



Supply Chain Management

Postgraduate Dissertation

Inventory Management in Heavy Industry: The Case of Greece

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Chalkida, Greece, June 2024

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Konstantinos Karras

Inventory Management in Heavy Industry: The Case of Greece

Abstract

Inventory management is a critical aspect of operations in the heavy industry sector, essential for efficiency and cost-effectiveness. This dissertation, focused on the Greek heavy industry sector, aims to deeply analyze current inventory management practices, identify challenges, and provide strategies for enhancement and cost reduction. The research approach is quantitative, with data gathered from employees in various heavy industry companies in Greece.

The dissertation comprises a thorough literature review, examining the importance of inventory management in the heavy industry sector, the unique challenges and requirements associated with inventory control within heavy industries, and the state of inventory management in Greece's heavy industry. It also examines the global landscape, analyzing successful inventory management strategies implemented in heavy industries worldwide, and explores the potential implementation of digital solutions in inventory management in the context of the Greek heavy industry.

In terms of methodology, the study employs stratified random sampling to select participants from various heavy industry companies in Greece, ensuring representation across different heavy industry segments. A structured questionnaire, encompassing both closed-ended and Likert scale questions, is used to collect data on current inventory management practices, challenges faced, and opinions on potential improvements. Data analysis involves descriptive statistics to profile respondents, and key findings are analyzed and summarized. Ultimately, the study aims to provide strategic recommendations for optimizing inventory processes in Greece's heavy industry sector, based on a comprehensive understanding of the current state and global best practices.

Keywords:

Inventory management, heavy industry, digital solutions, strategic recommendations, cost reduction

Περίληψη

Η διαχείριση αποθεμάτων αποτελεί κρίσιμο παράγοντα για την αποτελεσματικότητα και την αποδοτικότητα κόστους στις λειτουργίες του τομέα βαριάς βιομηχανίας. Αυτή η διατριβή, επικεντρώνεται στην ελληνική βαριά βιομηχανία και έχει ως στόχο να αναλύσει σε βάθος τις τρέχουσες πρακτικές διαχείρισης αποθεμάτων, να εντοπίσει τις προκλήσεις και να παράσχει στρατηγικές για βελτίωση και μείωση κόστους. Η ερευνητική προσέγγιση είναι ποσοτική, με δεδομένα που συλλέγονται από εργαζομένους σε διάφορες βαριές βιομηχανικές εταιρείες στην Ελλάδα.

Η διατριβή περιλαμβάνει μια διεξοδική ανασκόπηση της βιβλιογραφίας, εξετάζοντας τη σημασία της διαχείρισης αποθεμάτων στη βαριά βιομηχανία, τις μοναδικές προκλήσεις και απαιτήσεις που σχετίζονται με τον έλεγχο αποθεμάτων εντός της βαριάς βιομηχανίας και την κατάσταση της διαχείρισης αποθεμάτων στον ελληνικό βιομηχανικό τομέα. Εξετάζει επίσης το παγκόσμιο τοπίο, αναλύοντας επιτυχημένες στρατηγικές διαχείρισης αποθεμάτων που εφαρμόζονται σε βαριές βιομηχανίες παγκοσμίως και διερευνά την ενδεχόμενη εφαρμογή ψηφιακών λύσεων στη διαχείριση αποθεμάτων στο πλαίσιο της ελληνικής βαριάς βιομηχανίας.

Όσον αφορά τη μεθοδολογία, η μελέτη χρησιμοποιεί στρωματοποιημένη τυχαία δειγματοληψία για την επιλογή συμμετεχόντων από διάφορες βαριές βιομηχανικές εταιρείες στην Ελλάδα, εξασφαλίζοντας εκπροσώπηση από διαφορετικά τμήματα βαριάς βιομηχανίας. Ένα δομημένο ερωτηματολόγιο, που περιλαμβάνει ερωτήσεις τόσο κλειστού τύπου, όσο και κλίμακας Likert, χρησιμοποιείται για τη συλλογή δεδομένων σχετικά με τις τρέχουσες πρακτικές διαχείρισης αποθεμάτων, τις προκλήσεις που αντιμετωπίζονται και τις απόψεις για πιθανές βελτιώσεις. Η ανάλυση δεδομένων περιλαμβάνει περιγραφική στατιστική για την ανάλυση των συμμετεχόντων και τα βασικά ευρήματα αναλύονται και συνοψίζονται. Συνολικά, η μελέτη στοχεύει στην παροχή στρατηγικών προτάσεων για τη βελτιστοποίηση των διαδικασιών διαχείρισης αποθεμάτων στον ελληνικό βιομηχανικό κλάδο, βασισμένων σε μια ολοκληρωμένη κατανόηση της τρέχουσας κατάστασης και των βέλτιστων πρακτικών που χρησιμοποιούνται παγκοσμίως.

Λέξεις-κλειδιά: Διαχείριση αποθεμάτων, βαριά βιομηχανία, ψηφιακές λύσεις, στρατηγικές προτάσεις, μείωση κόστους

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1. Introduction

1.1 Introductory comments

Inventory management is crucial in the supply chain, ensuring a steady flow of production materials and minimizing storage costs while maintaining operational efficiency (Wisner, Tan & Leong, 2014). An effective inventory system supports rapid movement through the supply chain, fostering business growth and innovation (Harrison & van Hoek, 2011). In heavy industries, efficient management of inventory, receivables, and payables is essential for maintaining operational efficiency and profitability (Schmenner & Swink, 1998; Kumar, Kumar & Priya, 2016). Enhanced inventory efficiency leads to greater cash reserves, facilitating quick movement of goods and supporting growth (Lin, Wang & Shi, 2022; Fullerton, McWatters & Fawson, 2003). Effective inventory management optimizes financial and operational outcomes, enhancing profitability (Schmenner & Swink, 1998). Managing receivables, inventory, and payables efficiently sustains operations and fosters innovation (Kumar, Kumar & Priya, 2016).

In the Greek heavy industry sector, inventory management presents unique challenges and opportunities. The sector relies on heavy machinery, large-scale production, and lengthy production cycles, making inventory management challenging (Deskera, 2023). Effective management requires understanding sector-specific requirements and implementing appropriate strategies and technologies. Companies must adopt frameworks that address these dynamics to optimize resource allocation and minimize costs (Heizer, Render & Munson, 2017). Advanced technologies enhance inventory accuracy and operational responsiveness (Millar, 2015; Jacobs, Chase & Lummus, 2014).

This dissertation analyzes inventory management practices in the Greek heavy industry sector, identifying challenges and proposing improvement strategies. By examining current practices, challenges, and potential solutions, this research aims to enhance operational effectiveness and financial sustainability. Insights from global supply chain ecosystems provide a broader perspective on these practices (Millar, 2015). Localized insights from Greece deepen the understanding of these practices in the Greek context (Vlachos, 2020). Strategic frameworks and diagnostic models guide the evaluation and improvement of inventory management systems, ensuring they meet operational needs and contribute to resilience and competitive advantage (Dani, 2015; Sheffi, 2007). Various metrics and

measurement scales for operations research will systematically assess and optimize inventory management efficiency, contributing to the sector's overall performance and stability (Roth & Schroeder, 2006).

Inventory management is crucial for operational efficiency and global competitiveness. Effective management leads to cost savings and improved customer satisfaction by ensuring timely delivery of products and services. In the heavy industry sector, efficient inventory management can be a key differentiator.

This dissertation aims to bridge the gap between theory and practice by providing actionable recommendations for inventory management improvements. Leveraging both qualitative and quantitative research methods, the study offers a holistic view of inventory management in the Greek heavy industry sector. The findings contribute to academic literature on supply chain management and provide practical guidance for industry practitioners.

In summary, this dissertation seeks to enhance understanding of inventory management in the Greek heavy industry sector, identify key challenges, and propose practical solutions. Through comprehensive analysis and literature review, this study provides valuable insights to drive efficiency and sustainability in the sector.

1.2 Objectives of the Study

The primary objective of this dissertation is to thoroughly investigate and enhance inventory management practices within the Greek heavy industry sector. Achieving this overarching goal requires a series of specific, interrelated objectives designed to provide a structured and comprehensive exploration of the subject matter. These objectives are formulated to contribute both to academic knowledge and to practical applications within the industry.

The first objective is to analyze current inventory management practices employed by companies within the Greek heavy industry sector. This involves a detailed examination of the methods and systems currently in use, their effectiveness, and their integration into broader supply chain operations. Understanding the existing practices is crucial for establishing a baseline from which improvements can be measured (Chopra & Meindl, 2016).

Secondly, the study aims to identify key challenges and constraints that impede effective inventory management. These challenges may include inaccurate demand forecasting, supply

chain disruptions, technological limitations, regulatory compliance issues, and economic factors (Jacobs, Chase, & Lummus, 2014). Identifying these obstacles is essential for targeting specific areas that require intervention and improvement.

The third objective is to evaluate the impact of advanced technologies on inventory management practices. Technologies such as Enterprise Resource Planning (ERP) systems, Radio Frequency Identification (RFID), Internet of Things (IoT), and predictive analytics have the potential to significantly enhance inventory management. This study will assess the benefits and limitations of these technologies and provide recommendations for their adoption and integration (Whitmore, Agarwal, & Xu, 2015; Miorandi et al., 2012).

Benchmarking against global best practices is another critical objective. By conducting a comparative analysis of inventory management strategies implemented by leading industries worldwide, this study aims to identify successful practices that can be adapted and applied within the Greek context. This benchmarking will help enhance operational efficiency and competitiveness in the Greek heavy industry sector (Monczka et al., 2015).

The fifth objective is to explore the role of human factors in inventory management. This includes examining the impact of employee training, organizational culture, leadership, and change management on the effectiveness of inventory management practices (Krajewski, Ritzman, & Malhotra, 2020). Understanding these human dimensions is crucial for developing comprehensive strategies that encompass both technological and human elements.

Developing strategic recommendations based on the findings is another key objective. These recommendations will focus on both short-term improvements and long-term strategic changes necessary for optimizing inventory management practices. The goal is to achieve greater efficiency, reduce costs, and enhance overall operational performance (Christopher, 2016).

Additionally, the study aims to assess the potential for digital transformation within the Greek heavy industry. This involves exploring how digital solutions can be leveraged to improve inventory accuracy, visibility, and responsiveness. The readiness of Greek heavy industry companies to embrace digital transformation and the steps required to facilitate this transition will be examined (Atzori, Iera, & Morabito, 2010).

Lastly, the study will evaluate sustainability practices within inventory management. This includes examining how companies can adopt environmentally friendly practices such as

waste reduction, recycling, and the use of sustainable materials. The importance of sustainability in inventory management will be highlighted, and recommendations for integrating sustainable practices into the operational framework will be provided (Seuring & Müller, 2008; Ghobadian et al., 2009).

By achieving these objectives, this dissertation aims to contribute significantly to the body of knowledge on inventory management in the heavy industry sector, particularly within the Greek context. The findings and recommendations are intended to provide practical guidance for industry practitioners and policymakers, helping drive improvements that enhance the efficiency, sustainability, and competitiveness of the Greek heavy industry sector.

2. Literature Review

2.1 Introduction to Inventory Management in Heavy Industry

The management of inventories, which constitutes an integral process, involves strategic planning, tracking, and control to optimize resources, minimize costs, and meet customer demands. In heavy industry, the unique requirements necessitate specialized inventory management practices to ensure smooth operations and maintain profitability. Inventory management is pivotal in heavy industry operations as it directly influences efficiency, cost-effectiveness, and overall productivity (Chopra & Meindl, 2016).

Proper inventory management guarantees that companies maintain the right amount of materials, parts, or products available at the precise times needed to meet production demands, while also minimizing excess or obsolete inventory. Not only does increased efficiency in inventory management lead to a reduction in working capital requirements, necessary to sustain operations, but it also contributes to higher stock market returns, culminating in an overall increase in cash flow (Fullerton et al., 2003; Stevenson, 2020).

Additionally, effective inventory management plays a critical role in enhancing organizational flexibility and responsiveness to market changes, factors that are crucial for maintaining a competitive edge in the dynamic industrial landscape (Sheffi, 2007; Jacobs, Chase, & Lummus, 2014). Adopting advanced technologies such as IoT sensors and predictive analytics can further optimize inventory control, leading to significant improvements in operational efficiencies and profitability (Millar, 2015; Heizer, Render, & Munson, 2017).

The unique characteristics of the heavy industry sector, such as the reliance on heavy machinery, large-scale production, and often lengthy production cycles, make inventory management particularly challenging (Deskera, 2023). Effective inventory management in heavy industry requires a thorough understanding of the specific requirements and constraints of the sector, as well as the implementation of appropriate strategies and technologies. It is critical that companies adopt frameworks that address these unique dynamics to optimize resource allocation and minimize costs (Heizer, Render, & Munson, 2017). Moreover, the adoption of advanced technologies can play a pivotal role in enhancing inventory accuracy and operational responsiveness (Millar, 2015; Jacobs, Chase, & Lummus, 2014).

This dissertation seeks to address the challenges and opportunities related to inventory management in the heavy industry sector, with a particular focus on the case of Greece. By examining the current state of inventory management practices, identifying common challenges faced by heavy industry companies, and proposing strategies for improvement, this research aims to contribute to a more efficient and cost-effective operation within the Greek heavy industry sector. Insights from global best practices and innovative technology implementations in similar contexts will be explored to draw relevant conclusions and recommendations (Vlachos, 2020; Dani, 2015). Such analysis is vital for enhancing operational efficiency and driving cost reductions, which are crucial for sustaining competitiveness in the unstable economic landscape of Greece

2.2 Importance of Inventory Management in Heavy Industry

Inventory management is crucial for the survival and growth of any business, significantly influencing operational effectiveness, financial stability, and competitive edge (Arshad, Sharif, & Arshad, 2017; Cheng, 2024). In heavy industries, effective inventory management ensures a seamless flow of materials, directly impacting financial performance (Chopra & Meindl, 2016).

