An Assessment of Inventory Management in A Wholesale Organization - A Case Study on Challenges, Practices, and Strategic Technological Integration

Research dissertation presented in partial fulfillment of the requirements for the degree of

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Dissertation Supervisor: **Mildred Brown**

Student Name: **Ayyappadas Ponneth Mohanan**

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Supervisor Name: Mildred Brown

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Ayyappadas Ponneth Mohanan

Abstract

In this study, the inventory management practices of a small to medium-sized enterprise (SME) wholesale organization in Ireland were analyzed to identify the challenges, assess the effectiveness of current practices, and develop strategic recommendations for improvement. The company imports goods from South American and Asian nations, but it has serious problems with stockouts, manual inventory procedures, and logistics. This study used a qualitative case study methodology, conducting in-depth interviews with important organization members to learn about their systems, technology, and inventory management practices. The results showed that although the company uses Sage software to manage inventory well for simple activities, it faces challenges with delays in logistics, which often result in stockouts, and lacks sophisticated technology tools for inventory optimization and demand forecasting. The study also showed that the existing dependence on manual procedures restricts scalability and takes a lot of time, even if skilled workers can produce high accuracy. The organization's usage of key performance indicators (KPIs) like stockout rates and sales performance was found to be beneficial; however, more comprehensive measures like customer satisfaction and supply chain efficiency might be added to improve the KPIs even further. The study concluded by recommending the integration of advanced technologies like RFID and IoT to improve inventory tracking and forecasting accuracy, as well as the expansion of KPIs to provide a more holistic view of inventory management performance. The study's conclusion included expanding KPIs to give a more comprehensive picture of inventory management performance as well as integrating cutting-edge technologies like RFID and IoT to increase inventory monitoring and forecasting accuracy. These suggestions are meant to assist the company in improving its operational effectiveness, lowering stockouts, and better meeting client demand in a competitive sector. In addition to providing useful insights for enhancing inventory management practices through strategic technological integration and process optimization, this research advances knowledge of the inventory management difficulties faced by SMEs in the wholesale sector, particularly those that depend on foreign suppliers.

Key words: Inventory Management, Wholesale Supply Chain, Economic Order Quantity (EOQ), Demand Sensing, Replenishment Processes, Technological Integration, Supply Chain Efficiency, Inventory Control, Small and Medium Enterprises (SMEs), Industry 4.0, RFID, VMI, Stock-out, IoT, AI

Chapter 1: Introduction

1.1 Overview

Managing inventories, or stocks, is essential to supply chain and industrial processes. It entails the thoughtful management of items in progress, completed goods, and raw resources to guarantee that manufacturing procedures are effective and satisfy consumer needs. During the production cycle, finished products are made using raw materials and work-in-process items. These products might then be sold to consumers, kept in inventory, or used in subsequent manufacturing processes. Inventory management in the retail sector varies according to the size and kind of firm. While bigger shops may store extra inventory at warehouses or distribution facilities outside the shop, smaller merchants may retain products on the business's premises. Inventory is the main asset for a lot of businesses; it can even make up a sizable amount of the entire capital investment or up to half of operating costs. Therefore, maintaining a healthy balance between supply and demand, guaranteeing product availability, and reducing carrying costs all depend on effective inventory management (Munyaka Baraka and Yadavalli, 2022).

In Ireland, the retail industry contributes over 12% to the GDP, generating about €30 billion in sales annually. It's crucial to determine the feasibility of integrating cutting-edge inventory management solutions into the existing wholesale supplier infrastructure and assess the potential obstacles and return on investment. This assessment will help wholesale suppliers make informed decisions on adopting new tactics and technology based on the report prepared by Clifford, 2021.

The ability of an organization to either increase value or decrease costs is a common metric used to evaluate performance. In order to reach optimal cost efficiency, businesses must adopt strategies that maximize cost-effectiveness. These strategies may include cutting out non-value-adding activities from the production process, utilizing economies of scale to lower costs per unit, and utilizing optimization techniques to improve capacity utilization and overall operational performance. A business's ability to maximize cost-effectiveness, minimize costs per unit, and optimize capacity utilization and overall operational performance are all factors that go into achieving optimal cost efficiency. Manufacturers and retailers are stepping up their efforts to adopt cost and waste-reduction strategies in response to greater competition from low-cost countries and global markets. These strategies include applying lean manufacturing principles, streamlining supply chain operations, and using advanced technologies to reduce costs. By concentrating on these areas, businesses can secure sustainable growth in an economic environment that is tough on them and achieve significant cost savings (Ondiek, 2015).

This research paper aims to investigate inventory management practices in a small single wholesale food products supplier in Ireland, called M&C Ireland to study the inventory management practices used in that organization, its advantages and disadvantages, to understand the level of technological advancement made and can be made in that organization

to improve the organization's inventory management and its effects on the overall performance of the organization and provide suggestions for the further development of the organization by reviewing latest studies related to inventory management and Industry 4.0. This chapter will discuss about aim, objective, significance of the research, and scope and limitation of the study and will provide a brief idea about data collection and methodology.

The results of this study aim to provide industry experts and decision-makers with valuable insights to enhance organizational performance and gain a competitive advantage. To align with the overarching goal of enhancing inventory management procedures in the retail supply chain, the comprehensive research will encompass key performance indicators, technical readiness, and strategic recommendations. This project will establish a strong foundation for understanding and improving inventory management practices within the context of the Irish wholesale business through a thorough literature review, development of a conceptual framework, and qualitative case study methodology.

1.2 Research Purpose:

1.2.1 Aim and Significance:

This research paper looks at how inventory control practices affect a wholesale supplier's performance. More specifically, it looks into the inventory management practices that M&C Ireland currently uses and offers suggestions for improving them. The rise in popularity of e-commerce behemoths such as Amazon and Alibaba have highlighted the significance of effective inventory management and the use of cutting-edge technologies in optimizing workflows and increasing operational effectiveness. The objective of this research paper is to investigate the effects of inventory control practices on the performance of a wholesale supplier. More specifically, it looks into the inventory management practices that a small wholesale supplier in Ireland currently uses and offers practical suggestions for improving these practices.

This study is important because it shows how inventory management is currently handled in the wholesale import industry. It will examine the difficulties wholesale suppliers encounter in eliminating surplus stock, avoiding stockouts, and maintaining ideal inventory levels. Additionally, the study will go over the most recent developments in inventory management technology, including IoT, RFID, demand sensing, and data analytics, and how to use them to improve inventory control's accuracy and efficiency. It is crucial to acknowledge the retail industry's substantial influence on the Irish economy while analyzing it.

In Ireland, the retail industry generates sales of about €30 billion annually, or over 12% of the GDP (gross domestic product), according to Clifford, 2021 projection. This significant contribution highlights how important the retail sector is to Ireland's continued economic development and stability. Another crucial component of the research is determining how feasible these cutting-edge inventory management solutions are inside M&C Ireland's infrastructure. It entails

assessing the degree to which new technologies can be seamlessly incorporated into current systems, the possible obstacles that may appear, and the total return on investment. The assessment will assist wholesale suppliers in making well-informed choices on the use of new tactics and technology.

This research is conducted by an in-depth qualitative interview approach and the study follows a case study for research design. A case study involves a thorough analysis to understand the underlying causes of a situation and uncover key principles. The study employed a qualitative method and case study design to explore real-world scenarios, which was well-suited to the research question. Qualitative interviews were conducted with employees of M&C Ireland who were involved in the importation of food products from Asian and Latin American countries to wholesale distribution in Ireland. The company is among the largest food and cosmetics enterprises in the Republic of Ireland, founded in 2013. M&C Ireland is a top wholesaler offering approximately 2000 varieties of frozen, dry foods, and cosmetics, encompassing Asian, Oriental, and Brazilian products (MandC Ireland, 2021).

The findings of this research are to offer pertinent details to two different groups of individuals about inventory management practices in wholesale companies and the most recent technologies, processes, or systems linked to inventory management. First, professionals at wholesale companies are working in organizations that have not yet adopted the most up-to-date inventory practices or technologies. After the study, they could discover the benefits of implementing the latest technologies and the most effective practices for wholesale company warehouses. Secondly, future researchers, or the researchers themselves if they choose to continue this study, could use this research paper as a solid foundation for conducting further inquiries into inventory control practices within wholesale companies, particularly if they delve deeper to evaluate its impacts on highly specific departments.

1.2.2 Scope and Limitations

The study will encompass an investigation of inventory management procedures at an Irish wholesale food supplier, called M&C Ireland. Its main objective is to analyze M&C Ireland's current inventory management systems and explore the potential integration of advanced technologies to enhance effectiveness and efficiency. The study will involve examining the existing inventory control processes, systems, and technologies used by the organization, as well as identifying challenges within the current system. Additionally, it will assess the organization's interest and readiness to adopt Industry 4.0 technologies, such as RFID, the Internet of Things (IoT), and other advanced inventory management systems. The study will also involve determining the key performance indicators (KPIs) relevant to wholesale supplier inventory management and providing practical recommendations to enhance the existing inventory control procedures.

The study will focus solely on a single Irish wholesale food provider. As a result, any findings may have limited generalizability to other industries or geographical locations. Additionally, the

research may be influenced by subjectivity, as it will primarily rely on qualitative data gathered from interviews with key staff members. The study's scope may also be constrained by the availability and willingness of participants to provide accurate and comprehensive information about their inventory management practices and use of technology.

1.3 Research Objectives:

The research aims to evaluate the impact of inventory control practices in a wholesale food product supplier, M&C Ireland.

The research question to guide this study was: "How can small and medium-sized wholesale organizations in Ireland improve their inventory management efficiency by adopting advanced technologies and practices?

It will be centered around four main objectives:

- To identify the challenges faced by Wholesale organizations in managing their inventory.
- To assess inventory management practices within the organization, including processes, systems, and technologies employed.
- To identify key performance indicators for the improvement of the performance of inventory management such as efficient replenishment processes.
- To develop strategic recommendations for enhancing the current inventory management practices.

1.4 Research Structure

The present study is organized into six main chapters, each serving a specific purpose in the research process. These chapters are: Chapter 1 - Introduction, Chapter 2 - Literature Review, Chapter 3 - Methodology, Chapter 4 – Findings, and Chapter 5 – Conclusion. The introduction chapter sets the groundwork for the research by providing background information, articulating the research rationale, and emphasizing the study's significance. The methodology chapter meticulously delineates the materials and methods utilized in the research, ensuring transparency and reproducibility. The findings chapter comprehensively presents the final results, while the conclusion chapter critically examines the implications of these findings. Lastly, the literature review offers a comprehensive analysis of existing research, shedding light on key trends and findings in the field.

1.5 Summary

This research investigates the factors influencing inventory management practices in a retail wholesaler in Ireland, focusing on advanced techniques such as Economic Order Quantity (EOQ) and demand sensing. By conducting in-depth interviews with management staff, the study aims to understand the current practices, challenges, and opportunities in inventory management, and

to propose enhancements to improve efficiency and sustainability in the supply chain. The study adopts an interpretivist research philosophy and an inductive approach, utilizing qualitative methods and a case study design to explore real-world scenarios. Primary data collection involves semi-structured, open-ended interviews with three managers who are the key players in M&C Ireland a single wholesale food products supplier in Ireland. This approach is complemented by a thorough literature review and thematic analysis to identify patterns and themes.

Key objectives include identifying inventory management challenges, assessing current practices, determining key performance indicators, and developing strategic recommendations for improvement. The research also evaluates the potential integration of Industry 4.0 technologies, such as IoT and RFID, into existing systems to enhance operational performance. The study's findings aim to provide valuable insights for professionals in wholesale companies and serve as a foundation for future research in inventory management. However, the research is limited to a single organization, which may affect the generalizability of the findings. Despite these limitations, the study offers practical recommendations for enhancing inventory control procedures and underscores the importance of effective inventory management in the retail sector.

Chapter 2: Literature Review

2.1 Overview

There are various types of research to explore, studying, surveying, and gathering information regarding inventory management processes in wholesale businesses, as well as the connections between manufacturers, wholesalers, and retailers. In this section, we will provide a critical review of relevant literature. The review will include evaluations of contextual, conceptual, and empirical articles, and will also highlight the existing debates in the literature. We will carefully organize the review into specific themes, which will aid us in our data collection and analysis.

2.2 Inventory Control Strategies and Organizational Performance

An Inventory Management System is a combination of technology, processes, and procedures that oversees the control and maintenance of stocked products, whether they are company assets, supplies, raw materials, or finished goods. Inventory management, which is also referred to as stock management, encompasses a range of procedures that are aimed at arranging, supervising, and ensuring that a company's products are easily accessible to its clients (Otieno, 2018). In a study of Macas et al., 2021 Discussing key Performance Indicators (KPIs) in inventory management, there are 22 key aspects to consider when managing inventory, which serve as performance indicators for inventory control and management decisions (Macas et al., 2021). The main KPIs identified are actual inventory and its relationship with the company's information system, stock level, insufficient stock, product reordering, Supply Chain lead time, and service level (Macas et al., 2021).

A study conducted by Priniotakis and Argyropoulos, 2018 discussing that, It is important to determine the appropriate inventory level because inventory ties up money and affects performance. Too much inventory reduces working capital and impacts the company’s liquidity. On the other hand, having too little inventory leads to stockouts and missed sales, resulting in lower profits. Management should prioritize maintaining inventory levels between attempt for improved customer satisfaction and minimal stockouts while minimizing inventory costs.

2.2.1 Actual inventory and its relationship with the company's Information System

The relationship between a company's information system and its actual inventory is crucial for retail operations. It's important for the data in the system to match the physical inventory to avoid issues. Discrepancies between the two are common and can lead to significant problems, resulting in shortages and impacting operational performance. Providing accurate inventory information to customers improves service quality and ensures product availability. A reliable inventory system helps track inventory levels and identify any inconsistencies, ultimately resulting in financial losses for the retailer (Macas *et al.*, 2021).

2.2.2 Product Reordering

The Re-Order Point (ROP) method is employed to initiate inventory replenishment based on current inventory levels. The ROP is determined by calculating the expected demand during the

lead time, augmented by a safety stock (Priniotakis and Argyropoulos, 2018). A study conducted by Macas *et al.*, 2021, It is essential to have a replenishment policy that is adjusted based on variations in service levels and cost considerations under specific guidelines. Failing to restock products promptly can lead to depletion of stock, resulting in missed sales, even if the inventory is available in the backroom but not on the shelf. Moreover, slight delays in replacing products can increase the overall cost of the product.

