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ERP System Selection and Its Implementation Plan

With the Focus on Purchasing, Inventory, Manufacturing, and Delivery

Metropolia University of Applied Sciences

Master's Degree

Degree Programme in Business Informatics

Master's Thesis

9 November 2025

Abstract

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Title:	ERP System Selection and Its Implementation Plan, with the Focus on Purchasing, Inventory, Manufacturing, and Delivery
Number of Pages:	78 pages + 5 appendices
Date:	9 November 2025
Degree:	Master of Business Administration
Degree Programme:	Business Informatics
Instructor:	Zinaida Grabovskaia, PhL, Senior Lecturer

This thesis focuses on addressing critical operational inefficiencies at a 33-person Finnish construction-tech SME. The company is currently relying on fragmented, manual processes (e.g., Google Sheets, whiteboards) for purchasing, inventory, manufacturing, and delivery (PIMD). It causes a lack of operational visibility, leading to production-halting material shortages and reactive "panic buying”. The objective of the thesis is to resolve these challenges by identifying core functional requirements and proposing a suitable Enterprise Resource Planning (ERP) system and implementation plan.

The study employed an Applied action research methodology. Data 1 was collected via qualitative interviews and participant observations to complete in the current state analysis. The analysis identified “as-is” process flaws and 18 functional requirements for the future ERP. Data 2 was collected from a certification project, and vendor demos and co-creation with key stakeholders. Data 3 was collected in a final validation session with key stakeholders.

The outcome of the thesis is seven re-designed processes and an ERP selection analysis results based on vendor documentation. The study also produced a validated, two-part proposal: Part 1 is an immediate, "no-cost" "Inventory Action Plan" that leverages the company's existing, underutilized Odoo system. Part 2 is a long-term "Strategic ERP Roadmap" with a "Finalist Shortlist" (NetSuite, Monitor ERP, and ERPNext) recommended for future evaluation. Stakeholders refined this proposal by adding requirements for financial auditability (e.g., two-level purchase approvals) and expanding the long-term vision to include Sales and Finance modules.

The results of this thesis have direct, practical business value. The "Inventory Action Plan" is already in use by the case company, providing the standardized processes required for its FPC certification. The "Strategic ERP Roadmap" provides a data-driven and expert-validated path for the company's future technological investment. The thesis, therefore, delivers both an immediate tactical solution and a sustainable, long-term strategic plan.

Keywords ERP, Enterprise Resource Planning, Manufacturing

Contents

Glossary

ATO	Assemble-to-Order
BoM	Bill of Materials
BPR	Business Process Re-engineering
CMR	Convention relative au contrat de transport international de marchandises par route. A standardized consignment note used in most European countries for the cross-border transport of goods via road.
CSA	Current State Analysis
ERP	Enterprise Resource Planning
FPC	Factory Production Control
JIT	Just-In-Time
MRP	Material Resources Planning
MTO	Make-to-Order
MTS	Make-to-Stock
OCM	Organizational Change Management
OOTB	Out-Of-The-Box
PIMD	Purchasing, Inventory, Manufacturing, Delivery
POD	Proof of Delivery
QC	Quality Control
R&R	Roles & Responsibilities

S&D	Sales & Distribution
S&OP	Sales and Operations Planning
SME	Small and Medium-sized Enterprise
TCO	Total Cost of Ownership
WMS	Warehouse Management

List of Tables

List of Figures

1 Introduction

“The process of sharing information, especially when this increases understanding between people or groups”, this concise definition from the Cambridge Dictionary perfectly captures the essence of effective communication (Cambridge University Press, n.d., para. 7). In the modern business environment, streamlined operations and informed decision-making rely heavily on this very principle. Different departments may have their own way of storing business data, but when they need to work across teams, how do they ensure the other team has access to the most updated information? How can they be sure that work is not redundant or, at times, even faces delays?

This thesis aims to explore how Enterprise Resource Planning (ERP) systems can enforce effective communication within a company by consolidating business data and serving as a bridge for information sharing. Specifically, this study will explore the critical process of ERP system selection based on a company’s unique functional requirements across purchasing, inventory, manufacturing, and delivery. In addition, it will outline a comprehensive implementation plan designed to ensure seamless integration and optimal utilization of the chosen ERP solution, which will foster internal communication and operational efficiency within these core business areas.

1.1 Business Context

The company forming the basis of this thesis is a Small and Medium-sized Enterprise (SME) operating within the Technology sector, with its core activities focused on developing construction technologies that utilize robot automation. Established in Finland in 2020, the company currently employs 33 individuals within the country. Its stated objective is to innovate within the construction industry by addressing challenges related to environmental impact, specifically by working to lower carbon emissions through the use of carbon-negative concrete made from recycled materials and by improving construction precision and speed through robot automation.

Like many other SMEs, the company faces inherent challenges where the primary focus is on achieving operational growth, which can sometimes lead to the neglect or understaffing of other crucial areas. This often results in a single employee managing a multitude of diverse duties, or in resistance to the adoption of new technologies, or simply a lack of access to the most robust technological solutions available in the market. Such circumstances can significantly hinder operational efficiency and sustained development (Touriki et al., 2022). To effectively cope with these challenges, SMEs are compelled to continuously seek innovative methods for optimizing task completion. This approach aims to maximize employee capability and enable great output within compressed timelines.

1.2 Business Challenge, Objective and Outcome

The operational complexities inherent in developing and deploying advanced construction technologies present a distinct set of business challenges for the company. While the previous section highlighted general SME growth concerns, this firm's specific activities in robot automation and carbon-negative concrete production amplify the need for highly integrated and precise management of its core functions.

For instance, in purchasing, the acquisition of highly specialized components for robotic systems and unique materials for sustainable concrete involves navigating intricate supplier networks. Challenges frequently arise in sourcing vendors who meet very specific demands for smaller quantities, precisely tracking lead times for custom or low-volume orders, and crucially, maintaining robust relationships with qualified vendors supplying key components. Without a well-synchronized platform to consolidate information on these critical vendors, efficiently managing purchase orders and ensuring timely material acquisition becomes challenging, directly impacting production schedules.

Furthermore, inventory management poses a significant challenge for an agile SME. The simultaneous handling of high-value robotic parts, raw materials for sustainable concrete formulations, and finished goods demand meticulous real-time tracking to prevent costly overstocking of perishable or unique materials, or critical stockouts that halt manufacturing. As the company operates in a fast-paced environment, it is particularly prone to overlooking detailed inventory maintenance, which can lead to inaccuracies. When a critical item is discovered to be missing from stock, it often results in immediate production delays and increased costs due to urgent procurement needs.

As a consequence of fragmented inventory management, the manufacturing side of the company is directly impacted. The manufacturing process, which relies entirely on the timely availability and accuracy of its materials, currently faces a lack of realistic production planning and frequent material delays. This is further exacerbated by the fact that the company's manufacturing operations are managed on a separate, non-integrated platform from its inventory system. The manual transfer of data between these two systems increases the risk of human error and creates significant communication gaps regarding material status and production readiness.

This reliance on a disconnected manufacturing platform is rooted in the limited functionality of the company's existing ERP system, which possesses only a basic Manufacturing module. The required configurations to make this module fully functional and integrate with other departments are complex, and the company currently lacks the in-house expertise to properly set it up. Consequently, there is a strong dependence on costly external experts for any adjustments or integrations, making the system inflexible and challenging to scale. This results in highly reactive, almost hourly-based planning, and necessitates diverting valuable manpower to handle unplanned tasks that arise, thereby making it difficult to maintain a continuous production pace, ensure timely delivery, and uphold quality standards for its final product.

Finally, as a company poised for international growth, the delivery function is beginning to encounter challenges stemming from a lack of integrated systems. While delivery volumes have been relatively low to date, each shipment, particularly those to customers outside the European Union, requires meticulous coordination and documentation. The company currently relies on manual processes, such as generating proforma invoices for customs clearances in Google Docs, which creates a significant risk of human error and disconnects this crucial documentation from the rest of the sales and manufacturing data. The absence of this functionality within the current ERP system highlights a critical gap in its ability to support and scale international operations.

Furthermore, the company's reliance on a specialized, smaller-scale shipping agent for logistics poses another challenge. Unlike larger carriers such as DB Schenker or FedEx, for which the current ERP provides pre-built plug-ins, this specific shipping agent is not natively supported. As a result, critical information regarding shipment tracking, status updates, and delivery timelines is not automatically integrated into the company's central data. This necessitates manual information exchange between the shipping agent and internal teams, leading to communication delays and a lack of real-time visibility for both internal stakeholders and end customers. These manual, siloed processes emphasize the need for a more flexible and robust ERP solution capable of accommodating a wide range of logistical partners and providing comprehensive documentation functionality to support the company's global expansion.

