examples, relevance or provide the opportunity for unique research access. Extreme examples are used to exaggerate trends and challenge assumptions by testing theories in unusual scenarios (Seawright, 2016). Relevance can come from interviewing companies that have undergone a similar 3PL development journey.

Differentiating from a multiple case study, a single case study offers in-depth insights into a specific phenomenon (Voss et al., 2002; Eisenhardt and Graebner, 2007) and contributes to generating new scientific knowledge applicable to a broader set of phenomena (Swanborn, 2010). Although the study will include insights from multiple companies, the focus remains on a single 3PL solution. Therefore, a single case study is considered the most appropriate approach, rather than a multiple case study. The individual unit may be studied in various ways, qualitative or quantitative or by mixed methods (Denzin and Lincoln, 2018). There is no defined limit on unit of analysis in business research. The most common unit of analysis is the individual, but research problems can be answered more accurately through the analysis of other type of units (Kumar, 2018). In this study, the unit of analysis is the logistics operations within the Lindab Group, with a specific focus on GW. While data is primarily collected from individuals, the analysis centers on the logistics function they are part of, not the individuals themselves.

## 2.2 Research Process

To gain a deeper understanding of how the thesis was conducted the research process was illustrated in *Figure 2.1* below.

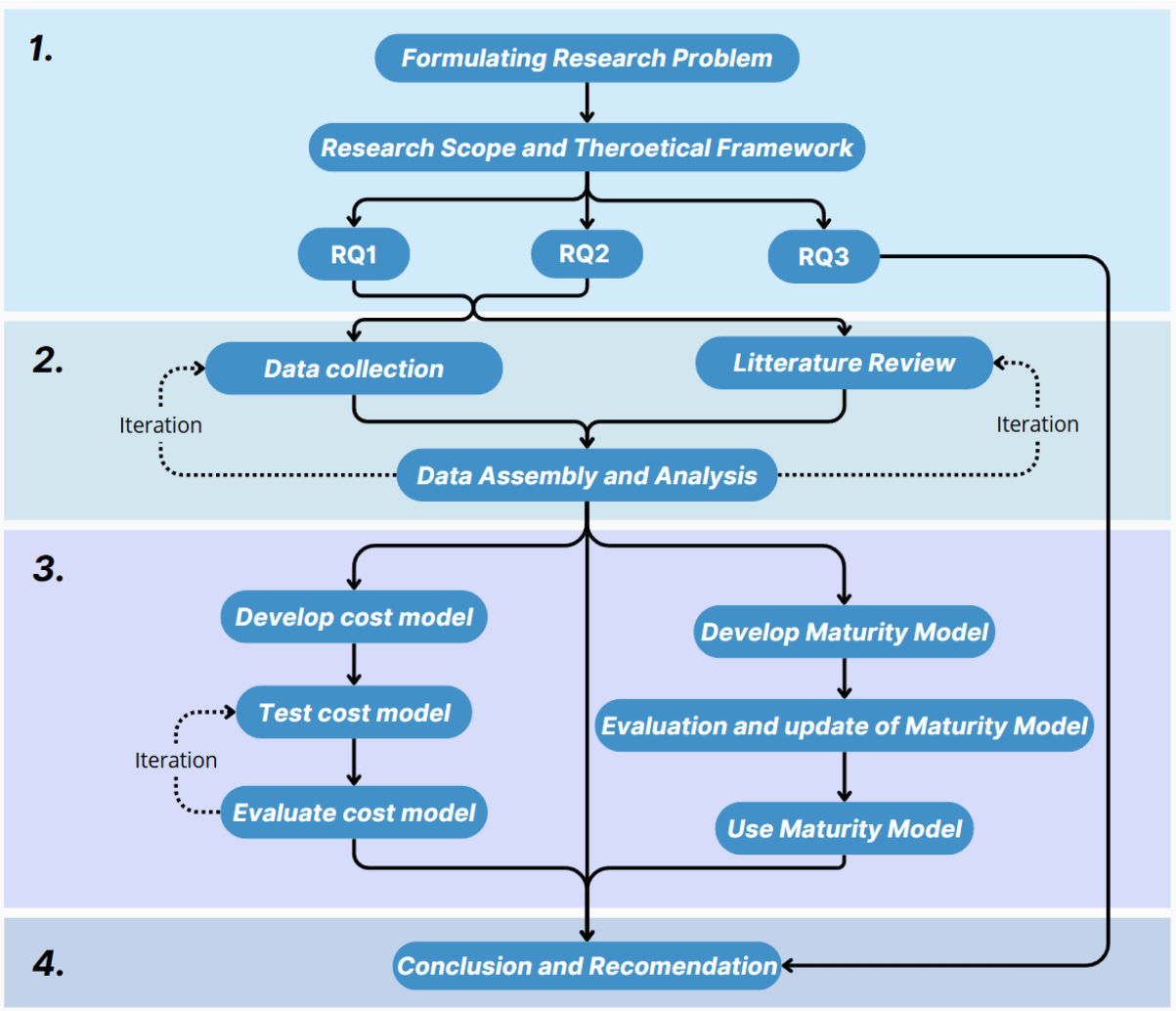


Figure 2.1: *Illustration of research process.*

At the beginning of the project, the direction of the work had not yet been fully determined. Instead, the focus was on exploring the case company and possible research areas, allowing for a more flexible approach as discussions with the assigned representative at Lindab helped shape the thesis's objectives and scope. Once a deeper understanding of the chosen subject had been established, the outline of the thesis was defined. This included formulating the RQs, setting the delimitations of the topic and determining the methodology. The RQs were developed to ensure alignment with both a gap in academic research and the company's objectives. The chosen methodology was designed to effectively address these questions and support the thesis's aims. With the scope, methodology and aim clearly defined, the outline was reviewed to confirm its feasibility and that it could be completed within the given timeframe. This step laid the foundation for further exploration and the development of a theoretical framework.

In the second step, the foundation of the study was established. A literature review was conducted alongside the collection of empirical data, including interviews and numerical data from Lindab. As the analysis progressed, new areas were identified that required further investigation, leading to an iterative process. Both the data collection and literature review were continuously revisited and refined as new insights emerged. Given the extensive data collection, certain aspects of the analysis

were started before all the data was available. This approach was possible because not all parts of the analysis were fully dependent on each other.

In the third step, both a cost model and an analytical framework were developed. The cost model was inspired by existing literature and knowledge of the current setup at GW. Once developed, it was tested and evaluated. Evaluations were conducted based on the authors' assessment of its feasibility, as well as feedback from the case company to ensure it reflected reality. Revisions were made accordingly, followed by further testing, creating an iterative process that continued until all parties were satisfied with the model's structure. Simultaneously, a framework was developed based on insights from existing literature and then applied to the case company, serving as a tool in the interview process.

Finally, a conclusion was made based on the results of the study. The key findings were summarized, highlighting the most important insights. Along with this, recommendations were given to the case company to help address the challenges and improve operations.

## 2.3 Literature review

Acquiring research and connecting it to the existing pool of knowledge is central to all academic research activities (Snyder, 2019). Webster and Watson (2002, p.xiii) argue that "*an effective and well conducted review as a research method creates a firm foundation for advancing knowledge and facilitating theory development*". In contrast, reviewing has become increasingly difficult, as the production of knowledge in business research has rapidly accelerated. Thus, it is challenging to keep up with state-of-the-art research (Snyder, 2019). The studied subject in this case is 3PL and all relevant areas connected to it. Key literature was found through well-known research article databases, mainly LUBsearch and Google Scholar. With keywords like *third-party logistics performance*, *3PL evaluation*, *3PL cost* and *3PL change*, significant literature could be accessed. The literature search has been conducted through a four-step methodology by Snyder (2019), seen in *Figure 2.2*. Rowley and Slack (2004) present similar ways of structuring your literature review, but they also highlight the importance of constantly tracking the progress by making notes, addressing ongoing debates and refining the review iteratively before finalizing it.

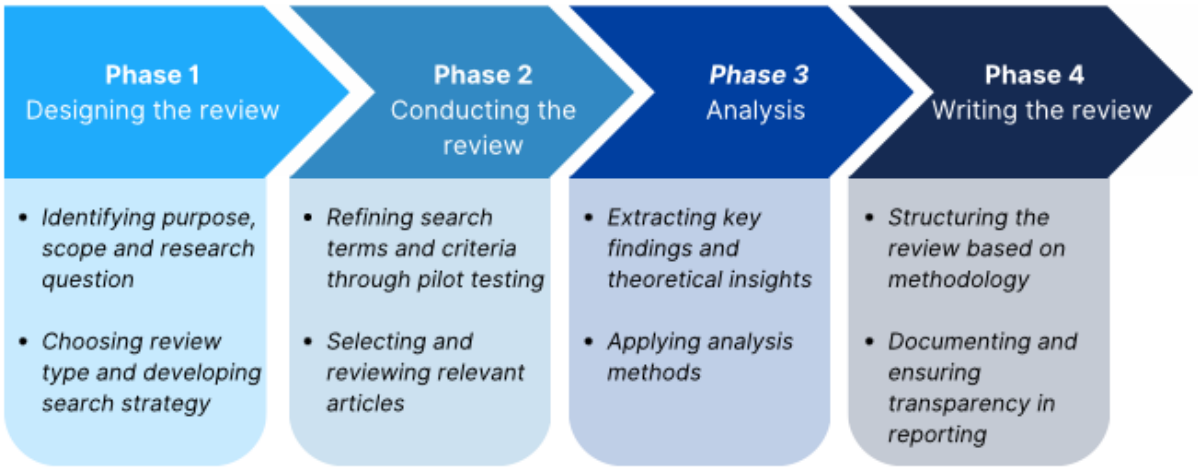


Figure 2.2: *Steps for conducting a literature review according to Snyder (2019).*

Snyder (2019) presents three review types to select from during phase one. The semi-systematic review type is appropriate for this study. Compared to the systematic and integrative approach, semi-systematic explore rather broad RQs, sample mainly from research articles and can adapt both qualitative and quantitative data. Semi-systematic review however requires more development and tailoring to the specific project (Wong et al., 2013), but if done correctly it is highly effective.

## 2.4 Data Collection

When deciding on data collection methods, researchers often divide data into two groups, qualitative and quantitative. However, the definition of these are widely debated (Schoonenboom, 2023). To address this, the terms are not treated as strictly separate categories, but rather as practical labels as proposed by Schoonenboom (2023). Throughout the rest of this thesis, qualitative data will refer to information expressed in words, while quantitative data will refer to information expressed in numbers.

Combining qualitative and quantitative methods for a single project is debatable. Concerns include whether both methods examine the same phenomena and whether they can be effectively integrated (Edmondson and McManus, 2007). However, according to Yauch and Steudel (2003) the two types of data contribute to validity via triangulation and give a more complete understanding. A study positioned as intermediate on the spectrum by Edmondson and McManus, 2007 often integrates a hybrid approach, where qualitative and quantitative data are both used. Mixed-method studies have emerged from the conflict of whether a qualitative or quantitative approach should be employed (Terrel, 2015). For this thesis, both qualitative and quantitative data will be gathered to provide a more comprehensive and reliable result, which makes the mixed-method approach suitable. The method of research systematically incorporates quantitative and qualitative methods to answer complex questions that might be beneficial from such a combination (Schoonenboom, 2023; Tashakkori and Newman, 2010). Terrel (2015) explains that there are various strategies for approaching a problem with a multi-methodology and selecting the appropriate one is primarily based on four key factors. *Table 2.1* displays the four factors, with each factor showing its alternatives and the most suitable one highlighted in blue.

Table 2.1: *Four-factor dependency for a multi-method research approach (Terrel, 2015).*

| | | | | |
|---|---|---|---|---|
| 1. Theoretical perspective | Explicit - based firmly on a theory | | Implicit - based indirectly on a theory | |
| 2. Priority of strategy | Equal | Qualitative | Quantitative | |
| 3. Sequence of data collection implementation | No sequence | Qualitative first | Quantitative first | |
| 4. The point at which the data are integrated | At data collection | At data analysis | At data interpretation | With some combination |

The theoretical perspective of this study is implicit, as it does not involve testing a specific, well-defined theory. Instead, the theoretical framework may emerge as the data is analyzed, rather than being established upfront to guide the study. Both qualitative and quantitative data will be equally prioritized and collected without following a specific sequence. The integration of data refers to the point at which qualitative and quantitative data are combined, connected or related to each other within a study. In this case, data will be collected simultaneously and integrated at many stages, most often having an effect on each other. The results from the decision framework in combination with the case study's exploratory nature suggested the concurrent nested strategy to be closest fit.

The concurrent nested strategy involves two data collection methods, where one method, either qualitative or quantitative, is embedded within the other, as seen in *Figure 2.3*. The primary method is given more emphasis, while the secondary method provides additional insights or addresses different RQs. This strategy allows for the simultaneous collection of both types of data, providing a broader perspective than using just one method. However, it may be challenging as the data need to be

converted for integration, which can lead to difficulties in addressing discrepancies between data types (Terrel, 2015).

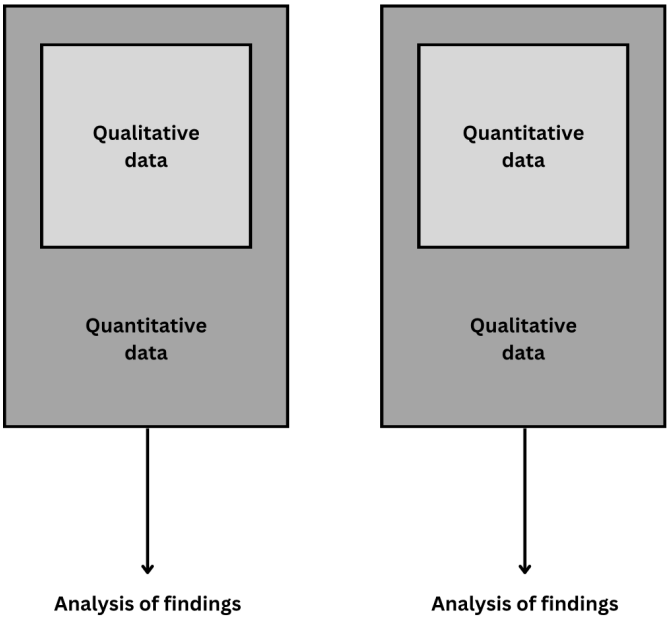


Figure 2.3: *Graphical representation of a concurrent nested mixed-method strategy (Terrel, 2015)*.

### 2.4.1 Qualitative Data

Qualitative data has been collected through interviews with Lindab employees and external parties. Interviews are the most common way to collect qualitative data (DiCicco-Bloom and Crabtree, 2006; Taherdoost, 2022; Witzel and Reiter, 2012), often used to generate theories, themes or models (Brinkmann, 2023; Paradis et al., 2019). Interviews can be divided into the three groups structured, unstructured and semi-structured. For structured interviews the order and phrasing of the questions remain consistent for all interviewees. This method helps reduce biases and save time however, it limits elaboration. As a result, it is mainly recommended for collecting sociodemographic data rather than qualitative research. Unstructured interviews still require a script to ensure relevance to the study, but they allow for greater flexibility in questioning. The interviewer begins with broad questions and adjusts them based on the interviewee's responses, focusing on themes rather than fixed questions. While this approach allows for discovering unexpected information, it is not suitable for inexperienced researchers (Brinkmann, 2023; Taherdoost, 2022). Semi-structured interviews are commonly used for qualitative data collection. They ask open-ended questions, for flexibility, with follow-up questions, for clarification and in-depth understanding. However, it requires skilled interviewers who can navigate when and how to ask questions while ensuring all relevant information is captured (Adeoye-Olatunde and Olenik, 2021; Brinkmann, 2023; Rogo, 2024; Taherdoost, 2022). Since the interviewees have different roles and areas of expertise, their perspectives will vary, even though they will provide input on the same key questions and themes. To fully capture these diverse insights, a semi-structured approach is the most suitable. It is also suitable since semi-structured interviews are the most common technique when applied in a case study (De Sordi, 2024). This method allows for flexibility in questioning, enabling the interviewer to adapt follow-ups based on each participant's expertise while ensuring that all essential topics are covered. The outline used for the interviews can be found in *Appendix A*. Note that the questions vary slightly depending on the expertise of the interviewee.

To get the most insight from interviews, participants who are directly connected and experienced in the subject were chosen. Moreover, it is crucial to incorporate diverse perspectives by including stakeholders from various areas (De Sordi, 2024; DiCicco-Bloom and Crabtree, 2006; Rogo, 2024;

Taherdoost, 2022). The preferred number of participants can be discussed infinitely. Taherdoost (2022) argues that for quality research the goal is not to generalise findings and therefore sample size should be small, 10-60 participants. Brinkmann (2023) emphasizes that it is more valuable to conduct a smaller number of interviews with in-depth analysis than to gather a large number of interviews that are only examined at a surface level. Further, the number of ideal participants are stated to be around 15. However, in addition to this Brinkmann (2023) states that a researcher should conduct interviews with as many participants as required to gather the necessary information. Suggesting that the answer to how many interviews should be enough is quite vague and ultimately up to the researcher to determine. This is further supported by De Sordi (2024, p. 9) who states that *"we continue to collect information from entities of interest as long as we are discovering, learning something about our topic of interest"*. Therefore interviews were made until the perception that no new insights could be found were reached. This resulted in 14 interviews with 12 interviewees and a total of 550 minutes.

The reason for gathering qualitative data via interviews was to get a better insight in the organisation of Lindab, understanding their readiness of developing a 3PL and trying to capture the perspective of all parts that would be affected by this change. Therefore, when selecting individuals to interview, the most crucial factor was to choose people from different parts of the Lindab group, rather than interviewing multiple individuals from the same area. Interviews were held online via Microsoft Teams or in person and ranged from 30 minutes to 1 hour. They were all conducted one-on-one to maintain focus in the conversation, ensure confidentiality (Brinkmann, 2023) and handle the practical challenge of coordinating the schedules of participants. A list of conducted interviews can be found in *Table 2.2*.

Table 2.2: *List of conducted interviews*

| **Participant** | **Company or group** | **Date and duration** | **Purpose** |
|---|---|---|---|
| Interviewee A | Lindab | 50 minutes<br>2025-03-06 | Comprehensive overview of the group's Nordic operations. |
| Interviewee B | 3PL company | 50 minutes<br>2025-03-06 | Well-informed on the subject of 3PL and how to succeed as one. From a successful 3PL company that has made the same journey as Lindab plans to do. |
| Interviewee C | Lindab | 45 minutes<br>2025-04-04 | General insight in the costs connected to GW. |
| Interviewee D | Lindab | 30 minutes<br>2025-04-10 | Experience of delivering to GW. |
| Interviewee E | Lindab | 30 minutes<br>2025-04-11<br><br>*20 minutes<br>2025-05-07 | Highly knowledgeable about the operations connected to GW. |
| Interviewee F | Lindab | 40 minutes<br>2025-04-14 | Great knowledge of delivering to GW. Previous experience with similar logistic solutions. |
| Interviewee G | Lindab | 65 minutes<br>2025-04-15 | Broad knowledge about the costs connected to the whole group and models used today. |

| | | | |
|---|---|---|---|
| Interviewee H | Lindab | *60 minutes<br>2025-04-24 | Deep insight in the logistics of the whole group. |
| Interviewee I | Lindab | 30 minutes<br>2025-04-29 | Great knowledge about the transportations connected to GW. |
| Interviewee J | Lindab | *50 minutes<br>2025-05-07 | Well-informed about the logistics perspective of customers to GW. |
| Interviewee K | Lindab | *40 minutes<br>2025-05-09 | Significant insight in Lindab collaboration. A more objective perspective. |
| Interviewee L | Chalmers University | *15 minutes<br>2025-05-09<br><br>*30 minutes<br>2025-05-13 | Expert within logistics and transportation. |

*interviews focusing on the framework

To ensure the interviews were carried out in a scientific and reliable manner, a number of measures were taken. As stated by Brinkmann (2023) and Taherdoost (2022), the researcher is the most crucial instrument in qualitative interviewing. With this as premise, the focus during the interviews was to keep an open mind and adapt follow-up questions based on the discussion while still keeping them relevant to the RQs. To achieve this, potential follow-up questions were planned in advance. Rogo (2024) and Adeoye‐Olatunde and Olenik (2021) highlight the importance of protecting the anonymity of the interviewee. To make sure this was secured, all references to specific participants were replaced with an assigned letter, as seen in *Table 2.2*. The names and positions of interviewees were not published to maintain their anonymity, though all selected participants held high-ranking roles with significant visibility in their organization. However, it was decided to share the company which the interviewee were associated with to ensure transparency for potential biases. All interviews were recorded and a transcription was made as soon as possible after the interview. This to ensure accuracy of the notes and capture intangible elements such as facial expressions, atmosphere and tone (Brinkmann, 2023).

### *2.4.2 Quantitative Data*

Quantitative data is typically presented in numerical form and, unlike qualitative data, can be analyzed using statistical or computational methods (De Sordi, 2024; Gaciu, 2025; Schoonenboom, 2023). The quantitative data is often divided into primary and secondary data. Primary quantitative data is collected firsthand by the researcher, for example through direct observation or measurements. Secondary quantitative data, on the other hand, refers to data that has already been collected by others and is made available through reports, databases or literature (Sreejesh et al., 2014; Gaciu, 2025).

This thesis relies mainly on secondary quantitative data provided by Lindab. The data consists of numerical values processed and visualized using tools such as Power BI and extracted from relational databases via Microsoft SQL Server, that is connected to their ERP-system. Since this data originates from internal company systems, it can be classified as internal secondary quantitative data (Sreejesh et al., 2014). To visualize how the data was extracted and arranged in Power BI, a number of data parameter examples are presented in *Table 2.3*. Note that this is a simplified version of the parameters, only intended to illustrate how the data model was constructed.

Table 2.3: *Example template Secondary data collected for the thesis*.

| Company | Item | Quantity | Pallet location | Purchase price (SEK) | Selling price (SEK) |
|---|---|---|---|---|---|
| 1 | A | 3 | GW-101 | 400 | 448 |
| 1 | B | 10 | GW-201 | 4 000 | 4 448 |
| 1 | C | 60 | GW-301 | 300 | 336 |
| 2 | D | 5 | .. | .. | .. |
| 2 | E | .. | .. | .. | .. |

The data required thorough preparation before it could be used for analysis. Data preparation is a time-consuming process involving cleaning, transforming and integrating data from different sources. It should be conducted systematically and carefully, ensuring trustworthiness and meaningfulness of future analysis results. Cleaning of data involves activities to ensure that the data is accurate and relevant. It must clean unwanted data without introducing bias or undermining the dataset. Transformation ensures the data is in a suitable format for the intended analytical methods (Williamson and Johanson, 2018).

Secondary data for this thesis was gathered from the year 2024, as it offers the most recent and relevant financial information, reflecting the company's current performance. Although Lindab reached its highest-ever net sales of 13.3 billion SEK, the growth rate of 1.6% was relatively low compared to previous years, see *Figure 2.4*. However, using a more stable year like 2024, it may be easier to see real improvements in how the company operates, without being distracted by changes in growth. These financial indicators serve not only to justify the choice of data year but also to guide the interpretation of the results.

| Financial key performance indicators | 2024 | 2023 | 2022 | 2021 | 2020 |
|---|---|---|---|---|---|
| **Continuing operations** | | | | | |
| Net sales, SEK m | 13,323 | 13,114 | 12,366 | 9,648 | 8,220 |
| Growth, % | 1.6 | 6.0 | 28.2 | 17.4 | –3.4 |

Figure 2.4: *Financial indicators for Lindab year 2020-2024*.

## 2.5 Validity and Reliability

When conducting research, particularly case studies, it is crucial to ensure that the study is both valid and reliable. Since researchers bring their own perspectives, the results are shaped by their interaction with the topic. This makes it harder to judge the quality of the research. Still, even with different viewpoints, it is possible to evaluate how good the research is (Lindgreen et al., 2020). According to Farquhar (2012) the quality of research is something that cannot be fixed in retrospect and must be improved progressively throughout the project. To address this, continuous feedback was sought from Lindab, the academic thesis supervisor and fellow students enrolled in the same academic program, who have knowledge of the subject. Lindgreen et al. (2020) and Farquhar (2012) suggest that the validity and reliability should be conducted via the four design tests, construct validity, internal validity, external validity and reliability.

**Construct validity**

Construct validity ensures that the measures used in a study accurately capture the concept or idea they are intended to measure (Farquhar, 2012; Heale and Twycross, 2015; Lindgreen et al., 2020). In other words, it confirms whether the research is measuring what it claims to measure. This is

especially important when dealing with abstract concepts such as trust, satisfaction or organizational maturity. As noted by Jiménez-Buedo and Russo (2021), construct validity also concerns whether the conclusions drawn from used data actually reflect the bigger concept or idea studied. As suggested by Lindgreen et al. (2020) and Farquhar (2012) the construct validity is expressed in this study by proving a clear chain of evidence and triangulation specifically with the use of different methods.

**Internal validity**
Internal validity ensures that the results are only influenced by the studied variable, with no interference from other variables (Farquhar, 2012; Lindgreen et al., 2020; Sreejesh et al., 2014). However, since this thesis is based on an exploratory case study, internal validity is not a primary concern, as these types of studies typically aim to generate insights and understanding rather than establish causal relationships (Farquhar, 2012; Lindgreen et al., 2020).

**External validity**
External validity refers to the extent to which the findings of a study can be generalized to other settings, populations or time periods beyond the specific conditions of the study (Lindgreen et al., 2020; Sreejesh et al., 2014). This study enhances external validity by providing a detailed historical context of the case and placing each individual case within this context, ensuring that the insights drawn are not isolated but can be relevant to broader applications (Lindgreen et al. (2020).

**Reliability**
Reliability refers to ensuring that the case study can be replicated or consistently produce similar results when applied in the same context (Farquhar, 2012; Heale and Twycross, 2015; Lindgreen et al., 2020). This means that the methodology should be described in such detail that another researcher could replicate the study and achieve similar outcomes. Reliability is further ensured through triangulation specifically with the use of secondary data, using concepts from existing literature and addressing multiple concepts (Lindgreen et al., 2020). Additionally, this thesis aims to improve its reliability by carefully documenting the research process and outcomes, ensuring transparency in the steps taken and acknowledging any potential sources of error that arose during the project.

### *2.5.1 Triangulation*

The validity and reliability of this thesis are further strengthened through triangulation, where multiple independent measures all point in the same direction, increasing the confidence in the findings (Farquhar 2012; Noble and Heale, 2019). Farquhar (2012) and Noble and Heale (2019) identified four types of triangulation seen in *Table 2.4*.

Table 2.4: *Triangulation types (Farquhar 2012; Noble and Heale, 2019)*.

| Triangulation type | Description |
|---|---|
| Data | Data gathering from different sources, possibly at different times on the same object |
| Investigator | Use of more than one researcher in gathering and interpretation of data with the same objective |
| Theroterical | Use of more than one theoretical perspective in the interpretation of a single data set |
| Method | Within-method (multiple techniques with same method) or between-method (different methods) with same object |

Data triangulation is applied in the thesis through interviews with both internal and external personnel, including individuals with varying levels of subject matter expertise, roles within the

company and perspectives. For quantitative data, triangulation is achieved by gathering insights from a diverse range of respondents. For quantitative data, this is done by analyzing data from different years and forming assumptions based on average trends. Investigator triangulation is implemented by having two authors involved in the research. The findings are further validated through cross-comparison and discussions with the thesis supervisors. Theoretical triangulation means using different theoretical perspectives to interpret or analyze the same data or phenomenon. This will not be applied in this thesis. In this study Method triangulation is applied by using three different methods: a theoretical one based on literature, an empirical one based on interviews and an analytical one based on cost analysis. By looking at 3PL success from these different angles, the study gains a broader and deeper understanding of what makes a 3PL solution successful and in which situations it works best. This approach helps strengthen the study's conclusions and makes the findings more useful in practice.

### *2.5.2 Measures taken based on Lack of Information*

Given that the topic of becoming a 3PL provider is a relatively unexplored research area, finding reliable and relevant sources proved to be challenging. Ideally, sources based on the Swedish or European market would have been preferred, as they would be more directly applicable. However, due to the lack of available literature specific to this context, the research had to expand to gather data from a broader range of sources globally. The goal was to validate the collected information by identifying connections between sources from various regions, allowing for more universally applicable insights.

Moreover, the absence of direct sources on the process of becoming a 3PL provider meant that literature on related topics had to be used. Studies evaluating the performance of existing 3PL providers, assessing which 3PL to choose or examining the benefits and challenges of outsourcing in general were referenced. This broader approach helped form a more comprehensive understanding of what the process might look like for companies transitioning to a 3PL role.

However, over the past two decades much of the literature surrounding 3PL has remained relatively consistent. While this consistency provides a solid foundation, it also highlights a gap in new perspectives and updated insights. By using a broader range of sources, both in terms of geography and focus areas, this thesis aims to make the results more reliable. Using more varied literature also helps create a deeper understanding and supports more balanced conclusions, especially when multiple sources align despite differing contexts or methodologies.

## 2.6 Assessment Models

The following section presents the models that will be used in the thesis, along with a description of why they were selected.

### *2.6.1 Capability Assessment*

When evaluating Lindab's current situation and their readiness to become a 3PL, some criterias are difficult to quantify, find reference values for or relate to a scale. One such example is Lindab's ability to adapt to changes. This challenge is reflected in a literature review on 3PL evaluation criteria, which state that many studies lack a strong theoretical foundation, with only a small percentage of 18% providing solid theoretical insights (Aguezzoul, 2014).

Previous research when doing evaluations in the field of 3PL uses models such as multi attribute decision-making techniques, statistical approaches, artificial intelligence (AI), mathematical programming and hybrid methods (Aguezzoul, 2014). However this is used to evaluate a comparison between 3PL providers or to rank criteria to consider when choosing a 3PL provider. The authors of this thesis have found little to none previous research that assesses the readiness or conditions of a company on becoming a 3PL provider. This is also the perception of Qiao and Zhao (2008) who

describes research on the capability of 3PL as poor. Therefore they developed a service capability maturity model. Further, Rahadian et al. (2024) list a number of researches where maturity models (MM) have been used to evaluate a company's logistics performance. Ferraro et al. (2023) conducted a literature study analysing the use of MM. Of the 126 sources identified, 28% applied them to evaluate logistics management. Therefore it seems reasonable to use a MM to attempt to handle the challenge of evaluating the readiness of becoming a 3PL provider. Unlike performance-focused or benchmarking models, maturity models offer a developmental perspective, allowing for the identification of capability gaps and progression stages.

### *2.6.2 Cost Assessment*

The other objective of this case study is to identify whether there are financial incentives that could justify Lindab's implementation of a 3PL solution, based on the associated logistics costs. Logistics costs account for most of the cost associated with the SC of a company and comprise a significant share of the overall costs a company has (Muha, 2019). When choosing or developing a logistics model it is important to note that logistics costs vary across different industries. One major complexity of logistics cost management lies in the difficulty of measuring them, since costs are often allocated across different functions within a company, like sales, purchasing and manufacturing. Another challenge is ensuring that cost reductions in specific logistics areas do not lead to increases elsewhere that offset the overall savings (Muha, 2019).

This thesis combines insights from Lindab's specific cost structure with relevant literature to identify the most effective approach for assessing the cost aspect of implementing the 3PL solution. The model will also be shaped by the availability of data. Therefore, it will be developed throughout the project and continuously refined based on the factors mentioned.

