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DETERMINING THE KEY PERFORMANCE INDICATORS FOR MANAGING THE WAREHOUSE PERFORMANCE: A CASE STUDY OF INTERNATIONAL LOGISTIC COMPANY

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ABSTRACT

Measuring the performance of a warehouse is necessary to enhance the efficiency of the logistics system. To enhance warehouse efficiency, it is essential to define Key Efficiency Indicators (KPIs). This study attempts to discover the KPIs of warehouses to enable warehouse managers to take corrective measures quickly and effectively for their warehouses.

This master's thesis is based on a case study that was conducted at DHL, which is a multinational corporation. A qualitative methodology was used in this study, and primary data was gathered via a total of ten interviews, both formal and semi-structured. KPIs and operation and process management were the subjects of secondary data analysis, which included perusing scholarly articles. In addition, internal papers were used as a supplementary source.

This study has found 13 KPIs that are associated with warehouse operations. It has been determined that productivity and demand forecast accuracy are the two most important key performance metrics. This research will add to the knowledge about suitable KPIs used for measuring warehouse performance.

KEYWORDS: Key Performance Indicators (KPIs), Warehouse Management, Core Competence, Critical Success Factors (CSF)

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1 INTRODUCTION

This section presents the core components of the thesis. The thesis is constructed using fundamental elements such as research problem, research topic, and so on.

1.1 Background of the study

Staying competitive in the global economy is a necessity for organizations worldwide. These businesses' strategies have evolved in response to shifting consumer preferences, more product diversity, and an emphasis on the client (Nudurupati et al., 2011). Businesses have had to use Supply Chain Management (SCM) strategies to enhance their supply networks to deal with these problems. To reduce costs throughout the supply chain and increase customer value, SCM integrates connections with both suppliers and consumers; it links internal processes to the external outcome (Lai et al., 2002). To make matters more complicated, each link in the supply chain brings a unique set of experiences and viewpoints to the table, making it hard to standardize metrics for monitoring performance across the board. It is essential to establish a reliable performance measurement system (PMS) to assess the overall or partial success of the supply chain (Aramyan, 2007). This system uses several carefully selected indicators to monitor the many links in the supply chain that are vital to its smooth operation. Several characteristics have been defined as critical to the chain's performance, and these have been called Key Performance Indicators, or KPIs.

Indicators and performance assessments have been receiving an increasing amount of attention in recent years, as shown by studies (Anand & Grover, 2015; Kucukaltan et al., 2016; Rajesh et al., 2012). This focus has been demonstrated to be increasing in a variety of contexts, including industries such as research programs and businesses. It is becoming more apparent that various types of indicators are becoming increasingly significant in logistic organizations throughout the supply chain. Businesses are having a difficult time determining which processes and activities are responsible for the extra trash they produce. Most businesses want to be market leaders and gain a competitive edge by efficiently running their operations. This is a common goal for businesses.

Understanding if there are current or new performance indicators that may be used has become much more important as a result of the changes that have been occurring in the company and market contexts. This may lead to a more advanced level of reporting across different levels of the organization, as well as a greater level of performance and communication, which can be accomplished with improved outcomes indicators. Following this, it is necessary to determine the appropriate ways that may be used to make internal processes more effective at each level of an organization. In addition to revealing problems, key performance indicators show where the company is falling short of its goals and where it needs to improve. However, organizations lack practical guidelines on how to construct key performance indicators (KPIs), making it difficult to select and set the proper ones. (Chae, 2009).

1.2 Research problem of the study

Companies' efforts to boost efficiency and save costs have put a premium on logistics performance's place in the supply chain (Nudurupati et al., 2011). At its core, logistics management is about optimizing the flow of goods and services from the procurement of inputs to their destination for the consumer at the lowest feasible cost (Aramyan, 2007). As inflation impacts all aspects of the supply chain, including holding costs and component prices, among others, cost reduction has taken on more significance in response to external factors like inflation (BANSAL & AHALAWAT, 2013). As a result of these outside influences, supply chain optimization becomes even more important for businesses. This is because it may help save costs, boost productivity, and enhance relationships with customers (Cai et al., 2009). Key performance indicators (KPIs) are an important part of logistics performance monitoring and decision-making. Logistics performance key performance indicators (KPIs) might be difficult to choose without first fully comprehending the processes and systems at work (Chae, 2009).

The issue originates from the procedures inside the warehouse operations in companies. Regrettably, the organizations do not fully adhere to data-driven stock management practices, instead relying heavily on their own experience. Without sufficient data for comparison, it is impossible to determine whether a process is

operating at maximum efficiency. This raises the question of how to enhance these processes to a more efficient condition. Another concern with this problem is that so many companies lack self-awareness about the effectiveness of their methods. It would be inaccurate to claim that the procedure is ineffective since the firm lacks sufficient knowledge. The process may function well, but it needs minor modifications, or it may necessitate a complete overhaul. Key performance indicators (KPIs) are a useful tool for initiating process modifications. By using KPIs, international companies can uncover discrepancies between planned and actual execution, as well as identify and rectify possible problems and concerns (Chae, 2009).

Although previous studies have brought attention to the significance of monitoring the performance of warehouses (Andika et al., 2013; Meiliana et al., 2014; Zhu et al., 2014), there is an extremely limited knowledge of the key performance indicators (KPIs) that are used for efficiently managing warehouse performance.

1.3 Research objectives and question of the study

The precedent discussion steers the course of the present thesis. The primary objective of this is to identify the key performance indicators for measuring the warehouse performance of an international logistic company.

Accordingly, the main research question of this thesis is:

What are the key performance indicators for measuring the warehouse performance of an international logistic company?

1.4 Delimitations of the study

To optimize the results of this master thesis, some constraints have been established, considering practical considerations and the allowed time frame. The emphasis will just be on a select number of crucial performance indicators inside the warehouse operations, to encompass the full growth process. Only the warehouse activities of DHL in Vaasa, Finland have been considered, excluding additional operations.

1.5 Terminology

The key terms used in this thesis are defined in the below table.

Key Terms	Definition
Supply Chain Management (SCM)	The term "supply chain management" (SCM) refers to the practice of organizing the moving parts of a company's supply chain, from sourcing raw materials and components to delivering finished items to the end user (Akkawuttiwanich & Yenradee, 2018).
Key Performance Indicators (KPI)	The term "key performance indicators" (KPIs) refers to a set of measurable goals that an organization may use to evaluate its success over time. Key performance indicators are useful for gauging how well a firm is doing financially, strategically, and operationally, particularly when compared to other companies in the same industry. (Anand & Grover, 2015)
Critical Success Factors (CSF)	A critical success factor (CSF) refers to a necessary achievement that an organization, company, or project must complete to achieve its aim successfully. Critical success criteria assist a team or organization in determining their areas of emphasis and evaluating their progress toward the established objectives. (Gunasekaran & Kobu, 2007).
Performance Measures (PM)	When organizations employ financial or nonfinancial metrics to assess how well they've accomplished their goals, KSFs, strategies, and plans, it's called performance measurement (PM). (Stricker et al., 2017)
Warehouse Management	Warehouse management encompasses the multitude of procedures involved in the upkeep and regulation of a company's warehouse. The process is comprehensively

	executed, including all stages from initiation to completion, and is often supervised by warehouse managers. (Authoni & Suryani, 2014)
Core Competency	Core competencies refer to the specific resources and talents that provide a corporation with its strategic advantages. According to contemporary management theory, for a corporation to be successful in the face of competition, it is essential to identify, develop, and use its fundamental strengths. (Prahalad & Hamel, 2009)

2 THEORETICAL BACKGROUND OF STUDY

This part will offer the foundation for the theoretical framework. The objective of this master thesis is to examine the impact of Key Performance Indicators (KPIs) on enhancing operations and procedures. The literature about process and operation management, as well as performance measurements, has been discussed.

2.1 Operational and Procedural Aspects

Operation and process management focus on the methods and procedures that businesses use to manufacture things and provide services. Processes are crucial and pertinent to all managers since every component inside an organization is composed of processes. Operations and process management refers to the task of overseeing the resources and procedures involved in the creation of goods and services (Slack et al., 2015). Engaging in these actions is crucial, particularly if you want ongoing enhancements in your organization. Every operation consists of processes. A process refers to the systematic organization of resources and activities that convert inputs into outputs, hence meeting the requirements of internal or external customers (Slack et al., 2015).

To provide a comprehensive understanding of the process, it is essential to elucidate the distinction between operations and processes. Explaining the distinction between operations and processes may be challenging since both involve the transformation of inputs into outputs. Operations consist of individual components known as processes, which together form the operations. The available resources, such as personnel, computer systems, and physical infrastructure, will be allocated and structured into distinct operational processes. Within a logistic operation, several procedures are involved, including the handling of finished items. Processes are ubiquitous (Staudt et al., 2015).

2.1.1 Optimal management of processes

The analysis of processes involves studying how various processes should be controlled to achieve maximum efficiency. Managing all processes uniformly would be convenient, yet each process exhibits some degree of variation. It has the potential to be technical.

Variations exist in the form of dissimilar products or services, which need distinct sets of skills or technology for their production. Next, we must consider the demand parameter. Products and services exhibit varying levels of demand, resulting in distinct processes. When managing processes related to demand, it is important to examine four criteria (Slack et al., 2015).

2.1.2 The four V's of Processes

Volume: There are advantages associated with procedures that provide a large amount of output, and one of these benefits is the capacity to repeat the process consistently. Given the frequent repetition of the procedure, it is customary to provide instructions on how the job should be carried out, resulting in the creation of standardized work. This provides a greater possibility to manufacture items or provide services at a reduced per-unit cost (Figure 1).

Variety: Processes with a high degree of variation are more intricate and, as a result, more expensive than processes with minimal variety (Figure 1). They must manage a myriad of diverse tasks and constantly transition between each activity. The complexity of a service may be attributed to the diversity of items it offers.

Variation: When the flow is constant and there are no fluctuations in demand, managing the operations becomes typically simpler. Allocating resources according to anticipated demand is feasible, but, in cases of uncertain and highly variable demand, it is necessary to maintain a safety stock to accommodate unforeseen swings in need. Due to the significant variability in some branches, it is necessary to maintain additional safety stock since they are unable to effectively plan, leading to increased expenses (Figure 1).

Visibility: To what extent are the processes observable by the consumer and does the customer engage with the process (is the process accessible to its customer)? Typically,

procedures with minimal visibility have cheaper costs since they do not need direct client interaction. For instance, using means such as the telephone or the internet enhances its resemblance to a factory. To achieve high utilization, it is necessary to wait for a response to your inquiry, which might result in a lengthy response time and a delay between actions. However, it is common for operations to include processes that vary in terms of their level of visibility, including both high and low-visibility activities (Figure 1). (Slack et al., 2015).

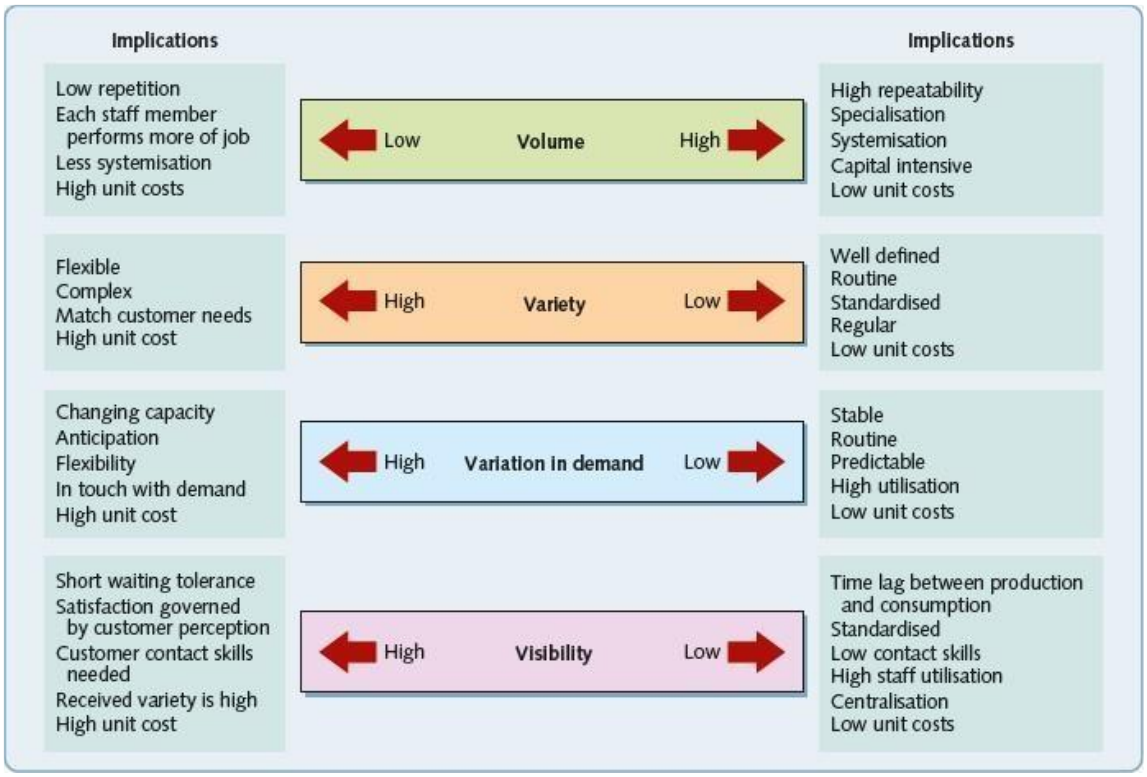

Figure 1: Summarizing the low-cost implications on the right side and the high-cost implications on the left side (Slack et al., 2015).