The company's operational disconnections underscore a critical need for a comprehensive system that can bridge information gaps and streamline workflows across the entire value chain.

The objective of this study is *to make a recommendation of which ERP system is suitable for the case company and build the key processes based on business requirements.*

The outcome of this study is *an ERP selection recommendation most suitable for the case company's needs and the maps of the required key processes.*

1.3 Thesis Outline

The scope of this thesis will focus on the operational functions of a case company, a growing SME located in Finland. The study is intended to identify requirements and key processes within its core business departments of purchasing where only production related purchases will be studied, inventory, manufacturing, and delivery. Based on these findings, the research will then provide a recommendation of an ERP system most suitable for the company's specific needs.

The study is written in seven sections. Section 1, Introduction, guides the reader through the case company's background and the challenges it faces, including the objective and outcome of the study itself. Section 2, Method and Material, broadens the research with a review of relevant literature and outlines the specific research approach used. Section 3, Current State Analysis, evaluates the company's current operational practices and key findings from stakeholder input. Section 4, Existing Knowledge on ERP and Business Process Design, builds on the identified pain points by introducing best practices for working with ERP systems. Continuing the study, Section 5, Building the ERP Proposal for the Company, develops a detailed ERP proposal that includes redefined processes for purchasing, inventory, manufacturing, and delivery, and incorporates feedback from key stakeholders. Section 6, Validation of the Proposal, validates and makes final adjustments to the proposal before continuing to next steps. The final section, Section 7, concludes, summarizes the findings and presents a managerial action plan toward implementation, as well as a final evaluation of the thesis.

2 Method and Material

This section outlines the research approach and design used in this study. It continues by detailing the methods selected for data collection and analysis.

2.1 Research Approach

"Research approaches are plans and the procedures for research that span the steps from broad assumptions to detailed methods of data collection, analysis, and interpretation" (Creswell, 2014, p. 211). The selection of a research approach typically starts with the choice of *the research family*. Basic research is known as academic or foundational research with the goal of advancing and expanding knowledge (Baimyrzaeva, n.d., p. 6). The initial impact of this research is primarily fell within the academic and research communities (Saunders et al., 2023, p. 11). On the other hand, *applied* research is conducted to solve specific problems for individuals, organizations, and industries (Baimyrzaeva, n.d., p. 6).

In a business context, applied approach is used to improve a business or management problem and is normally undertaken by professionals within an organization or academia alike (Saunders et al., 2023, p. 11). The selection of approaches dictates the type of data and analysis methods used, whether it is numerical methods for a quantitative approach, non-numerical for a qualitative approach such as words, images, and interviews, or a combination of both for a mixed methods approach (Saunders et al., 2023, p. 11).

Additionally, specific *research strategies* that would help facilitate their studies. Action research is one such strategy that does not limit itself to only understanding a problem's root cause; instead, it actively aims to engage an organization's members or a community. The strategy is known for yielding change from within, as once those inside an organization realize the need for change, it becomes more difficult to ignore, often leading to their cooperation with the researcher in resolving the issues (Saunders et al., 2023, p. 211). Action research promotes organizational learning and is a cyclical process that produces practical outcomes by identifying existing issues, planning and taking necessary actions to address those issues, and then evaluating those actions (Saunders et al., 2023, p. 211). In contrast, 'a case study is an in-depth inquiry into a topic or phenomenon within its real-life setting', which can be designed to identify what is happening and why, to understand the effects of the situation and implications for action (Mark N. K. Saunders, 2023).

In this study, the research strategy is applied action research (according to Kananen 2013). The study employs a qualitative approach, as it will use non-numerical data like interviews and internal documents to gain an in-depth understanding of the company's current state and processes. The chosen research strategy is informed by an intention for identifying existing issues and creating a proposal for adopting a new system and processes, built in co-creation with stakeholders.

2.2 Research Design

The research design for this study is structured into a five-stage process that aligns with the thesis objective. The Research design, from setting the thesis objective to the final outcomes, is illustrated in Figure 1.

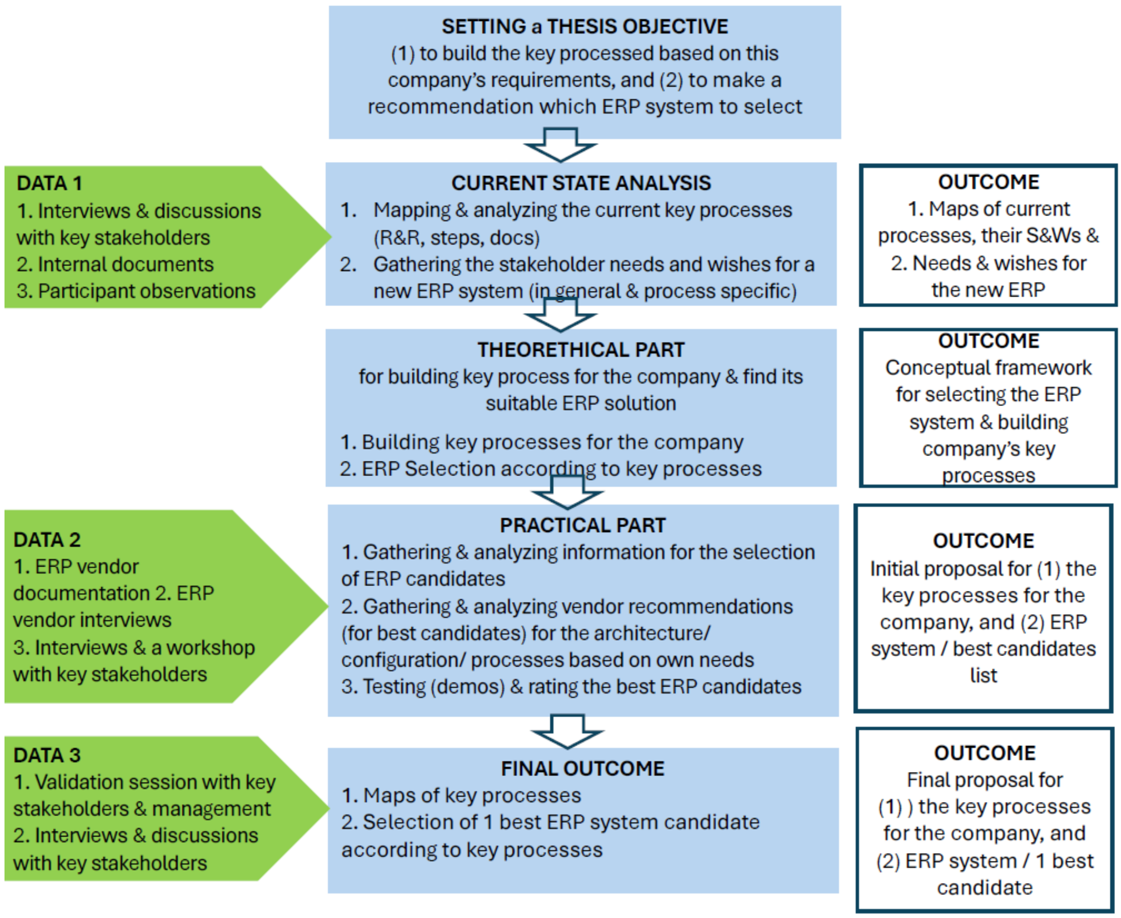


Figure 1. Research design of this study.

As shown in Figure 1, the study begins by setting a clear thesis objective, namely, to make a recommendation for which ERP system to select and build the key processes based on the company's requirements. Following this, the first stage is the current state analysis. This is where Data 1 is gathered through interviews and internal document reviews to understand and uncover the strengths and weaknesses of the key processes of purchasing, inventory, manufacturing, and delivery. The outcome of this stage is a map of the current processes and a list of stakeholder needs for a new ERP system.

The study then moves into the theoretical part to explore available theory and best practice solutions. Next, in the practical part, Data 2 is collected by reviewing ERP vendor documentation and conducting vendor interviews and workshops with key stakeholders. The outcome is an initial proposal for both the best key processes and the most suitable ERP system candidates.