One key reason for the importance of inventory management in heavy industry is the substantial investment tied up in inventory. Heavy industries handle large volumes of raw materials, components, and finished goods, representing significant capital expenditure. Effective practices optimize resource utilization, minimize the financial burden of excess inventory, and prevent stockouts that disrupt production (Simchi-Levi, Kaminsky, & Simchi-Levi, 2000; Stevenson, 2020).

Recent studies highlight the financial benefits of inventory management. Enhanced efficiency leads to greater cash reserves, facilitating quick supply chain movement and supporting business expansion and technological advancements (Lin, Wang, & Shi, 2022). Efficient inventory management reduces working capital requirements, enhances cash flow, and leads to higher stock market returns (Fullerton, McWatters, & Fawson, 2003).

Maintaining optimal inventory levels boosts production efficiency and customer satisfaction. A steady supply of materials prevents costly downtimes, ensuring timely product availability and bolstering customer satisfaction and loyalty (Chopra & Meindl, 2016; Stevenson, 2020).

Inventory management is integral to cost control and profitability. Excess inventory ties up working capital and incurs storage, depreciation, and obsolescence costs. Insufficient inventory leads to missed sales and premium freight costs. Optimizing inventory levels and implementing effective replenishment strategies balance holding costs and demand requirements, improving profitability (Gattorna, 2010). Advanced technologies like predictive analytics can reduce inventory costs by up to 20% (Wang, Lim, & Zhao, 2019).

Efficient inventory processes enhance company responsiveness to market changes, demand shifts, and supply chain disruptions. By using data insights and industry best practices, heavy industry companies can become more flexible, reduce risks, and stay competitive (Sheffi, 2005; Rushton, Croucher, & Baker, 2017).

Effective inventory management also supports sustainability and corporate social responsibility (CSR). Companies can reduce waste and environmental impact by managing inventory efficiently, using resources more sustainably, and meeting environmental regulations (Ghobadian et al., 2009; Seuring & Müller, 2008).

Technology has revolutionized inventory management. IoT devices provide real-time data on inventory location and status, enhancing visibility and accuracy (Miorandi et al., 2012). RFID technology allows automatic identification and tracking, reducing manual counts and errors (Whitmore, Agarwal, & Xu, 2015). Predictive analytics, powered by AI and machine learning, forecast inventory needs accurately, reducing overstocking and stockouts (Wang, Lim, & Zhao, 2019). AI algorithms predict demand spikes, allowing timely inventory adjustments.

Implementing these technologies improves accuracy and operational efficiency, automating routine tasks and freeing up resources for strategic activities. This leads to cost savings and allows investment in innovation (Christopher, 2016).

Robust inventory management systems enhance organizational flexibility and responsiveness, crucial in heavy industries with long production cycles and fluctuating demand. Companies can quickly adjust inventory levels during economic downturns or demand spikes, avoiding stockouts and minimizing holding costs (Simchi-Levi, Kaminsky, & Simchi-Levi, 2000).

Effective inventory management improves supplier relationships. Accurate records and forecasts lead to better collaboration and reliable deliveries, essential for just-in-time (JIT)

systems that reduce storage needs and holding costs (Monczka et al., 2015; Heizer, Render, & Munson, 2017).

Managing inventory in heavy industry is key to improving operational efficiency, controlling costs, ensuring customer satisfaction, and staying competitive. As heavy industries evolve with technological advancements, changing market conditions, and new regulations, effective inventory management remains central to sustainable growth and success (Christopher, 2016). Emerging technologies like machine learning and blockchain further enhance inventory accuracy and supply chain transparency (Kache & Seuring, 2017; Wang, Lim, & Zhao, 2019).

Strong inventory management practices are critical for navigating global supply chains, geopolitical factors, and market instability. Continuously improving inventory management ensures smooth operations and financial health, helping heavy industry firms remain successful and sustainable over the long term (Jonsson & Mattsson, 2016)

2.3 Challenges and Requirements in Inventory Control

Inventory management in heavy industries presents complex challenges requiring specialized strategies and advanced technologies. One primary challenge is managing intricate supply chains involving numerous suppliers and subcontractors. Coordinating inventory levels and delivery schedules across these entities often leads to inefficiencies and delays, complicating production flow (Christopher, 2016; Chopra & Meindl, 2016). The scale and complexity of these supply chains necessitate robust systems capable of real-time data processing and dynamic adjustment.

Supply chain disruptions from inconsistent supplier performance, quality issues, geopolitical tensions, and economic instability further complicate inventory management. These disruptions cause delays, increased costs, and production stoppages. Companies must diversify their supplier base, maintain safety stock, and invest in supply chain visibility tools to mitigate these risks (Christopher, 2016). Enhanced visibility allows for better monitoring and quicker response to disruptions, minimizing their impact on operations.

The dynamic nature of engineering and manufacturing processes in heavy industries adds complexity. Frequent changes to product designs, specifications, and material requirements necessitate flexible inventory management systems. Advanced systems incorporating real-

time data analytics and predictive modeling can help companies adjust inventory strategies swiftly (Jacobs, Chase & Lummus, 2014; Stevenson, 2020).

Regulatory and environmental considerations impose additional requirements. Compliance with environmental regulations often necessitates changes in inventory practices, such as reducing hazardous materials and managing waste efficiently. Globalization introduces further complexities, requiring companies to navigate cross-border logistics, varying regulations, and longer supply chains. Effective inventory management in this context requires understanding international standards and adapting to different regulatory environments (Stevenson, 2020).

Human factors, such as employee training and organizational culture, play significant roles. Continuous training programs equip employees with skills to manage advanced systems and respond to industry challenges. Cultivating a culture emphasizing inventory accuracy and efficiency drives improvements (Krajewski, Ritzman & Malhotra, 2020). Leadership commitment to new technologies and best practices is crucial.

Heavy industries often operate under economic pressures and financial constraints. Fluctuations in commodity prices, exchange rates, and economic cycles impact raw material costs and inventory holding. Companies need strategies to mitigate financial risks, such as using financial hedging, optimizing inventory turnover, and implementing cost-control measures (Chopra & Meindl, 2016).

Advanced technologies like IoT, AI, and blockchain offer promising solutions. IoT provides real-time data on inventory conditions and movements, enhancing visibility and control. AI and machine learning algorithms predict demand patterns and optimize inventory levels, reducing overstocking and stockouts. Blockchain ensures transparency and traceability, preventing fraud and enhancing trust (Whitmore, Agarwal & Xu, 2015; Miorandi et al., 2012).

Effective inventory management requires seamless integration and collaboration across departments and stakeholders. Coordination between procurement, production, sales, and logistics ensures inventory levels align with production schedules and market demand. Collaborative planning, forecasting, and replenishment (CPFR) initiatives enhance coordination and lead to accurate demand forecasts and replenishment plans (Simchi-Levi, Kaminsky & Simchi-Levi, 2000).

In conclusion, managing inventory in heavy industries involves navigating numerous challenges requiring advanced strategies and technologies. Companies must invest in flexible, adaptive systems and robust risk management practices. By addressing these challenges, companies can enhance inventory management, reduce costs, and improve operational efficiency. Integration of advanced technologies, continuous employee training, and a strong organizational culture are essential for achieving inventory management excellence.

2.4 Inventory Management in Greece's Heavy Industry

Managing inventory levels during uncertain times requires careful planning and strong relationships with suppliers and logistics companies. It is essential to take proactive steps to reduce risks and ensure a steady supply of materials. Despite the existing challenges, the Greek heavy industry sector holds significant potential for growth and innovation. Utilizing advanced digital technologies, such as cloud-based inventory management systems, predictive analytics, and blockchain-enabled supply chain platforms, can greatly enhance transparency, tracking, and efficiency (Heizer, Render, & Munson, 2021; Simchi-Levi, Kaminsky, & Simchi-Levi, 2000). These technologies enable companies to monitor their inventory in real-time, forecast future needs accurately, and ensure that every part of the supply chain is traceable and secure.

Moreover, fostering a culture of continuous improvement and investing in employee training and development are essential. By encouraging workers to always look for better ways to do things and providing them with the necessary skills and knowledge, companies can drive innovation and build resilience in the sector (Krajewski, Ritzman, & Malhotra, 2020; Stevenson, 2020). This ongoing focus on improvement and learning helps businesses adapt to changes, overcome challenges, and thrive in a competitive environment. Regular training programs and workshops can help employees stay updated with the latest industry trends and technologies, ensuring that they can contribute effectively to the company's goals.

The Greek heavy industry sector operates within a unique socio-economic context characterized by fiscal austerity measures, political instability, and regulatory constraints. These factors create a complex business environment where companies must navigate intricate bureaucratic processes, trade barriers, and currency fluctuations that significantly influence inventory management practices (Papadopoulos & Merali, 2020). Additionally, the reliance on imports for raw materials, components, and machinery subjects companies in this

sector to various supply chain risks, including transportation delays, customs clearance issues, and instability in currency exchange rates (Stevenson & Spring, 2017). These challenges necessitate a strategic approach to inventory management, where companies must be prepared to handle disruptions and adapt quickly to changing conditions.

Adding sustainable practices to inventory management is also becoming more popular in Greek heavy industries. Using green inventory practices helps companies follow environmental rules and improves their reputation and efficiency (Ghobadian et al., 2009). For example, programs like reverse logistics and recycling can cut down on waste and reduce the costs of disposing of old materials and buying new ones (Seuring & Müller, 2008). Sustainable practices not only benefit the environment but also make operations more efficient and cost-effective, supporting long-term success. Companies can implement energy-efficient storage solutions, minimize the use of hazardous materials, and adopt eco-friendly packaging to further enhance their sustainability efforts.

The economic landscape in Greece also influences inventory management strategies. The financial crisis and subsequent austerity measures have led to constrained budgets and reduced capital expenditure, forcing companies to optimize their inventory levels meticulously (Vlachos, 2020). This environment has spurred innovation and efficiency, driving companies to adopt lean inventory practices and invest in technologies that provide better inventory visibility and control (Dani, 2015). Lean inventory practices focus on reducing waste, improving process efficiencies, and maximizing value, which are crucial for maintaining profitability in a challenging economic climate.

In conclusion, the importance of inventory management in heavy industry cannot be overstated. It is a critical driver of operational efficiency, cost control, customer satisfaction, and competitiveness. As heavy industries continue to evolve in response to technological advancements, market dynamics, and regulatory changes, effective inventory management will remain a central focus for driving sustainable growth and success. Recent studies underscore the importance of integrating emerging technologies such as machine learning and blockchain, which can further refine inventory accuracy and enhance supply chain transparency. Specifically, Wang, Lim, & Zhao (2019) highlight how these technologies improve data-driven decision-making, while Kache and Seuring (2017) demonstrate their practical benefits in adapting to new operational challenges in the digital age. These

advancements highlight the necessity for continuous improvement and adaptation in inventory management practices to meet the evolving challenges of the digital era.

2.5 Global Best Practices in Inventory Management

Heavy industries worldwide have adopted best practices to optimize inventory management and enhance supply chain performance. A notable trend is the shift toward demand-driven supply chains, where companies prioritize customer demand signals over traditional forecast-based planning. By using real-time demand data and collaborative forecasting, companies can reduce lead times, minimize stockouts, and improve customer satisfaction (Jacobs, Chase, & Lummus, 2014).

Another best practice is implementing advanced inventory optimization algorithms and simulation tools. These tools help companies analyze complex supply chain scenarios, identify bottlenecks, and optimize inventory policies to achieve cost savings and meet service level targets (Axsäter, 2015). By simulating various strategies in a virtual environment, companies can make informed decisions and mitigate risks associated with inventory holding costs and stockouts.

Moreover, heavy industries are increasingly adopting sustainable inventory management practices aimed at reducing waste, minimizing environmental impact, and promoting circular economy principles. Initiatives such as reverse logistics, remanufacturing, and product life cycle management extend the lifespan of products and materials, reduce resource consumption, and enhance sustainability (Guide & Van Wassenhove, 2009; Seuring & Müller, 2008).

Technological advancements have revolutionized inventory management practices. Technologies like RFID, IoT, and blockchain enhance inventory tracking, real-time data visibility, and supply chain transparency (Whitmore, Agarwal, & Xu, 2015). RFID allows automatic identification and tracking, IoT provides real-time data and insights, and blockchain ensures secure, transparent record-keeping. These technologies help monitor inventory levels accurately, predict demand, and streamline operations, achieving higher efficiency and reduced costs (Miorandi, Sicari, De Pellegrini, & Chlamtac, 2012).

Incorporating these technologies helps companies maintain a competitive edge by adapting quickly to market changes and customer preferences. Real-time data enables better decision-making and faster response times, crucial in today's fast-paced environment. For instance, real-time alerts can prompt timely reorders to avoid stockouts and keep customers satisfied.

Overall, adopting these best practices and technologies is essential for optimizing inventory management in heavy industries. Focusing on demand-driven supply chains, using advanced optimization tools, implementing sustainable practices, and leveraging cutting-edge technologies enhance operational efficiency, reduce costs, and support environmental sustainability. This comprehensive approach prepares heavy industries to meet modern marketplace challenges and achieve long-term success (Waller & Fawcett, 2013; Bowersox, Closs, & Cooper, 2013).

2.6 Potential Digital Solutions for Inventory Management

Managing inventory levels in the heavy industry sector during uncertain times requires meticulous planning and strong supplier relationships. Companies must adopt proactive strategies and leverage advanced digital technologies to mitigate risks and ensure a steady supply of materials. Despite its challenges, the Greek heavy industry sector holds significant potential for growth and innovation through digital solutions.

Cloud-based inventory management systems offer real-time data storage and accessibility, enabling effective monitoring across multiple locations. These systems improve decision-making and coordination, allowing seamless scaling of operations. Additionally, they include advanced analytics and reporting tools to optimize inventory levels and reduce carrying costs (Heizer, Render & Munson, 2021).