2.2 Supply Chains

The term "supply chain" refers to the interconnected web of businesses that work together to bring goods and services to the end user via a series of upstream and downstream stages (Christopher, 2016). Everything from sourcing materials to delivering finished products to customers is a part of the supply chain. This includes not just logistics and distribution but also marketing, sales, and customer support. The

supply chain encompasses not just the organisations' suppliers and consumers, but also the middlemen who enable the exchange of goods, data, and capital.

One process reference model that gives a thorough outline of the business operations needed to fulfill consumer demand is the supply chain operations reference (SCOR) model. The six basic processes are as follows: planning, sourcing, making, delivering, returning, and enabling. Within each of these processes, some sub-processes and tasks are industry and organization-specific (Huan et al., 2004). Supply chain managers can effectively communicate supply chain performance to both internal and external stakeholders by utilizing the SCOR model, which also helps them identify process gaps and opportunities for improvement (Archie & Kevin, 2004).

The SCOR model and its six primary procedures are shown in the following figure:

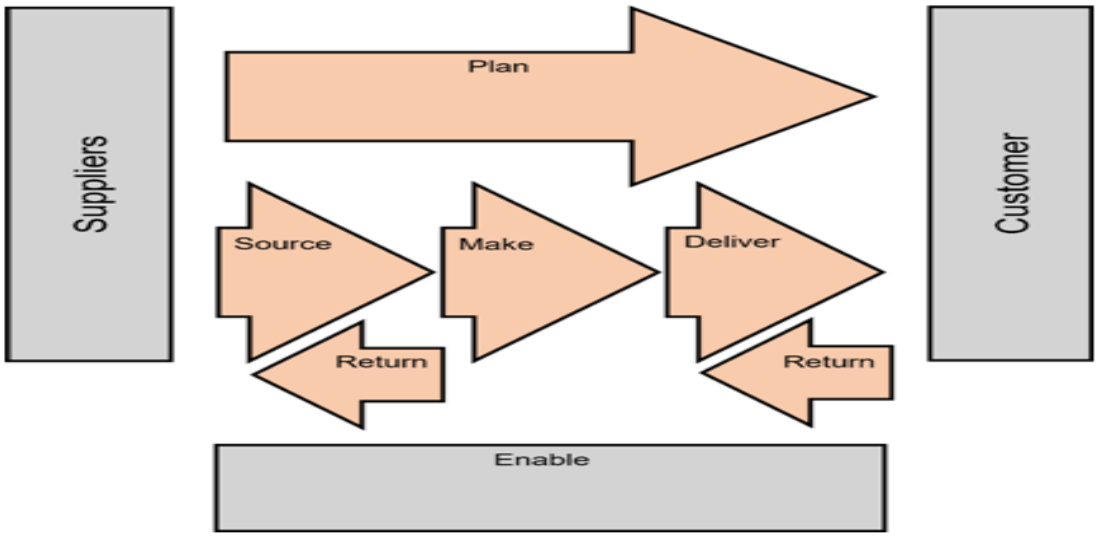

Figure 2: Supply chain operations reference (SCOR) model (Archie & Kevin, 2004).

2.3 Logistic Management

The term "logistics management" refers to an all-encompassing strategy for meeting consumer needs that involves integrating and managing the flow of information and materials from suppliers to the marketplace. According to Christopher (2005), figure 3 highlights how all the parts and activities that contribute to providing value to consumers are interconnected and should work together.

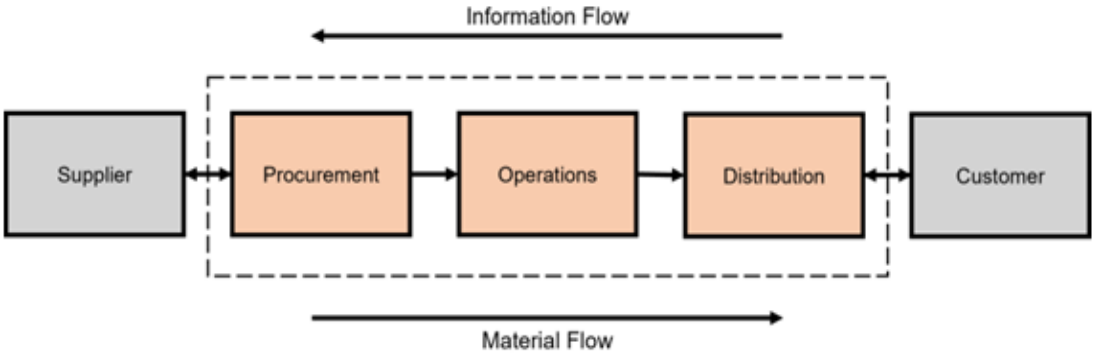

Figure 3: Logistics Management (Christopher, 2005).

According to Chow et al. (1994), logistics performance is a multi-faceted notion that represents how well supply chains fulfill consumer and market needs. Fugate et al. (2010) state that there are three aspects to logistics performance: effectiveness, distinctiveness, and efficiency.

Finding the right performance dimensions and indicators that mirror the organization's strategic objectives and operational needs is essential for evaluating and improving logistics performance. Market circumstances, consumer expectations, and environmental concerns are examples of external factors that might impact logistics performance; it is also crucial to think about the interconnections and trade-offs between various dimensions and indicators (Chow et al., 1994). Managers need a balanced and all-encompassing set of metrics to keep tabs on logistics processes, find out where they stand in comparison to best practices, and launch continuous improvement campaigns since no one metric can capture logistics performance (Fugate et al., 2010).

Management of a company's warehouse is an essential part of logistics. When a company's stock and logistics operations are well-managed and optimized, it has a profound effect on the efficiency and success of the business (Ziukov, 2018).

2.4 Warehouse Management

The procedures involved in running and overseeing a warehouse are referred to as warehouse management by Richards (2022). From beginning to end, it explains the

whole process. Receiving cargo, monitoring assets, and shipping are all part of warehouse management. Improving warehouse operations to guarantee timely and effective delivery of certain items is part of it. No matter how many warehouses a company has, it is possible to oversee each one of them. According to (Myerson, 2015), automated technology plays a crucial role in order processing, shipment tracking, inventory management, and warehouse management.

According to Woods (2022), efficient warehouse management improves supply chain processing and delivery timeliness, enhances product organization, simplifies inventory and warehouse space management, and boosts warehouse operation efficiency. According to Myerson (2015), warehouse management involves managing inventories and minimizing risks via cost reduction achieved by efficient planning and forecasting. It tracks commodities from the moment they are acquired as raw materials until they are sold as completed goods. This may also enhance efficiency by managing all ordering and receiving requirements.

It impacts a company's expenses, revenues, and customer happiness, making it an essential part of supply chain operations. Maintaining a happy medium between stock-outs and surpluses is a perennial problem for inventory managers. Lost sales or backorders are the results of an inventory deficit, which happens when demand exceeds supply. When supply surpasses demand, extra inventory is created, leading to holding costs and the danger of obsolescence. This situation is called an inventory overage. (Gunasekaran & Kobu, 2007)

2.5 Performance Measures

Today, several businesses use and collaborate using performance metrics, although an equal number of organizations prefer to employ incorrect measurements. Organizations sometimes mistakenly refer to all performance measurements as Key Performance Indicators (KPIs). There are four distinct categories of performance measures, and they are categorized into two groups: result indicators and performance indicators. (Anand & Grover, 2015)

The result indications demonstrate that several team inputs are merged in numerous metrics, making it a valuable tool for assessing collaboration. However, regrettably, it fails to provide the management with the essential information required to address an issue, since it is difficult to identify the exact location of the problem and determine which teams performed well and which did not. (Stricker et al., 2017)

Performance indicators are quantifiable metrics that can be attributed to either a particular team or a group of teams collaborating toward a shared objective or purpose. The responsibility for both good and poor performance now lies with a dedicated team, ensuring clear accountability for performance outcomes, whether positive or negative (Parmenter, 2020).

The following example (figure 4) is used by (Parmenter, 2020) to better explain the link between these four measurements. A Key result indicator (KRI) makes up the outside layer. Nevertheless, more details become apparent as we continue to remove the onion layers. The onion's central core stands for the most important performance indicator, while its layers stand for the many performance and outcome indicators.

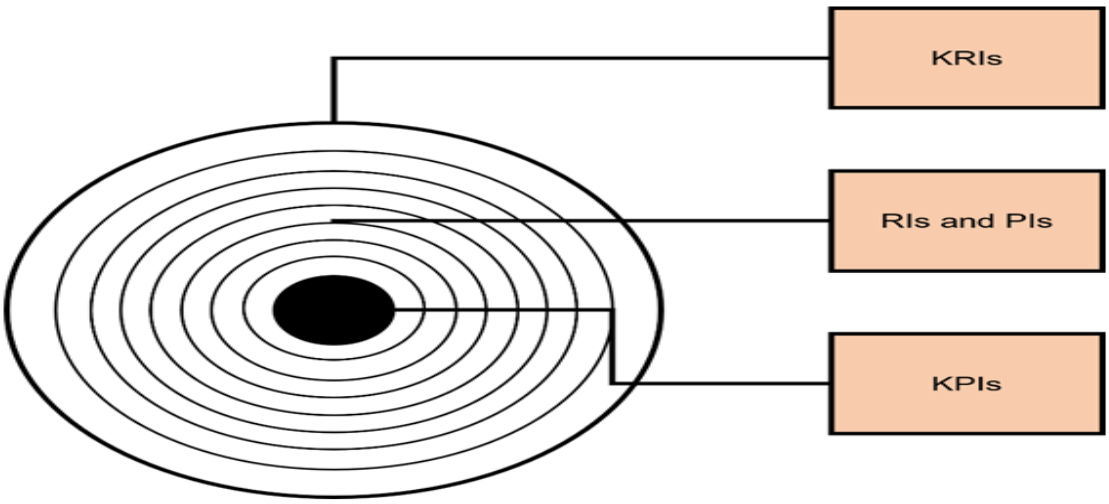

Figure 4: The four performance measures (Parmenter, 2020).

- Key result indicators (KRIs) provide the board with a comprehensive overview of the organization's performance.

- Result indicators (RIs) provide management with information on how teams are collaborating to achieve outcomes.
- Performance indicators (PIs) provide management with information on the output of teams.
- Key performance indicators (KPIs) provide management with insights into the organization's performance in its essential success elements. By closely monitoring these indicators, management may significantly enhance performance (Parmenter, 2020).

These many tactics will be beneficial in enhancing a company's business, both inside and outside. Depending on the specific variable you want to quantify (Parmenter, 2020). However, the primary purpose of any performance measure is to supply the organization consistently and accurately with data from its indicators (Zall Kusek & Rist, 2004).

2.5.1 Determining Performance Metrics

Before selecting performance measures, the organization should ensure that it is the most suitable for the specific aspect it intends to monitor. Several strategies and frameworks have been created to assist businesses in implementing suitable measures (Kennerley & Neely, 2003). Regrettably, several firms in the present day mistakenly assume that they are using the appropriate metric when they should be utilizing a different one. These companies often introduce new metrics to align with new objectives, but they neglect to eliminate metrics that align with outdated objectives (Meyer & Gupta, 1994). In some instances, firms may mistakenly feel that they are using a certain performance metric, while they are employing an entirely different one.

For instance, if a company's crucial determinants of success are centered around delivering products punctually to their customers, the company's performance indicators should assess the methods employed by the personnel to ensure timely product delivery. These performance indicators collectively contribute to the key performance indicators (KPIs) that the company can subsequently utilize to monitor and

manage its operations. However, as time progresses, the organization's critical success factor (CSF) may evolve to something other than timely delivery. In such a scenario, the company would be assessing the incorrect performance indicators (PIs). (Gunasekaran & Kobu, 2007).

2.5.2 Key Performance Indicators

Key performance indicators (KPIs) are indicators that specifically target the components of organizational performance that are most important for the present and future success of the organization (Wudhikarn, 2017). KPIs are derived from the important success aspects of an organization. Therefore, if these critical success criteria are not defined or not properly linked, the firm would be unable to successfully use KPIs. However, assuming that everything is well, the most effective approach for operations and supply chain management is to determine Key Performance Indicators (KPIs), as suggested by Bai & Sarkis (2014).

2.5.3 The seven attributes of Key Performance Indicators (KPIs)

The following are the seven essential attributes of key performance indicators that must be adhered to for successful utilization and implementation (Parmenter, 2020).

Table 1: Seven characteristics of KPIs (Parmenter, 2020).

Characteristic	Description
Non-financial	Assigning a monetary value, such as dollars, yen, pounds, euros, etc., to a unit of measurement will promptly transform it into an indication of the outcome. For instance, daily sales are a direct outcome of the activities carried out to execute the sales and, therefore a revenue indicator (RI). The Key Performance Indicators are located at a deeper level. Performance measurements, such as Key Performance Indicators (KPIs), cannot serve as financial indicators. It is important to note that all KPIs are nonfinancial measures.