2.2.3 Service Level

In the study of Priniotakis and Argyropoulos, 2018, describing about Service Level (SL), it measures a company's ability to meet customer demand, expressed as a percentage. In inventory management, it represents the likelihood of fulfilling customer orders on time. A higher service level leads to greater customer satisfaction and higher inventory levels. However, achieving a 100% service level is impractical due to the uncertainty of future demand, as it would require an infinite amount of inventory. Therefore, management needs to balance the cost of inventory with the cost of stock-outs and establish inventory levels based on specific criteria.

2.2.4 Forecasting Error

Customer demand is inherently uncertain, making accurate predictions a challenge for managers. Although it is difficult to forecast future demand precisely, using statistical data and various criteria can provide a reasonable estimate. Predicting demand, despite its uncertainty, is preferable to having no expectations at all. While the specific methods and tools for forecasting are beyond the scope of this discussion, the disparity between actual demand and forecasted demand is termed the Forecast Error (Priniotakis and Argyropoulos, 2018).

According to past research, the majority of the blame for out-of-stock (OOS) situations has been attributed to the ordering and forecasting methods used by retail and wholesale stores (Corsten and Gruen, 2003). In a study of Lalou *et al.*, 2020 suggests that, in many cases, managers often use simple methods and traditional linear time series analysis despite their limitations in capturing complex patterns. Advanced non-linear machine learning methods are less frequently used due to the requirement of specialized knowledge. These methods can improve demand forecasting in retail or wholesale outlets thereby reducing the stockout.

2.2.5 Safety Stock

The aim is to maintain an inventory level that aligns closely with actual needs. Recognizing that forecast errors are inevitable, adding extra stock—known as Safety Stock—can compensate for these inaccuracies. Safety Stock is crucial for mitigating the impact of forecast errors and preventing stockouts. In a simplified model, if there is a 30% variation in forecasted demand, the inventory level should similarly increase by 30% to ensure adequate supply (Priniotakis and Argyropoulos, 2018).

2.2.6 Supply Chain Lead Time

Variability in transit lead times may lead to serious problems for the environment and the economy, which can disrupt inventory systems. Delays may result in stockouts, which compel companies to employ more costly and alternative modes of transportation like air freight, raising expenses and carbon emissions (Arıkan *et al.*, 2014). In the context of a supply chain, lead time is the entire amount of time that passes between placing an order with a supplier and when the order is delivered. Based on the study conducted by Arıkan *et al.*, 2014, Lead time is calculated by factoring in both average transit time and shipping delays, particularly in the case of containerized ocean shipping. Metrics like transit time (the anticipated duration) and schedule reliability (the actual time taken, taking into account unanticipated delays such as terminal operations, marine passages, and port access) are used to quantify the variability in lead time.

2.3 Inventory Management Techniques

Organizations have to use different strategies and inventory management techniques to reduce stock-outs and excess inventory. Efficient inventory management is essential for any business, as it strives to minimize expenses or maximize revenue while satisfying customer needs. This involves maintaining the optimal level of stock, ensuring it is of the right quality and quantity, and making it available at the correct time and location. This section will delve into the different methods employed in inventory management by examining pertinent research.

2.3.1 Vendor Managed Inventory (VMI):

Under this system, manufacturers are tasked with monitoring and controlling inventory levels at the distribution center and even at retail stores, if necessary. This approach represents a significant shift in traditional inventory management practices (Ondiek, 2015).

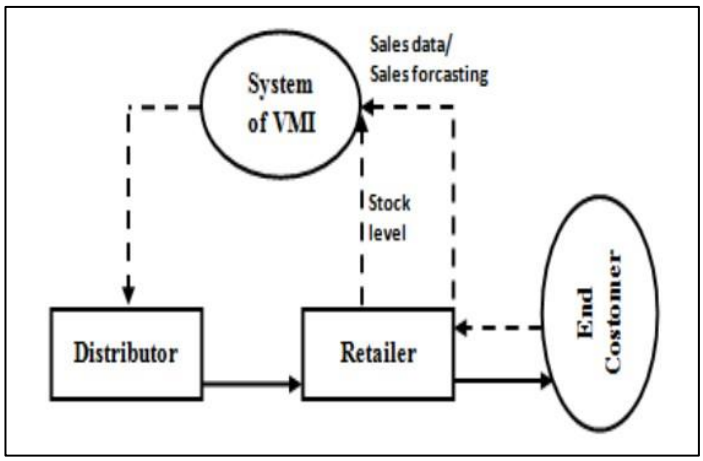

FIGURE 1: MATERIAL FLOW AND SUPPLY CHAIN INFORMATION OF VMI

SOURCE: SABILA ET AL., 2018

A study conducted by Sabila et al., 2018 explaining about Vendor Managed Inventory (VMI) and it is a method of inventory management and procurement in which the supplier takes on the

responsibility of monitoring and restocking stock levels. Despite appearing to contradict the concept of pull scheduling, which usually relies on downstream demand to control production, VMI actually relies on sales information provided by the retailer. For long-term planning purposes, the vendor gets access to retailer inventory and demand data through the VMI program. Retailers are protected from having too much inventory and don't have to pay for orders. The benefits of using VMI programs are numerous and may be summed up as an increase in the supply chain's dynamic performance(Jasemi *et al.*, 2014). Within the VMI framework, suppliers monitor sales and inventory levels, using this data to initiate procurement. By granting suppliers and distributors direct access to real-time purchase information from retailers, this approach simplifies the supply chain and enables more accurate and timely inventory replenishment. Fig.1 shows a supply chain diagram depicting dashed lines for information flow and solid lines for material flow from the producer to the final customer can help illustrate the VMI process. By facilitating the seamless transfer of sales data from retailers to suppliers, providing instantaneous access to crucial information, and optimizing the precision and speed of inventory management, VMI enhances the efficiency of the supply chain (Rana *et al.*, 2015).

2.3.2 Collaborative planning, forecasting, and replenishment (CPFR):

CPFR, an acronym for Collaborative Planning, Forecasting, and Replenishment, is a specialized application of supply chain management concepts in the retail sector (Wang *et al.*, 2005, p. 25). CPFR aims to boost profitability by enhancing forecast accuracy, improving customer satisfaction, reducing inventory, and ensuring the availability of accurate information. A study by (Johnson, 2016) noted that CPFR benefits the entire supply chain by increasing profit margins, refining forecasting and scheduling, and minimizing stockouts through enhanced information exchange. CPFR provides a wide range of advantages that strongly encourage businesses to embrace this innovative approach to managing the supply chain. CPFR greatly improves forecast accuracy, with enhancements that can range from 10% to 40%, thus enabling better synchronization between supply and demand (Wang *et al.*, 2005). This increased accuracy results in a quicker response to consumer demand, as real-time information sharing and improved collaboration make it possible to make rapid adjustments to market changes. CPFR cultivates lasting improvements in the relationships between supply chain partners through enhanced communication and collaborative planning, which in turn leads to increased sales (Ireland, R. *et al.*, 2000).

The implementation of Collaborative Planning, Forecasting, and Replenishment (CPFR) faces several significant barriers that complicate its effectiveness, including lack of trust between supply chain partners, ineffective use of Point of Sale (POS) demand data, change management challenges, miscommunication, scalability issues, insufficient senior management support, unclear objectives, lack of collaboration discipline, and limited pilot study data. These barriers underscore the challenges of implementing CPFR effectively, despite its potential to improve supply chain efficiency (Folinas and Rabi, 2012).

Folinas and Rabi, 2012 emphasize the importance of improving internal forecasting procedures to successfully implement CPFR. This involves enhancing management, systems, methodologies, and performance assessment. Additionally, promoting the flow of timely and specific information and training employees in collaborative techniques can enhance the efficacy of CPFR. It's advised to avoid large expenditures in CPFR technology initially and focus on creating strong alliances and smooth information exchange. Streamlining internal procedures, facilitating efficient information interchange, and providing cooperative training can significantly improve CPFR projects.

2.3.3 Economic Order Quantity (EOQ):

The effective management of inventory requires a rational approach to decision-making on when and how much to order. The Economic Order Quantity (EOQ) serves as a valuable tool for businesses in strategically scheduling stock replenishments on a monthly, quarterly, semi-annual, or yearly basis. The utilization of the Re-Order Point (ROP) and EOQ is vital for enhancing inventory management, as these tools work to minimize holding costs within distribution facilities (Atnafu and Balda, 2018). EOQ is most suitable for scenarios where a product experiences consistent demand year-round and orders are replenished in full upon depletion of inventory. A fixed fee is charged for each order, regardless of the quantity of units purchased. In addition, there is a holding or storage cost for every unit in inventory, which is sometimes calculated as a percentage of the item's purchase price (Kithinji, 2015).

The EOQ formula is a mathematical model utilized to calculate the optimal order quantity, aiming to minimize the sum of ordering and holding costs. The formula is given by:

$$EOQ = \sqrt{(2DS)/H}$$

Where D represents the annual demand for the product, S is the ordering cost per order, and H is the holding cost per unit per year. This model helps in identifying the quantity that minimizes overall inventory expenses by finding the right balance between order frequency and inventory holding costs. Precise calculation of EOQ allows retail wholesalers to optimize their inventory management, leading to efficient and cost-effective ordering and storage methods (Riza and Purba, 2018).

Ordering costs include all of the costs associated with placing and processing an order. These include communication expenses for contacting suppliers by phone and email, administrative expenditures including paperwork, data input, order processing, and shipping and handling expenses for moving items (Riza and Purba, 2018). Ordering costs also include costs related to receiving inventory, such as quality checks and inspections and costs related to maintaining supplier relationships, like negotiating and unloading. These expenses are often set per order, so they don't change based on the quantity of the order but rather on how frequently it is placed.

Holding costs, on the other hand, are the costs associated with keeping inventories in storage and upkeep over time. These expenses cover maintenance, utilities, and storage-related costs

like rent or warehouse space depreciation. Holding expenses also include insurance payments to guard goods against loss, damage, or theft. The expenses of obsolescence, or inventory that ages and loses value over time, and spoiling or deterioration, which deals with perishable commodities or things that deteriorate over time, are other important factors. Additionally, capital expenses—which reflect the lost opportunity cost of money spent elsewhere instead of being locked up in inventory—and security costs—which pay to protect the inventory—are included in holding costs (Riza and Purba, 2018).

Due to its ability to balance ordering and holding expenses, EOQ is essential for preserving ideal inventory levels. This indicates that retail wholesalers shouldn't overstock; instead, they should have enough inventory to match client demand (Riza and Purba, 2018). Through EOQ, wholesalers may guarantee that they possess the appropriate inventory quantity, enhancing their capacity to rapidly and effectively fulfill client requests. Because wholesalers can steer clear of the dangers associated with both excess inventory and stockouts, this optimization improves customer happiness and operational efficiency.

2.4 Technological Advancements

To fully reap the reviewed benefits of efficient inventory management, organizations have decided to automate their inventory management activities (Ondiek, 2015). Inventory management is implementing an optimum inventory strategy, such as a plan to reduce costs while increasing firm earnings (Johnson, 2016). The following section provides a brief overview of the major systems implemented to automate inventory management.

2.4.1 Industry 4.0

First proposed by the German government, Industry 4.0 stands for the Fourth Industrial Revolution. This revolution marks the beginning of a new era in which diverse technologies—such as cloud computing, big data, RFID tags, the Internet of Things (IoT) (Mashayekhy *et al.*, 2022), and the Internet of Services (IoS)—are integrated to improve organizational efficiency (van Geest *et al.*, 2021). Industry 4.0 is a revolutionary approach to warehousing and manufacturing that uses cutting-edge technology to build automated, highly networked systems. In order to improve the intelligence and operational capabilities of industrial systems, this new industrial revolution integrates a number of disruptive technologies, including edge computing, fog computing, augmented reality, deep learning, the Internet of Things (IoT), big data analytics, digital twins, and cloud computing (van Geest *et al.*, 2021).

Regarding inventory management, Industry 4.0 makes it easier for conventional warehouses to transform into smart warehouses. A smart warehouse uses cutting-edge technologies and best practices to run as efficiently as possible. It makes procedures like delivery, accounting, and pickup paperless and man-free by automating them (Liu *et al.*, 2018). According to (Liu *et al.*, 2018), the primary research difficulties in this field include multi-robot collaboration, human activity identification, time-efficient communication scheduling, and robust localization of objects.

In order to support this idea, smart warehouse management systems are being created. These systems will incorporate features like zone capacity picking, product positioning, and optimal order picking through a variety of algorithms. With the addition of sensors, network gateways, actuators, cloud and fog systems, data processing applications, visualization tools, and power sources, IoT technology improves smart warehouse monitoring and control systems even further (Čolaković *et al.*, 2020). Organizations must set up specialized infrastructures that can support cutting-edge business models in order to implement Industry 4.0 technology. In a completely digital world, these new models—disruptive business models among them—are necessary to provide customers with intelligent goods and services (Mashayekhy *et al.*, 2022).

2.4.2 Internet of Things (IoT)

The concept of the Internet of Things (IoT) proposed by an executive director of the Auto ID Center is key to the development of Industry 4.0. IoT aims to integrate networked devices into an efficient system that operates without human intervention, enabling the creation of intelligent factories and machinery. This concept facilitates strong connectivity between the digital and physical worlds, enhancing the intelligence of operations, services, and items along the value chain. By employing internet-based wireless technologies and sensors for real-time data transfer, IoT significantly improves resource efficiency, transparency, real-time management, optimization, and agility in the supply chain (Mashayekhy *et al.*, 2022). The fundamental principles of IoT offer a multitude of valuable applications across various domains such as sustainability, safety, and security. The Internet of Things (IoT) is transforming the wholesale industry by enabling hyperconnectedness of products through sensors, software, and wireless connections. These connected devices can communicate with each other, collect, store, and send data, fostering better collaboration among employees, suppliers, wholesalers, and retailers. IoT is driving new business models in the wholesale sector by providing insights into customer profitability, enabling predictive analytics for future demand, and improving product lifecycle management. As a result, wholesalers can better anticipate needs, manage inventory, and automate processes like replenishment, leading to more efficient operations and improved customer service (Karen Lynch, 2016).

