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A Plan to Improve the Ordering Strategies as a Step to Improve Inventory Management in Unit X

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Abstract

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The objective of the thesis was to optimize the case organization´s inventory system with the focus on improving its Ordering strategies. The business challenge related to poor ordering strategies, which involved insufficient demand forecasting due to sales fluctuations, and considerable wastage, exacerbated by complexity in sales patterns. As a result, there was an urgent need to improve the Ordering strategies and more accurately forecast demand and protect against stockouts and overstock in Unit X.

During the current state analysis, interviews, discussions, and analysis in internal documents shed light on the current Ordering strategies, inventory management, and the specific unit´s needs. This analysis helped in understanding the basis behind the relationship between inventory management and the Ordering system. The analysis results pointed to a number of weaknesses especially related to the current Ordering strategies and resulting wastage. These weaknesses informed the topics in theoretical framework as the next step of the thesis.

The literature and best practice review on operations management and inventory tools helped understand the concepts and solutions for improving the Ordering strategies. Key practices such as Safety stock, Reorder point, and KPIs based on ABC analysis were later applied in the proposal development. In the Proposal, the improvements were developed to the current Ordering list, the product review system based on the product ABC analysis and the Safety stock and Re-order points, which were crucial to meeting the market demand and variability in lead time. Moreover, using the FIFO method was a significant factor because of the perishable items in the unit.

In the Validation, further development and amendments were made to the Initial proposal. In particular, the method to minimize wastage via training of the employees was supported by the top management as a suitable approach that can bring many positive changes to the firm. Lastly, the study also produced Recommendations for continuous improvement. In the recommendations, it was stressed that, the more the data becomes available, such as time series data and customer and peer feedback, the more reliable and accurate will be the stock orders in Unit X. Next, Unit X will need more accurate and recent data to make any further improvements, especially in demand forecasting.

Key words: Ordering strategies, safety stock, re-order point, inventory management

Contents

ACRONYMS

COGS   Cost of goods sold

IM   Inventory Management

AI   Average Inventory

ROP   Re-order point

MRP   Material Requirement Planning

GAAP   Generally Accepted Accounting Principal

SOP   Speed of service

SKU   Stock Keeping in Unit

EOQ   Economic Order Quantity

MTO   Make to Order

MTS   Make to Stock

PLC   Product Life Cycle

F&B   Food and Beverages

FIFO   First in, First out

LIFO   Last in, First out

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1 Introduction

Since the first inventory model was developed in 1913 with the help of systemic and classical EOQ (Economic Order Quantity), innovation in this segment has begun, and revolutionary tools and new techniques have appeared. Inventory management is an exciting art of managing assets and is often seen as a liability even though it is an asset. However, the wholesalers and retailers that are major actors involved in downstream distribution channels face many challenges in keeping inventory at reasonable levels due to the difficulty of forecasting demand and expectations of customers about product availability (Coyle et al., 2003).

Business practitioners believe that there are two crucial reasons for keeping and managing inventory in any organization. The first is to provide customer satisfaction by showing or giving them products instantly at the same point when they need them. The second is to improve the cash flow in the organization and optimize the use of working capital. Waller et al. (2006) mentioned that a firm's fate depends on its ability to manage inventory. For every company's controlling of capital, one of the essential elements to consider is all the available materials and goods it owns or holds before selling. In today's competitive environment, adequate planning and inventory is a pillar of business because it leads to customer satisfaction and revenues, which may have a long-term effect on the company. The dichotomy of inventory is that it ties up significant amounts of materials and working capital (because both cost money). However, the inventory is necessary to have to add value and sell (because it ensures product availability and thus customer service levels) (Geoff et al. 2019: 07,08).

It is said that achieving, for example, a 20% inventory reduction is simple to say but complex to put into action (Geoff et al. 2019: 2). This Thesis sheds light on how to improve the current methods of ordering raw materials to satisfy everyday customers' needs and reduce the wastage of expensive raw materials.

1.1 Case Company Background

The case company of this Thesis is one of the most recognized and successful firms in the USA, the EU, and Asia. The primary market for the corporation is the hospitality industry. In 2024, it merged with Swiss-based travel retailers and opened its stores in

seaports, cruise lines, railway stations, airports, and central tourist areas to attract more tourists. The idea is to provide each customer with the finest experience in the F&B and traveling experience. The authorization stands for enhancing the innovative travel experience with enhanced digital engagement. The company has over 76 thousand employees, with 51 thousand plus franchise outlets in 73 countries to empower travelers and create value for all stakeholders.

Among other assets, the firm holds different units in one of the locations at Helsinki International Airport, Finland. Furthermore, different stores also store its products per their policies to meet customer demand. However, one of the units in the airport is facing an unprecedented increase in business due to unpredicted market trends, seasonal demand variations, limited holding places, and lack of flexibility in ordering policies; as a result, it becomes challenging to forecast the accuracy of the inventory. The main obstacles are significant wastage, perishable products and ordering strategies. These are related to demand forecasting and inventory management issues. The profit margin ratio and customer satisfaction are negatively affected by the lack of indicators in the firm that define the re-order point (ROP) based on historical data or the MRP material requirement planning based on future projections. Frequent changes in the day-to-day operations adversely affected product control and balance, and they were concerned with sales and wastage in Unit X.

Specifically, the firm aims to supply customers with the finest hospitality and food services. The internal aim is to help clients minimize waste by offering the best SOS (Speed of Services) and quality with a smooth Ordering system.

1.2   Business Challenge, Objective and Outcome

At the current stage, the company is developing, and management plans to extend different stores of their units to expand the growth of the firm. However, the urgent overall pain points are stocking inventory (preprocessed materials), real-time monitoring and alerting (demand forecasting), and management's ineffective communication impact on several repetitive product orders and inventory issues. Also, overstocking pre-processed materials in storage is another problem different units face. What items, where, when, and what quantities are needed? Thus, it creates challenges in inventories and emphasizes the need for urgent action or intervention.

The thesis aims *to propose a plan how to improve the Ordering strategies* as a step in improving its Inventory management, which should also help to minimize wastage and brings other improvements. The overall goal is to better manage optimal inventory in Unit X.

The outcome of the thesis a plan *a plan how to improve the Ordering strategies* as a step in improving its Inventory management. With the increasing customer demand and competition, following a traditional and outdated system may be problematic, and the proposal of a new, updated approach is an essential need.

1.3 Thesis Outline

The thesis is concerned with improving the Ordering strategies and minimizing wastage. In addition, improvements will touch on inventory forecasting analysis, control strategies, and tools and techniques to develop operations smoothly. The scope of the Thesis is the improvements in Unit X.

To achieve this goal, the study is divided into the following seven sections: the introduction, the methods and material, the current state analysis, literature review and conceptual framework, the proposal building based on stakeholder engagement, and lastly, the validation with top management. With the help of these steps, effective solutions are developed and proposed based on the weaknesses and strengths identified in the current state.

1.4 Key Terms

Inventory Management (IM)	A key element of logistics and supply chain management. Inventory management decides on when to order, how much to order and how much stock to maintain. (Murphy and Wood 2014)
Periodic review system	A periodic inventory system is a form of inventory valuation where the inventory account is updated at the end of an accounting period rather than after every sale and purchase (Wensing, 2011)

Safety Stock	Safety stock is defined as the average level of the net stock just before replenishment arrives. A positive safety stock provides a cushion or buffer against a larger than average demand or disruptions in supply during the effective replenishment lead time. (Schonberger and Knod, 1997)
Continuous review system	A system where the stock level of each product is calculated each time a product moves in or moves out of the system in real-time. This triggers an order for more stock when the inventory level falls below a particular re-order point. (Lincoln C. Wood; 2015)
Re-order point	Reorder point or point of order defines when the purchase order should be placed, given it is the moment in which the material must be ordered so that it arrives at the right time, considering the variables of restock time and safety stock (Corrêa and Corrêa, 2009)
Economic order quantity	Economic order quantity (EOQ) is the order quantity that minimizes the total holding costs and ordering costs in inventory management. (Ford Whitman Harris 1913)
Key Performance Indicator	The metrics to monitoring the performance of companies, departments, or individuals in relation to specific targets or goals.
Min - Max	A system to describe the level points, especially to measure safety stock and re-order points

2   Method and Material

The method and material section includes outlook of the research approach, research design and data collection. This section provides a description to the collected data, and type of data collection methods. It gives understanding of overall research and development process including some visuals..

2.1   Research Approach

Based on the available data, there are three crucial research approaches: qualitative research, quantitative research, and a mixed research approach. Quantitative research includes the majority of the data in the form of numbers or measurements. The term refers to a whole way of thinking or an approach used to collect clusters of methods and numerical form. While most of the data are in words but not most of the time, this is called qualitative research. A mixed research approach, which combines both qualitative and quantitative methods, involves the use of both data and numbering. Each method has its strengths and weaknesses, and it is significant to use specific methods for delivering the research proposal. For example, in the case of the research proposal, qualitative research is more diverse than quantitative methods as well as in data collection. (Punch, 2006). The strengths of qualitative research are rooted primarily in its inductive approach, and its focus on specific phenomena or people, and its emphasis on words rather than numbers (Maxwell et al., 1996). These include observations on past data, qualitative analysis, interviews, etc. On the other hand, quantitative analysis focuses more on analysis via figures, numbers, mathematics, and numerical calculations for demonstrating the results. Both sets of data have their own methods and instruments.

Second, based on Saunders et al. (2003), the critical step is to identify *the research methods* and ensure coherence within the quantitative, qualitative, or mixed methodology. Each research design will result in distinct outcomes to minimize ethical issues. This is done by establishing and implementing a valid research design to achieve the objective. The most typical *research methods* / techniques used in the applied research family include interviews, surveys, observations, document analysis, etc. Qualitative data collection methods can include in-depth structured or unstructured interviews, including oral and life histories; group discussions and interviews; participant and non-participant observations; and analysis of textual and narrative sources such as reports, diaries, letters, and film or television (Carter, Henderson, 2005).

Third, there are diverse research strategies. As for *research strategies*, Saunders et al. (2003) present eight research strategies: experiment, survey, case study, grounded theory, ethnography, action research, cross-sectional and longitudinal studies, and exploratory, descriptive, and explanatory studies. For example, Robson et al. (2002:178) defines *a case study* as 'a strategy for doing research that involves an empirical investigation of a particular contemporary phenomenon within its real-life context using multiple sources of evidence' (cited in Saunders et al., 2003). A qualitative case study strategy focuses on understanding the dynamics of precedence within the context in order to build a theory by exploring a small sample of a bounded system (Eisenhardt & Graebner, 2007; Yin, 2009). The role of *action research* is to introduce an innovative idea or to assess and reflect on the effectiveness of existing practices with the view of improving practice (Action Research for Improving Practice: A Practical Guide, n.d., p. XII*).* The action research is considered as "Plan, Act, Observe and Reflect" cycle that involves planning, observing the process, reflecting on the change and replanning, acting and observing and reflecting, and so on. This process is similar with most of the action research plans developed by different authors (Mertler, 2009) The meaning of action research is "participatory research" and the objective is to solve a practical problem with the help of group to achieve the change (Moilanen et al. 2022)

There is also a newer approach, especially for theses, the Applied action research strategy was selected. There are several reasons for selecting applied action research. Firstly, the background of applied action research is the phenomenon, process, or situation that one wants to improve after the development of change (Kananen, 2013, p. 13). Secondly, it combines research and development parts, which typically relate to continuous enhancement and improvement in organizations (p.20). The result of this enhancement of improvement is typically a change to the better (p.20). The third and most important objective of applied action research in working life may be processes, activities, products, services, and situations subject to continuous organizational improvements (p.21).

In this arrangement, the development work becomes research work since it is conducted according to the research conventions: data is carefully collected, documented, and analyzed using research methods, which means the methods that produce reliable and novel results (p.22). Applied action research makes a difference from Action research as it has fewer iterations (often, only one iteration) and is less focused on researching the change process while implementing the change. It is mainly concerned with the practical result with improvement to the better.

Therefore, qualitative data collections was used for this study. The data was collected from multiple sources; and from the most knowledgeable stakeholders. In CSA, the focus was to explore the current practices. It was done by observation, analysis, listening to stakeholders and management, questioning, and involvement one's own knowledge. For validation and feedback, the leading experts from the case company were involved, and discussed with management, with ethics and rigor in the procedure.

2.2   Research Design

Figure 1 below presents the research design for the thesis. The research design starts by setting up the objective. The next step is the current state analysis, which focused on collecting and analyzing data. The current state combines interviews, internal surveys, observations, feedback, data analysis, stakeholder views, and management discussions. In the first data collection, three primary interviews with the logistics head and subdivision managers were conducted and the internal documents were analyzed, supported by participant observations. The outcome of the current state analysis was the list of weaknesses especially related to the ordering process and wastage. The list of these weaknesses informed the search for best practice and available knowledge.
The third step included search for existing knowledge and best practice in ordering and inventory management systems. The outcome of the existing knowledge is conceptual frameworks.

Based on inputs from the analysis and suggestions from literature and best practice, the proposal was discussed with top management and stakeholders. Data 2 gathered the stakeholders' point of view, to build a proposal for improvement. Three main focus areas were combined during the proposal process: ordering, waste, and more effective inventory planning.

The three developments were later tested and validated into the final proposal with the management and other participants, as explained in Section 6. Validation combined stakeholders and management insights to achieve the aim. In addition to Ordering, the proposal also touches on demand forecasting, inventory management improvement communication in internal departments, etc., which are all vital for successful work.
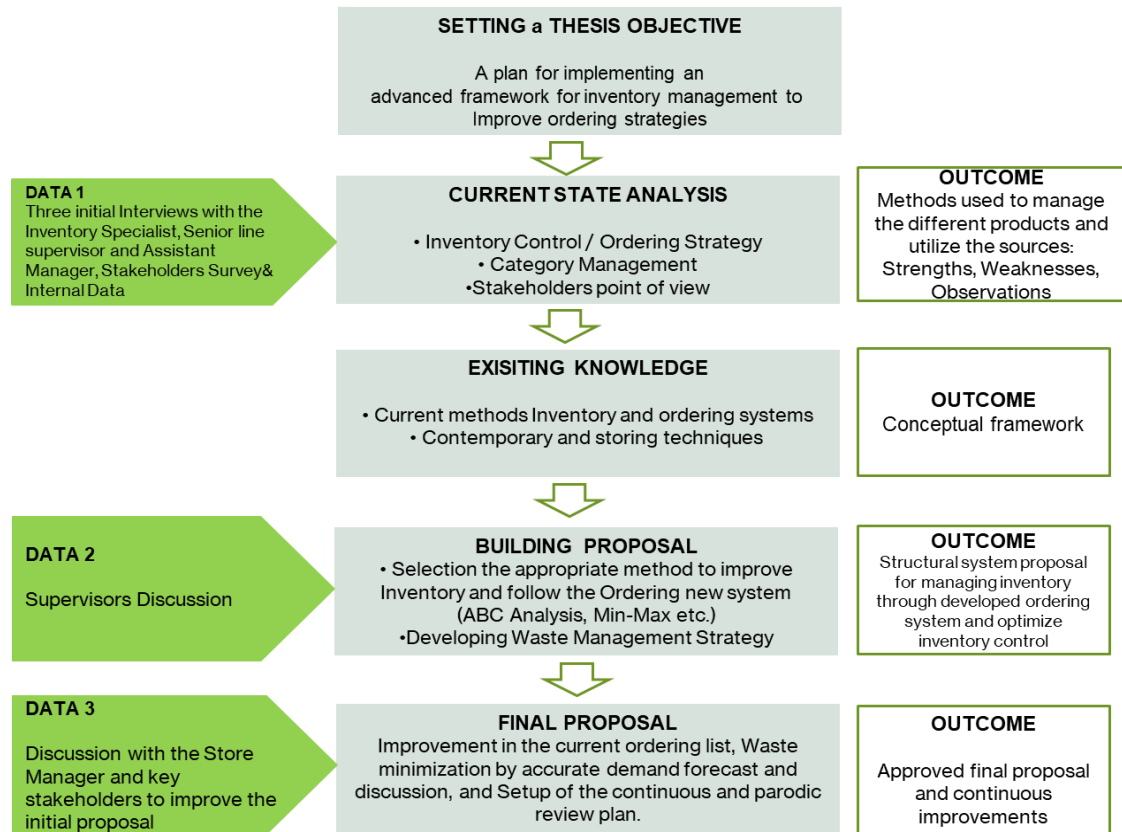
Figure 2: Research design for the thesis Data Collection and Analysis

This thesis relied on qualitative research methods applied via interviews, surveys, and internal document analysis according to the case company's GDPR policies. The thesis also analyzed the data in the internal inventory management system, the demand supply and sales data, and some other numerical data, but without using any quantitative research methods. In this thesis, data collection and analysis were split into three rounds shown in Table 1 below.

Table 1.   Data collections 1-3 used in this study.

Data	Data type	Purpose of Analysis
Data 1 Current State Analysis	Face to Face Interview, Internal survey, sales data, observations	Existing regulations, Weakness and strength, Controlling strategies, Budget, Tools and techniques, Inventory methods, Reasons for wastage, Future expectations and goals

| Data 2
Building Proposal	Discussion with management (Supervisors)	Stakeholders and supervisors view on Inventory management, Observations, Level Planning Data, Visuals impact on inventory, Managers and employee relationship
Data 3
Validation of the Proposal	Discussion with top management (Manager)	Validation and further amendments

The table explains the purpose of analysis in each data collection round. The data types included face-to-face interviews, surveys with stakeholders, observations, internal document analysis, etc. The goal of Data 1 collection was to understand the current strengths and weaknesses of the inventory management system. Moreover, the sales data used the historical data. The goal of Data 2 collection was to build the proposal, especially based on the stakeholdres' points of view. The goal of Data 2 collection was to discuss critical points and improve the initial proposals for the Ordering process, reduction of wastage, and development of the overall inventory management system in Unit X, especially based on the supervisor's points of view. Table 2 shows details of Data collections 1-3.

Table 2.   Data collection plan used in research.

No.	Data Source / Participant, Role	Data Type	Topic, Description	Date & Length	Documented As
Data: 1 - Current State Analysis					
1	Unit Manager	Face-to-face Interview	Current Methods of Inventory, Ordering system, and strengths and weaknesses	March 2024 (1.25 hr.)	Recordings and Notes
2	Inventory Specialist Supervisor	Face-to-face Interview	Current methods and Improvements for the system	March 2024 (30 min Approx)	Notes
3	Senior Line Manager	Face-to-face Interview	Current difficulties and improvement areas to minimize the waste and improve profit ratio through controlling the inventory system	March 2024 (1 hr. Approx)	Recordings and Notes

4	Survey	Survey form	Effectiveness of current system and proposal to	9 Internal Responds	Forms
Data: 2 – Building Proposal					
4	Discussion with management	2023/24 Sales and Inventory data (Internal documents and analytics)	Important ordering problems and solutions based on sales data	2023/24 Data	Report and Data
Data: 3 – Validation of the Proposal					
5	Discussion with the managerial level and testing of conceptual technique	Final Report & Discussion	Validation, Evaluation and final improvements	April / May 2024	Reports, and field notes

Table 2 illustrates the details of data collection from March to April 2024. The first data stage is for the current state analysis, which involves the interview stage with management and stakeholders. In the interviews, the leading suppliers, partners, contributors were involved, including the analysis of some numerical data, such as pricing, which are not published under the privacy policies. The discussion topics included integration challenges, weaknesses and strengths of the current methods, human elements, ordering, and inventory systems.