# 3. Literature Review

*This part presents a compilation of previous research related to the thesis subject, providing a foundation for the study. It includes an overview of relevant regulations and key theories that contribute to the understanding of the topic. By reviewing existing literature, this section establishes the theoretical framework and contextual background necessary for addressing the RQs.*

## 3.1 Third-Party Logistics

Third-party logistics commonly referred to as 3PL or TPL has increased in popularity over the last three decades, as providers have reliably proven to increase SC effectiveness and efficiency (Premkumar, 2020). The increasing market demand of advanced logistics, globalization, customer orientation and lead time reductions are major factors which have shaped the 3PL industry (Alfredsson and Hertz, 2003). SCs are becoming increasingly complex, which has made logistics an important factor on how companies perform (König and Spinler, 2016). As a result, SC integration has become a crucial strategy for gaining a competitive edge (Aktas and Ulengin, 2005; Hertz and Alfredsson, 2003; Zhang et al., 2023).

A unified definition of a 3PL provider is difficult to identify. However, broadly speaking, a 3PL provider is an external party that manages, controls and delivers logistics activities on behalf of a 3PL user. This relationship may be formal or informal, but the relationship is generally intended to be continuous and mutually beneficial (Alfredsson and Hertz, 2003). The scope of services can range from handling specific logistics tasks to managing the entire logistics function (Premkumar, 2020).

### *3.1.1 Levels of 3PL Outsourcing*

Outsourcing is a business practice in which companies use external providers to carry out business processes that would otherwise be handled internally. Inherently, logistics outsourcing specifically focuses on outsourcing logistics activities (Pragtap, 2014). Nowadays, outsourcing can be on many levels. Pragtap (2014) argues that while traditional outsourcing literature emphasizes keeping core processes in-house and outsourcing non-core processes, this distinction can be harmful in today's era of hyper-competition, meaning constant change of competition. Instead, firms should focus on developing and refining their *"outsourcing capability"* to effectively manage the diverse range of processes they may need to outsource.

Generally, the levels of outsourcing have two dimensions, scope and criticality. Scope can be defined as the extent of responsibility assigned to the 3PL (Zacharia et al., 2011). The second dimension, criticality, refers to the importance of the outsourced task or function of the company (Darko and Vlachos, 2022; Zacharia et al., 2011). At one instance, the outsourced tasks are seen more as a tactical move, aiming for improvement on day-to-day operations. Tasks related to this could be smooth in- and outbound flows, communicating on upcoming demand peaks or package recommendations (Siekerman, 2021). At the strategic level, the focus is on the long run. This could be creating digital tools to improve inventory accuracy, improving the efficiency of the distribution network and adding services like e-commerce and contract packaging (Siekerman, 2021). Although the degree of criticality correlates with the scope, it is not always the case (Zacharia et al., 2011). Summarized from literature, there are four levels combined of scope and criticality:

1. *Standard 3PL providers*: Involves a specific and basic logistics task such as inventory, warehouse or transport management. This outsourcing form has very standardized ways of executing between supply chain entities. Only one aspect of the total function is handed over to the 3PL (Zacharia et al., 2011). For most of these firms, the 3PL function is not their main activity (Vasiliauskas and Jakubauskas, 2007). The level criticality is low and involves non-strategic transactions (Darko and Vlachos, 2022; Zacharia, 2011).

2. *Service developers*: A larger scope is assigned to the 3PL provider but still under direct control of the company. They typically share responsibility for the tasks and assets (Zacharia et al., 2011). At this stage, the providers will offer more of their value-adding services like track and trace, specific packaging or cross-docking. Focus on the economies of scale together with a solid IT foundation will enable the provider to perform these tasks (Vasiliauskas and Jakubauskas, 2007). The scope is higher but the criticality still remains relatively low as it is a contractual relationship (Darko and Vlachos, 2022; Zacharia, 2011).

3. *Customer adapters*: The responsibility has shifted to the 3PL having complete control of a logistics function (Vasiliauskas and Jakubauskas, 2007). The provider engages in design, implement and manage end-to-end solutions, like full management of a company's transportation. It is seen as a neutral partner that works with other parts of the supply chain on the company's behalf (Zacharia et al., 2011). At this level, scope and criticality align quite well, as the user and provider form a strong relationship built on enduring trust and commitment (Darko and Vlachos, 2022; Zacharia, 2011).

4. *Customer developers*: This is the highest level that a 3PL provider can obtain with respect to its processes and activities (Vasiliauskas and Jakubauskas, 2007). On top of having complete control over functions, at this stage, the 3PL provider will often set the strategic direction of the function. The services are usually highly customized to fit the company's specific business environment (Zacharia et al., 2011). The most comprehensive relationship is achieved here, where both scope and criticality is high. Not only is the relationship strong but strategic with frequent interactions, significant trust and huge commitment (Darko and Vlachos, 2022; Zacharia, 2011).

### *3.1.2 Logistics Operations Performed by 3PL providers*

The role of a 3PL has a considerable number of stages and research support that 3PL providers evolve into 4PL if they work even more strategically with optimizing the entire supply chain (Maersk, 2024; Vasiliauskas and Jakubauskas, 2007). To make a distinction, 3PL providers typically handle the following logistics operations according to Maersk (2024) seen in *Table 3.1*.

Table 3.1: *Logistic operations handled by 3PL (Maersk, 2024)*

| Name | Description |
|---|---|
| *Receiving, warehousing and storage* | 3PLs handle the receipt of goods, ensuring they are checked for accuracy, documented and stored efficiently for easy retrieval. |
| *Inventory management* | 3PLs monitor stock levels using advanced software to provide real-time inventory insights and prevent issues like stock outs or overstocking. |
| *Order fulfilment* | 3PLs manage the process of picking, securely packing and shipping customer orders to ensure timely deliveries and high customer satisfaction. |
| *Transportation and returns management* | 3PLs coordinate the most cost-effective and timely transport for goods and handle returns by inspecting, restocking or disposing of items efficiently. |
| *Value-added services* | 3PLs offer services such as product assembly or customization, allowing businesses to offer tailored products without additional internal strain. |

| | |
|---|---|
| *Data analytics and insights* | 3PLs use data to provide businesses with insights on supply chain performance, such as shipping times and inventory turnover, helping improve decision-making and efficiency. |

## 3.2 Benefits with 3PL

Outsourcing various activities or processes to a 3PL provider offers a wide range of benefits. While specific advantages may vary depending on the type of service provided, this section will focus on generalized benefits. According to Selviaridis et al. (2008), 3PL benefits can be categorized into three levels, namely strategic, financial and operational, see *Table 3.2*. Strategic benefits focus on long-term goals of the business, while finance relates to cost savings. Operational benefits improve logistics performance on a day-to-day basis. There is an obvious connection between the three levels, but the categorization helps provide a clearer understanding of how 3PL benefits impact businesses from different perspectives (Selviaridis et al., 2008).

Table 3.2: *Benefits of using a 3PL provider, on three hierarchical levels (Selviaridis et al., 2008).*

| BENEFIT | DESCRIPTION |
|---|---|
| **STRATEGIC** | |
| Increased customer service | Improves delivery speed and accuracy, leading to improved customer satisfaction |
| Innovation | Introduces new logistics ideas and technologies to keep a competitive edge |
| Core competence focus | Frees up resources to focus on main business activities |
| Logistical expertise | Access to specialized knowledge and best practices |
| New market access | Supports expansion into new regions with established networks |
| Logistics network access | Provides connections and infrastructure for effective distribution |
| Flexibility in relation to market | Quickly adapts to fluctuations in demand and market dynamics |
| **FINANCIAL** | |
| Economies of scale | Reduces costs by leveraging high volumes and efficient operations |
| Sharing development costs | Lowers expenses by distributing development costs across multiple clients |
| Reduction of capital investment | Opportunity to avoid investing in logistics assets |
| Reduction in equipment maintenance costs | Avoids maintenance costs by using provider assets |
| Reduction of financial risk | Transfers financial risks related to logistics to the provider |

| | |
|---|---|
| Turning fixed costs to variable | Aligns logistics costs with actual business volume |
| External benchmark for logistic costs | Helps evaluate internal logistics efficiency against market standards |
| | **OPERATIONAL** |
| Better capacity utilization | Make better use of logistics resources |
| Volume flexibility | Allows scaling operations up or down based on demand |
| Inventory reduction | Optimizes stock levels, reducing holding costs |
| Order cycle reduction | Speeds up order processing and fulfillment |
| Lead-time reduction | Shortens the time between order and delivery |
| Access to IT logistics system | Have advanced technology for tracking and managing logistics |
| Improved service levels | Increases reliability and performance of logistics services |

While leaving logistics operations in the hands of experts, companies free up resources and allocate more time to focus on their core competencies (Maloni and Carter, 2006; Rahman, 2011; Selviaridis et al., 2008; Vasiliauskas and Jakubauskas, 2007), such as production, product development, marketing or customer service (Jean, 2024). The providers' expertise stems from their relative position in the SC (Vasiliauskas and Jakubauskas, 2007). With established distribution networks, they have valuable insight into new markets (Rahman, 2011; Selviaridis et al., 2008). This is particularly important when international firms need help entering the 3PL provider's market, as they rely on the provider's local logistical expertise (Selviaridis et al., 2008; Tezuka, 2011). Experienced 3PL providers are also skilled at coordinating with reliable partners or subcontractors, ensuring goods move smoothly between companies. Over time, this coordination ability strengthens, as providers refine their skills in managing complex SC networks, further demonstrating how experience and specialization contribute to logistical expertise (Tezuka, 2011). As providers handle higher volumes, they develop advanced flow management capabilities, particularly in terms of logistics planning and control over transport and warehouse operations (Marchet et al., 2017). A good example of 3PL expertise is in IT-related tasks like managing databases and processing inventory, which are key to effective logistics services. These IT skills help 3PL providers stand out from the competition (Tezuka, 2011). 3PL providers play a crucial role in driving innovation within SCs by introducing new technologies and methods to enhance logistics effectiveness and reduce overall SC costs (Long, 2024; Rahman, 2011). Their ability to work with diverse users promotes innovation, as it enables 3PL providers to re-engineer processes and evaluate new solutions (Marchet et al., 2017). Re-engineering the distribution network can be a quick and effective way to meet global demands and gain competitive advantage (Vasiliauskas and Jakubauskas, 2007). Essentially, a 3PL provider has a strong flexibility in relation to the market (Selviaridis et al., 2008). Another example of expertise is the ability of providers to manage SCs effectively, ensuring that customers and stores remain properly stocked and consistently delivering the perfect order. (Vasiliauskas and Jakubauskas, 2007). Erkinovich and Makhmudov (2024) saw in their study of multiple companies engaging in 3PL, an average improvement of 25% in order fulfillment times, allowing them to meet customer demands more effectively. Same study reported an average inventory turnover rate increase by 30%, indicating better inventory management and reduced holding costs.

Economies of scale refer to the concept that average cost falls as the firm expands (Culyer, 2014). Profitability comes in many forms and Maloni and Carter, (2006), Lehmer et al., (2024) and Selviaridis et al., (2008) claim that an important source of cost reduction is the 3PL provider's access

to economies of scale, which is the ability to spread fixed costs across a larger volume of output. High volume can also boost productivity, which is achieved by sharing production resources among different users or dynamically allocating these resources as needed (Marchet et al., 2017). 3PL providers leverage large truck fleets and warehouses, which allow them to consolidate shipments from multiple clients (Tezuka, 2011). They also reduce costs through economies of scope, meaning offering a variety of logistics services using the same resources, for example transportation, warehousing and inventory management with a single infrastructure. They have the flexibility to adapt resources to meet varying client needs (Tezuka, 2011). The impact of these economies vary between asset-based and non-asset-based 3PL providers. Asset-based firms, which own trucks, warehouses and distribution centers, focus on maximizing asset utilization, making their operations more cost-effective as volumes increase. They compete with non-asset-based providers, who outsource logistics services to other companies, allowing them to remain more flexible. This lets them choose the best and most cost-effective logistics solutions without being tied to specific assets or locations (Rodrigue, 2011; Tezuka, 2011).

A large 3PL benefit is reducing the financial risk for the users (Selviaridis et al., 2008; Tezuka, 2011; Vasiliauskas and Jakubauskas, 2007). They help companies reduce capital investments, as they avoid large upfront costs associated with logistics assets like warehousing facilities, vehicles and IT networks (Selviaridis et al., 2008; Rahman, 2011). Instead, 3PLs often lease these assets on flexible terms that match their contracts, minimizing capital expenditure and maintenance costs (Selviaridis et al., 2008; Vasiliauskas and Jakubauskas, 2007). Activities like quoting, booking, routing and auditing without needing to own physical assets, allow them to spread risk by subcontracting to other service providers (Vasiliauskas and Jakubauskas, 2007; Tezuka, 2011). By sharing development costs, such as creating IT interfaces that can be utilised for multiple users, 3PLs can reduce the *"first-copy cost"*, leading to lower service unit costs (Selviaridis et al., 2008; Marchet et al., 2017). By outsourcing logistics functions, businesses can particularly reduce expenses related to transportation, warehousing and labor (Jean, 2024; Rahman, 2011), as fixed costs are turned into variables (Liu and Tyagi, 2017; Selviaridis et al., 2008). The shift allows the firm greater flexibility, as costs are now directly tied to volume, reducing financial risk and enabling the firm to maintain higher pricing strategies in competitive markets (Liu and Tyagi, 2017).

Long (2024) and Maloni and Carter (2006) mean that one of the key reasons why companies choose to engage in 3PL is the possibility to increase their service quality, which is directly related to improved customer satisfaction (Asthana, 2015; Selviaridis et al., 2008). This can be done through improving service levels, as 3PL providers offer expertise and technology, like access to logistics IT systems (Long, 2024; Selviaridis et al., 2008) that improve delivery times, accuracy and responsiveness (Jean, 2024). Providers are able to reduce the order cycle integrates several activities, including order transmittal, order processing, order picking and order delivery (Selviaridis et al., 2008), which essentially reduce the lead time. As providers have the capability to scale both up and down capacity they are utilizing it more efficiently, which also incurs better volume flexibility (Selviaridis et al., 2008).

## 3.3 Barriers with 3PL

Barriers and risks associated with 3PL providers can in the same way be categorized on the three levels strategic, tactical and operational (Selviaridis et al., 2008). As with the benefits, the barriers presented are generalized, and variations may occur in specific cases. A provider's abilities must be evaluated per specific situation (Tezuka, 2011). Failing to do so can impact not only the logistics provider's performance but also that of their customers, potentially leading to inefficiencies and reduced responsiveness across the entire supply chain, given its highly interconnected nature in today's business environment (Govindan and Chaudhuri, 2016). The barriers are showcased in *Table 3.3*.

Table 3.3: *Barriers of using a 3PL provider, on three hierarchical levels (Selviaridis et al., 2008).*

| BARRIER | DESCRIPTION |
|---|---|
| **STRATEGIC** | |
| Resistant to change | Hesitant to adopt new ways of working or trust an external logistics provider |
| Customer alignment | Difficulties in constantly ensuring logistics services are what customer needs |
| Information sharing | Sharing information relies on mutual trust and clear communication, difficult to establish and maintain |
| IT development | Investing in and updating the right digital tools is essential but is challenging and costly |
| Sustainability | Balancing environmental responsibility with cost and service goals |
| Provider dependency | The risk of becoming too dependent on the provider's ability |
| **FINANCIAL** | |
| Cost Competitiveness | Constant pressure to cut costs, reducing profit margins and affecting the quality of service |
| Opportunism | Both user and provider may act in self-interest |
| **OPERATIONAL** | |
| Employee expertise | Lacking of talent and innovation, especially in a tech-driven environment |
| Poor IT capabilities | Incompatible technology makes logistics operations slower and less reliable |
| Minimizing lead times | Balancing delivery times and cost, with lack of performance metrics |

While engaging in 3PL can generate many benefits, the firm may not be ready for outsourcing due to poor timing and large differences in company cultures (Ben-Daya and Akram, 2013). Misalignment in values, operational approaches and different communication styles are some factors that can lead to misunderstanding and inefficiencies, negatively affecting the partnership (Jean, 2024). Being present in a constantly evolving market with a high rate of digital transformation has been affecting workers' willingness to change (Mvubu and Naude, 2024). The lack of awareness on the benefits of implementing IT systems is likely contributing to this (Gabriel and Parthiban, 2020). The adoption of IT in the SC is according to Gabriel and Parthiban (2020) slower than predicted, making changes slow-paced and not ideal. Further, 3PL providers may struggle with meeting customer needs (Selviaridis et al., 2008). A major challenge for user's is to find a 3PL with capabilities to meet their specific logistics requirements (Ansari and Modarress, 2010). Trying to achieve high customer expectations (Alkaabi, 2023) some providers tend to under-deliver and over-promise (Tezuka, 2011), resulting in service levels falling short of what was anticipated (Ben-Daya and Akram, 2013). Lack of oversight, misaligned goals or poor communication are factors contributing to performance expectations not being met. Regular monitoring and active involvement can help to mitigate these

issues (Jean, 2024). On a strategic note, current demand may be met but future growth of 3PL users is challenging (Ansari and Modarress, 2010). A good provider has flexibility in both scaling up and down volume, but according to Govindan and Chaudhuri, (2016) and Thuermer (2022) this balance can be difficult to obtain for providers. Lack of flexibility in unexpected business change is rather common (Ben-Daya and Akram, 2013). Another example of lacking in flexibility is the inability to handle 3PL user's special product needs (Vasiliauskas, 2007).

Sharing information to an external party has many elements and can be classified as one of the biggest challenges for engaging with a 3PL (Govindan and Chaudhuri, 2016; Selviaridis et al., 2008). Information sharing is something that is complicated in SCs in general. Barriers are commonly attributed to trust (Govindan and Chaudhuri, 2016; Thuermer, 2002), confidentiality, incompatibility, power imbalances and technological infrastructure (Valashiya and Luke, 2022). It is also dependent on the availability, completeness and consistency of the information (Ben-Daya and Akram, 2013). Moreover, security related issues like sensitive information being leaked and accessed by competitors (Ansari and Modarress, 2010; Ben-Daya and Akram 2013; Valashiya and Luke, 2022). This mistrust results in large effects on planning and forecast accuracy (Govindan and Chaudhuri, 2016; Valashiya and Luke, 2022). Coherently, Vaidyanathan (2005) found that the role of IT is very significant when users utilize 3PL providers. Tremendous growth has been witnessed in especially the logistics area and information technology, pushing companies to constantly develop and incorporate new technologies (Gabriel and Parthiban 2020; Thuermer, 2022). According to Gabriel and Parthiban (2020) there is only a limited time for providers to not lose their customers, meaning it prohibits experimenting and investing in new technology as it is highly time-consuming, much related to training human resources. Not adopting new technologies will also gradually increase overhead costs, slowly placing providers out of competition.

Not only does the market demand new technology but customized solutions in general, putting pressure margins and standard operations (Thuermer, 2022). Sustaining logistics excellence among competitors is tough (Alkaabi, 2023). Regarding sustainability, one would argue that 3PL introduces sustainability benefits, other means there is limited awareness and focus on sustainability measures (Alkaabi, 2023). Like with technology advancements, there is an increasing pressure on reducing carbon emissions and adopting green logistics practices, which affects the 3PL industry (Thuermer, 2022). From an economic standpoint, environmental issues in logistics often arise from externalities, where polluters do not carry the full cost of their actions. Although 3PLs can reduce these impacts through efficiency, their primary focus on cutting costs means sustainability goals may be overlooked (Tezuka, 2011).

Other challenges associated with using 3PL providers are when you get too dependent on them. This dependency is problematic if the 3PL experiences operational or financial issues, potentially resulting in reduced service quality or delays (Erkinovich & Makhmudov, 2024; Govindan and Chaudhuri, 2016; Jean, 2024). There has to be a balance between dependency and control, as losing complete control of logistics functions may affect the user's customer relationship. 3PL users can even be so comfortable with outsourcing they lose in-house logistics capability (Selviaridis et al. 2008), leading to less or no logistics innovation (Ben-Daya and Akram, 2013). Balance in the relationship between user and provider is also important so that no opportunism occurs, where either party may act in self-interest at the expense of the other (Ben-Daya and Akram, 2013; Govindan and Chaudhuri, 2016). One notable example is the *"hold-up problem"* which occurs when a 3PL invests in customized facilities or assets for a specific user, only for the user to later renegotiate terms in their favor, knowing the 3PL has limited alternative uses for those investments (Tezuka, 2011). While resource sharing has been introduced to reduce risks and bring industry-wide cost benefits (Gabriel and Parthiban, 2020), joint decision-making on logistics cost efficiency often proves difficult (Alkaabi, 2023). Cost is a major challenge in 3PL partnerships, often due to unrealistic fee structures and difficulties in assessing actual savings (Selviaridis et al., 2008). Users push for lower costs while demanding higher service levels, squeezing provider margins (Theurmer, 2022). High service and technology costs further strain finances for providers (Alkaabi, 2023). Hidden or underestimated logistics costs (Ben-Daya and Akram, 2013) can prevent cost savings from being realized.

On an operational level, 3PL struggles primarily with inadequate expertise and poor IT capabilities. Incompatibility between the user's and the 3PL's information systems can prevent real-time data exchange and coordination (Ansari and Modarress, 2010; Thuermer, 2022). Misalignment between IT and business goals during digital transformation further complicates integration (Mvubu and Naude, 2024). Poorly evaluated 3PL IT infrastructure (Ben-Daya and Akram, 2013) and incompatible platforms or data systems can disrupt communication, tracking and overall SC efficiency (Jean, 2024). Workforce and talent-related is arguably one of the most significant challenges for 3PL providers. Poor personnel quality, lack of expertise and weak managerial skills hinder performance and innovation (Selviaridis et al., 2008; Govindan and Chaudhuri, 2016; Gabriel and Parthiban 2020). The industry struggles to attract and keep skilled workers, facing high turnover and labor shortages, especially in an increasingly tech-driven environment (Thuermer, 2022; Alkaabi, 2023). Training is costly and time-consuming, yet necessary to keep up with technological advancements and evolving market demands (Gabriel and Parthiban, 2020). Additionally, a lack of visionary leadership further complicates digital transformation efforts (Mvubu and Naude, 2024). Finally, literature suggests that minimizing lead time is an operational challenge faced by many providers (Gabriel and Parthiban 2020; Govindan and Chaudhuri, 2016). Lack of standardized performance metrics like measuring service levels across different logistics activities may be a contributing factor (Thuermer, 2022).

## 3.4 Primary Logistics Cost-Drivers

Logistics costs represent a substantial and strategically important portion of total business expenses. Depending on the calculation method and industry context, they typically account for no less than 10 percent of a company's turnover in developed economies (Engblom et al., 2012). In logistics, the most important cost components are transportation and warehousing. Depending on factors such as company size, business type and the overall state of the economy, transportation cost (TC) typically represent the largest portion of total logistics costs, ranging from 25% to 50% (Andrejić et al., 2018). Warehousing costs account for approximately 15% to 40% (Andrejić et al., 2018; Richards, 2014). However, a substantial share of logistics costs remains intangible, often referred to as *"hidden"* logistics costs. As a result, there is growing interest in identifying and understanding these costs, so that they can be reduced (Andrejić et al., 2018).

When studying SC costs in general, it is important to consider all relevant cost components in a total cost analysis. This is because a change in the SC may increase some costs, while reducing others. To avoid sub-optimizing total SC costs when reducing costs in one area, it is essential to constantly keep a holistic view (Olhager, 2019). Oskarsson et al. (2021) argue that a total cost model works as a way to estimate costs associated with changes in the SC. The model should include costs related to all aspects of logistics operations. To illustrate the importance of considering total cost, it may seem intuitive that the number of transports have the biggest impact on the TCs, but transportation activities influence all cost components in the total cost model (Oskarsson et al., 2021).

Numerous studies highlight the significant impact of 3PL providers on company logistics costs (Erkinovich and Makhmudov, 2024; Rabinovich et al., 1999; Selviaridis et al., 2008; Wambua et al. 2017). In a study of 210 large companies, the top two reasons for outsourcing were cost reduction, chosen by 78% of respondents, and reducing capital investment, selected by 70% (Rahman, 2011). While the exact percentage of cost reduction varies by case, certain areas are suggested to benefit more from outsourcing. However, stakeholders highlighted the importance of a thorough cost-benefit analysis before partnering with 3PL providers, as understanding the financial impact enables organizations to make informed decisions (Erkinovich & Makhmudov, 2024). A total cost model specifically related to outsourcing decisions has been developed by Vasiliauskas and Jakubauskas (2007), where the company defines logistics costs. Hence, logistics cost per item is defined by this equation:

$$LC = HC_{hold} + MC \quad (1)$$

where LC = logistics cost, $HC_{hold}$ = holding cost and MC = moving cost. Holding cost is the sum of rent (RC) and inventory (IC) costs:

$$HC = RC + IC \quad (2)$$

Moving cost is the sum of transport (TC) and handling ($HC_{hand}$) costs:

$$MC = TC + HC_{hand} \quad (3)$$

Hence, the logistics cost is defined as the sum of four main variables:

$$LC = RC + IC + TC + HC_{hand} \quad (4)$$

### *3.4.1 Warehousing Cost*

The largest expenses for operating a warehouse are facility, personnel, equipment and Warehouse management system (WMS) costs (Frazelle, 2016). Andrejić et al. (2018) argue that the cost of inventory can also be associated with warehouse costs, making warehouse costs include RC, IC and $HC_{hand}$. This underscores both the significance and complexity of warehouse management, especially when allocating costs. Furthermore, warehousing costs largely depend on factors like warehouse products, size, technology, location and the handling equipment used (Andrejić et al., 2018). Some research on the impact of warehouse size on warehousing costs shows that smaller warehouses tend to have higher operational and inventory costs per unit of product, whereas larger warehouses generally experience lower costs. This can be explained by the fact that warehousing costs are closely tied to the three key variables being warehouse capacity, level of technology and turnover. These factors play a decisive role in determining the warehousing cost allocated to each unit of product (Andrejić et al., 2018).

RC, in the model by Vasiliauskas and Jakubauskas (2007), refers to costs associated with the physical space, primarily facility rental, leasing fees or depreciation if owned. It may also include utilities for keeping the facility running like electricity, heating or cooling as well as costs related to security systems, insurance and maintenance.

HC relates to the physical handling of goods (Christopher, 2016; Oskarsson et al., 2021). This includes basic warehouse operations like personnel and equipment needed for receiving, put-away, picking, packing and shipping. In warehouses with more manual processes, personnel costs typically have the highest impact (Baker and Halim, 2007). Assets engaging in administrative tasks, as well as management required to run the warehouse are equally important drivers of handling costs, but more difficult to allocate (Andrejić et al., 2018).

IC refers to the expenses incurred from holding stock over time (Oskarsson et al., 2021). They include tied-up capital in inventory, stock management, insurance costs and costs related to depreciation and damage goods, all increasing when more products are stored. The capital cost is often considered the opportunity cost of capital tied up in inventory that could otherwise be invested for a higher return. This is typically the largest cost associated with inventory (Rushton, 2022). The risk cost connected to depreciation and damage of inventory is often underestimated by companies, especially in industries with short product life cycles and high inventory turnover rates (Rushton, 2022).

### 3.4.2 Transportation Cost

The two main categories of TCs are primary transport and delivery transport (Rushton, 2022). Primary transport, often referred to as trucking or line haul, moves products in bulk and typically uses road transport, though bulk goods may involve other modes. While the number of DC sites affects primary TCs, the impact is more significant with fewer DCs, as costs usually increase with more sites (Rushton, 2022). Delivery transport involves delivering products from the warehouse to the customer, either using the company's own transport fleet or a 3PL. The cost of delivery depends primarily on the distance that must be traveled. The relation between different logistics costs, including TCs, with the increasing number of sites can be seen in *Figure 3.1*.

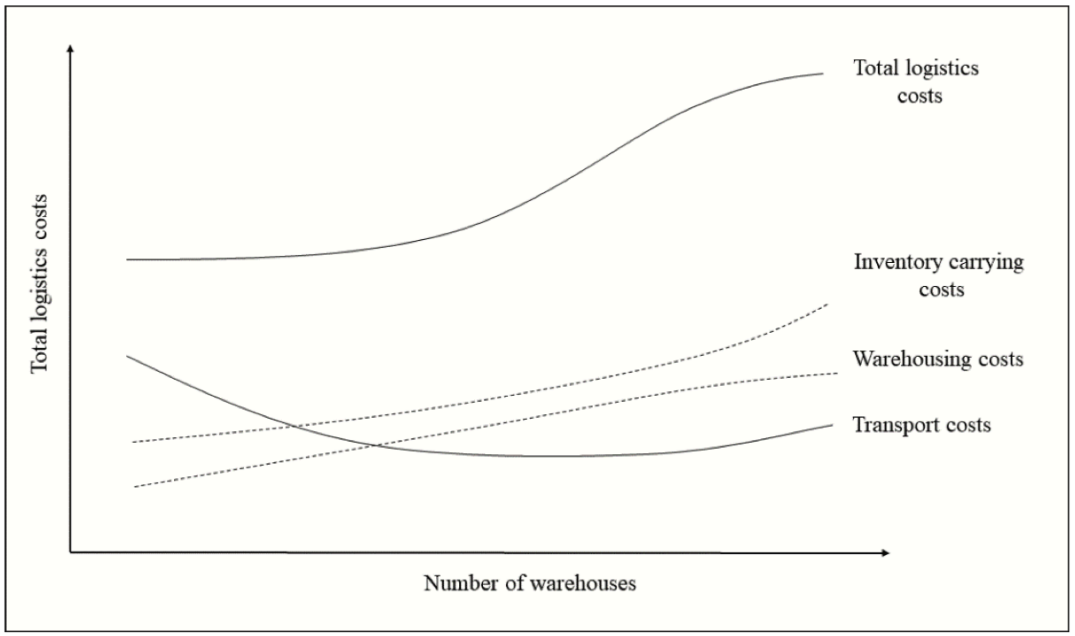


Figure 3.1: *Total logistics depending on the number of warehouses (Mura, 2019)*.

TC are also dependent on a cost-weight curve, meaning there has to be a good balance between how much you ship, how often you ship and how heavy or bulky the goods are. Since trucks have limits on both weight and space, shipping costs are often based on dimensional weight, meaning both the size and actual weight of the goods are considered. It involves comparing a package's size to its weight in order to determine how much space it will occupy during transport (DHL, 2023).

The impact of logistics systems on company profitability has increased in recent years due to growing customer demands for delivery service (Dorer and Calisti, 2014). With these increasing demands, the need for transportation services have been growing rapidly (Ege and Njoku, 2021). In a recent study by Jacobs et al. (2018), approximately 41% of SC costs could be allocated to last-mile deliveries. Transport fill rate is correlated to TCs and environmental impact. Companies that have a high fill rate make more efficient use of the maximum capacity, needing less transports to deliver the same amount, resulting in lower costs and emissions (Mrabti et al., 2021; Oskarsson et al., 2021). Lewis (2019) and Oskarsson et al. (2021) mean that fill rate can be improved by higher inventory availability, but Olhager (2019) mentions the importance of considering inventory holding costs so that the total logistics costs are still lower. Another example of a connection between warehouse and transportation costs is that reducing the number of transports may lower the need for personnel involved in outbound activities, decreasing warehouse costs. By partnering with a 3PL, companies can optimize transportation routes and more efficient warehouse activities to heavily reduce their TCs (Jean, 2024). This is mainly due to the economies of scale involved (Erkinovich and Makhmudov, 2024).