2.4.3 Artificial Intelligence and Machine learning

Businesses are now able to forecast demand, control stock levels, and maximize operational efficiency thanks to the revolutionary ways that AI and ML have been incorporated into inventory management procedures. Businesses may move from traditional reactive inventory management to a more proactive and strategic strategy thanks to AI and ML's powerful predictive analytics. In inventory management, machine learning (ML) improves prediction accuracy by learning from data trends and making adjustments over time, while artificial intelligence (AI) focuses on decision-making by evaluating large volumes of data. The difficulties of managing inventories in dynamic and unpredictable contexts are addressed by the incorporation of these technologies

into inventory systems, which enables more responsive and adaptable supply chains (Javaregowda *et al.*, 2020).

Inventory management may be enhanced by the application of various AI and ML approaches. In the study of Javaregowda *et al.*, 2020 discusses some, Bayesian networks, which offer a probabilistic approach to forecasting and decision-making; Artificial Neural Networks (ANN), which are excellent at fitting issues and may be used to predict demand patterns; and Support Vector Machines (SVM), which are well-known for their classification skills. By improving demand prediction, these strategies lower the possibility of stockouts and overstock scenarios. Effective inventory level monitoring is provided by AI models like Decision Support Systems (DSS) and multi-agent systems found in JADE platforms. Benefits from these AI approaches include better forecasting, automated tasks, and better decision-making; nevertheless, implementation may face obstacles due to model complexity and data quality.

2.4.4 Radio Frequency Identification (RFID)

RFID technology and Bar codes allow for daily evaluation of inventory levels in a store, reducing technology breaches and improving accuracy and ease of use. This helps retailers with their merchandising plan and store display performance (Macas *et al.*, 2021). A possible alternative to traditional barcodes is radio frequency identification (RFID). RFID has the advantage of being able to read tags even when they are hidden, for aesthetic or security reasons (Costa, F. *et al.*, 2021). Because it is cost-effective, RFID can be widely used as an environmental sensor. Its applications include non-invasive monitoring, hazardous agent identification, monitoring physical parameters, and detecting tampering. RFID tags can be read from a distance of a few millimeters to several hundred meters, depending on the specific use. Since each application is unique, feasibility studies are necessary to determine the best frequency and tags for practical implementation (Costa, F. *et al.*, 2021).

RFID sensors are crucial in the food industry because they enable intelligent labeling to identify and report the freshness and condition of food goods. There is a growing need for inexpensive and battery-free food safety and quality sensors in the market. RFID sensors function using the electric field produced in their antenna, which is affected by their surroundings (Costa, F. *et al.*, 2021). This allows for monitoring various food conditions, such as the freshness of seafood, milk, and bacterial presence. Passive RFID sensors are more affordable and do not require batteries compared to other battery-operated systems. They primarily detect changes in the dielectric characteristics caused by food deterioration, which alters the sensor's resonant frequency. These sensors enable real-time monitoring of food quality and can be placed either on the food or directly on the food packaging (Costa, F. *et al.*, 2021) .

	Wired Sensors	Wireless Sensors	RFID Sensors	Chipless RFID Sensors
Installation cost	High	Low	Low	Low
Maintenance cost	Low	High	Low	Low
Hardware cost	High	Medium	Low	Low
Scalability	Low	High	High	High
Sensor accuracy	High	High	Medium	Low

FIGURE 2: COMPARISON BETWEEN DIFFERENT SENSORS (SOURCE: COSTA, F. ET AL., 2021)

2.5 Demand Sensing and Inventory Accuracy

Demand sensing involves the identification and interpretation of consumer purchasing patterns and decision-making processes. This includes determining a potential customer's economic segment and estimating the price they are willing to pay for a new or existing product. Another aspect of demand sensing is understanding the customer's latent consideration set, which comprises the new features or items that the consumer is likely to find appealing (Karumanchi *et al.*, 2005).

Demand Sensing aims to enhance two critical areas for businesses: Working Capital and On-Shelf Availability (OSA). OSA is vital for both producers and retailers as it measures the availability of products on store shelves. Poor OSA is often caused by inaccurate forecasting and inefficient replenishment processes, both of which negatively impact customer choices and create new challenges for consumer packaged goods (CPG) companies. By utilizing Demand Sensing to address these issues, organizations can improve OSA and bring benefits to both customers and businesses. Additionally, since working capital represents a significant portion of logistics costs—of which over 24% are frequently tied to inventory—it is crucial for cost control and operational efficiency (Folinas and Rabi, 2012). The integration of demand sensing into inventory management processes can enhance product availability and optimize working capital. This, in turn, can boost an organization's overall productivity and profitability.

The methodical process of projecting future demand for a good or service that a company offers amid a variety of uncertain and competitive factors is known as demand forecasting (Javaregowda *et al.*, 2020). Its main goal is to quickly and accurately translate downstream data—such as Point of Sale (POS) and Radio Frequency Identification (RFID) data—into actionable insights. Using sophisticated algorithms to evaluate this data, connecting CRM systems to improve data flow, and exploiting unstructured data sources like social media and weather patterns to improve demand forecasts are some of the strategies used in demand sensing (Folinas and Rabi, 2012). Organizations may proactively influence customer behavior, improve

inventory levels, and guarantee that items are available at the appropriate time and place by integrating demand sensing with demand-shaping operations.

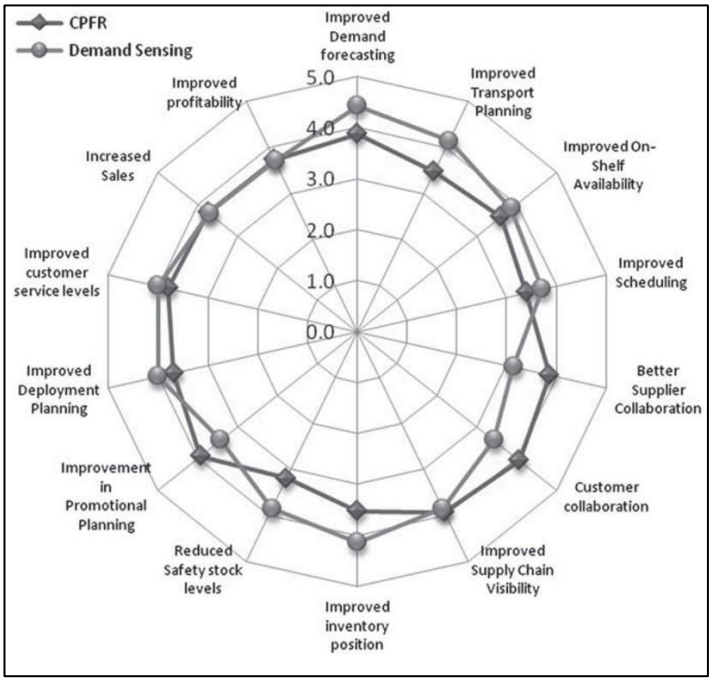

FIGURE 3: COMPARISON BETWEEN CPFR AND DEMAND SENSING (SOURCE: (FOLINAS AND RABI, 2012))

The perceived benefits of applying demand sensing are shown in the above figure prepared by Folinas and Rabi, 2012, participants rated 14 criteria on a scale from 1 (very low) to 5 (extremely high). The results reveal that the majority of respondents consistently rated demand sensing favorably. Demand sensing was found to be highly beneficial in several key areas, including improving forecast accuracy, enhancing on-shelf product availability, optimizing inventory levels, and reducing costs associated with excess inventory and stockouts. Moreover, demand sensing was commended for its ability to provide real-time insights into external variables and customer demand, enabling businesses to respond swiftly and effectively to market shifts. This capability enhances overall supply chain performance, improves customer satisfaction, and boosts operational efficiency. The positive evaluations suggest that demand sensing is perceived as a critical tool for driving significant improvements across various supply chain functions.

2.6 Theoretical Perspective

In regards to the applications of retail and warehouse inventory control strategies across the Irish retail industry, the emphasis of the study includes the Chaos theory, resource-based view (RBV) theory, and Dynamic Capabilities Theory. Chaos theory links independent and dependent variables in the conceptual framework and explains the dynamic and complicated nature of retail supply networks, making precise customer demand forecasts tiresome. Chaos theory is not a theory in the usually recognized sense of theory as a series of interconnected statements (Bolland

and Atherton, 1999). Chaos theory clarifies why some retail managers utilize inventory optimization, restocking methods, and forecasting strategies to prevent stockouts, ensuring cost-effective inventory management.

The RBV theory, introduced by Jay Barney in 1991, emphasizes that a company's internal resources and capabilities are vital for gaining a competitive advantage. Distinctive, scarce, valuable, and irreplaceable resources, as they form the foundation of a company's triumph (Pierre, 2023). In the context of this study, the Resource-Based View (RBV) theory can be applied to analyze how a M&C Ireland's competitive advantage and performance are improved through the unique digital resources and capabilities they acquire as part of their digital transformation efforts.

The Dynamic Capabilities Theory, developed by David J. Teece in the 1990s, revolves around a firm's capacity to adapt and reconfigure its resource base in response to a constantly evolving environment. It underscores the vital importance of a business's ability to perceive changes, seize opportunities, and efficiently reallocate its resources. This theory provides valuable insights into how organizations and M&C Ireland can leverage digital transformation strategies to enhance performance amidst rapid changes, proactively address shifts, and heighten market awareness within the dynamic landscape of Ireland's food retail industry, where digital technologies and consumer preferences are in a continual state of flux (Pierre, 2023).

2.7 Conceptual framework

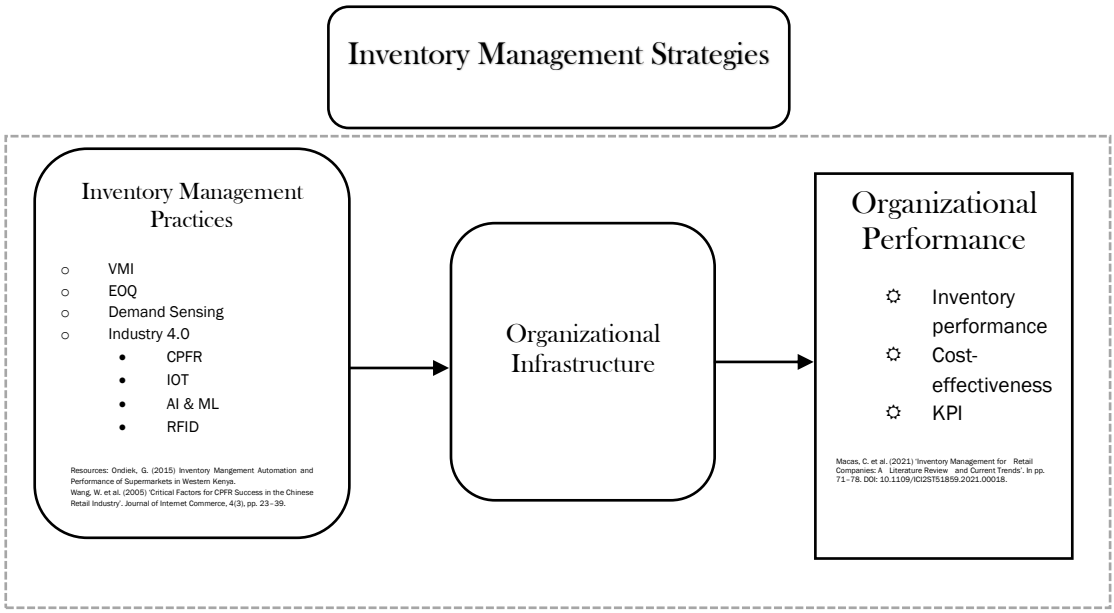

FIGURE 4: CONCEPTUAL FRAMEWORK (SOURCE: DEVELOPED BY LEARNER)

This framework is centered on the integration of modern technologies and their influence on organizational performance. It delineates the interrelation of crucial elements concerning

inventory management methods in wholesale companies. The framework is designed to steer future research on the assessment and enhancement of inventory control procedures in a wholesale provider operating in Ireland.

Vendor Managed Inventory (VMI) effectively minimizes stockouts and excess inventory by entrusting suppliers to maintain and replace inventory levels. This approach also fosters seamless cooperation between suppliers and retailers. In contrast, the Just-in-Time (JIT) inventory system is designed to minimize waste and holding expenses by ordering and receiving inventory only when needed. However, for JIT to operate efficiently, accurate demand forecasts and reliable suppliers are imperative. The Economic Order Quantity (EOQ) is a robust mathematical model that optimizes holding and ordering costs, ensuring efficient inventory levels by pinpointing the ideal order quantity that minimizes overall inventory costs. Supply chain partners collaborate on forecasting and replenishment tasks, significantly enhancing the accuracy of demand forecasts, reducing inventory levels, and boosting customer satisfaction as part of Collaborative Planning, Forecasting, and Replenishment (CPFR). Finally, Safety Stock Management guarantees inventory availability during unforeseen swings by maintaining a buffer stock to guard against demand and supply uncertainty.

The effectiveness of inventory management is influenced by various factors such as market conditions and technological advancements. Technological innovations such as Industry 4.0, AI & ML, Internet of Things (IoT), and Radio Frequency Identification (RFID) greatly enhance the efficiency of inventory control. RFID enables real-time inventory tracking, which improves accuracy and reduces error rates. Meanwhile, IoT facilitates the integration of different systems and devices, enabling automated inventory management and real-time monitoring. Industry 4.0 technologies like big data analytics, cloud computing, and artificial intelligence further enhance the responsiveness and effectiveness of inventory management systems.

The management of inventory is influenced by market conditions, including changing customer preferences, strong competition, and difficult economic situations. To remain competitive in the midst of increased competition from both local and international businesses, it is crucial to have effective inventory management systems that are adaptable and responsive. Economic changes can affect demand and purchasing power, leading to fluctuations in inventory levels and management approaches.

