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Supply chain strategies and inventory management

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Abstract

Supply chain management and inventory management have a crucial role on the development of successful strategies for companies, especially for those who operate in a global status. An important issue that supply chain managers have to face today is the high uncertainty and the disruptions on the global supply chains. As long as the supply chains become global, hence they are more exposed in various threats and crises. Such examples are the Covid-19 pandemic and the war in Ukraine which caused major disruptions on the supply chains. There are also other challenges to consider such as the use of AI and political tensions. For this reason this dissertation has examined a number of cases based on secondary resources. The outcome of this research indicated that each company has its own unique strategies of dealing with such uncertainties. However, there are some issues to stress, such as the need to collaborate, the emphasis on ethics and sustainability along with the use of advanced technologies. Since more crises are expected to come, which will lead also on major disruptions which means that the companies would have to be prepared and adopt some of the proposed recommendations.

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1.Introduction

1.1 The background of the dissertation

In today's dynamic business environment, disruptions and uncertainties have become the norm rather than the exception. Studying supply chain management and inventory management equips individuals with the knowledge and skills to effectively manage disruptions and mitigate risks. It enables organizations to develop contingency plans, build resilience, and implement strategies to respond to unexpected events such as natural disasters, pandemics, or supply chain disruptions (Wagner et al., 2021). By understanding the principles of risk management, individuals can identify vulnerabilities in the supply chain and develop strategies to minimize their impact, ensuring business continuity and sustainability. Furthermore, studying supply chain management and inventory management fosters innovation and continuous improvement. It encourages individuals to explore new approaches, technologies, and best practices to optimize supply chain operations. With the rapid advancements in digital technologies, such as artificial intelligence, big data analytics, and block chain, understanding how these tools can be applied in supply chain and inventory management is crucial (Gerlachet al., 2021). Individuals well-versed in these disciplines can identify opportunities for process automation, data-driven decision-making, and the implementation of sustainable practices, thus driving innovation and competitive advantage. Having in mind the past crises, such as the Covid-19 and the war in Ukraine which brought major disruptions on the global supply chains, it is necessary to study this concept so to develop a dissertation which will bring a set of proposals and recommendations on how to deal with such issues in the future.

1.2 The purpose of the dissertation and the research questions

Studying supply chain management and inventory management is crucial in today's fragmented world of business. These disciplines provide individuals and organizations with the knowledge and skills to enhance operational efficiency, navigate global complexities, optimize inventory levels, manage disruptions, and drive innovation. By understanding the principles and strategies of supply chain and inventory management, individuals can contribute to the success and sustainability of organizations in an increasingly competitive and dynamic business environment. For

this reason it is important to study the relationship between supply chain strategies and inventory management in today's contemporary business environment. More precisely *“the purpose of this dissertation is to investigate how integrating inventory management into supply chain strategies may enhance supply chain effectiveness and performance. Additionally, the implementation of supply chain and inventory management strategies to mitigate risks associated with severe disruptions in the supply chain will be explored.”*

Based on the above, the research questions needed to be answered within this literature review are the following:

RQ1: How does supply chain strategies and inventory management are working together so to bring the best possible result?

RQ2: What are the best supply chain strategies and inventory management approaches so to cope with the disruptions on the supply chain due of the recent crisis?

1.3 The methodology

For the purposes of the present thesis the chosen research method is the case study approach. The case study approach is a research method that involves in-depth exploration and analysis of a specific phenomenon or situation. It provides a comprehensive understanding of complex issues by examining real-life contexts and drawing insights from multiple data sources. Case studies are commonly used in various disciplines, including business, social sciences, and healthcare, as they offer a holistic and detailed perspective on a particular subject. In this study, we will discuss the case study approach and why it is considered a valuable research method based on a literature review. The case study approach allows researchers to investigate real-world phenomena in their natural settings, providing rich and detailed data. By examining a specific case, researchers gain a deep understanding of the context, processes, and interactions that influence the phenomenon under investigation (Yin, 2018).

In the context of the current thesis a number of well-known companies have been chosen, such as Toyota and Wal-Mart which operate a global supply chain, while their size allows identifying publications related with the examined case. Moreover,

the examined companies are well known as having some of the best practices in terms of supply chain and inventory management, such as the Kanban approach of Toyota, so their study makes it quite interesting.

1.4 Discuss the findings of the work

This dissertation has come up with some findings. Overall, it is important to be well prepared for a future crisis and disruptions which will derive from the crisis. What is important is to utilize the key innovations and expertise related with the supply chain and inventory management. Furthermore, it should be noted, that each company has treated the disruptions in a different manner, which is expected since each company has different characteristics and therefore different strategies. An interesting point is that the companies are able to change fast and adapt into new situations as developed from the disruptions, since they have gain the necessary knowledge, experience and skills so to deal with crises.

1.5 Main limitations of the dissertation

This is a dissertation which has relied in the research of selected companies which are making the examined cases. Although, it provides a glance on how the companies had dealt with the disruptions caused by the crises, surely the most effective way would be the use of primary data. Since, it is not easy or possible to retrieve such data the dissertation has been reduced in a case study analysis using desk research so to develop its conclusions.

1.6 Outline of the dissertation

The dissertation begins with the key issues examined as presented on its introduction. The next chapter examines the key definitions and issues of supply chain strategies and inventory management while it is also making an attempt to provide a literature review on this examined issue. The third chapter examines the cases of the selected companies. The aim is to understand how each company has deal with those issues. The case study analysis leads in the final stage of the dissertation which is the conclusions and a set of recommendations.

2. Definition of the key issues and literature review

2.1 The evolution of supply chain management

The term Supply Chain is not just a variable or a business theory, but on most companies it constitutes an integrated part of their strategy or even a strategic business unit. In order to provide a definition of Supply Chain Management, often referred as SCM, the definition of Chopra & Meindl (2016:1) which is that *“a supply chain consists of all parties involved, directly or indirectly, in fulfilling a customer request. The supply chain includes not only the manufacturer and suppliers, but also transporters, warehouses, retailers, and even customers themselves. Within each organization, such as a manufacturer, the supply chain includes all functions involved in receiving and filling a customer request. These functions include, but are not limited to, new product development, marketing, operations, distribution, finance, and customer service”*

At its core, SCM aims to optimize the efficiency and effectiveness of the supply chain by synchronizing and streamlining various components, such as procurement, manufacturing, logistics, inventory management, and distribution (Simchi-Levi et al, 1998). It seeks to create a seamless flow of materials, information, and financial transactions throughout the entire supply chain, thereby ensuring that the right products are available at the right place, time, and cost.

The necessity of supply chain management arises from the increasingly complex and global nature of modern business operations. Globalization has expanded markets and created opportunities for businesses to source materials and sell products across borders, but it has also introduced a host of challenges. Supply chains have become longer and more intricate, involving multiple suppliers, intermediaries, and geographically dispersed production and distribution centers. This complexity brings forth various risks and uncertainties, including demand fluctuations, supplier disruptions, transportation bottlenecks, and regulatory compliance issues.

Effective supply chain management helps organizations address these challenges and gain a competitive advantage. By optimizing the flow of goods and information, SCM enables companies to reduce costs, enhance operational efficiency, and improve customer satisfaction (Chopra, 2021). It enables organizations to achieve

greater visibility and transparency across the supply chain, enabling better decision-making and risk mitigation. SCM also fosters collaboration and coordination among supply chain partners, facilitating the exchange of information, knowledge, and resources for mutual benefit.

Supply chain management is an influential topic, both in academia and in industry. Though the term "supply chain management" emerged in the late 1980s, the concept of a system encompassing all inter- and intra-organizational dynamics had already been established since the late 1950s. Pioneering work by Forrester (1961) contributed to the development of a complete company model that accounted for the flow of materials, information, manpower, capital, equipment, and money. During the 1990s, supply chain management evolved into a concept encompassing strategic, tactical, operational, and managerial issues. As such, suppliers, manufacturers, and retailers integrated supply chain management into their organizational perspectives to improve overall performance and efficiency.

Industry associations and professional bodies also play a significant role in shaping the field of supply chain management. The Council of Supply Chain Management Professionals (CSCMP) and the Institute for Supply Management (ISM) are two prominent organizations that provide valuable resources, research, and networking opportunities for supply chain professionals.

In conclusion, supply chain management is a vital discipline that enables organizations to effectively manage the complex flow of goods, services, and information across the global marketplace (Chopra, 2021). By optimizing the supply chain, organizations can achieve cost savings, operational efficiencies, and improved customer satisfaction. The field of supply chain management continues to evolve, driven by ongoing research, industry best practices, and the need to adapt to the ever-changing business landscape.

2.2. The key operations of supply chain management

Supply chain management (SCM) involves a series of interconnected operations aimed at ensuring the efficient and effective flow of goods, services, and information from the initial sourcing of raw materials to the final delivery of products to end customers (Simchi-Levi et al., 1998). These key operations play a vital role in

optimizing the supply chain and achieving operational excellence. Let's explore some of the key operations in supply chain management:

1. **Demand Planning and Forecasting:** Demand planning and forecasting involve analyzing historical data, market trends, customer preferences, and other relevant factors to predict future demand for products. This operation enables organizations to align their production, procurement, and inventory management processes with anticipated demand, minimizing stock outs or excess inventory (Chopra, 2021). Accurate demand planning helps in achieving better customer satisfaction, optimizing inventory levels, and reducing costs associated with under stocking or overstocking.

2. **Strategic Sourcing:** Strategic sourcing involves identifying and selecting suppliers who can provide the required goods or services at the right price, quality, and delivery time (Monczka et al., 2015). It involves activities such as supplier evaluation, negotiation, and contract management. Effective strategic sourcing helps organizations build strong supplier relationships, obtain competitive pricing, ensure product quality, and mitigate supply risks.

3. **Procurement and Purchasing:** Procurement and purchasing operations involve the acquisition of materials, goods, and services from approved suppliers (Monczka et al., 2015). This includes activities such as requisitioning, ordering, receiving, and payment processing. Efficient procurement and purchasing processes help organizations optimize costs, ensure timely availability of materials, and maintain good relationships with suppliers.

4. **Inventory Management:** Inventory management is crucial for balancing supply and demand. It involves tracking and controlling the levels of raw materials, work-in-progress, and finished goods within the supply chain (Chopra, 2021). Effective inventory management ensures that adequate stock is available to meet customer demand while minimizing carrying costs and the risk of obsolescence. Techniques such as just-in-time (JIT) inventory and economic order quantity (EOQ) models help optimize inventory levels (for more details see chapter 2.6 and 2.7).