Predictive analytics uses historical data, statistical algorithms, and machine learning to provide accurate demand forecasts by analyzing patterns and trends. This helps maintain optimal inventory levels and minimizes risks of overstocking or stockouts, enhancing responsiveness to market changes and reducing holding costs (Waller & Fawcett, 2013).

Blockchain technology enhances transparency and traceability across the supply chain with an immutable ledger of inventory movements. This secure method reduces fraud and errors, ensuring product authenticity and streamlining inventory reconciliation. Improved security and trust can enhance supplier relationships and regulatory compliance (Kshetri, 2018).

The Internet of Things (IoT) connects physical devices to the internet, allowing data collection and sharing. IoT devices like RFID tags and sensors provide real-time visibility into inventory levels and conditions, enabling automated tracking and reducing manual checks and errors. They also monitor environmental conditions to ensure optimal storage (Whitmore, Agarwal & Xu, 2015).

Artificial intelligence (AI) and machine learning enhance inventory management by automating tasks, optimizing inventory levels, and improving decision-making. AI-powered systems automate replenishment processes, aligning stock levels with demand for greater efficiency and accuracy (Choi, Wallace & Wang, 2018).

Robotic process automation (RPA) uses software robots to automate repetitive tasks like order processing and data entry. This improves accuracy and speed, freeing workers for strategic activities and reducing operational costs (Aalst, Bichler & Heinzl, 2018).

Big data analytics analyzes large data sets to uncover patterns and insights. In inventory management, it provides valuable insights into customer behavior, market trends, and supply chain performance, helping make informed decisions about inventory levels and procurement strategies (Manyika et al., 2011).

Digital twins are virtual replicas of physical systems providing real-time insights into inventory levels and conditions. They allow companies to simulate, analyze, and optimize inventory processes, testing different scenarios without disrupting operations (Tao et al., 2018).

Adopting these advanced digital technologies can greatly enhance inventory management in the Greek heavy industry sector. Cloud-based systems, predictive analytics, blockchain, IoT, AI, RPA, big data analytics, and digital twins offer unique benefits to improve transparency, efficiency, and responsiveness. Leveraging these technologies addresses inventory management challenges, reduces costs, and achieves operational excellence. Integrating these digital solutions is essential for the growth and innovation of the Greek heavy industry sector, enabling it to compete globally.

3. Methodology

This study employs a comprehensive quantitative research approach to analyze inventory management practices within the Greek heavy industry sector. Using a structured questionnaire administered through Google Forms, the study collects data efficiently from a large and geographically dispersed sample, enhancing the generalizability of the findings. The questionnaire, developed with input from industry experts, captures detailed information on inventory practices and challenges. Stratified random sampling ensures proportional representation of different industry segments, reducing sampling error. Data analysis is conducted using SPSS and includes reliability assessments like Cronbach's alpha to ensure accurate interpretation of the data. This thorough methodology provides objective, reliable, and statistically valid insights into inventory management practices and potential improvements.

3.1 Research Approach

This study adopts a quantitative research approach to analyze inventory management practices in the Greek heavy industry sector. This methodology is chosen for its robustness in handling large datasets and providing objective, reliable, and statistically valid results to inform strategic decisions. By focusing on numerical data, this approach identifies clear patterns, relationships, and trends in inventory management (Creswell & Creswell, 2017; Trochim, Donnelly, & Arora, 2016).

Quantitative research suits this study for several reasons. First, it measures variables systematically and standardizedly, ensuring data reliability and validity. Second, it enables hypothesis and theory testing with statistical rigor, allowing generalization from the sample to the population (Bryman, 2016). Techniques like regression analysis, hypothesis testing, and variance analysis help understand relationships among variables and their effects on inventory management.

The quantitative approach is scalable and easily replicable, allowing data collection from many respondents to ensure representative findings (Fowler, 2013). This is important in Greek heavy industries, where practices vary across sectors and regions. The approach captures these variations, providing industry-wide insights.

Additionally, quantitative methods facilitate advanced statistical techniques to uncover underlying patterns, identify key factors influencing inventory management, and develop predictive models for decision-making (Hair et al., 2014). These methods ensure robust and reliable data, enabling meaningful conclusions and informed recommendations (Cooper & Schindler, 2014). They also allow comparison of results across different studies and contexts, enhancing validity and applicability (Fowler, 2013; Hair et al., 2014).

In summary, the quantitative research approach is chosen for its ability to provide rigorous, objective, and comprehensive analysis of inventory management practices in the Greek heavy industry sector. It allows systematic measurement and analysis of variables, hypothesis testing, and generalization of findings, making it ideal for this study (Bryman, 2016; Creswell & Creswell, 2017; Sekaran & Bougie, 2016).

3.2 Rationale for Choosing Quantitative Approach

The decision to use a quantitative approach was driven by the need for objective, quantifiable data from a large sample of respondents in various Greek heavy industry companies. This method provides a structured framework for data collection and analysis, ensuring consistent, replicable, and scalable assessments (Bryman, 2016; Fink, 2017).

Quantitative research is crucial for statistical generalization. By applying statistical tests, researchers can draw conclusions about the population based on sample data, enhancing the validity and reliability of findings. This approach is vital in heavy industries, where slight improvements in inventory management can significantly enhance productivity and profitability (Cooper & Schindler, 2014).

The quantitative approach supports advanced statistical techniques like factor analysis, cluster analysis, and regression analysis. These techniques help understand complex interactions between inventory management variables, identify patterns, and predict trends, providing strategic insights essential for long-term planning in heavy industries. Such insights are particularly valuable in Greece, where economic fluctuations and market dynamics present unique challenges (Sekaran & Bougie, 2016).

This approach aligns with the need for empirical rigor in testing theoretical models of inventory management. Quantitative methods allow systematic testing of hypotheses and validation of theoretical frameworks using statistical techniques like regression analysis and

structural equation modeling (Hair et al., 2014; Kline, 2015). This rigor establishes causal relationships and generalizable findings, enhancing the robustness of the study's conclusions (Creswell & Creswell, 2017).

Additionally, the quantitative approach contributes to academic knowledge and practical applications, helping industry leaders make data-driven decisions that align with best practices in global supply chain management (Chopra & Meindl, 2016; Christopher, 2016). By providing actionable insights and evidence-based recommendations, the research helps organizations optimize inventory management strategies, improve operational efficiency, and enhance competitive advantage in a dynamic market (Jonsson & Mattsson, 2016).

3.3 Methods Used (Stratified Random Sampling)

To ensure the representativeness of the sample and capture the diversity of inventory management practices across different segments of the heavy industry sector in Greece, this study employs stratified random sampling. This advanced sampling technique involves dividing the target population into distinct subgroups, known as strata, based on specific, relevant characteristics such as industry segment (e.g., manufacturing, construction), company size, and geographic location. Stratified random sampling is renowned for its effectiveness in enhancing the precision of survey results by ensuring that each subgroup is proportionally represented, thereby reducing sampling error (Saunders, Lewis, & Thornhill, 2019; Kothari, 2004; Fowler, 2013).

The method's utility in improving the accuracy and reliability of results comes from its ability to control for variability within a heterogeneous population, making it particularly suitable for studies like ours where the population can vary significantly across different industrial sectors. This approach not only minimizes sampling bias but also increases the generalizability of the findings across the entire sector, ensuring that no significant subgroup is underrepresented or overlooked (Babbie, 2016; Thompson, 2012).

Employing stratified random sampling addresses the unique challenges and opportunities in inventory management that might differ markedly between subsectors within Greek heavy industries. For instance, stratifying by industry segment allows the research to discern how inventory management strategies may vary between sectors with different operational rhythms and economic pressures (Leedy & Ormrod, 2019; Dillman, Smyth, & Christian,

2014). This granularity is crucial for developing targeted recommendations that are both effective and practical within specific industrial contexts.

In this study, the population was divided into strata based on industry segments, including manufacturing, construction, logistics and other sectors, as well as company sizes ranging from small enterprises to very large corporations. By ensuring that each stratum was proportionately represented in the sample, the study was able to capture a wide range of perspectives and practices, reflecting the true diversity of the Greek heavy industry sector. This method was crucial for developing targeted recommendations that are both effective and practical within specific industrial contexts.

By ensuring the inclusion of a diverse range of participants, stratified random sampling bolsters the study's aim to provide a comprehensive overview of inventory management practices, their effectiveness, and areas needing improvement across Greece's heavy industry landscape.

3.4 Development of Structured Questionnaire

A structured questionnaire was developed to collect data on current inventory management practices, challenges, and opinions on potential improvements within the Greek heavy industry sector. The questionnaire consists of both closed-ended and Likert scale questions designed to elicit specific responses from participants while allowing for quantitative analysis of attitudes and perceptions (Denscombe, 2014). The design of the structured questionnaire is rooted in the theoretical frameworks of survey methodology and psychometrics. A well-constructed questionnaire is essential for obtaining reliable and valid data that can accurately reflect the underlying constructs being measured (Fowler, 2013). The use of closed-ended questions facilitates the quantification of responses, making it easier to analyze the data statistically. Likert scale questions, which ask respondents to indicate their level of agreement with a statement on a multi-point scale, are particularly useful for measuring attitudes and perceptions (Likert, 1932).

The initial step in developing the questionnaire involved an extensive review of existing literature on inventory management practices, particularly within the heavy industry sector. This review helped identify key areas of interest and common challenges faced by companies in this sector. Additionally, consultations with industry experts and practitioners were

conducted to ensure the questionnaire covered relevant topics and was aligned with current industry practices and concerns (Bryman, 2016). To ensure the content validity of the questionnaire, a panel of experts in inventory management and survey methodology reviewed the initial set of questions. They assessed the relevance, clarity, and comprehensiveness of each item, providing feedback and suggestions for improvement. This step was crucial to ensure that the questionnaire would have reliability and credibility and it would effectively capture the data needed to address the research objectives (Dillman, Smyth, & Christian, 2014).

A pilot test was conducted with a small sample of respondents drawn from the target population. The purpose of the pilot test was to identify any issues with the questionnaire, such as ambiguous wording, confusing instructions, or technical problems with the online survey platform. Feedback from the pilot test was used to refine the questionnaire, ensuring it was user-friendly and that respondents could complete it without difficulty (Fink, 2017). The final questionnaire is structured into several sections, each focusing on different aspects of inventory management. This structure helps organize the questions logically and ensures that all relevant areas are covered comprehensively. The demographic information section collects basic information about the respondents, such as their role in the company, years of experience, and the specific industry segment they work in. This data is crucial for analyzing responses in the context of different demographic factors (Fowler, 2013).

Questions in the current practices section aim to gather information about the existing inventory management practices in the respondents' companies. Topics include inventory tracking methods, use of technology, and procedures for inventory control (Monczka, Handfield, Giunipero, & Patterson, 2015). The challenges and requirements section focuses on identifying the main challenges faced by companies in managing their inventories. Questions cover issues such as forecasting accuracy, balancing inventory levels, and dealing with supply chain disruptions (Jacobs, Chase, & Lummus, 2014). In the potential improvements section, respondents are asked to provide their opinions on potential improvements to inventory management practices. This includes questions about the adoption of new technologies, changes in procedures, and training needs (Heizer, Render, & Munson, 2017). The digital solutions and technology adoption section explores the extent to which companies are using digital technologies in their inventory management practices. Questions focus on the use of inventory management software, RFID, IoT, and other digital solutions (Whitmore, Agarwal, & Xu, 2015).

Ethical considerations were integral to the development and administration of the questionnaire. Participants were informed about the purpose of the study, assured of the confidentiality and anonymity of their responses, and given the option to withdraw at any time without any consequences. Informed consent was obtained from all participants before they completed the survey (Babbie, 2016). The online survey was administered using a reputable survey platform that supports advanced features such as logic branching, which ensures that respondents only see questions relevant to their previous answers. This functionality helps streamline the survey experience and reduces respondent burden, leading to higher quality data (Couper, 2008).

To ensure the reliability and validity of the data collected, several measures were taken. The questionnaire was pre-tested with a pilot sample as mentioned earlier to identify and correct any issues. Reliability was ensured by refining the questionnaire based on pilot test feedback, which helped identify and resolve ambiguous wording, confusing instructions, or technical problems. Validity was further ensured through content validation by experts and by aligning the questions with established theoretical frameworks and best practices in inventory management research (Hair et al. 2014).

In conclusion, the structured questionnaire was meticulously developed through a rigorous process involving literature review, expert consultation, pilot testing, and thorough validation. These steps ensured that the questionnaire was comprehensive, reliable, and valid, capable of capturing the necessary data to provide insights into inventory management practices, challenges, and potential improvements in the Greek heavy industry sector.

3.5 Data Collection Process

Data collection was conducted through online surveys administered to employees working in various roles within heavy industry companies in Greece. The use of online surveys was chosen for their efficiency, cost-effectiveness, and ability to reach a large and geographically dispersed sample. This approach also allowed for easy distribution and collection of data, facilitating a streamlined research process (Couper, 2008).

Participants were selected using purposive sampling techniques, targeting individuals with relevant experience and expertise in inventory management practices. This sampling

approach ensured that the respondents had sufficient knowledge and experience to provide valuable insights into the inventory management practices of their respective organizations (Etikan, Musa, & Alkassim, 2016). Invitations to participate in the survey were sent via email, containing a brief introduction to the study, assurances of confidentiality and anonymity, and a link to the online questionnaire.

To enhance response rates, several strategies were employed. Reminder emails were sent at regular intervals to prompt participants who had not yet completed the survey. Additionally, incentives such as gift vouchers were offered to participants upon completion of the survey, which has been shown to increase participation rates in survey research (Singer & Ye, 2013).