Finally, the study concludes with the Final proposal. Here, Data 3 is collected through a validation session with key stakeholders and top management to refine the proposed processes and select the most eligible ERP system candidate. The final proposal includes a refined map of the key processes.

It is important to note that while the overall Applied Action Research structure was followed, the specific data collection methods for Data 2 were adapted in response to real-world business constraints, a common and expected outcome in this methodology. The original plan for Data 2, which included conducting vendor interviews and workshops, was modified. Instead, the collection of Data 2 focused on two parts: (1) an internal co-creation of "to-be" process maps to meet an urgent FPC (Factory Production Control) certification requirement, and (2) a structured market analysis of vendor documentation. This adaptation and its reasoning are detailed further in the overview of Section 5.

2.3 Data Collection and Analysis

Data for this study was collected in three distinct rounds, as outlined in the research design. Table 1 provides an overview of the key elements of the data collection rounds.

Table 1. Details of Data collections 1-3.

	Participants / role	Data type	Topic, description	Date, length	Documen-ted as
	Data 1, for the Current state analysis (Section 3)				
1	Respondent 1: Project Manager	Face-to-face Interview	1. Experience in current project delivery process 2. Strengths in project delivery process 3. Weaknesses in project delivery process 4. Improvement points in streamlining the process and tool used	June 2025, 1 hour	Field notes
2	Respondent 2: Production Manager	Face-to-face Interview	1. Experience in current production process 2. Strengths in process and tools used 3. Weaknesses in process and tools used 4. Improvement points in streamlining the process and tool used	June 2025, 1 hour	Field notes
3	Respondent 3: Facility Manager	Face-to-face Interview	1. Experience in current inventory and receiving processes 2. Strengths in processes 3. Weaknesses in processes 4. Improvement points in streamlining the processes and tool used	June 2025, 1 hour	Field notes
	Data 2, for Proposal building (Section 5)				
4	Researcher, Process Engineer, Key Process Owners	Co-creation workshops & Document analysis	Data 2a: Co-design of 7 "to-be" process maps for PIMD to meet FPC project needs.	Sep-Oct 2025	7 Process Maps (Appendices 1-7)
5	Researcher	Market analysis of vendor documentation	Data 2b: Structured review of Odoo, NetSuite, Monitor ERP, and ERPNext claims against 18 functional requirements.	Oct 2025	Vendor Comparison Matrix (Table 7)
	Data 3, from Validation (Section 6)				
6	Key Stakeholders (CTO, Head of Ops, Process Engineer, Production Mgr, Facility Mgr)	Group validation session	Evaluation and feedback on the two-part Initial Proposal (the "to-be" processes and the ERP shortlist).	November 2025, 2 hours	Stakeholder Feedback Spreadsheet (Table 8)

As shown in Table 1, the first round of data collection (Data 1) focused on a qualitative understanding of the current situation. This was gathered through three semi-structured, face-to-face interviews with key process owners: the Project Manager, Production

Manager, and Facility Manager. The conversations were documented through field notes.

In addition to these interviews, a critical part of the Current State Analysis was a collaborative review of internal documents with the Process Engineer (who also serves as the Quality Engineer). This analysis, detailed in Table 2, involved mapping the "as-is" workflows for all PIMD (Purchasing, Inventory, Manufacturing, Delivery) functions. This was combined with the researcher's own participant observation, acting in the role of Supply Chain Specialist and owner of the purchasing process, which was a primary data source for analyzing the purchasing workflow (see Figure 2).

Table 2. Internal Documents Used in the Current State Analysis, Data 1.

	Name of the document	**Number of pages/other content**	**Description**
A	Active purchasing and inventory processes	1 diagram	Process diagram
B	Active production process	1 diagram	Process diagram
C	Active delivery processes	2 diagrams	Process diagram

This dual approach of cross-referencing stakeholder interview data (Table 1) and participant observation (Figure 2) with the documented "as-is" process maps (Table 2) provided the comprehensive foundation for the analysis in Section 3.

The second round of data collection, Data 2, focused on building the proposal. As noted in Section 2.2, this stage was adapted from the original plan. It was divided into two parts as shown in Table 1. Data 2a consisted of iterative co-creation workshops with the Process Engineer and key process owners to design the "to-be" standardized process maps (Appendices 1-7) needed for the urgent FPC project. Data 2b was a structured market analysis of vendor documentation, which resulted in the Vendor Comparison Matrix (Table 7) used to create the long-term roadmap.

The final round, Data 3, was the group validation session held with key stakeholders. This session provided the expert feedback, detailed in Table 8, used to refine and finalize the proposal.

The data collected during all three rounds were analyzed using a thematic and content analysis approach to identify the core problems, build a two-part proposal, and validate the final solution with stakeholders.

3 Current State Analysis of Business Processes with the Focus on Purchasing, Inventory, Manufacturing, and Delivery

This section discusses the findings of the current state analysis. It details the existing key processes, their strengths and weaknesses, as well as stakeholder needs and wishes for a new ERP system. The analysis is based on data collected through interviews and internal document reviews. This section first presents a mapping of the current processes, followed by a discussion of the identified weaknesses and the stakeholder needs, which together form the basis for selection of a new ERP.

3.1 Overview of the Current State Analysis

The goal of the current state analysis (CSA) was (1) to systematically map the case company's key operational processes, (2) identify their strengths and weaknesses, and (3) gather stakeholder needs and wishes for a new ERP system.

This section describes the key processes being investigated: purchasing, inventory, manufacturing, and delivery. This description sets the scene for the analysis and provides sufficient context for the reader to understand the findings. It is organized by functional area, with a detailed report on the current state of each process, including its roles and responsibilities, available tools, and key interfaces. The descriptions is supported by process maps and data collected during the current state analysis. The analysis of these findings is presented in the following sub-sections.

The analysis was implemented by first collecting Data 1 through semi-structured interviews with key stakeholders and reviews of internal documents. The logic of this approach was to cross-reference insights from key personnel with existing documentation to ensure a comprehensive and accurate understanding of the processes. The interview data, for example, was used to identify the steps and roles and responsibilities (R&R) within each process, while internal documents were used to verify and complement this information.

Based on these data, the current state analysis provided results of this analysis, including the maps of the current processes, their strengths and weaknesses, and the identified wishes for the new ERP, detailed in the following sections.

3.2 Description of Key Operational Processes

The case company's business relies on several key processes directly including product manufacturing and delivery. The company currently relies on visual cues and manual work, which can lead to inefficiencies. To understand where the missing links in these key processes are, this study requires a deep dive into the existing processes, if they exist, and interviews with key stakeholders who are directly involved with or impacted by these processes.

3.2.1 Purchasing and Inventory

These intertwined processes of purchasing and inventory are critical to the company's production-related operations. The production-related aspects of the purchasing and inventory processes are fundamentally. The existing inventory management directly influences the purchasing process, and the issues in one area are often symptoms of a larger, systemic problem. The procurement of production materials is used in both finished goods and production maintenance, which are highly specialized and must meet specific, advanced criteria to maintain product quality. Due to their newly developed nature, production maintenance parts also have strict requirements and are procured through the company's trusted suppliers.

As stated in Section 1.2, the company currently relies on manual work and visual cues, which can lead to inefficiencies. The interviews with the stakeholders about the existing process reveal a reliance on manual communication and a lack of a formalized inventory management system.

As illustrated in Figure 2, the current purchasing process is driven by manual actions and communication around them. The process begins with a manual purchase request, which is often triggered by visual stock checks and verbal communication from the production floor. The procurement team then issues a purchase order to the supplier. While a digital copy of the purchase order is saved, the process relies on manual, unintegrated steps to inform the relevant teams of the material status. Figure 2 shows the current purchasing process.