5. **Production and Operations Management:** Production and operations management involves coordinating the manufacturing or service

delivery processes to meet customer demand efficiently (Jacobs and Chase, 2018). This includes capacity planning, scheduling, quality control, and process improvement. Efficient production and operations management enhance productivity, reduce lead times, and improve product quality, ultimately leading to higher customer satisfaction.

6. Warehousing and Distribution: Warehousing and distribution operations are responsible for the storage, handling, and transportation of goods within the supply chain (Jacobs and Chase, 2018). Efficient warehouse management ensures the proper storage and retrieval of inventory, minimizing damage and improving order fulfillment speed. Effective distribution management optimizes transportation routes, reduces delivery times, and enhances customer service levels.

7. Logistics and Transportation: Logistics and transportation operations involve the movement of goods and materials from suppliers to manufacturers, distributors, and customers (Bowersox et al., 2012). This includes activities such as transportation planning, carrier selection, route optimization, and tracking. Efficient logistics management helps organizations reduce transportation costs, improve delivery speed, and enhance overall supply chain responsiveness.

8. Information Technology and Systems: Information technology (IT) and systems play a crucial role in supply chain management by facilitating the flow of information, data analysis, and decision-making (Monczka et al., 2015). Technologies such as enterprise resource planning (ERP), warehouse management systems (WMS), and transportation management systems (TMS) provide visibility, integration, and automation across the supply chain. IT systems enable organizations to track inventory, monitor production, collaborate with suppliers, and respond quickly to changing customer demands.

These key operations in supply chain management are interconnected and rely on effective coordination and collaboration between various stakeholders (Simchi-Levi et al., 1998). By optimizing these operations, organizations can achieve better supply chain performance, enhance customer satisfaction, reduce costs, and gain a competitive advantage in the marketplace

2.3 Supply Chain Quality Management

It is understood that Quality management is a critical aspect of supply chain management (SCM) that focuses on ensuring products and services meet or exceed customer expectations (Rafele, 2004). It involves a series of activities aimed at planning, controlling, and improving quality throughout the supply chain (Mentzer et al., 2001). By implementing effective quality management practices, organizations can enhance customer satisfaction, reduce costs, mitigate risks, and gain a competitive advantage. The key elements of quality management in supply chain management are:

1. **Quality Planning:** Quality planning involves defining quality objectives, establishing quality standards, and determining the processes and resources required to achieve them. It starts with understanding customer requirements and translating them into measurable quality metrics. This includes factors such as performance, reliability, durability, and safety (Mentzer et al., 2001). The International Organization for Standardization (ISO) provides guidelines and standards, such as ISO 9001, for quality management systems that organizations can follow to ensure consistent quality planning and implementation (ISO, n.d.).

2. **Supplier Quality Management:** Supplier quality management focuses on ensuring that the materials and components provided by suppliers meet the required quality standards. It involves evaluating and selecting suppliers based on their quality capabilities, conducting supplier audits, and establishing clear quality requirements in supplier contracts (Christopher, 2016). Effective supplier quality management helps organizations mitigate the risk of receiving substandard inputs, reduce defects, and maintain consistency in product quality (Mentzer et al., 2001).

3. **Incoming Quality Control:** Incoming quality control is the process of inspecting and verifying the quality of raw materials or components received from suppliers before they enter the production process. It involves conducting visual inspections, measurements, and tests to ensure compliance with specified quality requirements (Christopher, 2016). Statistical quality control tools, such as sampling techniques and control charts, can be used to monitor and control incoming quality (Montgomery, 2017). The goal is to identify and address quality issues early on to prevent defects from entering the supply chain.

4. **Process Quality Control:** Process quality control focuses on monitoring and controlling the quality of production processes. It involves collecting data, conducting inspections, and analyzing process performance to identify and address any deviations or variations from the desired quality standards (Mentzer et al., 2001). Statistical process control techniques, such as control charts and capability analysis, help organizations monitor process stability and capability over time (Montgomery, 2017). By maintaining process control, organizations can prevent defects, reduce waste, and improve overall process efficiency and quality.

5. **Total Quality Management (TQM):** Total Quality Management (TQM) is an overarching philosophy that promotes a customer-centric approach to quality. It involves involving all employees in the continuous improvement of processes and products (Oakland, 2014). TQM emphasizes the importance of employee empowerment, teamwork, and data-driven decision-making to achieve customer satisfaction and operational excellence (Mentzer et al., 2001). Key TQM principles include customer focus, continuous improvement, employee involvement, and a culture of quality (Oakland, 2014).

6. **Continuous Improvement and Six Sigma:** Continuous improvement methodologies, such as Six Sigma, play a significant role in quality management. Six Sigma aims to minimize defects and variation in processes by using statistical analysis and structured problem-solving approaches (Pyzdek & Keller, 2014). It involves the DMAIC (Define, Measure, Analyze, Improve, Control) framework to identify and solve quality-related issues. By focusing on data-driven decision-making and process improvement, organizations can enhance quality, reduce costs, and improve customer satisfaction (Mentzer et al., 2001).

7. **Performance Measurement and Metrics:** Performance measurement and metrics are crucial in quality management as they provide organizations with objective data to evaluate and monitor quality performance. Key performance indicators (KPIs) such as defect rates, customer complaints, and on-time delivery can help organizations assess their quality performance and identify areas for improvement (Christopher, 2016). The balanced scorecard framework is often used to measure and manage performance across multiple dimensions, including quality (Kaplan & Norton, 1996).

In conclusion, quality management is a critical aspect of supply chain management that focuses on ensuring products and services meet or exceed customer expectations. By implementing effective quality planning, supplier quality management, incoming and process quality control, TQM, continuous improvement, and performance measurement practices, organizations can enhance customer satisfaction, reduce costs, and gain a competitive advantage in the marketplace.

The concept of quality management and efficiency on supply chain management has been examined from various authors based on empirical evidence (Goetsch& Davis, 2016). the certification of the applied quality management systems, the evaluation of suppliers, the control of the supplier's facilities (included in the requirements of ISO 9001), as well as the training of the supplier by the client company, with the purpose of familiarization with its requirements, which is an important parameter of the Total Quality Management philosophy, are key axes for quality management in the supply chain.

It is important to note that the quality level of the product delivered to the end customer is the result of the quality management practices of each partner in a supply chain, and therefore each partner plays an important role in the production and distribution process. There is evidence that improving the quality of all operations at all stages of the supply chain results in reduced costs, improved resource utilization and overall improved system performance (Beamon&Ware, 1998). They developed a conceptual model for assessing, improving and controlling the total quality of supply chain systems. There are only a few empirical studies that have investigated the effect of quality practices on logistics performance, from a supply chain management perspective.

Through research into supply chains in the US electronic components industry, Forker et al. (1997) demonstrated that quality management practices are related to organizational performance and suggested that companies should continue to promote quality management practices. Anderson et al. (1998) developed a causal model based on Malcolm's criteria Baldrige Award to investigate the impact of quality practices on supply chain performance. Their results showed that there is a significant relationship between the level of quality practices and the results of logistics companies, especially in the context of operational performance of logistics and customer service.

The study by Choi & Rungtusanatham (1999) aimed to compare the quality management practices of manufacturing companies at different levels of the supply chain and in different industries. The study found no statistical difference in the level of quality management practices across the supply chain. However, the results revealed that the automotive industry was more active in strategic quality planning than the electronics industry.

Romano & Vinelli's (2001) study of the apparel industry found that quality management practices and continuous monitoring of quality parameters in supply chain activities can improve a firm's ability to meet customer expectations. A comprehensive survey of the status of quality practices in the supply chain was conducted by Read & Miller (1991), who investigated the implementation of quality practices in the logistics operations of North American and European companies in order to gain insight into the to what extent quality initiatives were implemented, how such programs were structured and what their main results were. The study found that lack of pressure to initiate programs and lack of management support were the main barriers to implementing a logistics quality program. One of these critical findings was that logistics quality programs are not driven by overall business success factors.

Millen & Maggard (1997) found that the major barriers to implementing quality systems were the lack of human and financial resources. In addition, they found a greater degree of application of quality practices and use of tools in different areas of logistics operations. Sohal et al. (1999) investigated the adoption of quality practices in the logistics activities of Australian companies. The results showed that on-time delivery and total customer support are the most important needs and the two most important elements determine quality in the supply chain. The study also found that lack of administrative support and lack of financial resources were the main barriers to implementing quality systems in logistics operations.

2.4 Strategies on supply chain management

Supply chain management (SCM) plays a critical role in the success and competitiveness of organizations operating in today's globalized and interconnected business environment. Effective supply chain strategies are essential for optimizing operations, reducing costs, improving customer satisfaction, and achieving a sustainable competitive advantage. This essay will discuss various strategies

employed in supply chain management, drawing on in-text references to support the analysis.

One key strategy in supply chain management is demand forecasting. Accurate forecasting allows organizations to anticipate customer demand, align their production and inventory levels, and optimize their supply chain operations (Mentzer et al., 2008). Effective demand forecasting techniques, such as statistical models, collaborative forecasting with customers and suppliers, and the use of advanced analytics and artificial intelligence, help organizations make more informed decisions and reduce the risk of stock outs or excessive inventory (Babiloniet al., 2012; Ren et al, 2020).

Inventory management is another critical strategy in supply chain management. Effective inventory management aims to strike the right balance between minimizing inventory holding costs and ensuring adequate product availability. Techniques such as just-in-time (JIT) inventory management, vendor-managed inventory (VMI), and collaborative planning, forecasting, and replenishment (CPFR) enable organizations to reduce inventory carrying costs while maintaining efficient supply chain operations (Chopra, 2021).

Supply chain integration is a strategy that emphasizes collaboration and information sharing among supply chain partners. Integration allows organizations to streamline processes, improve visibility, and enhance coordination throughout the supply chain (Chopra, 2021). Collaborative tools and technologies, such as electronic data interchange (EDI), radio frequency identification (RFID), and cloud-based platforms, enable real-time sharing of information, enabling organizations to respond quickly to changing market conditions (Ivanov et al., 2014). Risk management is another crucial aspect of supply chain strategy. Organizations need to proactively identify, assess, and mitigate risks that could disrupt their supply chain operations. Risk management strategies include diversifying suppliers and sourcing locations, developing contingency plans, and implementing robust supply chain resilience programs (Yang & Hsieh, 2021; Wagner et al., 2021). The use of advanced analytics and simulation models helps organizations evaluate the potential impact of disruptions and make informed decisions to minimize risks (Bag et al., 2021). In recent years,

sustainability has gained significant importance in supply chain strategy. Organizations are increasingly adopting environmentally friendly practices and incorporating sustainability considerations into their supply chain decision-making processes. Strategies such as green procurement, reverse logistics, and carbon footprint reduction initiatives help organizations achieve their sustainability goals while also improving operational efficiency and reducing costs.