The first interview was with the firm's unit manager who oversaw the manager. The interview was conducted in the airport office and fieldnotes were taken during the interviews. During the interview, nine questions were supposed to be asked, but the manager illustrated the entire work system, usage of technologies, inventory items, and data policies, including the data shared by Oracle, Finnavia, and the system generated PLS data to forecast customer demand, management role, responsibility, and some parts of profit and budget. The main points discussed during the interview were about the weakness and gap in Unit X.

The second interview was with the inventory specialist. He explained the crucial insights, including techniques of counting stock, data entry, manual data sheets to calculate the

first input, etc. The manual counting and list were not updated because of recent changes by the firm. For example, certain products are changed by the officials. The need to change products is also a priority because of weight, pricing, product code, etc. Moreover, the questions are more towards technological advancement and improvement in Oracle to improve stock balancing, the timeline for counting stock, storage one and two stocking procedures scenario planning, etc.

The third interview was with a senior line manager who has 15+ years of experience in management in the same firm. The interview was conducted online in teams; field notes and voice recordings were taken. During the interview, the main discussion was about technological advancement, suppliers' relations, possibilities of applying new formats in inventory management, KPI and metrics, etc.

Internal documents were also part of Data 1 collection. The documents includes Inventory historical data, PLS and level planning, Oracle forecasting. Moreover, documents given by the airport authority to track the customers were also important, however it was limited to the top department.

In the following step, Data 2 collection discussed proposals with supervisors and stakeholders. During Data 2 collection, the focus areas were the improvements to the current system, resolving the problems faced during the product production, and other improvement areas. In addition, performance measurements to reduce wastage were the main topic.

In the following step, Data 3 collection focused on discussing the initial proposals into the final report, the implementation of the proposed Ordering strategies, and ensuring continuous improvements. Apart from the crucial insights, the validation and approval were also obtained from the management.

Thus, the data collections aimed at extensive analysis, and the central idea was to develop the improvement proposals and recommendations, so that enhance the overall efficiency of the current inventory management system, and improve the current weak spots.

3 Current State Analysis of Inventory Management Practices with the Focus on Ordering Strategies

This section discusses key concepts of inventory management to ordering strategies, wastage, and other essential factors that influence the overall system in X. Furthermore, this section covers the current ordering system, demand forecasting methods currently in use, limitations, and strengths of the system in more detail.

3.1 Overview of the Current State Analysis

The section covers how the current state analysis was conducted. It is formed with three interviews, a stakeholders survey, and internal unit data. The primary aim of the CSA was to understand the weaknesses, strengths, observations, and focus areas based on the ongoing ordering system in the unit and available data.

The initial interview was with the unit assistant manager. It was pre-arranged and conducted during the working hours at the unit premises. An interview question was established before the interview to understand the scenario and plan for future steps. The initial part of the interview was mainly focused on current tools and techniques used for inventory management. In addition to that, in the second part of the interview, different insights were shared, such as weakness of management error, internal communication as a huge gap during the order process, demand forecasting errors, unmarked wastage, budget, etc. Another crucial weakness is the indefinite safety stock at the current movement and structure of the ordering sheet.

The second interview was with the senior manager, focusing on the difficulties faced during the order processing for each day. The conclusion was a lake of utilizing resources during the ordering time, such as internal documents and poor internal management, for continuous improvement during the sales fluctuation. There is no way to gather feedback because of individual working systems, etc. Communication and cooperation from peers and management were considered the drawbacks. Thirdly, inventory specialists explain that counting errors due to extensive and lengthy ordering structures and limited storage were primary defects that caused difficulties in order.

Secondary data for the current state analysis was a stakeholder survey to understand the problems faced by the workers. Most stakeholders wanted more from the unit's

current stocking and ordering system. The major limitation was a lake of integration cases and the stock-out situation in the unit. The internal sales documents were the taken to check the current outcome of the stock.

3.2   Description of the Current Ordering System in the Case Company

The case company's ordering policies are associated with two partners. K Group and International Store. The international store is an internal case organization store in the airport. Moreover, K-Group is Finland's biggest food supply chain supplier. As per the organization's needs, some of the product's international storage is also provided to different units in the airport. International Store intends to provide daily supplies with instant distribution in case of demand variability. However, it only includes some of the common items for the firm because each franchise has its own products and standards for providing services. The supply is generally relatively easy to understand, as the system has been followed for approximately ten years now.

The ordering system works in two stages. The first stage reviews product needs based on the forecasting model, and the second stage is placement. Currently, the system follows manual paperwork with approximately seven pages. The delivery operates with straightforward approaches. For instance, each weekday order is delivered on the following day of the working day. However, suppliers deliver the orders on the usual working days, on weekends, and on holidays. The attached concept will make it easy to understand the delivery cycle based on the regular week.

Please check second storage list please. PRODUCT	Ordering Date & Day Order For Average		MONDAY TUESDAY	TUESDAY WEDNESDAY	WEDNESDAY THURSDAY	THURSDAY FRIDAY	FRIDAY SAT&SUN	FRIDAY MON
███████████████	LTK	3						
███████████████	LTK							
██████████	LTK	3						
████████████	LTK	2						
████████████	PSS	1						
███████████	LTK	2						
█████████████	LTK	1						
█████████████	LTK	2						
█████████████	LTK							
	LTK							
█████████████	LTK	5						
███████████████	LTK	4						
██████████████████	LTK	1						
█████████████████	LTK	1						
███████████	LTK							
███████████	LTK							

Figure 3: Order List followed by X for everyday process.

At the current stage, X adheres to an approach called 'moving averages', and a recent research survey conducted in the organization found that the main challenge is defining product needs for the day. The major complication in the overall system is that the average system needs to be updated more often based on the actual sales, and the averages do not give the true and fair value of demand. In the firm, most of the supervisors are following the average numbers because of the list, which is complicated, and almost 130 plus products in the single list creates a complicated ordering system.

The second complication is product categories. Two types of units are assigned to the firm. One is in the store, and the second is far away from the stores (The second storage is downstairs). The importance and utilization of products in two different units is a serious subject. The complex decision-making process involves the allocation of unit storage or second storage for different products, which is a significant challenge. The complexity results in problematic situations in the unit. The complicated choice between two storage and product categories is a principal obstacle. This leads to poor product management in the X.

Moreover, in the order list, some lines are dark, with backgrounds to help the reader understand the importance of the words. From the manager's perspective, lack of communication on channels and responsibility creates problematic situations in the firm. Following that, one of the significant obstacles is product categories, which set up

complicated and time-consuming to order. A few listed items that are used once a month or need to be ordered come on the first pages, and the most needed products come after that. In the first planning stage, the product category is one of the crucial factors to consider. Categories enhance the supplies, storage, and movement in the firm.

> *"We had 1800 quantity for a specific product category C product in the unit and supervisor who recently promoted ordered 3000 more and which will last for at least 6 months. The cost of the product is not important, but the storing of the product will cost more than the cost of product for next 6 month." (Informant 1)*

It is essential for shift supervisors to understand the importance of ordering products and the risk elements of keeping that product for the longer term in case of low demand. Apart from that, perishable products it is essential to figure out the critical level because companies pay vast amounts for them and keeping them safe until the final product is the most essential task.

Confirmation from seniors is an essential priority for the everyday ordering task, especially for the weekend delivery. The topic is separate from the cost and other financial terms; however, as one of the busiest units in the airport, the order size is extensive day to day, especially for the weekend plus Monday orders. Delivery for the week must be arranged in advance due to the supplier firm's working schedule.

During average sales, it is essential to check the products, verify their ideal usage using sources, and place an order. Although productivity was low, the size of the order was more than expected.

In one case scenario in March 2024, data showed that Friday delivery held 96 boxes on a specific weekend, which was average because of low productivity and average sales during the unexpected winter. The flights were not up to expectations, and productivity was negative between actual sales and forecast. However, the order size was magnificent and justified the responsibility as a supervisor to order for the day and the importance of demand to optimize the inventory level at ideal. The attached original level planning shows the difference, which was negative, starting from 18% to 3% during the busiest hours. Some graphical data are hidden because of privacy and data policies.

Figure 4: The delivery list highlights high quantities of the product scheduled for delivery. Reference to level planning negative difference.

Managing boxes in the unit storage is challenging, especially during long orders. However, using two different storage spaces unit storage and second storage is efficient to manage all the products. Some supervisors have different opinions on storing the products, which negatively affects the employees because of constantly changing product spaces. However, management has already resolved such issues by creating strict product rules. In some scenarios, the product's label must be visible, and following the FIFO methods for food makes a tough choice.

> *"Providing enough time to order the product for a specific day, especially for weekends or holidays or seasonal sales, is important to review the product forecast and demand". (Informant 2)*

From the supervisors' point of view, the timeline significantly affects inventory management and the ordering system. A list or plan showing turns of duty or leave for individuals or groups in an organization is called a roster, and it needs to be formatted so that a delegated person can spend precise time managing the order level and verifying the ordering list. One such error from March 2024 was ordering C-category products, which were not crucial for the unit at that moment because of a steep decline

in sales. The attachment highlights some issues related to specifying ordering problems and instances of over-quantity orders.

Figure 5: The delivery list showcases high quantities of the same product scheduled for delivery on the same day as part of level planning.

In addition, document-level planning defines productivity, sales forecasts, and actual sales gaps between hours. As per the planning and gap, level planning is also one of the crucial tasks concerning forecast. However, the lack of management and communication gaps is one of the reasons for not achieving the target and for wasting resources.

During seasonal demand, we need more inventory, and layout plans are supportive of finding the inventory. For example, creating a visual design or graph of the top A and B product lists with their locations will be easy for the person. The proper listing and

available products can be smooth to find for any person in the unit. level planning records to compare actual sales with forecasted demand for product requirements.

Figure 17: Level Planning record in X for a particular day.

Thus, several factors clash with market demand predictions and ordering strategies at the foundation level. To overcome the deliberate problem, the operation needs a methodical and organized system for future needs.

3.3   Description of Internal Stock Transfer

Internal transfer means the movement of goods from one unit to another unit in the same organization. Three similar franchise units are in the Helsinki airport, which gives a choice to use an internal transfer system to overcome operational needs. In an emergency scenario, when the inventory is not up to the level of demand and to overcome the customer need, management internally asks for some specific products. Once the other unit approves sharing the specific product with the other unit, the shift supervisor signs the official documentation, and the goods transfer occurs.

Apart from the documentation and verbal communication, the person in charge is responsible for making a transfer list for an order and reassigning it to the

Oracle/inventory system. The transfer aims to implement a smooth, automated system regulated by Oracle. After the transfer of goods, possible improvements are vital to overcome future situations.

The internal stock transfer makes internal relations stronger through continuous communications and improvements. Through such input, operational efficiency develops business efficiency and is one of the reasons for minimizing wastage. Also, regular detailed reviews and the movement of goods help to find the system gap and solve the issues for future improvements.

Table 3.   The benefits of the internal system.

Work as a safety stock	The unit does not have a defined safety stock. However, borrowing from another unit will manage the sales when the product's need is prioritized, such as the essential products in the A category.
Diminish the stocking risk	Other units keep the product in their own storage, which decreases the risk of managing, controlling, and balancing inventory. Apart from that, perishable items need continuous review, which saves time for the supervisor.
Flexibility in unit	With the help of other units, demand fluctuation can easily support and balance the flexible cycle ordering in the unit..
Improve relations	Using constant communication with two other units, the relationship with other supervisors also improves and supports coordination in the firm.
Cost effective	The firm gives a budget for each unit, and based on that, the manager must support employee working hours, stock investment, supervisor needs for the day, etc. Keeping limited stock saves capital and investment.

However, there are many disadvantages to dependency on the other unit. Continuous internal transfer creates a glitch in the system because of the number of data and entry for products in the firm, which results in deception and maintaining stock levels. The following table presents a list of adverse effects.

Table 4.   The limitations of the internal system

Complex Structure	Everyday transfer and dependencies on other units create logistical complexity for the unit. Inventory periodic transfer makes it difficult for the manager who is taking care of transfer because of the amount of data.
Conflicts	Frequently asking for product makes conflict situation in relation and consider as deficient performance in the firm
Risk	In case of denial, a request for exchange products may lead to negative sales for the unit. It is not possible for other units as well to keep specific products in stock either.
Quality	In exchange of product via internal transfer the other unit sometimes makes smart moves. The product which is likely to expire soon usually transfers to another unit, so the host unit does not need to worry about the wastage cost.

The positive effects and negatives are reality in working life because of unidentified tools in inventory and categorized systems. Support from top management is an asset for the unit; however, constantly raising costs to manage inventory will be a serious topic for losing liquidity and customer satisfaction.

3.4   Analysis and the Identified in the Current Inventory Management

Figure X summarizes the pain-points identified from the analysis of the current Inventory management in Unit X. Each pain-point is discussed separately below.
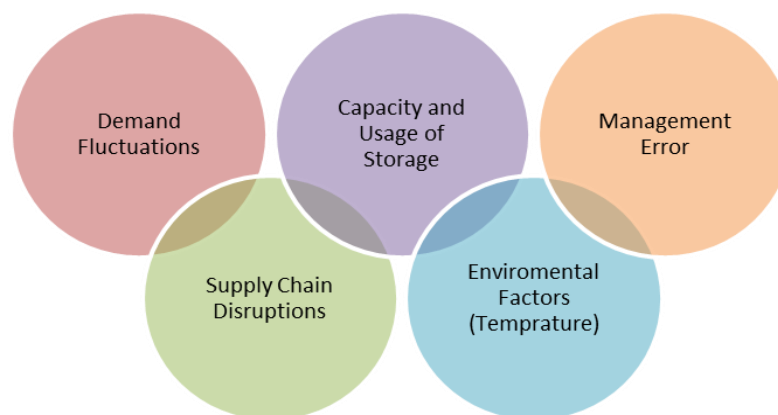
Figure 6: Five pain-points identified from the analysis of the current Inventory Management in Unit X.

Pain-point 1: Demand Fluctuation

According to interviewees, the firm provides enough resources to track the demand and sales, but its usage is limited. There are three primary data sets to track demand and forecast for the future. Oracle data shows the AI planning based on the last week's similar day sales. Those data are easily trackable to understand trends. The second is level planning, which checks the half-hour sale and forecast, mentioning passengers traveling daily. The usage of such data is significant, but management needs to focus on ordering. The base standard that is followed by most of the staff is `*moving averages.* ` The average structure was defined nearly three to four months ago, and before that, there needed to be a systematic style and timeline for data processing.

Pain-point 2: Supply chain disruptions

Supply chain interruption is not one of the drawbacks of managing stock or ordering problems. Due to the high chances of strikes (Helsinki Times), especially after the new government rules, transportation disruption is often seen during the ordering periods. Direct effects can be seen in the lead time estimations, including rotational plans, which are challenging to implement and often lead to critical stock levels. With the help of channels, reliable communication from suppliers is straightforward and effortless. For example, the recent update on sandwich holidays from Friday to Monday affected the delivery timelines.

Table 5.   Communication from Suppliers to Unit X Regarding Changes in Product Delivery

CHANGES	27.3. WEDNESDAY 10:00	27.3. WEDNESDAY 10:00	27.3. WEDNESDAY 10:00		27.3. WEDNESDAY 10:00	27.3. WEDNESDAY 10:00
DELIVERY	28.3 THURSDAY	29.3 FRIDAY	30.3 SATURDAY	31.3 SUNDAY	1.4 MONDAY	2.4 TUESDAY
INFO	NORMAL DELIVERY	FRIDAY´S LOAD WILL BE DELIVERED ON THURSDAY 15:00	SATURDAY´S LOAD WILL BE DELIVERED ON THURSDAY 15:00		MONDAY´S LOAD WILL BE DELIVERED ON SATURDAY 15:00	NORMAL DELIVERY

The importance of lead times for drivers is crucial to plan the product's needs. The franchise has the standards on use of the products. And those products can be sold in the firm even though they are available with different suppliers.

> *"Currently, we do not have many suppliers associated with the company. However, few suppliers provide the product at a cheaper rate. The*

company should also accumulate and find more suppliers to verify product costing—senior line manager." (Informant 2)

When the disruptions occur, the firm faces difficulties in keeping the stock level in the unit and leads to stock out situation. In such times having variety of suppliers support the situation in the firm.

Pain-points 3 & 4: Capacity and usage of storage & Environmental Factor

One essential role of managing adequate inventory is to keep the storage. As discussed above, the storage is small, and we should plan how many products we need and what amount is required. Most of the time, units were either full or empty, and product shifting is a frequent problem. Empty boxes and unmanaged pathways reduce productivity and sales. In the airport, most of the customers are in a hustle. The prompt Speed of service is one of the principal factors in F&B. The structure of the storage layout by keeping well-ordered product boxes supports time management, order fulfilment, and error-free services.

Another critical problem is maintaining the temperature of frozen items in storage. All perishable products are sensitive to temperature, and break-off can reduce the shelf life and quality of the product and create spoilage. Apart from product spoilage and quality assurance, product hygiene is a controversial topic.

Delivery handling and unloading the goods as soon as delivery arrives can decrease the risk of changing product temperature. Taking care of goods and managing each product on FIFO are critical arguments in management. Also, highlighting the manufacturing date and expiry of the product on perishable items by highlighter helps to define the use of products based on FIFO methods. The method is like the Japanese technique "Kanban" to highlight, but instead of using a signboard, the box highlighter is used in the organization. However, the management does not regularly follow such methods in everyday tasks.

> *"One of the significant risks in inventory management is the product life cycle for perishable products. About market disruptions, seasonal changes in demand as well as storage temperatures, ligating can directly affect the quality and shelf life of the products. And to curb this issue managing environmental factors are indeed serious" (Informant 1)*

Insufficient management of the storage system adversely affects Inventory because of manual damage to goods, difficulties in counting errors, undefined wastage, etc. The concern for maintaining and managing storage also leads to increased overall ability, reduction in carrying cost of the products, and profit of the business.

Figure 7: Recent picture of Inadequately managed storage

Figure 7 shows an illustration of storage issues, as temperature and product management is the biggest problem for perishable products. There is an urgent need for making the place and using tools to overcome the current issues.

Currently, two storages use different temperatures to store the products. For each product, FIFO is set up by the management to handle the product rotation and minimize the risk of expiring products. Due to the easy and transparent system found by Peter Alfke in 1969, the effectiveness of the inventory system is clear and smooth. However, there are three major difficulties for using FIFO in X.

- Due to the minimum storage capacity in the firm, the unit has two multiple storages. Using the current method of FIFO is difficult because of two storage and a high volume of transactions. Tracking is difficult for the system; sometimes newer stock is used first (LIFO) instead of older stock.