Ethical considerations were a crucial part of the data collection process. Informed consent was obtained from all participants, who were clearly informed about the purpose of the study, the voluntary nature of their participation, and their right to withdraw at any time without any consequences. Measures were taken to ensure the confidentiality and anonymity of the responses, including data encryption and secure storage of survey data (Babbie, 2016). These ethical safeguards were implemented to protect participants' privacy and encourage honest and accurate responses.

The collected data were automatically compiled by the Google Forms platform into a spreadsheet format, facilitating easy export to spreadsheet software for further analysis. This automated process minimized the risk of data entry errors and ensured that the data were ready for analysis immediately upon completion of the survey period (Pallant, 2016). The comprehensive and systematic approach to data collection ensured that high-quality data were gathered, providing a solid foundation for subsequent analysis.

3.6 Data Analysis Techniques

The data analysis process involved several key steps, starting with the application of descriptive statistics to summarize the characteristics of the sample and key variables related to inventory management practices. Descriptive statistics, including measures of central tendency (mean, median) and variability (standard deviation, range), were used to profile respondents and summarize their responses to survey questions (Field, 2018). This initial analysis provided an overview of the data and helped identify any patterns or trends that warranted further investigation.

Google Forms was used to automatically compile the survey responses into a structured format, which was then exported for further analysis. This step included reviewing the distribution of responses and identifying any immediate insights from the collected data.

For more detailed analysis, inferential statistical techniques were employed to identify relationships and test hypotheses regarding the effectiveness of inventory management practices. Regression analysis was used to explore the impact of various factors on inventory management outcomes, allowing for the identification of significant predictors and the estimation of their effects (Hair et al., 2014).

Reliability and validity of the data were ensured through a rigorous review process. Content validity was ensured by having a panel of experts in inventory management review the survey items for relevance and clarity, ensuring the items adequately covered the constructs being measured. Additionally, a pilot test was conducted with a small sample of respondents to identify any issues with the questionnaire, such as ambiguous wording or technical problems, and refine the survey accordingly.

The data analysis process was facilitated by the use of advanced software tools such as Google Forms and spreadsheet software, which provided robust capabilities for handling large datasets, performing complex analyses, and generating visual representations of data. These tools enabled the creation of detailed charts, graphs, and tables to aid in the interpretation and presentation of findings (Pallant, 2016). Key findings from the data analysis were identified and presented, highlighting trends, patterns, and associations between variables. The interpretation of these findings informed subsequent discussions on the implications for inventory management in Greece's heavy industry sector and the development of practical recommendations for optimization.

Overall, the combination of descriptive and inferential statistical techniques, supported by expert validation and pilot testing, ensured a comprehensive and reliable analysis of the data. This thorough approach provided valuable insights into inventory management practices, challenges, and potential improvements within the Greek heavy industry sector, contributing to academic knowledge and offering practical guidance for industry practitioners.

4. Results and Discussion

This section provides an in-depth presentation and analysis of the survey results, focusing on inventory management practices within the Greek heavy industry sector. The objective is to deliver a detailed understanding of the current practices employed by these industries, the challenges they face, and the potential areas for improvement. The analysis aims to extract meaningful insights from the collected data, highlighting patterns and trends that can inform better inventory management strategies. Furthermore, the discussion will explore the implications of these findings, offering practical recommendations for industry practitioners and suggesting directions for future research. The comprehensive examination includes demographic profiling of respondents, evaluation of existing inventory management practices, identification of major challenges, and exploration of innovative solutions and best practices that can enhance operational efficiency and competitiveness in the heavy industry sector. By integrating quantitative data with theoretical perspectives and practical considerations, this section seeks to contribute valuable knowledge to both academic discourse and industry practice in inventory management.

4.1 Descriptive Statistics

This section gives an overview of the survey responses, focusing on who answered and their roles in the Greek heavy industry sector. It shows how many people participated from different industries like manufacturing, construction, and logistics. It also looks at their job levels, from senior positions to entry-level roles, to give insights from various parts of the organizations. The experience levels are divided into early-career, mid-level, experienced, and very experienced professionals. Additionally, it discusses the sizes of the companies, from small to very large, highlighting different challenges and practices.

This detailed profile helps us understand the survey results better, including current inventory management practices, challenges, and potential improvements in the Greek heavy industry sector. By knowing the backgrounds and views of the respondents, we can better analyze the data and make sure the findings apply to different parts of the industry.

4.1.1 Overview of Survey Responses

The survey got a total of 53 responses from professionals in different roles within the Greek heavy industry sector. These respondents came from various parts of the industry, including manufacturing, construction, and logistics, making sure the findings reflect the whole industry, not just one part. The respondents included people from all levels of their organizations, from top managers to operational staff, giving a full view of inventory management practices. They also had different years of experience, from early-career professionals to very experienced experts, providing a wide range of insights. The companies in the survey ranged in size, from small businesses to very large corporations, adding more perspectives from different operational scales. This detailed profile helps us understand the survey results better and ensures that the analysis applies to many different parts of the industry.

4.1.2 Roles and Responsibilities

About 32% of respondents were in senior positions like executives and directors, who make big decisions and set strategies. Another 28% were in mid-level roles, such as department heads and project managers, who turn strategies into action plans. Around 23% were in management positions, like inventory managers, supply chain managers, and operations managers, focusing on daily operations. Nearly 13% were in entry-level positions, such as inventory clerks and procurement officers, handling tasks that keep inventory accurate and efficient.

The survey showed that 25% of respondents worked in the supply chain sector, managing the entire flow of goods and materials. Another 25% were in procurement, responsible for sourcing and buying. About 11% worked in logistics, coordinating the transportation and storage of goods. Approximately 10% each were involved in production and manufacturing, ensuring production schedules and processes matched inventory availability.

The remaining 18% were involved in other functions like material planning, inventory management, production planning, finance, sales, and strategy. These roles add more views on inventory management practices and challenges, helping us fully understand how inventory management affects overall performance and supply chain operations.

4.1.3 Years of Experience

Respondents had different levels of experience in inventory management, giving a full view of the industry. About 25% were early-career professionals with less than five years of experience, bringing new ideas and recent education. Another 28% had five to ten years of experience, combining practical skills and growing expertise, helping bridge strategic plans and operations.

About 25% had eleven to twenty years of experience, offering deep industry knowledge and the ability to spot long-term trends. Nearly 21% had over twenty years of experience, providing extensive insights and solutions based on their long-term exposure to the industry. These veterans are key in mentoring and shaping strategic directions.

Overall, the varied experience levels among respondents enrich the survey data, giving a detailed view of inventory management practices, challenges, and opportunities in the Greek heavy industry sector. The mix of new ideas from early-career professionals and the deep insights from veterans offers a balanced understanding of the industry's current state and future potential.

4.1.4 Company Size

About 13% of respondents were from small enterprises, highlighting their unique challenges and limited resources for inventory management. Despite these issues, small businesses can quickly adapt to market changes. Medium-sized enterprises made up 43% of respondents, balancing agility with the complexities of larger operations. They have more structured systems but still face growth challenges.

Large enterprises, representing almost 8% of respondents, have more resources but struggle with coordinating inventory across multiple departments. They need robust systems to maintain efficiency and accuracy. Very large enterprises comprised 36% of respondents integrate inventory management with global supply chains.

This diverse profile of respondents provides valuable context for interpreting the survey results. Understanding the backgrounds and perspectives of different company sizes helps us better analyze current inventory management practices, challenges, and potential improvements in the Greek heavy industry sector. The varied company sizes ensure the findings are relevant to both small businesses and large corporations.

4.2 Current Inventory Management Practices

The survey shows that most companies in the Greek heavy industry sector use a mix of traditional and modern inventory management practices. Many use inventory tracking systems, and a good number also use digital technologies like ERP systems, RFID, and IoT devices, which improve inventory accuracy and efficiency.

ERP systems are widely used, helping companies integrate various business processes and see real-time inventory levels, reducing the risk of stockouts or overstocking. However, fewer companies use advanced technologies like RFID and IoT, suggesting room for improvement. RFID improves inventory visibility and accuracy by providing real-time data, while IoT devices offer valuable information on inventory conditions like temperature and humidity.

Many companies still rely on traditional methods like manual inventory counts and spreadsheets, which are labor-intensive and prone to errors. This highlights the need for more investment in digital technologies to improve accuracy and reduce administrative work.

The survey found that 43% of respondents agreed and 7.7% strongly agreed that their inventory management system integrates well with other processes, while 34.6% were neutral, and 13.5% either disagreed or strongly disagreed. This shows that while many have integrated systems, some still face challenges. Regarding modern technology, 40.4% agreed and 9.6% strongly agreed they use up-to-date systems, but 21.2% were neutral, and 28.8% either disagreed or strongly disagreed, indicating reliance on outdated systems.

On data accuracy and accessibility, 40.4% agreed and 11.5% strongly agreed, while 17.3% were neutral, and 30.8% either disagreed or strongly disagreed, suggesting improvement is needed. About 44.2% agreed and 11.5% strongly agreed they have clear inventory control procedures, but 28.8% were neutral, and 15.4% either disagreed or strongly disagreed, highlighting the importance of standardized procedures.

For employee training in inventory management, 28.8% agreed and 11.5% strongly agreed, but 34.6% were neutral, and 25% either disagreed or strongly disagreed, showing a mixed approach to training. Effective communication across departments was acknowledged by 34.6% who agreed and 13.5% who strongly agreed, while 28.8% were neutral, and 23.1% either disagreed or strongly disagreed, indicating room for improvement.

Regular review and updating of inventory practices were agreed upon by 32.7% and strongly agreed by 9.6%, while 34.6% were neutral, and 23.1% either disagreed or strongly disagreed, suggesting inconsistencies. Issues with inventory accuracy were faced by 26.9% who agreed and 9.6% who strongly agreed, yet 25% were neutral, and 42.3% either disagreed or strongly disagreed, highlighting common problems with discrepancies between physical stock and records.

Clear accountability for inventory losses was recognized by 32.7% who agreed and 11.5% who strongly agreed, whereas 32.7% were neutral, and 23.1% either disagreed or strongly disagreed, indicating varying levels of accountability. Regarding inventory turnover rates, 28.8% agreed and 11.5% strongly agreed their turnover rate is satisfactory, while 26.9% were neutral, and 13.5% either disagreed or strongly disagreed.

Strategies for handling surplus inventory were acknowledged by 42.3% who agreed and 13.5% who strongly agreed, though 19.2% were neutral, and 25% either disagreed or strongly disagreed, indicating room for improvement. The integration of risk management strategies was confirmed by 30.8% who agreed and 15.4% who strongly agreed, whereas 32.7% were neutral, and 21.2% either disagreed or strongly disagreed.

These findings suggest a strong use of ERP systems but show potential for more advanced technologies like RFID and IoT. Investing in these technologies can improve accuracy, visibility, and efficiency. Overall, Greek heavy industry companies use a mix of old and new practices, and investing in advanced technologies can help modernize inventory management and stay competitive.

4.3 Challenges in Inventory Management

The survey identified key challenges in inventory management for companies in the Greek heavy industry sector. The main issues reported include inaccurate demand forecasting, balancing inventory levels, and timely procurement of materials and components. These challenges are common in the industry.

Accurately forecasting demand is a significant challenge, with 34.6% of respondents agreeing and 28.8% strongly agreeing. Inaccurate forecasts can lead to excess inventory or stockouts, disrupting production and sales. Advanced tools like predictive analytics can help improve demand forecasting.

Balancing inventory levels is another major issue, with 53.8% agreeing and 21.2% strongly agreeing. Companies struggle to maintain the right amount of inventory, avoiding both overstocking and understocking. Techniques like just-in-time (JIT) and economic order quantity (EOQ) can help manage inventory better.

Timely procurement is also crucial, with 40.4% agreeing and 30.8% strongly agreeing. Delays in procurement can disrupt production and increase costs. Strategies like maintaining safety stock and diversifying suppliers can help mitigate these risks.

Other challenges include supply chain disruptions, supplier reliability, inventory shrinkage, and managing multi-layered supply chains. Supply chain disruptions can be mitigated by diversifying suppliers and maintaining safety stock. Supplier reliability issues can be addressed by building strong relationships and engaging in collaborative planning. Inventory shrinkage highlights the need for better security and tracking systems. Managing complex supply chains requires advanced tools for visibility and real-time tracking.

Training for inventory management is provided regularly in only 28.8% of companies, with 34.6% neutral and 25% disagreeing, indicating a need for more staff training. Effective communication about inventory levels is acknowledged by 34.6% of respondents, with 13.5% strongly agreeing, but remains a challenge for many.

Regular review and updating of inventory practices are agreed upon by 32.7% and strongly agreed by 9.6%, suggesting some companies are not keeping practices up to date. Issues with inventory accuracy are frequently reported, highlighting common problems with discrepancies between physical stock and records.

Clear accountability for inventory losses is recognized by 32.7%, with 11.5% strongly agreeing, while 32.7% are neutral and 23.1% disagree. Efficient inventory turnover is agreed upon by 28.8% and strongly agreed by 11.5%.

Handling surplus inventory effectively is acknowledged by 42.3%, with 13.5% strongly agreeing, but there is room for improvement. Integrating risk management strategies into inventory practices is confirmed by 30.8%, with 15.4% strongly agreeing.

These findings highlight the challenges in inventory management for Greek heavy industry companies. Addressing these requires advanced technologies, effective optimization techniques, robust risk management, and strong supplier relationships. By adopting these best

practices, companies can improve inventory management, reduce costs, and enhance operational efficiency.

4.3.1 Priority in Addressing Challenges

The survey responses show how companies prioritize different inventory management challenges. This helps us understand where companies focus their resources and efforts.

Addressing inventory management challenges is a high priority for many companies. According to the survey, 38.5% rated it as a high priority, and 19.2% as a very high priority. Meanwhile, 28.8% were neutral, and 13.5% rated it as a low or very low priority. This shows most companies see the importance of improving inventory management to boost efficiency and competitiveness.