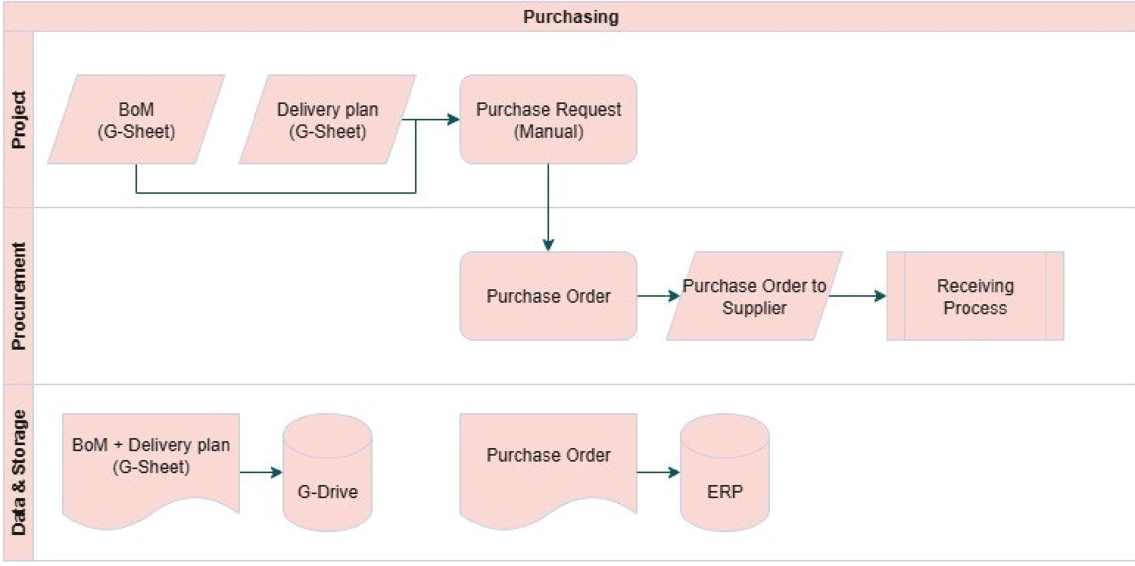


Figure 2. Current Purchasing Process, a map.

As stressed in the interviews, this reliance on a manual system makes it difficult to track materials and creates a disconnect between the purchasing and production teams. The company currently lacks a formal inventory management process. Upon receipt of materials, the receiving process is documented, but there is no systematic method for tracking materials as they are taken from stock. The inventory is managed through a manual counting system, and the process is reactive rather than proactive. This often leads to last-minute "panic" buying when material counts fall below a critical threshold. This informal process also creates a reliance on manual counting and a lack of real-time visibility, which directly impacts the efficiency and effectiveness of the purchasing process.

3.2.2 Manufacturing and Delivery

The manufacturing process begins once a project has been confirmed and a delivery plan is issued to the project team. The Production Manager, in collaboration with Procurement, creates a detailed production plan based on material availability and the project's overall deadline. This plan aims to guide the entire production cycle, from start to finish. However, the process is highly reactive and susceptible to daily alterations due to unforeseen circumstances. These interruptions can be caused by overly ambitious material delivery schedules or unexpected team member absences. Figure 3 shows the current manufacturing process.

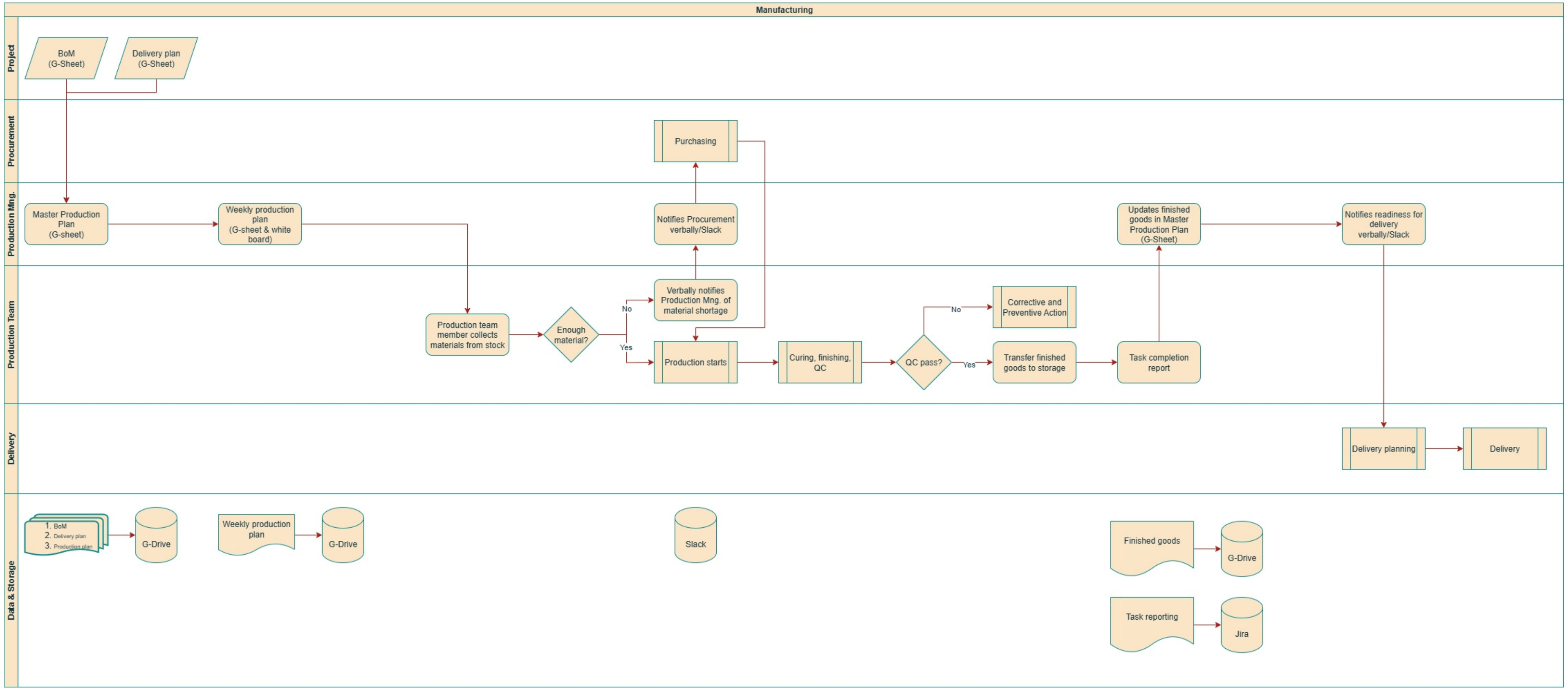


Figure 3. Current Manufacturing Process, a map.

As illustrated in Figure 3, the process relies on a combination of digital spreadsheets, a physical whiteboard, and verbal communication. The workflow begins with the Production Manager, who uses the Bill of Materials (BoM) and the project's delivery plan, both stored in Google Sheets, to create a Master Production Plan. From this master document, a Weekly Production Plan is generated and made accessible to the production team by being physically displayed on a whiteboard and digitally stored in Google Drive.

Execution is carried out by the production team members who follow the weekly plan to collect the necessary materials from stock. According to the interviews, a critical inefficiency is embedded at this stage: there is no system to pre-emptively check for material availability. If a team member discovers a material shortage, the production process is halted. The shortage is reported verbally to the Production Manager, who then verbally notifies the Procurement team. This reactive and informal communication loop for managing stock-outs directly impacts the planned production schedule, causing frequent disruptions.

Once production and a subsequent curing/finishing phase are complete, the items undergo a quality control (QC) check. If a product fails this check, a 'Corrective and Preventive Action' is initiated, and the item re-enters the production flow for rework. If the product passes QC, it is transferred to the finished goods storage area. The logging of this completed task is fragmented across different platforms; a task completion report is filed in Jira, and the Production Manager manually updates the finished goods inventory in the Master Production Plan Google Sheet. The manufacturing process concludes with another verbal handoff, where the Production Manager informs the delivery team that the goods are ready, thereby initiating the delivery planning process.

Next, the Delivery process itself is divided into two distinct stages: Delivery Planning and Delivery Execution. The workflow is heavily reliant on manual coordination, the sharing of digital documents through non-integrated platforms, and informal communication channels. Figure 4 shows the current delivery process.