Timely	It is essential to continuously monitor all Key Performance Indicators (KPIs) around the clock, either on a daily or monthly basis. KPIs that are monitored on a monthly, quarterly, or yearly basis cannot be considered as true KPIs. Infrequent measurement renders it inconsequential for the firm.
CEO priority	All key performance indicators (KPIs) have the potential to have a significant impact if managed effectively. The CEO should consistently prioritize the monitoring of KPIs.
Simple	Every Key Performance Indicator (KPI) should be capable of being dissected, allowing a clear understanding of the necessary activities required to drive enhancements.
Team-based	A Key Performance Indicator (KPI) is considered effectively incorporated into the organization when it can be directly linked to a particular team. The Key Performance Indicator (KPI) should be easily associated with management.
Significant impact	The critical success factors are intricately linked to the key performance indicators (KPIs), indicating that the KPIs will influence the critical success factors in one or several ways. The CEO, management, and people should prioritize the Key Performance Indicators (KPIs) to get a beneficial outcome.
Restricted negative aspect	Before being designated as a key performance indicator (KPI), a performance measure must undergo testing to ensure that it effectively produces the desired behavioral result originally intended with the measure. There are several instances when performance measures (PMs) have caused unanticipated changes in behavior among employees, and the purpose of the test is to eradicate such occurrences.

2.5.4 Effects of Key Performance Indicators

Key Performance Indicators (KPIs) may serve as a double-edged sword for firms, as they can be both beneficial and detrimental. Companies must recognize that the implementation and use of KPIs can be challenging. The primary errors often encountered in using KPIs are a lack of concentration and the inability to establish a

connection between the KPIs and the business model. Companies must demonstrate a willingness to experiment with various strategies and ascertain their criteria for defining success. For a corporation to become data-driven, it must address cultural and organizational challenges. (Lamont, 2013).

The use of performance measures is often combined without awareness of the important success determinants of organizations and with limited comprehension of the behavioral repercussions associated with performance measurements. It is crucial to identify the planned conduct of a measure and the actual behavior that accompanies it. A significant proportion of the measures used inside an organization may inadvertently promote undesirable conduct among its personnel, sometimes exceeding fifty percent. It is crucial to use metrics that have the least detrimental impact on conduct in such situations. (Franceschini et al., 2007).

It is important to realize that businesses should ideally focus on optimizing just one element at a time. If an organization implements many changes simultaneously, it may have difficulty identifying the specific factor that led to the change in performance (Lamont, 2013). It is important to note that developing sufficient indicators will need many attempts, therefore it may take some time to arrive at a finished collection of suitable indicators (Zall Kusek & Rist, 2004).

2.5.5 Attaining Exceptional Critical Performance Indicators

To attain outstanding performance in key performance indicators (KPIs), the organization needs to have a comprehensive KPI management system, which includes implementing the PDCA (plan, do, check, and action) cycle. The companies are required to formulate strategic initiatives and thereafter establish a strategy management system. Ultimately, organizations should establish a superior management framework that seamlessly incorporates the monitoring of Key Performance Indicators (KPIs) with strategic management and the oversight of daily managerial performance indicators (DMPIs). To significantly increase their Key Performance Indicators (KPIs) and surpass their competitors, firms must allocate

resources towards IT systems, internet infrastructure, automated systems, and facilities, as well as customer relationship management (CRM) technologies. This includes investments in data warehousing, data mining, and online analytical processing. (Chen et al., 2017).

To attain exceptional Key Performance Indicators (KPIs), it is crucial to delegate responsibility to the front line. This serves as a fundamental pillar for ensuring the effective functioning of KPIs. Any erroneous judgments made are attributed to deficiencies in training rather than the individual's competence. Therefore, it is the responsibility of the management to respond appropriately (Parmenter, 2020). However, via vigilant monitoring of the Key Performance Indicators (KPIs), it becomes possible to uncover any discrepancies that may exist between the planning phase and the actual implementation. This process aids in the identification and rectification of any issues that may arise. (Chae, 2009).

Two additional crucial factors that are often executed incorrectly when using KPIs are the personnel's commitment to the KPIs, or more precisely, the absence of their motivation to work with KPIs. Organizations sometimes struggle to establish a connection and integration between their Key Performance Indicators (KPIs) and their business strategy. These two characteristics are crucial for a business to attain outstanding Key Performance Indicators (KPIs). However, it is important to acknowledge that Key Performance Indicators (KPIs) are subject to change by the evolving requirements of the company. (Lamont, 2013).

Figure 5 illustrates the seven fundamental principles that are crucial when starting work with Key Performance Indicators (KPIs). To achieve success, it is essential to establish a strong foundation to build upon. Begin the implementation of the desired Key Performance Indicators (KPIs) in the company by following the six-stage approach. (Samsonowa, 2011).

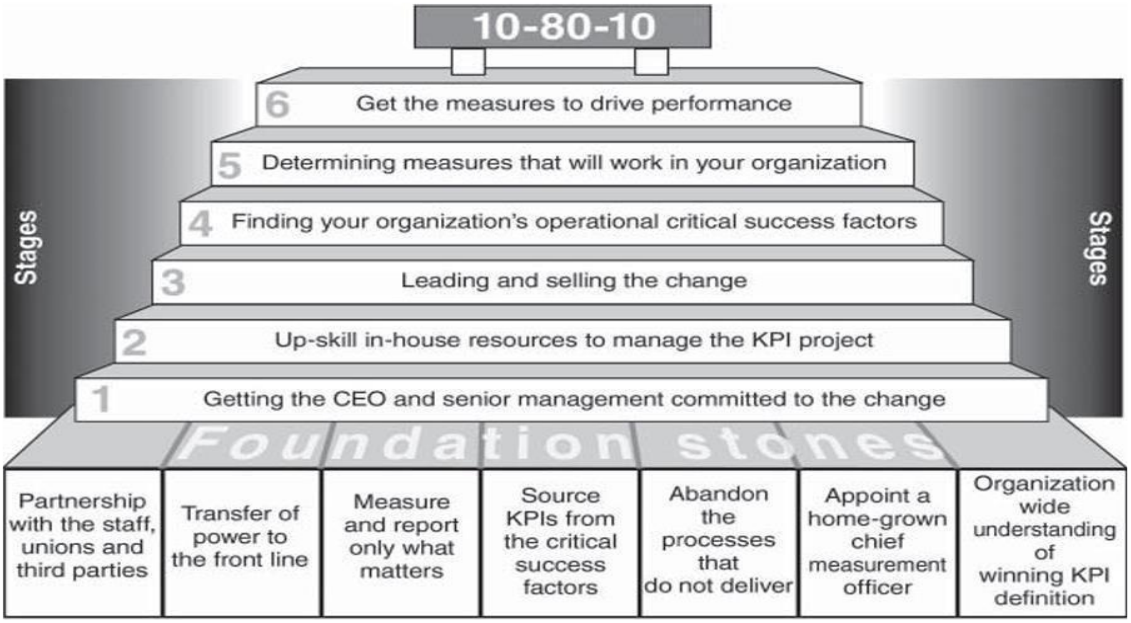

Figure 5: The seven fundamental principles that support the six-step procedure (Samsonowa, 2011).

2.6 Performance Indicators

Performance indicators (PIs) refer to nonfinancial measures, as opposed to outcome indicators. The origin of PIs may be attributed to a particular team. Key performance indicators (KPIs) and performance indicators have distinct distinctions. KPIs play a crucial role in determining the overall health and success of a business. On the other side, PIs are vital for the company, albeit not essential. They assist teams in aligning themselves with the organization's strategic choices. PIs may be seen as a supplementary measure to KPIs (Parmenter, 2020).

2.6.1 Key Result Indicators

Key result indicators (KRIs) often arise from the cumulative efforts of many teams, serving as a comprehensive and concise assessment of the team's success. KRIs serve as a reliable measure to assess if the organization is progressing in the correct trajectory or not. Key Result Indicators (KRIs) are often assessed on a monthly or quarterly basis. This evaluation serves to determine if the board's strategy, plan, and execution have successfully met their intended objectives. Therefore, the infrequent

distribution of reports makes it difficult for the management team to make essential modifications, making KRIs less useful. (Gözaçan & Lafci, 2020)

2.6.2 Result Indicators

Key Result Indicators (KRIs) provide a comprehensive and significant summary of the actions that have occurred, offering a broader perspective on how teams are collaborating. In contrast, Result Indicators (RIs) operate at a lower level, focusing on specific outcomes. Result indicators assess activities over an extended period. RIs are not limited to monthly or quarterly measurements since they include a broader duration on a weekly or even daily basis. In addition, future scheduled activities are also taken into consideration. Result indicators serve as a valuable metric, but they obscure the underlying factors that influence success. To properly understand what is being augmented or diminished, it is important to examine the activities themselves. (Gözaçan & Lafci, 2020)

2.6.3 Critical Success Factors

The synchronization and integration of everyday activities with the pivotal critical success factors (CSFs) of a corporation has significant significance. Despite the presence of organizational strategies, it is often seen that teams end up pursuing divergent paths that deviate from the intended direction of the plan. Project managers should meticulously derive their objectives from the critical success factors of their respective organizations.

These Critical Success Factors (CSFs) will assist workers in synchronizing their everyday operations with the CSFs of the organization, hence fostering cohesive collaboration across the whole organization toward the desired objective (Parmenter, 2020). This behavioral congruence often serves as the crucial element that distinguishes excellent organizations from exceptional ones.

In his book Transforming Performance Measurement, Spitzer (2007) emphasizes the crucial role of managers in effectively conveying expectations to their workforce.

Personnel tend to do tasks based on what management evaluates, rather than what management anticipates. Considering this reality, it is crucial to implement appropriate measurements, such as Key Performance Indicators (KPIs) (Spitzer, 2007). According to Spitzer (2007), a key challenge in implementing performance measures is the question of measurement leadership. The chance to implement twenty-first-century measurement arises successfully and efficiently only when the CEO has both enthusiasm and expertise in this field.

The interconnection between Key Performance Indicators (KPIs) and Critical Success Factors (CSFs), and their collective role in facilitating the organization's attainment of a competitive edge, is shown in Figure 6. Before anything else, it is crucial to analyze to identify the Critical Success Factors (CSFs). Subsequently, the organization's core competencies (CC) and core skills should be linked to these CSFs. An analysis should be conducted to compare the primary rivals based on their fundamental skills. Once these processes have been finished, the Key Performance Indicators (KPIs) may be identified, and their objectives can be set to attain the core competencies. When these relationships are effectively used, organizational competitive advantage may be achieved. (Chen et al., 2017).

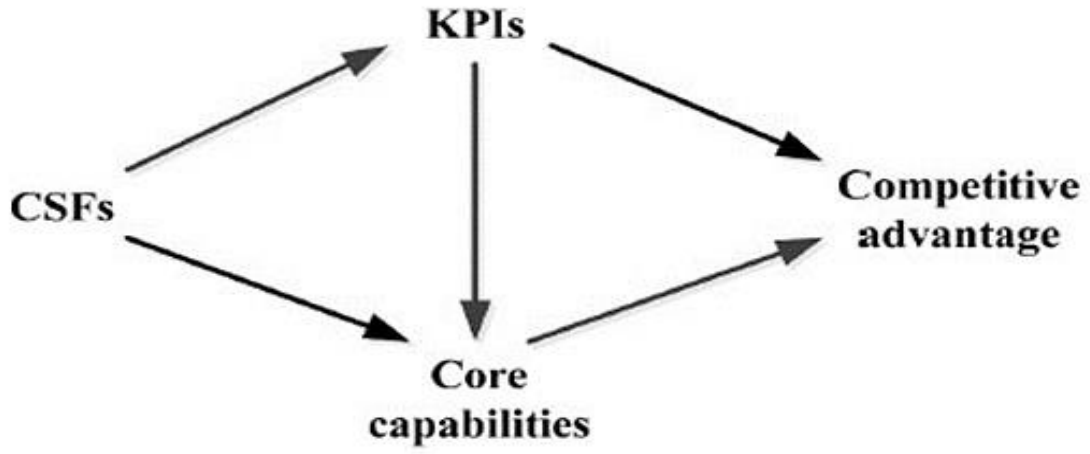

Figure 6: The correlation between Key Performance Indicators (KPIs) and Critical Success Factors (CSFs) (Chen et al., 2017).

2.7 Core competencies or core capabilities

Business management gurus strongly emphasize the need for all sectors to cultivate core skills and establish a competitive edge. In his work, Andrews (1971) defined core competency as "the specific abilities that a company excels at" (Mooney, 2007). Several writers have attempted to differentiate between core competency and core capabilities, leading to further perplexity. As a result, the phrases competence and capacities are used interchangeably. A collection of interconnected and synchronized capabilities that differentiate the company in the market. (Schilling, 2017).

The amalgamation of diverse proficiencies, such as distribution management and information system management, is frequently intricate and constitutes the essence of a firm's core competence. This complexity renders core competence arduous to replicate. Core competence also encompasses the interconnections between various functions and business units, characterized by high-quality relationships. Core competence plays a pivotal role in enhancing a firm's competitiveness, necessitating a strategic approach to its cultivation and provision. (Schilling, 2017)

2.8 Logistics Performance Metrics

Understanding the scope of logistics can be challenging due to its broad nature. However, a concise explanation of logistics would be the management of the flow of information and materials from the point of order to delivery. This encompasses both internal and external processes. To assess the quality of logistic performance, an evaluation is conducted to measure effectiveness and efficiency in the flow of materials and information throughout these processes. (Forslund, 2007).

In a study conducted by Staudt et al. (2015), a comprehensive analysis of the literature was carried out to examine performance measures (PMs) in the context of warehousing. The researcher identified the most appropriate metrics for the areas of storage and inventory, which are listed below.