- Due to product tracking difficulties, it is normal for products to get out of stock. Products also expire because of employee and manager errors in following FIFO.

- Handling and managing inventory are burdensome. The error of managing inventory and setting up items based on FIFO every day is complicated because of limited storage and overweight boxes.

Pain-point 5: Management errors

Management errors are considered common errors during data entry or the ordering process. The recent case (March 2024) in the international unit shows about 100kg (about 220.46 lb.). Specific products not shown in stock or for sale were considered ghost products. These types of errors are considered data entry errors. The primary source of error is human error when counting or typing data into the Oracle system.

At the current stage, the X firm's periodic inventory is every 14 days (about two weeks). However, there are human data entry errors; measurement levels are not current because of changing raw materials, counting, and supervision issues. errors create enormous gaps in financial statements and future orders for products. One such reason is employee training, continuous improvements, and frequent audits, which are necessary for the first-class ordering system.

Similarly, an error while placing an order is called an ordering process error. Without sufficient data, manuals from suppliers, and sources, forecasting errors lead to ordering errors in the unit. There are three primary reasons for formulating such an error: first, *mi*scommunication with internal team; second, usage of outdated data from the ordering list (Averages), and third, poor oversight for future forecast.

Another issue is ghost products, which means the product is not in the inventory or in the sales list. Ghost products create many negative effects on the inventory system, such as inaccurate inventory valuation, future predictions can be misguided by stocking value,

and the sales figure value is not truthful. This leads to many negative decisions for the entire financial system.

> *"During the learning stage I personally cited the error in the system. For the item "B" mentioned in the per KG. During the manual counting the paper shows 6.5 KG however, I wrote 65 KG in the system, which shows the enormous difference in the inventory system. Moreover, the value of holding stock was almost double and the financial department similarly followed the same to figure out the capital investment in stock." (Informant 3)*

3.5   Analysis of Wastage as a Significant Drawback

In the interview, the unit manager stated that a zero-waste policy is impossible in the food and beverage industry. However, X is one of the top units, which creates the highest wastage. The principal reasons are management and the employees. The research survey conducted in the organization reflects that training and awareness related to waste management can affect 100% of organization waste. However, recent figures show that waste management is essential in improving an organization's inventory management.

Quality is an important concept, and high-risk products need special attention to keep them safe. Examples of substantial risk products are perishability, fragility, hazard, contamination potential, etc. Apart from special attention, distribution, equipment, and defrosting are valuable points for such products. For some products, the temperature needs to be kept because of frozen items.

Perishable products always need extra attention on a day-to-day basis; otherwise, the quality of the products is lost. In firm X, most of the products are perishable products, and the invention of the systematic platform of management policy of products is inventible to support customer satisfaction and brand loyalty. The system we currently follow is based on a manual marking system. In more detail, units have wastepaper and when we dispose of the waste in the bin, we mark the quantity and timeline. However, most employees and supervisors do not follow the mark list. There are several factors, such as overloaded work simultaneously, frequent speed of sales, and number of customers simultaneously, etc. As a result, demining the actual waste is an obstacle because of insufficient data.

Figure 8: Wastage data sheet for a particular day in Unit X.

The attached picture shows the waste produced by unit X per day at different times. The mark data are inaccurate, and it is difficult to check the actual waste. Sometimes, figures are hard to read, and random forecasts are needed to determine actual quantities. The structure of the storage layout, which includes well-ordered product boxes, supports time management, order fulfilment, and error-free services.

Insufficient waste data generates complication in the system, and in the end, the inventory worker needs to put average numbers and assumptions for each product. As per the management, this leads to many negative outcomes in the system and generates an obstructive decision-making process in the department.

- Inaccurate Inventory Management

- Financial Obstacles

- Operation Inefficiencies

- Sustainability losses

- Mismanage of food safety regulations and Industry standards

The screenshot below explains the figure of three days wastage in the system. Various products are mentioned with their item number, item name, unit, quantity and cost are hidden because of data restrictions. However, the highlighted figure is about 724.89 Euro noted on the date of 9th or March 2024.

Item No	Item	Unit	Qty	Reference	Cost	Total
742						86.11
741						239.21
3637						2.25
5210						1.83
586						3.25
28513						0.93
5211						2.59
40134						1.86
1369						9.50
748						22.08
5113						11.06
6817						7.79
10905						13.58
678						1.74
686						0.62
685						0.66
4379						0.82
2577						0.74
3744						1.03
4381						0.85
687						0.72
5078						2.89
5895						0.44
6272						210.32
28826						0.00
1362						2.91
680						7.97
679						3.31
5213						14.99
8939						7.73
11000						4.14
1345						2.49
12737						0.88
8104						30.05
1337						27.54
					Total:	724.89

Figure 9: The wastage published data on 9th March 2024 in unit X.

3.5.1   Impact of Inventory, Demand and Wastage in Unit X

The chart below shows the random data on demand, wastage, and Inventory in company X. It clearly defines the fluctuations in the data and management of planning strategies. The chart reveals the data for a particular product category demand and wastage for a particular period. The mentioned data is taken from unit X based on average entries. The product line mentioned here is the most essential product of the unit. For example, based on the proposal, the A category product has a direct relation to sales in case wastage occurs even in tiny amounts.
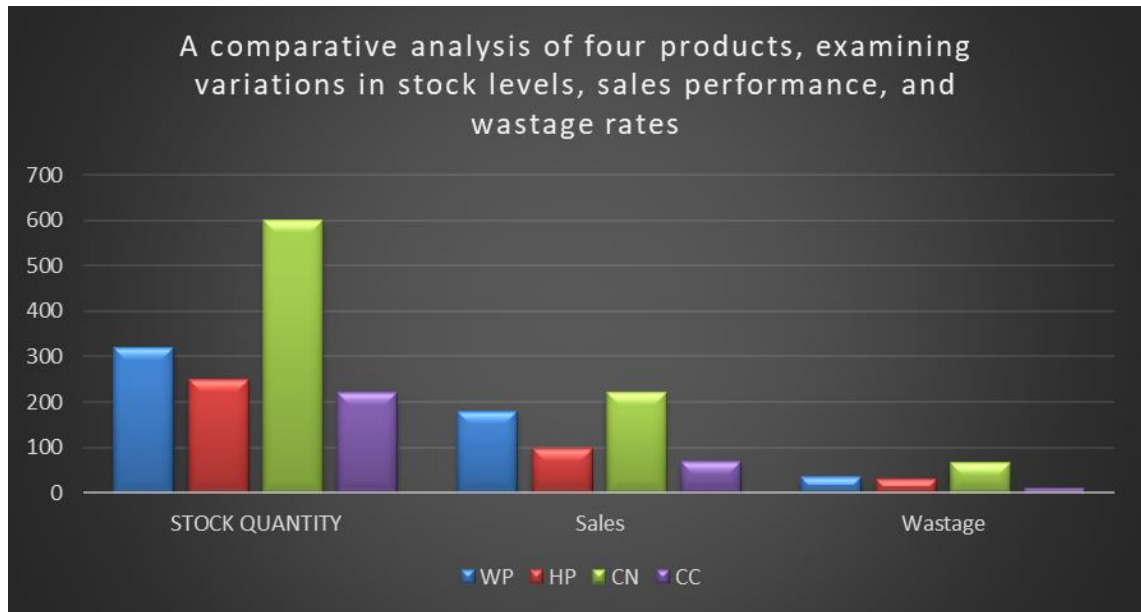
Figure 10: The bar chart illustrates four products' quantities, sales, and wastage on a randomly chosen day in March 2024.

The column chart shows the data provided by X company for a random day with four distinct products with their short form, namely CC, CN, HP, and WP. The recent data taken from official documents in March 2024 displayed that the unit was investing higher value in stocking. However, this is not always the case in these scenarios because there are periods when some products' stock level is lower. Apart from that, sales and overall productivity were lower. Throughout March, the gap between the number of stock and sales almost doubled, creating a glitch for a higher stock system in the unit. Following that, the amount of waste in the chart shows lower visuals; however, it was nearly 20% to 30% of sales value for those four category A products. The limitation is that the company has fewer customers, which results in a lower profit.

Additionally, the numbers contribute to unsatisfied wastages in the unit. Wastage generates a massive gap in the numbers. Sometimes, this goes extreme, and it is difficult to anticipate the actual numbers.

Overall, in one year, the total wastage in the firm is appx. *85 000 euros per shared data*, considered an extensive number for a single unit. Systematic control methods, balancing, and effective planning are indispensable. Apart from the overstocking and stocking challenges, the leading issue is the outdated and manual counting inventory system, insufficient communications, difficulties in forecasting, and record-keeping requirements disconnect the entire system. The purpose of managing inventory in the

unit is not to maximize profitability, but the first step is to reduce wastage by creating a suitable system.

Compared to last year's data, the current average wastage data has rapidly grown. On the other hand, sales are also increasing because travellers are growing annually. The advantages of sales are more significant than the disadvantages of wastage, which is one of the primary reasons the numbers are always neglected. However, wastage in the unit and overall firm is alarming and requires solutions.

3.5.2   Existing demand forecasting

Demand forecasting is a key element in the organization's efforts to keep inventory at an optimized level, minimize holding costs, and improve customer service. X is using diverse demand forecasting methods to keep inventory at the current level. From a technological perspective, Oracle is used to optimize the forecasting methods based on last week's sales.

The level planning document also shows the forecast and calculations of current sales and trends. Moreover, it also reflects the current stage of **productivity** considering the number of staff working. The screenshot from the mobile application in Figure: 11 emphasizes the demand forecasting points (Orange dots) and actual sales (Blue bar graphs) and compares the trend in percentages with the past week's sales. The visual functions are quick to figure out the current trends and demand patterns and analyse the market to find quick growth in the organization. To some extent, these figures help apply ordering strategies. Moreover, the visual data also shows historical data to predict future trends. For example, Summer is known to be one of the highest selling periods for the firm.

The data usually updates every five to seven minutes, and based on the sales level, a planning calculation is completed. The system is also accessible from the online website, but a screenshot is attached from the mobile application, which all the supervisor's use. Data access is limited to shift supervisors and managers, so employees cannot check the planning and data.
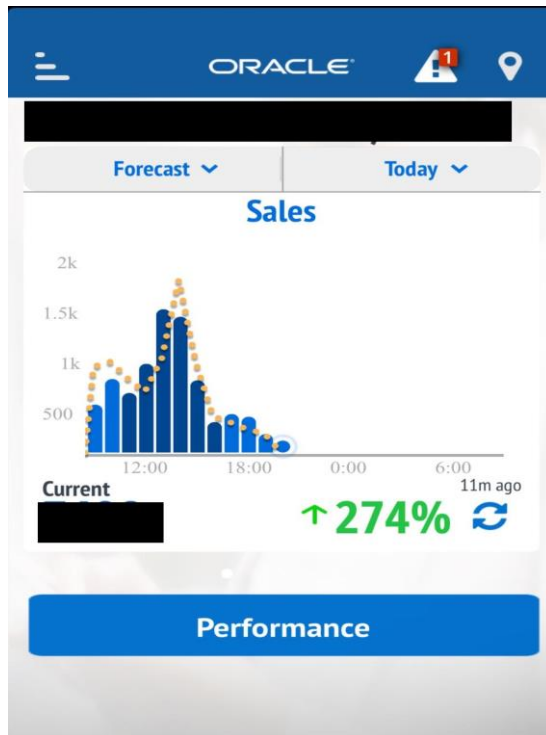
Figure 11: Oracle system performance screenshot for a particular day.

Figure 11 shows the Oracle mobile version sales and forecasts for a particular day to understand the use of the system and performance to determine future forecasts.

Unit X runs with an elevated level of demand in the whole organization and is one of the main units considering the sale of the company. As it is the most active unit, the minimum sales each day are clear to anticipate; however, the maximum is hard to predict, and one of the reasons for the ambitious tasks is to estimate the need for stock each day. Fluctuating demand also misallocates resources and capital and boosts the wastage in dynamic working life, and it is important to curb the issues of demand forecasting at the current level using all the available resources.

The running system is acceptable to some extent, considering the strength of demand forecasting in using moving average data, just-in-time delivery scenarios, and FIFO product usage methods. However, there are some downsides of the system, such as limited usage of resources, delay in ordering, unidentified safety stock and reorder points, insubstantial product category as well as a review system for controlling and balancing inventory, poor change requests, absence of communication in the internal team, etc.

The system's fundamental shortcoming is the development part. Without a suitable system of peer review and feedback mechanisms, finding gaps in the system is troublesome. The urgency of change is essential to overcome the grave issue within the system.

3.6   Key Findings of the Current State Analysis

The section covers the analysis and outlines the current state analysis. Multiple weaknesses and strengths were found in five different stages. A detailed description of each weakness was obtained during the various stages, which is explained below in the Fishbone diagram. Moreover, the main deficiencies in the system are wastage, forecasting errors, and inventory errors. Each step is crucial to enhancing the current system and delivering the solution based on existing knowledge and conceptual framework.
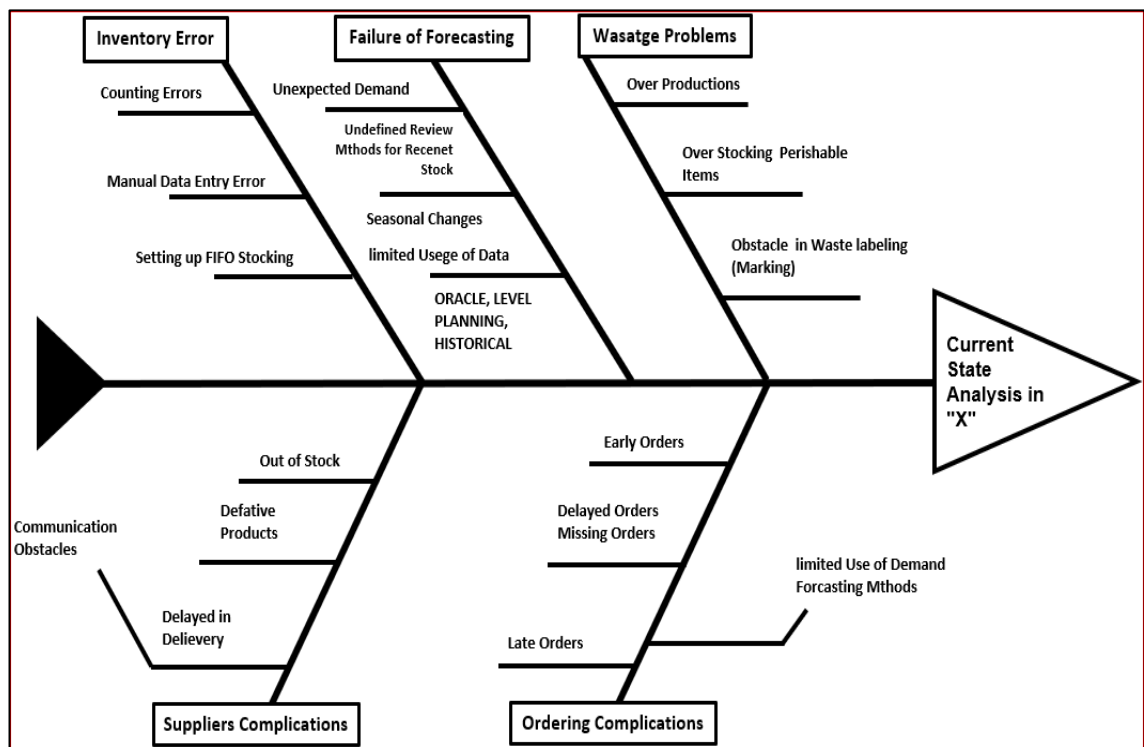
Figure 12: Expatiation of Current State Analysis in Fishbone Diagram.

As seen from Figure 12, the fishbone diagram is divided into five main sections and two sub-sections of the research proposal. The key elements we have seen are similar to the figure mentioned above. Many adverse circumstances are mentioned in the survey and management interviews, such as failure of ordering, forecasting, logistics, suppliers' belongings in order policies, etc.

On the other hand, positive sides, such as data analysis that makes decision-making in order, international storage and internal transfer, collaboration from top management, effective and continuous communication from suppliers, etc., entirely show supportive signs. In CSA data collection, a list of crucial factors has been classified. In general, Qualitative data collection proposes a roadmap with insights into the strengths and weaknesses of the system. The table illustrates the strengths and weakness of the of the case company identified in the CSA.Strengths and weaknesses are processed and presented in the table as data collection plans. The table below shows the findings of strength from data collection.

No	Strength	Executive Department	Description
1	Product tracking	Unit Assistant Manager	Based on the average list, it is easy to forecast how many products will be needed for the day.
2	Direct delivery from suppliers / Internal delivery system	Unit Assistant Manager	During an emergency, the product can be borrowed with an internal exchange system in case of demand fluctuations.
3	Data predictions helpful to some extent	Unit Assistant Manager	Oracle, Finavia flight tracking, and PLS data are helpful in decision-making.
4	Effective communication from Suppliers	Senior Line manager	During seasonal changes, transportation disruptions, and lead time differences, inform in advance to plan smooth deliveries.
5	Day to ordering system	Senior Line Manager	Cycle ordering system instead of periodic order

Strength 1: The list that mentions the average product consumed per day (regardless of day/time/seasonal changes) is favourable for decision-making during the ordering process. Moreover, the forecast list can also track sales predictions and control inventory and wastages. Product tracking is an essential element and critical figure for identifying the unit's overall performance.

Strength 2: For general products, the available international stores support supplying items needed for the day during working hours instantly. Apart from the store, the other two units are the backbone to supply register products for the need in case of demand fluctuation, ordering error, failure to order, inadequate lead time, etc. Situation by

imperative and prompt product transfer. After that, there is a chance to show the error and minimize future obstacles.

Strength 3: Data provided by technologies such as Oracle, level planning, PLS, Finavia flights, and traveler passengers is also an essential element for predicting future demands and inventory needs for a specific day. Apart from stock, the information also helps to determine the company's liability, such as how many employees are needed for the day, overtime needs, etc., and saves the firm's cost by organizing and analyzing carefully.

Strength 4: Communication is a key element to running an operation smoothly. One of the crucial factors in the inventory and ordering process is effective communication from suppliers in case of lead time changes, transportation disruptions, out-of-product details, etc., which need to be settled before the order so the new planning and strategies can overcome the hustle during delivery and the final stage.

Strength 5: In the X unit, the fundamental advantage of the ordering system is that it works as a cycle order instead of a periodic order. Things we need for the next day are generally considered except for deliveries on weekends or holidays. In such cases, it is easier to forecast if demand and predictions for the next day are analysed carefully with the help of historical data.

Strength plays a vital role in the organization, smoothly running inventory and ordering processes. However, a few loopholes are considered glitches in the system and work environment. The following table illustrates the weakness of the current system.