## 3.5 Critical Success Factors of 3PL

To achieve excellence in managing as an 3PL provider a number of critical success factors (CSF) can be established. A compilation of CSF can be found in *Table 3.4*. When analyzing the sources, it is evident that most reflect the perspective of companies that hire a 3PL. This trend was observed two decades ago (Berglund, 1997) and does not appear to have changed. With this in mind it is important to take the results of the current existing literature in the subject of 3PL and interpret them with caution. This is because Rajesh et al. (2011) as well as Mitra and Bangchi (2008) highlights a gap between the expectations of 3PL users and the actual capabilities of their logistics providers.

To bridge this gap, Rajesh et al. (2011) emphasize that both 3PLs and their customers must maintain open communication regarding expectations and capabilities. This transparency is essential for identifying innovative ways to enhance SC performance. Additionally, they state that companies should foster closer collaboration with 3PLs by actively engaging in learning current practices, developing joint solutions and sharing the benefits of these improvements.

Table 3.4: *Critical success factors for 3PLs*

| General CSF | Specific CSF | Reference agree | Reference disagree |
|---|---|---|---|
| Strategy and Growth | Broad Industry focus | Mitra and Bangchi (2008); Mothilal et al. (2012); Perera et al. (2021) | |
| | Innovation capabilities | Alioni et al. (2024); Borgstrom et al. (2022); Chu, Feng and Lai (2018) | |
| | International-ization | Mitra and Bangchi (2008); | Hertz and Alfredsson (2003); Perera et al. (2021) |
| | Service (often breadth) | Arfan and Ardi (2022); Borgstrom et al. (2022); Berglund (1997); Chen and Karia (2024); Hertz and Alfredsson (2003); Maltz and Ellram (1997); Mitra and Bangchi (2008); Mothilal et al. (2012); Perera et al. (2021); Rajesh et al. (2011); Zhang et al. (2023) | |
| Operational Excellence | Adaption | Berglund (1997); Borgstrom et al. (2022); Hertz and Alfredsson (2003); Selviaridis et al. (2008) | |
| | Information system | Berglund (1997); Janné and Rudberg (2020); Mitra and Bangchi (2008); Saha and Yin (2021); Selviaridis et al. (2008); Perera et al. (2021) | Mothilal et al. (2012) |
| | Infrastructure/ Design | Berglund (1997); Perera et al. (2021) | |
| | Product-adapted handling | Hertz and Alfredsson (2003); Saha and Yin (2021) | |
| | Technology and | Alioni et al. (2024); Arfan and Ardi (2022); Borgstrom et al. (2022); Perera et | |

| | | | |
|---|---|---|---|
| | automation | al. (2021); Rajesh et al. (2011) | |
| Performance and Quality Management | Sustainability | Borgstrom et al. (2022); Perera et al. (2021) | |
| | Value adding | Berglund (1997); Rajesh et al. (2011) | |
| | Cost | Arfan and Ardi (2022); Berglund (1997); Chen and Karia (2024); Janné and Rudberg (2020); Karagiannis et al. (2023); Zhang et al. (2023) | |
| | Flexibility | Arfan and Ardi (2022); Berglund (1997); Janné and Rudberg (2020); Maltz and Ellram (1997) | Alioni et al. (2024) |
| | Quality | Arfan and Ardi (2022); Berglund (1997); | |
| | Tracking KPIs | Janné and Rudberg (2020); Perera et al. (2021) | |
| Human Capital and Relationships | Experience | Perera et al. (2021) | |
| | Expertise of Employees | Alioni et al. (2024); Borgstrom et al. (2022); Berglund (1997); Chen and Karia (2024); Hertz and Alfredsson (2003); Mitra and Bangchi (2008); Mothilal et al. (2012); Saha and Yin (2021); Perera et al. (2021) | |
| | Leadership | Perera et al. (2021) | |
| | Relationship/ Trust | Arfan and Ardi (2022); Borgstrom et al. (2022); Chu, Feng and Lai (2018); Hertz and Alfredsson (2003); Janné and Rudberg (2020); Maltz and Ellram (1997); Mothilal et al. (2012); Perera et al. (2021); Rajesh et al. (2011) | Chu, Feng and Lai (2018) |

### *3.5.1 Strategy and Growth*

**Broad Industry focus**

A review of the literature on CSFs for 3PL reveals that some sources recommend a broad industry focus. Mothila et al. (2012), Mitra and Bangchi (2008) as well as Perera et al., (2021) points out that narrowing down a 3PLs focus to a specific industry might hinder the logistical provider from future growth. Hertz and Alfredsson (2003) supports the idea that industry focus can limit profit growth by restricting customer acquisition. However, instead of recommending a broad industry focus, they highlight that niche specialization can help 3PLs build expertise while still fulfilling diverse customer needs. Instead of going fully broad or fully specialized, 3PL firms can use a multi-niche approach to combine expertise with customer diversity. It is also stated that most 3PL firms originate from a side activity and are influenced by the firm's existing systems.

**Innovation capabilities**

Alioni et al. (2024) found in their African study that innovation capabilities were crucial for 3PL companies in these areas to succeed. Similarly, Chu, Feng and Lai (2018) states that the innovation of

3PL companies is crucial to meet the modern competitive landscape. Borgstrom et al. (2022) further substantiates these arguments by proving the importance that innovation capabilities had for the Swedish 3PL companies during the Covid-19 crisis.

**Internationalization**
Other mentioned CSF connected to the strategy and growth focuses of 3PL companies are done by Mitra and Bangchi (2008). They state that a way to stay competitive is to follow the client driven need for international services, growing with the size of the companies. However, Perera et al. (2021) suggests by their study that internalization is an outcome rather than a direct driver of change. Hertz and Alfredsson (2003) support this argument since they suggest that internationalization is closely tied to the development of 3PL firms, but it does not guarantee success.

**Service**
Chen and Karia (2024) lifts the relevance of having a competitive strategy are crucial for succeeding as a 3PL provider. Whether the strategy is providing the lowest cost or distinguishes its services. Multiple studies conducted worldwide emphasize the importance of a broad range of services and effective service management at 3PL providers, according to 3PL users (Arfan and Ardi, 2022; Berglund, 1997; Hertz and Alfredsson, 2003; Mitra and Bangchi, 2008; Perera et al., 2021; Rajesh et al. (2011)). Perera et al. (2021) found that expanding the scope of services has had a positive impact on revenue growth in India. Mitra and Bangchi (2008) support the findings in their North American study. According to 3PL users included in the study, offering a wider range of services increases demand and customer satisfaction, which can indirectly lead to revenue growth. While the 3PL providers included in the study do not directly confirm that a broader range of services leads to revenue growth, it suggests that service expansion is a key strategy for market growth. Borgstrom et al. (2022) identified strategic insights from 3PL providers in Sweden during the Covid-19 crises. They suggest that expanding service offerings and adapting to the needs of customers, especially during crises, are crucial factors that can lead to business growth and improved financial performance.

### *3.5.2 Operational Excellence*

**Adaptation**
Selviaridis et al. (2008) highlight the importance of service adaptations specifically during implementations. Berglund (1997) does not explicitly state that adaptation is a CSF however, he demonstrates that adapting to market trends, technological advancements and customer demands is an essential factor for success in the 3PL industry. Borgstrom et al. (2022) suggests that short-term adaptation is important for immediate problem solving like in a crisis, while long-term adaptability is critical for sustained success in a competitive and ever-changing environment. Hertz and Alfredsson (2003) states that adaptation to the 3PL customers is of great importance.

**Information Systems**
Selviaridis et al. (2008) finds in their survey that information sharing is one of the most important success factors for 3PL. Berglund (1997) empirical study shows that one of the three most important capabilities of a 3PL to be successful is their information system. Janné and Rudberg (2020) conclude that a lack of or inaccurate information negatively affected the results of their analyzed Swedish 3PL case study. Mitra and Bangchi (2008) reveals that investments in information systems have proven to be a highly positive factor for numerous performance metrics. Saha and Yin (2021) named the information system as one of four key areas relevant to their studied companies outsourcing management process. Mothilal et al. (2012) finds via their literature study that investments in information systems should be of great importance for succeeding as a 3PL. However, in their study done by surveys of Indian 3PL providers information systems did not appear to be a significant factor. Perera et al. (2021) on the other hand find that the information system is of high importance in the Sir Lankan 3PL industry. However, they also note that improvements to the information system may be constrained or influenced by other variables, suggesting that enhancements in this area do not necessarily lead to immediate or direct increases in success.

**Infrastructure/Design**
Next of the operational CSF is the infrastructure and design of the 3PL process, according to Berglund (1997) this is one of the most important factors for success. Perera et al. (2021) suggest that having the right infrastructure can significantly influence business opportunities and support growth, even though it might not be the most visible or prioritized factor.

**Product-adapted handling**
Hertz and Alfredsson (2003) discuss the balance between adapting to specific customers and keeping a broad problem-solving ability. Saha and Yin (2021) shows the lack of 3PL providers in certain areas suggesting an underdeveloped but potentially high-growth market.

**Technology and automation**
Through outsourcing parts or entirety of the SC companies reduce their dependence on having direct access to up-to-date and high quality technology and automation. Rajesh et al. (2011) state that 3PL customers highly value the technology used by the provider and is supported by Alioni et al. (2024) who emphasizes the benefits of easy access to advanced technological tools. Arfan and Ardi (2022), Borgstrom et al. (2022) as well as Perera et al. (2021) agree by stating that 3PL providers should focus on upgrading their technology to stay competitive.

### *3.5.3 Performance and Quality Management*

**Sustainability**
Performance and quality management are crucial for the success of 3PL providers, as they directly impact customer satisfaction and operational efficiency. Borgstrom et al. (2022) highlights sustainability in the context of 3PL companies as a critical aspect of their organizational capacity and long-term success. Perera et al. (2021) research indicates that sustainability on its own is not a driving factor for success. However, it is highly related to driving other success factors forward.

**Value-adding**
In 1997, one of the most distinct trends among 3PL providers was a shift toward value-added activities that were not directly related to logistics services. Between 5-20% of most providers' total sales were counted towards these activities (Berglund; 1997). Rajesh et al. (2011) states that the partnerships between 3PLs and users tend to develop gradually, with an increasing scope of outsourced activities over time. The range of services expands to include more value-added and customized offerings. This implies that the role of 3PLs has continued to move beyond traditional logistics.

**Cost**
An often recurrent mentioned CSF is the cost. Berglund (1997) states that cost is the primary value offered to clients by 3PL providers. This statement is substantiated in recent studies as well, Arfan and Ardi (2022) conclude that cost is the most important criterion in selecting a 3PL. 3PL providers should prioritize determining the balance of cost carefully, as low prices could lead to losses, while high prices may drive customers to seek alternatives. Chen and Karia (2024) suggest that one of two strategies of competitiveness in 3PL is cost leadership, providing the cheapest services. Janné and Rudberg (2020) suggest that managing costs effectively and ensuring that the benefits of TPL arrangements justify the associated expenses are crucial for their success in construction projects. Both Karagiannis et al. (2023) and Zhang et al. (2023) integrate cost-focused decision models to enhance overall SC performance in a 3PL context, highlighting the importance of cost optimization as a key factor in driving efficiency and competitiveness for 3PL businesses.

**Flexibility**
Flexibility, particularly in the form of agility, is recognized as a CSF for 3PL providers. According to Arfan and Ardi (2022) agility, defined by the ability to rapidly respond to external changes such as demand fluctuations or disruptions, ranks highly in importance, emphasizing the need for adaptability and responsiveness in 3PL operations. Berglund (1997) concludes that flexibility is the third most

important value a 3PL provider offers to its customers. This is supported by Janné and Rudberg (2020) who lists increased flexibility as one of the benefits of outsourcing to a 3PL. The flexibility is also used by Maltz and Ellram (1997) as one of the key quality measures in logistics outsourcing. However Alioni et al. (2024) study says that flexibility does not have an effect on the success of a 3PL.

**Quality**
Arfan and Ardi (2022) states that previous research has identified quality as one of the key criteria for selecting 3PL providers. Similarly, Berglund (1997) notes that improved quality is a potential benefit of outsourcing to a 3PL.

**Tracking KPIs**
Last in the list of CSF connected to performance and quality management is the importance of tracking key performance indicators (KPIs). Perera et al. (2021) indicates that tracking KPIs is a key success factor, but improvements in KPIs are often dependent on broader factors like information systems, SC integration and continuous improvement initiatives. Janné and Rudberg (2020) suggest that tracking KPIs could be a CSF for 3PL arrangements, as companies often struggle to quantify the cost reductions and operational improvements gained from such partnerships.

### *3.5.4 Human Capital and Relationships*

**Experience and Expertise of Employees**
Continuing with the last cluster of CSF. Perera et al. (2021) suggest that 3PL clients expect service providers to place greater emphasis on factors like industry experience. Strongly connected to the industry experience is the expertise which Perera et al. (2021) states is one of the most significant characteristics for success as a 3PL, supported by Mitra and Bangchi (2008). Alioni et al. (2024) emphasizes that expertise is a key component of a 3PL provider's organizational capabilities, which is supported by Borgstrom et al. (2022) and Chen and Karia (2024). Berglund (1997) discusses expertise from multiple perspectives, noting that companies often choose not to outsource parts of their activities where they are experts, as these are seen as their core value. However, companies may outsource logistics to access expert knowledge that would be too costly to maintain in-house. Berglund concluded that the main constraint on expansion of 3PL companies is the challenge of having enough skilled and capable employees. Hertz and Alfredsson (2003) emphasizes that expertise plays a crucial role in a 3PL provider's ability to maintain a strategic edge in the market. This statement is reflected in the findings of Saha and Yin (2021) who have the expertise of employees as one of their main focuses when finding the best suited 3PL provider for their case company. Mothilal et al. (2012) concludes that skilled professionals play a significant role in both operational and financial success in the 3PL sector.

**Leadership**
Perera et al. (2021) stresses that management and leadership style are fundamental to driving success. They influence other critical factors such as information systems, SC integration and tracking KPIs, which are crucial but require strong leadership and strategic management to be effectively implemented.

**Relationship/Trust**
Trust is according to Hertz and Alfredsson (2003) important in 3PL collaborations. This is further proven by Rajesh et al. (2011), who discovered that both 3PL firms and their customers highly prioritize trust as a CSF. Arfan and Ardi (2022) states that a strong collaboration between a 3PL provider and its customer can enhance the company performance. Borgstrom et al. (2022) suggests that trust between 3PL providers and customers is crucial for managing complexities and responding to crises effectively. Janné and Rudberg (2020) state that the full potential of SC management can only be realized when all participants in the SC work toward a common goal, with trust playing a key role. They also highlight the strong link between managing construction SC relationships and project performance. This is further emphasized by Maltz and Ellram (1997), who identifies that trust and

strong relationships with 3PL providers affect both tangible and intangible outcomes. They also identify reliability as one of the key measures of performance in logistics outsourcing. Additionally, Mothilal et al. (2012) state that the lack of trust is one of the major barriers facing 3PL service providers. Perera et al. (2021) highlights that long-term relationships with 3PL customers are considered a core factor in customer orientation, which is critical for success. However, it does not affect the ability to penetrate new business opportunities. Chu, Feng and Lai (2018) on the other hand state that the trust and political relationships in China works better for 3PL providers with a more centralized or flexible organizational structure.

# 4. Developing the Maturity Model

*This chapter outlines the process used to develop the framework, including its underlying logic and approach. The model is created with existing literature and later used and evaluated through interviews.*

## 4.1 Description

Maturity models (MM) help organizations assess their current state and identify areas for improvement (Ferraro et al., 2023; Rahadian et al., 2024; Wendler, 2012; Werner-Lewandowska and Kosacka-Olejnik, 2018). The process starts with developing an MM, followed by an assessment to determine the organization's level of development. The model is built on two key aspects: elements, which represent the areas the company will evaluate, and levels, which outline the stages of development for each element, see *Figure 4.1*. For clarity, the intersection of each level and element should include a description that defines the criteria for that stage (Ministry of Defence and Currie, 2018; Wendler, 2012; Werner-Lewandowska and Kosacka-Olejnik, 2018). The assessment can be based on objective criteria or people's perceptions within the company. In other words, it reflects either internal insights from those involved in the process or external evaluations from an outside perspective (Ministry of Defence and Currie, 2018).

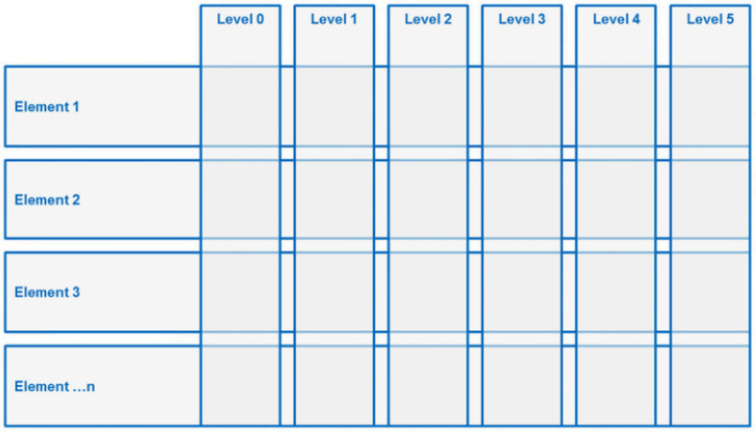


Figure 4.1: *Outline of a Maturity Model* (Ministry of Defence and Currie, 2018).

Lasrado et al. (2015) conclude that the development of MMs is described in the literature through a wide variety of approaches. They suggest that, based on this information, there is no single correct method for creating a MM. However, it is important to look at what earlier research says and to make sure the model is tested and based on real-world data. According to De Bruin et al. (2005), a top-down approach is effective when the subject area is not yet well understood. In this method, the maturity levels are defined first, followed by the development of appropriate measures to assess them.

## 4.2 Outline

The following section presents an overview of the MM structure, explaining how the levels were developed and outlining the key elements that were taken into consideration.

### *4.2.1 Levels*

The use of evaluating CSF via MM has been done before in other areas (Sohrabi et al., 2010). However, no existing MM specifically addressing multiple CSFs for 3PLs has been identified in the

literature. Although some models focus on individual CSFs for 3PL, there is a lack of a comprehensive approach. As a result, it was necessary to develop a new model. To ensure alignment with previous research, existing MMs were used as references, with some parts being adapted and integrated into the model proposed in this thesis. To ensure that the MM can be used by others, either if Lindab wants to evaluate their progress in the future or someone wants to make a comparison, the descriptions in the MM should be easy to comprehend and aim to leave no room for misunderstandings. To ensure this, clear outlines of the MM need to be established. A comparison of previous research shows that both the naming and the number of levels vary depending on the author (Lahti et al., 2009; Kosacka-Olejnik, 2020). According to Wendler (2012) the only well researched MM is the Capability Maturity Model, later developed into Capability Maturity Model Integration (CMMI), which originated from the software industry but later has extended to include, among others, service industries. Therefore, this seems as a reasonable foundation to build the model on, since that is the core concept of 3PL. CMMI categorizes its five stages as Initial, Managed, Defined, Quantitatively (Managed) and Optimizing (Adeniyi et al., 2019; Mansour et al., 2024). The levels are defined in *Table 4.1*.

Table 4.1: Definition of levels in CMMI (Adeniyi et al., 2019; Battista and Schiraldi, 2013; Li et al., 2017; Mansour et al. 2024; Sohrabi et al., 2010)).

| Level | Name | Description |
|---|---|---|
| 1. | Initial | Project chaotic, few defined processes and success depends on individuals. |
| 2. | Managed | A few basic project management practices, tracking and planning are being made to make sure success can be repeated. |
| 3. | Defined | Well-defined and standardized processes which are documented and applied on all projects. |
| 4. | Quantitatively | Use measurement and control techniques to ensure process and product quality are well understood, controlled and continuously improved. |
| 5. | Optimizing | Best practice, market leader, constantly improving processes and seeking feedback. |

### *4.2.2 Elements*

The elements included in the MM need to be established. This will be done by compiling the found CSFs of 3PL, since there is a large amount of factors that is mentioned just a few times it seems reasonable to only include the most important ones in the model. To further corroborate the findings in *Section 3.5,* a comparison with previous literature reviews will be conducted. Due to the limited number of studies focusing specifically on CSFs for 3PL providers, this comparison also incorporates broader literature reviews on 3PL providers. This ensures a comprehensive evaluation of success factors relevant to the industry. The comparison is presented in *Table 4.2* below.

As described by Aguezzoul (2014), the 3PL selection process involves numerous criteria, with some authors identifying up to 35 evaluation points. This is attributed to the broad range of services offered by 3PL providers and the natural difficulties in defining what quality means in a service environment. As evident from both the comparison in *Table 4.2* and the descriptions of CSF in *Section 3.5,* many of these criteria overlap or are closely related. Aguezzoul (2014) uses the Pareto method to list the most commonly used criteria. The Pareto principle, also known as the 80/20 rule, is not a strict rule but a general guideline suggesting that a small number of causes often account for the majority of the effect. In this context, it means that some criteria have a significantly greater impact than others. Based on this idea, the most frequently mentioned criteria in *Table 4.2*, representing over 80% of the total

mentions, have been identified and highlighted in green (Szymański and Ochodek, 2023). The Pareto charts used can be found in *Appendix B*. It should be noted that expert opinions are counted as a single source.

Table 4.2: *CSF found in different literature (Top 80% are marked as green)*.

| **Thesis literature review** *[total of 17 sources]* | **Aguezzoul (2014)** *[total of 67 sources]* | **Narkhede et al. (2017)** *[total of 51 sources + Experts opinion]* |
|---|---|---|
| Service (often breadth) [11] | Cost [46] | Information sharing and mutual trust [23] |
| Relationship/Trust [9] | Relationship [44] | Geographical spread and range of services provided [18] |
| Expertise of Employees [9] | Services [42] | Long-term relationship [17] |
| Cost [7] | Quality [40] | Cost [16] |
| Information system [6] | Information & equipment system [38] | Quality of service [16] |
| Technology and automation [4] | Flexibility & Adaptation [35] | Financial performance [15] |
| Flexibility [4] | Delivery [28] | Flexibility in operation[14] |
| Adaptation [4] | Expertise, competence and experience [24] | Delivery performance [13] |
| Innovation capabilities [3] | Financial position [19] | Reputation [11] |
| Quality [3] | Location [16] | Compatibility with users [4] |
| Broad Industry focus [3] | Reputation [11] | Operational performance [4] |
| Sustainability [2] | | Information technology capacity [3] |
| Tracking KPIs [2] | | Fixed assets [2] |
| Infrastructure/Design [2] | | Quality of management [1] |
| Product-adapted handling [2] | | Experience on similar product [1] |
| Value-adding services [2] | | Performance measurement [Experts opinion] |
| Internationalization [1] | | Willingness to use logistics manpower [Experts opinion] |
| Experience [1] | | Flexibility in billing [Experts opinion] |
| Leadership [1] | | Employee satisfaction level [Experts opinion] |
| | | Market share [Experts opinion] |

*Table 4.3* focuses on the CSFs most frequently mentioned across sources, as they are likely to have the greatest influence. These will be the elements in the proposed MM. These CSFs were then color-coded:

**Green:** All three literature reviews identified them in their top 80%
**Yellow:** Two reviews included them in the top 80% and one in the remaining 20%
**Orange:** One review included them in the top 80% while two reviews had them in the remaining 20% or not mentioned all.

Table 4.3: *A Pareto weighting of CSFs found in different literature.*

| Elements in MM | Thesis literature review | Aguezzoul (2014) | Narkhede et al. (2017) |
|---|---|---|---|
| Service | Service (often breadth) [12] & Broad Industry focus [3] *(Product-adapted handling [2] & Value-adding services [2] )* | Services [42] | Geographical spread and range of services provided [18] |
| Relationship | Relationship/Trust [9] | Relationship [44] | Long-term relationship [17] |
| Cost | Cost [7] | Cost [46] | Cost [16] |
| Information system | Information system [6] | Information & equipment system [38] | Information sharing and mutual trust [23] |
| Flexibility and Adaptation | Flexibility [4] & Adaptation [4] & Innovation capabilities [3] | Flexibility & Adaptation [35] | Flexibility in operation[14] |
| Quality | Quality [3] | Quality [40] | Quality of service [16] |
| Technology and automation | Technology and automation [4] | Information & equipment system [38] | *(Information technology capacity [3])* |
| Expertise of Employees | Expertise of Employees [9] | *(Expertise, competence and experience [24])* | *(Experience on similar product [1])* |
| Financial performance | - | *(Financial position [19])* | Financial performance [15] |
| Delivery | - | Delivery [28] | *(Delivery performance [13])* |

*Table 4.3* highlights the key CSFs that 3PL operations should prioritize to enhance performance and competitiveness. Where the other studies use broader descriptions, multiple of the CSF identified in our study are brought together. For example the description of services of Aguezzoul (2014) suits four of the CSF found in this thesis literature review. However, CSFs with fewer mentiones, though not included in the table, should not be overlooked. Critics argue that focusing too heavily on a few key factors may lead to the neglect of other important aspects(Guy-Evans, 2023).

## 4.3 Intersection of Elements and Levels

The selected elements require clear classifications for each level (Cheshmberah and Beheshtikia, 2020). In this section, each intersection will be described in detail, along with an explanation and justification for the chosen classifications. Depending on literature availability, each element has been evaluated slightly differently.

### *4.3.1 Service*

Theory of the service-element says service breadth is crucial. This suggests that level 1 of the MM represents a narrow or nonexistent service range, while level 5 reflects a broad service offering. The findings of Auezzoul (2014) aligned with this while also adding other aspects such as customization (Hertz and Alfredsson, 2003; Saha and Yin, 2021), variety in services, value added services (Berglund, 1997; Rajesh et al., 2011) and end-to-end customer services. Similarly, the literature review of Narkhede et al. (2017) also supports the statement of broad services range and adds possibility of internationalization (Mitra and Bangchi, 2008) as an aspect. However, since there are divided opinions on whether internalization is a CSF (Hertz and Alfredsson, 2003; Perera et al., 2021), it will not be a part of the service element in this thesis MM. Qiao and Zhao (2008) made a 3PL Service Capability MM (3PL-SCMM), connected to service the steps were identified as:

1. A few basic logistics tasks and the company is small with a simple setup. The quality of its logistics services isn't very good yet.
2. Capability to provide package deals of logistics service, complete and accurate documentation but cannot provide the function of information handling.
3. Provides standardized logistics service but cannot meet individuation demand or handle unusual requests; lacks flexible logistics service capability.
4. Provides flexible logistics service, handles customer dissatisfaction and product recall, lacks value-added logistics service capability.
5. Large scale of flexibility, explores logistics service to meet individuation demand (value-adding).

Hertz and Alfredsson (2003) supports the four-step categorization of 3PL providers based on service offerings in *Section 3.1.1*. Since there are more maturity levels in the 3PL-SCMM than service categories, one of the categories needs to cover more than one level, which leaves some room for interpretation. At the first level, companies typically handle just a few basic logistics tasks, which fits with the *standard 3PL provider* type. As they improve and start offering bundled services with better documentation, but still lack flexibility, they begin to move into the *service developer* category. This type becomes more relevant at the third level, where providers can deliver solid, standardized services but are not quite able to meet unusual requests. When a company becomes more flexible and able to handle more specific and end-to-end solutions, it aligns more with the *customer adapter*, where the 3PL takes full responsibility for certain logistics functions. Finally, the fifth level, where services are highly customized and value-adding, reflects the *customer developer*, which involves a deep and strategic partnership between the company and its 3PL. Overall, as a company's logistics maturity grows, so does the breadth and depth of its 3PL relationships.

An attempt to represent the presented research in the subject of breadth of service offering is visualized in *Table 4.4*. It follows the steps of Qiao and Zhao (2008) while incorporating the categorizations in *section 3.1.1* and the definition of levels, found in *Table 4.1*.

Table 4.4: *Developed MM levels for the service-element*

| Level | Description service-element |
|---|---|
| Initial | Limited service offerings and range; Simple setup with a small scale, isolated services; Low-quality logistics services. |
| Managed | Provides packages of logistical services; services are tracked and documented. |
| Defined | Can provide standardized logistics service; Broader service range. |
| Quantitatively | Customized logistical services; Handles all types of services. |
| Optimizing | Full breadth of services; Ability to provide value-added services; Continuous improvement and a focus on best practices. |

### *4.3.2 Relationship*

The relationship element of the CSF emphasizes the importance of trust and long-term relationships. Suggesting that the levels should range from bad relationships with low trust to excellent relationships with strong trust. This is further suggested by Auezzoul (2014) and Narkhede et al. (2017) who includes shared risks and rewards, cooperation (Arfan and Ardi, 2022), reliability, truth, dependence, alliance and compatibility as some of its characteristics. The 3PL-SCMM by Qiao and Zhao (2008) and its levels involving relationship:

1. Logistics operation capability is limited. Enterprises are formed from the former transportation and inventory company and some of them even have no corporation qualification. Service is low and prices are confusing.
2. The order is delivered complete, delivered on time, at the right location, in perfect condition, with complete and accurate documentation. But at this level, 3PL cannot provide the function of information handling.
3. Have the function of inquiring order but cannot meet customers' individuation demand and unusual request.
4. Can provide service for emergencies and also all kinds of logistics service, it has the ability to handle customers' dissatisfied emotion and product recall in time.
5. Can explore logistics service to customers' individuation demand.

Related to the criticality dimension mentioned in *section 3.1.1,* Hertz and Alfredsson (2003) present four segments connected to relationship can be concluded as followed:

1. *Standard 3PL provider* - 3PL services often provided on the side of the company's core business.
2. *Service developer* - Differentiated services for different customers, forming specific packaging, cross-docking, track and trace, offer special security systems. Combining services after customer demand. The focus would be more on creating economies of scale.
3. *Customer adapter* - Take over customers' total warehouses and the logistics activities and relies on a few very close customers.
4. *Customer developer* - High integration with the customer. Number of customers would be limited and the work for each customer extensive. Sharing the risk and rewards.

A representation of the research on relationship offerings is found in *Table 4.5*. This representation largely aligns with the framework of Qiao and Zhao (2008) also integrating the categorizations from

Hertz and Alfredsson (2003), levels presented by Lahti et al. (2009), when they developed a MM for SC Management and the level definitions presented in *Table 4.1*.

Level 1 from the 3PL-SCMM and the *standard 3PL provider* category both describe the least developed 3PL companies as often being side businesses to their core operations, focusing on basic logistics. This suggests that these companies have not yet built strong customer relationships. The service quality is described as low and prices are unclear, which indicates that trust from customers may be insufficient. Customers are likely to view the provider as a vendor performing a specific task rather than a long-term partner (Lahti et al., 2009).

At level 2, the 3PL-SCMM suggests that the services offered are made with good quality. While this builds some trust in terms of reliability, the absence of information handling means that the relationship remains largely transactional (Lahti et al., 2009). This aligned with the *service developer* category, where service reliability improves but deep collaboration is still lacking.

For level 3 of the 3PL-SCMM the customers rely on the provider for standard services but do not yet see them as a strategic partner. This reflects the beginning of mutual collaboration, but the relationship is still somewhat limited. As *Table 4.1* indicates, the defined-level should be standardized and applied on multiple processes. In terms of relationship, this suggests that trust is built on prior work and consistency, though it is not yet fully integrated.

At Level 4 of the 3PL-SCMM, there should be greater trust between both parties since the 3PL is reliable not just in routine operations, but also in managing crises. The *customer adapter* category aligns with this level, as these providers are dependent on a few customers. This mutual reliance demands high trust, which is proven by the 3PL being trusted with the full scope of the customer's logistics operations.

Finally, both Level 5 of the 3PL-SCMM and the *customer developer* category describe a highly integrated relationship, where risks and rewards are shared (Lahti et al., 2009). This level of customer service and individualization indicates a highly developed trust between the 3PL and the customer.