2.8.1 Metrics for evaluating warehouse performance.

The Staudt et al. (2015) article was analyzed to examine the research findings on performance measures in logistics, specifically in the context of warehouses. By utilizing a comprehensive review of the literature, performance indicators for these activities were identified and categorized into dimensions such as time, quality, cost, and productivity.

Table 2: Activities included in warehouse preventive maintenance (Staudt et al., 2015)

Characteristic	Description
Receiving	The act of unloading and acquiring items
Storage	The transportation of commodities from the unloading location to their allocated location
Order picking	Assembling the order
Shipping	The process of arranging and allocating the delivery of orders once they have been picked.
Delivery	Delivery refers to the process of transporting goods from the warehouse to the client

Table 3: Identify time performance measures in warehouses (Staudt et al., 2015).

Time (Dimension) and Indicator name	Definition
Order lead time	Duration between a client's order and the client's approval
Receiving time	Time for unloading.
Order picking time	Duration required to choose an order line.
Delivery Lead Time	Time required for delivery from the warehouse to the client.
Queuing time	The length of time when goods are held up for processing.
Put away time	The time it takes for a product or products to get from being unloaded to their destination.

Shipping time	Delay in loading a vehicle based on the total number of orders.
Dock-to-stock time	Duration between the delivery of supplies and the availability of products for order selection
Equipment downtime	Downtime occurs when equipment is not functioning properly or when repairs are necessary.

Table 4: Identified quality PMs in the warehouse (Staudt et al., 2015)

Quality (Dimension) and Indicator name	Definition
On-time delivery	Orders received by the client before the commitment date.
Customer satisfaction	Customer complaints as a percentage of total orders
Order fill rate	Every single order was fulfilled with the first shipping.
Physical inventory accuracy	Compare the reported inventory with the actual inventory in terms of location and units to determine how accurate the former is.
Stock-out rate	Sorting the number of goods in stock
Storage accuracy	Keeping goods in the right places
Picking accuracy	The precision of the order selection process, which allows for the detection of mistakes before shipping (e.g., during packing)
Shipping accuracy	Count of mistakes orders delivered for free
Delivery accuracy	Distribution of orders without incidents
Perfect orders	Products sent were dispatched promptly, undamaged, and with all necessary paperwork.
Scrap rate	Product damage and loss rate
Orders shipped on time	Timely shipment percentage as a percentage of total orders sent.
Cargo damage rate	Quantity of orders mishandled during shipment.

Table 5: Identified productivity performance measures in Warehouse (Staudt et al., 2015)

Productivity (Dimension) and Indicator name	Definition
Labor productivity	A measure of efficiency in managing inventory as a percentage of total item-handling hours worked.
Throughput	Warehouse exit items per hour
Shipping productivity	Count of items sent over a certain time frame.
Transport utilisation	Fill rate for vehicles
Warehouse utilisation	Throughout a given period, the typical use of storage capacity.
Picking productivity	Productivity in picking as a function of time spent picking.
Inventory space utilization	The ratio of storage space use
Outbound space utilization	Distribution center space use includes retrieval, order picking, packaging, and shipment.
Receiving productivity	Unloading rate in cars per hour of work
Turnover	Productivity ratio of average inventory to cost of goods sold.

Table 6: Identified cost performance measures in warehouses (Staudt et al., 2015).

Cost (dimension) and Indica-tor name	Definition
Inventory cost	Amount spent on storing one unit.
Order processing cost	Order total processing cost divided by order quantity.
Labor cost	The expense of workers engaged in warehouse tasks.
Distribution cost	Measures of distribution expenses include the average daily trip distance and the mean number of vehicles.
Costs as a % of sales	Amount spent on storage relative to revenue.
Maintains cost	Maintenance expenses for buildings and equipment

Table 7: Indicators concerning internal logistics (Staudt et al., 2015).

Indicator	Definition
Order lead time	The amount of time it takes to get an order from an internal customer to the client Acceptance.
Order picking time	Duration required to choose an order line
Delivery lead time	Product delivery timeframes from the warehouse to the end user
Warehouse utilisation	How much space in a warehouse is typically occupied during a certain period?
Picking productivity	Quantity of items selected for each hour of labor spent selecting.
Inventory space utilization	The rate at which storage takes up space.
Turnover	Divide the average inventory by the cost of goods sold.
On-time delivery	The quantity of orders that the client has received by the specified date.
Order fill rate	Every single order was fulfilled with the first shipping.
Physical inventory accuracy	Compare the reported inventory with the actual inventory in terms of location and units to determine how accurate the former is.
Demand forecast accuracy	Typically expressed as a percentage or an error rate and can be calculated using various methods, such as Mean Absolute Percentage Error (MAPE), Mean Absolute Deviation (MAD), or Root Mean Square Error (RMSE)
Picking accuracy	The precision of the order selection process, which allows for the detection of mistakes before shipping (e.g., during packing)
Delivery accuracy	Distribution of orders without incidents
Scrap rate	Product damage and loss rate
Orders dispatched on time	The total number of orders that were dispatched on time
Inventory cost	Storage expenses per unit
Order processing cost	Quantity of orders divided by total processing cost.

Labor cost	Expenses related to warehouse workers
Costs as a % of sales	Warehouse expenditures as a percentage of revenue
Maintains cost	Building and equipment upkeep expenses

2.9 Common KPIs in different international business

Accurate inventory counts are a common key performance indicator for global manufacturers. Organizations that deal with distribution also often use it. The objective's target value and the intended trajectory towards that goal are both expressed in these key performance indicators. A target number for inventory accuracy would be defined by the management team when they took a closer look at inventory accuracy. For example, consider an inventory of 100 items; the system reports a 92% accuracy rate, meaning that just 8 out of 100 items do not meet the declared accuracy. Despite having access to valuable event data, the management team is unable to address the problem identified by key performance indicators (Selmeci et al., 2012).

An additional case in point is the automotive sector, where the success of a corporation might hinge on the precision of its material stock forecasts. The accuracy of forecasts has to be measured, and inventory turnover is one way to do so. In the transportation sector, key performance indicators may include logistic costs, service quality, performance, investment cycles, and the length of logistics. Different indicators make it easy to understand how just-in-time delivery is influencing things. However, the quality of logistics service (i.e., the proportion of orders that are delivered precisely and the dependability of delivery) suffers when deliveries are delayed. In the long run, this will erode the competitive advantage of transport organizations and impact asset performance, as fines for each late delivery will drive up logistical costs. (Gunasekaran & Kobu, 2007; Lukinskiy et al., 2017)

The findings of Ishaq Bhatti et al. (2014) companies in the logistics sector are increasingly focusing on ensuring reliable delivery and customer satisfaction. A contrast to this is the emphasis on social performance and customer happiness by automotive sector organizations. Customers' needs and the dependability of deliveries

are at the forefront of the electronics, apparel, and sports sectors. According to Ishaq Bhatti et al. (2014), the takeaway here is that companies rank customer happiness high among their most critical key performance indicators. Organizations may guarantee a consistent cash flow by assessing customer satisfaction and using the data gleaned from surveys and similar sources to enhance their business operations.

3 RESEARCH METHODOLOGY

This section presents the various methodologies used in the case study on warehouse operations at DHL.

3.1 Research Approach

According to Patel & Davidson (2011), the researcher needs to use proper research methods if they want to get trustworthy data and make sound philosophical conclusions. There are three main types of primary research methods: deductive, inductive, and abductive. It is common practice in deductive research to formulate a working theory, hypothesis, or generalization before proceeding to gather empirical evidence to support or refute it. This approach takes a top-down approach, meaning that the researcher formulates a broad hypothesis and then evaluates it with more nuanced observations (Zangirolami-Raimundo et al., 2018). The researcher uses inductive reasoning to form ideas, conceptions, or hypotheses by observing and analyzing data for patterns and trends. The researcher begins with concrete examples and then extrapolates larger concepts; this is known as a "bottom-up" approach (Sileyew, 2020). Methodology in abductive research that integrates rigorous data analysis with the iterative, hypothesis-driven mode of abductive reasoning. Finding patterns or outliers that indicate specific hypotheses is the starting point for this method, which commonly employs qualitative data (Sileyew, 2020).

This study used the strategy of deductive reasoning. The reason is, that it explains the theory and adopts a theoretical position before data gathering. Theoretical analysis is used here because it may provide both broad and narrow insights. This study is based on the existing scenario analysis, to identify the specific areas in warehouses where Key Performance Indicators (KPIs) are required. This study necessitates a deductive strategy since its objective is to gain comprehension of warehouses and thereafter identify the precise Key Performance Indicators (KPIs) that may be used. (Bryman & Bell, 2015).

3.2 Research Method

Business researchers have the option of using either a quantitative, qualitative, or hybrid methodology approach. Qualitative and quantitative research may be seen as two independent clusters of research strategies. (Mishra & Alok, 2017)

The qualitative approach is characterized by its use of two often-used techniques: interviews and observations. These techniques may take on many structures and forms (Eliasson, 2013). The qualitative technique is sometimes referred to be a theory-generating method rather than a theory-testing method in contrast to quantitative methods, qualitative research relies on the interviewee's actual words rather than their interpretation of those words to conclude. (Bryman & Bell, 2015).

The quantitative technique is characterized by research that involves acquiring data via measurements and using various analytical procedures to statistically analyze the collected data (Patel & Davidson, 2011). A conventional method of collecting data involves conducting surveys and interviews using a questionnaire. The questionnaire consists of structured questions with several alternatives, rather than open-ended questions. The researcher opted not to use a survey as a technique as they did not need input from a larger population. (Bryman & Bell, 2015).

A qualitative study strategy has been used to determine how DHL can effectively manage its operations after the implementation of key performance indicators (KPIs). The suggested research is qualitative since all the obtained material is qualitative. Qualitative information is analyzed using qualitative methods. The researcher opted for the qualitative technique as it was the most suitable approach for this case study. This method included all the necessary instruments to effectively gather and analyze the relevant data essential for addressing the situation at hand. The researcher used it to conduct interviews to address any inquiries that emerged throughout the study. Hence, the researcher completely abstained from using organized interviews. Moreover, this study is exploratory of nature exploratory philosophy manifests in qualitative technique. Again, prior understanding regarding the KPIs for measuring warehouse performance is very limited.

In addition, a series of unstructured and semi-structured interviews were conducted to assess and comprehend the current situation. The open-ended nature of the interviews resulted in the use of a qualitative research approach. As a result of the fact that the researcher is more likely to rely on subjective interpretations of text or other visual material and that the investigation of phenomena will be conducted using small samples, the qualitative technique is the recommended way for doing the study (Melnikovas, 2018).

3.3 Data Collection

This research employs two methods of data collecting to examine the situation: secondary and primary sources. Data was gathered via primary sources, such as monitoring various processes in the warehouses. Similarly, workers with diverse roles and duties were interviewed using semi-structured and unstructured interviews. The analysis included the examination of internal records as a secondary source, with a comprehensive study of existing scholarly literature on the issue.

Primary sources provide original material, whereas secondary sources present information that has been derived from primary sources (Saunders et al., 2019). The image above illustrates that primary sources include observations, surveys, and interviews. The secondary sources include many forms of written materials such as articles, books, and internal records. Saunders et al. (2019), emphasize the need to ensure that respondents have a complete understanding of the study's objective, regardless of the data-collecting technique used. Consider the observation approach, whereby individuals who are aware of being monitored may alter their actions. This may have both detrimental and beneficial effects, depending upon the circumstances.

One's goal is to consistently get information that is completely precise and dependable, although none of the available data-gathering techniques can guarantee such outcomes. The quality of the data depends on several things. It is crucial to possess the capability to manage all these variables that might impact the quality (Kumar & Kumar, 2018).

The present scenario analysis, which has been carried out via interviews has highlighted the significance of the main source in this thesis. An immense advantage of primary sources is that they provide material that is tailored to the research topic (Haglund et al., 2016). The primary sources have played a crucial role in addressing the research issue and are provided in the empirical chapter.

Additionally, secondary materials such as internal papers, books, and articles have been used. According to Haglund et al. (2016), using secondary sources is a more efficient approach since it allows for the exploration and collection of many sources related to the topic. However, there are also drawbacks to consider. One common issue is that the content frequently becomes outdated, and the information provided may not be relevant to the specific topic you are investigating. Certain internal papers have been valuable since they have facilitated communication with the document maker, resulting in the provision of more comprehensive information.

3.3.1 Interviews

One of the best ways to learn about people's feelings and opinions on a given subject, occurrence, or phenomenon is to conduct interviews with them. One may learn about another person's thoughts, feelings, experiences, and perspectives by conducting an interview. Understanding how people and organizations construct their social existence is a fundamental process (Alvehus, 2013).

In this master's thesis, two different types of interviews were used: semi-structured and unstructured. Both the interviewer and the interviewee participate in the unstructured interviews, which may be seen as a conversation. When there are not many questions and the interviewer wants to let the subjects explain themselves, this kind of questioning works well. This approach also enables the participants to go deeply into the interview without being hindered by the framework of the interview (Eliasson, 2013). The primary emphasis in this form is mostly on the interviewee, so relegating the function of the interviewer to a rather secondary position. The primary goal of the interviewer is to sustain the discussion (Alvehus, 2013).