No	Weakness	Executive Department	Description
1	Internal communication	Unit Assistant Manager	Communication is not important part and it made lot of errors in ordering process
2	Traditional system	Unit Assistant Manager	Individual strategy system is used instead of ideal system with team work
3	Lake of define SS, ROP, Risk Factors	Unit Assistant Manager	In the system specific requirement for safety stock, re-order point, continuous review system, risk management etc. Is not specified

4	Lack of utilize resources	Senior Line manager	Available resources are not being handled the way they need to be. Documentation, Forecasting, Internal manuals, storage etc.
5	Employee and manager training	Senior Line Manager	Communication and cooperation between employees and managers are not up to the level.
6	Poor feedback collection	Senior Line Manager	Poor management and communication gap end the feedback collection for future improvements

Weakness 1: Communication creates a smooth work environment, increases firm productivity, improves business performance, and achieves collaborative organization success. Without appropriate communication, firms are facing complications such as too many stocks of particular products and too little for some. Without the approval of other supervisors, the decision-making process is individual instead of teamwork.

> *"A good leader always shares their strategy with others to run Operations smoothly" (Informant X)*

Effective communication does not help to run day-to-day operations, but it reboots future progression and innovation in the firm. During the interview, the superintendent shares insights into sales, budget, improvements compared to previous years, plan, profit numbers, etc. And one of the key elements of adverse outcomes is communication.

Weakness 2: The traditional system is followed from the beginning of the year. Indeed, there have been technological innovations in ordering and input systems. However, the usage of KPI and formation tools is limited. Apart from improvements, KPI is absolutely needed to diagnose gaps in the prediction and results, and such advanced metrics help to overcome the issues.

Weakness 3: Currently, the identification of Safety Stock, stop mark for re-order, Maximum ideal quantities, a system like continuous and periodic review is not implemented in a systematic way. These are essential characteristics for the balance and control of the inventory. The need for this figure is prime important due to severe problems such as wastage, overstock, and understock variations.

Weakness 4: The strength of the forecasting technique, such as demand data and flight data, is not used by the supervisors to forecast future demand because the need to

manage inventory is problematic. The employees' training is also considered an essential part because of the constantly rising wages at the movement in the unit.

Weakness 5: Analysis shows that essential training in the firm or support initiatives from management can be successful. This question was added especially to curb the wastage issue in the firm.

> *"Employees are the asset for the company and one the way to minimize the wastage and increase the productivity of the firm" (Informant 2)*

Communication and coordination between staff and supervisor are the major reason for the inventory imbalance. In franchise X there are various products that have certainly limited shelf life after defrosting and the right amount of product is foremost important. One such reason is communication and training for employees.

Weakness 6: Feedback is information provided by an agent about aspects of one's performance or understanding (Hattie & Timperley, 2007). Feedback collection is a milestone for the business in an organization. However, in the firm, the importance of feedback is limited to some level, and without the right communication and feedback, many valuable points are left unnoticed and underdeveloped.

Summing up, the problems with the current Inventory Management system in Unit X include:

1. *Entering different quantity or mismatch code during inventory valuation in the system*
2. *Miscalculating the product and misconfirming the quantity more or less*
3. *Damaged products/ Expire products/ Wastage products are not appropriately measured and mark in the relevant list*
4. *Records are not frequently updated especially out of order product and when it return to stock*
5. *Delay occurs between recorded inventory in advance and transaction error occurs*
6. *Most important products are often out of stocks*

7. *Inventory system is not accurate because of employee and management are not serious for their responsibilities*

8. *Ghost inventory is typical problem because of human error and management as well as employee do not mark the value when they consume free food.*

Overall, the current state analysis combines several crucial findings with the support of top management, decision-makers, employees, and staff, as well as data observation. The insights show diverse results because random supervisors across the operation department, supply chain, and inventory specialists showed interest in offering their insights for the research program.

Moreover, the data taken for the CSA are a combination of qualitative and quantitative data, making the decision-making process smooth and accurate. Apart from the Inventory management and ordering system, the CAS covers waste management, employee relationships, customer service improvements, management as a coordination need, etc.

In general, support from top management is crucial, and one reason it makes a difference here in the process. All the data and screenshots are taken from unit X as well, and the data are the most recent because analysing current data allows for a systematic and structural decision-making process and fair proposal. The most critical insights shown in the CSA are data and budget shares by managers regardless of insecurities, and those were identified as crucial elements to work this research project smoothly.

Accordingly, the focus areas for improvement in this Thesis were selected as follows:

1. Reliable Ordering system

2. Improving Stocking System and planning for addressing the demand fluctuation (including a demand forecasting tools/techniques)

3. Waste Control

4. Cross-checking of the Overall Inventory Management and with some of its most vital elements.

They inform the areas for available knowledge in best practice search in the next section.

4 Available Knowledge and Best Practices on Building a Framework for Inventory Management

This section covers inventory management, the pillar of Inventory management, five steps to set up new goals and visions, and demand forecasting techniques to improve the current situation. Each section is important and linked to the current weakness and focus areas mentioned in the current state analysis. The conceptual framework forms the best literature from the available practices. This section is vital and interconnected with the identified weaknesses and focus areas outlined in the current analysis.

4.1 Concept of Inventory

The inventory concept is crucial for the company as it considers liability instead of assets. It is often seen as a difference between recorded and actual inventory, emphasizing the food industry. We face similar challenges in the company's case.

The food industry must keep pre-processed food materials as work-in-progress stock. Also, ensuring the flow of the production cycle runs continuously reduces risk levels for customer demand. As a result, the finished products only need to be reserved to ensure they are clear for continuous sales. Sales failure adversely affects profits and harms a company's reputation and competitive position. Inventory accuracy is the instance where the recorded amount of the inventory in the system matches the actual physical stock level.

Apart from customer satisfaction, the inventory level has a direct relationship with the business's financial performance as stock holds the capital, and neither of the companies wants to lose their capital without returning on the investment. However, the organizations denote that excessive inventory ties up working capital and boosts carrying costs. One such issue in the host firm is regardless of financial terms.

Direct materials represent up to 50% of the total product cost because of the money tied up in inventory, thereby affecting the organization's profitability and the return to investors, according to Sander et al. (2010). The challenge is to balance between maintaining too little and too much inventory, which is a crucial topic for companies, as can be understood in the figure below. It is hard to balance, but the more we manage in the organization, the more we take advantage of inventory management.
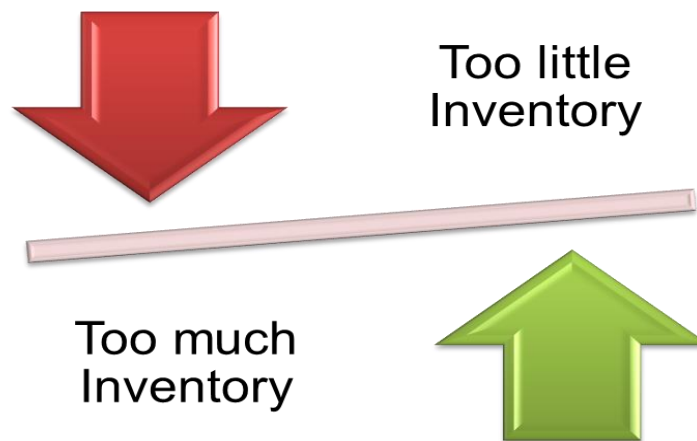
Figure 13: The concept of Inventory management by Sander et al. (2010).

Figure 13 illustrates the combination of optimum inventory to hold. Holding too much inventory leads to cash flow blockage and storage, and it is also challenging to react to market trends because of health and quality reasons. Such trends could be more stable, especially in the Food and Beverage or Fashion industry. Market demands are constantly changing, and the inventory level needs to be counted perpetually due to market factors. On the other hand, having too little inventory results in the loss of customers. More available resources are needed to satisfy customers' demands, negatively affecting the company's goodwill. The risk also leads to missed sales due to insufficient stock, which is why a safe stock is vital for a company.

4.2   Basics of Inventory Management Systems

Figure 14: Pillar of the Inventory (Relph and Milner 2019).

A modern POS (Point of Sales) has revolutionized retail inventory management. These new inventory methods help administrate the warehouse space, carry more products,

communicate with shelf stock, and much more. Inventory control keeps balancing conflicting requirements (Tony Wild, 2018). While the industry evolved rapidly, many retailers must adapt to such techniques. Retailers manage their products more efficiently and allow inventory management, which combines three main pillars (Geoff et al., 2019): first, *Inventory Planning*, which means figuring out the optimum level of stock, second, *Inventory Control*, which means administrating integrity of the stock, and third, *Inventory Balancing,* which means stabilizing demand and supply relationship (Geoff et al., 2019).

The best place to start is Planning, which determines the level of stock needed for today and the future. In simple words, Planning is equal to the optimum level of inventory. Inventory planning models have been developed and implemented, especially on the twin problems of inventory size and timing.

Several factors are involved in inventory Planning, such as market demand and forecasting future patterns, product categories based on sales values, profit margin, and product shelf life. The primary idea is to answer three main questions: What, When, and How Much? Apart from those frequencies of orders, Safety stock policies and lead times are also critical attributes in inventory planning. MRP (Martial Requirement Planning) is essential for executing inventory plans and driving the inventory to the most outstanding level.

Inventory control systems enable a business to determine and maintain an optimum investment in inventory to achieve the required operational performance. Inventory records are difficult to maintain as many activities occur during business operations; thus, the inventory record is very likely to need to be corrected, and it is a widespread problem across many industries.

Controlling inventory is all about managing the stock. Controlling inventory considers two main questions. Where and What quantities need to satisfy the demand? Controlling is always a critical part of the inventory system. The internal part of the unit includes sequencing the products according to the product's shelf life, Ordering strategies, and a numbering system (labeling). These types of methods can easily control the products' needs for the time and differentiate perishable products information.

The relationship between demand and supply management is balanced. Balancing determines the accuracy of planning workflow, inventory flow, the relationship between

inventory and plan progress, etc. The stock must be changed and balanced according to market trends if it needs to be more accurate. Using the effective way of balanced resources can meet goals, such as continuously meeting customer demand, minimizing cost, and effective workforce and management. When this equilibrium is disrupted or inaccurate, it signals the need for adjustments in stock levels to realign with market trends and demands.

4.3   Improving the Ordering system

The firm aims to develop a systematic proposal addressing the current weakness. These five steps will be taken with the vision of managing order in the best ways. The method was discussed during the proposal planning and analysis of the product needs based on customer demands. In the organization, this system will enhance the current shortage of products.
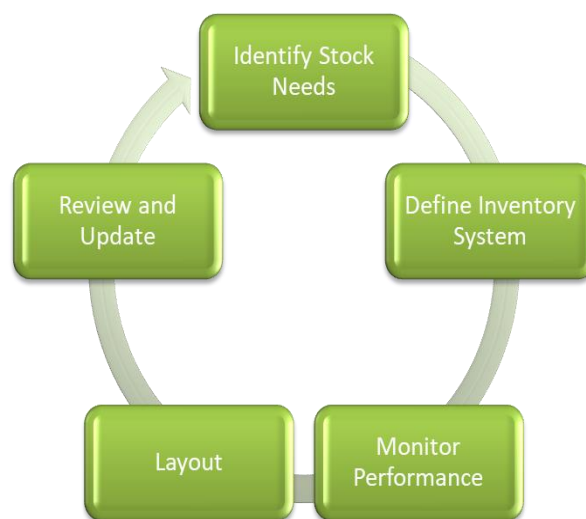
Figure 15: Five main steps to enhance the current ordering system to achieve the goal.

Inventory is the fluid that lubricates the wheel of the supply chain. The first step is to find the basic needs of the stock and the problems in the current inventory system. The best way to identify the trend is to avoid a chain of paperwork, use right systems, and link with suppliers and customers by integrating systems (Wild 2018; 14).

The second step is finding a helpful system. At the current stage, FIFO is used to manage day-to-day products, which can be a positive point. However, the requirements for the ordering system are not up to the level because of underdeveloped and lengthy paperwork. Three distinct categories can specify the product list. ABC analysis can be

an acceptable method for the cycling inventory. ABC analysis is one of the most widely used techniques in inventory management to classify items into three predefined and ordered categories:
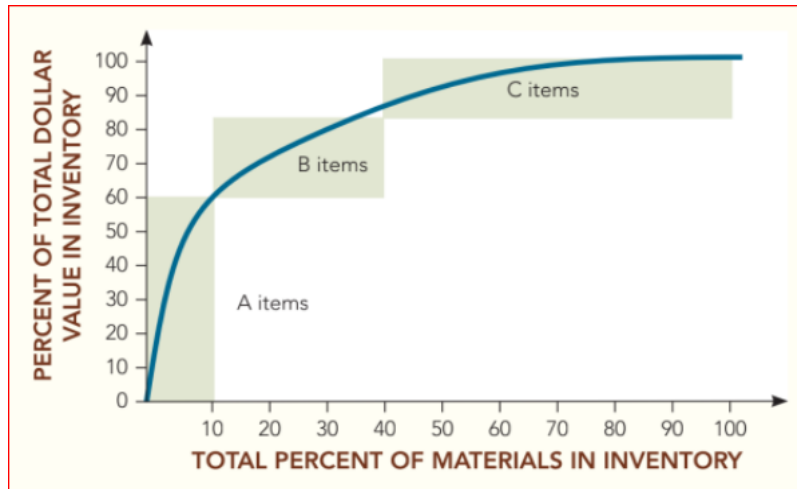
Figure 16: A typical Pareto curve in ABC Classifications of materials (Rein and Sanders 2019; 413).

ABC analysis, popularly known as "Always Better Control," is based on Pareto's principle of "Vital few and trivial many." A (Most important items) are only 10% of essential items and require controlling tightly; B (Moderately important items) let the system manage this; and C (Relatively unimportant items) do not take risks. This inventory method will bring many positive changes. These methods can be divided into two different elements, such as specifications by a margin of the product (based on profit) or by sales of the product (based on customers' choice). However, the most appropriate for the current condition can be ABC analysis based on customers' choice, as the main complication is products that get out of order because of the gap in the current system.

The third step is monitoring the performance. The monitoring system can be found by establishing various KPI's. This can also consider these points as observation positions. There are several ways to find the strong points and areas for improvement. There are three main stages, and different KPIs are mentioned in the table using Relph and Milner's (2019) case example in the Inventory Toolkit. In the table below mentioned A, B, and C analysis based on value and issue frequency of the product control.

Table 6.   A, B, and C analysis based on value and issue frequency of the product control.

Designation	Value / Policy	Issue Frequency/ Method

A Items	High - Tight control - Personal Supervision Balance safety stock	High - Frequent monitoring - Accurate records - Sophisticated forecasting
B Items	Low - Lean Method - Classical control method	High Limit order value Calculate safety stock
C Items	Low Minimum supervision Zero safety stock or can be high (depends on storage)	Low Simple system Occasional order

Figure 17 shows the ABC analysis based on the current ordering system. It is also called category management, and products with similar characteristics into groups for better inventory control and management (Rushton et al., 2011). Table 7 shows the KPIs for planning, controlling and balancing the products in the unit.

Table 7. Transformation KPI in Planning, Control and Balance stage (Relph and Milner 2019; Inventory toolkit).

Planning	Control	Balance
Min. Max Stock Levels	**Accuracy of Stock**	**Overstock Management (% Space available)**
Safety Stocks Investment	**Damage or Expire Stock**	**Supply/Demand administration**
Receipts Planed a day	**Loss/Gain Adjustment**	**Constrains (Short coded life)**
Seasonal and Planning	**Returns/Claims**	**Non-moving Stock**

The following steps are the layout of the products from ordering to receiving the goods and the demand for the product to sell out. Based on that category, it can be settled in the A, B, or C categories for the next step of ordering. Apart from that, SWOT (Strengths, Weaknesses, Opportunities, and Threats) and OGSM (Objective, Goal, Strategy, Measure) tools in the organization can be valuable to use as they set other metrics and identify the market trends, industry, and situation analysis as well as scenario planning.

Various layouts can be settled for ABC-categorized inventory management. For instance, the most widely used are E-shape, L-shape, and U-shape I-shape designs

(Gianpaolo et al., 2022, p. 337). There are several advantages to using proper layouts for the products, such as improving space management, customer services, improving SOP (Speed of services), reducing risk and damage because of the everyday review system, etc.

Level planning uses a level strategy, which refers to the firm constantly tracks the level of demand and actual sales with the help of updated sales and checks productivity based on the number of workers. In companies that make to stock, this means that finished goods inventory levels will grow during low-demand periods and decrease during high-demand periods (Paul, 2000). Also, it combines hourly sales forecast, actual sales, the difference between sales, productivity, etc. calculations. It shows the effectiveness and usage of forecasting methods. There are numerous advantages to using level planning methods. The basic concept is based on the previous week's sales; the manual system generates sales forecasting figures, and based on the average data, hourly sales have been counted for each day. Shift management's responsibility is to update correct data with the help of calculations available in the template.

The recent example mentioned in Figure 17 reveals the level of forecasting in 2023, and it is easy to define that the recent demand trend during that period is collapsing. However, we have seen a massive gap in the ordering system, which results in a waste of resources. As per the companies' data, the average wastage for the year is 85K Euro per unit, which is more than expected, and over a period, it rises continuously, which is a crucial step to overcome such a situation. Therefore, there is an approach to forecast the demand by Ruston et al. (2017).

However, level planning and five steps to develop the vision tools are valid up to some extent because it requires half an hour of calculations, and supervisors sometimes miss the markings and counting. Apart from that thee method is based on ABC analysis. The principal obstacles are unfilled documents and inaccurate calculations. The approach below is convenient for applying demand forecasting to meet the actual need for the product and processing the order. The alternative forecasting approach is explained below in the following section.

4.3.1   Demand Forecasting Approach

According to Ruston et al. (2017), it is sensible to adopt a methodical approach to future forecasting. To accomplish the ideal demand, several key steps will help streamline the product ordering structure. The following steps must be followed respectively.

Figure 18: Demand Forecasting Approach (Ruston et al. 2017).

The first stage is *Plan.* Forecasting methods must be followed regularly and updated weekly as sales demand and inventory ratios change continuously. The main point is to understand the products' key elements and double-check the planning level for available dates to predict the forecast. The ordering list has general ideas mentioned in the first line, which reform the average need for products and follow the analysis. Also, systematic feedback, sales analysis, and trend updates every week make more reliable plans for the order. Forecasting individual SKUs for each product is a 'bottom-up' approach, so the results should be checked with suitable 'top-down' information based on level planning information (Ruston et al. 2017).

The second stage is *Check.* Select the correct method for reviewing and counting the inventory, such as periodic, cycle counting, ABC analysis, random sample counting, etc. Check is a significant part of forecasting; if the analysis is inaccurate and fair, it delivers poor results and creates errors in future demand and order cycles (Ruston et al. 2017).

The second stage is *Categorize.* ABC classification is the most widely employed technique, which, in its basic form, considers only the criteria of annual use value. It defines high sales volume, low demand, profit and wastage ratio, etc. Reorder point and material requirement planning (MRP) are some of the developed strategies to categorize the assorted products into categories to control them. The main focus is on using the analytical hierarchy process (AHP) for ABC analysis. Implementing cluster analysis, contributing to a massive combination of attributes where products are more than average. (Ruston et al. 2017.)