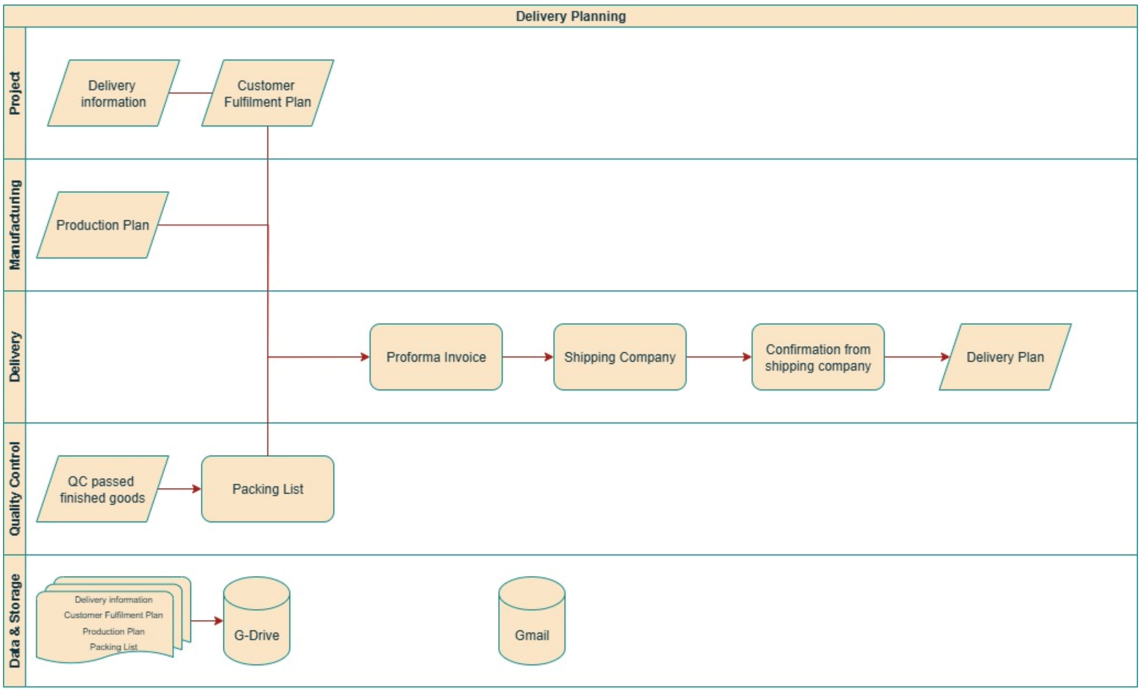


Figure 4. Current Delivery Planning Process, a map.

The Delivery Planning stage, shown in Figure 4, commences once the Packing List, Customer Fulfillment Plan, and Production Plan are stored in Google Drive. The delivery coordinator then creates a proforma invoice and contacts an external shipping company. The process is paused until a confirmation is received from the carrier via email, after which the final internal Delivery Plan is created.

Figure 5 shows the current Delivery Execution process.

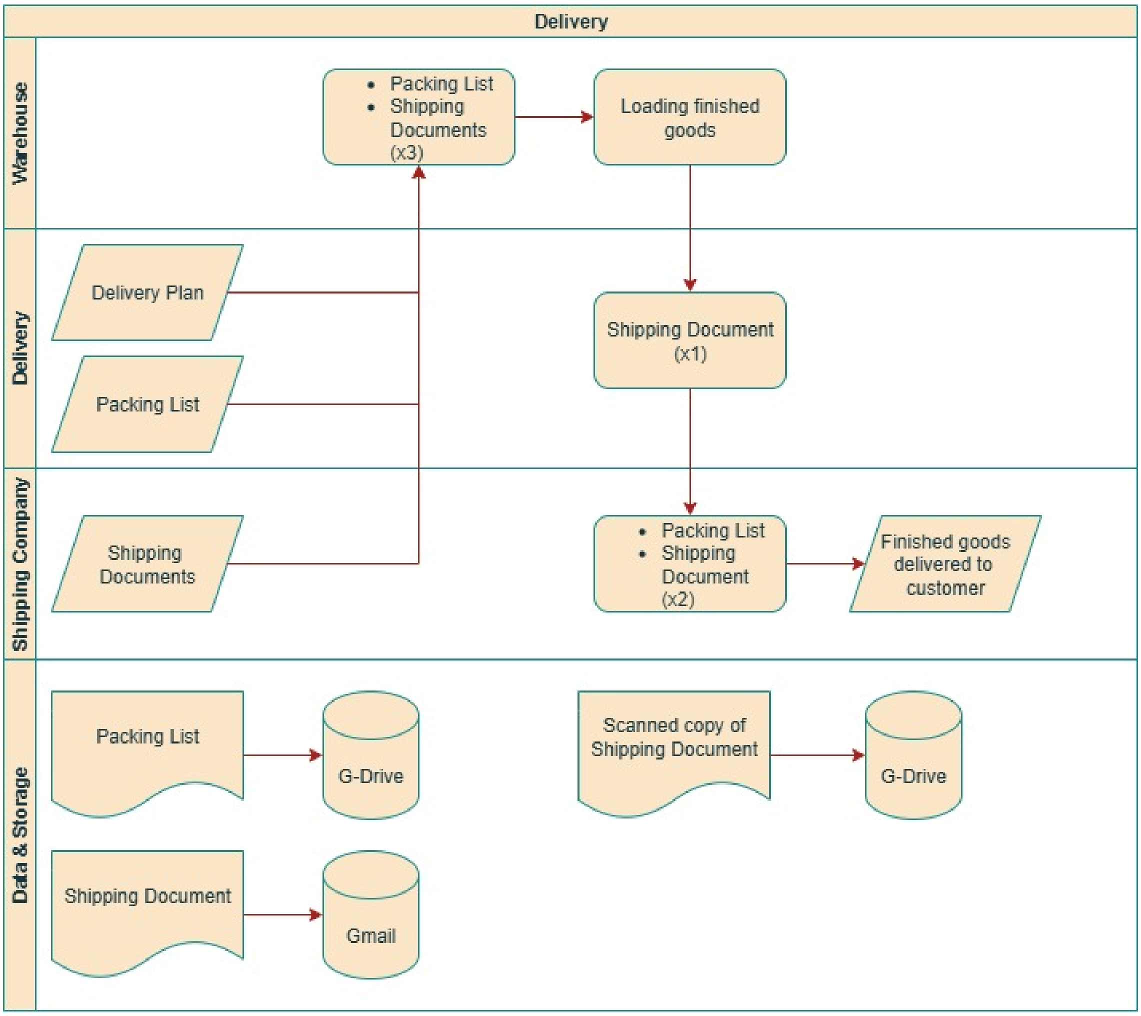


Figure 5. Current Delivery Execution Process, a map.

The Delivery Execution stage, detailed in Figure 5, begins once the Delivery Plan is finalized. The shipping company generates the primary shipping document, an international consignment note (CMR), which is based on the Convention on the Contract for the International Carriage of Goods by Road, which is bundled with export clearance documentation and the company's proforma invoice. Three physical copies are provided to the warehouse for loading the goods. During this handover, copies are allocated to the driver, the end customer, and one is retained for internal records. The post-shipment procedure for record-keeping highlights the system's weaknesses. The internal copy of the CMR is manually scanned and uploaded to the project-specific Google Drive folder, with notifications handled informally through Slack or verbal updates. The process lacks a formal mechanism for obtaining Proof of Delivery (POD), and tracking is a reactive, manual task of emailing the shipping company.

3.3 Analysis of the Key Operational Processes

This section focuses on identifying and categorizing the primary weaknesses, inefficiencies, and operational risks in the company's current methods of managing purchasing, inventory, manufacturing, and delivery. To provide a clear and structured overview, the findings are organized by their respective functional areas, which will be detailed in the subsequent sub-sections. All identified issues are directly substantiated by the process maps and workflow descriptions presented in Section 3.2.

3.3.1 Issues in Purchasing

The primary strength of the current purchasing process lies in its simplicity and the autonomy it provides to the production team. Because the process is informal, team members can verbally request materials as soon as a need is identified, which allows for rapid responses to immediate, unforeseen shortages. This direct line of communication, without the bureaucracy of a formal requisition system, can be effective for a small team handling urgent, small-scale purchases.

However, the purchasing process, as detailed in Section 3.2.1, is also characterized by a lack of formal systems and a reliance on manual procedures. This approach leads to several operational challenges, primarily related to process control, traceability, and visibility.

1. Informal Purchase Triggers

A significant weakness is the informal nature of purchase requests. As noted in the process description, procurement is often triggered by verbal requests from the production team or by manual visual stock checks.

> *“Interaction with supply chain: only communicate when it relates to project purchase or last minute purchases to borrow company card” (Appendix 1, Production Manager)*

This method is highly unreliable, as verbal communications can be forgotten, misunderstood, or duplicated. It also creates a lack of accountability and traceability, as there is no formal, auditable record of who requested what materials and when.

2. Lack of a Centralized Procurement System

The entire process operates without a dedicated procurement system, relying instead on a combination of Google Drive and email (Figure 2). While purchase orders are created and stored, the data within them is unstructured and cannot be easily aggregated or analyzed.