The framework examines customer satisfaction and organizational performance as dependent variables. Inventory control procedures play a critical role in influencing these variables, while technological advancements and market dynamics also have a moderating impact (Richard *et al.*, 2008). Effective inventory control procedures contribute to enhanced cost-effectiveness, operational efficiency, and inventory turnover, all of which positively impact organizational performance. Firms like M&C Ireland can improve cost efficiency by reducing holding and ordering expenses. Implementation of Vendor Managed Inventory (VMI) and Economic Order Quantity

(EOQ) practices can optimize resource utilization and mitigate obsolescence. Moreover, proficient inventory management can result in higher inventory turnover rates, ultimately leading to improved productivity. Effective inventory control procedures play a crucial role in influencing customer satisfaction. Procedures such as safety stock management and CPFR (Collaborative Planning, Forecasting, and Replenishment) are vital for achieving this goal. Implementing technologies like RFID can help reduce errors in inventory tracking and management, thereby increasing order accuracy and ultimately enhancing customer satisfaction. Successful inventory management leads to high service levels, which in turn contribute to improved customer happiness and loyalty.

The conceptual framework highlights the interconnected relationship between market dynamics, technology advancements, inventory management procedures, and their combined impact on consumer satisfaction and organizational success. By integrating advanced technology such as RFID, and Vendor Managed Inventory (VMI) systems, inventory accuracy can be significantly improved, leading to reduced stockouts, enhanced customer satisfaction, and improved operational effectiveness. Wholesale providers can adapt their inventory management procedures to remain flexible and responsive to changing consumer preferences and competitive challenges, thereby enhancing organizational performance. This framework underscores the essential elements that drive success in the retail supply chain, emphasizing critical inventory control procedures while considering the moderating influences of market conditions and technological advancements.

2.8 Research Gap

While acknowledging the limitations in the literature, it's critical to remember that this study aims to rectify a number of issues raised by earlier studies on inventory management in small- and medium-sized wholesale businesses. The majority of the material that has already been written concentrates on large-scale businesses and does not sufficiently examine the unique inventory management difficulties that SMEs have, especially when they operate in an environment that depends heavily on imports, as did the wholesale provider in Ireland under study.

This study also emphasizes the lack of support there is for small and medium-sized enterprises (SMEs) with limited resources on the use of Industry 4.0 technologies like RFID, AI and IoT. Furthermore, while the benefits of demand sensing and forecasting for retail operations are well-publicized, wholesalers that manage lengthy supply chains with extensive lead times sometimes receive less emphasis from these methods. Last but not least, although having a big influence on inventory levels, supply chain unpredictability, and transportation delays are still understudied in the context of wholesale trade. To close these gaps, this report offers specific ideas for enhancing inventory management using modern technology and tackling transportation-related issues in the SME wholesale industry.

Chapter 3: Methodology and Research Design

3.1 Overview

This research aims to analyze and distinguish the factors that affect inventory management practices in a retail wholesaler in Ireland. The study specifically seeks to understand how advanced inventory management techniques, employed by a small wholesale supplier in the Irish retail industry such as Economic Order Quantity (EOQ) and demand sensing and current practices and their impact on inventory control, cost efficiency, and overall operational performance. In this study we are studying a single organization and analyzing primary data gathered from top to bottom-level management staff, through in-depth interviews with employees at various organizational levels, this research seeks to gain insights into existing challenges and opportunities in inventory management and propose enhancements that can improve efficiency and sustainability in the supply chain.

Choosing the right research method is crucial for the success of any research project. Each research problem requires a specific approach, and using an inappropriate method can significantly undermine the study's integrity. Therefore, aligning the research method with the study's field is essential, as it directly influences the validity and credibility of the findings. This chapter explores the selected research methods specifically tailored to meet the objectives of this study.

According to Crotty, 2004; Saunders et al., 2009 cited in (Opoku *et al.*, 2016), Researchers have access to different methods, such as experiments, surveys, case studies, action research, grounded theories, ethnography, and archival research. The choice of a suitable research approach is determined by the research questions, objectives, current understanding, time and resources, and the researcher's philosophical standpoint (Opoku *et al.*, 2016). The choice of data collection and analysis methods, whether qualitative, quantitative, or mixed methods, depends on the research paradigm and the nature of the research question. According to Mouton, 2001 cited in (Opoku et al., 2016) Research methodology outlines the processes and tools required to gather necessary data. Regardless of the approach—quantitative, qualitative, or mixed—the primary aim is to collect data representative of the larger population stated by Gray, 2006 cited in (Opoku *et al.*, 2016). Since it is impractical to gather information from the entire population, sampling techniques are employed to obtain data from a subset of the population (Opoku *et al.*, 2016)

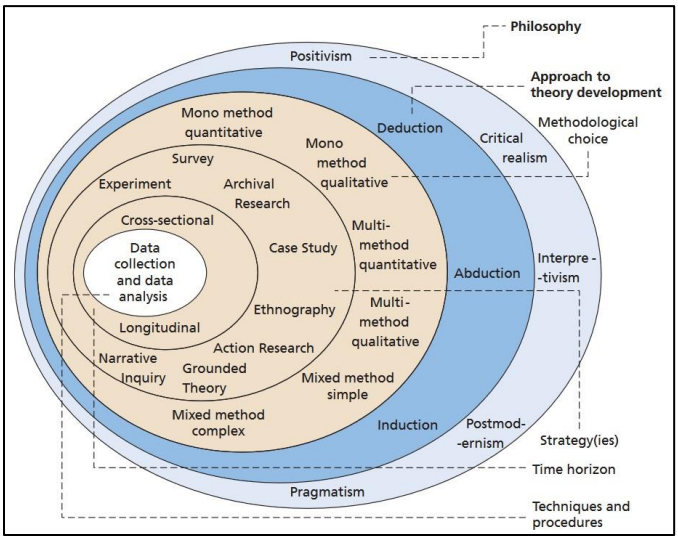

FIGURE 5: "RESEARCH ONION"

(SOURCE: (SAUNDERS *ET AL.*, 2019))

The outermost layer of the Research Onion is the "research philosophy". For this study, figure 5 shows that the chosen philosophy is the interpretivism paradigm, as it focuses on exploring and understanding the research topic through the experiences of retail managers. This interpretivist approach aims to gain insights into human experiences and the significance people attribute to various life events, intending to identify key aspects and the evidence supporting them (Ayton et al., 2023). Moving inward, the next layer is the research approach, for which the "Inductive approach" has been selected. This approach is suitable for developing theories based on observed data, allowing the research to develop theories related to inventory management, the latest technology, and organizational efficiency from specific observations within the selected organization.

The "research strategy" layer encompasses the overall plan for addressing the research questions. This study has employed a combination of "Interviews" and "Case Study" strategies to collect qualitative data. Interviews with three managers out of a total of five employees at the selected organization provided detailed insights into operational practices and challenges. These three managers were chosen for their pivotal roles in the organization, as they are primarily responsible for handling most of the organization's activities. Their perspectives are therefore critical for a comprehensive understanding of the organization's operational dynamics. At the research choices layer, the "Mono Method approach" was chosen, using a qualitative method and case study design to investigate real-world settings. This approach was deemed appropriate for the research issue and aims, serving as an effective exploratory method for addressing the study topic (Ayton et al., 2023).

For the time horizon layer, a "Cross-Sectional" design was selected, involving data collection at a single point in time. This design helps assess the current state of the organization's inventory management practices concerning reliability and sustainability, without the interference of

temporal changes. The innermost layer involves the specific techniques and procedures for data collection and analysis. In this study, “Thematic Analysis” was used to analyze the qualitative data obtained from interviews and case studies. Open-ended questions in interviews ensured rich, detailed responses, while case studies provided contextual depth. This research employs a qualitative case study methodology to investigate inventory management practices within a single organization. The study focuses on understanding the factors influencing inventory control and management, particularly in implementing advanced technologies such as demand sensing and Economic Order Quantity (EOQ). Since the research is exploratory, a case study methodology is adopted. Case studies are suitable for exploring issues that are too complex for empirical surveyor experimental research.

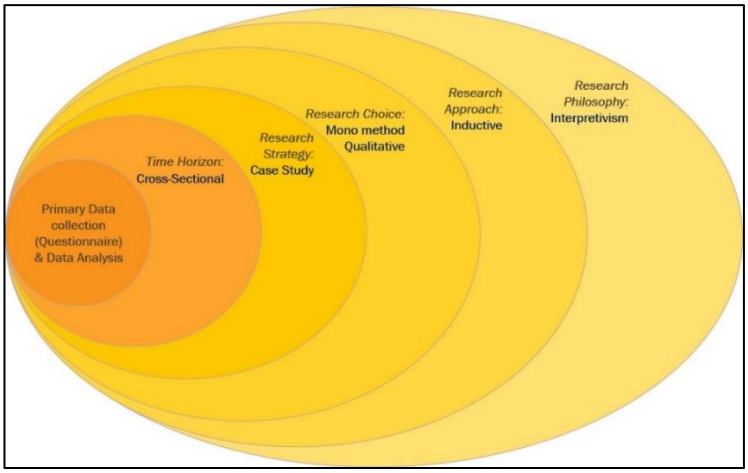

FIGURE 6: STEPS THE AUTHOR TOOK TO PREPARE THIS RESEARCH BASED ON THE ONION MODEL ABOVE. (ADAPTED FROM SAUNDERS ET AL., 2019)

The research onion framework, as described by (Saunders *et al.*, 2019), served as a conceptual underpinning for the development of an extensive research technique in this study. The research onion was carefully peeled back, starting with the interpretivism research philosophy at the base and working our way up to research approaches, tactics, procedures, and data-gathering techniques. The selection of acceptable techniques and processes for data gathering and analysis was guided by the careful consideration of each layer, which was built upon the one that came before it. Following the research onion model allowed the study to guarantee a methodical and organized approach to planning and carrying out the research, which in turn produced insightful and insightful results.

3.2 Research Philosophy and Approach

Research philosophy is the name given to a set of presumptions and views on the advancement of knowledge. Even though it may sound very deep, when starting a research project, the researcher is expanding their knowledge in a certain topic. Even though the knowledge growth achieved may not be as significant as creating a new theory of human motivation, the researcher is still learning new things by solving a particular issue within a certain organization (Saunders et

al., 2019). An interpretivist research philosophy was used in this study to investigate and comprehend the managers' individualized experiences and insights. Developing fresh, more insightful perspectives and understandings of social environments and situations is the aim of interpretivist research. For scholars studying business and management, this entails examining organizations from the viewpoints of various social groups (Saunders *et al.*, 2019). The interpretivist ideology emphasizes the researcher taking an empathic position. Entering the social environment of study participants and comprehending it from their perspective presents an interpretivist with a problem. Business scenarios are not only complex but also frequently unique at least in relation to their surroundings. They illustrate a certain combination of events and interactions involving people getting together at a certain moment (Saunders *et al.*, 2019).

Furthermore, an inductive technique was used throughout the study process. An inductive method involves collecting specific observations or evidence and then formulating broader ideas or hypotheses based on them. In this study, the inductive technique was applied to explore and understand the inventory management practices within a food product wholesaler, M&C Ireland, focusing on understanding the current practices in inventory management in that organization and providing relevant suggestions for further development in all aspects by utilizing and implementing new technologies. Based on the research purpose of this study, the researcher will conduct in-depth interviews to collect data, which will subsequently be analyzed to uncover patterns, themes, and concepts. Qualitative research is often said to involve inductive thinking or induction reasoning since it progresses from precise observations about distinct events to broader generalizations and assumptions (Soiferman, 2010). By employing an inductive methodology within the interpretivist research philosophy, the study aimed to generate rich, empirical data to enhance our understanding of how these technological innovations influence inventory management practices and operational performance in wholesaler environments.

3.3 Research Strategy

In research, there are different methods that can be used for explanatory, descriptive, and exploratory purposes. Some of these methods include experiments, surveys, case studies, action research, grounded theory, ethnography, and archival research (Takwi, 2021). While some methods align more with deductive or inductive approaches, it's not accurate to categorize them strictly as one or the other. Each method has its own strengths, and the most effective choice depends on how well it fits the study's goals and research topic. Factors such as research questions, objectives, available resources, and the researcher's philosophical position all influence the selection of a research method. The key strategy for this study was to use a case study qualitative research design.

For a deeper knowledge of the study setting and the procedures involved, case studies are very helpful. They work well for both explanatory and exploratory research because they can effectively address "why?" questions in addition to "what?" and "how?" inquiries. To verify the dependability

of data and triangulate it, a variety of data-gathering methods, including surveys, observation, documentary analysis, and interviews, are frequently combined (Takwi, 2021). The case study approach has allowed for a detailed examination of the inventory management practices and future plans of the selected food product wholesaler M&C Ireland. This has provided an overall understanding of its operations, challenges, and practices.

The qualitative method worked best as an exploratory approach to answering the study topic (Ayton et al., 2023). To investigate real-world settings, the research question was approached using a qualitative method using a case study design. This strategy was found appropriate for the research issue and aims. To get an understanding of social constructions, researchers employ qualitative methodologies that center on the use of words and pictures to interpret meanings and explain human behavior. The primary benefit of the qualitative approach is its ability to provide extremely detailed and rich data (Opoku *et al.*, 2016). The three qualitative interviews with the operational manager, marketing manager, and director of the organization provide an in-depth understanding of the current inventory practices, how they choose current practices, and their plan related to technological developments.

3.4 Data Collection

There were two basic components to the "data collection" process: the techniques for gathering "primary data" and "secondary data" (Takwi, 2021).

3.4.1 Questionnaire Design

The collection of primary data is a crucial aspect of the research methodology. In this study, the primary data collection method involves obtaining firsthand information from selected organization's managers in Ireland through semi-structured, open-ended interviews. Interviews are deliberate discussions that assist researchers in comprehending the experiences and viewpoints of the respondents in relation to the study topics, according to (Opoku *et al.*, 2016). According to Gray (2006) cited in (Opoku *et al.*, 2016), interviews are particularly helpful when respondents find writing challenging when more in-depth information is needed, when a high response rate is sought, or when concerns require more investigation. The major source of the primary data is shown in Appendix A Table 2.

3.4.2 Data Collection Process

To collect data for this study, telephone or face-to-face semistructured interviews with open-ended questions. After participants consent to an interview, the researcher gathers information by looking for supporting papers and rules on the company website. The interview protocols consisted of (a) a participant-selected private area, (b) an informed consent form, (c) a plain language statement (d) an interview questionnaire, (e) two voice recorders, (f) a pad of paper, and (g) writing implements. After addressing the participants' questions and completing the necessary forms, the interview commenced with an audio recording, followed by interview questions. At the end of the interview, the researcher requests secondary data such as supporting

documents, policies, or articles from each participant. Telephonic interviews are used to gather data because they are very convenient for the participants and researcher and do not interrupt their daily duties in the company.