Table 4.5: *Developed MM levels for the relationship-element.*

| **Level** | **Description relationship-element** |
|---|---|
| Initial | Trust is minimal and the relationship is based on service performance and price; Customer views the provider as a vendor rather than a partner. |
| Managed | Cooperation on specific logistics tasks; Trust begins to build, but the relationship remains transactional, focused on reliability rather than long-term collaboration. |
| Defined | Joint problem-solving and sharing of information; Development of mutual trust based on past successes. |
| Quantitatively | A high level of trust, with both parties aligned on long-term objectives and growth. |
| Optimizing | Full integration; Mutual growth; Collaborate on setting future goals, improving processes and innovating services. |

### 4.3.3 Cost

In the logistics industry, cost efficiency plays a crucial role in shaping the dynamics between 3PL providers and their customers. The cost element highlights the delicate balance between cost leadership and value proposition. Supported by the findings of Auezzoul (2014) and Narkhede et al. (2017). While minimizing costs is essential for competitiveness, focusing solely on price may hinder long-term relationships and service innovation. As 3PL providers mature, their approach to cost shifts from transactional pricing strategies toward collaborative financial models that support mutual growth.

At the Initial level, price is unclear (Qiao and Zhao, 2008), likely due to the absence of standardized pricing models, making cost management unpredictable. Additionally, limited operational capabilities and a lack of formal business structure (Hertz and Alfredsson, 2003) make cost control challenging. Lahti et al. (2009), presents a MM for SCs and suggests that for the first level cost reduction and process improvement are often inconsistent, with efforts sometimes causing more harm than good. Aligning with the description *Table 4.1* where the Initial level should be chaotic.

For Managed level, delivery is accurate and timely (Qiao and Zhao, 2008), potentially reducing unforeseen costs. Planned reductions are typically implemented internally within organizations and are often measured using department-specific budgets (Lahti et al., 2009). These budget limits help track cost-saving efforts and make sure each department stays within its financial boundaries while trying to improve operations. However, these reductions might not always be effective, as they often focus on short-term savings rather than long-term improvements or strategic growth (Boudet et al., 2023). This aligns with the description in *Table 4.1*, tracking and planning help reduce unforeseen costs, while budget-based reductions are a result of organized planning efforts.

The Defined level is in *Table 4.1* defined as *"Well-defined and standardized processes which are documented and applied on all projects"*. Suggesting that the cost of sold services should be standardized and applicable for new customers. This aligns with level 3 of the 3PL-SCMM which says that services are standardised and customers can request price information (Qiao and Zhao, 2008). Reduction efforts are still internal but are now implemented cross-functional (Lahti et al., 2009), creating economies of scale (Hertz and Alfredsson, 2003).

At the Quantitatively level, based on *Table 4.1*, the 3PL moves beyond simply cutting costs based on budgets and instead uses data to optimize costs in a controlled way. Where cost reduction remains primarily focused on logistics and other operating expenses (Lahti et al., 2009). However, since the 3PL does not yet offer value-added services (Qiao and Zhao, 2008), its cost management efforts should focus on improving efficiency rather than creating new revenue streams. Aligning with the *customer adapter* category which improves efficiency instead of developing new services (Hertz and Alfredsson, 2003).

Lastly at the Optimizing level, a 3PL provider becomes a market leader by focusing on cost efficiency, continuous improvement and using feedback to refine operations. As outlined in *Table 4.1*, this level is characterized by innovation, with the 3PL offering value-added services beyond basic logistics. These services are highly customized to meet the individual needs of each customer (Qiao and Zhao, 2008). This maturity level also aligns with the *customer developer* category (Hertz and Alfredsson, 2003), where the 3PL becomes deeply involved in the customer's operations. By managing complex logistics functions, the 3PL helps businesses reduce costs through better efficiency and economies of scale. Additionally, cost savings are often shared between the 3PL and its customers, creating a mutually beneficial partnership (Hertz and Alfredsson, 2003; Lahti et al., 2009). *Table 4.6* shows how 3PLs can develop in its cost management.

Table 4.6: *Developed MM levels for the cost-element.*

| Level | Description cost-element |
|---|---|
| Initial | Unclear pricing; Bad cost control; Inconsistent cost reduction. |
| Managed | Tracking and planning to potentially reduce unforeseen costs; internal cost reductions. |
| Defined | Standardised pricing; Cross-functional cost-reductions; Creating economies of scale and scope. |
| Quantitatively | Controlled cost optimization with efficiency; Operational cost-reduction. |
| Optimizing | Shared rewards; Cost leadership; Continues improvement of cost reduction. |

### *4.3.4 Information Systems*

Information sharing and investments in information systems are of high relevance for succeeding as a 3PL. Auezzoul (2014) and Narkhede et al. (2017) both agree with these statements and describe that a 3PLs information systems enhance logistical efficiency through capabilities such as real-time tracking and information security. In their research article Baglio et al. (2024) creates a MM for 3PL Logistics 4.0 technologies, that is digital technologies to optimize and automate SC operations in the 3PL industry. Focusing on information systems the levels can be summarized as:

1. 3PL is able to track the location of products inside the warehouse (with barcodes). No wireless connectivity. Limited data integration. Limited coordination with clients. Zero to little skills in Logistics 4.0 technologies.
2. 3PL is able to use warehouse management systems (WMS) and automation for monitoring and optimizing day-to-day activities. E.g. Radio Frequency Identification (RFID) and internet of things (IoT). Tracking technologies to optimize the distribution service. Short-range wireless connectivity e.g. Bluetooth . Partial data integration. Logistics 4.0 is part of strategy but not priority.
3. 3PL uses data analytics and tracking technologies to increase productivity, e.g. using Augmented Reality (AR) for more efficient picking processes. Uses a web app to provide real-time tracking to customers. Local area network, like Wi-fi. Full integration of information systems and partial visibility with users and providers. Logistics 4.0 is highly supported.
4. 3PL is able to fully control physical flow, simulation tools can change the layout to fit the different volumes and stock needs. 3PL tests advanced technology to automate distribution, e.g. drones. Wide area network technologies like 4G and Narrowband IoT (N-IoT). Full integration in the SC with shared forecasting and continuous improvement e.g. Application Programming Interfaces (API) and Smart Pallet (SP). Logistics 4.0 is the main strategic driver.

By combining four additional sources on the general MM of Logistics 4.0 (Elibal et al., 2021; Oleśków-szłapka, 2019), information security management systems (Proença and Borbinha, 2018) and information system integration (Anggoro et al., 2018) a proposed MM-level for information systems can be made, found in *Table 4.7*.

The initial level for information systems can be described as manual with no connection between existing information systems (Anggoro et al., 2018; Elibal et al., 2021; Oleśków-szłapka, 2019) emphasized by level one of Baglio et al. (2024) MM. Tracking is done manually (Elibal et al., 2021). Here the Information security is entirely missing (Proença and Borbinha, 2018).

At the Managed level, data is shared using simple electronic methods, but there is no standardization between units or organizations. Applications and databases are kept separate and not shared (Anggoro et al., 2018; Cubo et al., 2021; Oleśków-szłapka, 2019). Tracking is done manually but added to a software (Cubo et al., 2021; Elibal et al., 2021). Both of these statements are mentioned in level one of Baglio et al. (2024) MM. Information security is in the planning phase, focusing on defining the systems scope, setting policies, assessing and managing risks and obtaining necessary approvals to ensure security measures align with organizational objectives (Proença and Borbinha, 2018) aligning with *Table 4.1*.

Next, in the Defined level basic collaboration allows limited data exchange between independent applications. While some data is shared through distributed programs, applications and databases remain separate (Anggoro et al., 2018) matching the description "partial data integration" made by Baglio et al. (2024). Technology is used for monitoring within the warehouse, uses WMS and enables day-to-day reports of locations (Baglio et al., 2024; Elibal et al., 2021; Oleśków-szłapka, 2019). 3PL has begun implementing information security, implementing a risk treatment plan, establishing controls, measuring effectiveness, providing training, managing information security operations and resources as well as setting procedures for detecting and responding to security events (Proença and Borbinha, 2018).

At the Quantitatively level, data is shared across databases, with advanced collaboration enabling system integration between organizations or units (Anggoro et al., 2018; Oleśków-szłapka, 2019) highlighted in th MM made by Baglio et al. (2024). Tracking is done automatically by technologies such as AR or RFID (Baglio et al., 2024; Elibal et al., 2021). Information security is constantly monitored (Proença and Borbinha, 2018).

Finally, the Optimizing level, where information sharing is done without hinders (Anggoro et al., 2018; Baglio et al., 2024; Oleśków-szłapka, 2019) throughout the entire SC with shared forecasts and continuous improvement (Baglio et al., 2024). Tracking is done with a wide range of Logistic 4.0 technologies (Baglio et al., 2024; Elibal et al., 2021). High level of security (Anggoro et al., 2018) which is continuously improved (Proença and Borbinha, 2018) aligning with *Table 4.1*.

Table 4.7: *Developed MM levels for the information systems-element.*

| Level | Description information system-element |
|---|---|
| Initial | Manual tracking; Limited data integration; No information security. |
| Managed | Manual tracking is added to software; Some data integration; Planning for information security. |
| Defined | Daily location updates; Partial data integration; Implementing information security. |
| Quantitatively | Automatic tracking; Full data integration; Monitored information security |
| Optimizing | Automatic tracking with Logistics 4.0; Problem free data integration; Continuously improved High level of security. |

### *4.3.5 Flexibility and Adaptation*

The CSFs of flexibility and adaptation lies in the need for responsiveness and capability to handle short-term and long-term disruptions. Auezzoul (2014) and Narkhede et al. (2017) supports this, characterising the CSFs by the 3PL providers ability to meet future demands, expand with their clients, adapt their systems, respond to market needs and service requests, handle specific business

requirements and deliver timely responses. Fischer et al. (2016) created a MM for SC Flexibility, its levels is defined as:

1. Flexibility is of no concern.
2. Flexibility is only used intra-firm.
3. SC is able to react flexibly. No planning of flexibility ahead of time.
4. Structured preparation and utilization of flexibility potentials. Flexibility is managed proactively.
5. End-to-end flexibility planning.

Moreover, Wadhwa and Rao (2002) developed a MM of general organisational flexibility. There levels summarized:

0. Awareness of flexibility
1. Ability to identify and measure different types of flexibility in a current system and understand how they affect its performance.
2. Ability to use already existing flexibility to handle changing requirements
3. Ability to plan and control the available flexibility to sustain system performance.
4. Ability to actively shape flexibility needs by planning and controlling both internal and external factors. Instead of just reacting to changes, it aims to prevent issues and align available flexibility with future requirements.
5. Proactively managing flexibility to enhance agility within an organization. It focuses on using flexibility in a way that allows the organization to quickly adapt to changing conditions, making agility a key competitive advantage for survival and growth.

(6.) Potential future level where Flexibility of Flexibility is used.

Hertz and Alfredsson (2003) four segments as described in the MM-levels for the service, cost and relationship elements are developed based on the 3PL providers adaptability. They illustrate these four segments, seen in *Figure 4.2,* which highlights that a fundamental concept of 3PL is its ability to adapt, compared to other company types in similar fields. Therefore, the levels of flexibility and adaptation should have higher requirements compared to models for other types of firms.

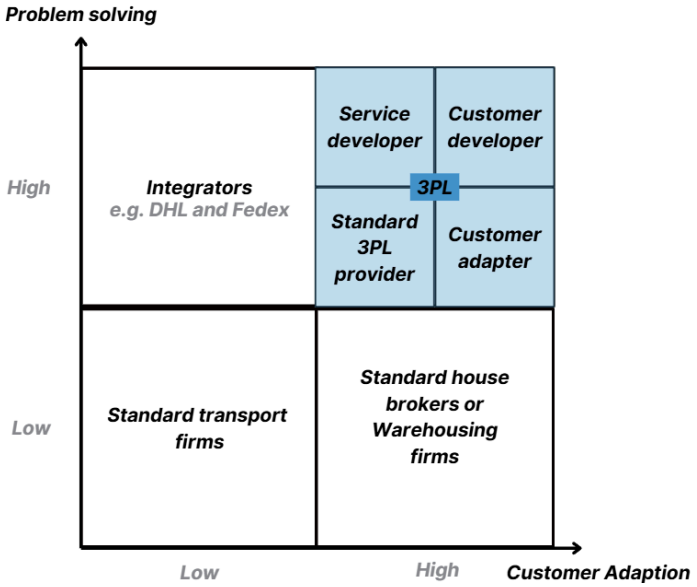


Figure 4.2: *Problem-solving abilities of 3PL firms (Hertz and Alfredsson, 2003).*

The Initial level of the presented MM for the flexibility and adaptation-element, seen in *Table 4.8,* should include an awareness and ability to identify and measure flexibility within the company (Wadhwa and Rao, 2002). Flexibility exists, but it may not be utilized or planned for (Cubo et al.,

2021; Fischer et al., 2016). This could fit with some 3PL providers in the *standard 3PL provider* category since these 3PL services are described as an activity alongside the company's main business operations. At this stage, forecasting is often made manually based on previous demand patterns (Elibal et al., 2021).

At the Managed level, flexibility is only used within the company (Fischer et al., 2016), meaning it is applied to specific work processes. Organizations at this stage can adapt to challenges when needed but do not have a clear strategy for managing flexibility (Wadhwa and Rao, 2002). Forecasts are made with technology-tools based on previous demand (Elibal et al., 2021).

3PLs at the Defined level begin to plan and structure their flexibility. There is an emphasis on proactively managing flexibility by preparing for it ahead of time (Wadhwa and Rao, 2002), which enables better response to changes. This includes creating mechanisms to address flexibility in processes and interactions within the firm and among business units. Forecasts are made with time series techniques (Elibal et al., 2021).

At the Quantitatively level, flexibility is not just a reactive response but is actively shaped to align with both internal and external changes. Organizations take a proactive approach to ensure flexibility is aligned with future requirements. Strategic flexibility is cultivated to address a wide range of challenges and agility becomes a key focus for organizational survival and growth (Wadhwa and Rao, 2002). Forecasts are made with mathematical models including a lot of parameters (Elibal et al., 2021).

At the Optimizing level, organizations extend flexibility beyond the firm to their entire value network or ecosystem. Flexibility is managed not only internally but also with suppliers, partners and external stakeholders. The goal is to create an agile, responsive system that spans all business partners and operations, aligning flexibility across the entire network. Forecasts are made with machine learning and AI (Elibal et al., 2021). This would connect to the *customer developer* categorization meaning market leading customizability *(Hertz and Alfredsson, 2003)*.

Table 4.8: *Developed MM levels for the flexibility and adaptation-element.*

| **Level** | **Description flexibility and adaptation-element** |
|---|---|
| Initial | Can identify and measure flexibility within the company; Flexibility may not be utilized or planned for; Manually forecasts. |
| Managed | Flexibility is applied to specific work processes; Can adapt to challenges when needed but lack a strategy; Uses technology for forecasts. |
| Defined | Proactively managing flexibility; Forecasts are made with time series techniques. |
| Quantitatively | Strategic flexibility to a wide range of challenges; Agility a key focus for survival and growth; Forecasts based on mathematical models. |
| Optimizing | Flexibility beyond the firm across the entire network; Goal is to create an agile, responsive system; Forecasts with machine learning and AI. |

### 4.3.6 Quality

The literature review in *Chapter 3.5* describes Quality as a strategy for 3PL providers to get an edge over competitors and enhance the value they deliver to their customers. This is also supported by Auezzoul (2014) and Narkhede et al. (2017) which addresses quality as the commitment to ongoing improvement, use of ISO standards, environmental considerations and risk management.

The Initial level could be defined as commitment to improvements relies on individuals and ISO standards are not used or understood. This aligns with the first level of the SC quality management MM by Cubo et al. (2021), where performance measurement is limited and quality tools and practices are rarely used. Moreover, the company does not prioritize sustainability (Cubo et al., 2021; Ormazabal et al., 2017). There are no activities aimed at identifying risks and due to the occurrence of undesired events, deliveries are executed in a chaotic manner (Tubis and Werbińska-Wojciechowska, 2021) such as delays, errors or customer dissatisfaction. This may be one of the reasons why 3PL service quality at this level is described as low (Cubo et al., 2021; Qiao and Zhao, 2008).

Next, at the Managed level, assessment and management of risks become integrated into the organization (Tubis and Werbińska-Wojciechowska, 2021; Proença and Borbinha, 2018). Services offered are made with good quality (Qiao and Zhao, 2008). However, customer satisfaction experience no notable progress (Cubo et al., 2021). Sustainability concerns start to emerge and a few practices are put into place (Cubo et al., 2021; Ormazabal et al., 2017). The general description for this level suggests that the 3PL provider has some awareness of ISO standards, but implementation is inconsistent.

The Defined level uses a standardized work process that aligns with significant improvements in customer satisfaction reported by Cubo et al. (2021). Since *Table 4.1* also characterizes this stage as having well-defined and documented processes, it is reasonable to assume that risk management has started to implement a risk treatment plan (Tubis and Werbińska-Wojciechowska, 2021; Proença and Borbinha, 2018). Additionally, some ISO standards are likely adopted, introducing formalized processes. Sustainability issues are handled to improve the company's reputation with society and stakeholders (Cubo et al., 2021; Ormazabal et al., 2017).

Further, at the Quantitatively level, the organization regularly uses quality tools and continuous improvement practices, including preventive actions, which result in improved customer satisfaction (Cubo et al., 2021). Risk assessment and management procedures have been put into practice in the entirety of the logistics system (Tubis and Werbińska-Wojciechowska, 2021). While sustainability is an important issue for the company, it is not yet a part of the company's overall goals (Cubo et al., 2021; Ormazabal et al., 2017). Corresponding well with the characteristics described in *Table 4.1* suggesting that some certification is achieved and additional standards are considered.

Optimizing level uses continuous improvement as a key part of the company culture, with quality practices used regularly (Cubo et al., 2021). This also implies that ISO standards are not just used because it is required by law but a core part of the 3PL provider competitive strategy. Sustainability is part of the company’s policy and vision, with clear goals and actions in place (Cubo et al., 2021; Ormazabal et al., 2017). Full use of supply risk management tools in logistics, with ongoing improvements based on risk assessments. The risk management system is aligned with the company’s main goals and strategy (Tubis and Werbińska-Wojciechowska, 2021). The description of each level of the quality-element can be found in *Table 4.9*.

Table 4.9: *Developed MM levels for the quality-element*.

| Level | Description quality-element |
|---|---|
| Initial | Performance measurement is limited; Quality tools and practices are rarely used; Quality is low. |
| Managed | Some basic risk assessment; Customer satisfaction is low; Few sustainability practices; ISO standards are inconsistently applied. |
| Defined | Risk treatment plan; Good customer satisfaction; Sustainability issues are addressed; Some ISO standards are followed. |
| Quantitatively | Regularly uses quality tools and continuous improvement practices; Risk management is systematically applied; Sustainability is an important issue; Additional ISO standards are considered. |
| Optimizing | Quality practices are fully embedded across all processes; Risk management and sustainability is part company's policy and vision; ISO standards is a core part of the strategy. |

### *4.3.7 Technology and Automation*

*A*dvanced technology and automation serve as a way for 3PL to stay competitive, as it eases the investment burden on its customers. This is further supported by Auezzoul (2014) and partly supported by Narkhede et al. (2017). Baglio et al. (2024) research article about Logistics 4.0 technologies in the 3PL industry uses a four level MM to describe the development of technology and automation, summarized as:

1. No specific use of technology and automation.
2. Technology and automation is used for monitoring and optimizing day-to-day activities. Logistics 4.0 is part of strategy but not priority.
3. Technology and automation is used to increase productivity. Logistics 4.0 is highly supported.
4. Technology and automation is used to fully control physical flow. Logistics 4.0 is the main strategic driver.

Based on only it having four levels, Level 2 is divided into two parts: the monitoring aspect is introduced at the Managed level, where tracking begins, while the optimization aspect is placed at the Defined level, as this stage involves standardized processes applied across all projects. This partition is supported by Machado and Rodriguez (2025) and their MM of Logistics 5.0. When analyzing specific technologies different sources place them on different maturity levels. A collection of MMs made by Baglio et al. (2024), Elibal et al. (2021), Machado and Rodriguez (2025), Tubis et al. (2024) and Werner-Lewandowska and Kosacka-Olejnik, (2018) is seen in *Figure 4.3*. Based on the discussed models and descriptions, a compilation for this framework has been developed.

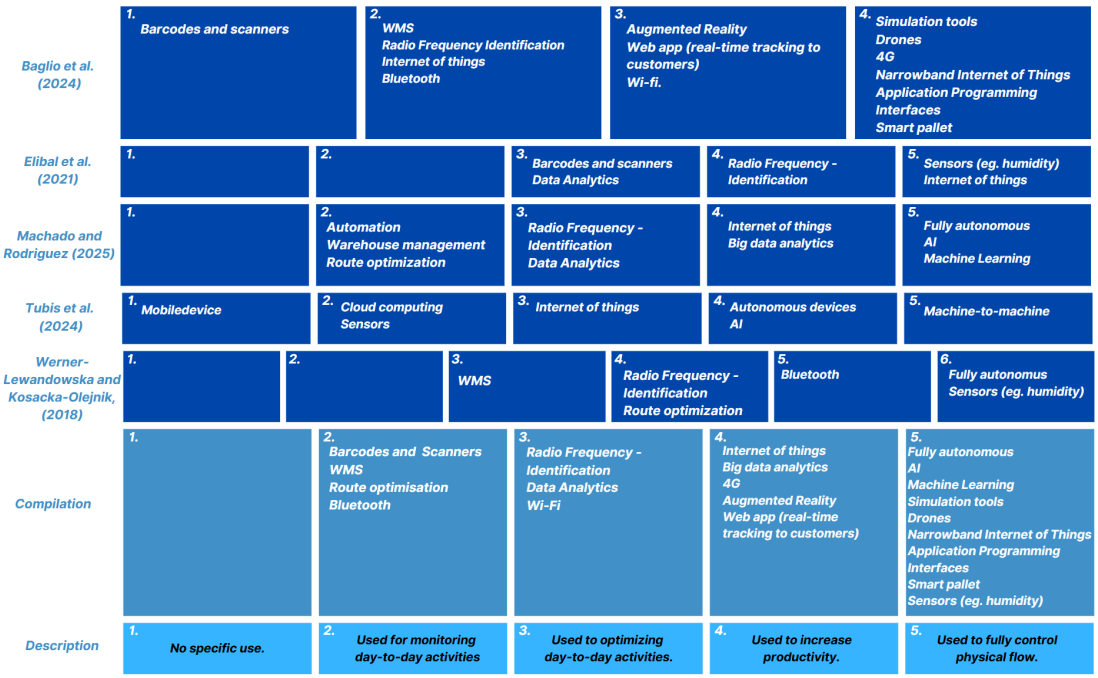


Figure 4.3: *Technical solutions used for different MM in logistics.*

The final compilation of used technical solutions as well as a description of what the technology and automation is used for is presented in *Table 4.10.*

Table 4.10: *Developed MM levels for the technology and automation-element.*

| Level | Description technology and automation-element |
|---|---|
| Initial | No specific use; Manuell process |
| Managed | Used for monitoring day-to-day activities; e.g. WMS, Barcodes and Scanners. |
| Defined | Used to optimizing day-to-day activities; e.g. RFID and data analytics. |
| Quantitatively | Used to increase productivity; e.g. IoT and AR |
| Optimizing | Used to fully control physical flow; Fully autonomous; e.g. AI, SP and sensors. |

### *4.3.8 Expertise of Employees*

Expertise of employees play a significant role in both operational and financial success for a 3PL provider. Which is partly supported by the findings of Auezzoul (2014) and Narkhede et al. (2017). Quantifying knowledge is a complex task, particularly within the field of logistics where expertise is often developed through a combination of theoretical understanding and practical experience. Current research on levels of expertise in logistics is relatively limited, making it difficult to establish a unified framework. When considering the skills and knowledge required for logistics professionals to perform their roles effectively, studies suggest that at least 68 distinct competencies may be relevant (Thai et al., 2011). Zhao et al. (2023) created a competency framework of logistics management majors. Although this might not be fully applicable on the knowledge needed for a 3PL company it might give a guideline for how competence in general develops. The level of their framework can be summarized as:

1. Non or minilam understanding of logistics.
2. Master basic knowledge, principles, methods and technologies necessary for logistics management and form the overall knowledge structure. Have a certain sense of innovation, understand the domestic and foreign logistics research status and the latest development.
3. Have the basic ability to analyze and solve the problems of logistics management by applying the theories and technical means of logistics management. Ability to think critically and innovate, to identify, discriminate, question and evaluate phenomena and problems in the profession and related fields and to express personal opinions.
4. Ability to systematically analyze complex problems in the field of logistics by applying the knowledge and principles of mathematics, management, economics and logistics. Have the ability to explore, innovate and start their own business.
5. Have the ability to track the cutting-edge technology of logistics management and solve complex problems in the logistics field such as SC management, logistics system optimization and operation management. Creative thinking methods to carry out scientific research and employment and entrepreneurship practice innovation ability. Can adapt to the changes of society and industry through lifelong learning, to achieve career development.

Abdollahzadeh et al. (2024) made a MM for human resource development based on employee maturity capabilities in knowledge-based companies. This could be somewhat translated to 3PL since their core business is logistics which is highly knowledge based. Their framework is summarized as:

1. Employees are familiarized with their job description, to foster alignment in their activities.
2. Employees' awareness of their own responsibilities, to human resource development. Training in the form of coaching and mentoring.
3. Competency frameworks in management and hire skilled managers to enhance technical competency. Having individual competency and meritocracy in appointments.
4. Specialized employee empowerment. Self-managed teams within the organization and implementing coaching and organizational capability management programs.
5. Increasing employee creativity in assigned tasks. Aligning employees with organizational goals.

For the Initial level of the thesis model, employees lack competence in logistics (Oleśków-szłapka, 2019; Zhao et al., 2023). Aligning with the description of chaotic projects described in *Table 4.1*, where success depends on individuals rather than established processes.

For the Managed level, basic employee training is in place (Abdollahzadeh et al., 2024). This aligns with the description in *Table 4.1*, which emphasizes that success is ensured through repeatable processes. The table also notes that basic management practices are established, supporting the idea that employees master basic knowledge in logistics management (Zhao et al., 2023).

Further, companies at the Defined level use models of managerial competence (Abdollahzadeh et al., 2024), which aligns with employees ability to apply logistics management theories and methods to analyze and solve problems (Zhao et al., 2023). This corresponds with the well-defined, standardized processes described in *Table 4.1*.

At the Quantitatively level, companies empower employees through self-managed teams, coaching programs and advanced development techniques (Abdollahzadeh et al., 2024). These practices enable employees to systematically analyze and solve complex logistics problems (Zhao et al., 2023). This ties into the focus on using measurement and control techniques to ensure quality and continuous improvement, as outlined in *Table 4.1*.

For the Optimized level, organizations fully utilize the knowledge and experience of logistics staff, along with external information from supply chain partners (Tubis and Werbińska-Wojciechowska,

2021). Employees are aligned with company goals (Zhao et al., 2023), leading the industry with innovative and efficient logistics solutions, as described in *Table 4.1*.

The combination of the two found maturity models cross-compared with the outline of levels in *Table 4.1* are summarized in *Table 4.11*.

Table 4.11: *Developed MM levels for the expertise of employees-element.*

| Level | Description expertise of employees-element |
|---|---|
| Initial | Employees lack competence in logistics. |
| Managed | Basic employee training; Basic knowledge in logistics. |
| Defined | Use models of managerial competence; Knowledge to analyze and solve logistics problems. |
| Quantitatively | Employee empowerment; Systematically analyze and solve complex logistics problems. |
| Optimizing | Fully utilize knowledge and experience; Logistics excellence. |

### *4.3.9 Financial Performance*

Financial Performance was not identified as a CSF in the literature review conducted in this thesis. However, since both Auezzoul (2014) and Narkhede et al. (2017) highlight its importance, it has been included in the developed framework. They both describe that strong financial performance enables 3PL providers to maintain uninterrupted service and continuously invest in equipment and service upgrades. In support of this, self-assessment tools provided by the American and United Kingdom's governments (Bureau of the Fiscal Service, 2024; National Audit Office, 2012) allow companies to evaluate their financial maturity. The maturity levels outlined in these tools, together with the comprehensive Logistics 4.0 maturity model developed by Elibal et al. (2021) and the descriptions provided in *Table 4.1,* form the foundation for the intersections related to financial performance, summarized in *Table 4.12*.

For the Initial level financial performance is unstable, with limited resources allocated for service continuity or equipment upgrades (Elibal et al, 2021). Logistics operations may face disruptions due to financial constraints (Bureau of the Fiscal Service, 2024; National Audit Office, 2012).

At the Managed level, financial performance is stable enough to maintain regular operations (Bureau of the Fiscal Service, 2024; National Audit Office, 2012). While upgrades and service improvements are initiated, they may not be consistent or fully planned (Bureau of the Fiscal Service, 2024; Elibal et al, 2021).

At the Defined level financial performance is solid, ensuring service continuity and scheduled upgrades to equipment and services. Resources are allocated to meet the standard needs of logistics operations, with a focus on efficiency (Bureau of the Fiscal Service, 2024; Elibal et al, 2021; National Audit Office, 2012).

Further, at the Quantitatively level, financial performance is tracked using precise metrics, ensuring consistent service quality and ongoing improvements to equipment and services. Investments are made to optimize logistics operations based on data-driven insights (Bureau of the Fiscal Service, 2024; Elibal et al, 2021; National Audit Office, 2012).

Lastly, at the Optimizing level, financial performance is strong and continually growing, allowing for sustained, proactive upgrades to equipment, services and infrastructure. This enables the 3PL to maintain industry-leading logistics solutions with minimal disruption and maximum efficiency (Bureau of the Fiscal Service, 2024; Elibal et al, 2021; National Audit Office, 2012).

Table 4.12: *Developed MM levels for the financial performance-element.*

| Level | Description financial performance-element |
|---|---|
| Initial | Unstable financial performance with limited funding for continuity or upgrades. |
| Managed | Financially stable enough for daily operations, but improvements are inconsistent. |
| Defined | Reliable financial performance supporting planned upgrades and operational efficiency. |
| Quantitatively | Financial performance is measured and optimized through data-driven decisions. |
| Optimizing | Strong and growing financial performance enabling continuous investment and innovation. |

### *4.3.10 Delivery*

The final element of the developed MM is delivery. This was not identified as a CSF in the literature review conducted for this thesis but it is supported by several sources referenced in the reviews by Auezzoul (2014) and Narkhede et al. (2017). It is represented by attributes such as delivery speed and accuracy. The levels of the delivery element can be described as follows and are largely based on the 3PL-SCMM developed by Qiao and Zhao (2008).

At the Initial level, the logistics service is basic and unreliable. The percentage of damaged goods is high (Qiao and Zhao, 2008). Information about deliveries is transmitted manually (Asdecker and Felch, 2018) increasing the risk of missed deliveries and errors. There is little to no integration between systems and operations are fragmented (Asdecker and Felch, 2018). Aligning with the first level of Baglio et al. (2024) four MM-levels of Logistics 4.0 technologies for 3PL.

At the Managed level, the logistics service improves significantly. The order is delivered complete, on time, at the correct location and in perfect condition. Documentation is accurate and complete, ensuring smooth operations (Qiao and Zhao, 2008). The system is fully digital, with integrated software to streamline operations (Asdecker and Felch, 2018).

For the Defined level, company-specific data such as delivery dates and delivery history are utilized to improve shipping processes (Asdecker and Felch, 2018; Baglio et al., 2024). However, while the process is defined and structured, the 3PL lacks flexibility and is unable to meet individualized customer demands or handle unusual requests effectively (Qiao and Zhao, 2008).