> *"Had to create a separate google sheet of materials to know what was ordered, when it would arrive, how many do we have on hand to make sure the tasks can be done with sufficient material, otherwise delay in production causing 1-2 weeks down time (especially for materials that have longer lead time)" (Appendix 2, Project Manager)*

This makes it difficult to track spending, monitor supplier performance, or generate procurement reports without extensive manual effort.

3. Poor Visibility of Order Status

Once a purchase order is sent to a supplier, there is no systematic way to track its status. To determine if an order has been confirmed, when it is scheduled to ship, or if it has been delayed, an employee must manually search through emails or proactively contact the supplier. This lack of real-time visibility is inefficient and makes it difficult to provide accurate delivery timelines to the production team.

4. Disconnected Receiving Process

The final step of receiving goods is disconnected from the initial purchase order. Without an integrated system, matching incoming deliveries to specific purchase orders is a manual reconciliation task.

> *"There's no structure in receiving deliveries" (Appendix 3, Facility Manager)*

> *"If incoming deliveries do not exist on ERP, had to do extra step into texting purchaser and letting her know of the arrival" (Appendix 3, Facility Manager)*

This makes it challenging to accurately track partial shipments, manage backorders, or ensure that the prices on the supplier invoice match the original purchase order.

3.3.2 Issues in Inventory

A notable strength of the current inventory management approach is its low cost and ease of use. By utilizing a simple Google Sheet for finished goods and visual checks for raw materials, the company avoids the cost and complexity of a dedicated inventory software system. This approach requires minimal training and offers a high degree of flexibility, allowing staff to quickly assess stock levels for specific, immediate production tasks without navigating a complex system.

However, the investigation into the company's inventory management also revealed a lack of systematic control, which introduces significant risks to the production schedule and overall operational efficiency. The primary challenges are the absence of a formal system, reliance on manual tracking, and a consequently reactive approach to replenishment.

1. Lack of a Formalized Inventory System

The core issue is the absence of a dedicated inventory management system. As described in section 3.2, finished goods are tracked in a basic Google Sheet, while raw materials are managed through informal visual checks and manual counts.

> *"Production calendar (physical calendar) to mark the main material A used. This is done by all of the team member who uses the main material A" (Appendix 1, Production Manager)*
>
> *"And then rest of the material tracking is done visually" (Appendix 1, Production Manager)*

This approach provides no central source of truth for all stock items, making it difficult to get an accurate, real-time overview of the company's entire inventory.

2. Inaccurate Stock Levels due to Manual Tracking

The reliance on manual counting and spreadsheet entries is inherently prone to human error. These methods are time-consuming and do not reflect stock changes in real-time as materials are consumed in production or as new goods are received.

> *“Stock of the main material A that is currently done visually” (Appendix 1, Production Manager)*

This leads to frequent discrepancies between the recorded stock levels and the actual physical inventory, making reliable production planning almost impossible.

3. Reactive Replenishment and Production Halts

Without an automated system to track stock levels against predefined minimums, the company operates a reactive replenishment process. As noted in the analysis, this often leads to "panic buying" when a critical material is found to be nearly depleted.

> *“Reached out to supply chain via Slack and in-person conversations to urgently procure material A in many rounds of different purchases” (Appendix 1, Production Manager)*

This not only strains the purchasing process with urgent, last-minute requests but also directly causes halts in production, leading to scheduling delays and reduced efficiency.

3.3.3 Issues in Manufacturing and Delivery

The main strength in the manufacturing and delivery workflow is the high degree of flexibility afforded by direct, informal communication. The use of verbal handoffs and tools like Slack allows the Production Manager to make real-time adjustments to the production schedule and immediately notify the delivery team of readiness. This agility enables the team to quickly pivot and reprioritize tasks, which can be advantageous in a dynamic environment with changing project deadlines.

However, the analysis of the manufacturing and delivery processes, as described in section 3.2.2, also revealed several significant operational issues that create inefficiencies and business risks. These challenges can be categorized into four main areas: fragmented systems, reliance on informal communication, inefficient process management, and a lack of real-time visibility.

1. Fragmented Systems and Data Silos

A primary issue is the reliance on a disconnected array of digital and physical tools. The manufacturing process alone utilizes Google Sheets for planning, a physical whiteboard for weekly schedules, and Jira for task reporting (Figure 3). Similarly, the delivery process depends on Google Drive for document storage and Gmail for external communication (Figure 4, Figure 5).

> *"Interaction with the project manager: if anything gets delayed, the production schedule in Google Sheet will get updated otherwise will keep the Project Manager updated in weekly meetings. In case of urgency: will use Slack to contact the Project Manager" (Appendix 1, Production Manager)*

This fragmentation means that data is not centralized or synchronized. For example, the completion of a production task in Jira requires a separate, manual update to the inventory levels in a Google Sheet. This creates data silos, increases the administrative burden, and introduces a high risk of data inconsistency.

2. Reliance on Manual and Informal Communication

The workflow is critically dependent on manual and informal communication channels. As shown in the manufacturing process map (Figure 3), crucial handoffs are conducted verbally, including key steps like notifying Procurement of a material shortage or informing the Delivery team of product readiness. The analysis of internal communication also revealed that shipment notifications are ad-hoc, handled via Slack messages or verbal updates rather than a formal system.

> *"Communication happens mostly in-person. If the anyone is absent, including himself, communication will be via Slack or phone calls" (Appendix 1, Production Manager)*

This approach is prone to human error, creates communication bottlenecks, and leaves no auditable trail of requests or confirmations.

3. Inefficient Process Management

Several core processes are managed inefficiently, leading to delays. The most prominent example is the management of material shortages in manufacturing, which are only identified when a team member physically attempts to collect materials. This reactive "fire-fighting" disrupts the production schedule and creates unplanned downtime. In the delivery stage, while archiving a signed CMR is a necessary step for evidence keeping, the current method of manually scanning the physical document is inefficient.

> *“The task was scheduled for Tuesday morning but at the time of execution, no fixing material nor instructions were available led to having to reschedule the task and the weekly production schedule consequentially” (Appendix 1, Production Manager)*

This process introduces a time lag between the physical event of shipment and the digital availability of the proof, delaying access to this critical record for other departments.

4. Lack of Real-Time Visibility and Control

A profound lack of real-time visibility and operational control is the cumulative effect of these issues. It is difficult for management or sales personnel to ascertain the precise status of a customer order without manually consulting multiple sources and individuals.

> *“Have to often look for delivery estimation date or POD once the shipment to customer is in transit” (Appendix 2, Project Manager)*

The absence of an integrated system means there is no central dashboard to track production progress or inventory levels. Furthermore, the lack of a formal Proof of Delivery (POD) process represents a significant control gap, as the company has no systematic method for confirming that a shipment has been successfully received by the customer. Tracking a shipment's status is a reactive, manual task requiring direct email correspondence with the carrier.

3.3.4 The need for a new ERP

The current state analysis of the company's purchasing, inventory, manufacturing, and delivery processes reveals a critical weakness: a severe lack of end-to-end operational visibility and control. The company's reliance on fragmented, manual systems (such as Google Sheets, Jira, and physical whiteboards) and informal communication channels (like verbal requests and individual Gmail accounts) creates significant data silos. This fragmentation means that a single, reliable "source of truth" does not exist.

The operational consequences of this, as detailed in the previous sections, are severe. They include production-halting material shortages, a complete lack of accurate inventory data, inefficient "panic buying", and an inability to provide real-time order status to customers. These issues are no longer sustainable as the company scales. The CSA confirms that the root cause of these problems is not the skills of the employees, who are highly adaptable, but the lack of integrated, systemic support.

A new, properly implemented Enterprise Resource Planning (ERP) system is therefore required to provide the core integrated platform that the company needs to solve these systemic issues. Key stakeholders have expressed numerous functional requirements for such a system.

The most critical requirements, identified from the CSA, relate to Inventory Management. Stakeholders require a system that provides a centralized, real-time view of inventory levels, which the company completely lacks. This system must be able to log material consumption against specific projects to enable cost tracking and ensure inventory accuracy. Furthermore, it must support a formal Quality Control (QC) process, so that received materials can be held in a "quarantine" status and prevented from entering production if they are non-conforming.

These inventory issues are directly linked to requirements for Purchasing. Stakeholders identified the need to eliminate the current untraceable verbal requests by requiring a formal, auditable channel for creating and approving purchase requisitions. The new system must centralize all purchasing data and provide real-time status tracking for open Purchase Orders, solving the major inefficiency of having to hunt through emails for updates. Finally, it must directly link the item receiving function to the original PO to automate reconciliation.