3.4.3 Participants of the study

The research included important personnel from several administrative roles in M&C Ireland, all of whom have direct exposure to the company's inventory management procedures. These participants offer a comprehensive understanding of the organization's approach to inventory management from several angles, including marketing, operations, and overall business strategy. Their positions, years of experience, and primary tasks are listed in the Table 1.

Participants	Position	Year of Experience	Key Responsibilities
Respondent 1	Operational Manager	5 years	Day-to-day inventory management, stock monitoring, replenishment coordination
Respondent 2	Marketing Manager	4 years	Demand forecasting, customer management, product alignment with demand
Respondent 3	Director	11 years	Strategic oversight, decision-making on inventory practices, technology adoption

TABLE 1 PARTICIPANT DEMOGRAPHICS AND KEY RESPONSIBILITIES

3.5 Approach to Data Analysis

There are many different techniques to evaluate qualitative data, each carrying its theoretical presumptions and expectations, even if there are undoubtedly common analytical procedures. This research data analysis technique involved conducting interviews with participants using open-ended questions, as well as gathering relevant documents from organizational websites. Semistructured interviews with twelve open-ended questions and supporting documentation obtained from participants and organizational websites. Once more, all of the data was compared to ensure that it was legitimate, consistent, and trustworthy. After gathering data from the participants in audio format transcribe to text format and translate the language used in the interview to English for data analysis. In this study, Thematic analysis is a research method employed to discover and interpret patterns or themes within a data set, frequently resulting in new insights and comprehension. Thematic analysis is a technique for examining qualitative data. It entails identifying and reporting patterns within a data set, which are subsequently interpreted to uncover their inherent meaning (Naeem *et al.*, 2023). These patterns can be identified by analyzing the meanings of keywords used by participants. The process entails breaking down the

six processes into a methodical manner: making transcripts and becoming acquainted with the data; figuring out keywords; choosing codes; coming up with themes; conceptualizing by interpreting codes, themes, and keywords; and finally, coming up with a conceptual model. The key themes and significant findings will be discussed in the next chapter.

3.6 Ethical Considerations

Ethics are guidelines that assist in evaluating key principles in a research project. These ethical values help researchers carry out survey methods and conduct interviews with participants in a specific setting. To preserve individual identity, all replies are anonymized and aggregated, safeguarding participants' privacy and confidentiality. Prior to their participation in the study, all participants are asked for their informed permission and are provided with comprehensive information about the study's objectives, data processing protocols, and participant rights. It is guaranteed to participants that their involvement in the study is entirely voluntary and that they will incur no penalties should they choose to leave at any point. In addition, measures are taken to minimize any risks to participants, including secure data transfer and storage. Furthermore, audio tapes will be securely disposed of upon the successful completion of this master's degree, fully adhering to GDPR regulations.

This study attempts to protect the rights and welfare of the participating participants while maintaining the integrity and credibility of the research findings by addressing ethical issues and putting strict data-gathering procedures in place.

3.7 Summary

This research aims to analyze and distinguish the factors that affect inventory management practices in a retail wholesaler in Ireland, with a specific focus on advanced inventory management techniques such as Economic Order Quantity (EOQ) and demand sensing. By collecting primary data through in-depth interviews with top to bottom-level management staff within a single organization, this study provides valuable insights into existing challenges and opportunities in inventory management. The research also proposes enhancements to improve efficiency and sustainability in the supply chain. The study adopts the interpretivist research philosophy, which emphasizes understanding human experiences and the meanings people attribute to various life events. Using an inductive approach, the research develops theories based on observed data, specifically related to inventory management and organizational efficiency. A qualitative case study methodology was chosen for its ability to provide detailed, context-rich data. This approach included the use of semi-structured interviews and case studies, which were analyzed using thematic analysis to identify patterns and themes. The research strategy was meticulously designed following the "research onion" framework by (Saunders *et al.*, 2019), ensuring a structured and systematic approach. This included selecting a cross-sectional design for data collection at a single point in time, which allowed for the assessment of current inventory management practices without the interference of temporal changes.

Ethical considerations were a critical component of this study, with strict protocols in place to protect participants' confidentiality and privacy. Informed consent was obtained, and participants were assured that their involvement was voluntary and that they could withdraw at any time without penalty. Measures were taken to minimize risks, including secure data transfer and storage. The thematic analysis employed in this study, which involved using qualitative data collection techniques, ensured the reliability and validity of the findings.

In summary, this research provides a comprehensive examination of inventory management practices in a retail wholesaler, highlighting the impact of advanced technologies and proposing actionable recommendations for improvement. The study's robust methodological approach and adherence to ethical standards ensure the credibility and reliability of the findings, contributing valuable knowledge to the field of inventory management.

Chapter 4: Findings

4.1 Overview

This chapter presents the findings of the thematic analysis of the interviews with significant members of the organization and draws a relationship between the results, the objectives of the research, and the body of existing literature on inventory management strategies. The chapter is structured around the themes identified in the investigation, which include worker reliance and manual inventory management, inventory management challenges, limited technology adoption, forecasting methodologies, and key performance indicators (KPIs). The discussion assesses the practices and technologies already in use, takes into account how these issues impact the organization's capacity to manage inventory efficiently, and looks at potential areas for improvement.

By conducting in-depth interviews with top and bottom-level management within the company, the research aims to analyze inventory management practices within a retail wholesaler in Ireland. The study identifies challenges, opportunities, and potential improvements in inventory control, cost efficiency, and operational performance. The study used an inductive methodology and interpretivist mindset to create ideas based on observable evidence. A qualitative case study approach was used, and thematic analysis was used to examine the data gathered from semi-structured interviews. The responses are attached in Appendix B, Table 3.

4.2 Thematic Analysis

4.2.1 Theme 1: Inventory Management Practices

M&C Ireland's current inventory management processes heavily rely on manual methods, as highlighted by (Otieno, 2018) in the literature. The answers given by the three respondents offer a thorough understanding of the organization's inventory management procedures as they are now, as well as any room for development. The views expressed here will be discussed in relation to a number of topics, including Vendor Inventory Management (VIM), Demand Forecasting, Inventory Optimization, Collaborative Planning, Forecasting, and Replenishment (CPFR), Economic Order Quantity (EOQ), and the use of cutting-edge technologies like RFID and the Internet of Things (IoT).

4.2.1.1 Vendor Inventory Management (VIM)

It is clear from the interviews that although the company manages its vendors to some extent, especially to guarantee on-time product delivery, a formal Vendor Inventory Management system is not in place. Respondent 3 stated that over time, earlier procedures involving regular communication with suppliers—such as planning and monthly reports—have become less common. This decrease in proactive vendor engagement might be a factor in some of the inventory-related issues the company is seeing, such stockouts and delays in logistics. The literature supports the idea that effective VIM, particularly through close collaboration and shared

planning, can significantly enhance inventory reliability and reduce the risks associated with supply chain disruptions (Rana *et al.*, 2015).

4.2.1.2 Demand Forecasting

According to Respondents 1 and 2, demand forecasting inside the company appears to be primarily manual and based on previous sales data and market trends. The company tracks inventory levels using Sage software, but it does not take full advantage of the system's sophisticated forecasting capabilities. Respondent 2 emphasized the use of "mind forecasting," an instinctive strategy founded on experience that, although useful, might not be as accurate as more methodical forecasting techniques. This method of demand forecasting is in line with the difficulties noted in the literature, where businesses frequently experience difficulties with forecast accuracy as a result of depending on antiquated or inadequately sophisticated methodologies. The lack of integration between demand forecasting and inventory management systems can lead to inefficiencies, such as stockouts or excess inventory, both of which were mentioned as occasional issues by the respondents.

4.2.1.3 Inventory Optimization

The concept of inventory optimization was touched upon by all respondents, albeit indirectly, through their discussions on maintaining stock levels and preventing both stockouts and excess inventory. Respondent 1 noted the use of Sage software to monitor inventory levels, suggesting an attempt at optimization through real-time data monitoring. However, the process remains somewhat manual, as Respondent 3 explained that while the Sage software provides data, decisions regarding reordering and stock levels are still made based on experience and basic analysis rather than advanced optimization algorithms. This approach can lead to inefficiencies and missed opportunities for cost savings, as the literature indicates that more sophisticated inventory optimization techniques, including those integrated with real-time data and advanced analytics, are necessary for maintaining optimal stock levels in today's complex supply chains (Čolaković *et al.*, 2020).

4.2.1.4 Collaborative Planning, Forecasting, and Replenishment (CPFR)

Respondent 3 recognized the organization's use of CPFR procedures, pointing out that although collaborative planning with suppliers was once used, it has now largely been abandoned. The responder hypothesized that the difficulties in sustaining such collaboration over time and a shift in emphasis toward internal planning might be the cause of this deterioration. The literature highlights how CPFR may help to reduce inventory costs, improve forecast accuracy, and align the various participants in the supply chain. One possible explanation for the organization's difficulties in keeping appropriate inventory levels and adapting to shifts in customer demand is the lack of active CPFR procedures.

4.2.1.5 Economic Order Quantity (EOQ)

The respondents did not specifically identify Economic Order Quantity (EOQ) as a formal organizational practice. Nonetheless, Respondent 3's explanation of the ordering procedure, which entails keeping a number of orders pending and modifying amounts in response to inventory levels and sales patterns, points to an informal implementation of EOQ principles. Although the business has a reordering procedure, the responder noted that it is based more on practical factors and human computations than on a complex EOQ model. Although this method works, it might not entirely optimize ordering and holding costs as noted in the literature, where EOQ models are suggested because of their capacity to maintain cost-effective inventory management by balancing these costs.

4.2.1.6 Internet of Things (IoT) and Radio Frequency Identification (RFID)

Respondent 3 pointed out that the company has not yet embraced these technologies, despite being aware of them and their prospective advantages. This is mostly because of anticipated operational size and expense issues. Rather, the emphasis is still on simpler tech solutions like Sage software, which works well for routine inventory management duties but lacks the real-time, detailed insight that IoT and RFID devices can give. The literature underscores the transformative potential of these technologies in improving inventory accuracy, reducing manual errors, and enabling real-time tracking of goods across the supply chain (Čolaković *et al.*, 2020). The organization's hesitancy to adopt these technologies may limit its ability to achieve the highest levels of inventory optimization and responsiveness.

In summary, the respondents' descriptions of the organization's present inventory management procedures show a careful combination of conventional techniques and smart application of existing technologies. Utilizing software such as Sage for inventory management has many benefits, but there are also drawbacks, such as the need for manual operations and a lack of sophisticated technical integration. Problems like stockouts, delays in logistics, and the odd instance of excess inventory point to the need for a more methodical approach to the organization's inventory management, one that incorporates formalized EOQ models, advanced forecasting tools, and increased supplier collaboration through CPFR. Consistent with Ondiek's (2015) research, which highlighted the need for a combination of technological advancements and human supervision for efficient inventory management, the company's existing procedures stand to gain from a phased implementation of automated procedures. This might enhance overall operational performance by boosting productivity and allowing employees to focus on more intricate tasks. These views are corroborated by the literature, which emphasizes that depending solely on manual procedures and simple software tools is becoming less and less effective in the competitive and fast-paced market climate of today.

4.2.2 Theme 2: Challenges in Inventory Management

One of the crucial themes that emerged is the diverse range of challenges that M&C Ireland encounters in its inventory management. According to all three respondents, the issues include

frequent stockouts, logistical issues, delays in transportation, inventory accuracy, and significant hurdles in customs clearance procedures.

4.2.2.1 Stockouts

The management of inventory levels, stockouts, and excess inventory within the organization reveals significant insights into the operational challenges and strategies employed to maintain optimal stock levels. The responses from respondents 1, 2, and 3 provide a nuanced understanding of how the organization navigates these issues, shedding light on both the strengths and limitations of their current practices.

Respondent 1 highlighted the use of Sage software for monitoring inventory levels and ensuring stock availability. This software provides real-time visibility into the quantity of products in stock, which helps the organization make informed decisions about when to replenish inventory. According to this respondent, a minimum threshold is established—specifically, when the stock level of a product drops to 50 boxes (or 15 percent of the order quantity, so this quantity will vary based on product to product), a new order is initiated. This approach reflects a reliance on predetermined reorder points to trigger replenishment, a practice commonly discussed in the literature as essential for preventing stockouts and minimizing excess inventory (Priniotakis and Argyropoulos, 2018). However, the respondent also indicated that while the system is in place, it is not entirely immune to discrepancies that arise from external factors such as logistics delays or demand fluctuations, which can still lead to stockouts.

Respondent 2 offered further information about inventory management procedures, highlighting the application of both technologically aided and manual forecasting techniques. The reply indicated that data from Sage software and experience-based forecasts are used to place orders. This dual approach is consistent with the research that highlights the value of combining qualitative judgment with quantitative data to improve forecasting accuracy, since it implies a reliance on both historical data and personal skill (Macas et al., 2021). However, the respondent also noted challenges related to the timing of orders, especially given the long lead times associated with international suppliers. This situation can lead to stockouts if the forecasting does not adequately account for potential delays, which reflects a key challenge in inventory management where balancing lead times with demand forecasts is critical (Johnson, 2016).

Respondent 3 underlined the value of openness and the capability to check inventory data, even though they too used Sage software to track inventory levels. Maintaining accurate data is essential to preventing stockouts and excess inventories. The reply indicated that the company makes sure there are always many orders pending, indicating a pro-active inventory management strategy meant to reduce the possibility of stockouts. The reply did admit, though, that actual order timing and amount are frequently manually modified in response to current sales analysis and market conditions. This technique suggests a hybrid strategy in which technology assists in decision-making but human involvement is still essential, especially when it comes to adapting

for shifting market conditions and logistical difficulties in real-time. As Respondents 2 and 3 noted, "Logistical problems, such as delayed delivery of ordered goods—which can also be impacted by delays in customs and safety clearance—are the primary cause of stockouts." These difficulties align with the research, which lists supply chain interruptions and logistical inefficiencies as frequent problems in inventory management (Mashayekhy *et al.*, 2022). These difficulties are made worse by the company's reliance on foreign suppliers, as hold-ups in shipping or customs clearance can result in large stockouts that affect the company's capacity to satisfy client demand. The literature supports these findings, with (Corsten and Gruen, 2003) noting that logistics and forecasting challenges are common causes of stockouts in retail and wholesale environments.