Another critical strategy in supply chain management is supplier relationship management. Strong and collaborative relationships with suppliers are crucial for ensuring a reliable supply of quality materials, timely deliveries, and cost-effective pricing. Organizations often engage in strategic partnerships, supplier development programs, and performance measurement systems to foster long-term relationships with their suppliers (Cousins et al., 2008; Monczka et al., 2015). Such relationships enable organizations to benefit from supplier expertise, leverage economies of scale, and jointly drive innovation and continuous improvement (Knight et al., 2022). Furthermore, technology adoption and digitalization have become integral to modern supply chain strategies. Organizations are leveraging technologies such as big data analytics, artificial intelligence, internet of things (IoT), and block chain to enhance visibility, automate processes, optimize decision-making, and enable real-time monitoring of supply chain operations. These digital technologies enable organizations to achieve higher efficiency, agility, and responsiveness in their supply chain management (Dolgui, Ivanov, & Sokolov, 2018).

In conclusion, effective supply chain management requires the implementation of various strategies to optimize operations, improve customer satisfaction, and gain a competitive advantage. Demand forecasting, inventory management, supply chain integration, risk management, sustainability, supplier relationship management, and technology adoption are critical elements of successful supply chain strategies. By employing these strategies, organizations can enhance their operational efficiency, reduce costs, mitigate risks, and adapt to the evolving business landscape.

2.5 Contemporary issues concerning the operation of modern supply chain management

Modern supply chain management (SCM) and inventory management practices have evolved significantly in response to the complexities of the global

business environment. With the advent of technological advancements, changing customer expectations, and increasing market volatility, companies face various challenges in managing their supply chains efficiently. This discussion explores the key aspects of modern supply chain management and inventory management, focusing on the hot issues companies are dealing with and the strategies they employ to address them.

Demand Volatility and Forecasting Accuracy

One of the prominent issues in modern supply chain management is coping with demand volatility (Gerlach et al., 2021). Fluctuating customer demands, influenced by factors such as seasonality, changing market trends, and unforeseen events, pose challenges for companies in maintaining optimal inventory levels. To address this issue, companies are leveraging advanced forecasting techniques, such as predictive analytics and machine learning algorithms, to improve demand forecasting accuracy (Sharma et al., 2022). By analyzing historical data, market trends, and customer behavior patterns, companies can enhance their ability to predict demand fluctuations and adjust their inventory levels accordingly.

Operations and Order Fulfillment

The rise of e-commerce and the increasing demand for seamless shopping experiences have led to the emergence of omnichannel operations in supply chain management. Companies are now expected to fulfill orders from multiple channels, including brick-and-mortar stores, online platforms, and mobile applications. This presents challenges in managing inventory across various channels, ensuring real-time visibility, and coordinating order fulfillment efficiently. To address this issue, companies are adopting technologies such as warehouse management systems, order management systems, and transportation management systems to integrate their operations, improve inventory visibility, and streamline order fulfillment processes (Abouelrous, Gabor, & Zhang, 2022).

Supplier Collaboration and Risk Management

Supply chain disruptions, such as natural disasters, geopolitical conflicts, and economic uncertainties, have highlighted the importance of supplier collaboration and

risk management in modern supply chain management. Companies are increasingly recognizing the need to build resilient supply chains by fostering collaborative relationships with suppliers, sharing information, and jointly addressing risks (Wieland & Wallenburg, 2020). This includes practices such as dual sourcing, supplier diversification, and supplier performance monitoring. Additionally, companies are investing in technologies that facilitate real-time communication and information sharing with suppliers, enabling proactive risk identification and mitigation (Knight et al, 2022).

Sustainable and Responsible Supply Chain Practices

In recent years, sustainability and corporate social responsibility have become critical considerations in supply chain management. Customers, investors, and regulators are demanding companies to adopt sustainable practices, reduce environmental impact, and ensure ethical sourcing (Seuring & Müller, 2008). Modern supply chain management involves incorporating sustainability into various aspects, such as supplier selection based on environmental and social criteria, implementing green logistics practices to reduce carbon footprint, and ensuring responsible waste management (Genovese et al., 2017). Companies are also focusing on traceability and transparency, using block chain technology and other digital solutions to ensure responsible sourcing and fair labor practices (Anupama Kumar & Anusha, 2023).

Inventory Optimization and Just-in-Time (JIT) Practices

Efficient inventory management continues to be a critical aspect of supply chain management. Companies are striving to optimize inventory levels to balance the costs associated with carrying inventory and the risks of stock outs (Tayur et al., 2012). Modern inventory management practices involve utilizing advanced analytics and optimization techniques to determine optimal order quantities, reorder points, and safety stock levels (Torabi et al., 2015). Moreover, companies are reevaluating their just-in-time (JIT) practices by considering factors such as supply chain disruptions and lead time variability.

AI Integration in Supply Chain Management:

The integration of artificial intelligence (AI) technologies in supply chain management has revolutionized the way companies handle various aspects of their operations. AI enables companies to enhance demand forecasting accuracy by analyzing vast amounts of data, including historical sales records, market trends, and external factors (Sharma et al., 2022). Machine learning algorithms can identify patterns, anomalies, and customer preferences, enabling companies to optimize inventory levels, plan production schedules, and improve supply chain responsiveness. Furthermore, AI-powered predictive analytics can help companies identify potential bottlenecks, mitigate risks, and optimize logistics and transportation routes (Sharma et al., 2022). By leveraging AI, companies can make data-driven decisions, improve operational efficiency, and enhance customer satisfaction.

Blockchain Technology in Supply Chain Management:

Blockchain technology has gained traction in modern supply chain management as a means to improve transparency, traceability, and security in global supply chains (Iansiti & Lakhani, 2017). By creating a decentralized and immutable ledger, block chain enables companies to securely record and share information across multiple parties, reducing the risk of fraud, counterfeiting, and data manipulation. Smart contracts, implemented on block chain platforms, enable automated execution and verification of supply chain agreements, reducing administrative costs and ensuring compliance (Korpela et al., 2017). Blockchain also enables enhanced traceability of products, ensuring responsible sourcing, ethical production, and adherence to sustainability practices (Kern et al., 2020). Companies are exploring the potential of block chain to enhance supply chain visibility, reduce transaction costs, and foster trust among stakeholders (Zekhnin et al, 2020).

Impact of Political Changes on Supply Chain Management:

Political changes, such as shifts in government policies, trade agreements, and geopolitical conflicts, significantly impact global supply chains. These changes introduce uncertainties, trade barriers, and regulatory requirements that companies must navigate effectively. Companies need to adapt their supply chain strategies and inventory management practices to mitigate the impact of political changes. For example, changes in trade policies or tariffs may lead companies to diversify their

supplier base or relocate manufacturing facilities to optimize costs and minimize risks (Kliem, 2021). Geopolitical conflicts or political instability may disrupt transportation routes, necessitating companies to identify alternative logistics options or secure supply chain resilience through risk mitigation strategies. Furthermore, changes in political climate may influence consumer preferences, regulatory compliance, and sustainability practices, requiring companies to align their supply chains accordingly (Sodhi & Tang, 2020).

Strategies for Adapting to Political Changes:

To navigate the impact of political changes on supply chain management, companies employ several strategies. Firstly, companies monitor and analyze political developments, trade policies, and regulatory changes to anticipate potential disruptions and identify areas of risk. This proactive approach allows companies to develop contingency plans and engage in scenario-based supply chain modeling to assess the impact of different political outcomes. Secondly, companies establish close relationships with government agencies, industry associations, and local partners to gain insights into the political landscape and collaborate on risk management strategies (Mangan et al., 2021). Thirdly, companies leverage digital technologies, such as AI and block chain, to enhance supply chain visibility, agility, and traceability, enabling them to respond swiftly to political changes (Dutta et al., 2020). These technologies facilitate real-time information exchange, enable risk assessment, and support compliance with changing regulations. Lastly, companies engage in collaborative initiatives and partnerships to build resilient supply chains, diversify sourcing options, and explore regionalization strategies in response to political uncertainties (Wieland & Wallenburg, 2020).

Overall, modern supply chain management and inventory management practices are continually evolving to address the challenges posed by technological advancements, political changes, and customer expectations. The integration of AI and block chain technologies offers company's opportunities to enhance demand forecasting accuracy, improve transparency, traceability, and reduce costs. Political changes introduce uncertainties, trade barriers, and regulatory requirements, necessitating companies to adapt their strategies, monitor developments, leverage

digital technologies, and engage in collaborative initiatives to build resilient and agile supply chains. By embracing these advancements and effectively responding to political changes, companies can enhance their supply chain performance, mitigate risks, and gain a competitive edge in the global marketplace. The integration of AI and block chain technologies offers companies opportunities to enhance demand forecasting accuracy, improve transparency, traceability, and reduce costs. Political changes introduce uncertainties, trade barriers, and regulatory requirements, necessitating companies to adapt their strategies, monitor developments, leverage digital technologies, and engage in collaborative initiatives to build resilient and agile supply chains. By embracing these advancements and effectively responding to political changes, companies can enhance their supply chain performance, mitigate risks, and gain a competitive edge in the global marketplace.

2.6 Definition of inventory management

Inventory management plays a crucial role in ensuring the smooth operation of businesses across various industries. It involves the control and tracking of inventory levels, stock replenishment, and the optimization of supply chain processes. By effectively managing inventory, organizations can minimize costs, enhance customer satisfaction, and improve overall operational efficiency. This essay aims to provide a comprehensive definition of inventory management, drawing upon relevant literature and industry sources. Inventory management refers to the process of overseeing and controlling the flow of goods and materials within an organization. It encompasses activities such as forecasting demand, determining optimal inventory levels, managing stock outs, and minimizing excess inventory. The primary objective of inventory management is to strike a balance between maintaining sufficient inventory to meet customer demand and minimizing holding costs, obsolescence, and other associated expenses (Fawcett, Ellram, & Ogden, 2007).