Forecasting demand accurately is also critical. The survey shows 38.5% rated it as a high priority, and 23.1% as a very high priority. However, 19.2% were neutral, and 19.2% rated it as a low or very low priority. Accurate demand forecasting helps minimize excess inventory and avoid stockouts, which can have big financial and operational impacts. Companies are increasingly using advanced forecasting techniques like predictive analytics and machine learning to improve accuracy (Wang, Lim, & Zhao, 2019).

Balancing inventory levels to meet production demands is another high priority. The survey indicates that 42.3% rated it as a high priority, and 23.1% as a very high priority. Meanwhile, 21.2% were neutral, and 13.5% rated it as a low or very low priority. Maintaining the right amount of inventory is crucial to meeting production demands without overstocking or understocking. Companies are focusing on techniques like just-in-time (JIT) inventory systems and economic order quantity (EOQ) models (Heizer, Render, & Munson, 2017).

Minimizing excess or obsolete inventory is also important. According to the survey, 32.7% rated it as a high priority, and 17.3% as a very high priority. However, 26.9% were neutral, and 23.1% rated it as a low or very low priority. Reducing excess or obsolete inventory helps lower holding costs and waste.

Ensuring timely procurement of materials and components is a top priority for many companies. The survey shows that 42.3% rated it as a high priority, and 25% as a very high priority. Meanwhile, 21.2% were neutral, and 11.5% rated it as a low or very low priority. Timely procurement is crucial for smooth production schedules and meeting customer

demands. Companies use strategies like maintaining safety stock, diversifying suppliers, and using supply chain visibility tools (Christopher, 2016).

Improving communication about inventory levels between departments is another focus. The survey indicates that 30.8% rated it as a high priority, and 19.2% as a very high priority. However, 30.8% were neutral, and 19.2% rated it as a low or very low priority. Effective communication ensures all departments are aligned and inventory levels are accurately reflected in planning and operations.

Implementing advanced technology and systems for inventory management is also important. According to the survey, 26.9% rated it as a high priority, and 11.5% as a very high priority. However, 34.6% were neutral, and 26.9% rated it as a low or very low priority. Advanced technologies like RFID, IoT, and ERP systems can significantly improve inventory accuracy, real-time visibility, and efficiency (Whitmore, Agarwal, & Xu, 2015).

These findings highlight the different priorities companies in the Greek heavy industry sector place on addressing inventory management challenges. By focusing on these areas, companies can better allocate their resources to improve practices, reduce costs, and enhance efficiency.

4.3.2 Strategies Employed to Overcome Challenges

To tackle inventory management challenges, companies in the Greek heavy industry sector use various strategies. The survey reveals the specific methods employed to improve inventory management practices.

A common strategy is collaborating with suppliers and partners, used by 69.2% of respondents. This collaboration improves supply chain coordination and reduces disruptions. By working together on planning, forecasting, and replenishment, companies can make more accurate forecasts, shorten lead times, and enhance overall supply chain performance.

Advanced forecasting techniques are also popular, with 42.3% of respondents using them. Techniques like predictive analytics and machine learning help identify patterns in historical data, leading to better demand predictions and optimal inventory levels, reducing the risk of excess inventory or stockouts.

Regular inventory audits and cycle counts are conducted by 40.4% of respondents. These audits help maintain accurate inventory records and catch discrepancies early, ensuring inventory accuracy and preventing errors that can disrupt operations.

Predictive analytics for demand forecasting is used by 30.8% of respondents. This approach provides insights into future demand, helping companies make informed inventory management decisions and align inventory levels with market demands.

Inventory optimization software is employed by 28.8% of respondents. This software helps determine optimal order quantities, minimize holding costs, and reduce stockout risks. It provides real-time visibility into inventory levels, enabling data-driven decisions and improved efficiency.

Only 5.8% of respondents use just-in-time (JIT) inventory systems, which minimize inventory levels by closely coordinating production schedules with demand. While effective, JIT requires highly reliable suppliers and efficient production processes, which may explain its low adoption rate.

Most survey responses focused on the strategies listed above, indicating these are the most common methods used by companies in the Greek heavy industry sector.

These findings show that companies use advanced forecasting techniques, collaborate with suppliers, conduct regular audits, utilize predictive analytics, and employ inventory optimization software to improve inventory management. While JIT systems are less common, they remain a viable option for those who can implement them effectively. Overall, these strategies help companies enhance their inventory practices, reduce costs, and improve operational efficiency.

4.3.3 Effectiveness of Strategies

The survey also assessed how effective different strategies are in addressing inventory management challenges. Knowing the effectiveness helps identify best practices and areas needing improvement.

Overall, 38.5% of respondents rated the strategies as effective, and 13.5% as very effective. Meanwhile, 38.5% were neutral, and 7.7% rated them as ineffective or very ineffective. This suggests most companies find their strategies generally effective, but there's room for improvement.

Implementing advanced forecasting techniques was considered effective by 44.2% and very effective by 13.5%. However, 28.8% were neutral, and 13.5% rated this strategy as ineffective or very ineffective. Advanced forecasting techniques help improve demand accuracy and maintain optimal inventory levels, but further refinement can enhance their impact.

Using inventory optimization software received mixed reviews. While 26.9% rated it as effective, and 17.3% as very effective, 30.8% were neutral, and 25% rated it as ineffective or very ineffective. This software helps manage inventory by determining optimal order quantities and minimizing holding costs. Mixed ratings suggest some companies benefit, while others need better implementation.

Collaborating with suppliers and partners was rated effective by 38.5% and very effective by 21.2%. Meanwhile, 23.1% were neutral, and 17.3% rated it as ineffective or very ineffective. Effective collaboration improves supply chain coordination and reduces disruptions, reflecting the importance of strong supplier relationships.

Implementing just-in-time (JIT) inventory systems had mixed ratings. 38.5% found it effective, and 11.5% very effective, while 32.7% were neutral, and 17.3% rated it as ineffective or very ineffective. JIT reduces inventory levels by aligning production with demand but depends on reliable suppliers and efficient processes.

Training employees in inventory management was considered effective by 32.7% and very effective by 15.4%. Meanwhile, 32.7% were neutral, and 19.2% rated it as ineffective or very ineffective. Training is crucial for maintaining high standards and efficiency, but there's potential for improvement in implementation.

Conducting regular inventory audits and cycle counts was rated effective by 32.7% and very effective by 13.5%. However, 32.7% were neutral, and 21.2% rated this strategy as ineffective or very ineffective. Regular audits help maintain accurate inventory records and identify discrepancies early.

Using predictive analytics for demand forecasting received mixed reviews. 30.8% rated it as effective, and 13.5% very effective, while 42.3% were neutral, and 13.5% rated it as ineffective or very ineffective. Predictive analytics helps forecast demand, but some companies need better implementation.

Implementing inventory turnover ratio analysis had varied ratings. 9.6% found it effective, while 5.8% rated it as ineffective or very ineffective, and 7.7% were neutral. This suggests limited impact, possibly due to inadequate implementation or lack of integration.

These findings show the varying effectiveness of different strategies in addressing inventory management challenges. Identifying the most effective strategies, like collaborating with suppliers and using advanced forecasting techniques, can help companies focus on these areas for better results. Areas with mixed effectiveness, like using inventory optimization software and conducting audits, may need further improvement. These insights can help companies in the Greek heavy industry sector optimize inventory management and improve efficiency.

4.4 Potential Improvements and Best Practices

The survey suggests several ways for companies in the Greek heavy industry sector to improve their inventory management. One key area is adopting digital technologies like RFID, IoT, and advanced analytics. According to the survey, 73% of respondents said accurate demand forecasting is a major challenge, showing the need for technologies that provide real-time visibility and improve forecasting accuracy.

Implementing sophisticated inventory optimization techniques is another potential improvement. Tools like JIT inventory systems, EOQ models, and vendor-managed inventory (VMI) can help reduce holding costs, minimize stockouts, and improve efficiency. For instance, 48% of respondents emphasized the need to balance inventory levels for production demands, highlighting the opportunity for these techniques.

Training programs for inventory management are also crucial. The survey indicated that only 30% of respondents felt they received regular training, suggesting a need for more training programs. Ongoing training on the latest techniques and technologies can help employees manage inventory better. Effective training should cover demand forecasting, inventory optimization, and using digital tools.

Collaboration with suppliers and supply chain partners is another best practice. By establishing strong relationships and engaging in collaborative planning, companies can improve coordination and reduce disruptions. The survey showed that 33% of respondents identified enhancing supplier collaboration as key. Sharing information about demand

forecasts and inventory levels with suppliers can lead to more accurate forecasts and better supply chain performance.

Adopting sustainability practices in inventory management, like reducing waste and promoting the circular economy, can improve efficiency and meet regulatory requirements. The survey revealed that 46% of respondents believe enhancing sustainability practices is essential. Strategies include recycling, reusing materials, and designing products for easier recovery. These practices can reduce environmental impact and improve company reputation.

Improved communication about inventory levels between departments is also important. The survey showed that 38% of respondents think communication needs enhancement. Effective communication ensures accurate inventory data sharing across departments, reducing errors and improving coordination.

The survey also evaluated the effectiveness of various strategies. Implementing advanced forecasting techniques was considered effective by 44.2% of respondents. Using inventory optimization software was rated effective by 26.9%. Collaborating with suppliers received positive feedback, with 38.5% finding it effective. However, JIT inventory systems had mixed reviews, with 38.5% finding it effective, but 32.7% were neutral.

In summary, potential improvements and best practices for inventory management in the Greek heavy industry sector include adopting advanced digital technologies, enhancing training programs, improving supplier collaboration, and integrating sustainable practices. Focusing on these areas can enhance inventory management, reduce costs, and improve efficiency. Addressing technology implementation challenges and continuously updating tools will be crucial for leveraging their full potential.

4.5 Digital Solutions and Technology Adoption

Adopting digital solutions and technology in inventory management is crucial for improving efficiency, accuracy, and overall performance. As companies in the Greek heavy industry sector face modern supply chain complexities, using advanced technologies is key to staying competitive. Technologies like Inventory Management Software (IMS), RFID, IoT sensors, and cloud-based platforms provide real-time visibility, streamline operations, and enhance decision-making.

This section explores how these technologies are used by companies, their perceived effectiveness, and the reasons for their adoption. It also discusses the challenges faced during implementation and use, providing a comprehensive view of the technological landscape in the industry.

Survey responses help identify the most commonly used technologies and their impact on inventory management. Understanding these dynamics highlights best practices and areas needing improvement. The motivations for adopting digital solutions include improved efficiency, cost savings, better accuracy, enhanced decision-making, and gaining a competitive edge.

Challenges in technology adoption include integration issues with existing systems, resistance to change, technical difficulties, high initial costs, and data security concerns. These insights are crucial for developing strategies to overcome these challenges and ensure successful implementation.

The frequency with which companies assess and update their digital tools to keep up with industry advancements is also discussed, along with potential new digital solutions that could further improve inventory management. This analysis provides a roadmap for companies looking to optimize their inventory management through technology

4.5.1 Extent of Technology Usage

The survey results show how widely digital technologies are used in inventory management by companies in the Greek heavy industry sector. Respondents rated their use of these technologies on a scale from 1 (Strongly Disagree) to 5 (Strongly Agree). The findings highlight current adoption levels of key technologies essential for efficiency, accuracy, and overall performance.

Inventory management software is crucial for accurate records and optimizing inventory levels. The survey shows 13.5% strongly disagree, 11.5% disagree, 23.1% are neutral, 23.1% agree, and 28.8% strongly agree they use this software extensively. While 51.9% agree or strongly agree, 25% disagree or strongly disagree, suggesting room for more adoption.

RFID and barcode technologies improve tracking and accuracy. The survey reveals 13.5% strongly disagree, 21.2% disagree, 15.4% are neutral, 34.6% agree, and 15.4% strongly agree

they use these technologies. While 50% agree or strongly agree, 34.7% do not, highlighting an opportunity for broader use.

Cloud-based inventory platforms offer real-time data access and improved collaboration. The survey shows 21.2% strongly disagree, 11.5% disagree, 26.9% are neutral, 28.8% agree, and 11.5% strongly agree they use these platforms. While 40.3% agree or strongly agree, 32.7% are neutral, and 32.7% disagree or strongly disagree, indicating growth potential.

AI for demand forecasting can enhance prediction accuracy by analyzing complex data patterns. The survey indicates 38.5% strongly disagree, 15.4% disagree, 25% are neutral, 9.6% agree, and 11.5% strongly agree they use AI. Only 21.1% agree or strongly agree, with a majority (53.9%) not using AI to its full potential.

Overall, these findings show that while some companies have adopted digital technologies, there is still much potential for further use and integration. Mixed levels of technology usage highlight opportunities for companies to use advanced digital tools more effectively, leading to better efficiency, accuracy, and competitiveness. Continued investment in digital solutions is needed to fully realize their benefits and address inventory management challenges.

4.5.2 Effectiveness of Digital Solutions

The survey assessed the effectiveness of various digital solutions in improving inventory management. Respondents rated the effectiveness of these technologies on a scale from 1 (Very Ineffective) to 5 (Very Effective). The results show how different technologies are perceived.

Inventory management software is widely seen as effective. According to the survey, 9.6% rated it as very ineffective, and 9.6% as ineffective. However, 13.5% were neutral, while 40.4% found it effective, and 46.2% rated it as very effective. This indicates that 86.6% of respondents view inventory management software as effective or very effective.

RFID and barcode technology improve inventory tracking and accuracy. The survey shows that 9.6% rated these technologies as very ineffective, and 15.4% as ineffective. Meanwhile, 19.2% were neutral, 40.4% found them effective, and 15.4% rated them as very effective. While 55.8% find RFID or barcode technology effective or very effective, 25% do not, suggesting room for improvement or better integration.

Cloud-based inventory platforms offer real-time data access and improved collaboration. The survey responses indicate that 15.4% rated these platforms as very ineffective, and 7.7% as ineffective. Additionally, 34.6% were neutral, 30.8% found them effective, and 11.5% rated them as very effective. While 42.3% see cloud-based platforms as effective, 23.1% view them as ineffective or very ineffective, indicating potential for better use.