The analysis of these responses, in conjunction with the literature, highlights a complex interplay between technology and human judgment in managing inventory levels. The use of Sage software across all respondents indicates a structured approach to monitoring stock levels and triggering replenishments. However, the reliance on manual adjustments and experience-based forecasting suggests that the current system may not fully optimize inventory management, particularly in preventing stockouts or managing excess inventory.

4.2.2.2 Errors in Inventory Accuracy

Errors in inventory accuracy, as identified through the responses from respondents 1, 2, and 3, reveal critical insights into the operational challenges faced by the organization. Each respondent provided a perspective on how discrepancies between recorded and actual inventory levels are managed, highlighting both the strengths and limitations of the current system.

Respondent 1 stated that during the processing of items in the warehouse, breakages or other unanticipated situations sometimes result in differences. Usually, the appropriate corrections are made to the inventory records to resolve these anomalies, especially if physical interventions are made during yearly stock inspections. The reply highlighted that even if inventory is managed by Sage software, a lot of adjustments still require human procedures, which raises the possibility of a flaw in the automation and accuracy of the inventory system in real time. The system may be vulnerable to further mistakes due to human error or delayed updates, as seen by its dependency on manual corrections.

Respondent 2 also identified warehouse management as a significant factor in inventory discrepancies. Mistakes were noted to occur during the picking and delivery processes, where products might be wrongly selected or incorrectly recorded during customer deliveries. This respondent pointed out that while Sage software helps in updating inventory levels, the root causes of discrepancies—such as errors in picking or changes in product conditions (e.g., expired goods)—are often manually rectified. This response highlights the limitations of the current inventory management system in fully automating and error-proofing the inventory handling

process, which aligns with literature emphasizing the need for advanced inventory management systems that can mitigate human error and enhance accuracy (Wang *et al.*, 2005, p. 25).

Respondent 3, while focusing less on the errors themselves, underscored the importance of Sage software in monitoring and managing inventory levels. This respondent suggested that the transparency and audibility provided by the software are key strengths in maintaining inventory accuracy. However, the respondent did not delve into specific discrepancies or errors, which may imply confidence in the system's ability to handle such issues or possibly a lack of awareness of the extent of these discrepancies. The reliance on software like Sage for monitoring, as discussed in the literature, underscores the importance of integrating advanced technological solutions in inventory management. However, the fact that discrepancies still arise, as noted by the other respondents, suggests that the current system may not fully address the complexity of managing inventory at the operational level.

In analyzing these responses alongside the literature, it becomes evident that while the organization has implemented tools such as Sage software to manage inventory, there are significant challenges in ensuring real-time accuracy and minimizing errors. The manual interventions described by respondents 1 and 2 points to a need for further automation and perhaps the integration of more advanced technologies embedded in the Sage software, RFID or IoT, which are noted in the literature for their potential to enhance inventory accuracy by providing real-time data and reducing human error (Johnson, 2016). Additionally, the literature suggests that practices such as continuous training and the adoption of more sophisticated inventory management systems could help mitigate these discrepancies (Macas et al., 2021).

4.2.2.3 Logistical issues, Delays in Transportation, and Significant hurdles in Customs Clearance Procedures

The interviews with respondents 1, 2, and 3 reveal critical insights into the logistical challenges, delays in transportation, and hurdles in customs clearance that significantly impact the organization’s inventory management. These issues underscore the complex and interconnected nature of global supply chains, particularly for a wholesale supplier that relies on international sources for its inventory.

Respondent 1 discussed the procedural aspects of inventory replenishment, highlighting the reliance on a minimum quantity threshold to initiate new orders. While this approach is standard in inventory management, the respondent pointed out that logistical delays, particularly in transportation, frequently disrupt the timely arrival of new stock. This disruption often leads to stockouts, which are exacerbated by the long lead times associated with international shipping. The literature echoes this concern, noting that the global nature of supply chains introduces variability in lead times due to factors such as port congestion, shipping delays, and customs procedures (Mashayekhy *et al.*, 2022).

Respondent 2 provided further elaboration on these issues, specifically emphasizing the unpredictability of transportation times. The respondent noted that while the organization attempts to forecast demand and order products well in advance—sometimes up to three months before the expected need—unforeseen delays often undermine these efforts. For instance, the time it takes for goods to clear customs can vary significantly depending on the country of origin, the type of product, and current geopolitical conditions. These variables make it challenging to maintain consistent inventory levels and meet customer demand on time. The literature supports this observation, indicating that customs clearance is one of the most unpredictable elements of international logistics, often leading to delays that ripple through the supply chain and affect inventory availability (Mashayekhy *et al.*, 2022).

Respondent 3 further highlighted the impact of these logistical issues on the organization's operational efficiency. The respondent described how transportation delays, particularly those related to customs clearance, not only cause stockouts but also contribute to the buildup of excess inventory when products arrive later than expected and after the peak demand period has passed. This misalignment between inventory arrival and market demand creates inefficiencies and increases carrying costs, as the organization must store unsold products until they can be moved through the supply chain. The respondent also mentioned the challenges posed by fluctuating transportation costs, which are often linked to broader economic factors such as fuel prices and shipping demand. These costs add another layer of complexity to inventory management, as they can significantly alter the cost-benefit analysis of holding versus ordering inventory (Folinas and Rabi, 2012).

The literature extensively discusses these challenges, emphasizing that the integration of advanced logistical technologies, such as real-time tracking and automated customs clearance systems, could mitigate some of these issues (Jono Langley, 2024). For example, IoT-enabled devices can provide real-time updates on the location and condition of goods in transit, allowing organizations to better anticipate delays and adjust their inventory management strategies accordingly (Mashayekhy *et al.*, 2022). Moreover, streamlined customs procedures, supported by digital platforms that facilitate faster documentation and compliance checks, could reduce the time goods spend in clearance, thereby improving the predictability of supply chains.

4.2.3 Theme 3: Technology Adoption

M&C Ireland is aware of the potential advantages of tools like RFID, IoT, and other automated systems, but these technologies have not yet been completely implemented. The main justification for this was the high cost of these expenditures and the requirement that the business expand before these costs can be justified. The findings are consistent with the body of literature indicating that a large number of small and medium-sized businesses (SMEs) frequently postpone investing in sophisticated inventory management systems because they believe the costs would be expensive and they are unsure of the investment's return (Mashayekhy *et al.*, 2022). However, as (Johnson, 2016) pointed out, that integrating cutting-edge technology may

result in notable gains in productivity, accuracy, and overall operational performance, making the investment profitable over time. This summary critically analyzes the respondents' perspectives on strategic technological integrations, the use of inventory management systems like Sage, the potential of supply chain analytics, and the current role of mobile applications within the organization.

4.2.3.1 Strategic Technological Integrations

The adoption of strategic technological integrations within the organization appears to be in a nascent stage. Respondent 3 indicated a general awareness of advanced technologies such as IoT (Internet of Things) and RFID (Radio Frequency Identification), but the organization has not fully embraced these technologies due to concerns over cost and the perceived scale of their operations. This hesitation to adopt cutting-edge technology aligns with the literature, which emphasizes the potential of IoT and RFID in transforming inventory management by providing real-time tracking, reducing manual errors, and enhancing overall efficiency (van Geest *et al.*, 2021). The reluctance to invest in these technologies may limit the organization's ability to fully optimize its inventory processes and maintain a competitive edge in the industry.

4.2.3.2 Inventory Management Systems

All three respondents highlighted the use of Sage software as the primary tool for managing inventory. Sage software is utilized for a variety of tasks, including monitoring stock levels, managing orders, and handling discrepancies between recorded and actual inventory levels. Respondents 1 and 2 specifically noted that while Sage is effective for basic inventory management, it does not offer advanced forecasting or real-time analytics capabilities that could further streamline operations. The literature supports the need for more sophisticated inventory management systems that can integrate with other technologies to provide deeper insights and real-time data analysis (Čolaković *et al.*, 2020). The current reliance on Sage, although functional, suggests a missed opportunity for leveraging more advanced systems that could enhance predictive capabilities and improve decision-making processes.

4.2.3.3 Supply Chain Analytics

The use of supply chain analytics within M&C Ireland is minimal. While Sage software does provide some level of data analysis, as mentioned by Respondent 3, it primarily serves as a tool for basic inventory tracking rather than a comprehensive analytics platform. The literature indicates that supply chain analytics can significantly improve inventory management by identifying bottlenecks, optimizing stock levels, and improving the overall supply chain (Čolaković *et al.*, 2020). The organization's current approach, which relies on manual forecasting and basic data analysis, may not fully capitalize on the potential benefits of advanced supply chain analytics, leading to inefficiencies and potential misalignment with market demands.

4.2.3.4 Mobile Applications

The organization has implemented a mobile application for customers to place orders online, as noted by Respondent 3. This application allows customers to view available inventory and place orders directly, which then integrate with the Sage software for processing. While this represents a step towards modernizing the organization's operations, it is primarily focused on the customer interface rather than internal inventory management. The literature suggests that mobile applications can be highly beneficial for inventory management, particularly in providing real-time access to inventory data and facilitating more efficient stock replenishment and order management (Čolaković *et al.*, 2020). However, the current use of mobile technology within the organization appears limited to customer interactions, with little emphasis on its potential for enhancing internal processes.

In conclusion, while the organization has made some progress in integrating technology into its inventory management practices, there is significant room for improvement. Embracing more advanced systems and technologies could provide substantial benefits, including improved inventory accuracy, better demand forecasting, and enhanced overall efficiency. To remain competitive and responsive to market demands, the organization should consider investing in these technologies and fully integrating them into their operations. By putting more sophisticated systems in place, the company may be able to control its inventory more effectively, minimize manual mistakes, and adapt more quickly to changes in the market. Furthermore, the research on Industry 4.0 highlights how crucial it is to implement new technologies in order to maintain competitiveness in a market that is changing quickly (van Geest *et al.*, 2021). The company may need to reevaluate its strategy to technology adoption in order to stay competitive, especially in a global market that is becoming more automated and digital. It may even need to start with small improvements that have obvious advantages right away.

4.2.4 Theme 4: Forecasting Practices

The respondents explained a hybrid method of demand forecasting that included the application of technological tools such as Sage with their expertise. However, because of the lengthy lead times connected with foreign suppliers, there were major difficulties in promptly responding to shifts in client demand. This is a serious problem as cost-effective inventory management and appropriate inventory levels depend on precise demand forecasting (Lalou *et al.*, 2020). The forecasting process's dependence on personal expertise is in line with conventional inventory management techniques, which place a strong emphasis on manager experience and previous sales data for making decisions. But as the study shows, these methods might not be as effective at identifying intricate demand patterns, particularly in a market that is evolving swiftly. It has been shown that employing advanced forecasting techniques, such real-time data analytics and machine learning algorithms, improves prediction accuracy by spotting non-linear patterns and facilitating quicker reactions to market fluctuations (Karumanchi *et al.*, 2005).

At present, M&C Ireland mainly concentrates on customers from foreign countries and it enables the company to predict their customer demand and easily get new customers. But in the future, the rate of incoming customers will get saturation and M&C Ireland may face more competition in the market. M&C Ireland stands to gain from incorporating more sophisticated forecasting tools that can generate highly precise predictions by analyzing a wider array of data inputs. These inputs could encompass market trends, customer behavior, and external factors such as economic conditions or geopolitical events. By doing so, the organization would be able to implement more proactive inventory management strategies and achieve better synchronization with customer demand.

4.2.5 Theme 5: Key Performance Indicators (KPIs)

The respondents listed a number of key performance indicators (KPIs), such as sales performance, stock-outs, inventory turnover, and carrying and transportation expenses, that they used to gauge how well their inventory management procedures were working. These KPIs are essential for keeping an eye on how well inventory management procedures are working and making sure the company meets its financial and operational targets. Despite their significance, the literature indicates that these KPIs are part of a larger, more all-encompassing performance management framework that also includes more specific metrics like customer satisfaction, order fulfillment rates, supply chain lead time, and the impact of inventory management on supply chain performance overall (Folinas and Rabi, 2012). The business could be missing out on important parts of inventory management that could offer a more comprehensive view of performance because of its present concentration on cost- and sales-related KPIs. Metrics like order accuracy and customer happiness, for instance, might be included to assist the company in better understanding how inventory management affects customer experience and pinpoint areas for development. Monitoring the effects of inventory management on other aspects of the supply chain's performance, including order fulfillment time or stockout frequency, may also reveal opportunities for improvement and offer insightful information about how well the present procedures are working.

4.3 Critical Evaluation and Interpretation of Results

4.3.1 Interpretation of Challenges

The difficulties with M&C Ireland's inventory management procedures may be attributed to a complicated interaction between logistical problems, manual processes, and a cautious adoption of new technology. Frequent stockouts, delays in logistics, inaccurate inventory records, and a lack of sophisticated technology tools are the main issues. The organization's dependence on foreign suppliers exacerbates these problems by introducing lead time uncertainty and exposing the company to interruptions in the global supply chain. The responders highlighted that using manual methods is a double-edged sword. Although manual oversight increases inventory management accuracy, it also reduces system scalability and increases the likelihood of human mistakes. The respondents emphasized that delays in customs clearance and shipping, which

are usually outside of the organization's control, are a major cause of stockouts. Because this system relies on outside forces to keep inventory levels stable, any interruption in the supply chain might have a big effect on business operations. Furthermore, the organization's inability to swiftly adjust to changes in demand is hampered by the manual nature of the present inventory management procedures, which can result in either excess inventory or stockouts. These difficulties have a significant effect on the organization's functioning. Stockouts have a direct impact on sales and customer happiness, resulting in lost income and perhaps sabotaging long-term client relationships. These problems are made worse by inventory record errors and logistical delays, which lead to inefficiencies that spread across the supply chain. Maintaining ideal inventory levels is challenging for the organization due to its dependence on manual judgment and lack of modern forecasting technologies, which hinder its capacity to predict and respond to changes in the market.