Effective inventory management is critical for several reasons. First, it ensures that the right products are available at the right time, preventing stock outs and associated revenue losses. Second, it minimizes excess inventory, reducing carrying costs, and preserving capital for other business investments. Third, it enables organizations to optimize production schedules, enhance order fulfillment capabilities, and streamline supply chain operations (Hugos, 2018). Overall, proper inventory

management contributes to improved customer satisfaction, increased profitability, and a competitive advantage in the marketplace.

Several key components are integral to the successful implementation of inventory management practices. These include demand forecasting, inventory control, order management, and technology-enabled systems. Demand forecasting is the process of estimating future customer demand based on historical data, market trends, and other relevant factors. Accurate demand forecasting allows organizations to optimize inventory levels, avoid stock outs, and minimize excess inventory (Simchi-Levi et al., 1998).

Inventory control involves monitoring and managing inventory levels to ensure optimal stock availability while minimizing costs. This includes determining reorder points, safety stock levels, and economic order quantities (EOQ). Implementing effective inventory control systems enables organizations to balance supply and demand, reduce carrying costs, and enhance responsiveness to customer needs (Heizer et al., 2017). Order management encompasses the entire order fulfillment process, from receiving customer orders to delivery. Efficient order management systems enable organizations to track orders, manage backorders, and coordinate inventory replenishment activities seamlessly (Chopra, 2021). It plays a vital role in maintaining customer satisfaction and ensuring on-time deliveries.

Technology-enabled systems, such as inventory management software and advanced analytics, have revolutionized inventory management practices. These systems provide real-time visibility into inventory levels, automate routine tasks, facilitate data-driven decision-making, and enable organizations to achieve greater operational efficiency and agility (Dolgui et al., 2018).

Overall, inventory management is a critical discipline that enables organizations to optimize their supply chain operations, balance inventory levels, and meet customer demands effectively. By implementing robust inventory management practices, businesses can minimize stock outs, reduce excess inventory, enhance customer satisfaction, and improve their bottom line. Through demand forecasting, inventory control, order management, and technology-enabled systems, organizations can achieve operational excellence and gain a competitive advantage in the marketplace.

2.7 Strategies of inventory management

Inventory management strategies are crucial for organizations to optimize their supply chain operations, minimize costs, and improve customer satisfaction. These strategies encompass various approaches to inventory control, demand forecasting, supplier management, and technology adoption. This essay aims to explore key strategies of inventory management, supported by relevant literature and industry sources, to highlight their significance in enhancing operational efficiency and meeting customer demands.

Some of the techniques and strategies that a company may use are the following/

Just-in-Time (JIT) Strategy:

The Just-in-Time strategy focuses on minimizing inventory levels by receiving goods and materials from suppliers exactly when needed in the production process. This approach enables organizations to reduce holding costs, minimize stock outs, and enhance cash flow (Shim & Siegel, 1999). JIT relies on efficient supply chain coordination, reliable forecasting, and strong supplier relationships to ensure timely delivery of materials. By implementing JIT, organizations can achieve lean inventory management and improve overall operational efficiency.

Economic Order Quantity (EOQ) Strategy:

The Economic Order Quantity strategy aims to determine the optimal order quantity that minimizes the total costs associated with inventory. It takes into account factors such as holding costs, ordering costs, and annual demand (Heizer et al., 2017). By calculating the EOQ, organizations can strike a balance between inventory carrying costs and ordering costs, ensuring optimal inventory levels that meet customer demand while minimizing expenses.

ABC Analysis:

ABC Analysis is a strategy that categorizes inventory items into different groups based on their value and usage frequency. The items are classified as A, B, or C, representing high-value items with low usage, moderate-value items with moderate usage, and low-value items with high usage, respectively (Chopra, 2021). By applying ABC analysis, organizations can prioritize their inventory management efforts,

allocating more attention to high-value items to prevent stock outs and reducing inventory levels for low-value items to minimize holding costs.

Safety Stock Strategy:

Safety stock is additional inventory maintained as a buffer to mitigate the risk of stock outs due to unexpected demand fluctuations or supply disruptions. This strategy ensures that organizations can fulfill customer orders even in uncertain circumstances (Fawcett et al., 2007). The determination of safety stock levels involves considering factors such as lead time, demand variability, and service level targets. By maintaining appropriate safety stock levels, organizations can enhance customer satisfaction, prevent revenue losses, and maintain operational resilience.

Technology Adoption:

Technological advancements have revolutionized inventory management practices. Organizations can leverage inventory management software, advanced analytics, and automation tools to enhance visibility, streamline processes, and improve decision-making (Dolgui et al., 2018). By adopting technologies like barcode scanning, RFID tracking, and cloud-based inventory systems, organizations can achieve real-time inventory monitoring, accurate demand forecasting, and seamless coordination with suppliers, leading to improved efficiency and reduced errors.

Collaborative Planning, Forecasting, and Replenishment (CPFR):

CPFR is a strategy that promotes collaboration and information sharing among supply chain partners to improve demand forecasting accuracy and inventory planning (Simchi-Levi et al., 1998). By working closely with suppliers, organizations can gather real-time sales data, market insights, and demand forecasts, enabling them to synchronize their inventory levels with customer demand more effectively. CPFR facilitates proactive decision-making, reduces lead times, minimizes stock outs, and enhances overall supply chain performance.

Overall, effective inventory management strategies are essential for organizations to optimize their supply chain operations, meet customer demands, and improve profitability. By implementing strategies such as JIT, EOQ, ABC analysis, safety stock, technology adoption, and CPFR, organizations can achieve efficient inventory control, accurate demand forecasting, and seamless supply chain

coordination. These strategies enable businesses to minimize holding costs, prevent stock outs, enhance customer satisfaction, and gain a competitive advantage in the marketplace.

2.8 The disruptions on the global supply chain due of the recent crises

Supply chain is particularly important during turbulent times for several reasons. Just to name overall some of those reasons for having an effective SCM during turbulent times, those are the following (Gligor et al, 2019; Lambert et al, 2018):

1. **Maintaining Business Continuity:** Turbulent times, such as natural disasters, pandemics, economic crises, or geopolitical conflicts, can disrupt normal operations and create challenges for businesses. An effective supply chain helps maintain business continuity by ensuring the flow of goods, materials, and services despite disruptions. It enables companies to meet customer demand, fulfill orders, and minimize the impact of disruptions on their operations.
2. **Managing Demand and Supply Variability:** Turbulent times often lead to fluctuations in demand and supply. For example, during a crisis, demand for certain products may increase sharply (e.g., medical supplies during a pandemic), while supply may be constrained due to production disruptions or transportation challenges. A robust supply chain helps companies anticipate and respond to these variations by optimizing inventory levels, adjusting production capacity, and identifying alternative sourcing options to meet customer needs.
3. **Mitigating Risks:** Turbulent times are characterized by increased risks and uncertainties. Supply chain management plays a crucial role in identifying and mitigating risks throughout the value chain. This includes assessing supplier risks, diversifying suppliers and sourcing locations, implementing contingency plans, and establishing robust communication channels to respond swiftly to disruptions. A resilient supply chain can help companies minimize the impact of risks and maintain operations despite challenging circumstances.
4. **Ensuring Cost Efficiency:** Turbulent times often bring cost pressures, such as rising input costs, currency fluctuations, or increased transportation expenses. A well-managed supply chain focuses on cost optimization by streamlining

processes, reducing waste, optimizing inventory, and negotiating favorable terms with suppliers. By improving cost efficiency, companies can maintain profitability even in turbulent times when margins may be under pressure.

5. **Strengthening Relationships:** Turbulent times can strain relationships with suppliers, customers, and other partners in the supply chain. However, effective supply chain management emphasizes collaboration and communication. By actively engaging with stakeholders, sharing information, and working together to overcome challenges, companies can strengthen relationships and build trust. These strong relationships can be invaluable during turbulent times, enabling companies to access support, resources, and expertise when needed.

In summary, a robust and resilient supply chain is critical during turbulent times to ensure business continuity, manage demand and supply variability, mitigate risks, maintain cost efficiency, and strengthen relationships. It helps companies navigate uncertainties, adapt to changing conditions, and position themselves for long-term success even in challenging environments.

Over the course of times several crises have brought disruptions. Currently, most of the major disruptions in the global supply chain are caused by the COVID-19 pandemic, the war in Ukraine, and other crises over the past years have had profound impacts on the world economy. These events have highlighted the vulnerabilities and interconnectedness of the global supply chain, leading to widespread disruptions in trade, production, and distribution networks. This essay will discuss the various disruptions and their consequences, drawing on references to support the analysis.

The COVID-19 pandemic, which originated in late 2019, has been the most significant disruptor of the global supply chain in recent years. Lockdown measures, travel restrictions, and social distancing protocols implemented by governments worldwide resulted in the closure of factories, reduced transportation capacity, and labor shortages. These disruptions severely affected manufacturing and logistics, leading to delays and shortages of essential goods, including medical supplies, personal protective equipment (PPE), and consumer products (Sombultawee et al., 2022). Supply chains heavily reliant on China faced the first and most substantial shock, given its role as the world's manufacturing hub (Keogh-Brown et al., 2020).

The pandemic exposed the risks of concentrated production and overreliance on a single country or region for critical supplies, while it brought the need for more networks and partnerships throughout the supply chain (Shih, 2020).

The war in Ukraine, which began in 2014 with Russia's illegal annexation of Crimea, has also contributed to disruptions in the global supply chain. The conflict in Eastern Ukraine, coupled with the imposition of sanctions by Western countries, led to trade disruptions between Russia and its major trading partners. Industries such as agriculture, mining, and manufacturing suffered significant setbacks due to the conflict and restricted access to key markets (Darvas & Martins, 2022). Companies relying on Ukrainian inputs or markets faced challenges in sourcing raw materials or distributing their products, further straining the global supply chain. Moreover, the past years have witnessed other crises and natural disasters that have further disrupted the global supply chain. For example, the eruption of the Eyjafjallajökull volcano in Iceland in 2010 led to the closure of airspace over Europe for several days, causing significant disruptions to air cargo and passenger travel (Mazzocchi, Hansstein, & Ragona, 2010). The earthquake and tsunami that struck Japan in 2011 disrupted the country's industrial production, affecting supply chains globally, particularly in the automotive and electronics sectors (Cavusgil et al., 2012).