The researcher opted for this framework to get insights into the execution of the task and to allow the respondents to provide explanations in their terms, unrestricted by specific queries. Semi-structured interviews are particularly suitable when the interviewer has a few broad questions for the interviewee. This kind of interview is characterized by a higher level of organization and formality compared to the previously described interview approach. These questions allow for a broader coverage of the topic area, but they cannot be as precise as the unstructured interview due to limitations in the questioning process (Eliasson, 2013). Utilizing this approach was suitable for conducting the follow-up interviews, which focused on addressing specific inquiries about a particular domain within the empirical investigation. However, the researcher wanted to allow them to engage in their conversation, hence researcher aimed to avoid burdening them with an excessive number of inquiries. Therefore, the researcher opts for semi-structured interviews over structured interviews. In this study, the interviews were conducted with 10 individuals who held positions at DHL, including managers, supervisors, and users, for a minimum of one year (Appendix 01). The purpose of these interviews was to collect pertinent data. All personnel were employed in several departments, including operations, inbound operations, outbound operations, quality control, and resource planning at DHL. In addition, certain criteria are used to choose employees, including a minimum work length of one year at DHL, extensive knowledge of KPIs inside the organization, and holding a vital position in the department. Each interview lasted between 15 and 20 minutes for data collection. A face-to-face approach was used to carry out the interview.

3.4 The case study generalizability

The case study technique is widely used as a research design in business research (Bryman & Bell, 2015). Flyvbjerg (2006) challenges the prevailing misconception that it is impossible to draw general conclusions from a single case study. According to Haglund et al. (2016), it is feasible to apply the findings to organizations other than those examined in the case study, however, the applicability may need justification. This is

referred to as a qualitative generalization. However, to demonstrate such an outcome, a comprehensive external validity is required. To establish external validity, it is crucial to have a strong internal validity. This entails that the researcher can assess the amount to which the findings may be generalized to other organizations. This is achieved by presenting a comprehensive and content-laden framework. This research aims to establish a comprehensive and content-rich structure. However, it may encounter certain challenges since some materials are classified and cannot be disclosed.

Although this study only used one case company named DHL, it is still possible to generalize the results. Nevertheless, you can't do anything unless you fulfill a few requirements.

Knowledge may be acquired via experiences in a warehousing organization that:

- Prioritises exceptional quality.
- Established in the international market.
- Opposing shared principles
- Engaging in operations that operate continuously 24 hours a day, 365 days a year.

These needs were established after doing the case study since it provided insights into the present scenario analysis. Naturally, these rules must undergo testing in comparable circumstances to see whether any modifications are necessary.

3.5 Validity and Reliability

Reliability pertains to the inquiry of whether the findings of research can be replicated or not. These problems arise from the use of measurements, namely if the appropriate metrics are employed and whether they exhibit consistency. Consistency in measurement outcomes should be achieved when the same process is assessed repeatedly. To determine the dependability of a measurement in a process, another individual must be able to replicate the technique that incorporates that measurement (Bryman & Bell, 2015). In this thesis, most of the assessments were completed via

interviews. In cases where any ambiguities arose after the interview, the interviewer reached out to the interviewee to resolve any such issues.

As it relates to the credibility of the investigation's results, validity is an important consideration. The concept of measure validity is often used when discussing validity; this refers to the extent to which the intended measure properly measures the target variable. If the study's results do not align, its credibility will be in doubt. Validity encompasses both internal and external validity. Internal validity pertains to the suitability of a thesis conclusion in including a link between two or more variables. Does the researcher have certainty that x is the causal factor for y, and not any other variable? External validity, in contrast, pertains to the inquiry of whether the findings of a study may be applied to situations outside the research setting. (Bryman & Bell, 2015). The data used in this analysis were collected from the company's business system under the supervision of an employee to ensure accurate information was obtained. These measures have been implemented to ensure the utmost validity of the thesis.

An essential point emphasized in this research is that a case study enables the investigator to acquire knowledge rather than substantiate a specific matter (Sahay, 2016). Having a tight engagement with the organization has been very advantageous, as it has enabled to have a deeper understanding of their difficulties. This has led to an increase in the validity of research as there is now a thorough comprehension of the foundational elements of the study. Both the investigator and those who participate will develop a mutual understanding, leading to a deeper and more advanced comprehension of information. The study's quality has greatly benefited from the thorough examination of findings and analysis, which were conducted in close collaboration with the supervisor.

3.6 Ethical Consideration

Bryman & Bell (2015) state that certain standards must be adhered to for research to be deemed ethically acceptable. One need is that the participants in the research must always be voluntary. By engaging in a discourse with the participants, you may tell them about the goal of the study and get their agreement. Wearing clothing that signifies

membership in a certain group is a means of self-identification and fostering a more cohesive culture. Failure to do so may result in heightened tension and discomfort among workers. This measure was implemented throughout the first week of the research.

Determining the total voluntariness of the conducted interviews is challenging, despite the participants receiving an email invitation. An overview of the project's objectives and the rationale for conducting the interview was provided. In this context, the participant may have a sense of obligation to assist the institution and may find it difficult to decline. The primary emphasis of most ethical discussions revolves around the obligations of the researcher towards the individuals participating in the study. Most conversations revolve around the potential damage inflicted upon study participants while neglecting to address the potential harm that may befall future consumers of the evidence generated by the research. For instance, the issue of wasted resources is often overlooked (Gorard, 2002). This research aims to enhance the efficiency of warehouse operations while also addressing the ethical concerns related to resource wastage.

4 EMPIRICAL PART

This part will present empirical data derived from interviews, guided tours, and internal documentation. The data gathered and analyzed will align with the study topic in a subsequent phase.

4.1 Introduction of the case company

DHL is globally acknowledged as a prominent logistics enterprise with operations spanning throughout the globe. The firm predates FedEx and has established a global footprint by using its proficiency in expediting customs clearance for transporting products. In addition to offering courier, package delivery, and rapid mail services, DHL is a German logistics firm that was established in the United States. The corporation delivers more than 1.8 billion packages throughout the world every year. The fast mail service DHL Fast, which is a part of the German logistics company DHL Group, is one of the market leaders for parcel services in Europe and is the primary courier and parcel service based in Germany. San Francisco, in the United States, was the location where the firm DHL was established in 1969. By the late 1970s, the corporation had extended its operation to include locations all over the globe. With the introduction of an inter-island cargo service in 1979, the firm began operations in the Hawaiian Islands under the name DHL Air Cargo. The company used two Douglas DC-3 aircraft and four DC-6 aircraft simultaneously. Until the company's final bankruptcy in 1983, Adrian Dalsey and Larry Hillblom directly managed the day-to-day operations of the property. DHL Air Cargo had a little more than one hundred employees, including management and pilots, when it was at its height. During warehouse operations, raw materials are acquired from vendors, undergo quality control, and are then stored. Once the items have been created, they are stored in the warehouse awaiting further delivery. (DHL History, 2023) In response to the specialized problems faced by different industries, DHL Supply Chain has created sector-specific solutions. Customers in the automotive, healthcare, retail, and technology sectors, among others, may make use of these specialized offerings to

meet their unique requirements. In light of the increasing focus on sustainability, DHL Supply Chain has introduced several programs to lessen its negative effects on the environment. Transportation route optimization, green technology investment, and the promotion of eco-friendly practices across the company are all part of this effort. Sustainability is a fundamental priority of the DHL Supply Chain. The business collaborates with customers to develop, launch, and expand green solutions. The current supply chains are being influenced by megatrends such as e-commerce, digitization, sustainability, and globalization, and this dedication is in line with them. (DHL Annual Report, 2022).

Moreover, DHL Supply Chain gives an overview of its worldwide operations, which include over 185,000 full-time workers, activities in fifty or more countries, more than 1,500 sites reaching all major cities, and fourteen million square meters of storage and operating space. With over 5,000 active digitalization projects, over 2,000 collaborative robots, and a Net Promoter Score (NPS) consistently measuring around 50, the firm proudly promotes its digitalization initiatives(DHL Annual Report, 2022; DHL History, 2023)

Finally, DHL Supply Chain provides e-commerce fulfillment services that are creative, efficient, sustainable, adaptable, and standardized worldwide. With its Lead Logistics Partner solution, the firm acts as a reliable orchestrator of the supply chain, giving customers an edge via environmentally friendly, adaptable, and quick packaging options. DHL Supply Chain is devoted to transforming supply chains via the acquisition, development, and design of robust and efficient facilities. Product functioning is ensured throughout their useful lives and beyond with the help of the company's intelligent transportation solutions, warehousing solutions that are efficient, adaptable, sustainable, and inventive, and service logistics. (DHL History, 2023)

Company purpose:

Connecting people, improving lives. The organization exists to connect people and improve their lives. It enables trade and helps businesses and people grow while also taking responsibility for the world we live in. (DHL Global, n.d.)

Company vision:

The organization is a logistics company for the world: as the most international logistics company, it shapes the future of the industry in a digitalized world. (DHL Global, n.d.)

Company mission:

Excellence. Simply delivered.

(DHL Global, n.d.)

4.1.1 Basic Value

DHL is a corporation that prioritizes enhancing the well-being of individuals, with its fundamental values strongly aligned with customer welfare. DHL's basic values are:

- Know your people: Engaged employees bring passion and commitment to work and deliver exceptional quality.
- Know your customers: Exceptional quality delights the customers and leads to loyalty.
- Know your numbers: Customer loyalty leads to profitable growth. (DHL Annual Report, 2022; DHL Strategy-2025, 2019).

4.2 General Flowcharts

The logistics flow, order, and distribution processes are standardized across all warehouses in DHL.

4.2.1 Logistic flow

The logistics flow in warehouses involves storing, sampling, weighing, and distributing orders to ensure the correct quality and minimize costs. Ensure timely supply of the appropriate raw materials for manufacturing at Wartsila in Vaasa, load the correct number of completed products to clients on time, and mitigate any deviations in the

process to minimize repercussions and guarantee on-time delivery. (Wärstilä Corporation, 2023)

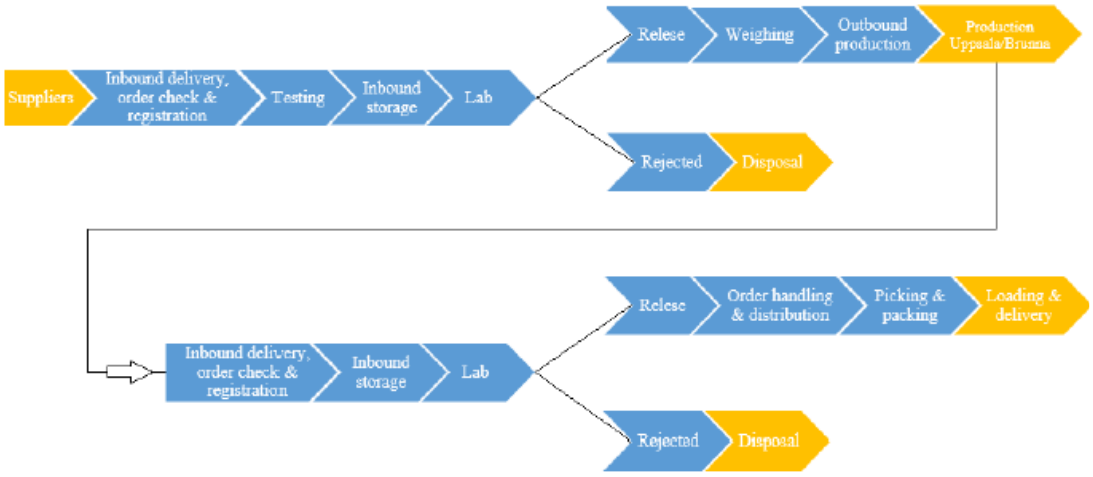

Figure 7: General logistical flow of DHL warehouse (DHL Supply Chain, n.d.)

4.2.2 Order and Distribution

The mission involves managing and coordinating the reservation, ordering, and delivery of orders from market firms and external clients, as well as coordinating transportation and billing. Engage in inventory audits, negotiate shipping contracts, provide statistical reports to customs, and manage insurance claims. Ensure precise delivery of the correct product to the designated client at the scheduled time, and in the event of any deviation, prioritize consistency and timely delivery. (DHL Supply Chain, n.d.)

4.3 DHL Supply Chain Logistics for Wärtsilä

For Wartsila, a firm based in Vaasa, Finland, DHL, a supply chain provider, maintained the warehouse support.

When it comes to innovative technological lifecycle solutions for the energy and marine sectors, Wärtsilä is unrivaled on a global scale. Adopting sustainable technology and services to enhance economic and environmental performance is the major purpose of the firm. (DHL Supply Chain, n.d.)

Logistics support partner DHL is crucial in the incoming and outward flow of commodities (mechanical components for marine and energy) via Vaasa Warehouse for Wärtsilä, a world leader in marine and energy solutions.

Inbound Process:

- Verifying the Goods Receipt (GR) and unloading goods.
- Validation for possible repacking; reroute to repacking location as needed.
- Repacking and quality control checks, with items sent to the inspection area if necessary.
- If no more processing is necessary, store in designated areas for salvage.