Further, at the Quantitatively level the 3PL provider is able to handle emergency situations and sensitive customer needs effectively. The ability to respond to customer dissatisfaction and manage situations like product recalls in a timely manner is well-established (Qiao and Zhao, 2008). Additionally, the 3PL uses automated real-time order management systems and can customize deliveries, including route preferences (Asdecker and Felch, 2018; Baglio et al., 2024).

Finally at the highest maturity level, the 3PL can provide highly customized logistics services, responding to individual customer demands. The ability to manage materials and enhance operational flexibility ensures that the logistics service is continuously improving and can handle complex and dynamic customer needs (Qiao and Zhao, 2008). The 3PL also integrates real-time simulation for decision-making, allowing for efficient order grouping and optimized shipping routes (Asdecker and Felch, 2018; Baglio et al., 2024). These attributes are then summarized in *Table 4.13* below.

Table 4.13: *Developed MM levels for the delivery-element*.

| Level | Description delivery-element |
|---|---|
| Initial | High product damage rate; Manual transmission of delivery information; Delivery errors and missed shipments. |
| Managed | Complete, on-time and accurate deliveries; Fully digitalized order management systems; Wide integration of enterprise systems. |
| Defined | Uses company-specific data to improve shipping processes; Unable to meet individualized customer demands. |
| Quantitatively | Ability to handle emergencies and customer dissatisfaction; Automated real-time order systems; Delivery customization. |
| Optimizing | Highly customized services for individual customer demands; Real-time simulation for decision-making. |

## 4.4 Evaluation of Developed Maturity Model

The MM levels developed in *Section 4.1.2* are assembled into a fully developed model and found in *Appendix C*. It uses the same color scheme as *Table 4.3* to represent the importance of each element. To ensure validity of the model, interviews were used.

### *4.4.1 Elements*

Quotes that strengthen the MM-elements and CSF of 3PL are found in *Appendix D*. Although the interview questions did not directly refer to the MM elements, most of them were still brought up by the interviewees, indicating their practical relevance for this case study.

**Service**
The Service element was clearly validated through the interviews. *Interviewee A* emphasized that service is one of the most important factors in 3PL success. *Interviewee B,* who works at a successful 3PL firm, highlights both the importance of a broad service offering and the ability to customize solutions, key aspects of service maturity in a 3PL context.

**Relationship**
The Relationship element was not emphasized in the interviews to the same extent as the Service element. *Interviewee F* did mention the importance of staying close to their customers. However, this referred more to the group's relationship with its external end-customers, rather than to relationships within the potential 3PL setup. Notably, none of the interviewees explicitly discussed the nature of the relationship between the 3PL provider and its internal logistics customers. One possible explanation is that the analysed 3PL function is internal to the group and all member companies already operate on a foundation of established trust. Therefore, the relationship element may be less visible or taken for granted in this specific context.

**Cost**
The Cost element refers to maintaining a balance between cost leadership and a strong value proposition. *Interviewee G* emphasized the importance of achieving this balance. Additionally, two other interviewees described cost as one of the most important factors for 3PL success, highlighting its central role in decision making and competitiveness.

**Information systems**
The Information systems elements are validated by *Interviewee B*, who emphasized its relevance in several parts of the conversation. *B* describes their company's competitive advantage as a 3PL provider by owning their own business systems. They also highlighted that increased transparency and higher levels of information sharing with customers are clear benefits. *Interviewee F* further supported this view by stating that a successful 3PL solution requires robust system support and daily communication. Moreover, based on previous implementations of similar solutions in their career, *F* identified communication and technology as key success factors.

**Flexibility and adaptation**
The Flexibility and Adaptation element was not explicitly discussed in the context of 3PL. However, both interviewed group companies, *Interviewee D* and *F*, emphasized that a important part of their current value proposition is the ability to flexibly respond to customer requests. They also expressed concerns that this level of flexibility might be difficult to maintain if a 3PL solution were to be implemented. This suggests that flexibility and adaptability will be important factors to consider in the design and execution of the 3PL setup.

**Quality**
*Interviewee E* stated that Quality is one of the most important success factors of 3PL. *Interviewee B* describes that their 3PL company constantly works with improving quality. Among others, they make sure that all their workers are recruited, employed and trained by themselves to ensure quality.

**Technology and Automation**
Technology and Automation were recurring themes across multiple interviews. *Interviewee B*, when asked about the reasons behind their 3PL company's market success, responded: *"We have automated and digitized processes where others are still working manually"*. Further *Interviewee F* said that technology is one of the CSF of 3PL.

**Expertise of Employees**
Expertise of Employees was a recurring theme across most of the interviewees. *A, B* and *F* each highlighted employee competence as the most CSF for 3PL. They argued that with skilled and engaged personnel, most challenges can be effectively managed. As previously described, *F* emphasized that all personnel and their related management, such as recruitment, training and direct employment, are kept in-house to ensure that every employee possesses the necessary knowledge.

**Financial performance**
Even though the cost perspective and what to prioritize regarding budgets and cost posts were discussed in the interviews no one brought up the need for Financial performance. *Interviewee G* briefly touches on the topic by discussing the need to make a profit and get a return on their investments. However, the need for Financial performance in general is not validated by the interviewees.

**Delivery**
Both interviewed group companies, *Interviewee D* and *F,* describe the speed and delivery flexibility of their deliveries as of high importance by their customer. This need for speedy and correct deliveries in logistics is reconnected to specifically 3PL by *Interviewee B* that highlights that their delivery performance is important to stay competitive.

### 4.4.2 Levels

In the search for feedback on how well the levels correspond to reality, an expert within logistics and transport was interviewed, *Interviewee L*. The feedback was mainly focusing on consistency across levels and keeping a clearity in descriptions. The first being that the Initial level should keep the word *limited* as a recurring theme, this change can be seen in *Figure 4.4*. All elements that did not include the word were changed except for flexibility and adaptation as it is of higher expectations for this element as prior stated. All changes were made so that the original meaning was still intact.

| | Initial | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Service | Relationship | Cost | Information system | Flexibility & Adaptation | Quality | Technology and automation | Expertise of Employees | Financial performance | Delivery |
| Original | Limited offerings; Small-scale; Isolated services; Low quality | Minimal trust; Performance -based; Price-driven; Vendor relationship | Unclear pricing; Bad cost control; Inconsistent cost reduction | Manual tracking; Limited data integration; No information security | Can identify and measure flexibility within the company; Flexibility may not be utilized or planned for; Manually forecasts | Performance measurement is limited; Quality tools and practices are rarely used; Quality is low | No specific use; Manuell process | Employees lack competence in logistics | Unstable financial performance with limited funding for continuity or upgrades | High product damage rate; Manual transmission of delivery information; Delivery errors and missed shipments |
| Updated after feedback | Limited offerings; Small-scale; Isolated services; Low quality | Limited trust; Performance -based; Price-driven; Vendor relationship | Unclear pricing; Limited cost control; Inconsistent cost reduction | Manual tracking; Limited data integration; No information security | Can identify and measure flexibility within the company; Flexibility may not be utilized or planned for; Manually forecasts | Limited performance measurement ; Quality tools and practices are rarely used; Quality is low | Limited use; Manuell process | Limited competence in logistics among employees | Unstable financial performance with limited funding for continuity or upgrades | High product damage rate; Limited and manual transmission of delivery information; Delivery errors and missed shipments |

Figure 4.4: *Change for consistency in the initial level.*

*Interviewee L* agreed that the order of the elements could be changed as some of them might affect each other or it could be grouped into similarities. However, after some discussion it was claimed that the order of elements can be kept, as it builds on the logic of how often it is mentioned in literature. The color-schemed weighing should be excluded as the number of reviews that mentioned the element does not necessarily mean that it is less important, just that the reviews focus on different areas. Therefore, the updated model will have the neutral color for each element.

*Interviewee L* comments that all levels for some of the elements do not include every subject as seen in *Figure 4.5*. Here the flexibility and adaptation element is analyzed, the green text shows descriptions of where the focus of flexibility is placed. As seen, the Defined level does not specifically say where the focus is placed. According to *L*, this may be confusing due to the lack of consistency. However, *L* also emphasizes that this inconsistency is not necessarily problematic, as improvements do not always occur in a step-by-step manner, but can come in waves.

| | Initial | Managed | Defined | Quantitatvely | Optimizing |
|---|---|---|---|---|---|
| Flexibility & Adaptation | Can identify and measure flexibility within the company; Flexibility may not be utilized or planned for; Manually forecasts | Flexibility is applied to specific work processes; Can adapt to challenges when needed but lack a strategy; Uses technology for forecasts | Proactively managing flexibility; Forecasts are made with time series techniques | Strategic flexibility to a wide range of challenges; Agility a key focus for survival and growth; Forecasts based on mathematical models | Flexibility beyond the firm across the entire network; Goal is to create an agile, responsive system; Forecasts with machine learning and AI |

Figure 4.5: *Flexibility and adaptation element with inconsistencies in focus.*

The same is stated regarding the cost element, as it develops from a functional focus to a value focus. *L* sees that there is not an absurdity in that type of change, but then the idea of cost leadership is a bit misleading, where there is not necessarily a focus that every 3PL company strives to achieve but

rather one of multiple strategies, as supported by literature (Chen and Karia, 2024). Regarding the same element, *L* suggests that the term *"shared reward"* should be clarified as a joint evaluation of total cost of ownership, to reduce the risk of misunderstandings. These changes can be seen in *Figure 4.6*.

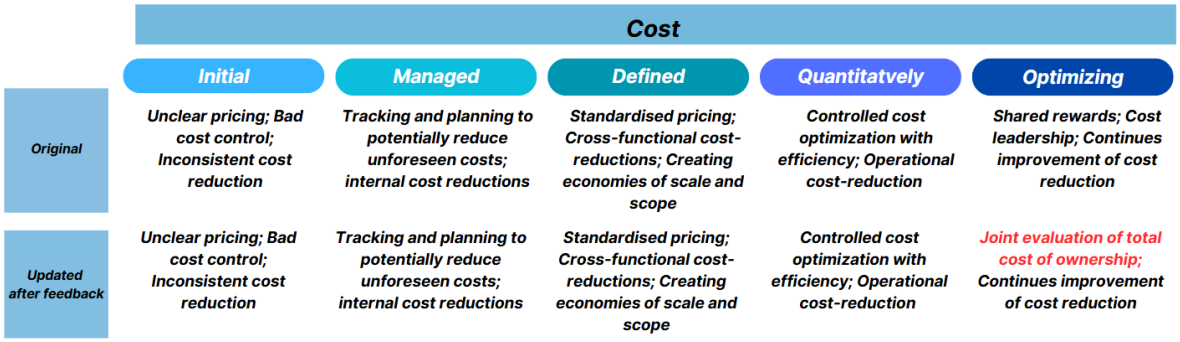


Figure 4.6: *Changes for the cost element.*

Beside the suggestions mentioned, *L* recommended adding full data integration in the Optimizing level of the information system element. Changing it from *"Problem free data integration"* to *"Problem free full data integration"*. At the same level *L* suggests changing *"Full integration"* to *"Maximal trust"* for the relationship element. An updated MM can be found in *Appendix E*. Further *L* recommend comparing the developed 3PL-MM against the studies of Berglund (2000) and Bask (1997). *L* suggests that the 3PL-MM could be a good complement to the strategic division of 3PL as described by Berglund (2000). The findings in Bask (1997) study of 3PL development projects in Finland indicate that the progression of these projects aligns well with the proposed levels, supporting their relevance and applicability in practice. The projects described can be seen in *Table 4.14*.

Table 4.14: *Development projects of seven 3PL service providers in Finland. 28 projects in total (Bask, 1997).*

| Development projects | No. of projects | Characteristics |
|---|---|---|
| Change in marketing activities | 6 | - Repositioning of strategy<br>- Reorganizing of services<br>- Improvement in efficiency and profit |
| Standardisation (ISO) | 7 | - Documentation of operations<br>- ISO certification |
| Information system | 7 | - Integration of information<br>- Technology upgrade |
| Organization, training | 2 | - Teamwork<br>- Cooperation between division |
| Service packaging | 2 | - Branding of services<br>- Bundling, pricing and marketing |
| Terminal operations | 2 | - Reorganization of operations<br>- HUB, cost efficient material flow |
| Environment | 1 | - Awareness of environmental issues<br>- Environmentally friendly trucking |

| | | |
|---|---|---|
| Business process Reengineering | 1 | - Definition of processes<br>- Radical change in process activities<br>- Efficiency and satisfied customers |

# 5. Empirical Data

*This chapter presents the empirical data collected for the study, serving as the foundation for analysis and conclusions. It includes cost model development and interview compilations. By providing a structured overview of the obtained information, this chapter enables a deeper understanding of how theoretical concepts apply in practice.*

## 5.1 Developing Cost Models

To better understand the current set up in GW and assess potential benefits of 3PL regarding costs and pricing models, two cost models were developed, see *Table 5.1*. Given the many variables influencing these cost models, the calculations are based on a number of assumptions. Each model will present the assumptions connected to it.

Table 5.1: *Description of cost models*.

| Model | Time perspective | Purpose | Approach |
|---|---|---|---|
| 1 | Present | Provide an indicative price for the 3PL service and compare it with the 12% markup. This analysis will also highlight any potential unfairness in the current cost model. | Estimate the costs related to logistics operations at GW and assess how these would be carried by companies today |
| 2 | Future | Identify potential cost-saving opportunities associated with implementing the 3PL solution | Study how one of the group companies, referred to as Company A, total logistics cost changes when all their products sold to customers in Sweden are routed through GW. |

### *5.1.1 Cost Structure Explained*

To easier understand how the models are developed and why certain costs are in- or excluded, it is necessary to explain general billing and cost allocation structure across the group. This information is provided by *Interviewee G*, as a part of their interview, but confirmed by multiple of the other interviewees.

Lindab group employs a cost-plus model for internal pricing, where product prices are set through markups, principally dependent on if the product is produced or traded. Traded products have a markup of 11-12%, while produced have higher. This is used on every transaction across the company group and calculated to cover expenses related to the product and desired profit margin. A significant share of these expenses are related to logistics, but the exact amount has not been quantified.

In regards to the Swedish market, when a company within the group sends a delivery to Lindab Sweden, they have freight collect, meaning Lindab Sweden pays for the transport. The TC is not included in the 12% markup and therefore not considered in the first analysis.

## 5.2 Model 1

Lindab aims to estimate the costs associated with providing the 3PL service and propose a preliminary pricing model for its users. To support this analysis, a number of initial assumptions have been made:

- Lindab Logistics will take over GW operations and separate logistics from Lindab Ventilation, meaning the model will focus on costs linked to Lindab Ventilation's logistics activities at GW.

- The data, such as sales or procurement data is provided in transactions and will thus serve as the primary unit of measurement. A transaction includes one type of product but can contain multiple units in quantity. An order consists of one or more transactions. It is assumed that the total number of transactions gathered for 2024 is representative.

- For the 3PL solution, companies will have full ownership of their inventory and be responsible for tied-up capital and the risks associated with storing their products. IC is therefore not a parameter that will be included in this scenario. Thus, the data considers the warehousing costs, including RC and $HC_{hand}$.

While the total warehousing cost for operating GW has been determined, it cannot be disclosed. However, the cost distribution between RC and $HC_{hand}$ can be presented as 24% and 76% respectively, see *Figure 5.1*. For RC, Lindab currently leases their facility and pays monthly leasing fees that includes all necessary utilities and systems to run it. $HC_{hand}$ is roughly three times bigger than RC and will have a larger impact on each company's cost. The majority of $HC_{hand}$ comes from labor connected to warehouse operations and administrative tasks.

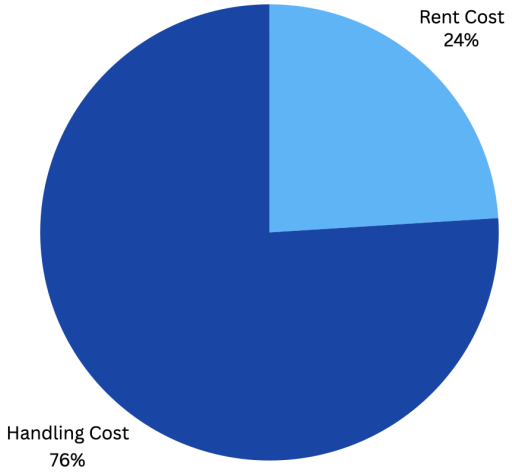


*Figure 5.1*: Current cost distribution between RC and $HC_{hand}$ at GW.

GW hosts and distributes products from 158 companies and they all vary greatly in how much they sell. To visually present the results effectively it has been decided to take out the 19 largest companies by share of total sales and then merge the rest of the 139 companies into one, see *Table 5.2*. The 19 companies are arranged after their share of total sales. Together they make up for over 95% of the total sales shares, which is considered sufficient enough to represent the current situation. Company 1, 4 and 7 have been revealed due their relevance of this analysis. Note that Company 20 represents 139 companies and its presented numbers reflect the average across these companies. When company numbers 1-20 are presented in figures in the following sections, it corresponds to the numbers in *Table 5.2*.

Table 5.2: *Company number*.

| Number | Company |
|---|---|
| 1 | Lindab Ventilation |
| … | |
| 4 | Company A |
| ... | |
| 7 | Company B |
| … | |
| 20 | 139 Companies merged |

### *5.2.1 Rent Cost*

When allocating RC each company carries the cost proportionate to its warehousing utilization rate. Based on data of products in GW the total current utilization is about 58%, see *Figure 5.2*. Given a 15% buffer, the free space is estimated to be at least 25% before reaching optimal capacity, indicating costs related to the warehouse can be allocated on more products, reducing the total cost. Only the total utilization is showcased in *Figure 5.2*, but each company's individual utilization rate has been determined for the calculation.

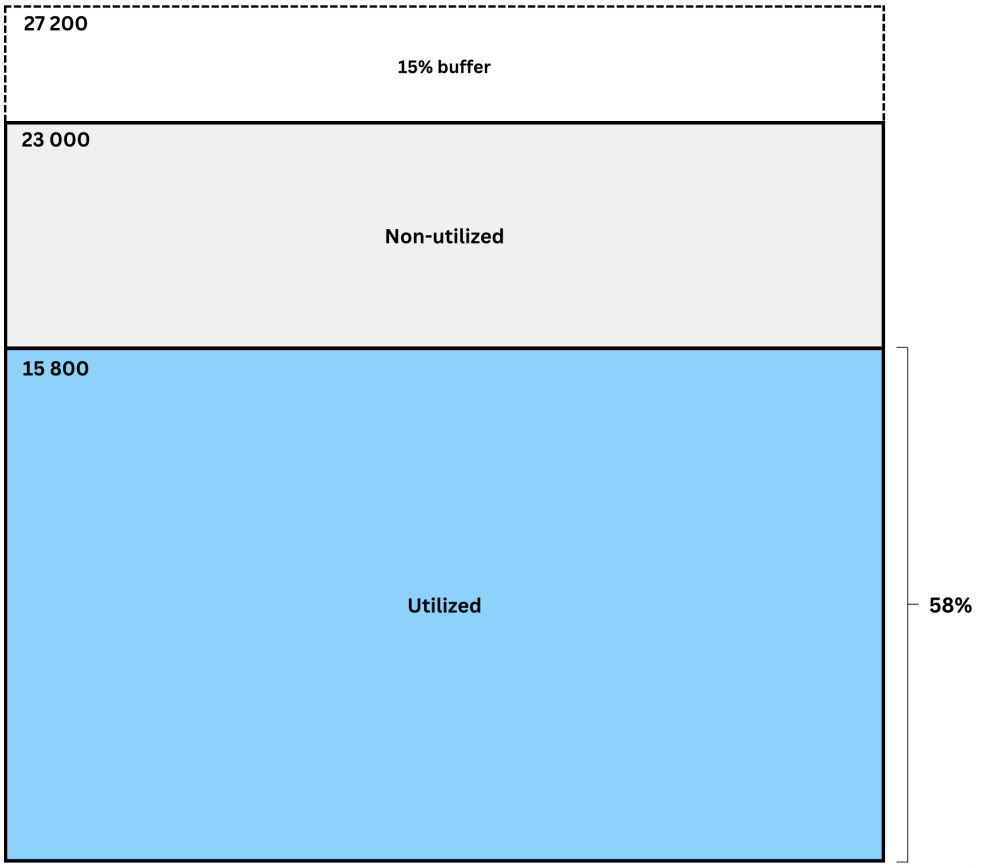


Figure 5.2: *Warehouse utilization at GW.*

Together all the companies make up 58% of the space, which will not allocate all RC. The entire RC must be distributed and the utilization will therefore be modified so that the number of pallet locations that are currently occupied is set to the total capacity. Thus, RC for each company will be calculated as:

$$RC = Total\ RC \cdot \frac{Current\ pallet\ location\ occupation}{Total\ pallet\ location\ occupation\ of\ all\ companies} \quad (5)$$

where

$$Total\ RC = Total\ warehousing\ cost \cdot 0.24$$

### 5.2.2 Handling Cost

In current logistics operations at GW, products are typically received in one type of packaging unit and are converted into a different packaging unit before being shipped. This can be concluded in the difference between transactions coming in and going out, resulting in a transaction ratio. On average, Lindab's ratio is 1:10, meaning that each incoming transaction generates approximately 10 outgoing transactions. Generally, they can be divided into the three types being pallet, box and piece. Relating to the transaction ratio, a typical situation is that a single type of product may arrive consolidated on one pallet but is then repackaged and shipped out as 10 separate boxes or individual pieces. In practice, the idea is that the lower a company's ratio, the less handling is required and consequently lower handling cost. *Figure 5.3* shows the current ratio in companies passing through GW.

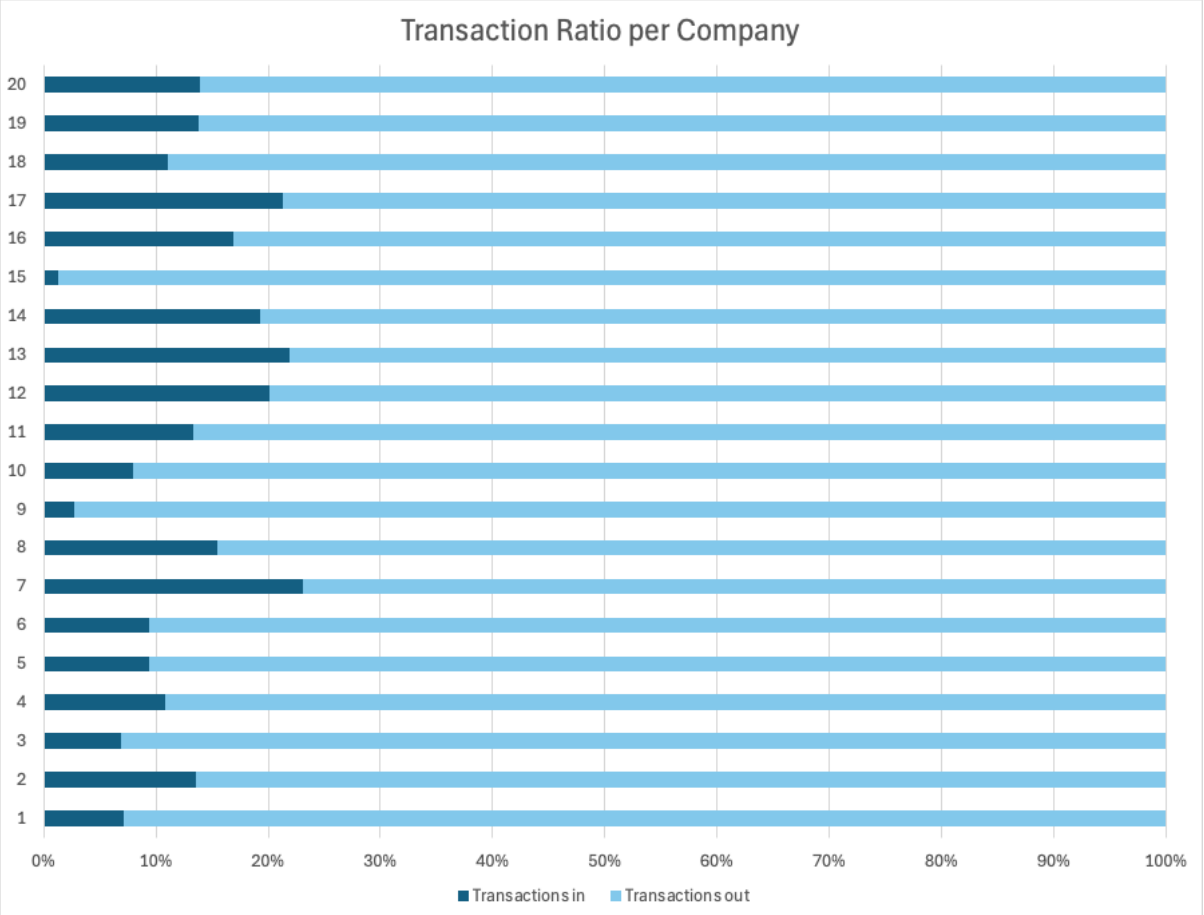


Figure 5.3: *Shows distribution between transactions in and out for each company.*

Each stack represents a company. Based on the findings, Lindab Ventilation, Company A and B has a ratio of 1:10, 1:8 and 1:3 respectively. With the reasoning previously mentioned, this means that B

should have the lowest handling cost of the three. Thus, the allocation of $HC_{hand}$ for each company will be:

$$HC_{hand} = Cost\ per\ transaction \cdot (Transactions\ in\ + Transactions\ out) \quad (6)$$

where

$$Cost\ per\ transaction = \frac{Total\ warehousing\ cost \cdot 0.762}{Total\ number\ of\ transactions\ of\ all\ companies}$$

### 5.2.3 Cost Model and Allocation Results

To compare the warehousing cost, or for this case logistics cost, each company carries against the current markup set by the pricing model, the amount of sales for each company is determined. If the markup is considered to be in the upper limit of 12%, each company's markup can be computed by taking:

$$Markup\ cost = Sales\ amount - \frac{Sales\ amount}{1.12} \quad (7)$$

This markup is essentially what companies today are charged for selling the products through Lindab Ventilation. So, by combining *Equation 5* and *6* the logistics cost for each company is determined and compared to this amount from *Equation 7*. To calculate the new suggested markup for each company, called the logistics markup, it can be done by

$$Logistics\ markup = \frac{(Sales\ amount - Markup\ cost) + Logistics\ cost}{(Sales\ amount - Markup\ cost)} \quad (8)$$

This is the final step to finishing the development of the model to calculate each company's cost associated with the logistics operations at GW. *Figure 5.4* illustrates the structure of the model to provide a better understanding of both the design process and the results.

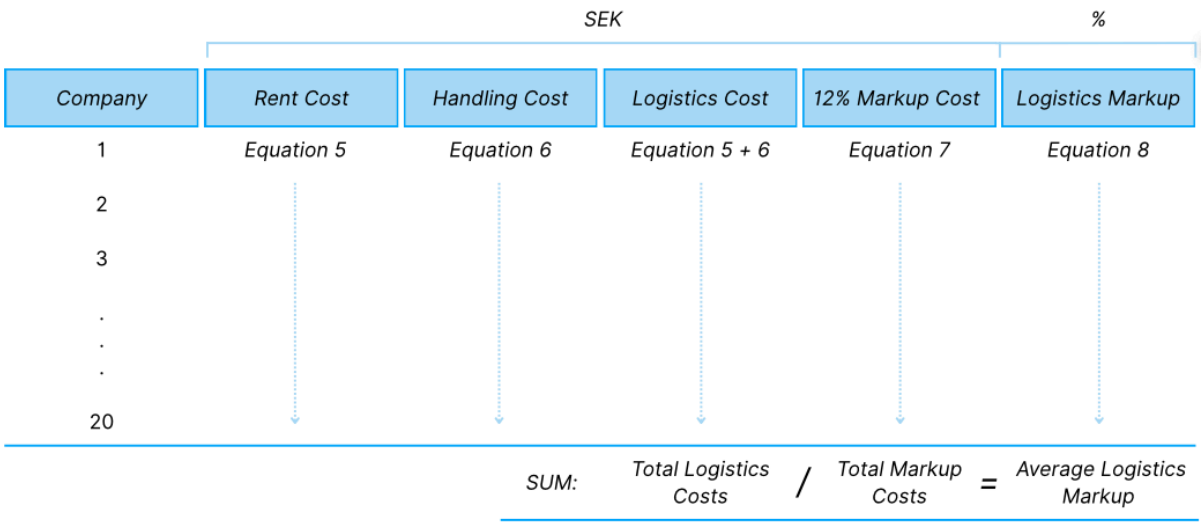


Figure 5.4: *Structure of cost model 1.*

Conclusively, the sum seen in *Figure 5.4* gives an average logistics markup, which is weighted since each company contributes differently depending on size. It can be seen in *Equation 9*.

$$Average\ Logistics\ Markup = \frac{(Total\ sales\ volume - Total\ Markup\ Cost) + Total\ Logistics\ cost}{(Total\ sales\ volume - Total\ Markup\ Cost)} = 4.0\% \quad (9)$$

This suggests that on average, Lindab Logistics would apply a 4% markup per product handled if their logistics services were to be offered. *Figure 5.5* illustrates how the companies' suggested logistics markups compared to the 4% average and the 12% markup.

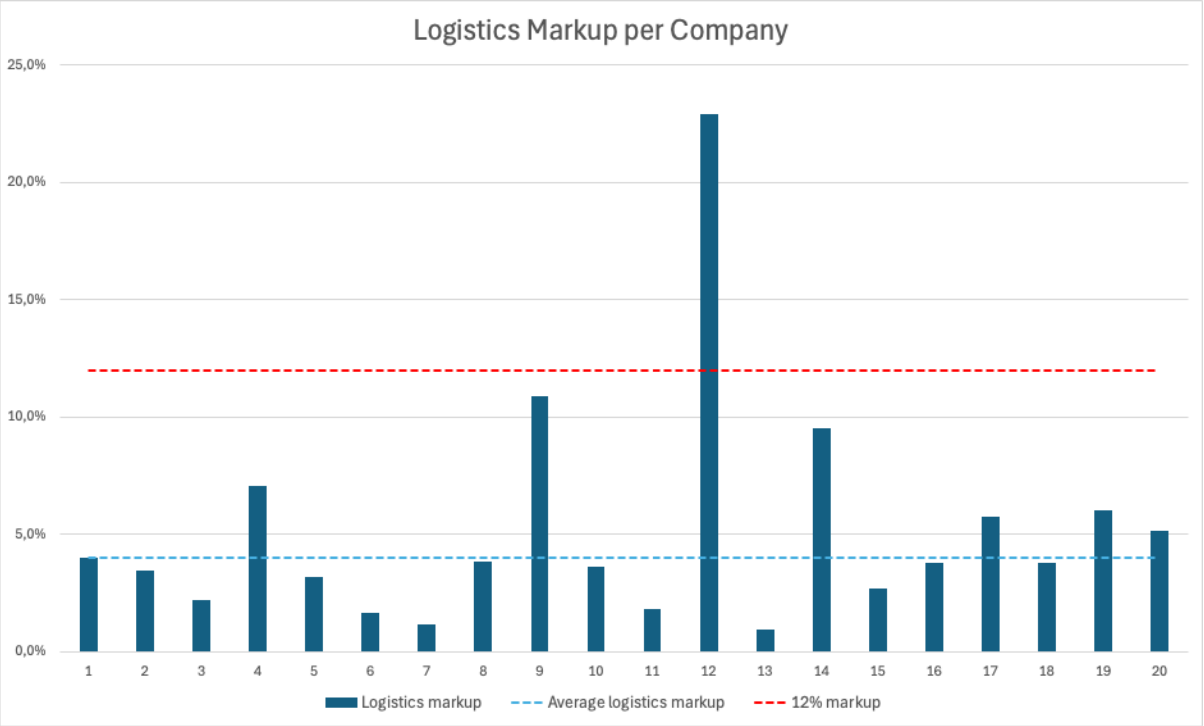


Figure 5.5: *Logistics markup per company.*

There is significant variation in the logistics markup across companies and a rate of 4% may not seem representative. However, it is reasonable to assume in this case that some companies have a greater influence on the overall logistics markup than others. Companies with higher sales volumes logically apply the 12% markup to a larger base, which in most cases corresponds to a higher logistics costs. Lindab Ventilation being the largest in terms of sales, thus has the greatest impact on the logistics markup, which is confirmed by it being at exactly 4%.