More analytically, the Covid-19 pandemic and the war in Ukraine have had significant disruptive effects on global supply chains, forcing companies to reassess and adapt their supply chain strategies and inventory management practices. In order to better understanding the analysis is as follow:

Supply Chain Strategies during Covid-19:

During the Covid-19 pandemic, companies faced unprecedented challenges such as lockdowns, travel restrictions, and disruptions in the availability of raw materials and transportation networks (Rinaldi & Bottani, 2023). Many companies adopted several strategies to mitigate the impact of these disruptions. One common strategy was to diversify their supplier base by identifying alternative suppliers in different regions to ensure continuity of supply (Mangan et al., 2021). Companies also focused on building more resilient supply chains by increasing inventory levels and implementing safety stock practices to buffer against uncertainties (Gerlach et al., 2021). Moreover, digitalization played a crucial role in enabling companies to

transition to remote work, virtual collaboration, and online sales to maintain business operations (Meyer et al, 2021). These strategies helped companies maintain supply chain stability and meet customer demands during the pandemic.

Inventory Management during Covid-19:

Inventory management played a critical role in responding to the disruptions caused by Covid-19. Many companies had to address sudden shifts in demand patterns due to panic buying, changes in consumer behavior, and disruptions in manufacturing operations (Mangan et al., 2021). Companies implemented several inventory management practices to adapt to these changes. For instance, they relied on demand forecasting models that incorporated real-time data and market insights to adjust production and inventory levels (Gerlach et al., 2021). Just-in-time (JIT) inventory practices were reevaluated, with companies increasing safety stock levels to mitigate supply chain uncertainties. Furthermore, companies utilized advanced technologies such as artificial intelligence (AI) and machine learning (ML) to improve inventory optimization and demand forecasting accuracy (Dolgui et al., 2018). These inventory management strategies helped companies optimize their operations, reduce stock outs, and meet customer needs during the pandemic.

Supply Chain Strategies during the war in Ukraine:

The war in Ukraine has also caused significant disruptions to global supply chains, particularly for companies sourcing materials or relying on transportation routes in the affected regions. Companies responded to these disruptions by implementing various strategies. One common strategy was to diversify sourcing locations and establish backup suppliers in unaffected regions (Rejeb et al, 2021). During the war in Ukraine companies collaborated closely with logistics partners to identify alternative transportation routes and modes. Additionally, some companies chose to increase their buffer stock levels to mitigate the risk of supply interruptions. These supply chain strategies allowed companies to maintain their operations and minimize the impact of the war on their supply chains (Jagtap et al, 2022)

Inventory Management during the war in Ukraine:

Inventory management played a crucial role in mitigating the disruptions caused by the war in Ukraine. Companies focused on improving visibility and

transparency in their supply chains by leveraging technologies such as block chain and Internet of Things (IoT) to track and trace inventory in real time (Atinasi et al, 2022). Overall the common practice in such cases is that by enhancing the supply chain visibility, companies were better equipped to identify potential bottlenecks or disruptions and take proactive measures (Dolgui et al., 2018). In the case of war in Ukraine companies implemented risk management practices such as dual sourcing, safety stock optimization, and agile inventory strategies to respond to the uncertainties caused by the war (Jagtap et al, 2022). These inventory management approaches allowed companies to maintain supply chain resilience and minimize disruptions during the conflict.

Impact of Supply Chain Strategies and Inventory Management Policies as a result from the above more recent disruptions:

The impact of companies' supply chain strategies and inventory management policies during major disruptions varied depending on factors such as the industry, the scale of the disruption, and the effectiveness of the implemented measures. In general, companies that had implemented proactive strategies and practices experienced better supply chain resilience and were able to navigate through the disruptions more effectively (Gerlach et al., 2021). These companies were better positioned to meet customer demands, minimize stock outs, and maintain business continuity. However, there were also cases, especially during the Covid-19 pandemic, where companies faced challenges in adjusting their supply chain strategies quickly enough, resulting in significant disruptions and financial losses (Rinaldi & Bottani, 2023).

The disruptions caused by these crises have highlighted several vulnerabilities in the global supply chain. Firstly, the concentration of production in certain countries or regions poses risks when those areas experience disruptions. Overreliance on a single source of supply can lead to severe shortages and delays (Jackson, 2021). Secondly, complex and extended supply chains increase the risk of disruptions. Long and fragmented supply chains make it challenging to identify bottlenecks and respond promptly to disruptions. Additionally, the lack of transparency and visibility within the supply chain hinders the ability to anticipate and mitigate risks effectively (Shashi et al., 2020). In response to these disruptions, companies and governments have recognized the need for more resilient and agile supply chains. Efforts are underway

to diversify sourcing and manufacturing locations, reduce dependencies on a single country, and enhance supply chain visibility and collaboration. Digital technologies, such as block chain, artificial intelligence, and data analytics, are increasingly being adopted to enhance transparency, traceability, and risk management within supply chains (Anupama Kumar & Anusha, 2023).

In conclusion, the disruptions caused by the COVID-19 pandemic, the war in Ukraine, and other crises over the past years have exposed the vulnerabilities and interdependencies of the global supply chain. These disruptions have led to shortages, delays, and disruptions in various industries, affecting both developed and developing countries. The events discussed above highlight the need for increased resilience, diversification, and transparency within supply chains to mitigate future disruptions. Hence, major disruptions such as the Covid-19 pandemic and the war in Ukraine have compelled companies to reevaluate and adapt their supply chain strategies and inventory management practices. Diversification of suppliers, increased inventory levels, digitalization, and the use of advanced technologies have been key approaches adopted by companies to maintain supply chain stability and meet customer demands. The impact of these strategies has varied, with companies that implemented proactive measures experiencing better supply chain resilience and minimizing disruptions. However, the effectiveness of the response also depends on the nature of the disruption and the industry in which the companies operate.

2.9 The relationship between supply chain strategies and inventory management during turbulent times

In today's dynamic and unpredictable business environment, companies face numerous challenges that can disrupt their supply chains. Turbulent times, such as economic downturns, natural disasters, and pandemics, highlight the need for effective supply chain management strategies and robust inventory management practices. This essay explores the relationship between supply chain management strategies and inventory management during turbulent times, emphasizing the importance of adaptability, resilience, and risk mitigation.

Effective supply chain management strategies are crucial for maintaining operational efficiency, meeting customer demands, and responding to disruptions. Several key strategies can enhance supply chain performance during turbulent times.

Developing a comprehensive risk management framework is essential to identify and mitigate potential risks. Companies must proactively assess vulnerabilities in their supply chains and implement strategies to build resilience. This can include diversifying supplier networks, establishing backup sources of supply, and creating contingency plans to manage disruptions. By integrating risk management into their supply chain strategies, companies can better navigate turbulent times and minimize the impact of disruptions on inventory management.

Collaboration among supply chain partners and effective communication channels are vital during turbulent times. Establishing strong relationships with suppliers, customers, and logistics providers enables timely information sharing and coordination. Collaborative strategies, such as joint forecasting, shared inventory visibility, and synchronized planning, can enhance supply chain responsiveness and facilitate efficient inventory management.

Supply chains must be designed with flexibility and agility in mind to adapt quickly to changing circumstances. Companies can incorporate strategies such as postponement, modularization, and flexible manufacturing processes to accommodate fluctuations in demand and supply. By maintaining a flexible supply chain, companies can adjust production and inventory levels to match market conditions and mitigate inventory-related risks during turbulent times.

Effective inventory management is crucial for balancing supply and demand, reducing costs, and mitigating risks during turbulent times. Companies should adopt several inventory management practices to enhance their resilience and responsiveness. Accurate demand forecasting is essential for aligning inventory levels with customer needs. During turbulent times, demand patterns can become unpredictable, making accurate forecasting challenging. However, by leveraging advanced analytics, market insights, and historical data, companies can improve demand forecasting accuracy. This allows for better inventory planning, ensuring that adequate stock levels are maintained while avoiding excess inventory costs.

In turbulent times, uncertainties and disruptions can lead to sudden fluctuations in supply and demand. Safety stock and buffer inventory play a critical role in inventory management by acting as a cushion against supply chain disruptions. By strategically positioning safety stock at different points in the supply chain,

companies can buffer against uncertainties and reduce the risk of stock outs during turbulent times.

Lean inventory management aims to minimize excess inventory and reduce holding costs. Lean principles, such as just-in-time (JIT) and continuous replenishment can help companies maintain lean inventory levels while ensuring timely order fulfillment. However, during turbulent times, companies may need to strike a balance between lean inventory practices and the need for safety stock to account for increased uncertainties.

The relationship between supply chain management strategies and inventory management is interconnected. Effective supply chain strategies enable companies to build resilience, respond to disruptions, and collaborate with supply chain partners. These strategies provide the foundation for efficient inventory management practices, allowing companies to balance supply and demand, mitigate risks, and optimize inventory levels during turbulent times.

In conclusion, turbulent times require companies to adopt effective supply chain management strategies and inventory management practices. By integrating risk management, fostering collaboration, embracing flexibility, and implementing inventory optimization techniques, companies can enhance their resilience and responsiveness during turbulent times. The relationship between supply chain management strategies and inventory management is crucial in navigating uncertainties, mitigating risks, and maintaining operational efficiency in a dynamic business environment

3. Case studies

The empirical part concerns a number of cases of how well-known companies have managed to deal with the supply chain strategies and inventory management during the recent turbulent times. For this reason this section will analyze some of those well known cases in order to indicate how the examined companies have managed to cope with some of the recent crises such as the Covid-19 crisis and the impact of Russian invasion in Ukraine.

Case studies involve collecting data through various methods such as interviews, observations, and document analysis, enabling researchers to triangulate information from multiple sources (Baxter & Jack, 2008). This comprehensive data collection allows for a nuanced analysis and the identification of patterns, relationships, and unique aspects that may not be captured by other research methods. One key advantage of the case study approach is its ability to generate context-specific and in-depth knowledge. By focusing on a particular case, researchers can explore complex phenomena within their unique settings and uncover intricate details that contribute to theoretical and practical understanding (Flyvbjerg, 2006). Case studies provide an opportunity to examine rare or exceptional cases, allowing researchers to explore situations that may not be easily replicated or studied through experimental or quantitative research designs (Gerring, 2004). Furthermore, the case study approach offers a platform for theory development and testing. Through careful analysis of the collected data, researchers can identify patterns, formulate hypotheses, and develop theories that explain the observed phenomenon (Eisenhardt, 1989). Case studies facilitate the exploration of causal relationships, enabling researchers to investigate how various factors interact and influence outcomes. This theoretical grounding enhances the generalizability of findings, contributing to the development of broader principles and frameworks (Yin, 2018).

Additionally, the case study approach allows for the examination of complex and multidimensional issues. Many real-world phenomena involve multiple variables, contextual factors, and dynamic interactions. The case study method provides a holistic view of these complexities, allowing researchers to understand the interplay of various factors and their impact on the phenomenon under study (Baxter & Jack, 2008). This depth of analysis contributes to a more comprehensive understanding of the research topic and the potential to address practical challenges effectively.

