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PERFORMANCE MEASUREMENT SYSTEMS IN SUPPLY CHAIN MANAGEMENT: THE CASE OF HITACHI ENERGY

Bachelor Thesis

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I have written this Bachelor Thesis independently. Any ideas or data taken from other authors or other sources have been fully referenced.

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Introduction

In an era characterized by rapid technological advancement and automation, supply chains across diverse industries have undergone significant transformations in their operational processes. The operational scale and complexity of energy companies, especially in a global context, underscore the critical need for diligent management and continuous improvement. The adaptation of performance measurement systems (PMS) to the unique intricacies of the energy sector's SCM poses its own set of challenges. The examination of SCM performance metrics highlights their pivotal role in achieving competitive advantage, emphasizing the need for a strategic focus. However, challenges persist, such as the scarcity of knowledge on PMS required for fully integrated supply chains, despite the topic of SCM gaining considerable attention from researchers (Ellram, 1991; Toni, Nissimbeni & Tonchia, 1994; MacBeth & Ferguson, 1994; Graham, Dougherty & Dudley, 1994; Landeros, Reck & Plank, 1995; New, 1996; Towill, 1997; Maloni & Benton, 1997).

The operational scale and complexity of energy companies, particularly in a global context, highlight the pressing need for diligent management and continuous improvement. Adapting performance measurement systems (PMS) to the unique intricacies of the energy sector's supply chain management has proven to be challenging. Nevertheless, the energy sector continues to be one of most vital importance, as the energy supply of the entire world's population depends on its ability to withstand intricate difficulties and adapt continuously to the rapidly changing environment.

While general frameworks and best practices for SCM performance metrics are available in the literature, there is a lack of in-depth studies that specifically address the unique challenges and intricacies of the energy supply chain. Existing research often lacks granularity in exploring how companies, such as Hitachi Energy AS, strategically tailor and implement performance metrics to navigate complexities related to the reliability, resilience, and regulatory requirements inherent in the energy sector.

This thesis aims to clarify the list of performance metrics within SCM, using the case of Hitachi Energy AS. Thereby, the thesis contributes to a more comprehensive understanding of SCM in the dynamic landscape of the energy industry. The energy supply chain is inherently intricate, involving various stages from raw material sourcing to end-user delivery. As a prominent player in the sector, Hitachi Energy AS operates within this complex framework. Additionally, as Hitachi Energy AS is likely to employ industry-leading practices due to being a key player in the sector, the best practices can be generalized and applied across the broader energy supply chain by studying its strategies and practices in performance metric development and implementation. Examining its performance metrics can yield valuable lessons applicable to other companies facing similar complexities.

The research tasks of this thesis, which aid in achieving the research aim, include:

- introducing an overview of key concept definitions provided by various authors;
- creating a synthesis of previous empirical studies;
- exploring the relevance and significance of performance management systems in a supply chain management context;
- examining the PMS framework of Hitachi Energy AS using the author’s empirical data;
- establishing a universal, adaptable PMS framework for SCM energy firms;
- discussing the results and drawing conclusions.

Chapter 1 of this thesis delves into fundamental concepts of SCM, exploring key definitions, the role of performance management, and the critical concept of supply chain resilience in subchapter 1.1. Subchapter 1.2 examines the various approaches to PMS in SCM based on previous empirical studies, as well as highlights the importance of performance measurement and metrics in the industry. Chapter 2, subchapter 2.1, describes the methodology employed for the author’s empirical study. Subchapter 2.2 explores the author’s empirical research findings, further addressing the implications associated with the findings, using a qualitative approach to analyze the collected data. All data and information gathered have been found from empirical studies, research, and academic articles.

KEYWORDS: Supply chain management, performance management systems, supply chain management in energy sector

1. Supply Chain Management fundamentals

1.1. Defining performance management in Supply Chain Management

One of the central concepts examined in this thesis is performance management. Kamble and Gunasekaran (2019) define performance management as “the process of quantifying the efficiency and effectiveness of action.” Indeed, efficiency and effectiveness are central to any member of the supply chain, as the success of the entire elaborate chain can be easily disrupted by one of its members failing to work up to the necessary requirements in a proper way. Performance management is a practice that aims to identify such pitfalls among the many tasks and processes involved in a supply chain, as well as function in the adaptation or transformation process in the face of change quite beneficially. Additionally, Gunasekaran and Kobu (2007) found that performance measures support a positive work environment and enhance organizational effectiveness by encouraging more honest and forthright communication between the organization's stakeholders.

The definitions of Supply Chain Management (SCM) vary among authors, as the term covers complex processes and nuanced considerations. Some of the definitions will be explored and compared in this subchapter. Supply chain management, defined by the Supply-Chain Council, is the "effort involved in producing and delivering a final product from the supplier's supplier to the customer's customer" (Kranz, 1996, p. 4). This definition underlines the extensive chain of production that is involved in any supply chain production. However, it disregards various essential aspects of SCM, such as management, expectations, and values, which supply chain organizations are presented with.

Stein and Voehl (1998) have proposed a more elaborate definition, defining the term as "the systematic effort to provide integrated management to the Supply Value Chain in order to meet customer needs and expectations, from suppliers of raw materials through manufacturing and on to end-customers." The definition provided by Stein and Voehl (1998) highlights the systematic nature of SCM, which the first definition disregarded, as well as accounts for the requirements and needs a firm has to take into consideration and apply for every step of the process.

However, one similarity between the two definitions is how both of them underline the beginning of the process (supplier's supplier in the first one and suppliers of raw materials in the second) and the numerous points of conduct the product has to pass before reaching its end customer. It may be argued that both of the definitions are combined and enhanced in the way Lambert, Stock, and Ellram (1998) defined supply chain management, which is "the integration of business processes from end user through original suppliers that provides products, services, and information that add value for customers." This sentence combines the description of the supply chain process involving various points a product has to go through in order to arrive to the end customer, and it accounts for the value it brings. However, this definition fails to accommodate for the needs and expectations that affect the entire supply chain process, as well as the systematic nature of SCM. Thus, this paper will focus on using the definition of SCM provided by Stein and Voehl (1998).

A critical definition in the context of SCM performance measurement systems is supply chain resilience. While Wieland and Durach (2021) argue that a clear definition of the concept has not been established yet, highlighting the long-running debate which surrounds the different interpretations, there is a broad assumption of the concept based on the definition of engineering resilience. As defined by Gupta, He, and Sethi (2015), Fahimnia, Tang, Davarzani, and Sarkis (2015), Pettit, Fiksel, and Croxton (2010), supply chain resilience is the capacity to recover from an interruption promptly and successfully. A narrower definition of supply chain resilience has been offered by Wieland and Durach (2021), focusing on the overlooked sense of social-ecological resilience. Supply chain resilience can be defined as “the capacity of a supply chain to persist, adapt, or transform in the face of change.” (Wieland & Durach, 2021, p. 2). While resembling the definition provided by Gupta, He, and Sethi (2015), Fahimnia, Tang, Davarzani, and Sarkis (2015), Pettit, Fiksel, and Croxton (2010), the second definition accounts for the importance of not only recovering from a disruption but adapting to the newly established environments and requirements. Indeed, the way Wieland and Durach (2021) have explored the concept provides a more precise overview of the objectives associated with overcoming disturbances besides recovery. This ability to withstand disturbances and disruptions in the supply chain and sustain operations, as well as the advantages it brings to a firm, will be further explored in Chapter 1.2. Supply chain resilience is a crucial and complex concept in risk management associated with SCM, which is one of the unconventional supply chain risk management (SCRM) approaches (Behzadi, O'Sullivan & Olsen, 2020).