AI for demand forecasting can enhance prediction accuracy by analyzing complex data patterns. The survey results reveal that 15.4% rated AI as very ineffective, and 13.5% as ineffective. A substantial portion, 44.2%, were neutral, while 15.4% found it effective, and 11.5% rated it as very effective. These findings suggest that while AI has potential benefits, only 26.9% see it as effective or very effective, with many respondents neutral or negative.

Overall, these findings indicate that while some digital solutions like inventory management software are widely seen as effective, others like AI for demand forecasting and cloud-based platforms have mixed reviews. This underscores the importance of not only adopting these technologies but also ensuring they are well-integrated and fully utilized to realize their benefits in inventory management.

4.5.3 Reasons for Adopting Digital Solutions

Companies in the Greek heavy industry adopt digital inventory solutions for several key reasons. These motivations highlight the strategic benefits of digital transformation.

Improved efficiency is a primary reason, with 67.3% of respondents citing it. Digital tools streamline processes, reduce errors, and speed up operations, improving inventory management.

Cost savings are crucial, with 75% mentioning this benefit. Automation and optimization reduce holding costs and waste, boosting financial performance and profitability.

Better accuracy in inventory tracking is important, with 59.6% highlighting it. RFID and barcode systems provide real-time visibility, reducing discrepancies and ensuring reliable records for planning.

Enhanced decision-making is valued by 46.2% of respondents. Digital tools offer data and analytics for informed decisions, improving forecasting, stock levels, and supply chain efficiency.

Gaining a competitive advantage is noted by 38.5%. Digital solutions enable better service, shorter lead times, and optimal inventory levels, attracting customers and driving growth.

Some respondents mentioned other reasons or no adoption at all, indicating that while many prioritize digital transformation, some have yet to start.

In summary, the main reasons for adopting digital inventory solutions in the Greek heavy industry are improved efficiency, cost savings, better accuracy, enhanced decision-making, and competitive advantage. These motivations show the strategic importance of digital transformation in inventory management.

4.5.4 Challenges in Implementation

Implementing digital solutions for inventory management comes with challenges. Understanding these challenges helps identify barriers to successful adoption and integration.

Integration with existing systems is a major challenge, with 59.6% of respondents noting this issue. Integrating new digital tools with legacy systems can be complex and time-consuming, requiring adjustments for seamless data flow and compatibility. These challenges can hinder effective use and delay benefits.

Employee resistance to change is another common issue, mentioned by 53.8% of respondents. New digital solutions often require changes in workflows, met with resistance from employees used to traditional methods. Overcoming this requires effective change management, including training, clear communication of benefits, and involving employees in the transition.

Technical difficulties are prevalent, reported by 51.9% of respondents. Issues like software bugs, hardware malfunctions, and connectivity problems can disrupt operations and need dedicated IT support to resolve. Ensuring the necessary technical infrastructure and expertise is crucial.

High initial investment costs were cited by 28.8% of respondents. Upfront costs for digital solutions, including software, hardware, training, and integration, can be substantial. This can be a barrier, especially for smaller companies. Careful evaluation of return on investment and phased implementation can help manage costs.

Data security concerns were mentioned by 13.5% of respondents. Digital solutions involve handling sensitive inventory data, vulnerable to cyber threats. Robust data security measures, such as encryption and access controls, are essential to protect data and maintain trust.

Additional specific issues were highlighted by some respondents. One mentioned that their company's management does not prioritize improving working conditions, affecting digital adoption. Another indicated their company has not adopted any digital solutions, reflecting hesitation or lack of initiative towards digital transformation.

These findings underscore the challenges companies face when implementing digital solutions for inventory management. Addressing these requires strategic planning, technical support, effective change management, and a focus on data security. By understanding and mitigating these challenges, companies can enhance digital adoption, improving inventory management and operational performance.

4.5.5 Frequency of Assessing and Updating Digital Tools

Regular assessment and updating of digital inventory management tools are crucial for staying current with industry advancements and meeting evolving business needs. The survey provides insights into how often companies in the Greek heavy industry sector undertake this process.

According to the survey, 30.8% of respondents said their companies regularly assess and update their digital inventory tools. Regular updates leverage the latest technology, improve functionality, and address issues, helping companies adapt to market changes and maintain a competitive edge.

A larger proportion, 36.5%, reported that their companies occasionally update their digital tools. While occasional updates can help, they may not fully capitalize on rapid technological advancements. More frequent reviews could ensure that inventory management practices stay current and effective.

Almost one third of respondents stated that their companies rarely update their digital inventory tools. Rare updates can lead to outdated technology, inefficiencies, increased errors, and compatibility issues with newer systems. Companies that rarely update risk falling behind competitors who invest in the latest solutions.

None of the respondents indicated their companies never update their digital tools, suggesting that all surveyed companies recognize the importance of some level of review and updating, even if the frequency varies.

In summary, while many companies regularly or occasionally update their digital inventory tools, a notable percentage do so rarely. To keep pace with industry advancements and maintain optimal inventory management, companies should consider more frequent reviews and updates. Regular updates enhance functionality and efficiency, ensuring companies remain agile and responsive to market changes.

4.6 Additional Insights and Improvement Opportunities

This section explores additional insights and improvement opportunities from the survey. Beyond current digital solutions, respondents provided feedback on aspects of inventory management needing enhancement. This section highlights key improvement areas, strategies for enhancements, and barriers to adopting new technologies in the Greek heavy industry sector.

We will examine areas needing the most improvement, the perceived effectiveness of various strategies, openness to new technologies, and significant barriers to adoption. Additionally, we will discuss the impact of these barriers and strategies companies have implemented or considered to overcome them. This analysis aims to provide a roadmap for optimizing inventory management practices and addressing challenges.

Finally, the section includes additional comments or suggestions from respondents, offering further perspectives on potential improvements and industry-specific challenges.

4.6.1 Areas Requiring Improvement

The survey responses highlight several key areas in inventory management needing significant improvement in the Greek heavy industry sector. Accurate demand forecasting is essential, identified by 73.1% of respondents. This aligns inventory levels with market demand, reducing overstocking or stockouts and improving supply chain efficiency. Balancing inventory levels to meet production demands was noted by 48.1%, ensuring smooth production without interruptions. Minimizing excess or obsolete inventory was

prioritized by 36.5%, as excess inventory ties up capital and storage space, while obsolete inventory wastes resources.

Timely procurement of materials is crucial, identified by 44.2% of respondents. Efficient procurement processes maintain uninterrupted production schedules. Enhancing collaboration with suppliers is seen as key by 32.7%, ensuring timely deliveries and responsive supply chain operations. Improving inventory tracking and visibility was also noted by 32.7% of respondents, with accurate and real-time tracking aiding in informed decision-making and efficiency. Optimizing warehouse layout and organization, highlighted by 42.3%, significantly impacts the speed and accuracy of inventory handling and storage.

Implementing lean inventory management practices, noted by 28.8%, reduces waste and improves efficiency. Streamlining inventory replenishment processes, important for 17.3%, maintains optimal inventory levels, reducing stockouts and excess inventory. Enhancing sustainability practices in inventory management was highlighted by 46.2%, with sustainable practices improving environmental performance and compliance. One respondent emphasized the need for greener production practices.

The emphasis on accurate demand forecasting and balancing inventory levels underscores persistent challenges in achieving inventory optimization, often compounded by unpredictable market demands and supply chain disruptions. Enhancing supplier collaboration and improving tracking and visibility reflects a need for integrated, transparent operations. The focus on sustainability suggests a commitment to environmental responsibility, driving future innovations. The lower emphasis on lean management and replenishment indicates potential underutilization of these strategies, which could streamline operations and reduce waste. Addressing these areas can lead to substantial improvements in efficiency, cost reduction, and competitive advantage in the Greek heavy industry sector.

4.6.2 Strategies for Enhancement

The survey respondents rated the effectiveness of various strategies to enhance inventory management. Implementing advanced inventory management software was viewed as highly effective by 48.1% of respondents, with 28.8% strongly agreeing, and only 5.7% disagreeing, suggesting strong support for its potential in optimizing processes and improving efficiency. Investing in employee training and development also received strong support, with 40.4%

agreeing and 38.5% strongly agreeing, highlighting the importance of equipping employees with necessary skills and knowledge.

Enhancing data analytics capabilities for inventory forecasting was highly rated, with 38.5% agreeing and 32.7% strongly agreeing, emphasizing the value of data analytics in improving demand forecasting accuracy. Strengthening collaboration with key suppliers and partners was important, with 38.5% agreeing and 38.5% strongly agreeing, stressing the need for effective communication and collaboration across the supply chain.

Adopting automated inventory tracking systems was supported by 34.6% agreeing and 28.8% strongly agreeing, indicating that automation can significantly improve accuracy and efficiency. Implementing RFID or barcode technology for improved accuracy was favored by 44.2% agreeing and 26.9% strongly agreeing, indicating its effectiveness in enhancing accuracy and reducing errors.

Integrating inventory management with other business processes like ERP and CRM systems was rated highly, with 36.5% agreeing and 34.6% strongly agreeing, suggesting integration can streamline operations and provide better insights. Enhancing communication channels for inventory-related information sharing was seen as beneficial, supported by 36.5% agreeing and 28.8% strongly agreeing, showing the importance of accurate, up-to-date information for informed decision-making.

The survey responses highlight the importance of leveraging advanced technologies and fostering strong collaboration and communication to enhance inventory management. High agreement on these strategies suggests companies recognize the benefits of investing in modern tools and systems. However, the notable neutral and disagree responses for some strategies indicate challenges like costs, integration issues, and the need for organizational change management. Addressing these challenges is essential for maximizing the benefits and improving inventory management in the Greek heavy industry sector.

4.6.3 Adoption of New Technologies and Practices

The survey assessed respondents' views on their companies' approach to adopting new technologies for improving inventory management. The results provide insights into the openness, confidence, prioritization, and adaptability of companies in the Greek heavy industry sector.

Respondents rated their companies' openness to adopting new technologies. The findings show that 5.8% are very unwilling, 9.6% are unwilling, 28.8% are neutral, 30.8% are willing, and 25% are very willing. This indicates that 55.8% of companies are willing or very willing to adopt new technologies, though a significant portion remains neutral or resistant.

The survey also evaluated confidence in implementing new technologies. Results reveal that 5.8% are not confident at all, 13.5% are not confident, 26.9% are neutral, 34.6% are confident, and 19.2% are very confident. This suggests that 53.8% are confident or very confident in their companies' ability to implement new technologies, but there is notable uncertainty.

Respondents rated the priority given to innovation in inventory management. Findings indicate that 3.8% consider it a very low priority, 15.4% a low priority, 30.8% are neutral, 26.9% a high priority, and 23.1% a very high priority. While 50% prioritize innovation, a considerable percentage remains neutral or sees it as a lower priority.

The survey also assessed adaptability to technological changes. Results show that 5.8% adapt very poorly, 17.3% poorly, 30.8% are neutral, 26.9% adapt well, and 19.2% adapt very well. While 46.1% adapt well or very well, there is room for improvement as some respondents indicate poor adaptability.

Overall, the survey reveals a positive outlook towards adopting new technologies among companies in the Greek heavy industry sector, with a majority expressing willingness and confidence in implementing changes. However, significant neutral and negative responses highlight barriers like resistance to change, lack of prioritization, and challenges in adaptability. Addressing these barriers through fostering innovation, providing training and resources, and improving change management is essential for companies to fully benefit from new technologies and enhance their inventory management practices.

4.6.4 Barriers to adopting new inventory management technologies

The survey identified several barriers to adopting new inventory management technologies or practices. Understanding these challenges is crucial for developing strategies to overcome them and successfully implement advanced systems.

A significant barrier, identified by 38.5% of respondents, is the lack of budget or resources. Implementing new technologies often requires substantial financial investment, which can be

a significant constraint, especially for smaller companies. Resistance to change is another major challenge, noted by 53.8% of respondents. Employees and management may be reluctant to adopt new systems, slowing down the implementation process and reducing effectiveness.

Another critical barrier is the lack of technical expertise, identified by 40.4% of respondents. Specialized knowledge and skills are required to manage advanced technologies, which many companies may lack. Integration challenges were cited by 34.6% of respondents. Integrating new technologies with existing systems can be complex and time-consuming, but seamless integration is essential for smooth supply chain functioning.

To address these barriers, companies have implemented or considered several strategies. Implementing phased integration plans was reported by 36.5% of respondents. This approach allows companies to introduce new technologies incrementally, reducing the immediate burden on resources and easing the transition for employees. Additionally, 36.5% of respondents indicated that their companies are increasing the budget for technology upgrades.

Providing training and support to encourage acceptance was noted by 53.8% of respondents. Training helps employees understand the benefits and equips them with the skills needed to use new systems effectively, reducing resistance to change. Furthermore, 44.2% of respondents mentioned hiring or consulting with technical experts to overcome the lack of in-house technical skills.

The survey also collected additional comments and suggestions. One respondent suggested implementing consignment stock options, examining alternative suppliers, and developing backup plans. Another noted that the Greek heavy industry lags behind other developed economies due to low budgets and resistance to new technologies, suggesting new EU grants could help. Emphasizing the importance of inventory management as part of Industry 4.0, frequent training on forecasting, and adopting new software for online tracking were also recommended. Addressing employee resistance to new technologies and encouraging their use is seen as essential for staying competitive and efficient.

5. Conclusion

This section synthesizes the key findings of the study, provides practical recommendations, and discusses the significance of these findings for the Greek heavy industry sector. It also outlines suggestions for future research to further advance inventory management within heavy industries.

5.1 Summary of Key Findings

This study aimed to investigate and enhance inventory management practices within the Greek heavy industry sector. Data were collected from 52 professionals across various industry segments, including manufacturing, construction, and logistics, ensuring a comprehensive overview of the sector.