4.3.2 Evaluation of Practices

The practices employed by M&C Ireland for inventory management, while rooted in tradition and experience, reveal both strengths and weaknesses. Utilizing Sage software as the primary inventory management solution is a step toward streamlining order processing, giving real-time stock level data, and modernizing processes. But the program's potential isn't being completely utilized, especially when it comes to tasks like inventory optimization and demand forecasting. While Sage software aids in stock level monitoring, respondents said that manual computations and expert judgment are still largely relied upon for choices on reordering and demand forecasts. This hybrid strategy, which combines human control with simple technology tools, shows that the company is trying to strike a compromise between convenience and accuracy. To meet the problems presented by a more complicated and competitive market environment, this strategy might not be enough. The literature emphasizes the importance of integrating more sophisticated tools and technologies to enhance accuracy and efficiency in inventory management (Otieno, 2018). M&C Ireland’s current practices, while functional, may hinder the organization's ability to scale operations and improve responsiveness to market demands.

4.3.3 Strategic Technological Integration

The respondents responded that M&C Ireland's inventory management processes integrate strategic technology not much. Although the potential advantages of cutting-edge technologies like RFID and the Internet of Things are known, their full implementation has not occurred because of worries about scalability and cost. The company is now unable to completely optimize inventory management and react to real-time market situations due to its reliance on simple software solutions like Sage without the backing of more sophisticated technology. Strategic technology integration has substantial potential benefits. Modern technologies such as RFID, IoT, and AI can manage inventory in real time, cut down on human error, and improve demand forecasting (van Geest *et al.*, 2021). According to the literature, these technologies can revolutionize inventory management by offering a degree of visibility and control that can't be

attained with just manual procedures. Using these technologies might result in significant gains for M&C Ireland in terms of customer satisfaction, lead time in the supply chain, operational efficiency, and inventory accuracy.

Though reasonable from a financial standpoint, the organization's present cautious adoption approach may eventually reduce its competitive edge. The literature highlights how important it is to be able to swiftly incorporate new technologies and react to a fast changing market in order to fulfill consumer expectations and preserve operational efficiency (Čolaković *et al.*, 2020). The company's hesitance to invest in these technologies may result in missed opportunities for growth and improvement.

4.4 Summary

In summary, M&C Ireland has implemented some efficient inventory management procedures, especially when it comes to using Sage software to track stock levels, but there is still a great deal of space for development. The business may not be able to compete in a market that is becoming more complicated due to its reliance on manual procedures and cautious adoption of new technology. M&C Ireland could increase inventory accuracy, lower costs, and better satisfy customer expectations by investing in cutting-edge technology and strengthening supplier partnerships. These improvements would ultimately result in increased operational efficiency and business success.

Chapter 5: Conclusion

5.1 Overview of Research Objectives

This research aimed to explore the inventory management practices within M&C Ireland, a retail wholesaler operating in a complex and competitive environment. The study was guided by four primary objectives: to identify the challenges faced by wholesale organizations in managing their inventory, to assess the inventory management practices within the organization, to identify key performance indicators (KPIs) that could enhance inventory management performance, and to develop strategic recommendations for improving current practices. The research methodology employed qualitative techniques, including in-depth interviews with key stakeholders within the organization, and a comprehensive review of existing literature on inventory management practices, technologies, and challenges in the wholesale sector.

5.2 Implications of Findings on Research Objectives

5.2.1 Identifying the Challenges Faced by Wholesale Organizations in Managing Their Inventory

The initial objective of the study was to identify the main obstacles to inventory management that wholesale companies, like M&C Ireland, must overcome. The results of the interviews, confirmed by the literature research, pointed to a number of interrelated problems that are mostly caused by the use of manual procedures, logistical difficulties, and the careful use of cutting-edge technology. One of the most prominent challenges identified was the frequent occurrence of stockouts. Stockouts, as the findings highlighted, are often the result of delays in transportation and customs clearance—issues that are particularly acute for an organization like M&C Ireland, which relies on international suppliers. These delays are exacerbated by the manual nature of inventory management processes, which, while offering a level of accuracy due to human oversight, lack the scalability and efficiency that more automated systems could provide. The literature corroborates this, noting that reliance on manual processes often leads to inefficiencies and increased susceptibility to disruptions in the supply chain (Mashayekhy *et al.*, 2022).

Another major obstacle that surfaced was logistical, especially when it came to keeping constant inventory levels. Respondents often cited two major reasons that impede the flow of goods and cause stockouts and excess inventory: the unpredictability of overseas shipment schedules and the obstacles posed by customs processes. These findings align with the broader literature, which identifies logistics and supply chain disruptions as common challenges in inventory management, particularly for organizations that operate on a global scale (Folinas and Rabi, 2012). Another challenge that surfaced in the study is the discrepancy between recorded and actual inventory levels, which can lead to errors in inventory accuracy. Respondents noted that these discrepancies often arise from breakages, picking errors, manual recordings, and the manual adjustments required during stock audits. The literature expresses worry about the inventory system's lack of automation and real-time accuracy, as seen by the dependence on manual interventions to address these disparities. Advanced inventory management systems, particularly

those that integrate real-time data collection and analysis, are recommended to mitigate such errors and enhance accuracy (Johnson, 2016).

Another issue that was noted was the cautious attitude to adopting new technologies, especially when it came to sophisticated inventory management systems like RFID, IoT, and AI. Although the company is aware of the potential advantages of these technologies, full deployment has not been possible due to perceived operational size and cost issues. This hesitation might make it more difficult for the company to completely improve inventory management and maintain its competitiveness in a market that is becoming more automated and digital. The literature supports this concern, emphasizing that the adoption of advanced technologies is crucial for enhancing operational efficiency and maintaining a competitive edge (van Geest *et al.*, 2021).

5.2.2 Assessing Inventory Management Practices within the Organization

The second research objective focused on assessing the inventory management practices employed by M&C Ireland, including the processes, systems, and technologies in use. The results show that the company mostly uses manual procedures, with Sage software acting as the main instrument for inventory control. Order processing, stock level monitoring, and resolving inventory inconsistencies between recorded and real are just a few of the duties that this program is utilized for. However, the capabilities of Sage are not fully leveraged, particularly in areas like demand forecasting and inventory optimization. The organization's inventory management practices are characterized by a hybrid approach that combines manual oversight with basic technological tools. While this approach allows for a certain level of accuracy and practicality, it also introduces limitations, particularly in terms of scalability and responsiveness to market changes. According to the literature, sustaining appropriate inventory levels in today's intricate supply chains requires more complicated inventory management systems that incorporate real-time analytics and advanced forecasting capabilities (Čolaković *et al.*, 2020).

The efficacy of the present inventory management procedures is further hampered by their manual nature. Rather than using sophisticated optimization techniques, decisions on stock-level management and reordering are frequently made on the basis of fundamental analysis and experience. This reliance on manual methods introduces a level of rigidity that can prevent the organization from achieving true inventory optimization. The literature emphasizes the importance of integrating more advanced tools and technologies to enhance accuracy, reduce costs, and improve overall operational efficiency (Otieno, 2018). The respondents also emphasized the importance of transparency and auditability in maintaining inventory accuracy. Sage software provides a certain level of transparency, allowing the organization to monitor stock levels and audit inventory data. M&C Ireland's engagement with advanced technologies, such as AI, IoT, and RFID, remains minimal. While there is awareness of these technologies and their potential benefits, cost concerns and the perceived scale of operations have limited their adoption. Although this cautious approach makes sense, in the long run, it can make it more difficult for the company to maintain its competitiveness and optimize inventory management.

The literature emphasizes how these technologies have the ability to revolutionize supply chain monitoring by enabling real-time tracking of items, decreasing human mistakes, and increasing inventory accuracy (van Geest *et al.*, 2021).

5.2.3 Identifying Key Performance Indicators for Improving Inventory Management Performance

The third research objective aimed to identify key performance indicators (KPIs) that could be used to enhance the performance of inventory management practices within the organization. he respondents listed a variety of KPIs that are currently in use, including carrying and transportation expenditures, stock-outs, inventory turnover, and sales performance. These KPIs are essential for monitoring the effectiveness of inventory management practices and ensuring that the business achieves its operational and financial objectives. However the emphasis on KPIs linked to costs and sales can make it harder for the company to get a complete picture of how well its inventory management is working. A more complete performance management framework should incorporate additional metrics, such as order fulfillment rates, customer satisfaction, and the impact of inventory management on supply chain performance overall, according to the literature (Folinas and Rabi, 2012). By incorporating these additional KPIs, M&C Ireland could gain a better understanding of how inventory management affects customer experience and identify areas for improvement.

5.2.4 Developing Strategic Recommendations for Enhancing Inventory Management Practices

The fourth research objective was to develop strategic recommendations for improving the current inventory management practices within the organization. Based on the findings and the literature review, several recommendations can be made to enhance the efficiency and effectiveness of inventory management at M&C Ireland. One important suggestion is to start incorporating more sophisticated technology into the company's inventory control procedures. To manage inventory more accurately, this may begin with the use of RFID or barcodes. Next, it could involve integrating IoT devices to track the whereabouts and conditions of products in transit in real time. With the help of these technologies, the company would be able to fully optimize its inventory processes and keep a competitive edge in the market. The literature highlights the importance of these technologies in transforming inventory management by reducing manual errors, enhancing accuracy, and enabling real-time tracking of goods across the supply chain (van Geest *et al.*, 2021).

Another suggestion is to use more sophisticated tools and methods to improve the organization's capacity for demand forecasting. In example, in a market that is changing quickly, the present dependence on manual forecasting and experience-based judgment may not be adequate to capture complicated demand patterns. According to the research, sophisticated forecasting techniques like real-time data analytics and machine learning algorithms may greatly increase prediction accuracy and provide more effective reactions to market developments (Karumanchi

et al., 2005). By integrating these solutions, M&C Ireland may better align with consumer demand and execute proactive inventory management initiatives. The company ought to think about reviving its supplier-focused collaborative planning initiatives. Respondent 3 pointed out that although the company used to work more actively with suppliers, this practice has gradually decreased. Reviving these cooperative initiatives with the use of CPFR (Collaborative Planning, Forecasting, and Replenishment) may enhance supplier alignment and lower the risks related to excess inventory and stockouts. The body of research backs up the claim that CPFR can result in improved inventory management and more precise demand projections (Wang *et al.*, 2005).

Apart from enhancing technology and teamwork, the company have to concentrate on broadening its KPI structure to encompass more all-encompassing measurements. The company might learn more about how inventory management impacts its overall operations and pinpoint areas for improvement by keeping an eye on additional KPIs like supply chain lead time variable, order accuracy, customer satisfaction, and the effect of inventory management on supply chain performance. In order to offer a thorough understanding of inventory management performance, the literature highlights the significance of a holistic performance management framework that includes a wide variety of measurements (Macas et al., 2021). Lastly, the company ought to think about putting more sophisticated inventory optimization strategies into practice. Even while stock-level management and reordering are now done by hand and offer some degree of accuracy, there may be chances to increase efficiency and save costs that are not completely taken advantage of. According to Čolaković et al. (2020), the research indicates that the complicated supply chains of today require more advanced algorithms for inventory optimization, especially those that incorporate real-time data and advanced analytics, in order to maintain appropriate stock levels (Čolaković *et al.*, 2020). M&C Ireland may save expenses, increase inventory efficiency, and enhance overall operational performance by using these strategies.

5.3 Limitations of the Research

It is crucial to recognize the limits of this study even if it has offered insightful information on a wholesale organization's inventory management procedures. Because the study was only carried out inside one company, it's possible that the conclusions cannot be applied to other situations or sectors of the economy. Furthermore, the study depended on qualitative information gathered through in-depth interviews with important staff members, which might be biased or contain incomplete viewpoints while being highly detailed. The results might not accurately reflect the variety of inventory management techniques used by other wholesale firms or geographical areas due to the single organization's focus. Moreover, the investigation of novel or developing patterns in inventory management may have been limited by the study's dependence on already published material and theoretical frameworks.

5.4 Future scope of the research

In light of the study's limitations and results, the following research suggestions can be made for the future:

1. In order to provide a more comprehensive understanding of the challenges and processes associated with inventory management, future research might look at inventory management strategies across a larger spectrum of industries and enterprises. This includes analyzing practices from different sectors, regions, or sizes of organizations.
2. In order to provide a more comprehensive view of inventory management practices, future study may incorporate qualitative and quantitative data from sources including performance indicators and surveys. This might strengthen the validity of the study's findings and provide a better understanding of the factors affecting inventory management effectiveness.
3. To give a more comprehensive understanding of supply chain management methods in wholesale firms, future studies might examine additional facets of supply chain management, such as procurement, distribution, logistics, or customer relationship management. This might lead to a better understanding of the factors influencing supply chain performance as well as the identification of new areas that require growth.
4. More studies may be done in the future to investigate the effects of technology adoption on inventory management techniques, especially as they relate to the application of cutting-edge technologies like RFID, IoT, Automatic customs clearance, and predictive analytics. This might offer insights into how businesses can most effectively incorporate these technologies into their inventory management procedures as well as aid in pinpointing the particular advantages and difficulties connected with technology adoption.

5.5 Reflection

In summary, this research has shed light on the difficulties encountered, the techniques and processes utilized, and the KPIs that are used to evaluate the efficacy of inventory management procedures in an Irish wholesale company. Strategic suggestions for improving these practices have also been generated by the research, with an emphasis on integrating new technology, boosting forecast accuracy, streamlining inventory management procedures, broadening the use of KPIs, and funding personnel development. Despite its shortcomings, the study offers a strong basis for further research in this field and useful insights that can assist wholesale firms in enhancing their inventory management procedures and achieving higher levels of operational efficiency. The significance of efficient inventory management will only grow as the business environment changes, necessitating ongoing evaluation and improvement of an organization's procedures in order to maintain competitiveness in the global marketplace.