Although, every company except number 12 should pay less than the current 12% markup if they were to use the 3PL service, there are still large differences in individual logistics cost, which is largely affected by the handling cost. This suggests that the pricing for the 3PL service should be dynamic and perhaps based on transactions and not on the 4% average. To see just how unfair the current 12% markup is, *Table 5.3* shows the difference in transaction ratio and average price per product for Company A and B.

Table 5.3: *Case comparison between Company A and B.*

| Company | Transaction Ratio | Average Price (P) per Product |
|---|---|---|
| A | 1 : 8 | P |
| B | 1 : 3 | 9·P |

Company B's products, on average, cost 9 times more than those of Company A, while requiring approximately 60% less handling. Based on the current pricing model, Company B is charged a

significantly higher markup per product compared to Company A. This highlights a key strategic insight, that certain companies and their products offer greater value due to their lower logistics costs. These high-value, low-handling products represent attractive investment opportunities, as they are more cost-efficient and can generate better margins when selling to customers.

## 5.3 Model 2

In a future state, Lindab's wishes to incorporate more products from the companies within the group through GW. To see what this potential could look like, a single study of Company A has been made. Although Lindab Ventilation is a larger player on the Swedish market they currently have all their products at GW since it is a part of the company, which is why A was chosen. Another reason for choosing A is that their products are not limited by individual item volume, meaning in theory, all of them could be stored at GW. The idea is to rearrange deliveries so that all products of Company A go via GW and see how total logistics cost changes. In a total logistics cost analysis it is important to consider multiple components and cumulative effects of decisions, so that the supply chain is not sub-optimized. Some initial assumptions based on discussions with *Interviewees H* and *I* when the analysis was performed were:

- Company A does not currently sell all their products to Lindab Ventilation in GW.
- TCs are higher when Company A sends directly to customers, instead of going through GW. This is due to bulk shipments to and from GW.
- As a result of more products going through GW, more handling is required.

### *5.3.1 Transport Costs for Company A*

Based on the delivery mapping, shown in *Table 5.4*, Company A sends approximately the same total weight to both customers and GW, but does so with roughly 7 times more transports directly to customers.

Table 5.4: *Delivery distribution for Company A.*

| Category | To GW | Direct to customers |
|---|---|---|
| Weight | W | W |
| Number of transports | T | 7·T |

Consequently, this affects the TC, which is presented in the data as SEK / kg transported. Company A is located in a different zone of Sweden than GW and has a slightly different TC depending on which other zone it delivers to. If Company A reroutes its products via GW they travel first the distance $d$ to GW, then a *distance factor* $\cdot$ $d$ to each zone. To simplify the process, the *distance factor* is set to 0.5, 1.0, 1.5 or 2.0. The TC for GW remains fixed at 1 SEK / kg / $d$. The setup for rerouting transports via GW is shown in *Figure 5.6*. When Company A ships directly to the customer, smaller transports and batches are possible. However, for bulk shipments from GW, the products must first be sent to DL and then redistributed in smaller transports. The additional repackaging effort is accounted for in the fixed cost.

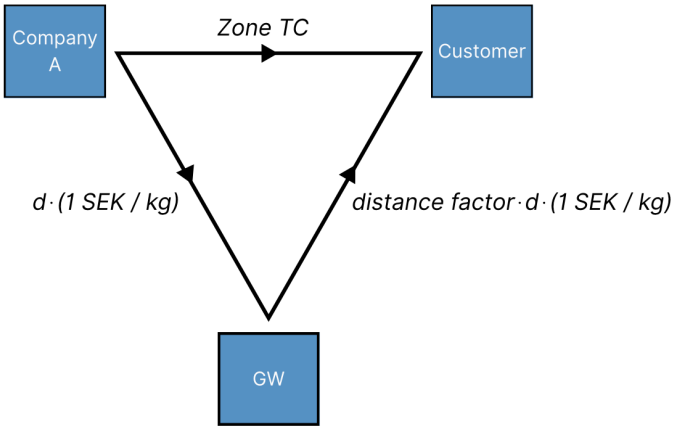


Figure 5.6: *Transport cost relationship between Company A, GW and customer.*

### 5.3.2 Final Model and Results

Thus, for each zone the total TC from Company A directly to customer is equal to

$$Total\ TC\ from\ Company\ A\ directly\ to\ customer\ =\ zone\ TC \tag{10}$$

It is then compared to the total TC from Company A to customer via GW, which can be calculated as

$$Total\ TC\ from\ Company\ A\ to\ customer\ via\ GW\ =\ d\ \cdot\ (d_f\ +\ 1) \tag{11}$$

where

$$d_f\ =\ distance\ factor$$

The final model accounts for a total of 8 zones with various zone TCs and distance factor, see *Figure 5.7.* The zones represent postal areas in Sweden and are arranged after proximity to Company A, meaning zone 1 is the closest.

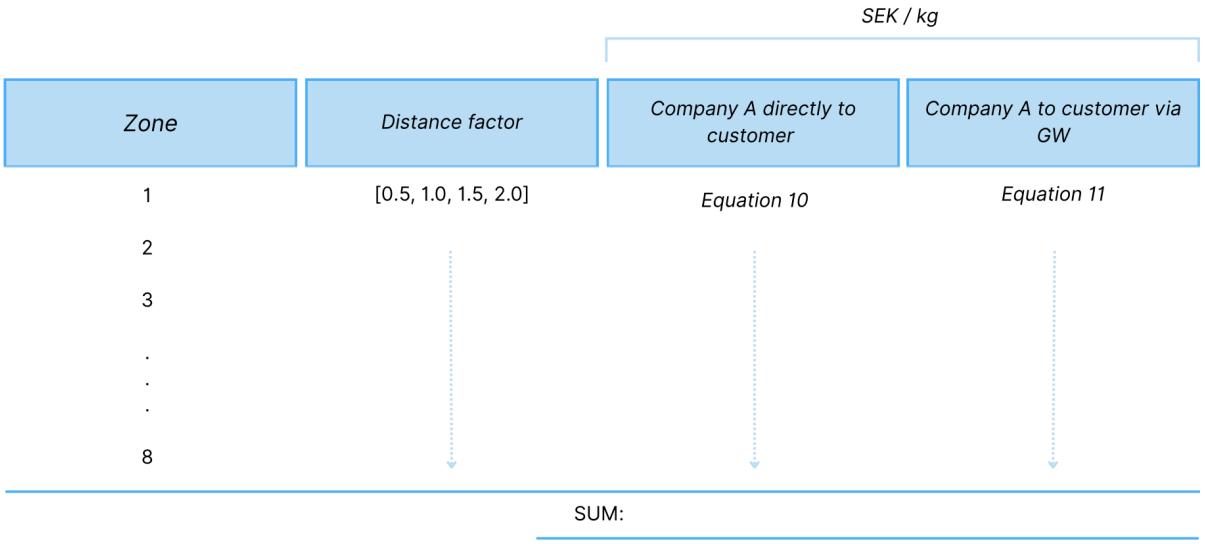


Figure 5.7: *Structure of cost model 2.*

*Table 5.5* shows data that is put into the model to generate the results. Note that TCs do not increase in a perfectly linear fashion with distance, but there is still a general trend of higher costs for zones farther from Company A. This is affected by factors like route efficiency and delivery volume. It is

also worth noting that, since the *distance factor* is an approximation, the results may not fully reflect the actual situation.

Table 5.5: *Transport cost data summary*.

| Zone | Distance factor | Company A directly to customer | Company A to customer via GW |
|---|---|---|---|
| 1 | 1.0 | 2.18 | 2.0 |
| 2 | 1.0 | 3.38 | 2.0 |
| 3 | 1.5 | 2.71 | 2.5 |
| 4 | 0.5 | 3.07 | 1.5 |
| 5 | 1.5 | 3.18 | 2.5 |
| 6 | 0.5 | 3.71 | 1.5 |
| 7 | 1.5 | 3.60 | 2.5 |
| 8 | 2.0 | 4.33 | 3.0 |
| | Total | 26.16 | 17.5 |

Looking at the total SEK / kg Company A and GW pays respectively across the zones, suggested savings for routing via GW can be calculated as

$$1 - \frac{To\text{-}be\ transport\ cost}{As\text{-}is\ transport\ cost} = 1 - \frac{17.5}{26.16} = 0.3310.. \approx 33.1\% \quad (12)$$

Essentially, if Company A routes its products through GW, it could achieve approximately 33% savings in TCs. However, this is based on a generalized model and several additional factors must be considered to get more accurate results. Given the current cost structure, transportation savings will benefit Lindab Sweden, as they are the ones bearing the cost.

### *5.3.3 Transfering Handling Cost*

Interestingly, a similar ratio is observed in both the transports from Company A directly to customers, as in the transactions of Company A's products in GW to customers. The ratios compare as 1:7 and 1:8. When considering the shift in handling cost it would essentially double at GW because they currently ship the same amount, as mentioned before. Same weight does not necessarily indicate same sales volume, but this is confirmed from data from Company A.

This supply chain optimization needs to be seen from a group perspective. What seems to be an increase in handling cost at GW when introducing more product volume, reduces the same or even more handling cost at Company A. Although handling costs have not been analyzed at Company A, it can be assumed that they are at least as high per transaction as at GW, mainly because A relies more on manual work. GW on the other hand, is highly automated and benefits from economies of scale, which helps reduce total handling costs. This indicates that the group could potentially achieve savings in total handling costs. Though it can be argued that the entire handling is not moved to GW. Company A still has to transfer products from its location, potentially leaving a transaction cost to consider. To account for this, the cost of transactions currently going from Company A into GW is

used as a reference, since this roughly corresponds to the extra volume that will be redirected via GW within this analysis.

$$transport\ savings\ -\ extra\ handling\ cost\ at\ Company\ A\ =\ 9.0\% \quad (13)$$

This calculation is based on the assmption that Company A and GW have the same handling costs. Therefore, the potential total savings is arguably lower than the estimated 9%. It is also important to note that these savings result from rerouting the transport flows of a single company. If similar changes were implemented for multiple companies, the cumulative effect could be significantly greater. Another aspect is that even if further analysis shows that the total cost remains the same, meaning if *Equation 13* results in 0, the 33% reduction in transport is still beneficial, as it shifts value from external transport providers to being retained within the company group.

## 5.4 Findings regarding Areas of Improvements at Lindab

During the interviews with employees from the Lindab Group, several areas of improvements related to the current logistics setup and organizational structure were brought to light. Supporting quotes can be found in *Appendix F*. In the interviews, some recurring patterns were found.

### *5.4.1 Silo Structure*

A recurring issue is that the group has a somewhat siloed structure, as described by *Interviewee A, E and F*. For many years, the goal at Lindab has been decentralization, with management aiming to give each associated company as much freedom as possible. In fact, some companies are even encouraged to sell to competitors. However, *A* notes that this structure has led to several issues and argues that Lindab is not fully leveraging its size. Rather than generating mutual benefits, each company operates with its own concepts and logistics systems, resulting in, among other things, high TCs.

*Interviewee A*, backed by *Interviewee K*, concludes that there needs to be a designated logistics owner within the group, a control tower that can oversee the broader logistics landscape. *Interviewee E* supports this perspective and says that *"What prevents us from improving is that we are not organized under the same structure, everyone is essentially running logistics on their own"*. *E* further explains that it is difficult to improve the group's logistics when each company manages its own operations, as improvements for one may lead to drawbacks for another. An overall group perspective would make it easier to identify solutions that offer the highest benefits. *F* validates this with concrete examples, where products are routed through GW before reaching customers, even when the original production site is located much closer to the end customer. *G* further builds on this by stating that the *"Sales companies have decentralized inventory control, which may be problematic for tied-up capital allocation"* These inefficiencies highlight the need for a more integrated logistics strategy.

### *5.4.2 Balancing Company against Group Results*

Closely related to the silo structure, but important enough to be considered its own issue, is the challenge of balancing individual company performance against group-level results. *Interviewees A, B, E, F* and *G* all emphasized that the financial performance of the group is the top priority, though this can be difficult to realize in practice. There are tendencies of Lindab companies focusing too much on their own results, according to *A* and *E*.

*Interviewee F* believes that one reason for this is the strong emphasis on Earnings Before Interest and Taxes (EBIT) at the company level. This leads to pricing strategies that prioritize individual performance, sometimes resulting in internal companies purchasing from external suppliers. Even when similar products are available within the group at slightly higher costs. *F* concludes with an expressed wish for a shared, holistic goal to guide all companies, rather than company-specific targets. *Interviewee G* adds that while each company has its own EBIT targets, so does the group. However, a

healthy balance can be hard to achieve, which affects incentives to implement solutions like a 3PL, that will primarily work in favor of the group.

To drive initiatives on a group level, both *Interviewee B* and *E* emphasize the importance of support from top management. *B* explains that in other organizations their 3PL company has worked with, a common issue has been that individual business unit leaders focus on protecting their own performance metrics, rather than the broader company goals. According to *E*, improving logistics in companies is difficult within the current structure, as when one company benefits, another often loses. *G* further notes the current structure means that any potential profit increase will be realized by the sales companies, meaning other companies may need to invest in improvement efforts without receiving the direct financial benefit. This highlights a core structural challenge in driving change across the group.

### *5.4.3 Logistics Responsibility*

Also related to the silo structure, perhaps even a consequence of it, is the lack of ownership regarding logistics. *Interviewee A* discusses that one of the problems with the current structure is that the one paying for logistics is not the one managing it. This becomes an issue where no one has the incentive to improve or optimize logistics. As *A* describes it *"It is usually the case that interest comes with cost, when the production sites paid for the transportations the interest for logistics were higher"*. According to the interviewee, relocating logistics under the sales function, instead of the production where it lies today, could be more appropriate. This is because the sales departments are more sensitive to pricing dynamics and customer requirements.

### *5.4.4 Transparency*

The two interviewed representatives from group companies both highlighted an important issue, the lack of transparency in the current system. When asked about the logistics operations in GW, *Interviewee D* was unable to answer due to poor visibility. Later in the interview, *D* stated that when it comes to understanding how much of their products are consolidated through GW, they are *"quite blind"*. This lack of insight affects the possibility of effective decision-making, as not all stakeholders have a complete picture of the product flow within the group. *Interviewee F* verified this concern, explaining that they have no idea how customers of products stored in GW perceive the product quality or related logistics. *F* also pointed out that GW does not provide proper sales information. This gap creates unnecessary complications, which according to *F*, could be resolved through the implementation of a shared system.

### *5.4.5 Cost Barriers*

One of the main problems with the current setup is the associated cost. *Interviewee A* explained that the placement of products in GW is too expensive for some internal companies, preventing them from taking advantage of the benefits offered by GW. This is supported by *F,* who states that GW is their, as a group company, most expensive logistical cost. At the same time, *Interviewee E* points out a perceived unfairness in the pricing model: *"Today there is unfair pricing, where more expensive products are charged higher handling costs than cheaper ones, even though the actual handling might be more costly for the cheaper product"*. This concern is also mentioned by *Interviewee G* and indicated in *Section 5.1. Interviewee J* states that the current cost-plus model undermines its original purpose. While the model was intended to bring profitability closer to the customer and clarify what generates value, it has instead given the opposite effect. *J* points out that this internal cost structure means that fixed costs like facility rent and automation investments are absorbed regardless of the actual business benefit, making it difficult to drive cost efficiency. High logistics costs affect the customer through the pricing model. As a result, Lindab's already high pricing becomes even higher, potentially reducing competitiveness. *D* comments this by stating that *"Inside sales (sales between group companies) kill the competition"*.

### 5.4.6 Split Perception

In general, the interviews revealed a pattern of differing views and perceptions among the respondents. This suggests that increased cross-functional collaboration and dialogue could be beneficial. These differences appeared in two ways. In some cases, interviewees recognized the issue themselves, while in others, statements from different interviewees directly contradicted each other. For example, Interviewee D noted that group members often associate them only with the products placed in GW, even though these represent just a small part of their total sales. This reflects an awareness of internal blind spots. In other cases, split perceptions were not known by the interviewees. An example of this being when *A* described the logistics costs as *"Unreasonable high"* claiming they are worth half of what is currently being paid, while *Interviewee G* addressed the same topic by saying:

*"Some people say that logistics can not cost that much, it can't be that expensive, but many companies don't have a full understanding of the entire income statement and how many costs exist beyond the standard calculation"*

### 5.4.7 Summary of Findings

The areas of improvement identified during the interviews are illustrated in *Figure 5.8*. Several of these areas currently affecting Lindab could potentially be addressed through the implementation of a 3PL solution and later discussed in *Section 6.2*.

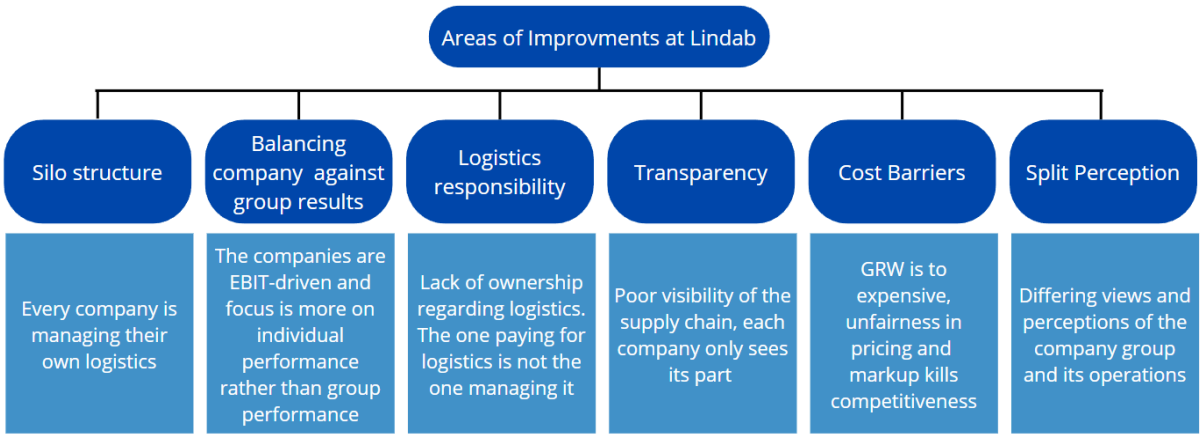


Figure 5.8: *Areas of improvements at Lindab.*

## 5.5 Lindab Logistics: the 3PL Solution

This section presents the specific views and reflections expressed by the interviewees regarding the proposed 3PL solution.

### 5.5.1 Ownership of Lindab Logistics

The idea of creating an internal company, Lindab Logistics, needed validation, so questions were asked to assess its feasibility. All interviewees agreed that it was a good idea and that Lindab Logistics should be a separate entity, not owned by Lindab Ventilation. This suggests a takeover of Lindab Ventilation's logistics operations by Lindab Logistics. Regardless of the ownership structure, *Interviewee F* and *D* pointed out the need for a carefully designed contract and *E* said that it would be critical to ensure transparency between the user and provider.

*Interviewee A, B* and *K* believe that Lindab Ventilation should focus on production, as that is their area of expertise, indicating that logistics should be handled by another party. *A* means that *"where the*

*costs lie, so should the responsibility*" which is affected by the ownership selection. *B* concludes there is a strong connection between the interest and performance of logistics in a company. When companies are more committed to something else, like production or product development they should not focus on logistics because that usually means companies lack interest in it.

Ownership plays a critical role in bottleneck situations, as it influences which company product flow is prioritized. To ensure neutrality, *A* and *B* believe the 3PL should operate as an independent entity. *F* says the 3PL solution seems reasonable on paper, but it has to work on an operational level. Creating a separate company will create a better supplier-to-customer relationship, where more competitive pressure can be put on, according to *A* and *J*.

I*nterviewee J* said that Lindab is very good at keeping its internal competence with a lot of internal recruiting and a *"do it yourself spirit"*. *J* sees this as something positive because it opens up possibilities on making a career at Lindab and everybody has great knowledge about how the company works. However, *J* also raises concerns about a tendency toward internal focus and limited external input. The company often develops in-house systems tailored to its own needs, which may result in missed opportunities to adopt more advanced or efficient solutions already available on the market. *J* argues that this approach also affects Lindab's take on 3PL, where internal solutions risk becoming "*a Lindab version of 3PL*", potentially lacking the expertise and innovation that some external providers could offer.

### *5.5.2 Perception of 3PL Solution at Lindab*

The idea of implementing a 3PL solution at Lindab was met with mixed reactions among the interviewees. While some see clear potential benefits, others express skepticism or concern. The arguments for a 3PL solution are based on numerous statements through the interviewees. *Interviewee A* and *J* argues that interest for optimizing process and logistical cost reductions is based on ownership, believing that a 3PL solution could help with this. This is further supported by *E* that states that the improvements a 3PL solution could give to Lindab is *"the heightened incentive to optimize logistics when someone is responsible for it"*.

*Interviewee B*, while not part of the Lindab group and therefore cautious about making direct judgements, pointed to the broader principle that companies should focus on their core competencies. If logistics is not one of them, outsourcing should be considered. *B* also shared that when their own organization separated logistics into an internal 3PL company, many hidden costs *"came to light"*. This enhanced transparency was a key benefit of the transition. Further, *B* stated that one of the abilities that makes them competitive on the 3PL market is that they are closely connected to the product owners, explaining that this perspective provides a deeper understanding of the products. This being the same for the potential 3PL solution at Lindab.

Lastly, *B* underlines the importance of *"The better requirements our customer puts on us, the better solution we can provide them with"*. This aspect is mentioned multiple times by *Interviewee F* who pushes that a 3PL solution at Lindab will need clear and specific agreements, which might be hard to establish. According to *F* and *D,* quick deliveries is one of the most important qualities they have against their customers therefore they suggest that this need to be fulfilled also by the 3PL provider. *F* worries that creating such a big system might make it less flexible and slower than today's solution.

Arguing against the 3PL solution is *Interviewee D*, from an internal company, who believes that the current logistical solution of Lindab is good and that just a few of their products would fit in the 3PL solution. The general impression of *D* is a skepticism against a 3PL solution at Lindab. However, in the end of the interview it is stated that if some intermediate steps could be removed, they would become more competitive and *D* ends that they need to evaluate the solution a bit more.

*Interviewee G* and *E* agrees the current cost-model is quite rough and works unfavourably for high-priced products, especially those with low weight and volume. However, *G* means there are

important reasons behind the standardized pricing model. Lindab adjusts prices every quarter on thousands of products, making a more individual pricing model very difficult and costly. This concern is shared with *Interviewee C*, stating that it will be way too complex to provide an individual cost to each internal supplier of GW. Further supported by *E* who states that the price would need to be updated often depending on the sales. Another problem highlighted by *G* is that when logistics initiatives are proposed to reduce costs, their impact is not always easy to assess on a product level.

According to *Interviewee B*, the transition to 3PL enabled their company to achieve much better control of logistics costs. *Interviewee E* does not see how the 3PL solution would lower costs because *"the only change is the billing model"*. *Interviewee G* says the control comes partly by having to benchmark the 3PL service cost against other companies within the same industry. If the solution proves effective and reduces costs, *E* says there will be no change in prices to the end customer. *G* confirms this by stating that increasing product volume through lower prices is rarely more profitable than simply raising margins. Both *Interviewee F* and *A* express that even if the 3PL solution might not be the best for all associated companies it could still be needed if it helps the group as a whole.

### 5.5.3 Alternative Solutions

While the 3PL solution might be a valid solution, other alternatives can be considered. To ensure quality and transparency this was investigated in the interviews as well. If a 3PL solution is not feasible, the majority of the interviewees agree that a more holistic approach to logistics within the group is necessary. *E* says the logistics are getting increasingly important to customers following higher requirements on more efficient and less costly solutions. According to *A* and *F* one such solution could be a control tower, where the logistics decisions are more centralized. A control tower can help improve supply chain visibility. *E* sees potential in a better cooperation between central warehouses and HUBs. *Interviewee K* thinks that there might not need to be such a big change to improve the overall performance by stating that:

*"3PL would be quite a revolutionary change. Maybe we could adjust our current model instead, by focusing on what doesn't work as well. We already have a functioning system, so if we're going to move to 3PL, it needs to be significantly better and have clear advantages over what we have today."*

### 5.5.4 Lindab's Current State in the 3PL Maturity Model

To evaluate how ready Lindab is to become a 3PL provider four interviews specifically focusing on this were made. Their opinions were also backed by quotes from the interviews made prior to the completed model. The placements according to the *four interviewees E, H, J* and *K* in the MM can be seen in *Figure 5.9*.

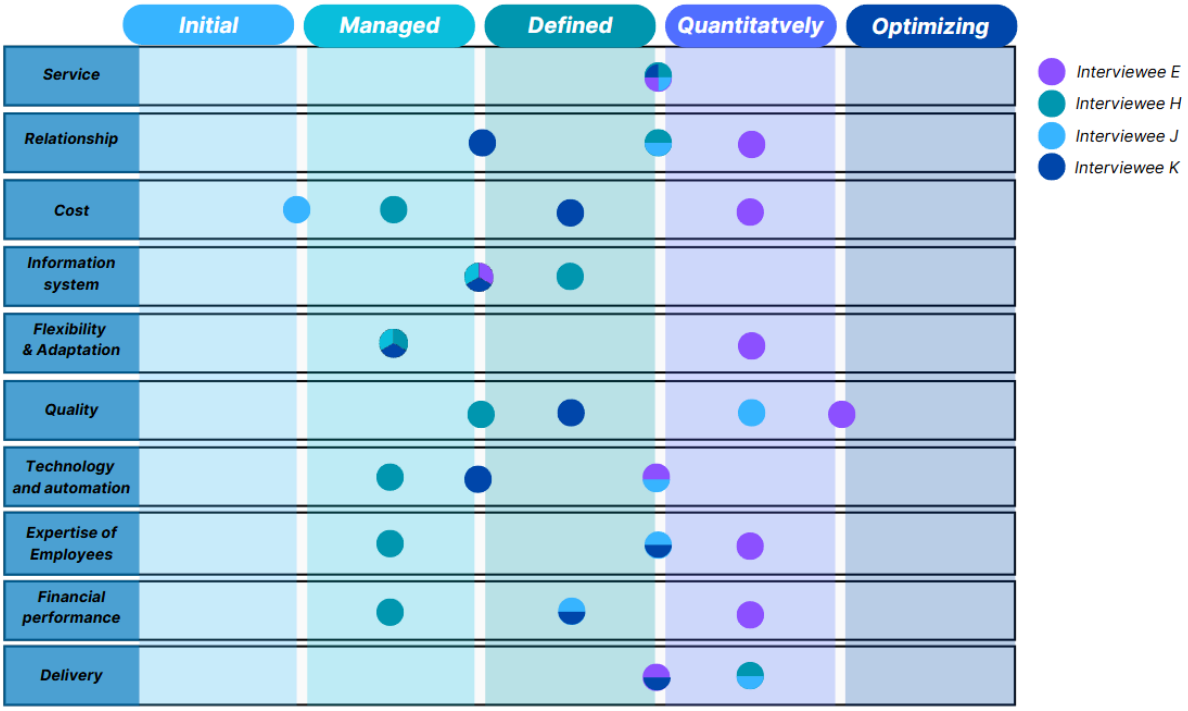


Figure 5.9: *Interviewees placement in the 3PL-MM.*

**Service**

*Interviewee H, J* and *K* describes the services of Lindab in GW as good, this is further supported by *Interviewee A* who stated that Lindab is very good at services and having high customer satisfaction. They have standardized processes and have a relatively broad service range. They can provide some customizable services such as the use of shipment labeling, meaning that they can deliver to a specific room on a customer's construction site. It is also possible for Lindab's customers to decide what products should be placed in each package. They provide standardised logistical services and have a high customer focus. Because of this, *Interviewee H, J* and *K* place Lindab at the Defined level on their way into the Quantitatively level. This placement is also used by *Interviewee E* who agrees with the statements and adds that they continuously try to improve their services.

**Relationship**

*Interviewee H* describes Lindab Ventilation's relation with its customers as success based. According to *H,* these customers mean that *"Lindab charges slightly more, but we have confidence that the delivery will be reliable"*. The relationships with the other group companies, the potential customers of the 3PL, are good. This is also supported by multiple of the interviewees, *A, D and F*. *H* says that both these relations would be placed at the Defined level, closer to Quantitatively. The placement is also supported by *J* who states that relationships are very good but common logistical goals are missing. The relationships are reactive rather than proactive. Both these arguments are used by *Interviewee K* but instead places Lindab in the lower levels. In contrast, *Interviewee E* is more optimistic and says that they do have proactive relationships where they have dialogues with their customers to improve and meet their needs, placing them at the Quantitatively level.

**Cost**

*Interviewee H* states that Lindab performs poorly in terms of cost assessment. While potential cost savings are identified, actual cost improvements, particularly in logistics are limited. This view is supported by *Interviewee A*, who describes Lindab's pricing strategy and ability to charge for their logistical services as weak. *A* mentions that the company sometimes prioritizes customer satisfaction to the extent that a transport is booked to an unreasonably high cost just to deliver one missing product from an order. Furthermore, *H* explains that in some projects, the sales representative responsible for price negotiation does not even include logistics costs in the final price. As a result, *H*

rates Lindab's cost maturity at the Managed level. However, *H* also highlights that there is significant potential for Lindab to improve its approach to logistics-related costs.

*Interviewee J* as a customer describe the pricing as unclear and that the transparency of what is included in the price is insufficient, stating that:

*"When steel prices go up, our prices increase because the product consists largely of steel. But when steel prices go down, the prices do not always drop. Suddenly it is no longer considered a steel-heavy product. It is a prime example of how there is no clear understanding of which costs actually drive pricing."*

Placing Lindab between the two lowest levels. *Interviewee E* on the other hand means that the cost is very transparent and clear because of the cost-plus model. *E* states that they are constantly working with cost reduction, at least in production and picks the Quantitatively level in the Maturity model. *Interviewee K* means that cost and pricing have come a long way but have a long way to go as well and places in the middle.

**Information systems**
*Interviewee H* describes the information systems at Lindab as being on the right track. They are able to track and monitor their deliveries. Regarding the data integration *H* describes it as good between some companies such as Lindab Ventilation and Lindab Sweden but a little worse against some of the more recently bought companies, which is supported by *D* and *F*. Therefore the data integration is seen as partial and *H* places Lindab in the Defined level. *E* and *K* states that they have some information sharing and places Lindab in between the Managed and the Defined level. *J* says that there is not much information sharing but that it has not caused any trouble either because of the high product availability. In other parts of the group these limitations in information sharing become more noticeable.