In conclusion, the multifaceted nature of Supply Chain Management (SCM) is evident in the diverse definitions provided by various authors. The definitions explored in this subchapter vary in their scope and emphasis, from the Supply-Chain Council's (Kranz, 1996) focus on the production and delivery process to Stein and Voehl's (1998) more comprehensive view that considers integrated management and customer needs. Lambert, Stock, and Ellram's (1998) definition emphasizes the integration of business processes and the creation of value for customers, which appears to combine and enhance aspects of the previous definitions. However, it falls short of capturing the systematic nature and addressing the needs and expectations crucial to the SCM process. Hence, the definition of SCM used in this paper will be the one provided by Stein and Voehl (1998). Performance management, a central concept in this research, is aptly defined by Kamble and Gunasekaran (2019) as the process of quantifying the efficiency and effectiveness of actions within the supply chain. This process is essential for identifying and rectifying potential disruptions among the intricate tasks and processes involved. Moreover, Gunasekaran and Kobu (2007) highlight that performance measures not only contribute to organizational effectiveness but also foster a positive work environment through transparent communication among stakeholders. In the realm of SCM performance measurement systems, the concept of supply chain resilience emerges as a critical and complex element. While definitions vary, the overarching theme revolves around the capacity of a supply chain to recover promptly and successfully from interruptions. The nuanced definition by Wieland and Durach (2021), encompassing persistence, adaptation, and transformation in the face of change, adds depth to the understanding of supply chain resilience. This resilience proves to be a crucial aspect in the risk management landscape of SCM, aligning with unconventional approaches and highlighting its significance in sustaining operations and advantages for firms (Behzadi, O'Sullivan & Olsen, 2020). The intricate nature of these concepts underscores the need for a holistic and strategic approach to SCM, considering the interplay of diverse elements for effective and resilient supply chain management.

1.2. Measurement and Metrics of SCM Performance

SCM emphasizes the effortless coordination of initiatives that generate value across organizational boundaries. With SCM, the company can maintain an adequate amount of inventory, eliminate all forms of waste, and take advantage of redundancies. Additionally, the company is able to compete successfully in the worldwide market. In this sense, a management effort to incorporate value-creating activities both inside and beyond the organization's borders signifies a strategic focus in supply chain management (Saragih, Tarigan, Pratama, Wardati & Silalahi, 2020).

The capabilities generated by an efficient supply chain's members aid in creating and sustaining a competitive advantage (Gupta, Tan & Phang, 2018). These capabilities are the primary sources of success for a firm (Mikalef & Pateli, 2017).

While the prospects and the capacity of SCM have been widely recognized in recent years, the accessibility of the knowledge crucial to meeting the requirements of a fully integrated SC has remained an issue (Gunasekaran, Patel & Tirtiroglu, 2001).

One of the considerably significant roles of integrating performance metrics in SCM is the opportunity to "test and reveal the viability of strategies without which a clear direction for improvement and realization of goals would be highly difficult." (Gunasekaran, Patel & Tirtiroglu, 2001)

A supply chain having no metrics is a common pitfall. Considering that the possibility of one site's objectives not meeting the other site's objectives is a common conflict, it is crucial to implement and measure performance metrics. Additionally, the lack of performance metrics provides room for other potentially harmful outcomes for the whole supply chain, such as one site's operational goals resulting in another site's inefficiencies. (Lee & Billington, 1992). The lack of performance indicators in a firm can drastically affect the efficiency of its supply chain risk management (SCRM system). The SCRM is focused on activities such as identifying, addressing, evaluating, and monitoring any potential risk sources that are plausible for an organization. (Saragih, Tarigan, Pratama, Wardati & Silalahi, 2020)

The remaining part of this subchapter aims to synthesize the findings of previous empirical studies of SCM performance metrics and to draw substantial conclusions for further comparison of the results to those of this thesis's empirical analysis.

Several empirical studies are to be examined and compared in this subchapter.

Harrison and New (2002) conducted an international survey among the leading SC firms to establish which performance measures were the most widely used. Their survey results will be used by the author as an example of a more classic approach to SCM KPIs as they date back closer to the beginning of the digitalization era of SCM than more recent studies. (Pisa & McCurdy, 2019)

Table 1

Supply chain metrics/measures monitored on an ongoing basis

Supply chain metrics	The number of respondents using this metric	% of total respondents using this metric
Customer delivery performance	221	86
Inventory turnover	195	76
Supplier delivery performance	171	66
Inventory days of supply	146	57
Perfect order fulfillment	140	54
Order fulfillment lead-time	134	52
Customer return rate	133	52
Supplier cost performance	125	48
Delivery cost per unit	107	41
Asset turnover	92	36
Obsolescence rate	88	34
Documentation error rate	85	33
Warranty costs	82	32
Returns processing costs	67	26
Cost-to-serve	59	23
Telephone response time	41	16
Line item deletions	24	9
Total number of respondents	258	

Source: Harrison & New (2002).

Table 1 presents the results of the survey in the form of the metric, the number of respondents using it, and the percentage of total respondents implementing it.

The results are presented in descending order from the most widely used among the respondents to the rarest of the metrics used by the surveyed group.

Harrison and New (2002) highlight the tendency of SCs to avoid more sophisticated measures as a base for assessing performance. Rather than choosing more elaborate metrics such as cost-to-serve, which was implemented by only 23% of the total respondents, the SCs track the more obvious ones, such as delivery performance, which was admittedly used by 86% of the respondents. While monitoring the delivery performance of the customer is crucial to supporting the supply chain, the cost-to-serve, for instance, provides insight into the actual cost of making the product available to the customer. Not only is it a valuable measure of performance, but it has also been called a driver for change (Braithwaite & Samakh, 1998). Braithwaite and Samakh (1998) argue that "[cost-to-serve] is a cornerstone of deciding what to change and how to prioritize such changes." Despite its benefits to the overall SCM strategy and its implementation, most respondents chose to turn to more conventional measures, which lack depth and accuracy compared to cost-to-serve, for example. Circling back to the customer delivery performance metric, which was admittedly used the most among the survey respondents, it has been criticized as early as 1998. There are significant gaps between the delivery performance and variables supposedly dependent on it, such as cost, productivity, and quality (Hines, 1998). Therefore, in spite of being perceived as reliable and conventional, the most widely used performance measure among SCs presents questionable and ultimately shallow insights.

The idea of prioritizing the performance metrics that have the highest diving power and the most significant impact on the other measures is also supported by an empirical study by Azevedo, Carvalho, and Cruz-Machado (2013). The authors proposed a diagram to reflect the relationships among performance measures, which indicated the measures considered the most important (see Figure 1).