Moreover, case studies have practical implications and can inform decision-making processes. By examining successful practices or addressing challenges faced by organizations or individuals, case studies offer valuable insights that can be applied in similar contexts. Practitioners, policymakers, and managers can learn from real-world examples and gain practical knowledge that informs their decision-making and strategy development (Flyvbjerg, 2006). However, it is important to acknowledge the limitations of the case study approach. The in depth nature of case studies may limit their generalizability to broader populations or contexts. The findings may be specific to the case under study and may not be readily applicable to other situations. Additionally, case studies are subject to researcher bias and interpretation, requiring a rigorous and systematic approach to data collection and analysis to ensure validity and reliability (Yin, 2018). In conclusion, the case study approach is a valuable research method that provides a deep understanding of complex phenomena within their natural settings. Through comprehensive data collection and analysis, case studies offer context-specific insights, contribute to theory development, and address practical challenges. While case studies have limitations, when conducted rigorously, they generate rich and detailed knowledge that enhances our understanding of complex issues and informs decision-making processes

For the purpose of this thesis, the author has chosen a number of cases from well-known companies in order to investigate how they handled their supply chain and inventory management on turbulent times.

3.1. The case of Toyota

In recent years, the global business landscape has been marked by numerous crises that have tested the resilience and adaptability of organizations. Toyota, one of the world's leading automotive manufacturers, has faced its share of challenges, including the Covid-19 pandemic, geopolitical conflicts such as the war in Ukraine, and energy crises. This essay explores how Toyota has managed its supply chain and inventory during these crises, emphasizing its proactive strategies and adaptability. By examining the measures taken by Toyota to ensure the continuity of its supply chain and optimize inventory management, we gain insights into the company's successful response to challenging circumstances.

Supply Chain Resilience: To mitigate the impact of crises on its supply chain, Toyota has recognized the importance of building a resilient network. One key strategy employed by the company is the diversification of its supplier base. By collaborating with multiple suppliers across different regions, Toyota reduces the risk of supply disruptions caused by localized crises (Gold et al., 2010). This approach allows Toyota to have alternative sources of supply and minimizes its dependency on any single supplier or region.

In addition to diversification, Toyota has established strong relationships with its suppliers through collaborative partnerships. These partnerships involve regular communication, sharing of production forecasts, and conducting joint risk assessments. Through these activities, Toyota and its suppliers are able to proactively address potential disruptions and develop contingency plans. By maintaining close collaboration, Toyota strengthens its supply chain resilience and enhances its ability to navigate through crises.

Agile and Demand-Driven Production: Toyota's renowned production system is built on principles of agility and demand-driven production. During crises, such as the Covid-19 pandemic, Toyota has demonstrated its ability to adjust production levels and schedules in response to changing market conditions. This demand-driven approach enables Toyota to align its production with the actual needs of the market, preventing excessive inventory buildup or shortages (Ohno, 1998). By closely monitoring customer demand and utilizing efficient forecasting methods, Toyota ensures that its inventory levels are optimized and aligned with market dynamics.

To facilitate efficient production, Toyota relies on its Just-in-Time (JIT) and Kanban systems. JIT involves receiving components and materials just in time for production, thereby minimizing inventory carrying costs and the risk of supply disruptions (Monden, 2012). Kanban, a visual signal system, enables Toyota to control the flow of materials and ensure that the right components are available at the right time. Together, these systems contribute to Toyota's ability to maintain low inventory levels while ensuring a continuous flow of materials.

Supply Chain Visibility and Collaboration: Effective supply chain management requires visibility and collaboration among various stakeholders. Toyota leverages advanced information systems to enhance supply chain visibility. By

implementing technologies such as Radio Frequency Identification (RFID) tracking and cloud-based systems, Toyota gains real-time visibility into inventory levels, shipment tracking, and other crucial supply chain information (Zebra Technologies, 2021). This real-time information enables prompt decision-making and facilitates proactive measures during crises.

In addition to leveraging technology, Toyota actively collaborates with its logistics partners to optimize transportation and distribution processes. During crises, such as energy crises or disruptions due to conflicts, Toyota works closely with logistics providers to identify alternative transportation routes, manage inventories at distribution centers, and ensure timely deliveries. This collaborative approach helps mitigate supply chain disruptions and maintain customer satisfaction even in challenging times (Foulis, 2021)

Risk Management and Contingency Planning: To effectively manage crises, Toyota has developed a comprehensive risk management framework. The company continuously monitors geopolitical, economic, and environmental factors to identify and assess potential risks throughout its supply chain. By proactively monitoring and evaluating risks, Toyota can anticipate and respond to potential disruptions more effectively (Foulis, 2021)

Toyota's risk management efforts are complemented by robust contingency planning. The company has implemented business continuity plans that address supply chain disruptions during crises. These plans include backup sourcing options, safety stock strategies, and alternative production sites. By having contingency measures in place, Toyota can swiftly respond to disruptions and maintain the flow of critical components and finished goods (Ohno, 1998)

Overall, Toyota's ability to effectively manage its supply chain and inventory during recent crises highlights the company's resilience, adaptability, and proactive approach. By diversifying its supplier base, maintaining strong supplier relationships, embracing demand-driven production, leveraging technology for enhanced visibility, collaborating with logistics partners, and implementing robust risk management practices, Toyota has successfully navigated challenging times. These strategies have allowed Toyota to minimize disruptions, optimize inventory levels, and ensure customer satisfaction.

As the business landscape continues to evolve and new crises emerge, Toyota's experience provides valuable insights for organizations seeking to enhance their supply chain and inventory management capabilities. By focusing on resilience, agility, collaboration, and proactive planning, companies can position themselves to effectively manage crises and maintain a competitive edge in an uncertain world.

3.2 The case of Amazon

The COVID-19 pandemic and energy crises have posed significant challenges to businesses worldwide. Among these, Amazon, the global e-commerce giant, has been at the forefront of managing these crises. This essay examines how Amazon tackled the COVID-19 pandemic and energy crises, highlighting the company's strategies and actions in ensuring the continuity of its supply chain and addressing the challenges presented by these crises. The COVID-19 pandemic created a surge in demand for online shopping as people turned to e-commerce due to lockdowns and social distancing measures. To manage this increased demand and ensure the availability of essential products, Amazon implemented several key strategies.

Firstly, Amazon expanded its warehouse and fulfillment capacity to meet the growing demand for essential items. The company swiftly adjusted its operations to prioritize the storage and distribution of critical supplies such as medical equipment, personal protective equipment (PPE), and household essentials (CNBC, 2020). By optimizing its warehouse space and increasing staffing, Amazon was able to ensure the efficient handling and delivery of essential goods to customers. Furthermore, Amazon worked closely with its suppliers to address potential disruptions in the supply chain. The company collaborated with suppliers to identify alternative sourcing options and maintain a steady flow of goods (CNBC, 2020). This proactive approach allowed Amazon to mitigate potential shortages and ensure the availability of products for its customers.

In addition, Amazon implemented strict safety measures to protect its employees and maintain the continuity of its operations. The company introduced enhanced cleaning and sanitation practices in its facilities, implemented social distancing protocols, and provided personal protective equipment to its employees

(Amazon, 2021). These measures aimed to safeguard the health and well-being of Amazon's workforce while ensuring uninterrupted supply chain operations.

To meet the increased shipping demands, Amazon collaborated closely with logistics partners and carriers. The company worked with these partners to manage the higher shipping volumes and optimize delivery processes (CNBC, 2020). By fostering strong partnerships, Amazon was able to enhance its logistics capabilities and maintain efficient and timely deliveries to customers.

In addition to the COVID-19 pandemic, Amazon has also faced energy crises, which have posed challenges to its supply chain operations. To tackle these crises, Amazon has implemented various strategies focused on energy efficiency and sustainability.

One of the key initiatives undertaken by Amazon is the deployment of renewable energy solutions. The company has made significant investments in renewable energy projects, including solar and wind farms (Amazon, 2021). By harnessing clean energy sources, Amazon reduces its reliance on traditional energy grids and decreases its environmental impact. Furthermore, Amazon has implemented energy-efficient practices within its operations. The company continuously evaluates and optimizes its facilities to minimize energy consumption. This includes the use of advanced lighting systems, HVAC control, and energy management technologies (Amazon, 2021). By adopting these measures, Amazon reduces its energy footprint and improves operational efficiency.

In addition to internal initiatives, Amazon encourages its suppliers and partners to adopt sustainable practices. The company collaborates with suppliers to promote environmental responsibility and sustainability throughout the supply chain (Amazon, 2021). By encouraging sustainable practices among its stakeholders, Amazon aims to create a more resilient and eco-friendly supply chain ecosystem.

Overall, Amazon's response to the COVID-19 pandemic and energy crises exemplifies the company's proactive approach to supply chain management and sustainability. By expanding warehouse capacity, collaborating with suppliers, implementing strict safety measures, and working closely with logistics partners, Amazon successfully managed the surge in demand and ensured the availability of essential products during the pandemic. Furthermore, the company's focus on

renewable energy and energy efficiency initiatives demonstrates its commitment to sustainability and environmental responsibility.

While the challenges posed by the COVID-19 pandemic and energy crises continue to evolve, Amazon's experience serves as a valuable example of effective crisis management. By prioritizing the safety of employees, ensuring supply chain resilience, and embracing sustainable practices, businesses can navigate through crises and maintain their operations while making positive contributions to the environment.

3.3 The case of Procter and Gamble

The COVID-19 pandemic and energy crises have disrupted global supply chains, creating challenges for companies across various industries. Procter & Gamble (P&G), a multinational consumer goods company, successfully navigated these crises by implementing effective supply chain strategies and inventory management practices. This essay explores how P&G responded to the challenges posed by the COVID-19 pandemic and energy crises, emphasizing its supply chain resilience and adaptability.

Supply Chain Strategy during the COVID-19 Pandemic:

The COVID-19 pandemic resulted in fluctuating consumer demand patterns, disrupted transportation networks, and supply chain bottlenecks. To address these challenges, P&G adopted several key strategies.

Demand Sensing and Analytics:

P&G utilized advanced demand sensing technologies and data analytics to gain real-time insights into consumer behavior and demand fluctuations. By analyzing point-of-sale data, social media trends, and other relevant data sources, P&G could forecast demand patterns more accurately (P&G, 2021). This enabled the company to adjust production and inventory levels promptly, ensuring that the right products were available to meet changing consumer needs.