**Flexibility and adaptation**
*Interviewee H* says that the silo based structure of Lindab's current state makes it hard for an overview of the supply chain, every company just sees their part of it, supported by *F*. According to *H,* this makes Lindab as a group less flexible in its logistics. *H* is therefore hopeful that a 3PL solution would increase the flexibility and adaptation when each company can see a bit more of the supply chain. *H* said that *"We have flexible processes for handling disturbances in place, but we are not moving forward"* and placing them at the Managed level. On the other side *Interviewee E* describes that they use mathematical models to forecast and are very flexible in the span of a specific time period placing Lindab at the Quantitatively level. *J* says that Lindab in GW is very good at meeting their needs and *"Ventilation always manages to solve our problems when needed"*. What could be improved according to *J* and *K* is the proactivity and being able to foresee the problems.

**Quality**
*Interviewee H* says that the quality work at Lindab GW is uneven. The production side is almost at the Optimizing level, but logistics is somewhere between Managed and Defined. This is because logistics is not given enough attention, while production is highly prioritized. Some ISO certifications are in place, but they mostly reflect the production side. *Interviewee J* says that the quality of picking and packing as well as accuracy in deliveries is very high. Looking at environmental aspects *J* says that *"It is not as they can provide CO2 impact from logistics"*. But the quality of logistical services is great and *"In terms of how many deliveries we do there are very few complaints from customers"*. *E* states that there is a high quality in their logistics and that they follow ISO standards placing Lindab between the Quantitatively and Optimizing level. *Interviewee K* states that they work a lot with sustainability even though they are at the beginning of their journey, there is high focus on it. Further stating a big trust in that the logistic functions maintains a high level and places Lindab in the middle of the maturity levels.

**Technology and Automation**
*Interviewee H* describes the maturity of technology and automation as divided. On one hand, Lindab stores its products in GW, a highly automated warehouse, which makes good use of space and allows for automated picking. This would qualify for the Optimizing level. On the other hand, other parts of their logistics do not use technology to improve daily operations, such as radio frequency identification. Because of this, *H* places Lindab at the Managed level. *Interviewee E* states that they have automation that is used to improve productivity not specifically being the given examples of technology's, *E* places Lindab between Defined and Quantitatively. *Interviewee J* says that Lindab in GW has come a long way in their automation process. *Ks* insight into this element is limited, but estimate that the maturity level falls between the second and third level.

**Expertise of Employees**
*Interviewee H* and *K* states that there are employees within the company, particularly in the logistics team at GW, who have excellent skills in logistics. However, this knowledge is not fully utilized or shared across the company, leading *H* to place Lindab at the Managed level of maturity. *H* also sees great potential in this area, noting that employee expertise and cost elements are closely linked. A greater investment in expertise and training would lower logistical costs, creating stronger incentives to continue developing employee skills, generating a positive spiral. *Interviewee E* says that they have great competence and places Lindab in the Quantitatively Level. *Interviewee J* and *K* states that the necessary competence is very much present within the company. However, *J* suggests that Lindab, as a group, has a long history of doing everything in-house from scratch, which may result in missed opportunities to bring in new knowledge and adopt valuable practices from other companies.

**Financial performance**
According to *Interviewee H* the company has the overall financial stable position, of course differing between group companies, making improvements possible. However, the logistics has not been prioritized in budgeting and therefore planned and continued upgrades are not used. Placing Lindab at the Managed level. *H* points out that they need to start working on getting to the Defined level to improve overall performance. On the other hand, *Interviewee E* means that Lindab is continuously working with investments to improve efficiency. *Interviewee J* also stands behind this and says that it is clear which of their suppliers invests in their logistics processes and not. Both *J* and *K* place Lindab at the Defined level.

**Delivery**
Lastly, *Interviewee H* and *J*, places Lindab at the Quantitatively level when it comes to delivery. Lindab uses a transport management system, a well working ERP-system and delivers with shipment labeling, as previously mentioned. This is also supported throughout multiple of the other interviews. *Interviewee E* mentioned that *"We are good at inventory control and have high delivery precision"* and *"It is greatly appreciated by our customers that we can deliver with such precision to construction sites"*. *E* then places Lindab in between the Defined and Quantitatively levels, also supported by *K*.

# 6. Results and Analysis

*This section presents the results of the study, offering a comprehensive analysis of the data collected. It includes a detailed presentation of the findings, highlighting key patterns, trends and relationships relevant to the RQs. By systematically examining the outcomes, this part of the thesis provides the empirical evidence needed to draw conclusions and further explore the implications of the study. The results are organized in a manner that supports the discussion and interpretation in subsequent sections.*

## 6.1 Cost Perspective

From the two analyses performed there are evidently potential positive effects on costs when a 3PL solution is implemented. The current setup with intermediate utilization of 58% the suggested markup for the 3PL service is 4% for a company. Comparing this to the 12% markup companies face today it is much lower and may create incentives for companies to use GW the strategic way it deserves. There is also room for scaling GW up in product volume, which eventually can offer the benefit of even lower markup.

However, an evaluation has to be made to understand how the pricing of the 3PL service is affected when more companies begin using GW. In theory, as additional companies make use of GW, the overall operating costs such as rent and handling can be spread across a larger number of products. This leads to a lower cost per transaction, which is positive as increased activity generally supports better efficiency. But this pricing structure introduces a challenge. Each company's service price becomes influenced by the presence and performance of all other companies operating within GW. When a company joins or leaves, which is likely to happen over time, the 3PL price for every company is affected. The fact that each company also has different transaction ratios adds further complexity to how prices are calculated. While a higher number of transactions reduces the average cost per transaction, a pricing model that constantly adjusts to these changes may be too unstable and difficult to manage in practice. This can be connected to the current pricing model, where it highlights the issue of having such dynamic pricing. It may therefore be more practical for Lindab Logistics to adopt a more stable approach, like the possibility of adjusting the 3PL pricing on a quarterly basis, in the same way product prices are currently reviewed. This would allow for greater predictability while still capturing the benefits of scale over time.

The 3PL solution is an initiative where cost savings must be evaluated from a company group perspective. Currently, the proposed 4% markup only covers the logistics expenses for Lindab Logistics and does not include any profit margin. Instead, the profit is realized by Lindab Sweden. This setup presents a challenge, as a company like Lindab Logistics needs to generate profit in order to reinvest in and further develop its logistics services. However, since the proposed 3PL markup is significantly lower than the current markup, there is potential for both Lindab Logistics and Lindab Sweden to generate profits.

Rerouting more of Company A's products through GW shows potential cost saving opportunities. However, there are more aspects than the ones used in the analysis that should be taken into consideration. Given the complex SC and different delivery modes from GW, it requires much coordination from both sides to fully consolidate transports. As stated in the interviewees, speed is an important customer value and the benefits from delivering directly to customers may outweigh the benefits of going via GW. Another aspect worth discussing is the ability to actually have products at GW. As mentioned, Company A has no crucial constraints like special handling or bulky items, while other companies may have and are therefore not be able to reroute the rest of their products. Lastly, the presented cost savings are only as percentages, without any corresponding actual values, making it difficult to understand the actual impact. The same issue applies to the 66% improvement in markup. However, this is not the purpose of the study, as the aim is merely to reflect the theoretical expected

savings, which can be applied regardless of the actual cost levels. This provides Lindab with the necessary information to make a decision themselves.

## 6.2 Opportunities and Challenges with a 3PL Solution at Lindab

A number of generalized benefits and barriers of 3PL were identified in the literature review. Using both quantitative and qualitative data in empirical findings, this section aims to connect those findings back to the identified benefits and barriers. Benefits are seen as opportunities and barriers as challenges. Not all benefits and barriers could be directly linked, which made the analysis highlight key opportunities and challenges. While some benefits and barriers are expected to be immediately realized, others depend on further development or may remain unachievable. This section also highlights some of the key differences between setting up an internal 3PL and using an external provider.

### *6.2.1 Opportunities*

Currently, a large issue is that there is little incentive to improve logistics, as the one paying for the logistics is another than the one managing it. Lindab Logistics would be responsible for logistics and the only focus would be to manage and improve this through innovation. As long as it will receive enough financial backing, which there seems to be room for according to the cost analysis, it will create a strong logistics *innovation* culture. However, this is a benefit that will be realized over time as Lindab needs to adapt first. This correlates to the benefit of *logistical expertise*, as high logistical expertise often means high innovation. According to interviewees and placements in the maturity model, logistical expertise is present, but perhaps not fully utilized and on the level of what 3PL requires. This is also something that will be achieved over time and would have been the same as for innovation, a direct benefit if engaging in an external 3PL. The corresponding barrier to *employee expertise* is therefore set not to be realized.

Something that will be directly realized as a benefit is the *core competence focus* for Lindab Ventilation. Lindab Logistics would separate the logistics responsibility from them and generate more time to develop their production. As described in the interviews, when logistics is put into its own cost post, hidden costs may be found. This can be realized rather immediately and will create more control over logistics costs. By separating the logistical cost there is also a possibility to use the benefit of *external benchmarks for logistics cost*. The computed 4% logistics markup is an indication of what the logistics costs are, but needs further comparison against 3PL industry standards.

While Lindab Logistics will initially serve only internal companies that already operate in their respective markets, the benefit of *accessing new markets* should be seen as not realized, as it can still deliver value in other important ways. Newly acquired companies may benefit from improved logistics performance by being integrated into a more efficient and shared logistics network. Although Lindab Ventilation already facilitates network access, the creation of an internal 3PL could act as a driver for companies to actively leverage this network. Currently, products in GW already share distribution systems, but with a 3PL solution, companies would gain greater visibility into transportation flows. The benefit of improved *logistics network access*, however, depends on whether companies choose to engage with the 3PL solution. The second cost analysis highlights the potential savings from leveraging the shared network more strategically. In the long term, if Lindab Logistics expands beyond the group, the full benefit of *accessing new markets* could be realized.

In terms of the financial benefits of Lindab Logistics being an internal company, the reduction of financial risk is not realized from the group's perspective. The performance of the 3PL will directly impact the group's overall results, meaning the group will carry both the costs and risks. However, individual companies within the group may still perceive it as a benefit, as they *reduce capital investments* in logistics assets and *equipment maintenance costs*, thereby decreasing their individual risk exposure. While investments will be required to develop the 3PL, these will be shared across the group rather than handled by each company independently. This approach *shares development costs*

more efficiently. The cost analysis also revealed a significant potential to introduce additional companies to GW without the need for immediate capital investments. This potential highlights the benefit of *economies of scale*, as increasing product volumes can lead to lower unit costs. So essentially, group companies will gain more accurate logistics cost allocation, as costs will better align with actual business volume, *turning fixed costs into variable* ones. This also concludes the benefit of *better capacity utilization* to be realized at GW. Similarly, there is a potential for *inventory reduction* as the 3PL solution would help internal customers to gain better control over their logistics flows, which could support reductions in inventory levels and associated holding costs.

The increased customer service is set to not be realized as a benefit because Lindab already has a high level of customer service, as perceived through interviews, meaning high service levels and high customer satisfaction. Therefore, any marginal improvements in service are unlikely to be noticed by customers or provide a competitive advantage. Instead, efforts might be better focused on maintaining current standards.

### *6.2.2 Challenges*

If the current silo structure is not addressed prior to implementation, it may pose challenges to the success of the 3PL solution. Implementing an internal 3PL can be more difficult if each entity is used to managing their own operations independently, which aligns with the broader challenge of *resistance to change*. Additional risks include limited *information sharing* and a lack of mutual trust between entities. Nevertheless, since the 3PL will be internal and given the interviewees responses, these challenges are not expected to be significant obstacles.

The issue of Lindab focusing too much at the individual results of each company might not be improved by a 3PL solution. However, it might provide challenges with the 3PL implementation. If proven that the 3PL solution would be feasible for the group it might be a financial loss for some companies. This could potentially be a challenge of implementing a 3PL solution, aligning with the challenge of *opportunism* where entities might work in self-interest. An example of this would be if some company either tries to oppose the decision or stops placing some of its goods in GW. Further, the risk with both being able to *benchmark logistic cost* as well as keeping the EBIT-driven strategy, now applied for the 3PL company as well, there is the challenge of *cost competitiveness* where the 3PL provider might focusing to hard on reducing cost and by that lowering the quality of logistical services.

Even though the 3PL solution might entirely solve the problem that no one prioritizes logistics, there are some other challenges that might arise instead. The 3PL provider must make sure that their services are what is desirable by its customers, as described in the challenge of *customer alignment*. This is also mentioned by some of the interviewees that stated that their end-customers highly validated speedy, on-time and precision delivery. Further saying that a detailed contract would be needed to ensure this.

Implementing a 3PL solution is unlikely to resolve the split perspectives within the organization. Management at Lindab should instead actively work to improve collaboration and integration across the group. Although these differing perspectives are unlikely to directly affect the operation of the 3PL solution, they may impact the willingness to adopt the change, particularly if all involved parties do not fully recognize the current challenges or the potential opportunities that a 3PL model could offer. Again aligning with the *resistance to change.*

In addition to the challenges identified so far, which are supported by previous research, the interviews revealed additional potential challenges that may influence the success of a 3PL solution at Lindab, but cannot be connected to a general challenge. The establishment of a comprehensive and well-defined contractual agreement will be essential, yet potentially difficult to achieve, due to the complexity involved in managing elements of another company’s operations. Critical issues such as the allocation of responsibility for disruptions or delays must be clearly addressed. Although the 3PL

provider would be operationally responsible, any service failures could have reputational consequences for the client company. In addition, there are several operational considerations that must be resolved. These include defining procedures for inventory management and clarifying which organization will have formal responsibility for the personnel working in the warehouse, particularly given that the warehouse is currently integrated into Lindab Ventilation's internal processes.

As seen in the cost analysis there is an injustice in the pricing of products placed in GW and using a 3PL would create an opportunity to fix it. This is known to some of the interviewees however they state that it would be way too complex to have a more individual pricing model, based on for example changes in sales and the number of suppliers. This risks being a challenge for the 3PL provider and will need a thorough investigation when applying the potential solution.

### *6.2.3 Summary*

To give an overview of each benefit and barrier connected to opportunities and challenges respectively, a summary can be seen *Table 6.1*. Each benefit and barrier have been categorized if it is believed to be realized immediately or eventually, when the 3PL solution is implemented. A few proposed benefits and barriers lack sufficient supporting data to determine whether they will be realized at all. Like other aspects, these areas require further investigation and have been marked as inconclusive.

Table 6.1: *Overview of realized benefits and barriers.*

| Aspect | Realized | Potentially realized | Not realized | Inconclusive |
|---|---|---|---|---|
| **BENEFITS** | | | | |
| Increased customer service | | | | |
| Innovation | | | | |
| Core competence focus | | | | |
| Logistical expertise | | | | |
| New market access | | | | |
| Logistics network access | | | | |
| Flexibility in relation to market | | | | |
| Economies of scale | | | | |
| Sharing development costs | | | | |
| Reduction of capital investment | | | | |
| Reduction in equipment maintenance costs | | | | |
| Reduction of financial risk | | | | |
| Turning fixed costs to variable | | | | |
| External benchmark for logistic | | | | |

| | |
|---|---|
| costs | |
| Better capacity utilization | |
| Volume flexibility | |
| Inventory reduction | |
| Order cycle reduction | |
| Lead-time reduction | |
| Access to IT logistics system | |
| Improved service levels | |
| **BARRIERS** | |
| Resistant to change | |
| Customer alignment | |
| Information sharing | |
| IT development | |
| Sustainability | |
| Provider dependency | |
| Cost competitiveness | |
| Opportunism | |
| Employee expertise | |
| Poor IT capabilities | |
| Minimizing lead times | |

### *6.2.4 Lindab's Readiness to Become a 3PL*

Separated from the theoretical opportunities and challenges with a 3PL solution at Lindab is the potential of Lindab's current operations. The current setup provides more case specific opportunities and challenges with implementing a 3PL solution. This is analyzed through the evaluation of Lindab's position in the 3PL-MM. An overview of the discussed placements from the empirical data is illustrated in *Figure 6.1*. The positions in the MM are estimated based on an analysis of the interviewees' responses. When multiple interviewees assign the same position to an element, this is considered to strengthen the credibility of that placement. If an interviewee has expressed a limited insight in an element or focuses on a part of the operations unrelated to logistics, their input is given less weight. In cases where several differing but reasonable placements are identified, an average has been used.

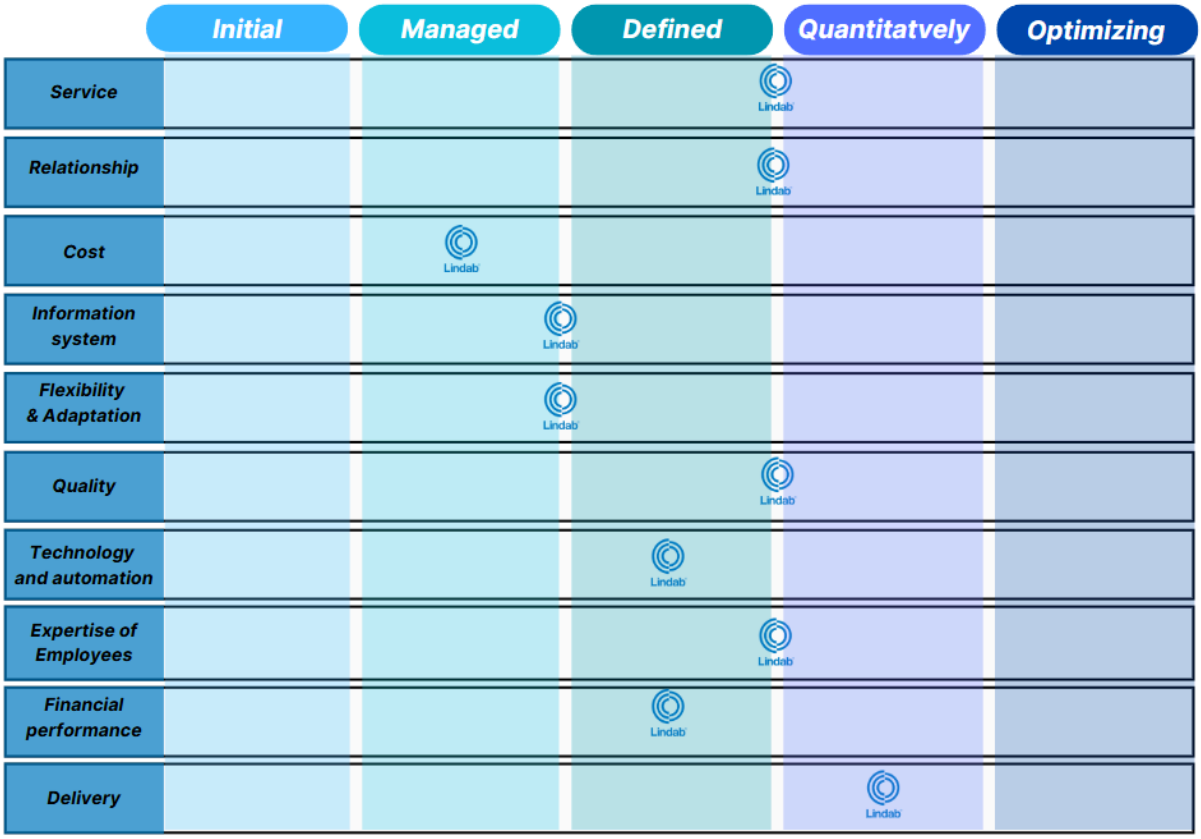


Figure 6.1: *Lindab's position in the 3PL-MM.*

As can be extracted from the 3PL-MM evaluation, the activities where Lindab currently are ranked highly are considered opportunities for Lindab to succeed as an internal 3PL provider within the company group. Areas where Lindab is placed at lower levels are seen as challenges for their success as a 3PL. It is important to distinguish this evaluation from the possible improvements suggested by the interviewees that a 3PL transition could have in the future. The evaluation of Lindab's key opportunities and challenges reflects their readiness to succeed as a 3PL provider if the transition were to happen today, without considering potential changes that could be made in the future. However, it was addressed by interviewees that Lindab's placement in the MM might automatically enhance over time when the 3PL solution is in place. Where some of them believe that if the ones responsible for logistics also would manage their own budgets and pricing the work with cost reductions naturally would increase. Logistics as an own entity would also heighten the incitement on spreading the knowledge inside the company and investmenting in new knowledge. These two could then trigger each other as described by *Interviewee H*. With the same reasoning a lot of the interviewees thought that the service and costs would automatically mature if someone were to be responsible for them.

Moving on, expecting to place Lindab in the optimized level is unrealistic since this represents being market leaders, always following best practise. It is quite hard to achieve excellence in logistics when that is not the current core strategy. The fact that all placements are found within the middle levels indicates a readiness to act as a 3PL provider, in Lindab's case, as an internal 3PL, but it also highlights several challenges.

Deliveries stands out as particularly well-suited for a 3PL solution and represents Lindab's strongest opportunity, an assessment that aligns well with Lindab Ventilations delivery reliability of 99.67%. Additionally, their service breadth, customer relationships, quality and expertise of employees are assessed as solid and manageable opportunities. However, three of the evaluated elements, namely cost, information systems as well as flexibility and adaptation, identified as potential major challenges. These should therefore be prioritized if Lindab decides to pursue a 3PL strategy.

## 6.3 Considerations Regarding the Recommendation

When considering whether to move forward with an internal 3PL at Lindab to answer RQ3, several aspects should be analysed. First, the purpose of developing internal 3PL operations at Lindab must be established, including what strategic or operational goals the company is hoping to achieve. Second, it is necessary to assess whether the identified opportunities align with and support this purpose. Third, the potential customer value created through such a shift must be evaluated. Finally, the identified challenges must be analysed, with a focus on how they can be handled to enable a successful implementation.

Based on the problem formulation, the main purposes of implementing an internal 3PL solution at Lindab are as follows:

- To create more just and transparent pricing for internal logistics services.
- To focus on and reduce overall logistics costs within the Lindab Group.
- To maximize the strategic potential of GW.
- To help business units make better SC decisions.
- To allow Lindab Ventilation and other units to focus on their core business activities.

When evaluating these purposes with the identified opportunities, several conclusions can be drawn. A 3PL solution is likely to result in more just and transparent pricing, as the pricing structure would be based on actual logistics service costs, rather than the markups applied through internal sales. It would also separate what the value of the product is. When it comes to cost reduction, the cost analysis suggests that an internal 3PL could lower logistics costs across the group. However, the exact size of these reductions is hard to quantify at this stage. Further investigation is required to determine whether the potential savings are enough to support a significant change in operational structure. In terms of GW utilization, while lowered service pricing could create an incentive for internal companies to place more products in the warehouse, this is not guaranteed. Similarly, while better SC decisions are not an automatic outcome of a 3PL solution, such a solution would create the necessary conditions for more coordinated and optimized logistics planning. Lastly, by placing the logistics responsibilities to a dedicated entity, Lindab Ventilation would be better positioned to concentrate on its core business.

The evaluation of customer value in a 3PL solution at Lindab can be viewed in two perspectives. Firstly, the internal customers, the companies within the Lindab Group, are likely to gain increased transparency in logistics operations and pricing. A centralized 3PL solution would enable shared investments in logistics infrastructure and capabilities, greater collaboration and economies of scale. Additionally, internal customers would gain greater control over their logistics flows, which could support reductions in inventory levels and associated holding costs. Secondly, there is the potential for increased value for end customers. Although not directly affected, they may benefit from internal logistics improvements if it means lower product costs. Furthermore, a 3PL with a specific responsibility, could improve delivery performance, flexibility and reliability, thereby improving the overall customer experience.

To ensure that Lindab succeeds in developing an internal 3PL solution, found challenges must be addressed. First, a shared understanding regarding which logistics processes are functioning well and which need improvement will be needed. This mutual understanding is necessary to achieve a willingness to change, creating a smoother transition. Second, the current EBIT-driven management model may need to be reviewed. When addressing logistics changes individual companies may receive higher internal costs in order to generate overall cost savings for the group. Making the companies work towards group goals rather than individual goals is necessary to avoid internal conflict and to support the 3PL as group-level optimization.

Operationally, based on the 3PL-MM the internal 3PL provider must focus on three areas: cost efficiency, information systems and flexibility. Improved transparency in pricing is essential, along

with a proactive approach to identifying and implementing logistics cost reductions. The information systems that will be supporting the 3PL should be improved to enable better tracking, communication and data-driven decision-making. However, further investigation on specific systems is required. In addition, the 3PL must be able to handle short-notice changes and variations in demand. This requires well-defined processes and a flexible operational mindset. A comprehensive service contract is necessary. It could be created with inspiration from contracts used by external 3PL providers, to easier define responsibilities, expectations and performance metrics. Finally, a pricing model must be carefully developed and evaluated. It should have a balance between simplicity and transparency while still being able to reflect the specific needs of individual business units.

As seen throughout this thesis an internal 3PL at Lindab could lead to significant improvements. However, it is important to acknowledge that an internal 3PL is not a perfect solution. The implementation of such a solution would also introduce new layers of organizational complexity. Therefore, the trade-off lies in balancing the potential efficiency gains and cost savings with the increased structural complexity and the need for effective change management. For the internal 3PL to succeed, Lindab must approach the transformation with a clear strategic framework, strong internal alignment and a readiness to manage the transition process carefully.

### *6.3.1 Ownership of 3PL*

The reasoning behind creating a new company instead of letting for example Lindab Ventilation manage the 3PL operations were multiple and are all validated through the interviews. Firstly, it was concluded that the logistic provider needed to be its own identity to be able to make decisions based on the general feasibility of the group and not create biases. This is also supported in the literature. Secondly, it was expressed by some interviewees that the logistics at Lindab should be closer to the sales departments since they have a better understanding of the pricing and they should also know what is affecting the costs. As well as making sure that the sales departments understand the problems with logistics. Thirdly, it was established that the Lindab group does not have operations on a group level. Instead the first interviewee came up with an idea that seems the most reasonable through the whole project. That would be for Lindab to create a new company, Lindab Logistics, acting as an internal 3PL provider. The internal structure of the company falls outside the scope of our expertise and is not directly supported by the research presented in this study. However, the best solution we have managed to find during the project is that Lindab Logistic should have a board consisting of the Nordic sales companies and therefore the success of the 3PL company would directly affect the sales companies. Nonetheless, this proposal should be further evaluated by Lindab to suit their organizational strategy.

As expressed during the interviews, Lindab has a strong tradition of leveraging internal resources, where they develop their own systems, promoting internal recruitment and thereby keeping the organizational knowledge. While this approach ensures that solutions are tailored to the company's specific needs and culture, it may also limit exposure to external innovations and best practices. For example, when systems are developed in-house, they are optimized for Lindab's operations, but the company may miss out on more efficient or advanced solutions that external experts in the field could provide. This dynamic is also relevant to the consideration of an internal 3PL. There are clear advantages to keeping the logistics function within the group, not least because of its strategic role in managing GW and the potential to leverage synergies across the business units. However, this raises a critical aspect to take into consideration, whether an external logistics partner could offer greater value, expertise or efficiency. This needs further investigation, as it speaks to the balance between control and specialization. While an internal 3PL allows for alignment with Lindab's structure and goals, an external provider may offer capabilities, tools and perspectives that Lindab currently lacks.

# 7. Discussion

*This chapter reflects on the broader implications of the study by discussing the potential to generalize the findings beyond the Lindab case. It also outlines the limitations that may influence the results and should be carefully considered to avoid potential misinterpretations. Acknowledging these limitations also serves to strengthen overall transparency and credibility of the study.*

## 7.1 Generalizability

Due to the complexity of the case company's SC, the results of this study are limited in their generalizability. As this is a single-case study, the recommendations are closely tied to the specific circumstances and organizational structure of Lindab and may not be directly applicable to other companies, even if they operate in similar settings. However, the developed framework can still serve as a useful tool for other organizations seeking to evaluate their own maturity as a 3PL provider or their readiness to transition into such a role. Similarly, the cost analysis method presented in this study can be applied step-by-step by other corporate groups with comparable structures, although some adjustments may be necessary to reflect specific conditions.

## 7.2 Critique of Simplification of Literature

One limitation of this thesis is the need to simplify and interpret existing literature due to the limited availability of research specifically focused on readiness to become a 3PL provider, particularly in the context of internal 3PL operations. Much of the available literature addresses CSFs from the perspective of 3PL users when selecting a provider. In this thesis, those factors have been adopted to represent the CSFs for becoming a 3PL provider. While this reasoning is based on the logic that a provider must meet user expectations to be successful, it may not fully reflect the internal capabilities required to operate effectively as a 3PL. Moreover, the literature points to a gap between what customers expect and what providers are actually able to deliver. This suggests that not all user-desired attributes are necessary for operational success and that the framework may include factors that are not truly critical.

Additionally, there is a significant lack of research on internal 3PL. As a result, all theoretical references have been drawn from studies on external 3PL providers. Throughout the project, the authors have critically considered whether such findings are applicable to internal 3PL contexts. The working assumption has been that they are, since an internal 3PL provider must be able to compete with external alternatives in order to be a viable option within a corporate group. Thus, it should possess similar capabilities.

That said, internal 3PLs may benefit from advantages such as stronger trust, closer system integration and better knowledge of customer operations due to being part of the same organization. However, there are also potential drawbacks. For example, internal politics and budgeting mechanisms may discourage internal business units from choosing external 3PL providers, even if such providers could offer better operational solutions. This reluctance may come from a desire to keep the money within the company group instead of paying an outside provider. Such dynamics could limit the competitiveness of the internal 3PL and reduce the overall effectiveness of the initiative.

## 7.3 Limitations of the Framework

Regarding the MM, several aspects require further discussion. First and foremost, such a framework should ideally be validated by external stakeholders and refined based on their feedback. In an effort to achieve this, the authors of this thesis have reached out to both academic experts and

representatives from 3PL companies to evaluate the model. The intention was to determine whether the underlying reasoning is sound and to identify any parts that may need to be revised or expanded in order to more accurately reflect the practical realities of 3PL. However, despite these efforts, only one external party has been able to participate in the validation process. As a result, the validity of the model remains somewhat uncertain. This lack of external review could pose a potential risk for the case company. For instance, if the progression between levels in a particular element is too steep, it may lead to an inaccurate assessment, such as over- or undervaluing Lindab's current capabilities. This, in turn, could result in the company focusing on less relevant areas or misjudging its readiness to operate as a 3PL provider. It should be noted that the evaluation of the MM was done late in the process of the project. Meaning that the interviewees placement is done in the original model. However, since the changes were not affecting the actual content of the MM it is assumed not to affect the evaluation.

Additionally, the MM was designed with general 3PL contexts in mind. However, certain aspects may be more or less relevant within the building materials industry. For Lindab, some elements of the model may carry greater importance than others, which limits the model's applicability without industry-specific adjustments. Another limitation is that the framework can be hard to interpret and apply in a consistent way. A company may fulfill some parts on different levels without filling all of them or have different business units at varying levels of maturity. This opens up for interpretation by the evaluator and makes it challenging to compare results over time or against other organizations in a reliable way.

Furthermore, self-assessment always carries a risk of bias. While ideally external evaluators would provide a more objective view, the individuals best equipped to assess operational capabilities are often internal employees. To prevent biases as much as possible, the authors have tried to make an objective assessment. This together with having interviewees from different parts of the company group while still being familiar with the operations in GW. Diverging perspectives were also captured by using quotes to both support and challenge key observations from the other interviews.

In summary, while the framework offers a structured way to assess 3PL maturity, its unvalidated nature, interpretive flexibility and reliance on internal evaluation all present challenges that should be considered when drawing conclusions or making strategic decisions. Note that when using the model, the general description of each element should be read to ensure that the brief descriptions of the intersections are not overly generalized.