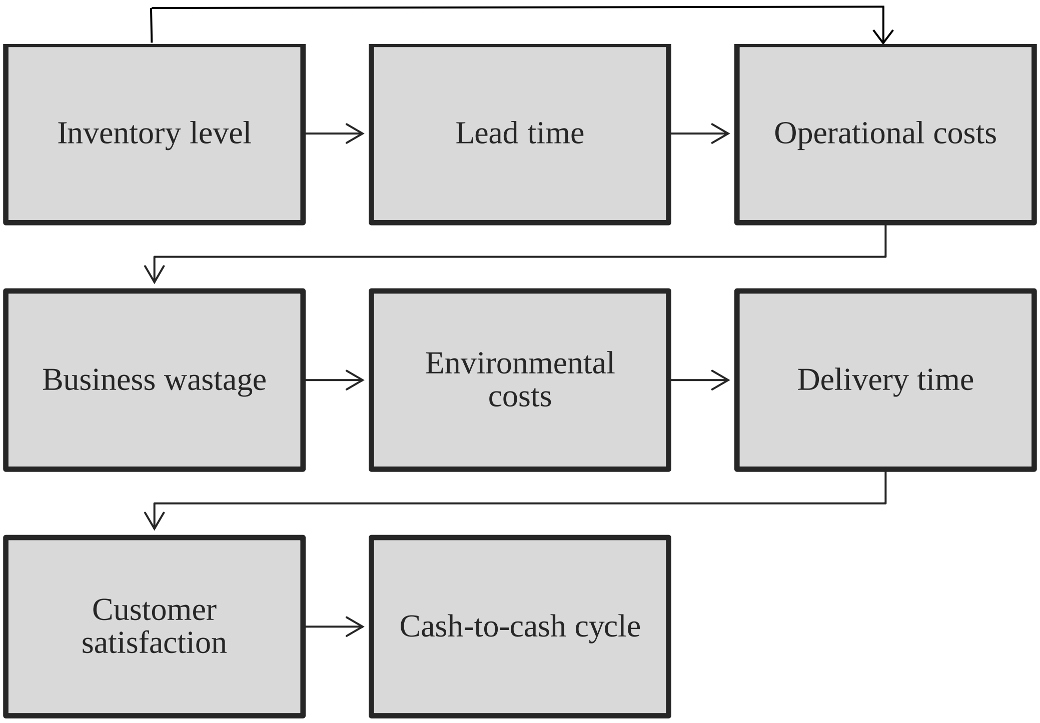

Figure 1. Diagram of the relationships among performance measures
Source: Azevedo, Carvalho & Cruz-Machado (2013).

As seen in Figure 1, the driving measures, according to Azevedo, Carvalho, and Cruz-Machado (2013), are inventory level and lead time. This view differs quite considerably from that of Harrison and New (2002); even though it can be argued that both of the studies have reached the same conclusion of prioritizing the metrics with the most driving power, the basis metrics of the two approaches vary significantly. The first empirical study overviewed in this thesis focused on more sophisticated measures, reflecting the true extent of a SC's quality performance, while the second study reached the conclusion of advising to focus on the conventional, primitive measures, which provide a surface-level overview instead of an in-depth one. It is worth mentioning that the two metrics highlighted by Azevedo, Carvalho, and Cruz-Machado (2013) – inventory level and lead time – appear in the survey results of the Harrison and New (2002) study, in which more than 50% of the respondents marked these metrics as currently implemented in their firms. Thus, a conclusion may be drawn that more than ten years prior to Azevedo, Carvalho, and Cruz-Machado's (2013) empirical study, the measures they advised SC managers to use were already being implemented widely.

Despite choosing the two conventional and obvious measures, Azevedo, Carvalho, and Cruz-Machado (2013) refer to other studies supporting the criticism of those exact measures. That includes a reference to Lambert and Pohlen (2001), who criticized the metrics employed in the assessment of supply chain performance. From their point of view, supply chain managers prioritize logistical metrics (such as lead time or on-time performance) above providing details on how effectively the supply chain has satisfied customer expectations or how successfully the primary business operations have been carried out. Lambert and Pohlen (2001) contend that these metrics miss the possibility of increasing each supply chain company's competitiveness, customer value, and shareholder value, and they do not reveal information on how the chain as a whole has done.

While explaining the process of identifying the best performance measures could seem redundant due to incomparable internal objectives, a universal question regarding the performance metrics in any supply chain was researched by Bourne et al. (2000). The authors have conducted a lengthy case study with the timeframe of approximately 13 months, during which multiple firms were participating in the process of designing new performance management systems. One of the conclusions reached by the end of the study was unexpected for the authors, on the one hand, while on the other hand, it could be easily predicted looking back. This conclusion involves the firms' management teams' resistance to focus on developing a PMS, which had been crucial at the early stages of the process. A thorough, precise system must be in place in order to avoid such resistance. The researchers highlighted how the designing and the implementation stages of the process resembled an exercise for management, while the development of the use of the designed metrics posed a considerable challenge. Over the course of the research, the management teams of the surveyed firms faced threats to their power bases being altered, a lack of skill when it came to evaluating the PMSs, and an inability to draw valuable lessons from the process during it. The research demonstrated that aims and measurements can change spontaneously throughout the usage of the measures, but if this evolution is unregulated, the performance metrics may diverge from strategy. Additionally, the study exhibited an example in which the arrangement was assessed without regard for the implications for the PMSs. Once again, in the event that this kind of activity is permitted to proceed unaltered, the old performance measures might conflict with the new ones (Bourne et al., 2000).

The empirical studies described in this subchapter have a common idea running through their contents, and that is the development of a PMS in a SCM context focusing on the most influential points in the process. Whether it is choosing the measurements with the most driving power or prioritizing adjusting the development of the PMS during its implementation, without regulating these instances the whole process altogether might not be worth the effort and the financing provided by the firm.

In conclusion, the discourse on Supply Chain Management (SCM) underscores the critical importance of seamless coordination across organizational boundaries to generate value. SCM enables companies to maintain optimal inventory levels, eliminate wasteful practices, and capitalize on redundancies, fostering successful global competition. The strategic focus in SCM involves integrating value-creating activities both within and beyond organizational borders (Saragih et al., 2020). Gupta, Tan, and Phang (2018) assert that an efficient supply chain's capabilities are instrumental in creating and sustaining a competitive advantage, emphasizing the pivotal role these capabilities play in a firm's success (Mikalef & Pateli, 2017). Despite the widely recognized prospects of SCM, the accessibility of knowledge required for a fully integrated supply chain remains a challenge (Gunasekaran, Patel & Tirtiroglu, 2001). Performance metrics play a crucial role in this integration, offering a means to test and evaluate strategies for continuous improvement (Gunasekaran, Patel & Tirtiroglu, 2001). The absence of metrics in a supply chain poses significant risks, with potential conflicts between site objectives and inefficiencies (Lee & Billington, 1992). The synthesis of empirical studies on SCM performance metrics reveals contrasting perspectives. Harrison and New's (2002) survey, conducted closer to the digitalization era's inception, highlights the prevalence of conventional metrics such as customer delivery performance and inventory turnover. This preference for simplicity contrasts with Azevedo, Carvalho, and Cruz-Machado's (2013) emphasis on sophisticated metrics like inventory level and lead time, arguing for a more in-depth assessment. However, the challenge lies not only in selecting appropriate metrics but also in the management's resistance to developing a precise Performance Management System (PMS). Bourne et al.'s (2000) case study exposes the resistance management faces during the design and implementation of a PMS, emphasizing the need for a regulated evolution to align metrics with strategy. In essence, the empirical studies converge on the importance of a strategic approach to SCM, emphasizing the need for precise and impactful performance metrics. Whether prioritizing metrics with driving power or regulating the evolution of a PMS, the overarching theme is the strategic development of SCM to make the entire process worthwhile for firms.