The fourth stage is *Metrics.* KPIs are a way of making decisions in stock updates. In inventory management, KPIs help monitor drivers such as sales, demand, turnover, cost, relationships, and much more. Apart from that, they also set up the target vs. result and define the gap, which helps establish the roadmap. As we found the KPI in the above section, the table below illustrates the elements to update the KPI in X. (Ruston et al. 2017.) The relationship between forecast and stock are summarized below. An optimal future forecast results in low stock in storage. Conversely, high stock means poor management.

Efficient forecast	Up to date resources to calculate the forecasting process and data verifications Make staff more responsible as well as link to employee to comments on forecast
Review Supply	Check the supply policy of each item at certain level of time Figure out to use lowest storage operations using greatest order quantity.
Safety Stock	Set up the safety stock using level planning as it is one of the secure parameters Define the target level and Min-max point for nonmathematical ordering strategies

The fourth stage is *Control.* Every system needs control policies and checked regularly. Inventory control management's impact on organizational efficiency has been a contentious topic for scholars and researchers as they hold different views and findings about its influence on organizational performance. Various policies control the inventory, storage, time, performance, etc. Moreover, there is a substantial link between inventory control management and organizational performance. Inventory control systems are considered necessary components in an organization's day–to–day operations, whose significance is to enhance organizational performance.

Summing up, this procedure is similar to the current demand forecasting. However, historical data, workers' communication, and scenario planning are necessary to make order and reduce waste. The stakeholders' importance and communication are explained below in the model proposed by a similar author.

4.3.2   Demand forecasting model for SKU

According to (Rushton et al. 2017; 268), the demand forecasting techniques is based on qualitative and quantitative methods. Different subtopics cover the methods and some of the tools are related to the above two tools. However, the main sections are executive brainstorming, scenario planning for the demand, Delphi studies, and time series.
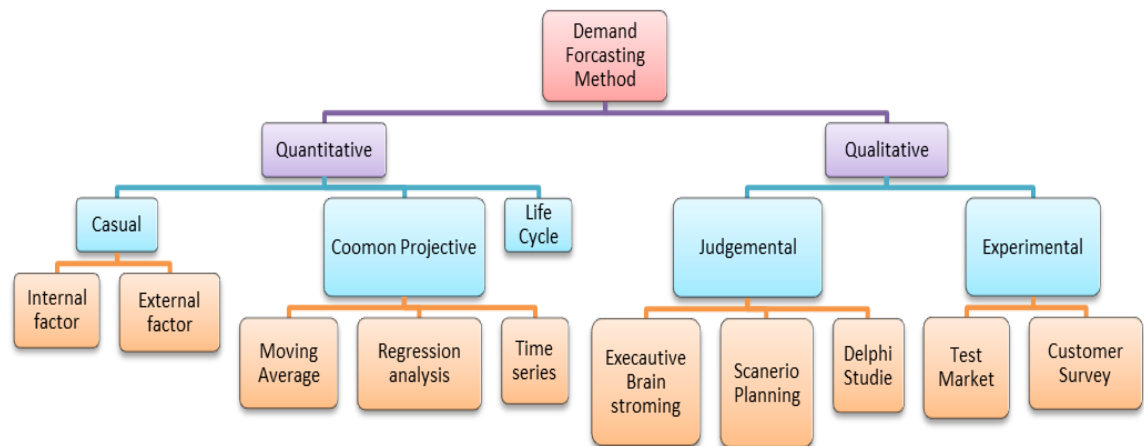
Figure 19: Demand forecasting model for SKU. (Rushton et al. 2017; 268).

Several methods are used to forecast demand, and currently, the company is forecasting based on the moving average. One of the significant reasons for inventory problems is poor forecasting methods. It is said that "all inventory mistakes end up as an inventory problem – whether too much or too little in the Handbook Logistics and Inventory Management 6th edition."

Inventory management is simplified if demand and supply match. It sounds simple in general, but the simplest task is most difficult because of uncertainty. This uncertainty seriously challenges the classic practice of running a business based on a forecast. The levels of volatility and turbulence that typify today's business environment add to the problem (Christopher, 2016).

1. **Executive brainstorming**

Based on the available data from the previous week or month, forecasting is essential; nevertheless, Oracle software gives the indicator. The limitation of the current assumption is that the data prediction is based on the last week of the same-day data;

however, it is for special events like Easter, Christmas, etc. It brings higher customer demands, and to meet that appeal, necessary planning is crucial. Moreover, judgmental methods are more based on internal experts such as sales, management staff, and working employees, as well as internal historical data. To define the baseline of future demand, an experienced employee's proposal will be an ideal choice for detailed information. This will also expand the relationship between employees and decision-making management.

Apart from that data given by other sources, such as estimation of passenger travel per day, the leading strategy before ordering the products for future needs is to use this data not only to accumulate the workforce needed for the day but also to input valuable insights into demand variations. Such data is strictly confidential, and keeping it to limited management and decision-makers is part of the company's policy.

2. Scenario planning for the demand

Scenario planning involves developing a plan for future demands and considering various aspects such as seasonal trends, current sales and demand, the economic and financial conditions of the company, competition in the food chain. For example, a recuring challenge in the airport is the change of gates for the flights. The critical conditions can bring down the sales for the day because of the movement of customers near stores. Moreover, a collaboration of top management, such as the manager, team leader, and team members, is an important asset in accumulating the planning for the demand period. One technique that is not common but helpful is monitoring the trend and, at the end of the day, checking out the product selling ratio, which can be beneficial for the next order delivery.

The available resources will be genuinely beneficial to the organization if the systematic approach of team meetings and involvement of working staff in decision-making with strategic communication resolve the demand foresting errors. The contribution of good communications throughout the supply chain must be considered in terms of efficacy, efficiency, and cost reduction. The contribution of good communications throughout the supply chain cannot be underestimated in terms of contribution to efficacy, efficiency, and cost reduction.

Scenario planning involves future situations that can affect the product's demand. For the unit gathering example, experienced working staff and supervisors should build a

bridge to communicate during working hours to draw the desired outcome with the products in question. In other words, the ideal demand for category A and B products is their perspective to know the judgmental view of the working staff. Moreover, setting up the plan by critical drivers, developing various strategies, and monitoring and controlling the product will be helpful.

3. Delphi Technique

Delphi defines a panel of internal and external experts who meet either individually or indirectly by taking part in surveys, answering questions, and describing their own opinions for the demand forecasting process. In general, it is identical to the above two judgmental methods as it involves the staff directly or indirectly in the decision-making process. In the book The Frontline CEO: Turn Employees into Decision Makers Who Innovate Solutions, Win Customers, and Boost Profits, it is mentioned that Employees could see what company leaders were thinking; we couldn't see the employees or hear their points of view. This is a significant barrier for the company by Eric Strafel 2021;3 pg. Likewise, formulating a management that allows employees to participate is also vital to forecasting demand.

4. Time series

Time series techniques are a model that follows the historical sales data and projects future sales. Based on the forecast, the ordering process is carried out for the period. The logic is straightforward, but the data can be complex because of the distinct types of data available based on historical sales. The essential need is not to project the data but to understand each fluctuation period and analyse it carefully, which is crucial. The time series data have distinct variations.

- Figuring out the order of short-term methods, such as exponential smoothing, is desirable. For example, historical data shows fluctuations for 2-3 months. The scenario, in general, makes the decision-making problematic. However, the visual trendline will help decide the average.

- During seasonal sales, such as the Christmas holidays and mid-summer, three months are always immense in sales figures. Using historical data and ordering huge quantities of fast-moving stock will be desirable. However, the need for storage will not be eliminated before placing huge quantities of orders.

- Forecasting random fluctuations is the most common difficulty in the system. As discussed above, data predictions and some general intelligence can help find the product's needs. For example, the flights from India during this time will sell more plant-based items than meat products.

There are several ways to reduce the inventory's negative impact in a company's case. As per the research, Figure 2 mentioned above can help create a pillar system for perfecting inventory management. This part of the concept is similar to the project management method. There are two different concepts: inventory management and inventory control. Inventory control is managing the stock in storage and setting up control parameters for stocks.

On the other hand, inventory management is the entire process of managing stock, from ordering to delivery. The definitions clearly define the difference between these two distinct scenarios.

With the guidance of a review system in day-to-day operations, decision-making, strategic planning, controlling, and balancing for each product, the perfect product inventory is managed, and wastages are minimized. Applying a simple formula by selecting the most selling and slow-moving items prevents inventory stagnation. Moreover, strict rules for marking wastage in employees and managers can play an exceptional role in forecasting the actual wastage figure. In the future, those numbers will help predict the profit and item needs.

An inventory record is a hard copy of electronic documents or manual written paper that reflects how much and what kind of inventory the company has on hand allocated to both WIP and on-order products.

4.4   Non-mathematical Techniques for Figuring out Order Quantity

This process of ordering is simple to understand in general. The concept is taken from Operation Management, an integrated approach. The three main stages are essential for reviewing the order before ordering. The detailed discussion of each of the three stages is described below to help you understand which one of the scenarios is helpful in fulfilling the order requirements.
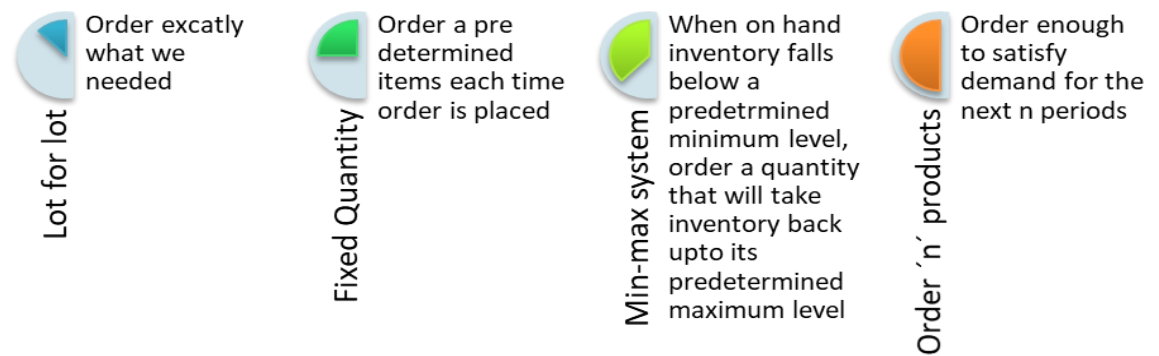
Figure 20: Nonmathematical techniques for determining out order quantity. (Rein and Sanders 2019; 413).

There are multiple quantitative options and tools available regarding ordering and forecasting methods. However, there are also qualitative, non-mathematical techniques that can be employed. For newly promoted managers, it is hard to calculate the static data based on the demand and forecasting techniques, resulting in complications for routine activities. Consequently, the solution is nonmathematical techniques developed by Dan (2019).

The terminology "runners, repeaters, and strangers" is analogous to non-mathematical techniques, albeit with distinct nomenclature.

- Runners: High and regular demand / Make continuously / Just in Time

- Repeaters: Repetitive demand / Regular Same Order

- Strangers: Odd order / MTO (Make to order).

There are three main situations. Situation A is when the firm orders the same amount for the next period as it sold during the earlier period. This is the approach the company is currently following. This method is convenient when the safety stock and ROP are defined in the system. Safety stocks are found at the right point in the supply chain where the pulling action of market demand starts affecting materials management. The chart shows the basic ordering system, which is also considered a cycle inventory system on a day-to-day basis.
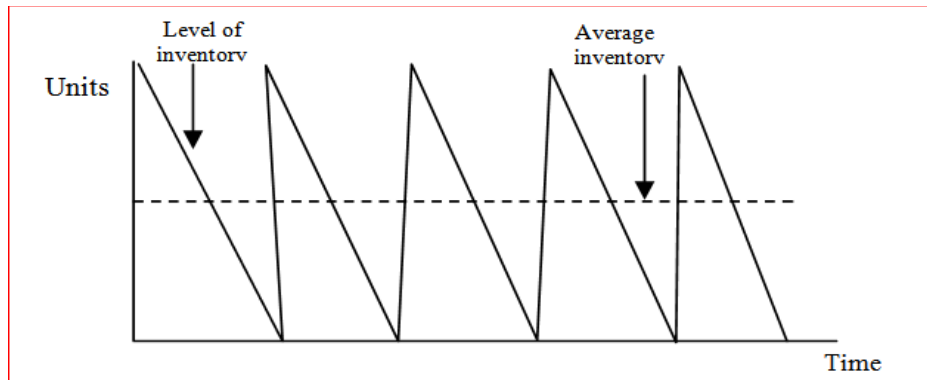
Figure 21: Basic order Quantity EOQ Model managing Inventory level. (American Journal of Applied Mathematics and Statistics, 2014).

The second approach is Fixed order. It is typically more advanced every time we order than the basic ordering system. This method is suitable when the demand is similar over time. Predefined items are ordered consistently at predetermined levels each time. For example, every certain level, 20 boxes of item B. Figure 9 shows the Fixed order Quantity. Continuous review system with fixed quantity order is offered by many authors as an ideal ordering system. The timing cycle is not fixed, but the ordering level is fixed due to stable demand. Figure 9 shows that the order is fixed and named by ´Q´ regardless of inventory level. For the fixed order quantity, the time is not fixed in this situation, but the order size is fixed every time the order is made. A fixed order system is convenient when the source gives exclusive offers, predictable demand patterns, low cost and stable lead times, and benefits in bulk quantities.
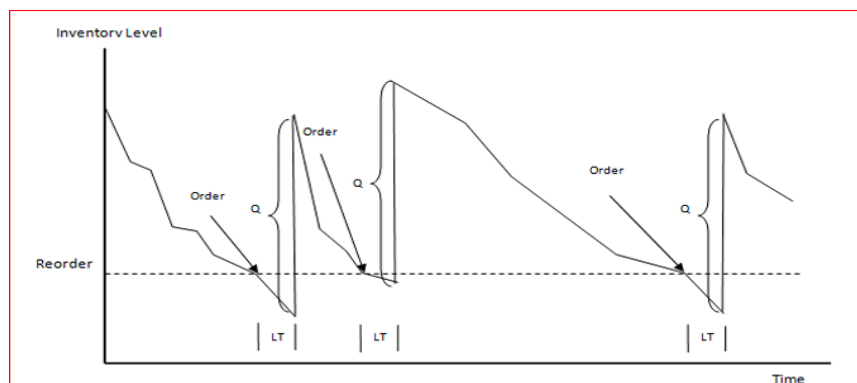
Figure 22: Fixed Economic Order Quantity Model managing Inventory level.

In general, the fixed ordering system is convenient for company X and its F&B products in the scenario below.

- When demand for the products is stable or not, enormous differences over a more extended period

- The level of safety stock is planned, and risk can be tolerated in case of unexpected demand in unusual circumstances.

- The sources are limited, such as the workforce. Continuous review is not necessary for all products, and overstocking is not a fundamental problem for future demands.

The third approach is Min-max ordering, where a critical approach to the ordering system has been presented with a specified ordering quantity. A free-flowing order fulfilment and delivery system is the system's aim (Ruston, 2018, p. 282). The stranger system is essential when the ordering process is independent of demand and sales. At some point, management needs to decide how much is safe to keep in stock, and based on that, continuous orders need to be fulfilled until they reach a certain level.

A careful and systematic review is essential before considering the minimum point for the SKU. This monitoring inventory method is called an optional replenishment system or a min-max system, which defines reviewing inventory levels at a fixed frequency and ordering replenishment if the stock level drops below a certain level. The system is convenient for meeting customer demand because the excess stock in the unit is at a certain level, and continuous review is not necessary as inventory is stored at every stage of the trend. The straightforward approach is easy if both points are correct, and for perishable items, parodic review is essential as it gets out of use at some point.
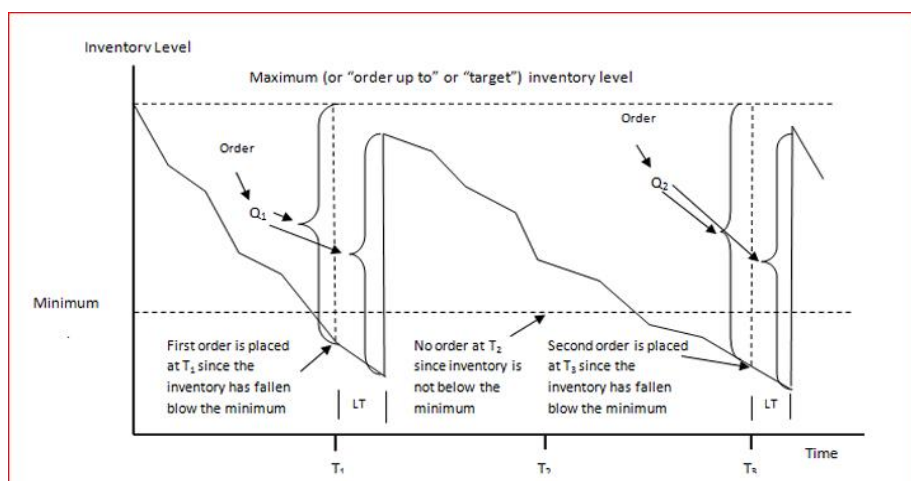
Figure 23: Min-Max System using Hybrid System of managing Inventory level.

The min max system could prove to be the right system of order in most scenarios. However, some important information needs to be acknowledged before implementing this system.

Table 8.   Benefits and limitations of the min-mx ordering system.

Advantages	Disadvantages
The Min max system is simple to understand and easy to follow when deciding target points. The structure needs less monitoring. In most of the scenario the product stock out is relevantly rare. The problem of carrying excess inventory is not an issue and reduces the overall cost of storage, insurance etc. Continuous review is not necessary.	Management is not so responsible to count for controlling inventory and balance between stock and demand. Ordering system is dependent on one system and no other logical structure can be found if min max points are not analyse for longer period. There are chances of wastages as items are perishable and easy to get expire. Complexity to identify two points based on future demand forecast.

Essential elements for using the above techniques, such as Inventory turnover rate, which defines the selling time of stock, continuous review and stocking analysis, seasonal trends, etc., are essential because they are nonmathematical techniques. As per the current state, the need for safety stock and re-order points is a vital function in managing the inventory optimally. The following topic is discussed to define the safety stock.

4.5   Define Safety Stock in the system

Safety stock is also referred to as buffer, security, or backup inventory (Gwynne & Susan, 2020). One of the critical and crucial tasks is to determine the safety stock in the organization. The importance of too much inventory is always before the number of firms, resulting in the ties of money being put into storage by holding too many products. On the other hand, if the stock is not limited, the firm will face a stock-out situation. To overcome such a situation, there is a need for safety stock, and it is part of the inventory to keep the stock safe in case of demand fluctuation.

Safety stock is a fundamental stock that protects the host company against three main situations. These three situations are commonly seen and create problems in the flow of demand and customer satisfaction. Safety stock is held because of following reasons:

- The variability of Demand (New trends, unexpected events, etc.)

- Inventory shortfall (Late order, damaged products, expiry of products, etc.)

- Service disruption (Order mistake, strike, seasonal interruption, etc.) (The Logistics and Supply Chain Toolkit 3rd edition).