## 7.4 Complexity of case study

The subject of this thesis involves a broad and fragmented area, which adds a level of complexity to the research. In particular, the case study focuses on a company group rather than a single company, and this group operates within a complex SC structure. This makes it more challenging to achieve a fully comprehensive analysis. Given the scope and complexity, the authors acknowledge the possibility that certain aspects of the company's operations may have been misunderstood, oversimplified or unintentionally missed. Despite efforts to gather a wide range of perspectives and validate findings, the nature of the study calls for a degree of modesty regarding its completeness and accuracy.

To support practical use, the developed cost analysis model has been handed over to the case company. It is designed to be transparent and user-friendly, with linked values that update automatically. This allows Lindab to easily adjust inputs, such as correcting data errors or refining estimates, without requiring major changes to the structure of the model. In this way, the tool can remain useful and relevant even beyond the scope of this thesis.

## 7.5 Limitations of methodology

This thesis was based on a request from the case company to investigate and evaluate the potential of a 3PL solution, an idea under consideration for several years. As a result, the thesis was structured to support and explore this specific direction. However, with a more scientific perspective, it may have been more appropriate to approach the analysis differently. For instance, the study could have first investigated what Lindab needs to improve in order to enhance customer value. Based on those insights' potential strategies, such as 3PL or other alternatives, could have been evaluated. In its current form, the thesis begins by exploring the concept of 3PL and then attempts to determine how a 3PL solution might fit Lindab's operations and what benefits it could have. This approach risks overlooking other, potentially more suitable solutions and may lead to recommendations involving significant changes that are not necessarily optimal. The thesis has been developed to the best of our ability and in alignment with the case company's expectations. Nonetheless, from a purely academic standpoint, a more open-ended and needs-driven research design might have resulted in a broader and more objective analysis.

# 8. Conclusion

*This chapter concludes the study by summarizing the key findings in relation to the RQs. Each question is addressed based on the insights gained from the empirical data and the developed framework.*

## 8.1 Answering Research Questions

RQ 1: *What is the current distribution map of suppliers and deliveries throughout GW?*

Based on the analysis results GW hosts and distributes products from a total of 158 companies, where the 19 largest companies account for over 95% of all total sales. Three Swedish group companies Lindab Ventilation, Company A and B have been further investigated as they cover a large part of the Swedish market. Currently, Company A has approximately 50% of its possible product volume at GW.

The ranking of the companies were based on sales amount, but the same ranking would apply for warehouse utilization. GW currently has 58% utilization, equalling 15 800 occupied pallet locations and is predicted to be able to increase it to around 85%. When mapping deliveries through GW the data was expressed in transactions, where findings revealed that Lindab had a 1:10 transaction ratio of in- and outgoing transactions. However, at the individual company level, there is significant variation in the number of transactions.

RQ2: *What are key opportunities and challenges for Lindab in creating an internal 3PL?*

The found key opportunities and challenges for Lindab in creating an internal 3PL is found in *Figure 8.1*. Understanding these aspects is important for determining the long-term benefits and alignment of the internal 3PL with Lindab's overall logistics strategy.

| | Opportunities | Challenges |
|---|---|---|
| Benefits and barriers | **Likely** | |
| | • *Core competence focus*<br>• *Economies of scale*<br>• *Sharing development costs*<br>• *Reduction of capital investment*<br>• *Reduction in equipment maintenance costs*<br>• *Turning fixed costs to variable*<br>• *External benchmark for logistic costs*<br>• *Better capacity utilization* | • *Resistant to change*<br>• *Information sharing* |
| | **Potential** | |
| | • *Innovation*<br>• *Logistical expertise*<br>• *New market access*<br>• *Logistics network access*<br>• *Inventory reduction*<br>• *Access to IT logistics system* | • *Customer alignment*<br>• *Cost competitiveness*<br>• *Opportunism* |
| Maturity Model | • *Service*<br>• *Realtionship*<br>• *Quality*<br>• *Expertise of Employees*<br>• *Delivery* | • *Cost*<br>• *Information System*<br>• *Flexibility and Adaptation* |

Figure 8.1: *Key opportunities and challenges for Lindab in creating an internal 3PL.*

RQ 3: *Should Lindab pursue establishing an internal 3PL?*

Given the potential benefits identified, such as improved cost transparency, reduced internal markups, improved logistics coordination and the opportunity for business units to focus on core activities, Lindab could gain significantly from an internal 3PL solution and is *recommended to further investigate the phenomenon*. Furthermore, the creation of a separate entity such as Lindab Logistics, with a neutral position, seems to be a potential organizational structure to support this transformation. However, this recommendation is not without reservations. The added complexity, necessary structural change and risks associated with in-house development must be acknowledged. Therefore, it is suggested that Lindab proceeds exploring a 3PL solution including:

- Financial modeling to better quantify savings.
- An organizational readiness and change management assessment.
- A comparative study of internal compared to external 3PL potential.
- Development of a concrete service-level agreement and pricing model.

To succeed, Lindab needs to ensure strong internal alignment, consider parts of its cost driven approach and improve systems for cost transparency and information sharing. If the 3PL solution is not something Lindab would like to proceed with it is highly recommended to explore some other type of mutual logistics solution as well as working with the identified problems.

## 8.2 Research Contribution

This thesis has supported the case company in evaluating whether to further explore the idea of developing an internal 3PL solution within Lindab. It has also provided an objective external perspective on the feasibility of leveraging their current logistical capabilities for such a transition.

In addition to the case-specific insights, the thesis contributes to the academic field by addressing existing gaps in the literature, particularly regarding the differences between internal and external 3PL solutions and the limited information available on the transition toward becoming a 3PL provider.

Furthermore, the study has developed two original models:

- A 3PL MM tailored to evaluate a company’s readiness and development areas in relation to 3PL capabilities.

- A cost analysis model designed to estimate potential cost savings associated with adopting 3PL solutions.

Lastly, the research presents a practical, real-world case that highlights challenges and opportunities in logistics strategy. It identifies specific issues that a 3PL approach could help address, thus providing a useful reference for both practitioners and researchers interested in similar transitions.

## 8.3 Future Research

To further continue investigation into this topic, several promising areas can be explored. As previously mentioned, the proposed Maturity Model has not yet been evaluated. A natural next step would be to conduct a thorough assessment of the model's validity and usefulness, incorporating feedback from industry experts and applying it in existing 3PL organizations to assess its practical relevance and applicability.

In relation to the specific case company, there are further opportunities for in-depth evaluation now that the groundwork has been laid. For instance, future studies could analyze the actual utilization of

transport resources, such as truck capacity and how these could be optimized through a 3PL solution. Another valuable area would be to examine the technological infrastructure required to support 3PL implementation. The case company has suggestions on a technical solution that can be an area of exploration Nevertheless, this remains an important topic that could form the basis of a dedicated thesis. Such research should consider the system's ability to manage inventory and orders for multiple clients while maintaining appropriate data separation between legal entities. Furthermore, an entire thesis could be devoted to developing a pricing model for customer billing under a 3PL arrangement. Handling costs may vary by product characteristics such as weight, size and turnover rate. However, as highlighted by interviewees, individual pricing models come with complexity and challenges. Therefore, an assessment of cost models will be critical for the future development and success of this project. Looking further ahead, if the proposed 3PL solution is implemented, it may be relevant for the Lindab Group to evaluate whether other parts of the organization, such as regional HUBs, should also be integrated into the 3PL framework.

In the broader academic context, continued research into the success factors for 3PL providers is necessary. As outsourcing of logistics continues to grow, understanding what enables 3PL providers to thrive becomes increasingly important. Despite its growing relevance, the field remains under-researched and current literature tends to offer a narrow perspective. Further studies could help provide a clearer and more complete understanding of what drives successful 3PL operations.

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# 10. Appendix

## Appendix A: Outlines of Interview.

(Note: the questions vary slightly depending on the expertise of the interviewee.)

### Interview [Name], [Company name]

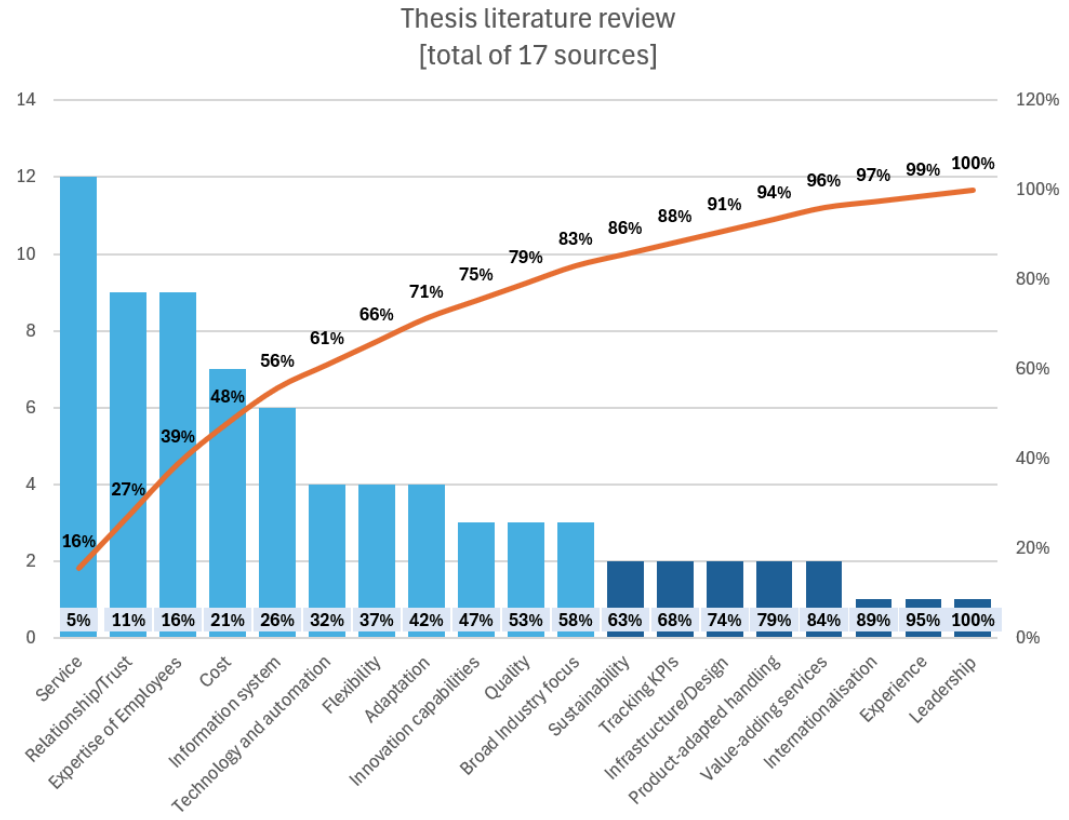
**Date:** 2025-xx-xx
**Duration:** xx min
**Interviewee:** [Name] from [Company name]
**Purpose:** Interviewee specific

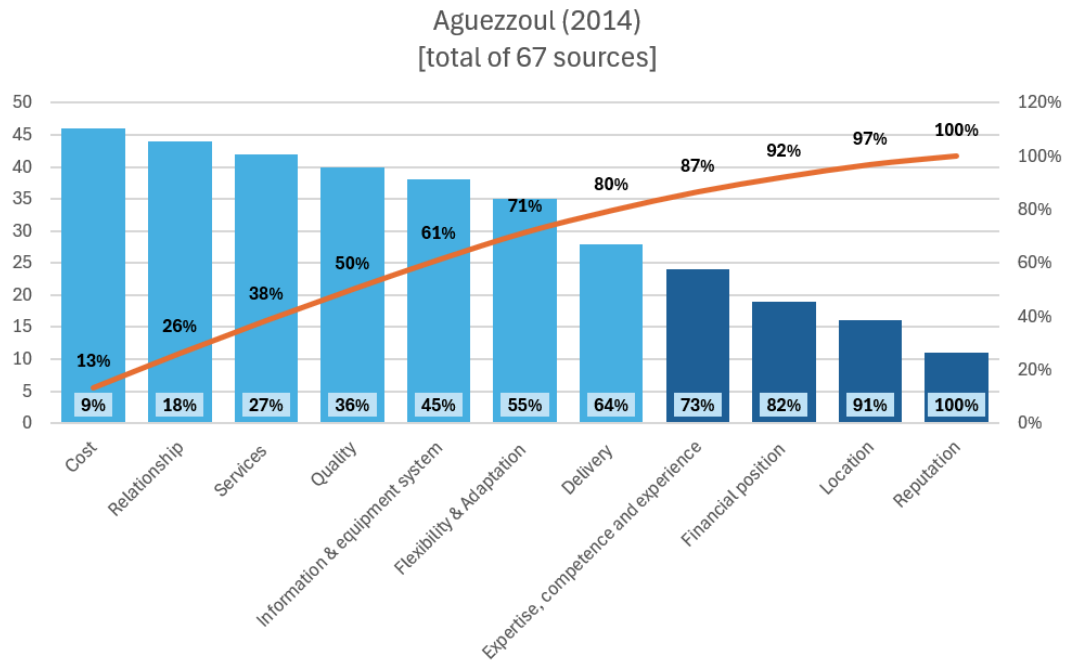
[***To ensure that both parties share a common understanding of what a 3PL provider means in our context, it is important to clearly define the scope:*** *There is the ongoing evaluation of how Lindab's warehouse in Grevie could function as a shared warehouse for the entire Lindab Group. In this setup, Lindab Ventilation would no longer purchase products from internal companies to place in its own warehouse. Instead, the internal companies would retain ownership of their products, while Lindab Ventilation would provide logistics services (such as warehousing and transportation) to them. In this way, Lindab Ventilation would act as an internal 3PL provider within the group.*]

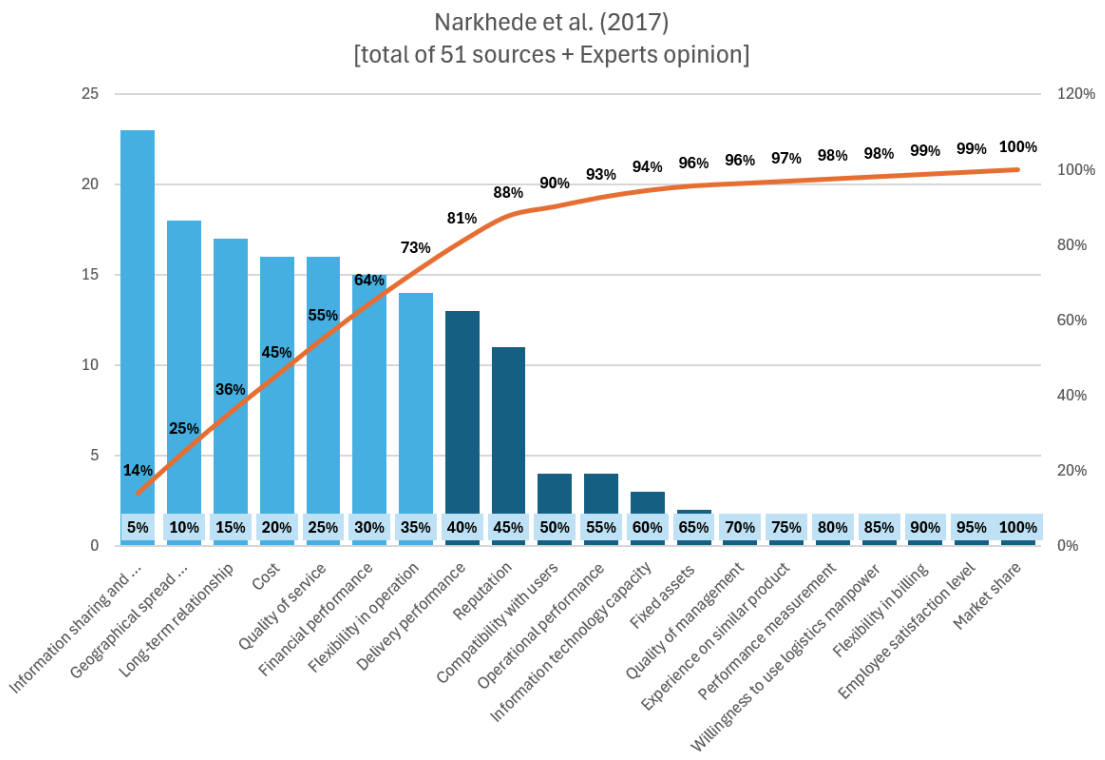
**Questions**

1. Can you briefly describe your role and main areas of responsibility?
   *Answer:*
2. What is your opinion on the current logistics setup within the group?
   - What are doing well? Do you see any challenges?
   *Answer:*
3. Do you think a 3PL solution would be beneficial for the group?
   - What specific advantages do you see with this solution for Lindab?
   - What specific disadvantages do you see with the solution?
   *Answer:*
4. What do you believe is critical for Lindab to succeed as a 3PL provider (CSF)?
   *Answer:*
5. Which cost components (e.g., warehousing, administration, transportation) do you think would be most affected by a 3PL solution?
   *Answer:*
6. There is a vision that Lindab could start another company (let's call it Lindab Logistics), which would be a dedicated logistics company with a strong focus on logistics specifically. Do you think that's a good idea, or should Lindab Ventilation be the one to provide the logistics services instead?
   *Answer:*
7. Do you think there is an alternative to a 3PL solution?
   - Do you think that would work better? Why?
   *Answer:*
8. How do you think Lindab's logistics needs will develop in the coming years?
   *Answer:*
9. Is there anything else you'd like to add that we haven't covered, but that you believe is important for our case?
   *Answer:*

# Appendix B: Pareto Charts of Mentioned CSF in Literature




Narkhede et al. (2017)
[total of 51 sources + Experts opinion]
25
20
15
10
5
0
120%
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Information sharing and ...
Geographical spread ...
Long-term relationship
Cost
Quality of service
Financial performance
Flexibility in operation
Delivery performance
Reputation
Compatibility with users
Operational performance
Information technology capacity
Fixed assets
Quality of management
Experience on similar product
Performance measurement
Willingness to use logistics manpower
Flexibility in billing
Employee satisfaction level
Market share

# Appendix C: Developed Maturity Model for a 3PL provider.

| | Initial | Managed | Defined | Quantitatvely | Optimizing |
|---|---|---|---|---|---|
| Service | Limited offerings; Small-scale; Isolated services; Low quality | Provides packages of logistical services; services are tracked and documented | Can provide standardized logistics service; Broader service range | Customized logistical services; Handles all type of services | Comprehensive services; Value-added; Continuous improvement; Best practices |
| Relationship | Minimal trust; Performance-based; Price-driven; Vendor relationship | Task-based; Transactional; Reliability-focused | Joint problem-solving; Information sharing; Mutual trust; Success based | A high level of trust, with both parties aligned on long-term objectives and growth | Full integration; Mutual growth; Collaborate on setting future goals, improving processes, and innovating services |
| Cost | Unclear pricing; Bad cost control; Inconsistent cost reduction | Tracking and planning to potentially reduce unforeseen costs; internal cost reductions | Standardised pricing; Cross-functional cost-reductions; Creating economies of scale and scope | Controlled cost optimization with efficiency; Operational cost-reduction | Shared rewards; Cost leadership; Continues improvement of cost reduction |
| Information system | Manual tracking; Limited data integration; No information security | Manual tracking is added to software; Some data integration; Planning for information security | Daily location updates; Partial data integration; Implementing information security | Automatic tracking; Full data integration; Monitored information security | Automatic tracking with Logistics 4.0; Problem free data integration; Continuously improved High level of security |
| Flexibility & Adaptation | Can identify and measure flexibility within the company; Flexibility may not be utilized or planned for; Manually forecasts | Flexibility is applied to specific work processes; Can adapt to challenges when needed but lack a strategy; Uses technology for forecasts | Proactively managing flexibility; Forecasts are made with time series techniques | Strategic flexibility to a wide range of challenges; Agility a key focus for survival and growth; Forecasts based on mathematical models | Flexibility beyond the firm across the entire network; Goal is to create an agile, responsive system; Forecasts with machine learning and AI |
| Quality | Performance measurement is limited; Quality tools and practices are rarely used; Quality is low | Some basic risk assessment; Customer satisfaction is low; Few sustainability practices; ISO standards are inconsistently applied | Risk treatment plan; Good customer satisfaction; Sustainability issues are addressed; Some ISO standards are followed | Regularly uses quality tools and continuous improvement practices; Risk management is systematically applied; Sustainability is an important issue; Additional ISO standards are considered | Quality practices are fully embedded across all processes; Risk management and sustainability is part company's policy and vision; ISO standards is a core part of the strategy |
| Technology and automation | No specific use; Manuell process | Used for monitoring day-to-day activities; e.g. WMS, Barcodes and scanners | Used to optimizing day-to-day activities; e.g. Radio Frequency identification and data analytics | Used to increase productivity; e.g. Internet of Things and Augmented Reality | Used to fully control physical flow; Fully autonomous; e.g. AI, smart pallets and sensors |
| Expertise of Employees | Employees lack competence in logistics | Basic employee training; Basic knowledge in logistics | Use models of managerial competence; Knowledge to analyze and solve logistics problems | Employee empowerment; Systematically analyze and solve complex logistics problems | Fully utilize knowledge and experience; Logistics excellence |
| Financial performance | Unstable financial performance with limited funding for continuity or upgrades | Financially stable enough for daily operations, but improvements are inconsistent | Reliable financial performance supporting planned upgrades and operational efficiency | Financial performance is measured and optimized through data-driven decisions | Strong and growing financial performance enabling continuous investment and innovation |
| Delivery | High product damage rate; Manual transmission of delivery information; Delivery errors and missed shipments | Complete, on-time and accurate deliveries; Fully digitalized order management systems; Wide integration of enterprise systems | Uses company-specific data to improve shipping processes; Unable to meet individualized customer demands | Ability to handle emergencies and customer dissatisfaction; Automated real-time order systems; Delivery customization | Highly customized services for individual customer demands; Real-time simulation for decision-making |

# Appendix D: Compilation of Interviews Regarding MM-Elements.

| Participant | Quote |
|---|---|
| Interviewee A | *"Most important of 3PL is service and cost"*<br><br>*"Is the knowledge there? That is important"* |
| Interviewee B | *"Competence is by far the most important thing, if people are innovative, solution-oriented and driven, things usually work out"*<br><br>*"We have customers across various segments and tailor solutions to their needs [...] We offer the full range of logistics services (and value-adding services) and primarily target medium-sized and large companies with large and complex flows"*<br><br>What makes you competitive on the market?<br>*"All our employees are recruited, owned and trained by us, which ensures competence and quality. [...] We have automated and digitized processes where others are still working manually. [...] We maintain an exceptionally rapid inventory turnover of 1.2 days, pushing the just-in-time concept to its limits*"<br><br>*"We have our own business system"*<br><br>*"The more transparency and information we can give to our customers the better it is"* |
| Interviewee D | *"Our customers have high demand on low delivery times. [...] Speed is the most important customer value for our company."* |
| Interviewee E | *"Cost and quality is important for customers"* |
| Interviewee F | *"Our USP (unique strength) is that we are close to the customer and can deliver a coated product within a day"*<br><br>*"The risk with going big is that the system would not be as quick-footed"*<br><br>*"The 3PL solution really requires very strong system support, as well as daily communication"*<br><br>*"I have made a similar implementation and the most important things is communication and technology systems and that you have competencies that is needed"* |
| Interviewee G | *"It naturally depends a lot on the competitive situation. Ideally, the market price level is such that we have a strong enough market position that we're not constantly exposed to price competition. Instead, we sell based on other customer values when we get started and can therefore leverage those"*<br><br>*"A major investment in a central warehouse is not just about covering the exact cost, we also have requirements from our shareholders to get a return on the capital we invest"* |

# Appendix E: Updated Maturity Model for a 3PL provider.

| | Initial | Managed | Defined | Quantitatvely | Optimizing |
|---|---|---|---|---|---|
| Service | Limited offerings; Small-scale; Isolated services; Low quality | Provides packages of logistical services; services are tracked and documented | Can provide standardized logistics service; Broader service range | Customized logistical services; Handles all type of services | Comprehensive services; Value-added; Continuous improvement; Best practices |
| Relationship | Limited trust; Performance-based; Price-driven; Vendor relationship | Task-based; Transactional; Reliability-focused | Joint problem-solving; Information sharing; Mutual trust; Success based | A high level of trust, with both parties aligned on long-term objectives and growth | Maximal trust; Mutual growth; Collaborate on setting future goals, improving processes, and innovating services |
| Cost | Unclear pricing; Limited cost control; Inconsistent cost reduction | Tracking and planning to potentially reduce unforeseen costs; internal cost reductions | Standardised pricing; Cross-functional cost-reductions; Creating economies of scale and scope | Controlled cost optimization with efficiency; Operational cost-reduction | Joint evaluation of total cost of ownership; Continues improvement of cost reduction |
| Information system | Manual tracking; Limited data integration; No information security | Manual tracking is added to software; Some data integration; Planning for information security | Daily location updates; Partial data integration; Implementing information security | Automatic tracking; Full data integration; Monitored information security | Automatic tracking with Logistics 4.0; Problem free full data integration; Continuously improved High level of security |
| Flexibility & Adaptation | Can identify and measure flexibility within the company; Flexibility may not be utilized or planned for; Manually forecasts | Flexibility is applied to specific work processes; Can adapt to challenges when needed but lack a strategy; Uses technology for forecasts | Proactively managing flexibility; Forecasts are made with time series techniques | Strategic flexibility to a wide range of challenges; Agility a key focus for survival and growth; Forecasts based on mathematical models | Flexibility beyond the firm across the entire network; Goal is to create an agile, responsive system; Forecasts with machine learning and AI |
| Quality | Limited performance measurement; Quality tools and practices are rarely used; Quality is low | Some basic risk assessment; Customer satisfaction is low; Few sustainability practices; ISO standards are inconsistently applied | Risk treatment plan; Good customer satisfaction; Sustainability issues are addressed; Some ISO standards are followed | Regularly uses quality tools and continuous improvement practices; Risk management is systematically applied; Sustainability is an important issue; Additional ISO standards are considered | Quality practices are fully embedded across all processes; Risk management and sustainability is part company's policy and vision; ISO standards is a core part of the strategy |
| Technology and automation | Limited use; Manuell process | Used for monitoring day-to-day activities; e.g. WMS, Barcodes and scanners | Used to optimizing day-to-day activities; e.g. Radio Frequency identification and data analytics | Used to increase productivity; e.g. Internet of Things and Augmented Reality | Used to fully control physical flow; Fully autonomous; e.g. AI, smart pallets and sensors |
| Expertise of Employees | Limited competence in logistics among employees | Basic employee training; Basic knowledge in logistics | Use models of managerial competence; Knowledge to analyze and solve logistics problems | Employee empowerment; Systematically analyze and solve complex logistics problems | Fully utilize knowledge and experience; Logistics excellence |
| Financial performance | Unstable financial performance with limited funding for continuity or upgrades | Financially stable enough for daily operations, but improvements are inconsistent | Reliable financial performance supporting planned upgrades and operational efficiency | Financial performance is measured and optimized through data-driven decisions | Strong and growing financial performance enabling continuous investment and innovation |
| Delivery | High product damage rate; Limited and manual transmission of delivery information; Delivery errors and missed shipments | Complete, on-time and accurate deliveries; Fully digitalized order management systems; Wide integration of enterprise systems | Uses company-specific data to improve shipping processes; Unable to meet individualized customer demands | Ability to handle emergencies and customer dissatisfaction; Automated real-time order systems; Delivery customization | Highly customized services for individual customer demands; Real-time simulation for decision-making |

# Appendix F: Compilation of Interviews Regarding Current Problems at Lindab.

| Participant | Quote |
|---|---|
| Interviewee A | *"Only Sweden is using it (GW)"* |
| | *"It is usually the case that interest comes with cost, when the production sites paid for the transportations the interest for logistics were higher"* |
| | *"Logistics is today placed under production and that is a bit wrong [...] it should be closer to sales [...] Sales is the best at logistics in the group"* |
| | *"There are two parts to logistics, one being services and having happy customers which Lindab is very good at. The other being pricing and to charge for the services, that one we are a bit worse on"* |
| | *"We do not utilize the fact that Lindab is a big group, there are different concepts in every part, leading to high transportation costs where every group company manages their own."* |
| | *"We have more than 35 companies with different CEOs all managing their own logistics [...] Logistics need a owner in the company group"* |
| | *"There is a need for mutual Logistics, a control tower"* |
| | *"It is in some cases too expensive for internal companies to use GW. [...] Today they are paying 12% for the service of ventilations which to me is unreasonable it should be around 4%"* |
| | *"Unreasonable high logistics cost"* |
| | *"It's a bit like the local result versus the group's result and it's always the group's result that's most important. However, that is not the case always"* |
| Interviewee B | *"I do not say that this is the case at Lindab, but I have seen it in a lot of other companies. That there are a lot of little popes that are all trying to protect their business. Somewhere at the top, we share a common interest, but I still want to look good, so I protect my own. Here it is important with a strong leader"* |
| | *"Currently, percentage-based markup but it can be misleading depending on whether the items are expensive or cheap"* |
| Interviewee D | *"Can not comment much on the logistics around GW"* |
| | *"Do not know if we have a lot of consolidating transportations with our products in GW, I am quite blind"* |
| | *"What is a bit dangerous is that from the group perspective they tend to see only the products we deliver to GW, but that is not representative of what our customers buy"* |
| | *"Inside sales kill the competition"* |

| | |
|---|---|
| Interviewee E | *"What prevents us from improving is that we are not organized under the same structure, everyone is essentially running logistics on their own"*<br><br>*"We are working in silos"*<br><br>*"We don't look at the whole picture, everyone focuses on their own part. I think it could be better if we were all on the same platform and worked towards what is best for Lindab"*<br><br>*"Today there is unfair pricing, where more expensive products are charged higher handling costs than cheaper ones, even though the actual handling might be more costly for the cheaper product"*<br><br>*"It is difficult to improve logistics between companies within the current structure. When one party benefits, another might lose. That is why we need someone who can see the whole picture"*<br><br>*"I think the support needs to come from all directions, especially from our management. It's really about showing that this is the path forward"* |
| Interviewee F | *"The group companies are driven by EBIT, which leads to pushing up prices even for internal customers. Sometimes this results in them buying from external companies instead, which is a bit strange. Not always working for the best of the group [...] Today we are very isolated"*<br><br>*"Products that are supposed to be delivered closer to us is sent to DC in GW and then sent to the customer, that doesn't really make sense"*<br><br>*"I feel a bit tied up, because the DC can't really give me proper sales information. I can get Norwegian sales from the DC on a quarterly basis, but the system feels a bit blunt. This really needs a system for this"*<br><br>*"When the products are bought by ventilation in GW I do no longer get any information about it so I have no clue how the customer thinks this works"*<br><br>*"Looking at the logistics cost it is transportation and DC that is the most expensive ones"*<br><br>*"I would have appreciated a more holistic view, looking at the big picture. For example: how large should the DC inventory be over the year and what should the sales and delivery flows look like based on that?"*<br><br>*"What is best for Lindab? That's the real question"* |
| Interviewee G | *"Some people say that logistics can not cost that much, it can't be that expensive, but many companies don't have a full understanding of the entire income statement and how many costs exist beyond the standard calculation. There are a lot of overhead costs that don't land directly on the product, but someone still has to carry them. So sometimes, it all gets a bit oversimplified."*<br><br>*"Even though individual companies within the group have EBIT requirements we still always working for the group's best"*<br><br>*"In general, just reducing costs is great, as it will benefit the group as a whole. It* |

*is not necessary to lower product prices. Increasing margins would be much better from a shareholder's point of view"*

*"We use a cost plus model for internal pricing, with different markups if the product is traded or produced. Approximately 12% for traded products, more for produced. The markups are the same when trading internally"*

*"Sales companies have decentralized inventory control, which may be problematic for tied-up capital allocation"*