2. Examining performance metrics in Hitachi Energy AS – empirical analysis

2.1. Data collection and method of analysis

In this subchapter, the author explains the process of data collection and the description and justification for the research methodology are provided.

Hitachi Energy AS stands as a significant entity in the energy sector, playing a pivotal role in the management and distribution of energy resources. As a key player in the industry, Hitachi Energy AS operates within a complex network of supply chain management processes, spanning from raw material procurement to end-user delivery. Understanding the intricacies of SCM within Hitachi Energy AS provides valuable insights into industry practices and challenges.

The chosen method for this thesis is a case study. An in-depth knowledge of a current problem or event in a confined system can be produced using the methodological research approach of a case study. In the social sciences, one of the most popular and well acknowledged types of qualitative research methodology is the case study. This method of research supports the process of gaining a thorough understanding of a problem, event, or phenomena of interest within its real-life context. Researchers have the chance to gain a deeper grasp of a subject through case studies. (Coombs, 2022) Moreover, contrasting industrial case studies that employ various phenomenological research approaches shows that evaluating the influence of SCM on company performance may be significantly enhanced (Towers, Abushaikha, Ritchie & Holter, 2020).

It serves to analyze the PMS within Hitachi Energy AS. This method was selected due to its effectiveness in exploring the nuanced aspects of modern SCM practices and performance metrics. Case study analysis allows for a comprehensive examination of industry-specific factors and facilitates the identification of strengths, weaknesses, and areas for improvement within the PMS.

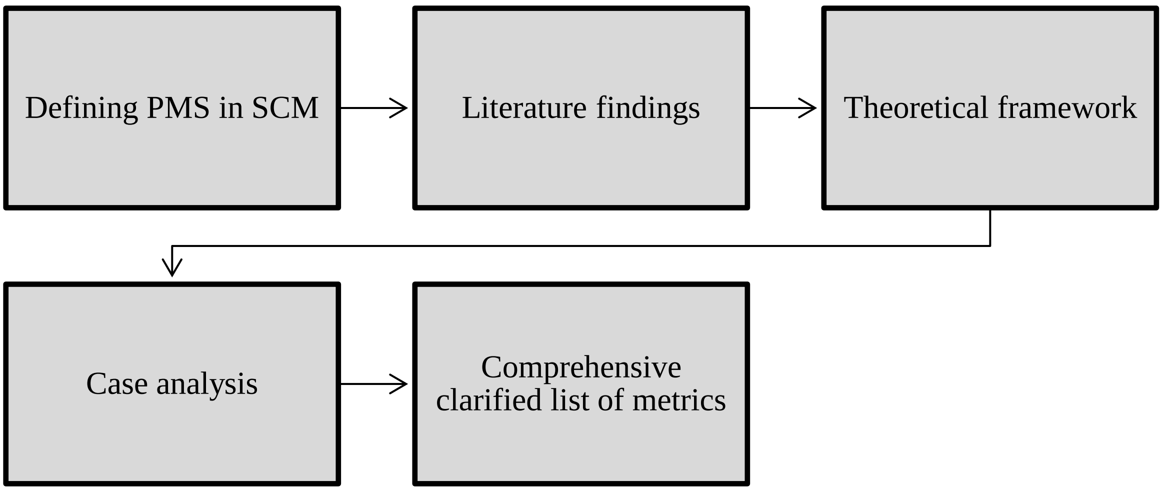

Figure 2. Methodology of the thesis

Source: Compiled by the author

The methodology (Figure 2) of the thesis is justified by the author through several key aspects. Firstly, the rationale for selecting Hitachi Energy AS as the subject of study is solidified by its significant role in the energy sector, emphasizing the relevance and importance of understanding its supply chain management practices. The complexity of SCM processes within Hitachi Energy AS underscores the need for a detailed qualitative analysis to explore its nuances effectively.

The methodology approach chosen for the study aligns with the research tasks, allowing for a comprehensive examination of industry-specific factors and performance metrics within Hitachi Energy AS. This methodological choice is justified by its effectiveness in uncovering strengths, weaknesses, and areas for improvement within the PMS, thus providing valuable insights for both academia and industry practitioners.

The comparative analysis strategy employed, contrasting Hitachi Energy AS's performance metrics with those outlined in the seminal study by Harrison and New (2002), further strengthens the methodology. This approach supports a detailed evaluation of the alignment of Hitachi Energy AS's PMS with industry standards, offering valuable insights into its effectiveness and relevance within the broader SCM context.

The utilization of tables to highlight discrepancies between the performance metrics employed in Hitachi Energy AS and those outlined in existing literature adds clarity and structure to the analysis. This structured approach enables a thorough examination of the PMS framework and its operational implications, ultimately contributing to the identification of blind spots and proposed improvements.

Data collection for this study involved obtaining performance metrics directly from Hitachi Energy AS. The process included gathering information on the performance indicators utilized by the company to evaluate its SCM operations. Through collaboration with company representatives and access to internal documentation, a comprehensive dataset of performance metrics was compiled for analysis. The data on Hitachi Energy AS performance metrics presented and analyzed by the author is not accessible to the general public.

The analysis employed a comparative approach, contrasting the performance metrics utilized by Hitachi Energy AS with those outlined in the seminal study by Harrison and New (2002). Specifically, the author examined similarities and discrepancies between the two sets of metrics to assess the alignment of Hitachi Energy AS's PMS with industry standards. Comparative analysis enabled a detailed evaluation of the effectiveness and relevance of the company's performance metrics within the broader SCM context.

In order to conduct a thorough case study analysis of the PMS framework which is in place in Hitachi Energy AS, firstly the performance measurement system was outlined. Using the data provided by the company, a comprehensive examination of the performance metrics has been performed with the use of tables, highlighting the discrepancies between the performance metrics employed in Hitachi Energy AS and the metrics outlined in the study by Harrison and New (2002), introduced by the author in Table 1. Harrison and New (2002) conducted an extensive international survey among leading supply chain firms to ascertain the most commonly utilized performance measures. Their research provides a comprehensive overview of industry-standard key performance indicators during a pivotal era in supply chain management evolution, positioning it as a benchmark for traditional SCM practices. This study is particularly relevant as it predates the widespread digitalization of SCM practices, offering insights into foundational metrics that have stood the test of time. By comparing Hitachi Energy AS metrics to those identified by Harrison and New (2002), the author aims to evaluate the alignment of Hitachi Energy AS's performance measurement system with longstanding industry norms and practices, and clarify the list of SCM performance metrics. Additionally, the hierarchical structure of metrics provided in the study by Harrison and New (2002) facilitates a systematic comparison, allowing for a nuanced assessment of similarities and discrepancies between the two sets of metrics.