Thus, it is true that keeping inventory ties up capital and storage in the firm and holds lots of operational problems. However, it is also true that supply chain managers always want to reduce working capital; on the other hand, marketing tasks always push for growing customer needs. In between, managing stock levels is a deliberate task. As per the researchers, there is no ideal technique available to manage the safety stock. Techniques such as continuous review methods and periodic counting play a role. Figure 24 demonstrates the importance of safety stock of ROP, re-order point.
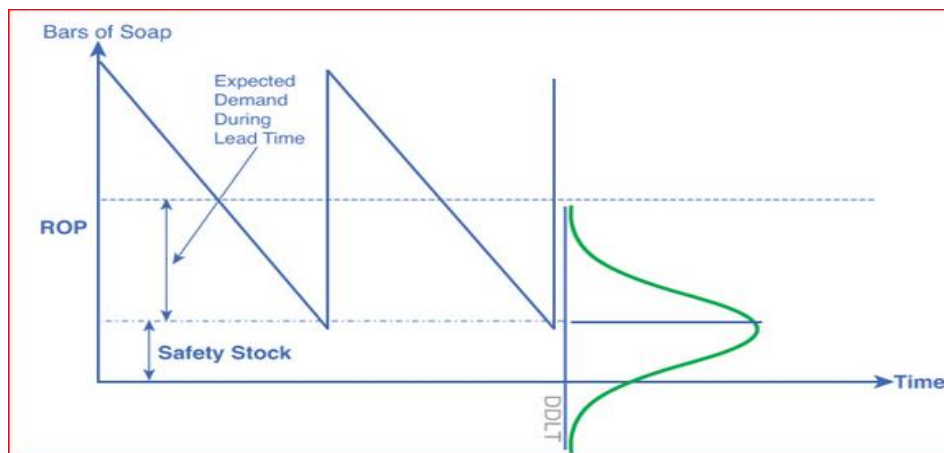
Figure 24: Understanding the importance of Safety stock and Re-order point (Waller & Esper 2014).

The inventory replenishment process plays a significant role in various aspects of business, such as improving the ability to use graphs of the process. Such visualization improves the ability to communicate, create, and innovate in the inventory and ordering process. A continuous review system defines monitoring the inventory as continuous.

The ROP (Re-order point) is based on the general concept that if the inventory level falls to or below a specific level, management orders predetermined quantities for some specific period (Gwynne et al., 2020, p. 153). It is essential to figure out the level of re-order point and safety stock because there are conditions such as stock out, trouble in forecasting, control, and visibility not enough for the products, etc., to protect against the inventory. ROP cooperation generates savings in cost, enhances customer services, streamlines and harmonizes the ordering process, etc.

When applying the ABC analysis, demand is independent for category A, and generally, ROP can also be used in B and C line products. This method is advisable for the firm because most products are not in the stable line, and controlling the product is necessary at this stage. There are several significant steps before deciding on ROP. First, *Obtain* the specific number for each category to decide ROP based on the average moving per week. Second, *Define* the lead timeline for the same specific products per week. Third, *Set up and format* the safety stock and ROP parameters indications for each product category. Fourth, *Analyse* the demand and lead timeline. The require updates needs to be specified if changes are huge in calculation of quantities. For this end, continuous and periodic reviews of each item pretending to be distinct categories are pivotal to minimizing wastage.

Table 9.   Continuous and periodic review concept.

Perpetual / Continuous review for A & B category	*Periodic review for B & C category (Every 2-3 days)*
Record every transaction real time	Spot checking before ordering some specific products
Manual computer or ordering list update after every change	Manual counting during slow day
Reconciliation (Sometimes it shows 3 in the list, but it is only 1 in the stock) Spent more time to specify the need for upcoming order	Periodic book vs reality reconciliation Average time is enough to consider the value

In addition, the dynamic approach of the operational system (busy hours) during the week and the busiest to slowest week help identify the product's requirements. Demand patterns require careful attention every day to create systematic requirements for the product in the storage one and main store.

4.5.1 Kaizen continuous improvement

Three main elements of Kaizen's action theory reveal different approaches. The Kaizen's meaning is that' Kai' emphasizes change, and 'Zen' explains good. The theory believes that small, essential steps can create achievable goals in the firm, such as housekeeping, Muda elimination, and standardization. As per the continuous improvement theory, the goal is to achieve the target within the organization and share ideas with top management, supervisors, or the workforce. The detailed Japanese workforce and the word meaning are defined below in the following paragraph. The lean Kaizen philosophy spotlights three principal areas: quality, efficiency, and profitability.

In addition to that, the objective extends quality control, JIT delivery, standardized work, use of efficient equipment, and elimination of waste. Kaizen's goal is to create minor changes over time to improve the current scenario in the firm. Similarly, the firm needs change in the constantly updating environment to have an enormous impact in the future. Management is essential, directly or indirectly, to improve the business model and update the importance of each workforce. The main requirement for implementing Kaizen in the firm is five essential elements (1) Teamwork, (2) Personal discipline, (3) Motivation, (4) Quality, and (5) Feedback and improvement. Figure 25 shows a Kaizen tool to minimize wastage.
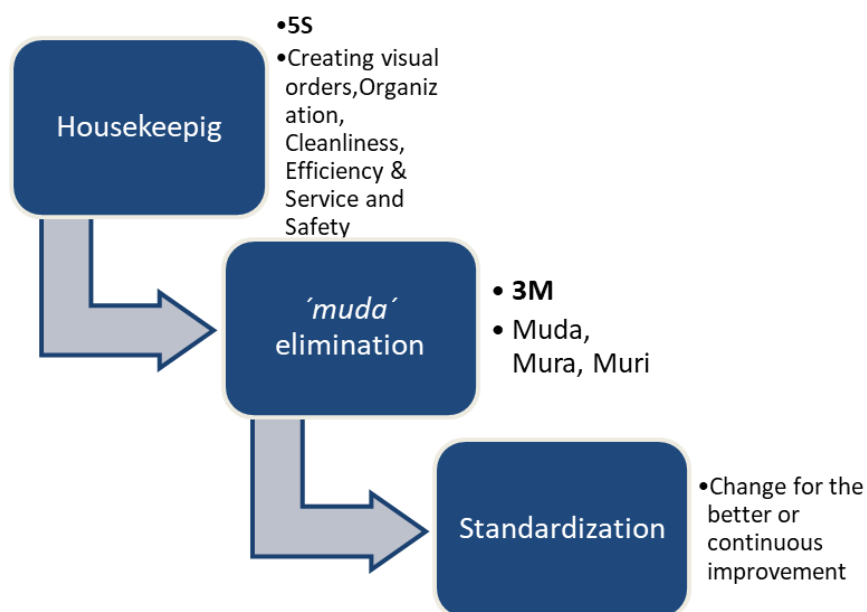
Figure 25: Kaizen tool to minimize wastage.

In Figure 25, there are three elements. First, *Housekeeping* is one of the ingredients of good management. Employees and supervisors are fundamental at this stage, and without self-discipline, it is impossible to provide the final product or service of excellent quality to the customer. Second, *Muda eliminations* focuses on decrees wastage in the firm and improving productivity. In Japanese, Muda means waste, and gamba means adding or not adding value. As per the Kaizen, he believes in improving the most efficient way of reducing the Gemba or Muda instead of increasing investment. Third, the ground rule is *standardization*, which defines the need to follow standards to assure the quality of each process to reach the final product. Figure 25 shows Kaizen Innovation Improvement Model (Imai 1997, 3).
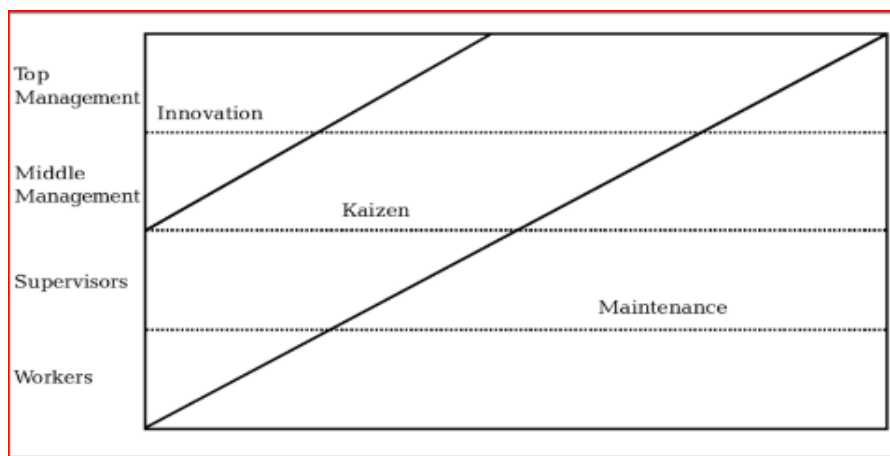
Figure 26: Kaizen Innovation Improvement Model (Imai 1997; 3).

According to the Kaizen view, this approach must be followed in organizations. The Kaizen theory has long-term benefits with a low-cost approach, including human effort, morale, communication, training, teamwork, involvement, self-discipline, and commonsense.

4.6   Conceptual Framework of This Thesis

The conceptual framework focuses on the approaches and tools for improving ordering strategies discussed in best practice and literature review. A streamlined and effective ordering strategy is an essential need of the inventory system. A detailed understanding of the literature is explained in the table below.

Table 10. Conceptual Framework of the thesis.

		Improving Inventory Management	
1	Improving the Ordering	-	ABC Analysis, EOQ (Economic Order Quantity), Just-In-Time (JIT) (Wild, 2017)
		-	Forecasting Techniques, Performance Metrics (A. Waller and L. Esper, 2014)
		-	Importance of Supply Chain, Optimizing ordering and stock (Slack et al. 2022)
2	Minimizing Waste	-	Gemba Kaizen, 3M (Imai, 1997)
		-	Overstocking and Understocking (Croucher et al. 2014)
		-	Understanding the root line for demand (Richards & Grinsted, 2018)
3	Improving the Safety stock & Re-order	-	Define ROP and SS (Wild, 2017)
		-	Calculation of safety stock and reorder point (Waller & Esper, 2014)
		-	Nonmathematical technique (Rein & Sanders, 2019)
		-	Tracking drivers: Market, customer demand, Fluctuations (Davis, 2016)

The choice of three main themes was informed by the results of the Current state analysis (Section 3). As mentioned in the CSA, the primary weakness was considering improving the current ordering list. Supervisors must be able to do the primary stock for everyday requirements. Ordering must be done correctly to maintain the firm's optimum stock. For this end, relevant tools and techniques should be used to control and balance the stock for daily ordering, which are listed under Theme 1.

The secondary weakness was minimizing the firm waste to enhance the overall efficiency of the business and intensify stock usage. Implementing the standard framework of stock access, continuous reviews and tracking of items, etc., can reduce the wastage cost. Excessive wastage is one of the severe reasons for instability in the available stock. To improve, relevant tools and techniques should be used, which are listed under Theme 2.

Finally, establishing a clear Reorder point and Safety Stock protects against product shortages during unexpected demand. Also, it clarifies the process and defines when to order and what needs to be ordered to satisfy future demand. One approach is setting a maximum point for some items; ordering maximum points will help protect against unexpected sales, which are listed under Theme 3.

In summary, the three themes list the essential steps towards a systematic ordering list based on the ABC category and consider the performance metrics to understand the basic needs of required products and improve the ordering list. Moreover, to keep the system smooth, minimizing wastage is also a priority, and the re-order point and safety stock should be considered ensuring safety against sudden variations in unit demand. This guidance is implemented next, in Section 5, when building a Proposal for the case unit.

5 Plan for Improving the Ordering Strategies as Part of the Current Inventory Management

This section clarifies the three main proposals to enhance the current inventory procedures via improving the ordering strategies at the case organization.

5.1 Overview of the Proposal Building Stage

The proposal was built in five stages. First, valuable knowledge and tools were discussed with the administrator, based on literature and best practice. Second, visuals and pictures were taken from *the storage, ordering, and wastage* sheets and remarks. Third, to cover the improvement area from the supervisor and workforce perspective, the survey results were analyzed with the manager. Fourth, further topics, such as the negative impact of waste and current stock, were discussed with the supervisors and managers to reduce waste and improve the firm's productivity. Finally, key improvements, such as periodic and continuous reviews, were discussed to improve the overall inventory and future ordering system.

The development part mainly pointed to three areas of improvements. The first is enhancing ordering techniques by *improving the Ordering list* using a conceptual framework and tools referred to by literature. The second improvement is introducing the *waste minimization plan* by analyzing the sources and elimination plan described in the table. The third is proposing *the cross-check* of the overall inventory process and the safety stock checklist.

The manager, assistant manager, and seven supervisors were invited to discuss three main improvements in detail. The results of the Proposal building stage are described below.

5.2 Findings from Data 2

Here, the inputs from the key stakeholders (Data 2) are summarized. The main inputs for the proposal building include: (1) Data 1 (findings from CSA, *very briefly* repeated form earlier reporting), and (2) CF (input from literature, *very briefly* repeated form earlier reporting), as well as (3) Data 2 (from this co-creation round; reported in detail). Inspired by these inputs, the Proposal was built.

Table 11: Key stakeholder suggestions (Data 2) for Proposal building in relation to the Conceptual framework.

	Key focus area for the Proposal	Inputs from literature (**CF**)	Suggestions from stakeholders for the Proposal, summary (from **Data 2**)	Descriptions of their suggestions (in more detail)
1	*Improving the Ordering list*	1) Settle ABC analysis to improve the category and importance of the product specification. 2) Use metrics to improve the forecast and understand the product needs. 3) Setup the structured inspection system and identify the need for a continuous and periodic review timeline	1) Communication needs to be priorities before placing the offer 2) Review the available resources to ensure the demand and based on that following day order needs to make.	*The unit manager explains that the day-to-day ordering sheet, especially for the A & B category, should be posted in the channel so that the available supervisors can check and comment on whether something needs to be ordered more or less. Communication with peers will help to perfect future orders.* *Three key elements need to be reviewed. 1. Level Planning Sales 2. Number of expected flights/travelers 3. Current Stock available in storage 1 & 2.*
2	*Introducing a Waste Minimization Plan*	1) Improve the gap between understocking and overstocking via demand forecasting 2) Implement the efficient store technique using FIFO for all perishable products.	1) Reduce overproduction by showing the average sales during the day. Numbers will help to understand the most active hours during the day. 2) Establish employee training and awareness to understand the importance of wastage ratio in the firm.	*The senior managers explained that the employees are the ones who can reduce the wastage by using each product based on FIFO (Expired Early) products and not overproducing the product during slow hours because most of the products have less shelf life once the final product has been made. It is essential to ensure that experienced staff members give feedback and training.*
3	*Proposing the cross-check of the overall inventory process and the safety stock checklist*	1) Identified SS and ROP based on time series (Historical sales) and demand forecasting based on future assumptions. 2) Understand the current trends such as weekly demand flow, customer	1) Establishing the checklist to ensure the cross-checking process: For category A, a continuous review procedure; for B category, twice every week; and for product category C, every weekly	*"Now it is time to change the current process, as each product is reviewed every 14 days (about 2 weeks) and another review should be done based on product category. Establishing a new review system will be more exact in tracking the product movements each week."*

		demand for products, upcoming holidays, or seasonal trends, etc.	review to minimize the risk.	

As seen from Table 11, three key elements were discussed with stakeholders, helped by the knowledge from available literature.

As per the current state analysis, the initial goal was to correct the current ordering list. All the products need to be categorized into three different stages. Category A is the demanding products that are extremely important for running the business. Category B is necessary but is different from the A category. Lastly, slow-moving products are in category C. Following the system's development, the products' KPIs were discussed. The primary element in setting the KPI is to ensure how much we need for each product. As explained in Table 5, KPIs are based on planning, Balancing, and Controlling for ordering products. The system discussed and settled the "MAX" and "MIN" points for category A. Categories B, and C constantly reviews and order, considering the sales and wastage ratio. Moreover, per strategic communication, the ordering list must be posted in the group channel. The main idea is to mitigate the risk of missing orders, and peer feedback will work as a learning strategy for future ordering. It was essential to introduce these three resources before placing an order. The number of travelers still needs to be used to place an order as per confidentiality; however, the number of flights is traceable to encounter the appropriate number of travelers. Most importantly, review the available stock in storage 1 and 2.

The second aim was to minimize waste by implementing a structured plan. The emphasis and coordination of employees and administrators were essential to discuss this point. Understanding busy hours by showing the visual graph on the notice board were helpful and provided a roadmap to stock the perishable products. Moreover, utilizing the current products with FIFO was pointed out to mitigate the risk of out-of-date products. To identify the product box, applying notes on the box was decided to be easily done by tracking the box. The morning supervisor's responsibility is to check the dates and mark them on the box.

Employee and administrator training were planned monthly to ensure updated information is shared between internal teams. Their feedback suggestions should improve the continuous process and mitigate the constant reduction of products. In relation to applying the waste management plan, the senior manager and other

management staff shared crucial insights because the working staff carefully examined day-to-day operations.

The third step was to develop a review checklist to understand the current stock situation and product movement. The inventory specialist examined several points, such as capturing the historical data and creating a baseline for reorder points. Moreover, as mentioned in the conceptual framework, the calculation of safety stock for raw material for category A and the practical planning were implemented to consider the value of each product. Based on the demand, the number of products accumulates in categories A, B, and C., etc. For safety stock, the checklist was developed to ensure its reliability. The review system was one of the most important in controlling and balancing the overall stock available in the unit. As per the system, the stock was reviewed every two weeks; however, the added review system was created based on three categories to add extra protection against fluctuations.

With these key inputs from the stakeholders made visible, the Proposal is pulled together below.

5.3   Proposal Element 1: Improving the Ordering List

For building the improved Ordering list, the first step was to refine all the available data into a form. As per the demand and historical sales, the Pareto curve was followed to filter the data into A category, B category, and C category. The resulting Ordering list has 143 products and is ideal to use. Figure 27 shows the visual understanding of A, B, and C analysis with the Pareto curve and the number of products in each category.
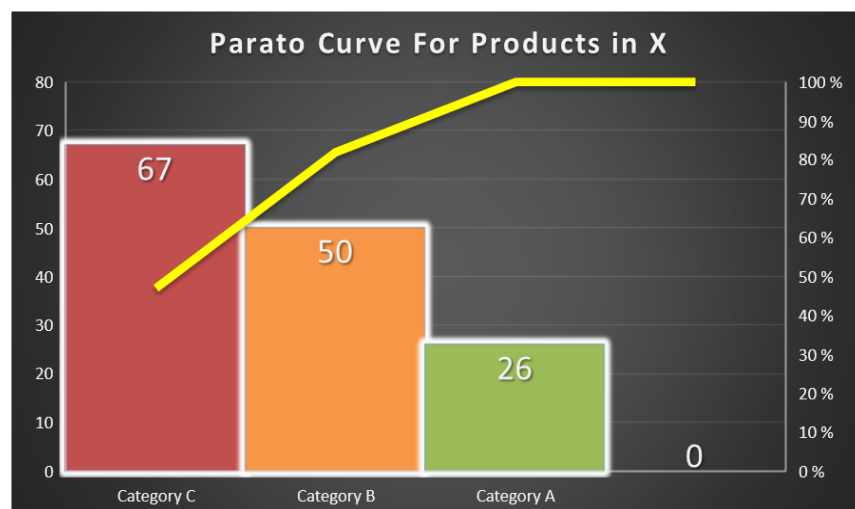
Figure 27: Distribution Product Pareto Curve for 143 products.