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Appendix A
Qualitative Interview Questions

Research Objectives	Variables from Conceptual Framework	Data to be collected specific questions/observations, etc.	Potential respondents, sample, etc.
• To identify the challenges faced by Wholesale organizations in managing their inventory.	○ EOQ ○ Demand Sensing ○ Industry 4.0 • CPFR • IOT • RFID	**Advantages and Disadvantages:** • What do you think are the strengths of our current inventory management practices? • What are some of the challenges you face with the existing inventory management system?	Operations Manager / Marketing Manager/ Director
• To assess inventory management practices within the organization, including processes, systems, and technologies employed.	○ EOQ ○ Demand Sensing ○ Industry 4.0 • CPFR • IOT	**Current Practices:** • Can you explain the daily inventory management tasks you are responsible for? • How has the organisation evolved since its inception? • How do you handle discrepancies between recorded and actual inventory levels? • How do you monitor inventory levels and ensure stock availability? • How is the organisation currently sense or predict customer demand?	Operations Manager / Marketing Manager
• To identify key performance indicators for the improvement of the performance of inventory management such as efficient replenishment processes.	○ EOQ ○ Demand Sensing ○ Industry 4.0 • IOT	**Finding Out KPIs:** • Can you explain the daily inventory management tasks you are responsible for? • How do you handle discrepancies between recorded and actual inventory levels? • How do you monitor inventory levels and ensure stock availability? • How does the organization currently sense or predict customer demand? • How to calculate re-ordering of the goods and	Operations Manager / Marketing Manager/ Director

		what are the replenishment processes implemented in the company? • What are the key performance indicators in our organization? Are they related to inventory management? How?	
• To develop strategic recommendations for enhancing the current inventory management practices.	○ VMI ○ EOQ ○ Demand Sensing ○ Industry 4.0 • CPFR • IOT • RFID	**Technology Implementation:** • Have you used or are you aware of any advanced inventory management tools or systems? • How do you think new technologies could impact your workflow and efficiency? • Are you familiar with any advanced inventory management technologies such as IoT, RFID, or automated systems? • What are your thoughts on integrating these technologies into our current inventory management system? **Interest in Improvements:** • What improvements would you suggest for our current inventory management practices? • How willing are you to learn and adapt to new technologies in inventory management? • What specific features or capabilities would you like to see in a new inventory management system? **Training and Support:** • What type of training or support do you think would be necessary if new technologies were implemented?	Operations Manager / Marketing Manager/ Director

TABLE 2: QUESTIONNAIRE

Appendix B

Qualitative Interview Responses (Translated from Malayalam to English)

Question 1. Can you explain the daily inventory management tasks you are responsible for?	
Respondent 1	My responsibility here is to handle deliveries as per the orders we receive. This involves picking the items, accurately spotting and loading them into the van, or handing them over to the driver. After that, I prepare the invoice and ensure the driver leaves for the delivery. When the driver returns after completing the delivery, if there are any returns, we credit them to the customer. Additionally, if anything is missing from what we picked and sent, we credit that as well and close the transaction. If any cash is received, we note it down in the cash book. If it's a check payment, we also make a note of that. The stock that arrives is directly entered into Sage Software. We use Sage Software for this purpose. The invoicing is also done through that software. As deliveries are made, the stock gradually decreases in the system. This allows us to see the remaining stock balance. Accordingly, we place a Re-Order as the stock decreases. If it falls below a certain level, the software will automatically provide a notification for re-ordering, based on a particular margin set within the system.
Respondent 2	These include emails from the previous day, mails from the purchase department, customer inquiries, supplier container status updates, container location updates, details of rejected products, and mails related to return credits. I respond to all these emails. After that, I head out into the field. I need to meet customers directly. Each order delivery is done on a weekly basis. Therefore, I visit each customer's shop to check the inventory level of the products we supply. I look at the inventory levels, check for any expired products, and assess the need for replenishment. I also have conversations with customers regarding new orders. My main responsibility is to generate new orders based on the list of products that need weekly replenishment. Our warehouse is located in Dublin, so orders for customers within Dublin are handled on a weekly basis. For customers in different counties, deliveries are made every two weeks.
Question 2. How has the organisation evolved since its inception?	

Respondent 1	I joined here in 2019. In the beginning, we didn't have many brands—just a small number, maybe two or three. Since then, the number of brands and product lines has increased. From the time I joined, we started importing from Brazil, and then we began dealing with oriental products, like items from the Philippines and Thailand. Recently, we added a new frozen products line, which we didn't have before. We've developed a wide range in the frozen category under our own brand name, 'Kera.' Besides frozen products, we are also expanding into dry products under the Kera brand. We've already introduced rice, and we plan to expand into a full range, including lentils and dry snacks. All the work for these expansions, including design and related activities, is ongoing. It was a different software back then. That software wasn't as advanced as Sage. With Sage software, we can manage all aspects of inventory management. We can even email customers directly from within the system, and handle statements and other tasks. Additionally, this software is linked with the bank and has many other advantages. The previous software didn't have all these capabilities.
Respondent 2	I have been working here for 4 years. During this period, the market has evolved significantly; it has become vaster, and communication has improved. Within Asian products alone, there are various sub-divisions like North Indian, and South Indian, as well as products from the Philippines and Vietnam. As these communities have grown, our business has also developed accordingly. This has brought about a systematic change in the organization. Previously, many practices were done manually, but now we have moved forward by integrating software and technologies. Since the introduction of software, the allocation of stocks and related tasks have become much easier.
Question 3. How do you handle discrepancies between recorded and actual inventory levels?	
Respondent 1	Discrepancies like that do occur. Most of the time, they are due to breakages. When items break, we account for them as damages. This can lead to discrepancies, but we adjust the stock levels accordingly. We conduct a stock take every year, typically at year-end, to check the actual stock we have on hand and carry forward the balance. If there are any variations, they are mostly due to breakages. Other than that, we don't usually face issues with expiry or other factors. Returns are added back into the stock.

Respondent 2	This typically falls under warehouse management. Such mistakes can occur when items are picked and loaded from the warehouse or when products are mixed up during delivery to customers. Although these errors are rare, they do happen occasionally. When they occur, we address and resolve them. If there are products that have expired, we process their details for credits, and this information is automatically updated in the inventory levels within the Sage software.
Respondent 3	Yes, discrepancies like that do occur and stockouts do occur. They usually happen when there are errors in logistics, such as delays in the delivery of ordered products. Delays in customs and safety clearance can also lead to stockouts. Other than these issues, stockouts are rare. Excess inventory is also very rare. These problems are directly affecting customer satisfaction.
Question 4. How do you monitor inventory levels and ensure stock availability?	
Respondent 1	We can monitor stock levels directly with this software. When we check the details of a product, it shows the balance and how much is in hand. So, that's what we usually look at.
Respondent 2	We monitor inventory levels through the Sage software. Every morning, after signing in, I check the stock tables before going out to meet customers.
Respondent 3	We use Sage software for this purpose. Sage was chosen to ensure that all data is transparent and easily auditable. In Ireland, many organizations use Sage software to monitor their stock levels and manage their finances.
Question 5. How does the organization currently sense or predict customer demand? Are you using any of the features in the Sage software for this?	
Respondent 1	We can sense customer demand based on the orders we receive. The items with the most movement indicate higher customer demand. Based on that, we place more orders with our suppliers.
Respondent 2	We try to understand market trends. Some products have demand only during certain periods, and once that trend is over, the demand decreases. However, some products always have demand, mainly food items, which are the primary products we handle. We add new items based on customer feedback by coordinating with our main supplier.

	Although we don't extensively use the Sage software for demand sensing, we primarily gauge market demand physically. However, using Sage, we can identify patterns and make comparisons, which helps us understand the demand trends to some extent.
Respondent 3	The main challenge we face in demand forecasting is logistics. It's difficult to quickly procure products in response to changing customer demand. Unlike European Union products that can be quickly moved to Ireland, we need to coordinate with suppliers and place orders 90 to 100 days in advance to ensure that products arrive on time for seasonal sales. After order confirmation, the entire pre-planning process can take at least 120 days because our products are sourced from countries like India, Brazil, and the Philippines. Given our specific circumstances, immediate order placements aren't feasible, and our customer base and product range are quite diverse. This makes demand sensing more complex, so we rely heavily on long-term planning. Our long-term planning is based on analyzing sales patterns from previous years, current market trends, and customer feedback. Additionally, as transportation costs increase, so does the price of our products, which is another factor we have to consider in our forecasting process.
Question 6. Is there any minimum quantity level in inventory management to replenish the products?	
Respondent 1	We start replenishment when we have around 50 boxes left in stock. This ensures that the next lot of products arrives before the current stock is depleted. For example, with Brazilian products, we place an order exactly when the load arrives here. That's because it takes about three months for products to arrive from Brazil, and typically, the products ordered within that time frame are sold out. We are confident that they will be sold. We can gauge customer demand accordingly.
Respondent 2	We monitor inventory levels through the Sage software.
Respondent 3	We determine the order quantity for new products by considering both the quantity in our transit orders and the quantity recorded in Sage. Fast-moving products are prioritized and ordered first. We typically have at least three orders in the pipeline, meaning there are orders in supplier production and transit for three consecutive months. If there's a delay or issue with the first order, we adjust it with the subsequent two orders. For a product to arrive in Ireland in a particular month, we need to pre-plan

	the order at least three months in advance. Even after finalizing the order quantity with suppliers, we sometimes make adjustments based on sales analysis of each product. The calculation of Economic Order Quantity (EOQ) and re-ordering points is done manually, without using specific software. Although Sage contains all the necessary data, we export this data to Excel for sales analysis and to make re-ordering decisions.
Question 7. Have you used or know of any advanced inventory management tools or systems?	
Respondent 1	I don't know much about it. Actually, we have planned for it, but we are growing towards a bigger platform. I am not very familiar with it. The company has considered it, but it is a bit expensive. The company needs to grow a bit more, and only then can we manage it. We have thought about it. We are procuring products from Brazil and other Asian countries and those are our limited items. We place orders based on our experience over the years. The Sage software provides reports on everything, such as Sales Reports.
Respondent 2	There isn't much we need to do related to that. Our primary responsibility is to ensure that products reach the customers. The suppliers provide the barcodes for the products, so there hasn't been a need to use them within our warehouse. It's the retailers who use barcodes to add products to their systems. However, there have been minor updates to the Sage software. For instance, we recently added a feature that sends automatic payment reminders when customers take more than 30 days to make a payment. Additionally, we've implemented a system to set credit limits for customers.
Respondent 3	We have created an online platform where customers can place orders. When a customer places an order, I receive notifications directly on my mobile. Since we are a wholesale business, this platform is not accessible to the general public; only retailers use it. We have provided them with an app that allows them to view the list of items available in our inventory. Once they place an order, we receive a notification. This is a paid online platform, and we also gain access to competitor data through it. Currently, we are not looking into high-end technologies like RFID. Instead, we are focusing on more basic technologies that suit our needs.

Question 8. How could new technologies impact your workflow and efficiency?	
Respondent 1	Implementing new technologies would make things much easier. There won't be any missings. Everything can be recorded just by scanning. Once scanned, the invoice will automatically be prepared. Right now, I don't have much knowledge about it, but I have seen it.
Respondent 2	New technologies have always had a positive impact. They have helped reduce manpower requirements and make processes more efficient. We consistently strive to stay updated. We keep track of the latest machinery available in the market for our warehouse, and if necessary, we make purchases. The company focuses on adopting technologies that not only make work easier and more efficient but also ensure that they are user-friendly for our employees.
Respondent 3	New technologies have always had a positive impact on our workflow and efficiency. They have significantly helped reduce the need for manpower, allowing us to streamline operations and focus on more strategic tasks. We constantly strive to stay updated with the latest advancements in technology if required.
Question 9. What do you think are the strengths of our current inventory management practices?	
Respondent 1	In the industry, we have a system that ensures incoming products are correctly assigned to specific locations, and when the product arrives, it is placed in the correct spot. However, we do not follow this system here.
Respondent 2	In this organization, inventory management practices rely heavily on manpower. Therefore, the main strength lies in our workers. They are the ones who accurately forecast and make decisions based on the flow of products. Since everything is done manually, the accuracy tends to be higher.
Respondent 3	Our primary strength lies in our workforce. They are the key to accurately forecasting and making decisions based on product flow. Because the processes are manual, the level of accuracy is generally higher.
Question 10. What challenges do you face with the existing inventory management system?	
Respondent 1	I haven't encountered any significant challenges with the existing inventory management system.

Respondent 2	The main challenge we have faced is related to transportation and logistics. Previously, the transit period for a container was 30 days, but due to the Ukraine war, there are times when containers are not delivered on time. Sometimes, containers are not even available. Moreover, container charges have increased significantly, rising to five times the previous rate. These kinds of problems affect customer behavior, and there's often little we can do about it. However, we can maintain transparent communication with our customers, informing them, for example, that the containers have reached Belfast and we can deliver on a certain day. Transparent communication is the key solution to these kinds of problems. Due to these challenges, we have also had to adjust our forecasting methods. Where the transit period used to be 30 days, it is now 60 days, and we place new orders according to this new timeline.
Respondent 3	The main challenge we have faced is related to transportation and logistics as I discussed earlier.
Question 11. What improvements would you suggest for our current inventory management practices?	
Respondent 1	I believe there needs to be an improvement in how products are stored. Currently, if all Indian products are kept in one location, it would be helpful for the picking process. For example, having a separate section for snacks and maintaining specific locations for different categories would make the process easier. It would also make monitoring and picking more straightforward for anyone involved. Alternatively, organizing the products alphabetically or in some other order could also simplify the process. However, we have space limitations here, so things are a bit mixed up at the moment. For instance, all cosmetics items are kept in one place. When we move to a larger space in the future, it would be beneficial to implement such an organization. We used to follow this method before, but now with the increase in the number of products we supply, the space has become a bit congested
Respondent 2	I suggest that the newly arrived pallets be packed and placed on the top rack, while the older lots should be stored on the lower racks. This way, the products on the lower racks, which arrived earlier, can be sent out first for delivery.
Respondent 3	Some suppliers used to follow Collaborative Planning, Forecasting, and Replenishment practices, and we used to communicate monthly reports

	with them. However, currently, no one is monitoring or communicating this regularly. Suppliers now mainly look at the yearly sales figures to set their targets. We have to manage the monthly planning ourselves. I would like to re-establish relationships with most of the suppliers.
Question 12. What key performance indicators (KPIs) do you use to measure the effectiveness of your inventory management practices?	
Respondent 1	I don't know much about it.
Respondent 2	I don't know much about it.
Respondent 3	The key performance indicators we use include monitoring the daily and weekly sales of products, focusing on profitable items and their performance. We regularly check for stock-outs, follow up on production, and closely monitor inventory turnover and carrying costs. While the product prices may remain stable, transportation and carrying costs fluctuate constantly, which we cannot control as they depend on international transport rates. This has been the case since the Covid pandemic. To counter these challenges, the only solution is to increase production and sales.

TABLE 3: QUESTIONNAIRE AND RESPONSES