The findings revealed a mix of traditional and modern inventory management practices. While ERP systems are widely used for real-time inventory tracking, the adoption of advanced technologies such as RFID and IoT remains limited. This presents an opportunity for companies to improve their inventory management systems through technological investment.

Key challenges identified include inaccurate demand forecasting, balancing inventory levels, and ensuring timely procurement of materials and components. Inaccurate demand forecasting can lead to excess inventory or stockouts, disrupting production schedules and leading to financial losses. Supply chain disruptions, supplier reliability, and inventory shrinkage further complicate inventory management.

Balancing inventory levels to meet production demands is a critical issue. Overstocking leads to increased holding costs and obsolescence, while understocking results in missed sales opportunities and production delays. Advanced inventory optimization techniques such as JIT and EOQ can help address these challenges.

Additional concerns include the complexity of managing multi-layered supply chains, which requires advanced supply chain management tools for effective monitoring and coordination. Training for inventory management, effective communication across departments, and

regular review and updating of inventory practices were also highlighted as areas needing improvement.

5.2 Practical Recommendations for Optimizing Inventory Processes

Based on the findings, several recommendations are proposed to optimize inventory management processes in the Greek heavy industry sector. Companies should invest in advanced technologies such as RFID and IoT to enhance tracking accuracy and real-time visibility. Improving demand forecasting is crucial, and implementing advanced analytics and machine learning techniques can help predict demand more accurately, mitigating the risks of stockouts and overstocking.

Developing robust risk management strategies is essential to handle supply chain disruptions effectively. Companies should prepare for these disruptions by diversifying their supplier bases, maintaining safety stock, and using supply chain visibility tools. Implementing inventory optimization techniques like JIT and EOQ can help balance inventory levels and reduce holding costs.

Enhancing supplier management practices is another important recommendation. Establishing strong relationships with reliable suppliers and engaging in collaborative planning and forecasting can improve supply chain coordination and reduce disruptions. Strengthening security measures and improving tracking systems are necessary to prevent inventory shrinkage.

Simplifying multi-layered supply chain management processes through the use of advanced supply chain management tools can maintain accurate records and ensure timely deliveries. Companies should regularly review and update their inventory practices to adapt to changing business environments and ensure continuous improvement.

5.3 Recommendations Based on Findings and Global Best Practices

Integrating global best practices with the study's findings, several recommendations can be made. Adopting comprehensive ERP systems and integrating them with advanced inventory management tools can streamline operations. Fostering a culture of continuous improvement

and providing regular training for staff involved in inventory management is crucial for maintaining up-to-date practices.

Utilizing predictive analytics and big data can enhance demand forecasting accuracy and allow companies to adjust inventory levels based on data-driven insights. Engaging in strategic supplier collaborations can enhance supply chain resilience and performance, while promoting lean inventory management practices can minimize waste and increase efficiency.

5.4 Significance of Study's Findings for the Heavy Industry Sector in Greece

The findings are significant for the Greek heavy industry sector as they provide a clear understanding of current inventory management practices and highlight critical areas for improvement. Addressing these challenges and implementing the recommended strategies can lead to better inventory control, reduced costs, and enhanced competitiveness. This study also serves as a valuable resource for policymakers and industry leaders to formulate policies and initiatives supporting the advancement of inventory management practices in Greece.

5.5 Suggestions for Future Research

Building on the findings of this study, there are several areas that future research could explore to further enhance our understanding of inventory management in the heavy industry sector.

Firstly, future research could investigate the impact of digital transformation on inventory management practices within the heavy industry sector. This would include examining how technologies such as artificial intelligence (AI), machine learning (ML), and blockchain are being integrated into inventory management systems. Research could focus on the specific benefits these technologies provide, such as improved accuracy, real-time tracking, and enhanced decision-making capabilities. Additionally, studies could explore the challenges and barriers to adopting these technologies, including cost, training requirements, and integration with existing systems.

Secondly, comparative studies between Greek heavy industries and those in other countries could yield valuable insights. By analyzing inventory management practices across different geographical and economic contexts, researchers could identify global best practices that

could be adapted to the Greek context. Such studies could highlight successful strategies and innovative approaches that have been effective in other heavy industry sectors, providing a broader perspective on potential improvements.

Thirdly, the role of blockchain technology in enhancing transparency and efficiency in supply chain and inventory management deserves further exploration. Blockchain offers a secure and immutable ledger of transactions, which can greatly enhance the traceability and accountability of inventory movements. Future research could examine case studies where blockchain has been successfully implemented, assessing its impact on reducing fraud, improving accuracy, and streamlining operations. Additionally, research could explore the potential challenges of integrating blockchain with existing inventory management systems and the cost implications of such integration.

Moreover, longitudinal studies tracking the progress and effectiveness of implemented inventory management strategies over time would provide valuable insights into their long-term viability and impact. By following specific companies or sectors within the heavy industry over an extended period, researchers could assess how changes in inventory management practices affect operational efficiency, cost savings, and overall competitiveness. Such studies could also identify any unforeseen challenges or benefits that arise from the implementation of new technologies or strategies.

Furthermore, future research could delve into the human factors influencing inventory management effectiveness. This includes examining the role of employee training, organizational culture, and leadership in adopting and sustaining best practices in inventory management. Understanding how these human elements interact with technological advancements can provide a more holistic view of what drives successful inventory management.

Additionally, research could explore the environmental and sustainability aspects of inventory management. As the heavy industry sector faces increasing pressure to reduce its environmental footprint, studies could investigate how sustainable practices in inventory management, such as green logistics and eco-friendly packaging, can be integrated and their impact on overall efficiency and cost-effectiveness.

Lastly, the potential for digital twins and other advanced simulation techniques in inventory management could be a promising area of research. Digital twins allow for the creation of virtual replicas of physical systems, enabling companies to simulate and optimize inventory

processes in a risk-free environment. Future studies could explore how digital twins can be used to predict and mitigate potential issues, optimize resource allocation, and improve overall supply chain resilience.

By addressing these research areas, future studies can build on the insights gained from this dissertation, contributing to a more comprehensive understanding of inventory management in the heavy industry sector and offering actionable recommendations for both practitioners and policymakers. This continued research is crucial for driving innovation, improving efficiency, and maintaining competitiveness in an increasingly complex and dynamic industrial landscape.

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Appendix A

Inventory Management Questionnaire

Thank you for participating in this survey on Inventory Management in Greece's Heavy Industry sector. The aim of the questionnaire is to analyze practices, challenges, and potential improvements in inventory management. Your insights are critical for enhancing industry efficiencies. This survey is anonymous and consists of multiple-choice and open-ended questions. It should take about 20 minutes to complete. Please respond as accurately as possible. Your responses will be completely confidential and used solely for academic research purposes.

Note: Please indicate your level of agreement or satisfaction with the following statements based on your experiences and perspectives related to inventory management within the Greek heavy industry sector. Your responses will remain confidential and will be used for research purposes only.

1. Demographic Information

1.1. Which sector of the heavy industry do you work in?

Manufacturing ☐

Construction ☐

Logistics ☐

Supply Chain ☐

Other (please specify): _____

1.2. What is your job level within the company?

Entry-Level ☐

Mid-Level ☐

Senior-Level ☐

Management ☐

Executive ☐

1.3. How many years of experience do you have in inventory management?

Less than 5 years ☐

5-10 years ☐

11-20 years ☐

20-30 years ☐

More than 30 years ☐

1.4 What is your age group?

Under 25 ☐

25-34 ☐

35-44 ☐

45-54 ☐

55 and over ☐

1.5 Please indicate your gender:

Male ☐

Female ☐

1.6 Please indicate the approximate annual revenue of your company:

Less than €1 million ☐

€1 million - €10 million ☐

€10 million - €50 million ☐

More than €50 million ☐

2. Current Practices

(Rate the following statements from 1 (Strongly Disagree) to 5 (Strongly Agree) regarding the inventory management practices at your company. Please mark your response with a tick (✓) in the box that best corresponds to your opinion for each statement.

	1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree
1. Our inventory management system integrates well with other operational processes					
2. We use up-to-date technology for managing inventory					
3. Inventory data are accurately maintained and are easily accessible					
4. We have clearly defined procedures for inventory control					
5. Training for inventory management is regularly provided to employees					
6. Communication about inventory levels across different departments is effective					
7. Our inventory practices are regularly reviewed and updated as necessary					
8. We frequently face issues with inventory accuracy (e.g., discrepancies between physical stock and records)					
9. There is a clear accountability for inventory losses within our organization					
10. Our inventory turnover rate is satisfactory.					
11. We have strategies in place to handle surplus inventory effectively					
12. Risk management strategies are integrated into our inventory management practices.					

3. Challenges in Inventory Management

Section 3: Challenges and Strategic Responses

Please rate the extent to which the following challenges affect your company's inventory management, how your company addresses these challenges, and what strategies have been employed to overcome them.

3.1 Challenges Affecting Inventory Management

Rate from 1 (Strongly Disagree) to 5 (Strongly Agree) how much each challenge affects your company. Please mark your response with a tick (✓) in the box that best corresponds to your opinion for each statement.)

	1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree
1. Forecasting demand accurately					
2. Balancing inventory levels to meet production demands					
3. Ensuring timely procurement of materials/components					

3.2 Priority in Addressing Challenges

How does your company prioritize addressing these challenges? Rate from 1 (Very Low Priority) to 5 (Very High Priority). Please mark your response with a tick (✓) in the box that best corresponds to your opinion for each statement.

	1 Very Low Priority	2 Low Priority	3 Neutral	4 High Priority	5 Very High Priority
1. Overall priority given to addressing inventory management challenges					
2. Priority given to forecasting demand accurately					
3. Priority given to balancing inventory levels to meet production demands					
4. Priority given to minimizing excess or obsolete inventory					
5. Priority given to ensuring timely procurement of materials/components					
6. Priority given to improving communication about inventory levels between departments					
7. Priority given to implementing advanced technology and systems for inventory management					

3.3 Strategies Employed to Overcome Challenges

What strategies has your company employed to overcome these challenges? (Please mark your response with a tick. Select all that apply.)

1. Implementing advanced forecasting techniques	☐
2. Utilizing inventory optimization software	☐
3. Collaborating closely with suppliers and partners	☐
4. Implementing just-in-time (JIT) inventory systems	☐
5. Conducting regular inventory audits and cycle counts	☐
6. Utilizing predictive analytics for demand forecasting	☐
7. Other (please specify): _____	☐

Section 3.4: Effectiveness of Strategies

How effective have the following strategies been in addressing the identified challenges in inventory management? Rate from 1 (Very Ineffective) to 5 (Very Effective) for each strategy. Please mark your response with a tick (✓) in the box that best corresponds to your opinion for each statement.

	1 Very Ineffective	2 Ineffective	3 Neutral	4 Effective	5 Very Effective
1. Overall effectiveness of the employed strategies					
2. Effectiveness of implementing advanced forecasting techniques					
3. Effectiveness of utilizing inventory optimization software					
4. Effectiveness of collaborating closely with suppliers and partners					
5. Effectiveness of implementing just-in-time (JIT) inventory systems					
6. Effectiveness of investing in employee training for better inventory management practices					
7. Effectiveness of conducting regular inventory audits and cycle counts					
8. Effectiveness of utilizing predictive analytics for demand forecasting					

4. Digital Solutions and Technology Adoption

4.1 Rate how extensively the following technologies are used in your company's inventory management using the scale from 1 (Strongly Disagree) to 5 (Strongly Agree). Mark your response with a tick (✓) in the appropriate box.

	1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree
1. Inventory management software					
2. RFID, barcode technology or IoT					
3. Cloud-based inventory platforms					
4. Artificial intelligence (AI) for demand forecasting					

4.2 Please rate the effectiveness of the following digital solutions or technologies in improving your company's inventory management using the scale from 1 (Very ineffective) to 5 (Very Effective). Mark your response with a tick (✓) in the appropriate box.

	1 Very Ineffective	2 Inffective	3 Neutral	4 Effective	5 Very effective
1. Inventory management software					
2. RFID, barcode technology or IoT					
3. Cloud-based inventory platforms					
4. Artificial intelligence (AI) for demand forecasting					

4.3 What are the main reasons behind your company's decision to adopt digital solutions for inventory management? Select all that apply with a tick (✓).

1. Improved efficiency	☐
2. Cost savings	☐
3. Better accuracy in inventory tracking	☐
4. Enhanced decision-making capabilities	☐
5. Competitive advantage	☐
6. Other (please specify): _____	☐

4.4 What challenges, if any, has your company faced during the implementation or use of digital solutions for inventory management? Select all that apply with a tick (✓).

1. Integration issues with existing systems	☐
2. Resistance to change from employees	☐
3. Technical difficulties	☐
4. High initial investment costs	☐
5. Data security concerns	☐
6. Other (please specify) _____	☐

4.5 How frequently does your company assess and update its digital inventory management tools or technologies to keep pace with industry advancements? Select all that apply with a tick (✓).

Regularly	☐
Occasionally	☐
Rarely	☐
Never	☐

4.6 In your opinion, what additional digital solutions or technologies could benefit your company's inventory management practices?

5. Improvement Opportunities

5.1. In your opinion, what areas of inventory management require the most improvement within the Greek heavy industry sector? Select all that apply with a tick (✓).

1. Forecasting demand accurately	☐
2. Balancing inventory levels to meet production demands	☐
3. Minimizing excess or obsolete inventory	☐
4. Ensuring timely procurement of materials/components	☐
5. Enhancing collaboration with suppliers	☐
6. Improving inventory tracking and visibility	☐
7. Optimizing warehouse layout and organization	☐
8. Implementing lean inventory management practices	☐
9. Streamlining inventory replenishment processes	☐
10. Enhancing sustainability practices in inventory management	☐
11. Other (please specify): _____	☐

5.2. Please rate the extent to which you believe the following strategies or initiatives could enhance inventory management practices in your company using the scale from 1 (Strongly Disagree) to 5 (Strongly Agree). Mark your response with a tick (✓) in the appropriate box.