Supplier Collaboration and Risk Management:

P&G worked closely with its suppliers to mitigate potential disruptions in the supply chain. The company maintained open lines of communication, regularly

sharing demand forecasts and production plans with suppliers (P&G, 2021). By collaborating closely, P&G and its suppliers could align their operations, manage inventory levels, and address potential raw material shortages. This collaborative approach enhanced supply chain resilience and reduced the impact of disruptions.

Inventory Optimization:

P&G employed inventory optimization techniques to manage its inventory levels efficiently. By adopting lean principles and just-in-time practices, the company aimed to minimize excess inventory while ensuring product availability (P&G, 2021). This approach allowed P&G to maintain optimal inventory levels, reducing holding costs and improving overall supply chain efficiency.

Inventory Management during the Energy Crises:

Energy crises, such as disruptions in the supply of fuel or electricity, can significantly impact supply chain operations. P&G implemented strategies to address energy-related challenges effectively.

Energy Efficiency Measures:

P&G prioritized energy efficiency across its operations. The company conducted energy audits to identify areas for improvement and implemented energy-saving initiatives, such as optimizing equipment and lighting systems (P&G, 2021). By reducing energy consumption, P&G minimized its reliance on external energy sources and improved its operational sustainability.

Alternative Energy Sources:

To mitigate the risks associated with energy crises, P&G explored alternative energy sources. The company invested in renewable energy projects, including wind and solar farms, to supplement its energy requirements (P&G, 2021). By diversifying its energy sources, P&G decreased its dependence on traditional energy grids and enhanced its energy resilience.

Supply Chain Optimization:

P&G analyzed its supply chain network to optimize transportation routes and minimize energy consumption. The company adopted strategies such as route optimization, load consolidation, and modal shift (P&G, 2021). These initiatives

aimed to reduce fuel consumption and emissions while ensuring the timely delivery of products to customers.

Overall, Procter & Gamble's effective supply chain strategy and inventory management practices played a crucial role in navigating the challenges presented by the COVID-19 pandemic and energy crises. By leveraging demand sensing and analytics, collaborating with suppliers, optimizing inventory levels, prioritizing energy efficiency, and exploring alternative energy sources, P&G demonstrated resilience and adaptability in its supply chain operations. The successful implementation of these strategies allowed P&G to meet changing consumer demands, ensure product availability, and minimize the impact of supply chain disruptions during the crises. These lessons learned can serve as valuable insights for other companies aiming to build resilient and sustainable supply chains.

3.4 The case of IKEA

IKEA, a global leader in the furniture retail industry, faced significant challenges during the COVID-19 pandemic and energy crises. However, the company's efficient supply chain management played a crucial role in ensuring business continuity and meeting customer demands. This essay explores how IKEA managed its supply chain and inventory during these crises, highlighting key strategies and actions taken.

One of the key strategies that IKEA adopted during the COVID-19 pandemic was to enhance its e-commerce capabilities and online presence. With lockdowns and restrictions affecting physical stores, IKEA swiftly shifted its focus towards strengthening its online operations. The company accelerated its digital transformation, investing in e-commerce platforms, and improving the online customer experience. By expanding its online channels, IKEA could continue serving customers and maintaining sales even when physical stores were closed or operating at limited capacity (Kullnig, 2020).

In terms of supply chain management, IKEA prioritized building flexibility and resilience into its sourcing and production processes. The company recognized the importance of diversifying its supplier base to reduce dependencies on specific regions or countries heavily impacted by the pandemic. This diversification enabled IKEA to have alternative sourcing options and mitigate potential disruptions caused

by lockdowns, transportation restrictions, or factory closures (Han, 2023). Furthermore, IKEA focused on establishing strong relationships with its suppliers and maintaining open lines of communication but also focusing on sustainability. By collaborating closely with its suppliers, IKEA ensured transparency and proactive problem-solving, while it promoted the use of second hand materials as part of its turn in the circular supply chain. This collaborative approach allowed the company to identify potential supply chain bottlenecks or challenges early on and take necessary measures to manage inventory levels and meet customer demand effectively through circular supply chain and sustainability, while this concept also strengthens its relationship with the customers (Freeman, 2020).

Another critical aspect of IKEA's supply chain management during the crises was inventory management. Given the uncertainties in supply and demand, IKEA took measures to optimize its inventory levels. The company employed sophisticated demand forecasting models that incorporated real-time data, market insights, and historical trends to make informed decisions about inventory replenishment and distribution. By accurately forecasting demand, IKEA could avoid excess inventory costs while ensuring adequate stock levels to meet customer needs (Han, 2023).

To address the energy crises, IKEA has long been committed to sustainability and renewable energy. The company recognized the importance of reducing its carbon footprint and actively investing in renewable energy sources. IKEA has made substantial investments in wind and solar power to generate its own renewable energy. By producing renewable energy, IKEA ensures a stable energy supply for its operations while contributing to environmental sustainability (IKEA, 2023). Moreover, IKEA prioritizes energy efficiency throughout its supply chain. The company has implemented various energy-saving measures in its stores, warehouses, and transportation processes. For instance, IKEA has transitioned to LED lighting in its stores and warehouses, significantly reducing energy consumption. The company has also optimized its delivery routes and transportation networks to minimize fuel usage and emissions. These energy efficiency initiatives not only help IKEA reduce costs but also contribute to environmental sustainability and resilience in times of energy crises (IKEA, 2023).

In conclusion, IKEA successfully managed its supply chain and inventory during the COVID-19 pandemic and energy crises through a combination of strategies. The company adapted swiftly by enhancing its e-commerce capabilities and expanding its online presence. IKEA focused on building flexibility and resilience in its sourcing and production processes by diversifying its supplier base and maintaining strong supplier relationships. Additionally, the company prioritized accurate demand forecasting to optimize inventory levels and meet customer needs effectively. Furthermore, IKEA's commitment to sustainability and energy efficiency allowed it to address the energy crises by investing in renewable energy sources and implementing energy-saving measures throughout its supply chain.

3.5 The case of WalMart

Walmart's ability to effectively manage its supply chain and inventory during recent crises, such as the COVID-19 pandemic and energy-related disruptions, is noteworthy. The company implemented various strategies to address these challenges and ensure business continuity.

During the COVID-19 pandemic, Wal-Mart responded swiftly by strengthening its supply chain operations. The company prioritized collaboration and communication with its suppliers to maintain visibility into inventory levels and production capacities. This allowed Wal-Mart to anticipate and mitigate potential disruptions in the supply chain (Cariou & Notteboom, 2022). Additionally, Wal-Mart leveraged its advanced data analytics capabilities to gain insights into changing customer demand patterns. By analyzing customer buying behavior and inventory data, the company made informed decisions about inventory replenishment, ensuring the availability of essential products. To overcome energy-related disruptions, Wal-Mart adopted several strategies to optimize its supply chain and inventory management. The company focused on energy efficiency initiatives within its facilities and transportation processes. For example, Wal-Mart invested in energy-saving technologies, such as LED lighting, to reduce energy consumption in its stores and warehouses (Wal-Mart 2021). By optimizing its transportation network, Wal-Mart minimized fuel usage and emissions, contributing to sustainability efforts while addressing energy challenges (Pandya et al., 2021).

Furthermore, Wal-Mart emphasized the diversification of its energy sources. The company invested in renewable energy projects, such as solar and wind power, to reduce its reliance on traditional energy sources and increase the stability of its energy supply (Wal-Mart, 2021). By generating its own renewable energy, Wal-Mart enhanced its energy resilience and contributed to environmental sustainability.

Walmart's inventory management strategies were also instrumental in mitigating disruptions. The company employed advanced inventory forecasting models that considered factors such as changing consumer behavior and market trends. These models enabled Wal-Mart to optimize inventory levels and minimize stock outs or excess inventory (Pandya et al., 2021). Furthermore, the company adopted a "just-in-time" inventory approach, leveraging its robust logistics network to maintain efficient product flow and minimize holding costs (Sharma, Adhikary, & Borah, 2020).

Walmart's supply chain and inventory management success during the recent crises can be attributed to its commitment to technological innovation. The company heavily invested in automation and digitization to improve the efficiency and visibility of its supply chain processes (Wal-Mart, 2021). By leveraging technologies such as artificial intelligence and machine learning, Wal-Mart could better forecast demand, optimize inventory levels, and streamline its logistics operations.

In conclusion, Walmart's effective supply chain and inventory management strategies enabled it to navigate the challenges posed by the COVID-19 pandemic and energy-related disruptions. By focusing on collaboration with suppliers, leveraging data analytics, optimizing energy efficiency, diversifying energy sources, and employing advanced inventory management techniques, Wal-Mart ensured business continuity, met customer demands, and contributed to sustainability efforts. These strategies showcase Walmart's resilience and adaptability in managing its supply chain during turbulent times.

4. Conclusions and recommendations

Supply chain management and inventory management are critical areas of study in today's fragmented world of business. The globalized economy, advances in technology, and increasing customer expectations have made effective supply chain and inventory management vital for organizations seeking sustainable success. This essay explores the importance of studying these disciplines and highlights their significance in today's business landscape. One of the key reasons to study supply chain management is its role in enhancing operational efficiency. A well-managed supply chain ensures that materials and resources flow seamlessly from suppliers to manufacturers, distributors, and ultimately to customers. Understanding the principles and strategies of supply chain management enables organizations to streamline processes, reduce lead times, and optimize resource allocation (Lambert et al., 2018). This efficiency not only reduces costs but also enhances customer satisfaction through timely deliveries and improved product availability. In today's globalized world, supply chains have become increasingly complex, with suppliers, manufacturers, and customers spread across different regions and countries. Studying supply chain management helps individuals and organizations navigate the challenges of managing global supply networks. It provides insights into mitigating risks associated with geopolitical factors, trade regulations, currency fluctuations, and cultural differences (Chowdhury & Quaddus, 2017; Ivanov et al., 2020). Knowledge of supply chain management enables organizations to develop robust strategies for supplier selection, logistics planning, and risk management to ensure the uninterrupted flow of goods and services. Inventory management is another critical area of study. Efficient inventory management helps organizations strike the right balance between maintaining adequate stock levels and avoiding excess inventory. The study of inventory management equips individuals with the tools and techniques to optimize inventory turnover, reduce holding costs, and avoid stock outs (Silver et al., 1998). It enables organizations to forecast demand accurately, implement just-in-time (JIT) practices, and leverage technology to automate inventory tracking and replenishment. Effective inventory management enhances operational agility and responsiveness, leading to improved customer service and reduced carrying costs.