The list of the performance metrics that the author compares to Hitachi Energy AS metrics is as follows (Harrison & New, 2002):

1. Customer delivery performance
2. Inventory turnover
3. Supplier delivery performance
4. Inventory days of supply
5. Perfect order fulfilment
6. Order fulfilment lead-time
7. Customer return rate
8. Supplier cost performance
9. Delivery cost per unit
10. Asset turnover
11. Obsolescence rate
12. Documentation error rate
13. Warranty costs
14. Returns processing costs

15. Cost-to-serve
16. Telephone response time
17. Line item deletions

Consequently, the data was analyzed and synthesized with the previous empirical findings, underlining the blind spots in Hitachi Energy AS's PMS and proposing improvements. The analysis enabled the author to conclude if the PMS holds up to its expectations on an operational level, specifically the requirement of adaptability.

The methodology of empirical analysis relies on a qualitative approach to the interpretation of the performance management system in Hitachi Energy AS. The chosen method of analysis has allowed the establishment of a PMS framework applicable to supply chain management companies in the energy sector by conducting an analysis of industry-specific aspects to it, as well as providing an insight into the factors prioritized in the everchanging and demanding environment of SCM.

2.2. Case study results and implications

Firstly, the metrics that make up the performance management system in Hitachi Energy AS must be outlined. The company uses a set of metrics, or Key Performance Indicators (KPIs), in order to evaluate and track the performance of its supply chain management department.

These performance indicators were explicitly created and outlined by the management with the intention of being used throughout all 197 Hitachi Energy hubs throughout the world. Thus, the metrics were designed to be universal, adaptable, and unifying; having the same performance indicators throughout all office locations provides invaluable insights to the management in regard to the company's overall success and achievement of strategic and developmental goals. In the process of creating this performance management system, the company was relying on the factors they had previously deemed crucial rather than relying on any academic literature.

However, there are still some metrics that coincide or overlap with the ones described in the academic papers, including some of the metrics highlighted in Chapter 1. In this subchapter, the author will analyze Hitachi Energy AS's performance metrics and compare them with the metrics outlined in subchapter 1.2., table 1, thereby identifying the advantages and gaps within the performance measurement system employed in Hitachi Energy AS.

The performance metrics utilized for the supply chain management department operations performance measurement in Hitachi Energy AS are presented in Table 2.

Table 2

Performance metrics in Hitachi Energy AS

Performance metric	Purpose and scope
Late purchase requisition (PR) creation	This metric tracks the percentage of purchase requisitions that were created later than the PRs' release date, excluding the deleted and closed PRs. A purchase requisition document serves as a source of information about the materials or parts that need to be ordered for production, and the document is compiled using the corresponding department's template for further procurement. Therefore, if the document is created later than intended, the process of procuring the needed materials is delayed, further delaying the whole production chain. This metric serves as an indicator of performance from the project's or planning's side to determine how much of the delayed procurement can be traced back to the requesting side in the organization. It provides a distinction of the responsibility for delay span within the supply chain management chain of command.
Manual PR changes to key fields	The purpose of this key performance indicator is to measure the manual changes of key fields in a purchase requisition (excluding deleted and closed PRs), such as vendor, quantity of the requested material, or delivery date. Manual changes prolong the procurement process by triggering the repeated approval flow of the PR document, which serves as a delaying factor in the process of obtaining the needed parts or materials. Much like late purchase requisition creation, this metric deals with the responsibility for the potential or actual delay from the requesting side, therefore providing insight into the point of conduct at which the delay occurred.
PRs with manual source determination	By measuring the percentage of PRs with manual source determination (PRs with no fixed vendor to order from or a manually changed vendor), it is possible to additionally track the delays caused by an unidentified or unregistered supplier. This metric allows to conclude further if a supplier should go through the attestation process and be registered for future purchases, as well as provides insight into which materials cannot be obtained from the vendors already

	registered in the system and the demand for them.
Cycle time: PR to purchase order (PO)	The purpose of this performance indicator is to measure the time taken from the creation of a purchase requisition to a purchase order line item creation, excluding the deleted and closed PR documents. By tracking the cycle time of PR to PO creation, it becomes possible to determine the average throughput time needed for an order to go from a requisition item to a registered PO item, therefore reflecting if the expected speed of procuring materials is justified and based on existing procedures. By being aware of the average time needed to transform a PR order line item into a PO order line item, the requesting side can improve other performance indicators, such as manual PR changes to key fields. For instance, urgent delivery dates will not have to be manually adjusted if the requesting side is aware of how long it will take to create a PO item line, therefore saving time and effort and avoiding unnecessary delays in the procurement process.
Cycle time: PO approval	In order for a purchase order line to be released, the PO has to be approved in the system first; the average time taken for a purchase order to get approved is measured by this performance indicator. While this part of the procurement process should not create any significant delays due to the way the process is organized, meaning the PR document has to have been approved by the time of PO creation, it might still cause inconveniences and potential setbacks. In that case, most often, the postponement occurs due to a communication gap between the requesting side and the procurement professional who places the purchase order in the system. The person from the project identified as the PO approver in the PR document might be out of office or lacking the required approval authority in the system, therefore creating a delay and additional work to resend the PO for its approval to another employee. Much like the previous metrics, this indicator deals mainly with the potential mistakes from the issuing side.

PO assigned on time with PR on time	The purpose of this performance indicator is to measure the percentage of purchase orders created late for purchase requisitions that were created on time. Tracking this information allows insight into the level of performance of employees who create and place the POs, reflecting the amount of delays occurring at the stage of PO creation. This information can be further scrutinized with the purpose of identifying the delaying factors, whether it is the extensive workload or lack of human capital in the department. Therefore, this metric serves as a source of multiple possible reasons for any potential postponements in the process of ordering materials.
Manual PO changes to key fields	This metric reflects the percentage of purchase orders line items with manual changes to key PO fields, such as the delivery date, the net price, or the quantity of the materials. There are several possible reasons as to why the need for these adjustments might arise, some of which can be linked back to the purchase requisition document if it contains any errors, and others relating to the quality of the buyers' work. Ideally, once the PO is created and released, it should not require any changes to it, as the information on the PO line items is being filled in accordance with the PR document. However, for instance, in the case of a PR created later than intended, which is being tracked as part of the late purchase requisition creation performance indicator, the delivery dates might need adjusting according to the lead time of the supplier. Alternatively, if the ordered materials are not registered in the system and no master data exists for them, their price might need to be changed later after the receipt of the purchase order acknowledgment document (OA). This metric provides insight into both the causes of PR-related delay and master data-related causes.
PO coverage – creation	This metric and the following metric both reflect the workload distribution within the buyers' team and allow to assess the adequacy of it. By measuring the percentage of purchase orders created by one buyer compared to the team's comprehensive results, it becomes possible to determine if the