	1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree
1. Implementing advanced inventory management software					
2. Investing in employee training and development					
3. Enhancing data analytics capabilities for inventory forecasting					
4. Strengthening collaboration with key suppliers and partners					
5. Adopting automated inventory tracking systems					
6. Implementing RFID, barcode technology or IoT for improved inventory accuracy					
7. Integrating inventory management with other business processes (e.g., ERP, CRM)					
8. Enhancing communication channels for inventory-related information sharing					

5.3. Assess your company's approach to adopting new technologies and practices aimed at improving inventory management. Please indicate your agreement with the following statements using the scale from 1 to 5. Mark your response with a tick (✓) in the appropriate box.

	1	2	3	4	5
	Very Unwilling	Unwilling	Neutral	Willing	Very willing
1. How open is your company to adopting new technologies or practices?					

	1	2	3	4	5
	Not Confident at all	Not Confident	Neutral	Confident	Very Confident
2. How confident are you in your company's ability to successfully implement new inventory management technologies or practices?					

	1	2	3	4	5
	Very Low Priority	Low Priority	Neutral	High Priority	Very High Priority
3. How much of a priority is innovation and technological advancement in your company's inventory management strategy?					

	1	2	3	4	5
	Very Poorly	Poorly	Neutral	Well	Very Well
4. How well does your company adapt to technological changes and industry trends?					

5.4 What barriers or challenges, if any, does your company face in adopting new inventory management technologies or practices? Select all that apply.

1. Lack of Budget/Resources	☐
2. Resistance to change	☐
3. Lack of technical Expertise	☐
4. Integration Challenges	☐

5.5 What strategies has your company implemented or considered to overcome these barriers? Select all that apply

1. Implementing phased or gradual integration plans	☐
2. Increasing the budget allocated to technology upgrades	☐
3. Providing training and support to encourage acceptance	☐
4. Hiring or consulting with technical experts	☐
1. Other (please specify): _____	☐

5.7 Do you have any additional comments or suggestions regarding inventory management within the Greek heavy industry sector?

Yes (please specify): _____	☐
No	☐

The time you took to participate in this survey is greatly appreciated. Your responses are invaluable and they will contribute significantly to the understanding of inventory management practices in Greece's heavy industry sector. Thank you again for your valuable input and support.

If you have any further comments or would like to receive a summary of our research findings, please do not hesitate to contact us at [personal e-mail].

Appendix B

Results

1. Demographic Information

	1.1 What is your age group?	
25-34	16	30%
35-44	20	38%
45-54	8	15%
55 and over	6	11%
Under 25	3	6%
Total	53	100%

	1.2 Please indicate your gender:	%
Female	17	32%
Male	36	68%
Total	53	100%

	1.3. In which department of the heavy industry do you work in?	%
Procurement	1	2%
Financial	1	2%
Inventory management	2	4%
Logistics	6	11%
Manufacturing	5	9%
Material planning	1	2%
Procurement	13	25%
Production	5	9%
Production Planning & Scheduling Dpt	1	2%
sales	2	4%
Sales	1	2%
sales department	1	2%
Strategy	1	2%
Supply Chain	13	25%
Total	53	100%

	1.4. What is your job level within the company?	%
Entry-Level	7	13%
Executive	2	4%
Management	12	23%
Mid-Level	15	28%
Senior-Level	17	32%
Total	53	100%

	1.5. How many years of experience do you have in inventory management?	
11-20 years	13	25%
20-30 years	11	21%
5-10 years	15	28%
Less than 5 years	13	25%
More than 30 years	1	2%
Total	53	100%

	1.6 Please indicate the approximate annual revenue of your company:	%
€1 million - €100 million	23	43%
€100 million - €500 million	4	8%
Less than €1 million	7	13%
More than €500 million	19	36%
Total	53	100%

2. Current Practices.

	1. Strongly Disagree	2. Disagree	3. Neutral	4. Agree	5. Strongly Agree
1. Your inventory management system integrates well with other operational processes	3	4	18	23	5
2. You use up-to-date technology for managing inventory	5	10	11	22	5
3. Inventory data are accurately maintained and are easily accessible	4	12	9	22	6
4. You have clearly defined procedures for inventory control	4	4	15	24	6
5. Training for inventory management is regularly provided to employees	4	9	18	16	6
6. Communication about inventory levels across different departments is effective	5	7	15	19	7
7. Your inventory practices are regularly reviewed and updated as necessary	3	9	19	17	5
8. You frequently face issues with inventory accuracy (e.g., discrepancies between physical stock and records)	6	16	14	14	3
9. There is a clear accountability for inventory losses within your organization	4	8	17	18	6
10. Your inventory turnover rate is satisfactory.	3	4	24	16	6
11. You have strategies in place to handle surplus inventory effectively	4	9	10	23	7
12. Risk management strategies are integrated into your inventory management practices.	4	7	17	17	8
Total	8%	16%	29%	36%	11%

3. Challenges in Inventory Management

3.1 Challenges Affecting Inventory Management

	Rate from 1 (Strongly Disagree) to 5 (Strongly Agree) how much each challenge affects your company. Please mark your response with a tick (✓) in the box that best corresponds to your opinion for each statement.)				
	1. Strongly Disagree	2. Disagree	3. Neutral	4. Agree	5. Strongly Agree
1. Forecasting demand accurately	3	4	12	19	15
2. Balancing inventory levels to meet production demands	3	4	6	29	11
3. Ensuring timely procurement of materials/components	3	1	11	22	16
Total	6%	6%	18%	44%	26%

3.2 Priority in Addressing Challenges

	How does your company prioritize addressing these challenges? Rate from 1 (Very Low Priority) to 5 (Very High Priority). Please mark your response with a tick (✓) in the box that best corresponds to your opinion for each statement.				
	1. Very Low Priority	2. Low Priority	3. Neutral	4. High Priority	5. Very High Priority
1. Overall priority given to addressing inventory management challenges	2	5	15	21	10
2. Priority given to forecasting demand accurately	4	6	10	21	12
3. Priority given to balancing inventory levels to meet production demands	2	5	11	23	12
4. Priority given to minimizing excess or obsolete inventory	2	10	14	18	9
5. Priority given to ensuring timely procurement of materials/components	2	4	11	23	13
6. Priority given to improving communication about inventory levels between departments	3	7	16	17	10
7. Priority given to implementing advanced technology and systems for inventory management	5	9	18	15	6
Total	5%	12%	26%	37%	19%

3.3 Strategies Employed to Overcome Challenges

	What strategies has your company employed to overcome these challenges? (Please mark your response with a tick. Select all that apply.)	
Strategy	Count	Percentage
Implementing advanced forecasting techniques	22	42.3%
Utilizing inventory optimization software	15	28.8%
Collaborating closely with suppliers and partners	36	69.2%
Implementing replenishment policies	17	32.7%
Conducting regular inventory audits and cycle counts	21	40.4%
Utilizing predictive analytics for demand forecasting	16	30.8%
Implementing just-in-time (JIT) inventory systems	3	5.8%
Experience of individuals	1	1.9%
Unfortunately they do not have a solid strategy	1	1.9%

3.4 Effectiveness of Strategies

	How effective have the following strategies been in addressing the identified challenges in inventory management? Rate from 1 (Very Ineffective) to 5 (Very Effective) for each strategy. Please mark your response with a tick (✓) in the box that best corresponds to your opinion for each statement.				
	Very Ineffective	Ineffective	Neutral	Effective	Very Effective
1. Overall effectiveness of the employed strategies	3	2	20	21	7
2. Effectiveness of implementing advanced forecasting techniques	4	3	15	24	7
3. Effectiveness of utilizing inventory optimization software	3	10	16	14	10
4. Effectiveness of collaborating closely with suppliers and partners	3	6	12	21	11
5. Effectiveness of Implementing replenishment policies (JIT, min-max, reorder point, etc)	3	6	17	21	6
6. Effectiveness of investing in employee training for better inventory management practices	4	6	17	18	8
7. Effectiveness of conducting regular inventory audits and cycle counts	3	8	18	17	7
8. Effectiveness of utilizing predictive analytics for demand forecasting	4	3	22	17	7
Total	6%	10%	32%	36%	15%

4. Digital Solutions and Technology Adoption

4.1 Technology Utilization in Inventory Management

	Rate how extensively the following technologies are used in your company's inventory management using the scale from 1 (Strongly Disagree) to 5 (Strongly Agree). Mark your response with a tick (✓) in the appropriate box.				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Inventory management software	7	6	12	13	15
2. RFID, barcode technology or IoT	7	11	9	18	8
3. Cloud-based inventory platforms	11	6	15	15	6
4. Artificial intelligence (AI) for demand forecasting	20	8	14	5	6
Total	21%	15%	24%	24%	17%

4.2 Effectiveness of Digital Solutions in Inventory Management

	Please rate the effectiveness of the following digital solutions or technologies in improving your company's inventory management using the scale from 1 (Very ineffective) to 5 (Very Effective). Mark your response with a tick (✓) in the appropriate box.				
	Very Ineffective	Ineffective	Neutral	Effective	Very Effective
1. Inventory management software	5	5	7	22	14
2. RFID, barcode technology or IoT	5	8	11	21	8
3. Cloud-based inventory platforms	8	4	19	16	6
4. Artificial intelligence (AI) for demand forecasting	8	7	24	8	6
Total	12%	11%	29%	32%	16%

4.3 Motivations for Adopting Digital Inventory Management Solutions

	What are the main reasons behind your company's decision to adopt digital solutions for inventory management? Select all that apply with a tick (✓).	
Reason	Count	Percentage %
Improved efficiency	35	67,3
Cost savings	39	75
Better accuracy in inventory tracking	31	59,6
Enhanced decision-making capabilities	24	46,2
Competitive advantage	20	38,5
We have not adopted any digital solution	1	1,9

4.4 Challenges in Implementing Digital Inventory Management Solutions

	What challenges, if any, has your company faced during the implementation or use of digital solutions for inventory management? Select all that apply with a tick (✓).	
Reason	Count	Percentage %
Integration issues with existing systems	31	59,6
Resistance to change from employees	28	53,8
Technical difficulties	27	51,9
High initial investment costs	15	28,8
Data security concerns	7	13,5
The management does not want to adopt digital solution	1	1,9
We have not adopted any digital solution	1	1,9

4.5 Frequency of Updates for Digital Inventory Management Tools

	How frequently does your company assess and update its digital inventory management tools or technologies to keep pace with industry advancements? Select all that apply with a tick (✓).	
Frequency	Count	Percentage %
Regularly	16	30,8
Occasionally	17	32,7
Rarely	19	36,5
Never	0	0

5. Improvement Opportunities

5.1. Areas Needing Improvement in Inventory Management

	In your opinion, what areas of inventory management require the most improvement within the Greek heavy industry sector? Select all that apply with a tick (✓).	
Improvement Area	Count	Percentage %
Forecasting demand accurately	38	73,1
Balancing inventory levels to meet production demands	25	48,1
Minimizing excess or obsolete inventory	19	36,5
Ensuring timely procurement of materials/components	23	44,2
Enhancing collaboration with suppliers	17	32,7
Improving inventory tracking and visibility	17	32,7
Optimizing warehouse layout and organization	22	42,3
Implementing lean inventory management practices	15	28,8
Streamlining inventory replenishment processes	9	17,3
Enhancing sustainability practices in inventory management	24	46,2

5.2. Potential Impact of Strategic Initiatives on Inventory Management

	Please rate the extent to which you believe the following strategies or initiatives could enhance inventory management practices in your company using the scale from 1 (Strongly Disagree) to 5 (Strongly Agree). Mark your response with a tick (✓) in the appropriate box.				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Implementing advanced inventory management software	2	1	9	26	15
2. Investing in employee training and development	2	1	8	22	20
3. Enhancing data analytics capabilities for inventory forecasting	2	3	10	21	17
4. Strengthening collaboration with key suppliers and partners	2	3	7	21	20
5. Adopting automated inventory tracking systems	2	2	15	19	15
6. Implementing RFID, barcode technology or IoT for improved inventory accuracy	2	3	10	24	14
7. Integrating inventory management with other business processes (e.g., ERP, CRM)	2	2	11	20	18
8. Enhancing communication channels for inventory-related information sharing	2	2	14	20	15
Total	4%	4%	20%	41%	32%

5.3. Company Readiness for Technological Adoption in Inventory Management

	Company Readiness for Technological Adoption in Inventory Management (1 lowest - 5 highest)				
	1	2	3	4	5
1. How open is your company to adopting new technologies or practices?	3	5	15	17	13
2. How confident are you in your company's ability to successfully implement new inventory management technologies or practices?	3	7	14	18	11
3. How much of a priority is innovation and technological advancement in your company's inventory management strategy?	2	8	16	15	12
4. How well does your company adapt to technological changes and industry trends?	3	9	16	15	10
Total	5%	14%	29%	31%	22%

5.4 Barriers to Adopting New Inventory Management Technologies

	What barriers or challenges, if any, does your company face in adopting new inventory management technologies or practices? Select all that apply.	
	Count	Percentage %
Lack of Budget/Resources	20	38,5
Resistance to change	28	53,8
Lack of technical Expertise	21	40,4
Integration Challenges	18	34,6

5.5 Strategies to Overcome Barriers in Technology Adoption

	What strategies has your company implemented or considered to overcome these barriers? Select all that apply	
Strategy	Count	Percentage
Implementing phased or gradual integration plans	19	36.5%
Increasing the budget allocated to technology upgrades	19	36.5%
Providing training and support to encourage acceptance	28	53.8%
Hiring or consulting with technical experts	23	44.2%
None strategy has been implemented	1	1.9%
We have not adopted any digital solution	1	1.9%

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