The special changes have been corrected and added to the company's Ordering list. In regards to the company's policies, it is not possible to publish the Ordering list openly; however, the information from the proposed Ordering list is shown on the Pareto curve for the items and coloring based on the importance of the product categories.

The ordering list was improved with the help of a checklist created during the discussion. To analyze more carefully and with detailed attention, each A category needs frequent review methods to overcome stock-out situations.

The testing of the proposed Ordering list was done in April 2024 by printing the sheets to use in the process. Priority was established based on the product's sales. The Ordering list included storage one, storage two, outside storage items, chemicals and other stuff needed for cleaning the equipment. Figure 28 shows the proposed Ordering list that was used for testing in the real process.

Figure 28: The Ordering list based on ABC analysis with colours to estimate the product importance.

The testing part was implemented in mid-April 2024. The primary purpose of testing the initial plan is to make necessary adjustments. The initial step was to analyze the product categories based on the A, B, and C categories. The confirmation was applied to decide which products go to A categories based on the available product needs. Based on variables in demand, the safety stock and re-order point were arranged based on the separate product.

In addition to this Ordering list, the sheet containing the Safety stock and Re-order point was implemented in the testing part. The division was based on the available storage

facility and determined the financial cost of storing different products (The product price is checked, but the package is a giant size, so those products are carefully reviewed for safety stock). Re-order points and calculations were also crucial because of perishable products. More orders needed more careful attention, so managing optimal levels was essential. Non-mathematical min-max was used to determine re-order point and safety stock based on category A product. Figure 29 below shows the screenshot from the Safety stock and Re-order point sheet for category A products used in the testing.

PRODUCTS	Average	Safety Stock	Re-Order Point	Total Stock
	3	2	3	5
		2	1	3
	3	1	1	2
	2	1	1	2
	1	1	2	3
	1	N/A	N/A	N/A
	1	1	1	2
	4	3	3	6
	1	2	2	4
	2	2	1	3
	1	1	1	3
	1	1	1	2
	1	1	1	2
	10	4	2	6
	2	2	1	3
	1	1	1	2
	8	4		
	3	2		
	3	2	SPECIAL	
	3	2		
	3	1		
		N/A		

Figure 29: Safety stock and reorder point for category A products.

During the testing of the above described documents (shown in Figures 27-29), the systematic use of Kanban was implemented to provide special attention to the A category before placing an order. However, the placement (office) is also important as it is easy to check out category A products and other related products to quickly look before ensuring the quantities for each item. (However, sometimes it is vital to check that the information is accurate and cross verification is indeed crucial)

The notes were helpful for two reasons. Firstly, the firm has two storages for X, and checking in both units every day before placing an order will be burdensome and time-consuming. However, the Ordering list helped reduce time and physical checking. Secondly, the periodic review system in the firm for all the products is every two weeks, and during that time, rechecking those products and sticking another sticky note will make it easy and precise to count in the system.

Risk assessment was a key principle for improving the Ordering list. First, *Define the SPECIAL items,* which are short life perishable (2-3 days) items that need to be ordered based on demand. These products also require extra attention while ordering and reviewing the available products in the stores.

Second, *Assess the product review,* especially for those items that have less shelf life and do not need to be kept in stock. The improved Ordering list was produced with the help of a product inventory checklist. Those products that have limited time and are in a category require frequent review (every day) to ensure the stock is not overextended.

Third, *Ensure changes are recorded* such as holidays, strikes, and other situations affecting the delivery network must be discussed with other management before placing an order. This method will provide more reliable solutions for products that will be needed in the future.

Fourth, *Improve communication*. It is important since in the firm, two main suppliers provide the resources, and two channels are available for communication. As per the recent Ordering system, not having right communication is the main reason for the overstocking. The initial step here should be to fix the language by proposing an ideal language for everyone to understand. The second part should be the additional product, which needs to be added as international store ordering is sometimes done through direct calling, but it is important to add to track the product usage and financial stability. (For example, some of the products were found to be missing from the product list. The products were mostly detected, which were supplied by the International Store. For example, when the unit needed those products, the supervisors directly contacted the store, and because of the availability of those items, it was unpublished in the ordering list and some items were new).

Fifth, *Improve data & information sharing*. Some of the data are limited to the managers. With assurance of privacy, these need to be shared with opening supervisors to ensure the forecast accuracy for the following day or the upcoming week. Apart from the order, it will also help to maximize the level of productivity by managing the needs of workers in the firm (for example, the data from airport authority to forecast the number of travellers per day during operating hours; currently those are not limited to specific managers in the unit).

5.4   Proposal Element 2: The Waste Minimization Plan

The Waste Minimization Plan contains the source of the waste, analysis of the organization´s activity and eliminating the waste by techniques. Table 6 describes details of the plan.

Table 12:   The Waste Minimization Plan for addressing the waste and proposing techniques for minimizing wastage.

Waste Category	Nature of waste	How to eliminate
1. Overproduction	Over production by defrosting the items in slow sales	Streamline the process by showing the figures to employees. Understand the root line for demand.
2. Ordering System	Too much stock for items that are not needed	Efficient and well-organized ordering structure and cross check to improve the future forecast.
3. Inventory	Holding too much stock in the unit is waste of capital and food products in the organization	Using logical demand data and managing inventory needs with placing order using ABC analysis and review system.
4. Defects	Perishable food has less shelf life and overproduces generates defects	Find ways for defects and communicate the logic behind in the organization
5. Waiting	When the people are not productive the serve within the Speed of service it is waste and losing customers	Managing ideal timeline by well-organizing the roster by assigning individual tasks and responsibility.
6. Broken	When receiving the delivery, the items are broken or not in the package as per the requirement	Providing the recommended timeline as per their needs can be helpful to working with moral and eliminate.

The challenge for the company is the total waste numbers. Additionally, in Kaizen (Imai, 1997), it was proven that communication with workers will have a positive effect on the overall waste issue. To improve the current techniques, it is important that employees also follow the key strategies to improve the efficiency and minimize waste.

Another important technique to control wastage is to ensure stocking based on FIFO products. Every supervisor's responsibility is to check the product labeling. Moreover, the highlighter notes **"USE FIRST"** to provide a visual spotlight to workers and management to confirm which products need to be used. In most boxes, the average size of the manufacturing and other details is small. Those techniques are useful to minimize product wastage by expiring items.

5.5   Proposal Element 3: Developing the Cross-check of the Overall Inventory Process
        and the Safety Stock Checklist

Table 7 splits the main Ordering list with 143 products developed in the excel sheet
(original sheet) into ABC analysis as per the Pareto analysis. As a result, the most
essential items are defined into A category, which includes 26 products. Category B
accounted for 50 items which are considered based on average sales data. Finally, 83
items are considered as C because without those products the effect on sales in minimal.

Table 13:   ABC counting frequency (developed based on: Gwynne Richards and Susan Grinsted
2020; 144).

ABC Class	Desired number of count cycle (Per Week)	Number OF ITEMS
A	Every ordering cycles	26
B	Every 2-3 days	50
C	Once or twice per week	67
		143

This approach based on the ABC analysis regulates the counting and determines how
often it needs to count the Category items using A, B, and C categories. For example,
Category A products need special attention and constantly counting for each order.
Likewise, B is the second crucial category that can be divided into two points. Point one
needs extra attention, and point two needs periodic review, considering (2-3 days)
counting on each cycle. Lastly, category C items are ordered when needed in case extra
storage space is available.

When Table 7 calculation became available, it became possible to implement the cross-
check of the Safety stock checklist and the check points in the Inventory process
(according to the steps by: Phillip Slater; 140):

1. Check the current level of Inventory and demand flow

2. Find the actual level of safety stock for the products

3. Find the drivers of safety stock for the products

4. Contact suppliers update on driving safety stock levels

5. Identify viability and risk factors of reduction or change

6. Develop change over plan and timetable for the product and inform

7. Implement the plan

8. Monitor the performance and make necessary changes

9. Confirm change of inventory.

These steps need to be done keeping in mind the Continuous Review (ROP) system for A Category and Periodic counting for Category B & C. The logic behind this proposal comes from available knowledge and best practice.

"Some operations managers use gut feelings or hunches to set safety stock levels, while others base them on the part of cycle stock level of 10 or 20 percent. That scenario is followed by the host company, for example. While easy to execute, such techniques generally result in deficient performance. A sound, mathematical approach to safety stock will justify the required inventory levels to business leaders and balance the conflicting goals of maximizing customer service and minimizing inventory cost.

> We don´t "plan" to go below our safety stock level

The above statement is a generalized statement that works for the first plan. The proposal does not need unique calculations to implement the solutions; nevertheless, the basic structure needs to be updated nearly before or every three months because of seasonal and other changes in demand and supply. To encounter the issue of how much we need for the day, the average formula is mentioned below.

Safety Stock = Max Demand Dueing a Slow Replishment time - Typical Demand During Typical Replishmanet time
Example:
Typical Demand for Sandwiches= 100 / Day
Typical Replishment Lead Time = 2 Days
Max Demand for Sandwitches = 200 / Day
Slow Replishment Lead Time = 4 Days
Safety Stock = (200*4) - (100*2)
Safety Stock = 800 -200
Safety Stock = 600 Sandwiches

Certainly, keeping in mind that the product is not a finished good but rather a calculation of *raw materials* required for safety stock.

Almost 140+ products are available in the storage and distinct ordering system. However, some products are not often important on an everyday basis; in contrast, some are more important. To overcome the confusion in deciding all the items to keep in stock, it is important to focus solely on A categories of products (ABC analysis), meaning that only the most critical products are needed for the day. This approach is valid because of limited storage capacity and a day-to-day ordering system.

"No Variations in Category B & Category C = No safety stock requires"

This approach is modified from ABC analysis, Parato curve, and safety stock calculations from Inventory management certifications. As per Interviews 1 and 2, as well as sales data for each product, the compelling outcome clarifies the products we need, such as categories B and C, which need more attention while ordering. Techniques such as continuous review methods and periodic counting play a symbolic role in defining how much we need on an average basis. In the ordering list, "averages numbers" that go per day log creative hint; however, figures require revision and updating twice a month to ensure the correct numbers for each product. In general, the ABC analysis of critical segment A shows approximately 60% sales value. And being the superlative, special attention is a priority.

This approach addresses the current problem as it allows to stabilize high/low stock levels by creating an Inventory replenishment system and minimize the disadvantages by finding the most appropriate amount to be stocked.

5.6   Summary of the Initial Proposal

This section covers the overall improvements made in the initial proposal. It was discussed extensively with the team supervisors and manager of the unit. Figure 30 below provides a detailed understanding of the overall improvements.
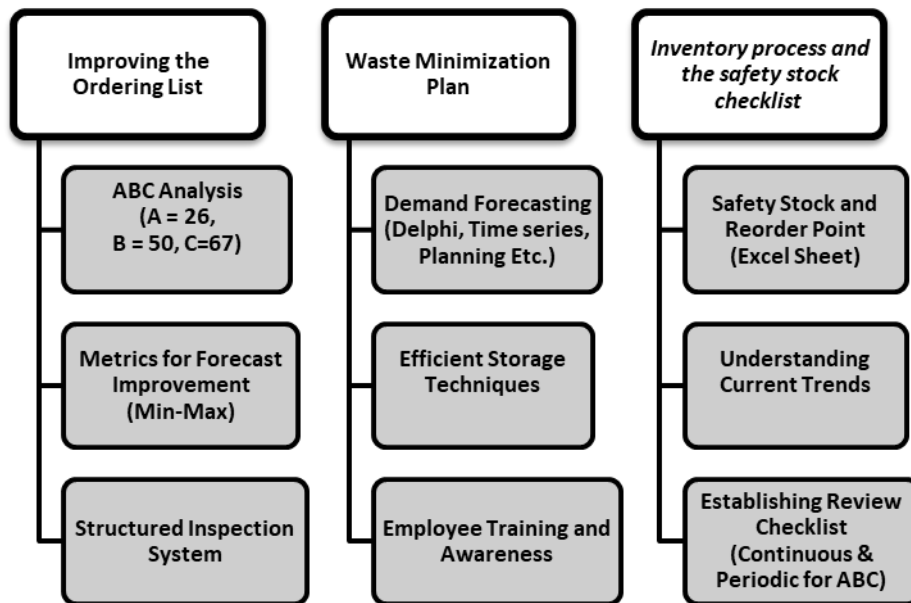
Figure 30: The detailed summery of initial proposal.

As seen from figure 30, three key improvements were proposed and discussed. The initial concern was to establish a systematic ordering list with the help of ABC analysis. Per the product tracking det, ermine which products must be in A, B, and C, respectively. The past year's data was used to check the importance of the products. After discovering the category, the idea was to set up the control and balancing points as mentioned in the conceptual framework table value and issue frequency of the product control to implement the supervision based on the designation of the product category.

Followed by easy calculations and improvement, the parameters were discussed using KPIs in three sections. Planning the products at the initial stage before ordering, the second stage when the order arrives and controlling the stock with necessary adjustments and deep checking, and lastly product, balancing the product based on the movement and managing the product, etc. (As per Table 5)

A structured inspection system was discussed to understand the product tracking logic. In more detail, assign tasks based on the responsibility of the shifts. For example, assign morning, day, and evening supervisor tasks in addition to management.

As discussed above, the crucial stage of the waste management plan was planned to execute, and the negative impact on the firm's operation. The combination of current techniques, moving averages, and historical data made it necessary to review before placing an order. Also, once every month, exceptional training and meetings were planned and carried out to gather feedback and suggestions.

To manage the inventroy process and cross varification of available stock, safety stock and re order point established to improve streamline management process. As mentioned in the table 13 the desired number of count cycle was put into action. The action plan was approved by the manager and each supervisors resposnbility was discussed.

As per the new amendments, the validation stage was proposed to improve the overall ordering linked with the current state analysis weakness, and a combination of consistent frameworks was executed. The following section covers the development part and testing results of the new changes.

6 Validation and the Final Proposal for Improving the Ordering Strategies as Part of the Current Inventory Management

This section reports on the results of the validation stage and points to further developments to the initial Proposal. At the end of this section, the Final proposal is presented.

6.1 Overview of the Validation Stage

The final proposal was validated with the top management, namely with the manager of the unit and supply chain manager of the firm. Moreover, the strategies described in the proposal were systematically discussed and reviewed with supervisors to implement the ordering strategies.

The critical element to use with the decision maker was to verify the ordering strategies. Unit X followed this and implemented them to some extent by the end of this thesis period. The three improvement proposals are currently being carried out, and the unit has seen various positive changes, especially in the ordering system. The waste area is also improving, although the testing showed that it is more difficult to improve due to the fluctuation in demand during the pick time.

Although the proposed three improvement areas continue to be in testing, some action points - such as those improving the demand forecasting including the flight tracking, PLS and Oracle structure - have become mandatory to follow during the ordering. In the future, training and development are key to further reduce the wastage in the unit. Testing is being carried out and the results will be available in the following months but they go beyond the scope of this thesis.

6.2 Testing Results

The process, scheduling, and testing are currently implemented with the improved Ordering list and the updated Safety stock and Re-order point (Proposal Element 1).

As per the current *Ordering techniques*, the visuals have become an important source for defining which products need extra attention and are carefully reviewed to optimize stock levels. Also, Category A and C have shown a positive outcome in optimizing the

stock arrangement and reducing overstocking. Category B needs to be revised regularly based on the sales due to the number of items. The feedback from the stakeholders tells that:

> *"The current process is not as complicated as before because of the organized list, and one major reason to accept the ordering list is that it is visual based on the importance of the product, which reduces time consumption for the whole ordering process." (Informant 2)*

The highest number of products needed in the storage, using the Proposal Element 1, mitigates the out-of-stock issue in the unit. The Ordering list was implemented in the last cycle of the roster, and it does effectively show the vast changes compared to previous numbers, but even the minor change in numbers is also important for effective working plans.

To mitigate the out-of-stock issue, motoring has defined KPI and relevant changes are still in the development process. The main three stages reflect positive achievement such as managing stock level, cost reduction, and the overall inventory system. Additionally, an important element was to track the changing market conditions. Some actions in the demand forecasting - such as flight tracking, PLS and Oracle structure - have become mandatory to follow based on the results of testing in the Ordering process.

However, as per the current *Wastage figures*, no significant changes in reduction were revealed, because of considerable fluctuations in sales. However, the training was implemented for the new staff, increasing the understanding about the minimum and maximum products needed to be produced during the peak hours, marking appropriate wastage as per the time sheets and overall calculation, etc. In the future, training will most likely show even better results. The arrangement of continuous training and development are essential parts of the Recommendations (in Section 6.5).

The improved alignment of planning currently reduces the impacts of over- or out-of-stock in the unit, which is the most important outcome of the three proposed improvements. Constant change is still a part of the process. But many needs are better fulfilled by gathering feedback from stakeholders and applying the improved Ordering process.

6.3   Developments to the Initial Proposal (based on stakeholder inputs, Data3)

This section encompasses the overview of inputs from the stakeholders taken in as Data 3 to improve the current Ordering strategies. The table below shows a brief summary of changes suggested to the Initial proposal (Section 5) by the stakeholders.

Table 14:   Stakeholder suggestions (Data 3) how to further improve the Initial proposal.

	Key focus area of the Initial Proposal	*Suggestions from stakeholders for the Final proposal, summary (from **Data 3**)*	*Descriptions of their suggestions (in more detail)*
1	*Improving the Ordering list*	1) More items should have been mentioned in the earlier order list based on updated products in the current month. (The majority of the items were in the C list from the International Store)	*As per the assistant manager, the current order list still needs to be fulfilled; some of the items that we directly contacted the international store still need to be added, which is one reason we sometimes missed the products in the unit.*
2	*Introducing a Waste Minimization Plan*	As per the new changes, making them strict and asking workers to mark the waste is also essential. Waste marking is necessary to track the product.	*"After counting an inventory, we found out why there was so much difference, and the result was that waste was incorrect. Every time you throw something, it must be marked on the waste sheet."*
3	*Proposing the cross-check of the overall inventory process and the safety stock checklist*	Per the firm rule, doing the inventory items every two weeks is essential. However, the additional internal inventory is also necessary to monitor the product's progress. (So now it is a process to assess the product)	*The special focus areas were written to check the product on day-to-day basis. Any special comments were mentioned in the notes to help us to understand the special review.*

As seen from Table 14, the final proposal was similar to the Initial proposal shown in Section 5. The three significant changes were added with the help of stakeholders' feedback after the initial proposal.

The manager, assistant manager, and seven supervisors were invited to discuss three main Proposal areas in detail. The initial limitation was discussed, and based on the ABC analysis, the assistant managers approved this proposal. It is often seen that administrators always create glitches during the placement. Tracking the product based on the historical data of each product will be easy to separate into three categories. Category D will also be established only for perishable items if needed. On top of that, senior management agreed to determine the safety stock and order points, which helped place the order. Due to limited storage, it is necessary to set up the maximum level for

category A so that overstocking will reduce and minimize the wastage of expiring products. This fundamental consideration introduced a new waste management policy approved by senior managers. As per the discussion, overproduction, overstocking, and inventory imbalance often impact the unit's performance. Even though one of the high sales units, due to pessimistic waste ratios, is one reason for the declining profit ratio.