	workload is being delegated and divided fairly, allowing for faster PO creation and a decreased possibility of any errors in the purchase order line items.
PO coverage – responsibility	Much like the previous performance indicator, this indicator reflects the distribution of the workload among the employees responsible for PO placement and open order management. This metric focuses on the latter by reflecting the percentage of all open PO line items under a buyer’s responsibility compared to the team’s overall number of open PO line items. These line items assigned to a buyer fall under their scope of responsibility for further open order management, such as ensuring the receipt of order acknowledgment documents, executing any necessary adjustments to the POs, and monitoring the on-time delivery of the materials. These operations make up a large part of a buyer’s workload, and therefore, if the PO line items are not distributed equally, delays might occur due to the overwhelming amount of work and time constraints.
Cycle time: PO to order acknowledgment (OA)	This metric measures the time taken from PO line item creation to the receipt of an order acknowledgment document from the supplier. In order to exclude any potential delays in the process of ordering and obtaining the required materials, the supplier is required to provide order acknowledgment within a certain period of time, typically ten working days for non-urgent purchase orders and five working days for POs with delivery dates indicated as earliest possible. This way, any adjustments that might need to be made to the PO line items can be performed in time before the order is processed, and in the case of the vendor confirming a delivery date later than requested, it can be shared with the relevant persons early in the process. Unconfirmed orders – POs without acknowledgment – must be chased with the supplier in order to receive the expected delivery date for the materials and the correct price.
PO items with OA within five days	This performance indicator tracks the percentage of order acknowledgments received within five working days from the point of sending the PO to the supplier. This indication allows for a comprehensive

	overview of the supplier's performance in terms of providing order acknowledgments in a timely manner, therefore excluding potential delays in the supply chain. Providing order acknowledgment on time ensures successful communication on both ends, as well as allows for the most relevant data to be reflected in the system. Suppliers with poor performance can be further analyzed and negotiated with.
Confirmed on-time delivery (OTD)	This performance metric calculates the percentage of purchase orders for which the supplier delivers the goods or services within the confirmed delivery dates. This metric is crucial because it directly impacts inventory management, production schedules, and customer satisfaction. Achieving high on-time delivery rates enhances operational efficiency, reduces the risk of stockouts, and supports trust between buyers and suppliers. Consistently missing delivery deadlines can lead to disruptions in production, increased carrying costs, and potential loss of customers. By closely monitoring confirmed OTD, the company can identify reliable suppliers, address performance issues with underperforming suppliers, and optimize their supply chain processes for better efficiency and customer service.
Invoices paid on time	This performance metric indicates the percentage of invoices received by buyers for the payment that has been processed according to the terms of payment before the due date. This KPI mainly focuses on the performance of buyers. However, it does not reflect all the nuances of the invoice handling process, as in some cases, the invoice becomes overdue for reasons out of a buyer's scope of responsibility. Still, this indicator creates a general overview of the company's end of processing payments for the PO and its performance in terms of successfully upholding the payment terms.
Payment terms vs payment	This performance indicator evaluates the timeliness of payments made for purchase orders (POs) in relation to the agreed-upon payment terms. When a purchase order is issued, there are typically terms outlined regarding when the payment should be made. The indicator calculates the percentage of

	purchase orders for which payment was made within the agreed-upon payment terms. This indicator is important because it reflects the efficiency and reliability of the payment process within the supply chain. Adhering to payment terms demonstrates financial discipline and fosters positive relationships with suppliers. It also helps in avoiding late payment penalties and maintaining a healthy cash flow for both parties involved in the transaction. Additionally, tracking this indicator allows the company to identify any inefficiencies in its payment processes and take corrective actions to improve them.

Source: Hitachi Energy AS (2024)

Hitachi Energy AS's metrics primarily focus on procurement and purchasing processes, such as purchase requisition creation, purchase order cycle times, and invoice processing. In contrast, the metrics from the literature review encompass a broader range of supply chain functions, including customer delivery performance, inventory management, and cost-to-serve analysis.

Inventory management :

Inventory turnover
Inventory days of supply
Asset turnover
Obsolescence rate

Operational efficiency:

Order fulfillment lead-time
Line item deletions
Returns processing costs
Documentation error rate
Warranty costs
Delivery cost per unit
Cost-to-serve

Customer satisfaction:

Customer delivery performance
Customer return rate
Telephone response time

Supplier performance:

Perfect order fulfillment
Supplier delivery performance
Supplier cost performance

Figure 3. Categorization of metrics provided in the study by Harrison & New (2002)
Source: Harrison & New (2002)

Figure 3 demonstrates the performance metrics that the author compares to Hitachi Energy AS metrics, categorized by their scope of performance measurement for further clarification.

As seen in Table 3, the performance metrics employed in Hitachi Energy AS do not drastically overlap with the performance metrics described in Table 1, which is based on the academic literature review. The metrics in Hitachi Energy AS are more elaborate, covering the entire process of the supply chain from the PR creation to processing invoice payments.

Table 3

Comparison of Hitachi Energy AS performance metrics to literature

Performance metric used by SCM firms according to the study by Harrison & New (2002)	Hitachi Energy AS performance metric	Comment
Customer delivery performance	Confirmed on-time delivery (OTD)	While not explicitly mentioned in the Hitachi Energy AS metrics, Confirmed on-time delivery (OTD) could be considered equivalent.
Inventory turnover		There does not seem to be a direct equivalent in Hitachi Energy AS performance measurement system.
Supplier delivery performance	Confirmed on-time delivery (OTD)	Confirmed on-time delivery (OTD) might partially overlap with this metric.
Inventory days of supply		There does not seem to be a direct equivalent in Hitachi Energy AS performance measurement system.
Perfect order fulfilment	Confirmed on-time delivery (OTD)	Confirmed on-time delivery (OTD) could partially cover this aspect.
Order fulfilment lead-time	Cycle time: PR to purchase order (PO), Cycle time: PO to order acknowledgment (OA)	Cycle times mentioned in Hitachi Energy AS metrics, such as Cycle time: PR to purchase order (PO) and Cycle time: PO to order acknowledgment

		(OA), might be related.
Customer return rate		There does not seem to be a direct equivalent in Hitachi Energy AS performance measurement system.
Supplier cost performance	Payment terms vs payment	Payment terms vs payment might partially cover aspects of supplier cost performance.
Delivery cost per unit		There does not seem to be a direct equivalent in Hitachi Energy AS performance measurement system.
Asset turnover		There does not seem to be a direct equivalent in Hitachi Energy AS performance measurement system.
Obsolescence rate		There does not seem to be a direct equivalent in Hitachi Energy AS performance measurement system.
Documentation error rate	Manual PR changes to key fields	Manual PR changes to key fields may fall under the documentation error rate's scope of measurement, as it reflects the adjustments of

		PR documents that had to be made.
Warranty costs		There does not seem to be a direct equivalent in Hitachi Energy AS performance measurement system.
Returns processing costs		There does not seem to be a direct equivalent in Hitachi Energy AS performance measurement system.
Cost-to-serve		There does not seem to be a direct equivalent in Hitachi Energy AS performance measurement system.
Telephone response time		There does not seem to be a direct equivalent in Hitachi Energy AS performance measurement system.
Line item deletions	Manual PO changes to key fields	Manual PO changes to key fields metric covers the order line item deletions that may occur.