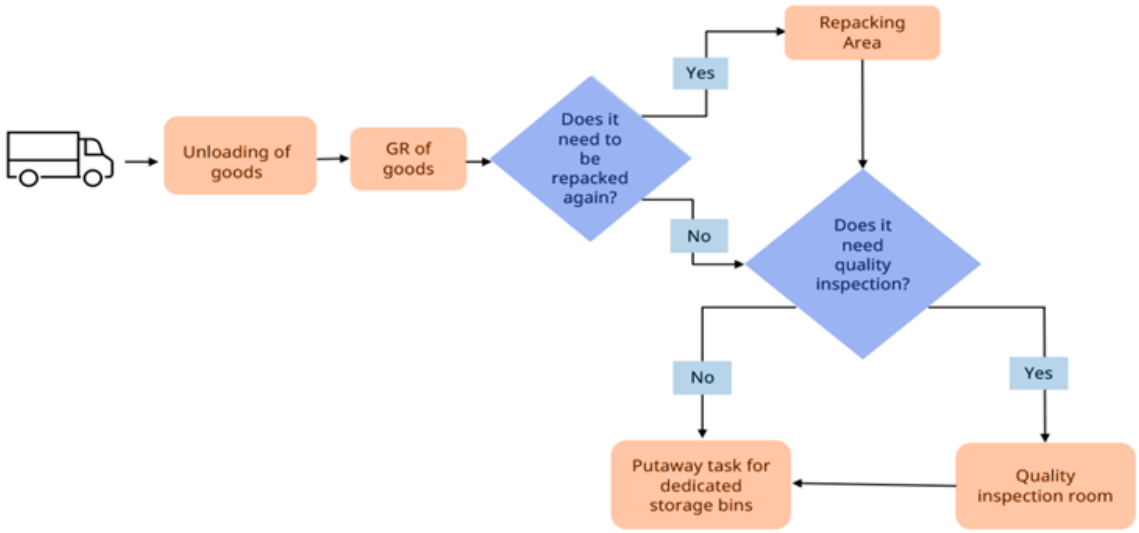

Figure 8: DHL inbound logistical flow of the Wärsilä Logistic Centre (Gautam, 2023)

Outbound Process:

Production materials and selling materials are the two categories of orders.

<u>Production order handling:</u>

- Moving selected items to the buffer for further sorting.
- Carry to the manufacturing location for production.
- Picking materials according to ordered quantity.

Sales Order Handling:

- Selecting supplies according to the amount requested.
- Moving the shelving unit to the buffer area after picking it up.
- Moved to the buffer for packing.
- Directing selected items to the packaging zone.
- Transporting the packaged goods to the shipping reserve.
- Prompt shipment by the timetable.

To keep Wärtsilä's worldwide operations running smoothly, this system meticulously controls incoming and outgoing logistics. Precision, efficiency, and long-term technical leadership are the pillars upon which DHL Supply Chain and Wärtsilä's joint venture rests.

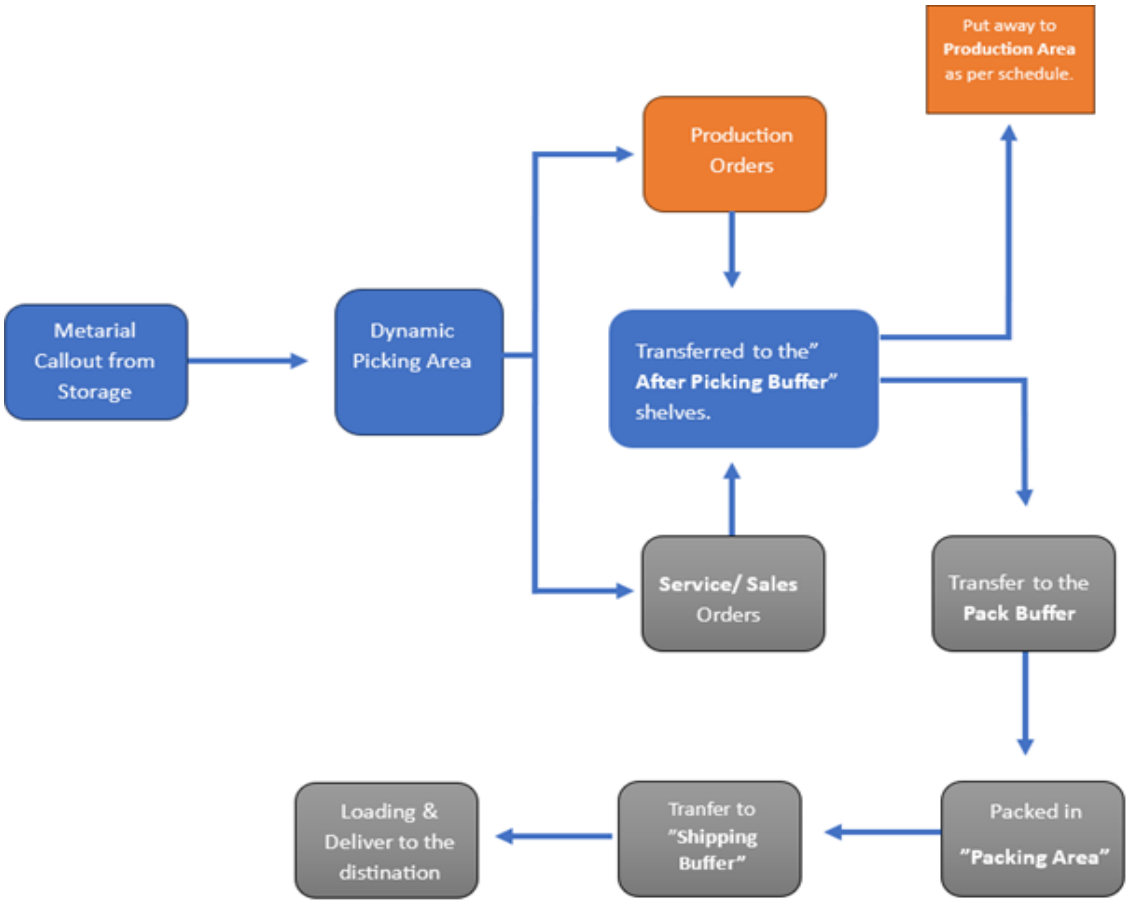

Figure 9: DHL Supply Chain, the outbound logistical flow of the Wärsilä logistic center.

4.4 Current measures DHL utilizes today.

The staff are now implementing and monitoring certain steps as shown in figure 10. the supervisor from DHL supplied a statistic and said, "We cannot definitively determine if outsourcing the warehouse is a wise decision. We need concrete data and facts to provide guidance and enable us to compare ourselves against DSV as well as internally, allowing us to learn from our practices." He emphasized that while these metrics are crucial, the well-being of employees is as vital as it directly impacts performance.

Focus 13 KPI								
Goals for focus 13 KPII		**ACT 2023**	**Goal 2024**	**Jan**	**Feb**	**'-->"**	**Nov**	**Dec**
Quality								
Deviations	st							
Capacity								
On time delivery's	%							
Costs								
According to budget	Yes/No							
Employees								
Risks	st							
Reported potential risks	st							
Management								
APT	st							
Management index	%							
Process								
Improvements	st							
Values								
Caring for life survey	1 to 5							
Sustainable								
Handling waste finished goods	ksek							
Handling waste raw materials	ksek							
Waste of finished goods	st							
Waste of raw materials	st							

Figure 10: Focus KPIs warehouse 2023 (DHL Group (2023).

**The information in the figure is deleted because of secrecy for the company.*

4.5 Core Competence

Challenges in replicating and ensuring worker competency:

Workers are the lifeblood of every business, contributing significantly to the company's strengths. The company's products and overall success are propelled ahead by a workforce that is intelligent, creative, and motivated. One of DHL's strong suits is the expert team that came up with a manufacturing technique that no one else could ever

imitate. Because of this, DHL has an edge over its competitors as their goods are difficult to copy.

It takes time and effort for DHL employees to develop their core competencies. It takes a lot of time and ongoing learning and development to build up. Changes to DHL's operations or products can be implemented quickly since the company has almost all the required knowledge in-house. (SHEQ Lead, DHL Supply Chain Oy, Vaasa)

Strategy used: DHL builds its strategy for optimizing logistics and warehousing operations on a comprehensive approach that combines customer-centricity, operational excellence, and technology innovation. The company aims to improve supply chain efficiency, agility, and value delivery at every stage by using a variety of tactics, including cutting-edge automation and robots as well as custom digital solutions. (Site manager, DHL Supply Chain Finland, Vaasa)

Differentiators from Competitors: DHL can build a workforce that is equipped with the skills, knowledge, and mentality necessary to flourish in a business environment that is always evolving by cultivating a culture that emphasizes agility, adaptation, and continual learning. DHL can leverage emerging technologies, explore new market opportunities, and remain at the forefront of industry trends as a result of our unrelenting focus on innovation, collaboration, and strategic partnerships. This has positioned the company as the preferred logistics partner for businesses that are looking to achieve sustainable growth and gain a competitive advantage. (Outbound Supervisor, DHL Supply Chain Oy, Vaasa)

4.6 Critical success factors(CFS)

It has been determined that these important success elements are the result of conducting several interviews with personnel at both low and high levels.

Quality: Quality is one of the most important aspects that DHL is always striving to improve. Consumers will have a hard time putting their faith in DHL again if the company makes a huge quality mistake even once. For that reason, it is critical for DHL to

consistently provide its clients with top-notch items. (Site manager, DHL Supply Chain Oy, Vaasa)

On-time deliveries: Delivery on time is yet another essential component that DHL must adjust to be successful. It should come as no surprise that DHL must follow stringent on-time delivery (OTD) standards and performance metrics, particularly when it comes to urgent orders. (SHEQ Lead, DHL Supply Chain Oy, Vaasa)

Passion and commitment: With all, the purpose of DHL is to "connect people." "Improving lives," which conveys the idea that they are a firm that is enthusiastic and dedicated to the work that they perform and that they are concerned about making people's lives better. (Inbound Supervisor, DHL Supply Chain Oy, Vaasa)

Effectiveness: DHL must pay attention to the logistics and delivery operations. To reduce throughput costs, they need to be simplified. There are a lot of regulations and guidelines that must be observed while dealing with goods, and quality must never be compromised to minimize the throughput costs of this process. Imagine if there was a technique to operate a warehouse operation that was much more efficient in terms of time, but it would put quality assurance at risk. Due to the importance of quality, this operation cannot be modified. (SHEQ Lead, DHL Supply Chain Oy, Vaasa).

5 ANALYSIS

An examination of the connections between the examined empirical data and the literature review will be carried out in the subsequent chapter.

5.1 Current Practice

Based on the data, DHL has a good idea of how to run its operations and procedures, and they are also aware of the many potential problems that may arise. However, it has been abundantly evident during the tenure here that DHL is clueless about its current performance. The lack of actual performance data prevents DHL from establishing a baseline by allowing them to compare current metrics to past performance.

Some respondents said it would have been a fantastic idea to track their performance metrics so that DHL could be compared to its rivals. The managers who were questioned made the case that the data that was gathered should only be used to make the company better. Finding the correct performance metrics to steer the organization in the proper direction is a topic covered by Parmenter (2020). Finding the correct performance metrics is an arduous procedure.

Gathering material for the empirical chapter via interviews and other scenarios may seem superfluous today, but it was essential for giving a full picture of contemporary practices. According to Lamont (2013), it is typical for companies to fail to link and integrate the created key performance indicators into their business strategy. It's also the reason why businesses invest so much in learning about and comprehending process after process. According to Kalman (2002), action learning often follows talks that take place during process mapping. By using the action learning tool, the organization has been able to better understand its operations and procedures in various contexts, identify problem areas, and choose where to concentrate its efforts.

5.2 Existing KPIs

According to Staudt et al. (2015), there is a common misconception that all performance measurements should be referred to as key performance indicators. DHL is using a wide variety of metrics, including the frequency with which improvements are made, as key performance indicators (KPIs), however, these metrics do not assess all the important performance that KPIs are meant to evaluate.

Key performance indicators (KPIs) require a daily or weekly action plan from DHL. Workers and supervisors may see what needs doing by visualizing the KPIs on a control tablet and using colors to represent the state of the KPIs at that time. This method is already in use by DHL and is very effective; it will also be utilized for the newly designed KPIs.

Even though DHL brings up several of these key performance indicators (KPIs) many times, nothing constructive is done about any of them. So, DHL should cease measuring things until there is a good reason to do so, and then act on the results of each measurement. Of course, this isn't an exhaustive list of all key performance indicators; nevertheless, it does include some of the most closely linked ones, whose values may trigger certain actions.

If DHL wants its indicators to perform what they're supposed to, they need to keep reviewing them and making choices based on them. Because it is typical for organizations to measure the incorrect values (Meyer & Gupta, 1994) and because new measures are often implemented without proper attention to the old ones, even when they are still used for decision-making. Accordingly, when a new measure replaces an old one, the business should carefully remove the old one to avoid making any errors.

5.3 CSFs related to core competence

For a firm to get the greatest competitive advantage, it is recommended that it align its core competency with the CSFs (Chen et al., 2017). To do this, the first step involves determining the CSF, followed by establishing a connection between the two by identifying DHL's core competency. The process of identifying the appropriate KPIs may

begin after these steps have been completed. According to Chen et al. (2017), researchers have attempted to accomplish just that by including all these aspects in the empirical study; after all, companies may gain a significant competitive edge by using these relationships. When it comes to its procedures and operations, DHL uses specialized expertise to ensure that its goods are of top quality. The quality of the items is a crucial success element for DHL since their clients need and expect nothing less. There seems to be a robust relationship between the two CSF specialized abilities and attributes.

DHL maintains its leadership position through heavy investment in digital tools and technology breakthroughs. These innovations allow them to retain and enhance their top-quality goods. This establishes a foundation of reliability for the items that are to be preserved. Consequently, there is a direct relationship between the reliability that clients have in a business and the capabilities that the business has. It is typical for companies to create metrics without first considering the potential connections between those metrics and factors inside and outside the organization.

Unfortunately, creating key performance indicators is a time-consuming and intricate process; as a result, many businesses miss the mark when using measures, they believed would benefit their company but which, upon closer inspection, served no purpose at all.