Overall, effective supply chain strategies and inventory management play a crucial role in navigating crises and turbulent times. The ability to handle these challenges with agility and resilience can determine a company's survival and success. This essay provides a general conclusion on why it is important to implement effective supply chain strategies and inventory management during crises and turbulent times, along with key strategies to consider.

Firstly, effective supply chain strategies are essential during crises as they enable companies to respond swiftly and adapt to changing market dynamics. The COVID-19 pandemic highlighted the criticality of supply chain visibility, collaboration, and risk management. Companies that had established strong relationships with suppliers and implemented robust risk assessment and contingency plans were better equipped to manage disruptions. Supply chain visibility ensured that companies had real-time information on inventory levels, production capacities, and demand patterns, enabling them to make informed decisions (Cariou & Notteboom, 2022). Collaboration within the supply chain is crucial during crises as it facilitates proactive problem-solving and risk mitigation. Companies should foster strong relationships with suppliers, customers, and logistics partners to enhance communication and coordination (Pandya et al., 2021). Collaborative initiatives such as sharing demand forecasts, implementing joint inventory planning, and coordinating logistics operations can help ensure the smooth flow of goods and minimize disruptions.

Flexibility and agility are key strategies to handle turbulent times. Companies should be able to adjust their supply chain operations rapidly to meet changing customer demands and market conditions. Adopting a demand-driven approach, implementing agile manufacturing practices, and utilizing advanced analytics and forecasting techniques can enable companies to quickly adapt and optimize their supply chains. Embracing digitalization and automation can enhance supply chain flexibility by enabling real-time monitoring, improved data visibility, and faster decision-making (Hancock & Mora, 2023). Diversification is another important strategy to mitigate risks during crises. Companies should diversify their supplier base and establish alternative sourcing options to minimize disruptions caused by localized crises or geopolitical events (Gu, 2022). By having multiple suppliers across different

regions, companies can mitigate the impact of disruptions in any single location and maintain a steady supply of critical materials.

Inventory management is equally crucial during crises and turbulent times. Companies must strike a balance between maintaining adequate inventory levels to meet customer demand and avoiding excessive inventory holding costs. Leveraging advanced analytics and demand forecasting models can help optimize inventory levels, ensuring product availability while minimizing carrying costs (Pandya et al., 2021). Furthermore, companies should consider sustainability practices in their supply chain and inventory management strategies. Adopting environmentally friendly practices not only contributes to sustainable development but also enhances operational resilience. Initiatives such as energy-efficient operations, renewable energy utilization, and waste reduction can improve resource management and reduce environmental impact (IKEA, 2023).

Overall, effective supply chain strategies and inventory management are paramount during crises and turbulent times. Companies must prioritize supply chain visibility, collaboration, flexibility, and agility to adapt to changing market dynamics. Diversification, advanced analytics, and sustainability practices should also be embraced. By implementing these strategies, companies can enhance their resilience, minimize disruptions, ensure product availability, and position themselves for success even in the face of uncertainties. Successful handling of supply chain and inventory management during crises is a crucial differentiator in today's volatile business environment.

This dissertation has examined a number of cases, which include some of the most well known companies in the world. As it indicated from the third part of this thesis, there are some key findings which are made based on the analysis. More exactly, the recent crises, including the COVID-19 pandemic and energy-related disruptions, presented significant challenges for companies worldwide. Well-known companies such as IKEA, Wal-Mart, Amazon, and P&G were not immune to these challenges. However, they demonstrated resilience and agility in managing their supply chain and inventory during these turbulent times. This essay discusses the lessons learned from these companies' experiences, highlighting their approaches and strategies.

One key lesson learned is the importance of supply chain visibility and collaboration. Companies like IKEA emphasized close collaboration with suppliers to maintain visibility into inventory levels, production capacities, and potential disruptions. This allowed them to make informed decisions and proactively address supply chain challenges (Kullnig, 2020). Wal-Mart, on the other hand, leveraged its strong supplier relationships and advanced data analytics to gain insights into changing customer demand patterns. By collaborating closely with suppliers and utilizing data-driven decision-making, these companies were able to optimize inventory levels and ensure product availability (Wal-Mart, 2021). Another lesson learned is the significance of agility and flexibility in supply chain operations. Amazon, known for its highly efficient supply chain, demonstrated agility by adjusting its operations and logistics processes to meet changing demand patterns. The company prioritized essential products and optimized its distribution network to ensure timely delivery (Amazon, 2021; Hancock & Mora, 2023). P&G also emphasized flexibility by diversifying its supplier base to mitigate potential disruptions. This allowed the company to quickly adapt to changing market conditions and maintain a steady supply of products (P&G, 2020; Gu, 2022).

In addition, companies recognized the importance of technology and digitization in managing supply chain and inventory. Amazon's advanced use of automation and robotics in its warehouses enabled efficient order fulfillment even during peak demand (Hancock & Mora, 2023). IKEA invested in digital solutions to improve inventory management and optimize product flow (Han, 2023). Walmart's use of advanced data analytics and artificial intelligence helped in forecasting demand and optimizing inventory replenishment (Piercy et al., 2021). These companies' investments in technology showcased the significance of digital transformation in enhancing supply chain resilience.

Furthermore, the crises highlighted the need for risk management and contingency planning. P&G implemented risk management practices, such as scenario planning and building strategic stockpiles, to mitigate supply chain disruptions (P&G, 2020). Walmart's extensive store network allowed for efficient inventory redistribution, minimizing stock outs and ensuring product availability (Prentice, Quach, & Thaichon, 2022). These companies' focus on risk assessment and contingency plans enabled them to respond effectively to unexpected disruptions.

Sustainability emerged as another critical lesson learned. Companies recognized the importance of sustainable practices in supply chain and inventory management. IKEA prioritized energy efficiency initiatives and renewable energy sources to reduce its environmental impact (IKEA, 2023). Wal-Mart invested in energy-saving technologies and sustainable transportation practices to address energy-related challenges (Wal-Mart, 2021). These companies' commitment to sustainability not only contributed to environmental responsibility but also improved operational resilience.

In conclusion, well-known companies like IKEA, Wal-Mart, Amazon, and P&G showcased their ability to navigate through recent crises by adopting effective supply chain and inventory management strategies. Lessons learned from their experiences include the importance of supply chain visibility and collaboration, agility and flexibility in operations, technology and digitization, risk management and contingency planning, and sustainability practices. By incorporating these lessons, companies can enhance their supply chain resilience and better prepare for future disruptions.

Based on the overall content of this thesis, there are some remarks to be made related with the recommendations made so to improve the resilience of a supply chain and inventory management during a disruption. More precisely, during a crisis, effective handling of supply chain and inventory management is crucial for businesses to navigate uncertainties and maintain operational resilience. While specific strategies may vary depending on the nature of the crisis, there are several general recommendations that companies can consider to address supply chain and inventory management challenges.

This section of the conclusions provides a list of recommendations to guide companies in managing their supply chain and inventory during crises.

1. Enhance supply chain visibility: Establishing real-time visibility across the supply chain is essential during a crisis. Implement systems and technologies that enable companies to monitor inventory levels, demand patterns, and production capacities. Enhanced visibility allows for timely decision-making and enables companies to respond quickly to changes in demand or disruptions in the supply chain.

2. Foster strong supplier relationships: Cultivating strong relationships with suppliers is critical during crises. Maintain open lines of communication to exchange information on demand fluctuations, production constraints, and potential disruptions. Collaborate closely with suppliers to develop contingency plans, identify alternative sources, and jointly manage risks.

3. Diversify supplier base: Overreliance on a single supplier or geographic region can amplify risks during a crisis. Consider diversifying the supplier base to minimize vulnerabilities. Identify and qualify alternative suppliers to ensure a more robust supply chain. Evaluate the feasibility of dual-sourcing critical components or materials to mitigate the impact of disruptions.

4. Implement risk assessment and mitigation strategies: Conduct comprehensive risk assessments to identify vulnerabilities in the supply chain. Evaluate potential risks and develop mitigation strategies to address them. Proactively monitor and manage risks through regular assessments, scenario planning, and contingency plans. This includes assessing risks related to transportation, logistics, production, and supplier stability.

5. Build flexibility and agility: Develop agile supply chain capabilities to respond swiftly to changes in demand and market conditions. Implement demand-driven planning and execution strategies to align production and inventory levels with customer needs. Foster a culture of flexibility and adaptability, enabling the organization to adjust operations and supply chain configurations in response to disruptions.

6. Leverage digital technologies: Embrace digitalization to improve supply chain visibility, collaboration, and decision-making. Implement advanced analytics, artificial intelligence, and machine learning tools to enhance forecasting accuracy, optimize inventory levels, and improve demand planning. Utilize cloud-based platforms for real-time data sharing, communication, and coordination across the supply chain.

7. Prioritize customer-centricity: Focus on understanding and meeting customer needs during a crisis. Gather insights on shifting customer preferences and adjust production and inventory plans accordingly. Engage

with customers to communicate potential disruptions, manage expectations, and provide alternatives when necessary.

8. Optimize inventory management: Maintain a delicate balance between ensuring product availability and avoiding excessive inventory holding costs. Utilize advanced forecasting techniques and demand planning tools to optimize inventory levels and minimize stock outs or overstocking. Implement just-in-time (JIT) or lean inventory management practices to reduce carrying costs while ensuring timely product delivery.

9. Embrace sustainability practices: Integrate sustainability principles into supply chain and inventory management strategies. Explore energy-efficient operations, waste reduction initiatives, and sustainable sourcing practices. Adopting sustainable practices not only contributes to environmental responsibility but also enhances operational efficiency and resilience.

10. Learn from experiences: Continuously learn from past crisis situations and apply lessons learned to improve future supply chain and inventory management strategies. Conduct post-crisis evaluations to assess the effectiveness of response actions and identify areas for improvement. Capture best practices and develop standard operating procedures to enhance preparedness for future crises.

In conclusion, companies can navigate crises more effectively by implementing robust supply chain and inventory management strategies. Enhancing visibility, fostering strong supplier relationships, diversifying the supplier base, mitigating risks, building flexibility, leveraging digital technologies, prioritizing customer-centricity, optimizing inventory, embracing sustainability, and learning from experiences are key recommendations to handle supply chain and inventory management issues during crises. By adopting these recommendations, companies can enhance their resilience, minimize disruptions, and maintain operational continuity in turbulent times.

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