Source: Harrison & New (2002); Hitachi Energy AS (2024).

The literature review metrics include several customer-centric metrics, such as customer delivery performance, perfect order fulfilment, and customer return rate. These metrics emphasize the importance of meeting customer expectations and enhancing customer satisfaction. In contrast, Hitachi Energy AS's metrics do not explicitly address customer-related performance aspects.

While both sets of metrics touch upon supplier performance, Hitachi Energy AS's metrics focus more on supplier delivery performance and procurement processes. The literature review metrics cover additional aspects such as supplier cost performance, which can provide insights into supplier relationships and cost efficiencies.

Hitachi Energy AS's metrics largely revolve around operational efficiency and process optimization, such as cycle times and order fulfilment lead-time. On the other hand, the literature review metrics include financial performance indicators like asset turnover, obsolescence rate, and documentation error rate, which offer insights into financial health and risk management.

Hitachi Energy AS's metrics provide detailed insights into procurement processes, allowing the company to optimize purchasing activities, reduce cycle times, and ensure timely payments. This focus on procurement efficiency can lead to cost savings and operational improvements. By tracking metrics related to purchase requisitions, purchase orders, and invoice processing, Hitachi Energy AS can identify bottlenecks, streamline processes, and improve overall operational efficiency within the procurement function.

However, Hitachi Energy AS's metrics lack a strong emphasis on customer-centric performance indicators, such as customer delivery performance and perfect order fulfilment. This blind spot may result in overlooking opportunities to enhance customer satisfaction and loyalty.

Moreover, Hitachi Energy AS's metrics primarily focus on procurement processes and do not cover other critical aspects of the supply chain, such as inventory management, distribution, and customer service. This limited coverage may lead to overlooking performance issues in areas outside of procurement. Additionally, Hitachi Energy AS's metrics do not include financial performance indicators, such as asset turnover and obsolescence rate, which are essential for assessing the company's financial health, profitability, and risk management.

As described in Subchapter 1.1., supply chain resilience is an important concept when discussing SCM performance measurement systems. A resilient PMS ensures the company’s ability to persist and transform in accordance to the ever-changing global context of SCM and the company’s own strategic focus adjustments. Hitachi Energy AS's performance metrics appear to be designed with supply chain resilience in mind, as they are intended to be universal, adaptable and applicable across all company locations. Hitachi Energy AS's performance metrics are explicitly created to be used throughout all 197 Hitachi Energy hubs worldwide. This indicates a deliberate effort to ensure that the metrics are applicable across different geographical locations, business units, and operational contexts within the company. The metrics cover various aspects of the supply chain management process, from purchase requisition creation to invoice payments.

By reflecting different stages of the supply chain, these metrics demonstrate adaptability to different processes and workflows within Hitachi Energy AS's operations. The performance metrics allow for the measurement of key aspects such as cycle times, manual changes, and on-time delivery percentages. This flexibility in measurement criteria enables the metrics to adapt to different scenarios and performance requirements within the supply chain management department. By tracking performance metrics such as late purchase requisition creation and manual changes to key fields, Hitachi Energy AS gains insights into potential delays and areas for improvement within its supply chain processes. Hitachi Energy AS's performance metrics are designed to support the achievement of strategic and developmental goals. By aligning these metrics with overarching business objectives, the company ensures that its performance measurement system remains adaptable to evolving strategic priorities and market conditions.

In conclusion, while Hitachi Energy AS's performance measurement system offers advantages in terms of procurement efficiency and process optimization, it has blind spots related to customer focus, supply chain coverage, and financial performance metrics. To address these blind spots and achieve comprehensive supply chain performance management, Hitachi Energy may need to consider incorporating a broader range of metrics that encompass customer satisfaction, supply chain visibility, and financial health.

Despite the abovementioned, the PMS within Hitachi Energy AS demonstrates a degree of adaptability by being designed for universal application, flexibility in measurement, and alignment with strategic goals. This adaptability enables the company to effectively monitor and improve its supply chain management processes across diverse operational contexts and geographical locations, as well as ensure that the supply chain remains resilient to transformations and challenges.

The author believes that synthesizing the performance metrics employed in Hitachi Energy AS with the conventional customer-focused and financial performance metrics may form a coherent, universal, and resilient supply chain management performance measurement system framework that would account for all intricacies of SCM while supporting the company's alignment with its strategic goals.

Conclusion

In conclusion, the thesis examines the evolving landscape of supply chain management (SCM), particularly in the energy sector, against the backdrop of rapid technological advancements and automation. The reliable flow of energy worldwide relies not only on sophisticated machinery but also on the expertise of SCM specialists and collaboration with external parties.

The empirical studies analyzed in Chapter 1 provide insight into diverse approaches to SCM performance metrics. Findings from Harrison and New's (2002) international survey reveal a tendency among supply chains to favor conventional metrics over sophisticated ones despite potential shortcomings. Azevedo, Carvalho, and Cruz-Machado (2013) advocate prioritizing metrics with driving power, challenging the widespread use of conventional measures. Chapter 1 introduces an overview of key concept definitions provided by various authors, synthesizing the findings and highlighting the differing opinions among scholars, as well as explores the relevance of PMS in an SCM context.

The synthesis of previous empirical studies highlights the common theme of prioritizing influential points in the SCM process, whether through metric selection or adaptive development during implementation. The challenge lies in regulating these instances to ensure alignment with strategy and avoid misdirection from intended goals.

The findings of Chapter 2 aid the author in examining the PMS framework within Hitachi Energy AS using the author’s empirical study, and establish a resilient PMS framework for SCM energy firms. In conclusion, the performance measurement system employed by Hitachi Energy AS provides a comprehensive framework for evaluating and optimizing supply chain operations, with a particular focus on procurement efficiency and process optimization. By utilizing a set of Key Performance Indicators (KPIs), the company aims to track and assess various aspects of its supply chain management department's performance across its global network of 197 hubs. These metrics, explicitly designed by management, are intended to be universal, adaptable, and unifying, ensuring consistency in performance evaluation throughout the organization. Such a standardized approach not only facilitates comparisons across different locations but also provides valuable insights into the company's overall success and its alignment with strategic goals.

The author has found that one of the strengths of Hitachi Energy AS's performance measurement system is its detailed coverage of procurement processes, from purchase requisition creation to invoice payments. Metrics such as late purchase requisition creation, manual changes to key fields in purchase requisitions, and cycle times from purchase requisition to purchase order and order acknowledgment reflect the company's commitment to operational efficiency and process optimization. By tracking these metrics, Hitachi Energy AS can streamline processes and improve overall efficiency within the procurement function, ultimately leading to cost savings and enhanced operational performance.

However, despite its strengths, the author has found that the performance measurement system in Hitachi Energy AS has several limitations that warrant consideration. Firstly, the system lacks a strong emphasis on customer-centric metrics, such as customer delivery performance and perfect order fulfillment. These metrics are crucial for understanding and improving customer satisfaction, loyalty, and overall supply chain performance. By overlooking these aspects, Hitachi Energy AS may miss opportunities to enhance customer relationships and drive long-term business success.