In Manufacturing, the primary requirement is to replace the disconnected whiteboard and spreadsheets with a single, integrated production scheduling module. Critically, stakeholders require this module to link to real-time inventory and verify material availability before a job is released, which would eliminate the most significant cause of production stoppages. The system must also automate critical notifications (like notifying delivery) and provide a centralized, end-to-end dashboard to track a customer's order status.

Finally, for Delivery, stakeholders require the system to automatically generate shipping and export documents by pulling data directly from the sales order, which would eliminate manual, error-prone re-typing. The system must also create a formal process for capturing and tracking Proof of Delivery (POD) and attaching key documents to the digital order record. This, combined with real-time shipment visibility, would finally create a fully auditable and controlled end to the order cycle.

These requirements, gathered from the CSA (Data 1), form the essential checklist for evaluating any new system. They are collected and summarized in Table 4 in the following section.

3.4 Summary of the Current State Analysis Results

This final section of the current state analysis consolidates the findings presented in the previous sections. It provides a high-level summary of the key operational strengths and weaknesses that characterize the company's existing processes for purchasing, inventory, manufacturing, and delivery. This synthesis serves as the foundation for selecting the primary focus areas for the ERP system proposal.

3.4.1 Strengths and Weaknesses

The primary strength of the company's current operational processes lies in the flexibility afforded by a small, experienced team. The reliance on direct communication allows for quick, informal adjustments to urgent issues. Furthermore, the existing toolset, based largely on Google Workspace, represents a low initial software cost. The system's functionality, however, is highly dependent on the diligence and know-how of key personnel who manually bridge the gaps between disconnected processes.

Despite this flexibility, the current state analysis has revealed significant and systemic weaknesses that impede efficiency and scalability. These issues, which span the entire operational workflow from purchasing to delivery, create risks and prevent the company from having a clear, real-time view of its operations. The most critical weaknesses identified in Section 3.3 are summarized in Table 4 below.

Table 3. Summary of Identified Strengths and Weaknesses in the Key Operational Processes.

Functional Area	Strengths	Weaknesses
Purchasing	• Simplicity and autonomy for production team • Rapid response to urgent, small-scale needs	• Informal and untraceable purchase triggers (verbal requests) • Lack of a centralized procurement system • Poor visibility of purchase order status • Disconnected and manual receiving process
Inventory	• Low cost due to no dedicated software • Ease of use and minimal training required	• Absence of a formal inventory management system • Inaccurate stock levels due to manual tracking • Reactive replenishment leading to "panic buying" • Disconnected tracking for raw materials vs. finished goods
Manufacturing	• High degree of flexibility via direct communication • Ability to make real-time adjustments to the schedule	• Fragmented systems and data silos (G-Suite, Jira, whiteboard) • Heavy reliance on informal and verbal communication • Reactive management of material shortages • Lack of a single, real-time view of production status
Delivery	• Agility in planning due to informal handoffs	• Inefficient, document-driven manual processes • Manual data archival (scanning CMRs) • Lack of real-time shipment visibility • No formal Proof of Delivery (POD) process

As the table illustrates, these weaknesses are not isolated to single departments but are highly interconnected. Issues in inventory management directly cause disruptions in manufacturing, while manual communication in production delays the delivery process. This cascading effect of inefficiency emphasizes the need for an integrated solution that can provide a single source of truth and automate handoffs between functional areas.

Table 4. A List of Key Requirements for the New ERP.

Functional Area	Requirement/ need/ wish	Who expressed (traceability)
Purchasing	1. Provide a formal, auditable channel for creating and approving purchase requisitions.	Purchasing Officer
	2. Centralize all purchasing data (POs, vendor details).	Purchasing Officer
	3. Provide real-time status tracking for all open Purchase Orders.	Purchasing Officer, Production Manager
	4. Directly link the item receiving function to the original Purchase Order.	Facility Manager, Purchasing Officer
Inventory	1. Provide a centralized, real-time view of all inventory levels.	Facility Manager, Production Manager
	2. Log material consumption against specific projects for cost tracking.	Production Manager
	3. Support a formal Quality Control (QC) "quarantine" process for received materials.	Facility Manager, Production Manager
Manufacturing	1. Replace disconnected spreadsheets/whiteboards with a single, integrated production scheduling module.	Production Manager
	2. Link production schedule to real-time inventory to verify material availability before a job is released.	Production Manager
	3. Automate critical notifications (e.g., notifying the delivery team of completion).	Production Manager, Project Manager
	4. Provide a centralized, end-to-end dashboard to track a customer's order status.	Project Manager
Delivery	1. Automatically generate shipping and export documents from the sales order.	Project Manager

	2. Create a formal process for capturing and tracking Proof of Delivery (POD).	Project Manager
	3. Allow for digital attachment of key documents (like the signed CMR) to the digital order record.	Project Manager
	4. Provide real-time shipment visibility.	Project Manager

3.4.2 Selected Focus Areas for ERP

Based on these results, it is clear that the most critical challenge facing the company is a severe lack of end-to-end operational visibility and control. This single, overarching issue is the root cause of most of the specific problems identified, including the reactive management of inventory, the inability to track production status, and the absence of a formal delivery confirmation process.

The goal is to propose a solution that would address all these core issues, which seems to be uniform in the eyes of the stakeholders, by establishing a single source of truth and automating key business processes via a new ERP system.

Therefore, this need will directly inform the search for available knowledge in the subsequent section. The literature review will explore the logic of selecting ERP systems and best practices specifically related to data integration, process automation, and real-time analytics. Subsequently, the proposal will recommend an ERP solution and map the processes aimed directly at improving operational visibility and control for the case company. Next, Section 4 will explore relevant literature and best practice.

4 Existing Knowledge and Best Practice on ERP Selection and Business Process Alignment with ERP

This section explores available knowledge regarding Enterprise Resource Planning (ERP) systems. Grounded in the selected focus area of improving operational visibility and control, this section discusses the criteria for selecting an ERP system and the best practices for business process design in purchasing and inventory. The primary focus, however, is on the critical factors that determine the success or failure of an ERP implementation. Ultimately, the key elements of available knowledge are synthesized into a conceptual framework to guide the proposal building later in the thesis.

4.1 ERP Selection as a Process

Business practitioners agree that the process of selecting an ERP system is a complex undertaking that requires careful consideration of multiple factors to ensure a successful outcome. Literature suggests that selection should not be based on technology alone, but on a holistic assessment of how the system aligns with the company's specific operational needs and strategic goals (Bradford, 2020; Monk & Wagner, 2013). Four key criteria are identified in literature: (a) process fit (Bradford, 2020), (b) total cost of ownership (Monk & Wagner, 2013), (c) vendor expertise (Monk & Wagner, 2013), and (d) industry-specific functionality (Bradford, 2020).

The decision to select and implement an ERP system is one of the most critical strategic investments a company, particularly an SME, can make. A failure to approach selection systematically can lead to a mismatch between the software and organizational requirements, a key factor contributing to implementation failure. A comprehensive model described by Turulja et al. (2025) outlines this process in distinct phases, beginning with a crucial period of internal preparation long before any vendors are formally evaluated. This structured approach is essential for navigating the complexities of the ERP market and making a well-informed decision that aligns with long-term strategic goals.

The entire process begins with the Pre-Evaluation Stage, an essential phase of internal analysis and planning. This stage is about understanding the company's own needs, capabilities, and goals before engaging with the external market. The first step is the formation of a cross-functional project team responsible for leading the selection process. This team should include representatives from top management to provide strategic oversight, key process owners from the affected departments (such as purchasing and manufacturing), and IT personnel to assess technical feasibility. This team is tasked with creating a clear business vision for the project, defining the high-level scope, and documenting the specific functional requirements the new system must meet, often drawing directly from the pain points identified in a current state analysis. (Turulja et al. 2025.)

A second critical activity within the pre-evaluation stage is a thorough IT infrastructure assessment. The team must audit the company’s existing hardware, network components, and software to determine what upgrades will be necessary to support a modern ERP system. This assessment is particularly vital for an SME and directly informs one of the most significant strategic decisions in the selection process: the choice between a traditional on-premise solution and a cloud-based, Software-as-a-Service (SaaS) model. An on-premise solution requires a large upfront capital investment in servers and hardware, while a cloud solution shifts this to a more predictable, recurring operational expense, an option often favored by capital-constrained SMEs. This stage concludes with initial market research to identify a long list of potential ERP solutions and vendors that could meet the company's needs. (Turulja et al. 2025.)