5.4 Logistical Performance Measures

At present, DHL is not tracking all the metrics that pertain to warehouse efficiency or productivity. According to Staudt et al. (2015), several metrics may be suggested in the literature; some provide a broader view, while others can identify the precise location of the issue. This variation is based on the needs of the firm. Both kinds of metrics are required here, but looking at the big picture is what the researcher thinks is the best place to start. Once the broad measures are in place, the next stage is to implement the ones that provide a better insight into the problem's location, whose team it affects, and so on.

Productivity and successfully foreseeing the needs of consumers will undoubtedly take the front stage after the completion of the present scenario of the study, which should help to further refine these metrics. Investigations of relevant internal records started as it became apparent that demand forecast accuracy and productivity would be the primary areas of attention.

There was some extra work involved before the researcher settled on productivity and demand forecast accuracy as their primary metrics. The researcher spent days observing the company's operations and conducting brief interviews before realizing that the data logged by the system was insufficient to complete the computations. Due to a lack of data, it was necessary to exclude that step from the computation. For the finished measurements, the researcher will use various methods to compute the same items.

5.5 Formulas for measures

An understanding of the staffing levels in each region of the warehouse was necessary before beginning the computation of the key performance indicators. Materials may be categorized into four types: indirect materials, direct materials (raw materials), completed commodities, and non-supply (post & parcels). It was the responsibility of the workforce researcher to determine the percentages allotted to each material and the number of full-time equivalents (FTEs) allocated to each material. With this proportion in hand, the researcher may determine the exact amount of time spent on each item out of the overall amount and arrive at a more accurate productivity metric. The percentage will be used to calculate demand forecast accuracy and productivity. (Reference: Staudt et al.,2015)

Scroll down to see the two metrics that will be the main emphasis. Both metrics have been absent from the company's decision-making process for warehouse operations control for far too long, but they are now fully incorporated. Using these two steps as a foundation, the company may create additional steps to improve warehouse control. Through this first metric, the company should be able to gauge its level of productivity.

An organization's current level of productivity might serve as a benchmark against which they can make future productivity targets. This identified production KPI originated from the receiving activity of the warehouse.

Definition: Productivity

Calculation:

$$\frac{Number\ of\ pallets}{Actually\ worked\ hours}$$

Frequency: Should be measured daily with weekly or monthly follow-up

The second metric demand forecast accuracy (DFA) is a KPI that assesses the precision of predicting consumer demand for goods or services. It measures the degree to which real demand matches the predicted demand. This identified demand forecast accuracy KPI originated from the shipping activity of the warehouse.

Definition: Demand Forecast Accuracy (DFA)

Calculation:

$$\left[1 - \frac{(Actual\ Demand - Forecasted)}{Actual\ Demand}\right] \times 100$$

Frequency: Should be measured once a week with monthly follow-up
(Staudt et al., 2015)

6 DISCUSSION

This section of the thesis will conduct an in-depth examination and discussion of the previous parts of the thesis. After the discussion, the results section will follow.

6.1 Reviewing the Findings

As the thesis has progressed, the study has revealed several intriguing details that have been cast into doubt. After thorough consideration, two key performance indicators (KPIs) have been determined suitable for implementation by DHL. Of course, every company's infrastructure is subject to change, rendering these procedures outdated. the recommendations, however, when implemented via an integrated manual, should be able to endure significant organizational changes. The development of these metrics is critical to the long-term viability of the company and its capacity to compete with others. To maintain the competitive advantage discussed in Figure 5 and the relationship between them by Chen et al. (2017), the data created by the comparisons might serve as a foundation for taking the necessary measures.

An additional goal of these measures is to instill a sense of waste reduction within the organization. Staff members should be motivated to work harder and more efficiently because of this real-time information and some further rules stating that productivity and demand forecast accuracy should not exceed an agreed-upon level. The expectation is that workers would begin to consider how these procedures may be improved, which ought to lead to the simplification of routine duties.

The study has touched on various topics that are somewhat unrelated to emphasis but are still relevant to warehouse operations, in some areas. Since the study has identified many areas with great potential for improvement in warehouse operations, these areas must be thoroughly investigated. However, to do this, DHL must first establish a comprehensive foundation from which they can measure every element of the facility. For the simple reason that DHL will be unable to determine whether the modifications were beneficial or detrimental if they are unable to quantify them. A giant leap forward

toward the creation of this massive foundation may be achieved by beginning with the proposed KPIs and setting the process and mentality in motion. Before commencing any substantial task, the major must suss issues be addressed. After all, the direction of what should be assessed is largely determined by the important success elements.
Finally, the researcher firmly thinks that DHL will be able to achieve a steadier and more informed workload with the support of the two key performance indicators. If management can find a means to better oversee warehouse operations, it will be good for everyone involved.

6.2 The company's benefit from the two KPIs

These two key performance indicators will mark the beginning of measuring something previously unmeasured in DHL's warehouse operations. Improved decision-making regarding productivity and demand forecast accuracy may be possible for DHL with the help of these new metrics. The necessity of closely monitoring key performance indicators (KPIs) is emphasized by Chae (2009) because they indicate any gaps that may exist between the planning and execution stages. This allows for the identification and correction of any issues that may arise.
Organizations rely on the Demand Forecast Accuracy KPI to assess the efficiency of their forecasting processes and to guide choices on production, inventory management, and supply chain planning. Improved prediction accuracy suggests that the organization has a deeper understanding of client demand patterns, allowing them to optimize inventory levels, minimize stockouts, and boost customer happiness. Precise demand forecasting assists organizations in optimizing inventory levels by matching supply with expected demand. High demand prediction accuracy helps organizations maintain ideal stock levels, minimizing the chances of excess inventory or stockouts and enhancing the inventory turnover ratio. (Staudt et al., 2015)
Extra time may be spent evaluating the warehouse's routines and seeing whether the routines from the least expensive warehouse could be moved to the most expensive one. It may be feasible, or at least conceivable to observe and discuss with co-workers

how the routines may be improved, even if the warehouse structure is very different from one another. Since there has to be an explanation for why one warehouse's expenses are greater than the other, the processes used to complete tasks in that location are often a nice beginning to begin looking into the matter. Workers shouldn't think they're stronger working alone but rather as part of a cohesive team to accomplish the company's stated goals; this is especially true given that warehouses store raw materials and finished goods, which are treated slightly differently and necessitate slightly different routines.

Another thing that came to light during the interview with the HR employee was that it's unethical to treat each employee differently because they all work under different conditions and have different ways of getting their jobs done. Finding the least productive team and sending them to train together would be a good first step. It is believed that bringing the underperforming team up to speed on development sessions and the like would help them become as professional and productive as the rest of the staff.

Regrettably, due to the restricted period, only a limited number of thoughts on the uses and generation of the two measures could be considered. Nonetheless, the researcher stresses the importance of DHL adopting the mindset outlined above about the key performance indicators. When DHL examines the KPIs from numerous angles, it may derive deeper analyses from the data, which might lead to the discovery of new, useful information about the organization.

6.3 Quality of the Study

Extensive documentation has been created to enable the transfer of the material in this case study practicable. To increase the study's reproducibility, as pointed out by Bryman & Bell (2015), it is necessary to thoroughly describe the techniques, which is accomplished with this documentation. To highlight the transferability of this thesis, the researchers have structured the work in a way that allows the reader to independently examine the gathered information before participating in the analysis.

Qualitative research, however, involves ongoing interpretations. However, under the academic contribution section, one may find the results applicable in other contexts as perceived by the researcher.

The significance of the researcher-participant connection in a case study is highlighted by Flyvbjerg (2006). Decisions about the treatment and interpretation of the gathered information were largely influenced by an ongoing discussion with the supervisor and subject reader that was maintained throughout the thesis. Because of the time and effort put into discussing potential problems, the resulting case study is more solid. Because of the contact you gain with the participants, the values of the researcher are also considered, leading to a more trustworthy study. The chapter on ethics and prejudice delves more into this topic.

6.4 Challenges during the work

Employees may experience more stress and strain as a result of the measures since they are aware that they are being monitored. But if it can be used properly, it may make people feel more involved and driven, which is the opposite of what the metrics are designed to achieve. Hence, the researcher must ensure that all parties understand that they are measuring processes and not individuals. It has been difficult to complete the tasks in a way that the employees can perceive and comprehend. Although it has been difficult, Lamont (2013) notes that the key to making sure that workers feel motivated and involved with the measurements is their commitment to the KPIs.

The empirical data used to understand the warehouse's activities and operations forms the basis of the research. The research has attempted, with some difficulty, to exclude any details that would be detrimental to the case firm. To keep the company's secrets safe, several details have been oversimplified, making them harder to grasp.

7 CONCLUSION

This section will detail the study's academic contribution and address the research questions that guided the investigation. Additional research has also been included.

7.1 Answers to the research question

At this point, a response to the research topic that has been explored during this thesis must be disclosed. The key purpose of this thesis was to identify the key performance indicators for measuring the warehouse performance of an international logistics company. To fulfill this purpose qualitative interview data was collected from key experts of DHL Finland. Based on data analysis, it is found that the relevant key performance indicators (KPIs) for DHL are productivity and demand forecast accuracy. When it comes to DHL's warehouse operations, these two key performance indicators will serve as the foundation for making decisions about the company's productivity and demand forecast accuracy. Monitoring and regulating the warehouses in a more efficient way than in the past requires these two metrics, which are of the utmost importance. The key performance indicators (KPIs) will have a significant impact on the way the job will be carried out in the warehouse operations after they have been completely created and included in the DHL organization. A graphic representation of the formulae that were used in the calculation of the two key performance indicators can be seen below.

Productivity:

$$\frac{Number\ of\ pallets}{Actually\ worked\ hours}$$

Demand Forecast Accuracy:

$$\left[1 - \frac{(Actual\ Demand - Forecasted)}{Actual\ Demand}\right] \times 100$$

Reviewing internal papers and conducting interviews for many hours led to the development of these two key performance indicators (KPIs). An exhaustive investigation of the present scenario has been carried out over several months, which has led researchers to discover the crucial success characteristics that DHL has. By assisting the researcher in delving further into the topic, the CSF made it easier for the researcher to determine which key performance indicators (KPIs) were the most significant. Furthermore, it has been essential to establish a connection between the

core competencies and the CSFs. All these links between the key performance indicators (KPIs), core competencies, and important success factors are used in the appropriate manner, which has led to the achievement of a competitive advantage.

7.2 Academic Contribution

When doing case studies, it is quite typical for complications to arise about the replication of the research since the events being studied are unique. A complete explanation of the performance of the work has been provided by the researcher to facilitate the replication of as much as feasible. The research literature shows that there is a path that the organization must travel to produce appropriate measures that are suitable for the company. This path has been followed in detail for this study. For other organizations, this contribution may serve as a foundation for producing key performance indicators (KPIs), if it satisfies the following requirements:

- Working for a multinational corporation that places a strong emphasis on quality.
- Being a part of a network that is established on the worldwide market.
- Working against comparable ideals.
- Being involved in activities that are carried out around the clock, continuously throughout the year.

As was indicated before, however, these criteria may need to be modified when they have been evaluated in comparable circumstances.

Beyond the framework, it will contribute to how you are building this kind of key performance indicator (KPI) if the firm is utilizing a business intelligence (BI) system such as SAP or something similar. Without a doubt, as was said before, every organization is one of a kind, and it is often difficult to find identical situations.

7.3 Managerial Implications

The management implications include the introduction of two new key performance indicators (KPIs) that may directly assist the organization in efficiently and successfully

monitoring warehouse performance. Based on these two key performance indicators (KPIs), the organization may establish further measures to enhance warehouse management. This will facilitate firms in adopting a proactive approach rather than a reactive one. By using this first key performance indicator (KPI) of productivity, managers at companies may accurately assess their level of productivity. Managers may evaluate the accuracy of anticipating customer demand for products or services by using the second key performance indicator (KPI) of demand forecast accuracy. The use of Key Performance Indicators (KPIs) in supply planning by the management may enhance warehouse control by providing dependable and comparable data, increasing knowledge and responsibility, and facilitating progress monitoring and accountability.

7.4 Further Studies

Since the research was carried out in the form of a case study, it has not been tested on additional instances, which would have significantly increased its validity. With that being stated, it is recommended that an organization that has successfully met the criteria use this framework to determine if it is appropriate or whether any modifications are required to make it even more generalizable.

After a successful introduction into the organization, these key performance indicators (KPIs) that have been generated are in the beginning stages of their development. Although they are functional, they need some fine adjustments. To get the key performance indicators (KPIs) to function flawlessly, it is necessary to make these little tweaks. It may take many years to completely perfect the KPIs that are being utilized. Consequently, steps have to be taken as soon as the implementation is accomplished in its entirety.

Furthermore, future studies should explore the variables that influence the selection of key performance indicators (KPIs) and subsequent research endeavors might augment the number of interviews and include individuals from other organizations to investigate additional performance variables. Furthermore, the feasibility of implementing the suggested Key Performance Indicators (KPIs) across various sectors might be examined

and evaluated. Given the emphasis on warehouse management in this study, it would be beneficial to reproduce the same approach and investigation on a larger scale across the whole organization. This would enable the development of a collection of Key Performance Indicators (KPIs) that can accurately assess and enhance organizational performance. Future researchers are advised to include the present study in their literature review and conduct more investigations on the themes discussed here to improve the current study and boost the overall understanding of key performance indicators.