Secondly, the metrics employed by Hitachi Energy AS primarily focus on procurement processes and do not adequately cover other critical aspects of the supply chain, such as inventory management, distribution, and customer service. This limited coverage may result in overlooking performance issues in areas outside of procurement, potentially leading to inefficiencies and disruptions in other parts of the supply chain. Furthermore, empirical analysis revealed that Hitachi Energy AS's performance measurement system does not include financial performance indicators, such as asset turnover, obsolescence rate, and documentation error rate. These indicators are essential for assessing the company's financial health, profitability, and risk management. Without insights into these financial aspects, Hitachi Energy AS may overlook important factors that could impact its overall business performance and sustainability.

Despite these limitations, the author can claim that Hitachi Energy AS's performance measurement system demonstrates a degree of adaptability and resilience. The system is designed to be flexible and applicable across different operational contexts and geographical locations, allowing the company to effectively monitor and improve its supply chain management processes. By aligning these metrics with strategic goals and continuously refining the system based on empirical findings and industry best practices, Hitachi Energy AS can enhance its overall supply chain performance and competitiveness in the market.

In conclusion, while Hitachi Energy AS's performance measurement system offers advantages in terms of procurement efficiency and process optimization, it has blind spots related to customer focus, supply chain coverage, and financial performance metrics. To address these blind spots and achieve comprehensive supply chain performance management, Hitachi Energy AS may need to consider incorporating a broader range of metrics that encompass customer satisfaction, supply chain visibility, and financial health. Despite the abovementioned, empirical analysis has revealed that the PMS within Hitachi Energy AS demonstrates a degree of adaptability by being designed for universal application, flexibility in measurement, and alignment with strategic goals. This adaptability enables the company to effectively monitor and improve its supply chain management processes across diverse operational contexts and geographical locations, as well as ensure that the supply chain remains resilient to transformations and challenges.

The author believes that synthesizing the performance metrics employed in Hitachi Energy AS with the conventional customer-focused and financial performance metrics may form a coherent, universal, and resilient supply chain management performance measurement system framework that would account for all intricacies of SCM while supporting the company's alignment with its strategic goals. The future research suggestions include various aspects aimed at enhancing the understanding and effectiveness of performance measurement systems in supply chain management. Firstly, exploring customer-centric metrics, including customer delivery performance, perfect order fulfilment, and customer return rate, could significantly improve customer satisfaction and loyalty. However, this effort may be threatened by challenges such as accurately defining and measuring customer satisfaction, variability in customer preferences, difficulty in obtaining timely feedback, and potential biases in interpretation. Secondly, expanding the scope of metrics to cover inventory management, distribution, and customer service would optimize overall supply chain operations. Nevertheless, the applicability of findings beyond Hitachi Energy AS may be limited by industry-specific dynamics, organizational culture, and geographical factors. Thirdly, incorporating financial performance indicators like asset turnover, obsolescence rate, and documentation error rate is crucial for assessing financial health and profitability in the modern supply chain context. However, challenges in attributing financial outcomes solely to SCM activities, the influence of external factors, obtaining comprehensive financial data, and the need for standardized metrics pose significant limitations. Finally, evaluating supply chain resilience presents challenges due to the complexity of assessments, lack of standardized metrics, dynamic nature of supply chains, and limitations in data availability. By addressing these limitations and exploring future research avenues, scholars can further advance the understanding of supply chain performance measurement systems and contribute to the development of more effective and comprehensive frameworks.

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Resümee

JÕUDLUSE MÕÕTMISE SÜSTEEMID TARNEAHALA JUHTIMISES: HITACHI ENERGY JUHTUM

Maria Polikarova

Käesoleva bakalaureusetöö eesmärk on luua Hitachi Energy ASi juhtumi abil SCMi tulemusnäitajate raamistik, aidates seeläbi kaasa SCMi ulatuslikumale mõistmisele energiatööstuse dünaamilisel maastikul. Energia tarneahel on sisemiselt keerukas, mis hõlmab mitmeid etappe alates tooraine hankimisest kuni lõppkasutajale tarnimiseni. Hitachi Enegry AS kui tuntud valdkonna võtmetegur, tegutseb selle keeruka raamistiku piires. Lisaks sellele, kuna Hitachi Energy AS tõenäoliselt rakendab sektoris juhtivaid tavasid, saab parimaid tavasid üldistada ja rakendada laiemas energiatarnelahenduste tarneahelas, uurides selle strateegiaid ja tavasid tulemusmõõtmete väljatöötamisel ja rakendamisel. Ettevõtte tulemusnäitajate uurimine võib anda väärtuslikke õppetunde, mis kehtivad teiste sarnaste keerukustega ettevõtete puhul.

Esimeses peatükis analüüsitud empiirilised uuringud annavad ülevaate erinevatest lähenemistest SCMi tulemusnäitajatele. Harrisoni ja New (2002) rahvusvahelise uuringu tulemused näitavad kalduvust tarneahelatel eelistada konventsionaalseid mõõdikuid keerukatele, hoolimata võimalikest puudustest. Azevedo, Carvalho ja Cruz-Machado (2013) pooldavad juhtivate mõõdikute prioriseerimist, pannes kahtluse alla konventsionaalsete mõõdikute laialdase kasutamise. Peatükk 1 tutvustab erinevate autorite poolt antud peamiste mõistete määratluste ülevaadet, sünteesides leitud tulemused ja esile tuues erinevad arvamused teadlaste vahel, samuti uurib PMSi asjakohasust SCMi kontekstis.

Teises peatükis sukeldub autori empiirilistesse tulemustesse Hitachi Energy AS-i kasutatava tulemusjuhtimissüsteemi kohta. Empiirilise analüüsi metoodika põhineb kvalitatiivsel lähenemisel Hitachi Energy AS-i tulemusjuhtimissüsteemi tõlgendamisel. Valitud analüüsimeetod võimaldab autoril luua PMSi raamistiku, mis kehtib energiasektori tarneahela juhtimisettevõtetele, tehes analüüsi tööstuslike aspektide kohta ning see annab ülevaate teguritest, mida eelistatakse SCMi muutuvas ja nõudlikus keskkonnas.

Hitachi Energy AS kasutab oma tarneahela juhtimise osakonna tulemuslikkuse hindamiseks ja jälgimiseks võtmetulemusnäitajaid (Key Performance Indicators, KPI). Need näitajad, mis on kavandatud universaalseks ja kohandatavaks kõigis ettevõtte asukohtades, annavad hindamatut teavet üldise edu ja strateegiliste eesmärkide saavutamise kohta. Analüüs näitab siiski lahknevusi Hitachi Energy näitajate ja akadeemilises kirjanduses esitatud näitajate vahel.

Hitachi Energy mõõdikud keskenduvad peamiselt hanke- ja ostuprotsessidele, kuid ei pööra rõhku kliendikesksetele näitajatele ja laiematele tarneahela funktsioonidele, nagu varude haldamine ja klienditeenindus. Kuigi Hitachi Energy mõõdikud pakuvad eeliseid hangete tõhususe ja protsesside optimeerimise osas, ei hõlma nad selliseid kriitilisi aspekte nagu kliendirahulolu, tarneahela nähtavus ja finantsseisund.

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