This was followed by the plan discussed during the strict validation of the improved waste management plan, which a senior manager approved. During the discussion, a few points covered the current issues in the unit, such as overproduction, overstocking, and imbalance in inventory, which often have negative impacts. Even though we are making satisfying sales, everyday waste negatively affects the overall ratio. Improving the understanding between administration and the workforce is essential by sharing rush hour schedules and slow hours. It will result in a reduction in wastage. Moreover, the need for accuracy in demand forecasting will bring more systematic results.

The third valuable point was cross-checking the overall inventory process and the safety stock checklist. Instead of counting every two weeks, more frequent reviews will make it easier to track the product. A frequent review system will also reduce the gap in the current system. Based on the ABC analysis, setting up periodic and continuous reviews for each product will positively impact unit operational efficiency.

Summing up, these significant changes were confirmed at the final stage, and the final proposal was implemented. The special notes were added in the unit to acknowledge the focus areas or special notes to review for a particular day. The original picture is mentioned in Figure 31.
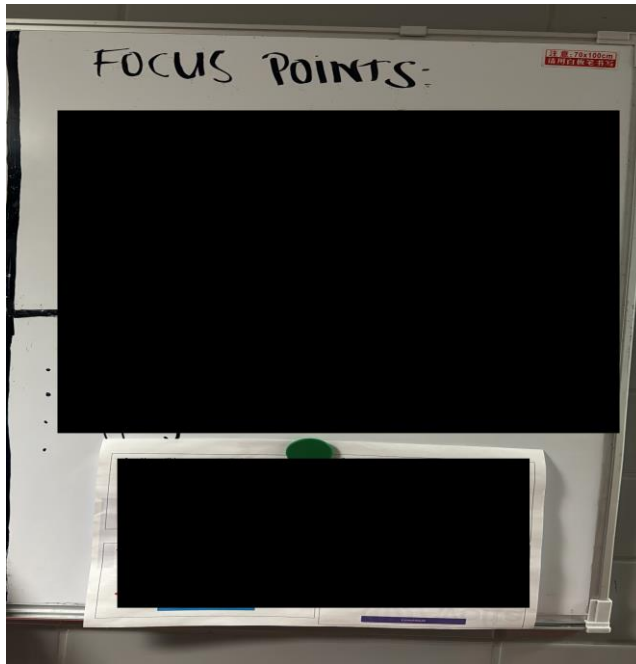
Figure 31: The attachment to understand the key notes to follow.

For example, as one significant input from the stakeholders about *Wastage minimization*, a special meeting was arranged at the workplace where the Initial proposal topics were discussed. One topic was the use of ABC category product by customer demand. It was discussed that, during the peak hours, minimum and maximum numbers of most essential and overpriced products need special attention. Newly hired employees have special challenges to check the production of the final product. In simple word, continuous analysis of each A category product can reduce the misuse and increase the unit productivity.

After discussing the developments to the Initial proposal, this section ends with the Final proposal presented in one overview.

6.4   Summary of the Final Proposal

This section covers an overview of the proposal and further development to the initial proposal. The initial discussion was with the managers; however, stakeholders' points of view were also important. Compared to the initial stage, there were some corrections, most of which were covered during the stakeholders' discussion. Figure 32 below provides a detailed summary of the remarkable changes made in the final proposal.
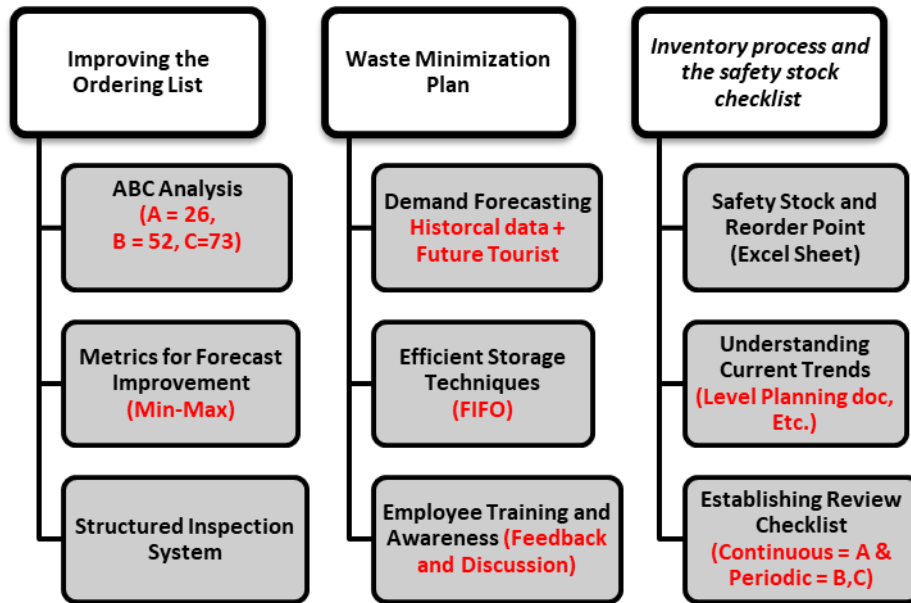
Figure 32: Final proposal for the validation plan.

The first element was an improvement in the ordering sheet. A few products were missing at the initial stage, which was added to make the ordering process smoother. Similarly, historical data was checked to separate the categories based on A, B, and C analysis. Most of the products were made because of the change in the manual for the current season. The other products were from the international store, where internal channels do the communication channels of communication were used. Because of the easy delivery system, the products needed to be included.

After determining the category, the next step was identifying the product reorder point and safety stock. As mentioned earlier, most of the products were either from the B or C category, and those were only needed if the unit had enough space.

The second element was strict measurement to follow the waste market. After implementing the initial plan, it took much work to measure the correct waste for each day. However, a special session was arranged to provide training, and the manager mentioned a strict guideline to mark the proper waste. As a result, it will show the correct value of available stock, sales value, and productivity and profit ratio in the firm. That factor makes it possible to track inventory and future ordering.

In addition to that, to check the new process, a regular review was conducted to evaluate the correct waste line. Separate waste reduction strategies were also applied to mitigate the severe issue. Feedback and communication from stakeholders help to understand the correct demand and changing market dynamics, which were implemented for everyday continuous improvement processes.

Finally, the improvement was done to the checklist and critical information to review carefully by checking the visual. After reviewing the A, B, and C products in the second storage, update the list on the office wall as per the "Kanban" technique to analyze the available stock. Moreover, the notice board reminds us to publish the to-do tasks in case of missing tasks.

As mentioned in Figure 31, special notes need to be written in case special attention is needed. The overall process flow and gap between available stock and future need improvement considering the written notation.

6.5   Recommendations for Continuous Improvement of the Ordering Strategies

Coming back to the results from the current state analysis, the unit´s weakness related to the Ordering strategies and Wastage were defined as follows (discussed in interview 1 and interview 2 in Data 1).

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1) 100% inspection is inefficient (0% wastage policy in food industry is not possible)

2) Focus should be placed on improving the Ordering process

3) Aim to reduce variations

4) Continuous improvement is a philosophy of doing this business.

Based on these results in the Unit, the following methods can be used to ensure continues improvements to the Ordering process discussed in this Thesis. These two approaches are recommended to consider by the case organization as effective tools to further improve the Ordering strategies.

Recommendation 1. Use DMAIC method for continuous improvement of the Ordering and minimizing Wastage

As there are various tools available (such as Kaizen in Toyota, Poka-yoke to find mistakes and prevent inaccuracy by designing the modern design, Value Stream Mapping (VMS) to minimize the wastage by analyzing flow of the material etc.), it is not possible to apply all these techniques. Therefore, the recommendation is made to consider this closest approach to the challenges of the case unit.

DMAIC and Six Sigma are identical and work similarly. DMAIC stands for *Define, Measure, Analyze, Improve and Control.* The main goal of using this tool is to improve the current process control in how variation in output is identified. Variation in any process is the problem. If everything in life or in business were totally constant or even predictable, then there would be few problems. *The essence of the method is to focus on variations. Hence, if variation can be reduced, then the consistency of the output can almost be guaranteed (Martin Christopher; 1999).* The method is explained in five phases, which are explained below (Peter et al., 2015, p. 190). The method applied to minimize the wastage by five different points, and it explain how to be developed. In this thesis, the recommendation is to use DMAIC to improve the current Ordering system, summarized in Table 15 below.

Table 15. Five step approach to enhance ordering system and minimize waste

Five step approach to enhance ordering system and minimize waste (based on: Peter et al., 2015, p. 190; Wild, 2018; 90)		
1	*Define*	The main goal is to improve and develop the current waste management system more effectively, identifying types of waste such as overproduction during slow hours, defects in the products, timeline limitations for perishable product and enhance the ordering system by updating *moving average* list with ABC analysis.
2	*Measure*	Using different KPIs, techniques, and performances, find the baseline for the waste and order to set up a baseline for the source improvements.
3	*Analyze*:	Understanding the structure of demand and supply timeline by employees and managers, imbalanced precise marking, responsibilities needing to be taken more seriously, etc.
4	*Improve*	The general idea for the improvement area is employee training and communication planning, as well as explaining to them the logic behind the reasons. Apart from that, 5S lean manufacturing principles (Short, Set, Shine, Standard, Sustain) improve quality improvement plans, reliability of supply, devaluation of responsibility, etc. It is said that time is a value-added commodity and wasting is unprofitable.
5	*Control*	Improves the visibility of the process's future performance control measures and sustains them as per 5S principles. The control step is one of the most critical steps. In the firm, regular audits and meetings are conducted to check the level of improvement training, engage employees, and share the data for the week's wastages to mitigate them. This system also finds ways of wastage, hourly dissolution, and controlling opportunities for future development.

Recommendation 2. More training and use of professionally trained incoming inspection staff

Training and the use of professionally trained incoming inspection staff can save the company time in blocking nonconforming material and money in avoiding rework on the production floor.

Providing *the staff training* and understanding the forecasting by them can significantly influence the actual number of wastages the unit make on a day-to-day basis. The senior workers can know the demand and busy hours from experience, but sometimes mismanagement and communication gaps create huge overproductions. Because of the short shelf life, the misuse of the products can be huge.

During the peak hours, the minimum and maximum numbers of most essential and overpriced products need special attention every time. *A special person* needs to be assigned to check the production of the final product. In simple word, continuous analysis of each A category product can diminish the significant value of misuse and increase the unit productivity.

In general, effective communication and empowering employees' skills will bring more benefits to the company. Effective demand forecasting will also help link the three roots with the correct order list, and strict analysis and monitoring of critical products will help improve the unit's productivity. Ultimately, a continuous process of learning and applying new strategies is part of achieving long-term success. A detailed conclusion is in the following paragraph.

Recommendation 3. Continuous monitoring and analysis of resources

To keep in control, supervisors need to conduct strict analysis in three main areas: Analyse the market trend, Utilize the resources, and Improve internal communication for a successful demand approach.

Additionally, as per *the waste management plan*, employee contributions are pivotal. The specific areas need to be analyzed; the waste mark is critical to tracking the overall process. As for *the checklist*, in case of a changing market or need for improvement, the checklist's questions and its basic structure can be modify to make an effective cross-checking. Finally, as per *the action plan*, the importance of collaboration between top management, supervisors, and workers plays a significant role.

The next step is to improve by investing in employee skills, rewards, and development programs. Also, the company needs to be rapid in analyzing the changing circumstances, the primary goal to enhance the new development and learning.

7   Conclusion

The section covers the conclusion, managerial implication, and evaluation of the thesis against it objective.

7.0   Executive Summary

The objective of the thesis was to optimize the case organization´s inventory system with the focus on improving its ordering strategies. The business challenge related to poor ordering strategies, which involved insufficient demand forecasting due to sales fluctuations, and considerable wastage, exacerbated by complexity in sales patterns, traditional forecasting methods during everyday ordering, inefficiencies in order placement, etc. As a result, there was an urgent need for improved ordering strategies including the forecasting method and using various tools that can more accurately forecast future demand and protect against stockouts and too much inventory.

During the current state analysis, interviews, discussions, and analysis in internal documents shed light on the current ordering strategies, inventory management, and the specific unit needs of day-to-day, etc. The detailed descriptions given by the manager helped in understanding the basis behind the relationship between inventory management and the ordering system. The current state analysis pointed to a number of weaknesses, primarily related to the current ordering strategies and resulting wastage: ineffective internal communication, undefined safety stock, re-order point, and risk factor, underutilized available resources, and the lack of feedback and training to resolve ongoing issues. These weaknesses were selected as the focus areas for literature and best practice review in the next step pf the thesis.

The literature and best practice review on operations management and inventory tools brought significant value to understand the concepts and solutions for improving the ordering strategies. Key practices such as safety stock, reorder point, and Key Performance Indicators, as certified by A-to-Z inventory management, were particularly enlightening.

In the Proposal, the improvements were developed to the current Ordering list to improve accuracy for everyday purchasing. The product review system was defined for a specific period based on the product ABC analysis to improve the current Ordering system and minimize wastage caused by overproduction, mismanagement, and inefficiencies linked

to stock-outs and overstocking. The Proposal included determining a new Safety stock and Re-order points which are crucial to meeting the market demand and variability in lead time. Moreover, understanding the appropriate level of Safety stock and using the FIFO method was a significant factor because of the perishable items in the unit.

In the Validation, further development and amendments were made to the Initial proposal, for example, to the Ordering list, the proposed Safety stock and Re-order points. It was done to further improve accuracy for everyday purchasing. The product review system is defined for a specific period based on the product classification. The method to minimize wastage via training of the employees was supported by the top management as a suitable approach that can bring many positive changes to the firm.

Lastly, the study also produced the recommendations for continuous improvement. In the recommendations, it was stressed that, the more the data becomes available, such as time series data and customer and peer feedback, the more reliable and accurate forecasts the unit can make to fulfill customer demand based on stock orders. In other words, the opportunities to improve based on the process based improvements are now exhausted, and for any next improvements, more accurate and recent data will be needed to make any further improvements, especially in demand forecasting. This plan should positively impact forecasting and improve estimation.

7.1   Thesis Evaluation vs. Its Objective

The thesis improves the unit's inventory management challenges with practical insights related to ordering strategies. To some extent, it should result in improving efficiency, especially in day-to-day operations; however, the proposed improvements are still part of the bigger process, and they will bring brighter outcomes in case of further changes and continuous improvements.

Compared with the previous ordering system, the current system makes the process more accurate. The situation between overstocking and understocking is improving, and as per the new process, storage usage is improving. The critical task is analysis and communication to determine which product is more important and must be stored safely. In other words, it is true to say that optimal management of safety stock.

Based on the A, B, and C control points, the need to analyze the product flow and consider the amount of product needed for the next day is less critical than it used to be. Previously, careful analysis of each product before placing an order was burdensome, and checking products every two weeks was considered long. Moreover, Observing the

flow of each day in two weeks is difficult. However, the current periodic and continuous counting makes it easy to understand the future need for the product.

As mentioned earlier, minimizing waste by understanding peak hours is still a key area to focus on. A sympathetic approach to communication and precise attention to waste are being improved. With the help of newly defined training and development every month, feedback and new suggestions have taken place. Changes have been encountered, especially in storing the products and utilizing as much space as possible in managing the boxes.

The implemented safety stock needs an analysis review, and some of the areas need to be figured out more carefully to determine its value. As per the current storage, the generalized rule was explained in the thesis; however, it needs detailed analysis and planning to consider the correct value of safety stock. Conversely, currently, the "MAX" technique mentioned in Section 4.3 is supported by all the managers because of th ease and simple logic.

Overall, some of the tools and ideas have been accepted by management, and the rest still need more careful testing before official validation. The plan is to share such techniques with other units to improve the firm's overall development, but currently it is limited to the particular store.

7.2   Closing Words

Throughout the thesis process, the invaluable contributions of the case organization's stakeholders and top management were instrumental. Their collaborative efforts, which involved diverse perspectives and insights, were pivotal in making decisions and resolving issues. This collaborative approach was particularly evident in cohabitation with the inventory specialist supervisor, where we explored the use of technologies like SAP and Oracle for internal transfers. Understanding the ordering system across different units, international store work management, delivery schedules, and inventory processes further underscored the logical and practical role of the inventory system.

Equally important was the support from managers and the utilization of data within the organization, including customer tracking, forecasting processes, and level planning for productivity checks.

I would also like to appreciate the most important pillar of the thesis worker: my supervisors from the workplace and university, assistant managers and managers, multiunit managers, and peers who supported me in developing the methodology of inventory management and provided me with understanding and knowledge.

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WRITTEN STATEMENT on the use of AI-based tools in this Thesis

by Yash Upadhyay, the student of BI Master´s Degree Programme

Thesis title: A Plan to Improve the Ordering Strategies as a Step to Improve Inventory Management in Unit X

According to the *"Guidance for addressing the use of AI-based tools in studies at Metropolia Business School (for written submissions)"* from August 2023, I make this statement on the use of AI-based tools in my submitted Master´s thesis.

1) Which AI-bases large language models or other AI-based tools I used

   *I have used **chat.openai.com (Chat GPT)** to **understand the different approaches** of Inventory tools, ABC analysis limitations and methods of improvements, how to succeed in effective communications as a part of the process, I have used chat.openai.com (Chat GPT) to understand the different approaches to Inventory tools, ABC analysis limitations and methods of improvement, how to succeed in effective communications as part of the process, and waste minimization tools and techniques. As well as **Grammarly** to make some basic changes in grammar.*

2) In which parts of the thesis which tools were used, and for which tasks *(please make a list)*

As per the previous answer, AI is used in section 5 to build the proposal. Numerous literatures have their views on managing inventory. However, sometimes the book has limited chapters and does not cover the key areas we need. In such cases, AI is implemented.

3) What portion of the text was helped with these tools, for each use
   1. *Concept of basic inventory*
   2. *Waste minimization tools and techniques*
   3. *Necessary key points needed to understand the demand forecasting approach with precise future estimation*
   4. *Importance of safety stock and reorder point*
   5. *Kaizen in more detailed*

4) Which prompts were asked, exactly *(please indicate the page number in the text where used)*

I have solely used to understanding the concept and learn new strategies and tools. No direct text was taken from the AI.

5) Here, I describe what continues an ethical and reliable use of AI-based tools that I used *(use, for example, the recommended documents from "MBS Guidance" referred to above)*

All the details mentioned in my thesis are accurate and fair based on the literature review and some guidance from management staff as well as thesis supervisors from the university.

6) Here, I describe how ethically and reliably I used the AI-based tools in my thesis submission

As mentioned earlier, the purpose to use AI is solely understanding the concept and learn new strategies and tools. No direct text was taken from the AI.

This written statement makes part of my thesis and is done to help in evaluation and assessment.

08/MAY/2024
Helsinki, Finland
Yash Upadhyay