REFERENCES

Akkawuttiwanich, P., & Yenradee, P. (2018). Fuzzy QFD approach for managing SCOR performance indicators. *Computers & Industrial Engineering*, *122*, 189–201.

Alvehus, J. (2013). *Skriva uppsats med kvalitativ metod: en handbok*. Liber.

Anand, N., & Grover, N. (2015). Measuring retail supply chain performance: Theoretical model using key performance indicators (KPIs). *Benchmarking: An International Journal*, *22*(1), 135–166.

Andika, D., Anggraeni, S. K., & Sirajuddin, S. (2013). Usulan pemilihan supplier bahan baku tetap menggunakan vendor performance indicator dan analytical hierarchy process (AHP). *Jurnal Teknik Industri Untirta*, *1*(2).

Aramyan, L. H. (2007). *Measuring supply chain performance in the agri-food sector*. Wageningen University and Research.

Archie, L. I. I. I., & Kevin, M. (2004). Linking SCOR planning practices to supply chain performance. An exploratory study. *International Journal of Operations & Production Management*, *24*(12), 1192–1218.

Authoni, A., & Suryani, E. (2014). Purwarupa Performance Dashboard Untuk Membantu Analisis Data Evaluasi Diri Perguruan Tinggi (PT) Berdasarkan Key Performance Indicators (KPI) Studi Kasus: PT X. *Pros. Semin. Nas. Manaj. Teknol. XXI*, *2011*, C11–C19.

Bai, C., & Sarkis, J. (2014). Determining and applying sustainable supplier key performance indicators. *Supply Chain Management: An International Journal*, *19*(3), 275–291.

BANSAL, D. R. K. K., & AHALAWAT, N. (2013). Effect of inflation on supply chain model with exponential demand. *Multi-Disciplinary Edu Global Quest*.

Bryman, A., & Bell, E. (2015). *Business research methods* (Fourth edition). Oxford University Press.

Cai, J., Liu, X., Xiao, Z., & Liu, J. (2009). Improving supply chain performance management: A systematic approach to analyzing iterative KPI accomplishment. *Decision Support Systems*, *46*(2), 512–521.

Chae, B. (2009). Developing key performance indicators for supply chain: an industry perspective. *Supply Chain Management: An International Journal*, *14*(6), 422–428.

Chen, P.-S., Huang, C.-Y., Yu, C.-C., & Hung, C.-C. (2017). The examination of key performance indicators of warehouse operation systems based on detailed case studies. *Journal of Information and Optimization Sciences*, *38*(2), 367–389.

Chow, G., Heaver, T. D., & Henriksson, L. E. (1994). Logistics Performance: Definition and Measurement. *International Journal of Physical Distribution & Logistics Management*, *24*, 17–28. https://api.semanticscholar.org/CorpusID:167930143

Christopher, M. (2005). *Logistics and supply chain management : creating value-adding networks* (3rd ed). Financial Times Prentice Hall.

Christopher, M. (2016). *Logistics and Supply Chain Management: Logistics & Supply Chain Management*. Pearson UK.

DHL Annual Report. (2022). *DHL Annual Report*. https://www.dhl.com/content/dam/dhl/global/dhl-supply-chain/documents/pdf/glo-dsc-anual-report-2022.pdf

DHL Global. (n.d.). *Vision - DHL - Finland*. 2023. Retrieved February 29, 2024, from https://www.dhl.com/fi-en/home/about-us/our-vision.html

DHL History. (2023). *The History of DHL Group*. Https://Group.Dhl.Com/En/about-Us/the-Group/History.Html.

DHL Strategy-2025. (2019). *STRATEGY 2025 We Deliver Excellence in a Digital World*.

DHL Supply Chain. (n.d.). *DHL Supply Chain – The world's leading contract logistics provider - Finland*. 2024. Retrieved February 29, 2024, from https://www.dhl.com/fi-en/home/supply-chain.html

Eliasson, A. (2013). *Kvantitativ metod från början* (3. uppl). Studentlitteratur.

Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry*, *12*(2), 219–245.

Forslund, H. (2007). The impact of performance management on customers' expected logistics performance. *International Journal of Operations & Production Management*, *27*(8), 901–918.

Franceschini, F., Galetto, M., & Maisano, D. (2007). *Management by measurement: Designing key indicators and performance measurement systems*. Springer Science & Business Media.

Fugate, B. S., Mentzer, J. T., & Stank, T. P. (2010). Logistics performance: efficiency, effectiveness, and differentiation. *Journal of Business Logistics*, *31*(1), 43–62.

Gautam, D. (2023). *Improving the packaging efficiency and performance in Logistic Center Vaasa by using Lean Inbounds from Italy to Vaasa* [master's thesis in Industrial Management]. University of Vaasa.

Gorard, S. (2002). Ethics and equity: pursuing the perspective of non-participants. *Social Research Update*, *39*, 1–4.

Gözaçan, N., & Lafci, Ç. (2020). Evaluation of Key Performance Indicators of Logistics Firms. *Logistics & Sustainable Transport*, *11*(1), 24–32. https://doi.org/10.2478/jlst-2020-0002

Gunasekaran, A., & Kobu, B. (2007). Performance measures and metrics in logistics and supply chain management: a review of recent literature (1995–2004) for research and applications. *International Journal of Production Research*, *45*(12), 2819–2840.

Haglund, L., Christensen, L., Engdahl, N., & Grääs, C. (2016). *Marknadsundersökning: en handbok*. Studentlitteratur.

Huan, S. H., Sheoran, S. K., & Wang, G. (2004). A review and analysis of the supply chain operations reference (SCOR) model. *Supply Chain Management: An International Journal*, *9*(1), 23–29.

Ishaq Bhatti, M., Awan, H. M., & Razaq, Z. (2014). The key performance indicators (KPIs) and their impact on overall organizational performance. *Quality & Quantity*, *48*, 3127–3143.

Kalman, H. K. (2002). Process mapping: Tools, techniques, & critical success factors. *Performance Improvement Quarterly*, *15*(4), 57–73.

Kennerley, M., & Neely, A. (2003). Measuring performance in a changing business environment. *International Journal of Operations & Production Management*, *23*(2), 213–229.

Kucukaltan, B., Irani, Z., & Aktas, E. (2016). A decision support model for identification and prioritization of key performance indicators in the logistics industry. *Computers in Human Behavior*, *65*, 346–358.

Kumar, & Kumar, R. (2018). *Research Methodology : A Step-by-Step Guide for Beginners*. SAGE Publications Ltd.

Lai, K., Ngai, E. W. T., & Cheng, T. C. E. (2002). Measures for evaluating supply chain performance in transport logistics. *Transportation Research Part E: Logistics and Transportation Review*, *38*(6), 439–456.

Lamont, J. (2013, October 1). KPI: Leveraging corporate data with key performance indicators. *KMWorld Magazine*.

Lukinskiy, V., Pletneva, N., Gorshkov, V., & Druzhinin, P. (2017). Application of the logistics “just in time” concept to improve the road safety. *Transportation Research Procedia*, *20*, 418–424.

Meiliana, M., Bryan, B., Joshua, F., & Raymond, R. (2014). Pengembangan Sistem Manajemen dan Analisis Key Performance Indicator “Smart Kpi” Berbasis Web. *ComTech: Computer, Mathematics and Engineering Applications*, *5*(2), 1119–1126.

Melnikovas, A. (2018). Towards an Explicit Research Methodology: Adapting Research Onion Model for Futures Studies. *Journal of Futures Studies*, *23*(2).

Meyer, M. W., & Gupta, V. (1994). The performance paradox. *Research in Organizational Behavior*, *16*, 309.

Mishra, Dr. S. B., & Alok, Dr. S. (2017). *HANDBOOK OF RESEARCH METHODOLOGY*.

Mooney, A. (2007). Core competence, distinctive competence, and competitive advantage: What is the difference? *Journal of Education for Business*, *83*(2), 110–115.

Myerson, P. (2015). *Supply chain and logistics management made easy: methods and applications for planning, operations, integration, control and improvement, and network design*. Pearson education.

Nudurupati, S. S., Bititci, U. S., Kumar, V., & Chan, F. T. S. (2011). State of the art literature review on performance measurement. *Computers & Industrial Engineering*, *60*(2), 279–290.

Parmenter, D. (2020). *Key performance indicators: developing, implementing, and using winning KPIs: Vol. 4th Edition*. John Wiley & Sons.

Patel, R., & Davidson, B. (2011). *Forskningsmetodikens grunder : att planera, genomföra och rapportera en undersökning*. Studentlitteratur.

Prahalad, C. K., & Hamel, G. (2009). The core competence of the corporation. In *Knowledge and strategy* (pp. 41–59). Routledge.

Rajesh, R., Pugazhendhi, S., Ganesh, K., Ducq, Y., & Koh, S. C. L. (2012). Generic balanced scorecard framework for third party logistics service provider. *International Journal of Production Economics*, *140*(1), 269–282.

Richards, G. (2022). *Warehouse Management: The Definitive Guide to Improving Efficiency and Minimizing Costs in the Modern Warehouse: Vol. 4th Edition*. Kogan Page Publishers.

Sahay, A. (2016). Peeling Saunder's research onion. *Research Gate, Art*, *3*(2), 1–5.

Samsonowa, T. (2011). *Industrial research performance management: Key performance indicators in the ICT industry*. Springer Science & Business Media.

Saunders, M. N. K., Lewis, P., & Thornhill, A. (2019). *Research methods for business students* (Eighth edition). Pearson.

Schilling, M. A. (2017). *Strategic management of technological innovation*. McGraw-Hill.

Selmeci, A., Orosz, I., Györök, G., & Orosz, T. (2012). Key Performance Indicators used in ERP performance measurement applications. *2012 IEEE 10th Jubilee International Symposium on Intelligent Systems and Informatics*, 43–48.

Sileyew, K. J. (2020). Research Design and Methodology. In E. Abu-Taieh, A. El Mouatasim, & I. H. Al Hadid (Eds.), *Cyberspace* (p. Ch. 3). IntechOpen. https://doi.org/10.5772/intechopen.85731

Slack, N., Brandon-Jones, A., Johnston, R., & Betts, A. (2015). *Operations and process management: principles and practice for strategic impact(4th edition)*. Pearson.

Spitzer, D. R. (2007). *Transforming Performance Measurement*. AMACOM. https://sfx.finna.fi/nelli07?url_ver=Z39.88-2004&ctx_ver=Z39.88-2004&ctx_enc=info:ofi/enc:UTF-8&rfr_id=info:sid/sfxit.com:opac_856&url_ctx_fmt=info:ofi/fmt:kev:mtx:ctx&sfx.ignore_date_threshold=1&rft.object_id=1000000000366296&svc_val_fmt=info:ofi/fmt:kev:mtx:sch_svc&

Staudt, F. H., Alpan, G., Di Mascolo, M., & Rodriguez, C. M. T. (2015). Warehouse performance measurement: a literature review. *International Journal of Production Research*, *53*(18), 5524–5544.

Stricker, N., Echsler Minguillon, F., & Lanza, G. (2017). Selecting key performance indicators for production with a linear programming approach. *International Journal of Production Research*, *55*(19), 5537–5549.

Wärstilä Corporation. (2023). *Wärstilä Annual Report*. www.wartsila.com

Woods, C. (2022). *The importance of effective warehouse management.* Https://Www.Locate2u.Com/Articles/Warehouse-Management/ [Accessed 13 February 2024].

Wudhikarn, R. (2017). Determining key performance indicators of intellectual capital in logistics business using Delphi method. *2017 International Conference on Digital Arts, Media and Technology (ICDAMT)*, 164–169.

Zall Kusek, J., & Rist, R. C. (2004). *Ten steps to a results-based monitoring and evaluation system: a handbook for development practitioners*. Washington, DC: World Bank.

Zangirolami-Raimundo, J., de Oliveira Echeimberg, J., & Leone, C. (2018). Research methodology topics: Cross-sectional studies. *Journal of Human Growth and Development*, *28*(3), 356–360.

Zhu, L., Su, H., Lu, S., Wang, Y., & Zhang, Q. (2014). Coordinating and evaluating of multiple key performance indicators for manufacturing equipment: Case study of distillation column. *Chinese Journal of Chemical Engineering*, *22*(7), 805–811.

Ziukov, S. (2018). A literature review on models of inventory management under uncertainty. *Verslo Sistemos Ir Ekonomika*, *1*.

Appendices

Appendix 1. All interviewed employees & management staff

Department/ Area of Concern	Work tasks
Site Manager, Operation	Operations Management, Staff Supervision and Training, Facility Maintenance and Safety
Supervisor-1, Inbound, Operation	Receiving and Inspection, Inventory Management, Team Management and Training
Supervisor-2, Inbound, Operation	Receiving and Inspection, Inventory Management, Team Management and Training
Supervisor-1, Outbound, Operation	Order Fulfilment Management, Shipping and Logistics Coordination
Supervisor-2, Outbound, Operation	Order Fulfilment Management, Shipping and Logistics Coordination
Quality Control	Safety Compliance and Risk Management, Environmental Management and Sustainability, Quality Assurance and Continuous Improvement
Key User-1 Resource planning (ERP) systems	System Configuration and Customization, User Training and Support, Process Improvement and Optimization

Key User-2 Resource planning (ERP) systems	System Configuration and Customization, User Training and Support, Process Improvement and Optimization
Field Operation	Material Movement and Handling, Inventory Management, Order Picking and Packing
Material Flow Planning	Optimizing Material Flow, Production Scheduling and Coordination, Inventory Management and Control