Following the internal preparation, the project enters the Evaluation and Selection Stage where the team formally engages with the ERP market. The first and most crucial step is to translate the documented business requirements into a formal set of evaluation criteria. These criteria can be used to score and compare potential vendors throughout the subsequent steps. A primary criterion is the fit between the system's embedded business processes and a company's specific requirements. According to Bradford (2020:3), this alignment is a key determinant of the implementation's ultimate success, as companies are essentially adopting a vendor's view of best practices. Unlike large corporations that may have the resources to heavily customize an ERP, an SME typically benefits from adopting the standardized best practices within a system to quickly establish a structured and scalable operational foundation.

Another key criterion is the expertise of the vendor and any third-party consultants. As suggested by Monk and Wagner (2013), given the complexity of these systems, most companies require external expertise to guide the selection and implementation process, including the choice of appropriate modules and configurations. This is especially important for SMEs, which may lack in-house ERP expertise and rely heavily on the vendor for support and guidance. Furthermore, the availability of an industry-specific solution is a crucial consideration. ERP vendors often develop specialized "vertical solutions" to meet the unique needs of different sectors (Bradford, 2020, p. 3). For companies that operates in the niche field, a generic manufacturing module may not suffice, however, highlighting the need to evaluate vendors that offer solutions tailored to project-based or technology-focused manufacturing.

Finally, according to Monk & Wagner (2013), a comprehensive evaluation must consider the full Total Cost of Ownership (TCO), which extends far beyond the initial software license. A complete financial assessment must include a range of associated costs, such as expenditures for any necessary new hardware, the significant fees for external consultants, the cost of internal project team members' time, employee training, and potential productivity losses (Monk & Wagner, 2013, pp. 36-37, 205). For SMEs especially, understanding the full TCO is particularly critical to ensure long-term financial viability and avoid unforeseen recurring costs.

Next, according to Turulja et al. (2025), using these now-defined criteria, a company can conducts further search to narrow the long list of vendors down to a manageable shortlist, typically consisting of three to five candidates. A formal Request for Proposal (RFP) is then issued to this shortlist. The RFP is a detailed document that outlines the company's background, requirements, and scope, and it requires vendors to provide a formal proposal detailing how their solution meets these needs, along with information on their company, implementation methodology, support services and pricing. This process is critical as it forces vendors to provide written, comparable responses, forming the basis for a data-driven evaluation. This stage will allow the company to pick and choose among the ERP vendors by comparing ERP solutions based on their capabilities, costs, and implementation strategies. (Turulja et al. 2025.)

According to Turulja et al. (2025), the next crucial step is to conduct vendor demonstrations. To be effective, these should not be generic sales presentations. Instead, the project team should provide the vendors with a script of real-world business scenarios drawn from their own operations and require them to demonstrate how their system would handle these specific tasks. This allows a company and its key users to directly compare the usability and functionality of each system. In parallel, a company must perform due diligence by verifying vendor references and speaking with other companies that have implemented the system to gain insight into their real-world performance and the quality of post-sales support. The evaluation stage concludes with a final, careful analysis of all the information gathered. A company scores each vendor against the predefined criteria, makes a final selection, and enters into contract negotiations to secure favorable terms on pricing, licensing, support, and service-level agreements. (Turulja et al. 2025.)

The evaluation stage concludes with a formal, data-driven decision-making process. To ensure objectivity, the project team conducts a formal assessment, scoring each vendor against the predefined criteria to generate a final, data-driven ranking. (Turulja et al. 2025.)

Following this, the project enters the critical contract negotiation phase. According to Monk & Wagner (2013), this is more than a simple price discussion; it involves securing favorable terms on software licensing, data ownership (especially in a cloud/SaaS model), future upgrade paths, and, crucially, the specifics of the implementation services and long-term support. The negotiation also establishes the formal partnership with the vendor and their consultants, a relationship that is a key success factor for the entire project, particularly for an SME that will rely heavily on this external expertise (Monk & Wagner, 2013). Once the contract is finalized, the selection process is officially complete, and the project transitions from choosing a system to planning its implementation. Summing up, this systematic approach provides a clear, justifiable rationale for the final selection.

4.2 ERP Implementation Success Factors Related to Selection of ERP

The step-by-step process for selecting an ERP system, outlined in Section 4.1, paves the way for choosing the most appropriate solution for the organization's needs, and is dependent on several underlying principles. A flawed selection process can lead to acquiring a system that is a poor fit for the business, too costly to maintain, or misaligned with strategic goals (Bradford, 2020). This section discusses the critical success factors that specifically govern the selection phase, ensuring that a company makes a well-informed and sustainable decision.

4.2.1 Internal Preparation and Process-Fit Evaluation

The most critical success factors are internal to the organization and relate to preparation and analysis. A foundational success factor is a comprehensive understanding of the company's own business processes and needs. Difficulties in ERP projects often arise when management "does not fully understand its current business processes and cannot make implementation decisions in a timely manner" (Monk & Wagner, 2013, p. 37).

According to Monk & Wagner (2013), the selection process must be conducted by a cross-functional and empowered project team. The selection process cannot be delegated to a single individual or department. As ERP systems are large and complex, "one person cannot fully understand a single ERP system" nor can they "adequately compare various systems" (Monk & Wagner, 2013, p. 35). A key success factor is the formation of a cross-functional project team composed of top management, key process owners from functional areas (like purchasing and manufacturing), and IT personnel. This diverse structure ensures that the needs of all business areas are represented and that the final decision has broad organizational support. For an SME, this team may be small, but its cross-functional nature is critical to prevent the selection of a system that serves one department at the expense of another.

Another success factor is the critical evaluation of the business process fit. According to Bradford (2020), a successful selection hinges on determining how well a vendor's embedded "best practices" align with the company's requirements (Bradford, 2020, p. 3). When an organization purchases an ERP, it is "buying into" that vendor's specific view of how a process should operate. This requires a conscious, strategic decision: the organization must either be prepared to change its own processes to adopt the system's best practices or find a system that is flexible enough to support its unique processes (Nestell & Olson, 2017, p. 47). For an SME, which often benefits from the structure that best practices provide, this evaluation is arguably the most important part of the selection.

4.2.2 Commercial and Partner Evaluation

The second group of success factors relates to the commercial and relational aspects of the decision. According to Monk & Wagner (2013), a rigorous financial assessment of the full Total Cost of Ownership (TCO) is also essential. A selection process that focuses only on the initial software license fees is a precursor to failure. This comprehensive assessment must include a wide range of factors, such as software licensing, hardware upgrades, consultant and analyst fees, internal project team member time, employee training, and potential productivity losses during the transition (Monk & Wagner, 2013, pp. 36-37, 205). For example, for an SME with limited capital, understanding the full

TCO, including recurring maintenance or subscription fees, is essential for ensuring the long-term financial viability of the chosen solution.

Finally, according to Monk & Wagner (2013), an organization is not just selecting a piece of software; it is selecting a long-term strategic partner. Given the complexity of ERPs, most companies, and especially SMEs, "hire an external team of software consultants to help choose the right software vendor(s) and the best approach to implementing ERP" (Monk & Wagner, 2013, p. 35). The expertise, industry knowledge, and cultural fit of this implementation partner are as important as the software's features. A successful selection, therefore, includes performing due diligence, checking vendor references, and evaluating the quality of the consultants who will be guiding the project (Monk & Wagner, 2013, p. 205).

While these factors ensure the right system is chosen, a different set of factors determines the success of the implementation project that follows. These implementation-specific factors are discussed in the next section.

4.3 ERP Implementation Success Factors Related to Implementation

While selecting a suitable ERP system is a critical first step, a project's final outcome is often less dependent on the technology itself and more on how the organizational and human factors of the implementation are managed. According to Monk and Wagner (2013:206), the key challenge in an ERP implementation is not in managing the technology, but in managing the people. This view is supported by other experts, who note that the "soft stuff" is more likely to determine the project's outcome (Bradford, 2020, p. 10) and that the "human factor costs of training and obtaining cooperative participation is the key" (Nestell & Olson, 2017, p. 51). A failure to address these non-technical factors is a primary reason for the high failure rates of 50 to 70 percent cited in business process re-engineering projects that are often associated with ERP implementations (Nestell & Olson, 2017, p. 50).

This section discusses the most critical success factors, which can be broadly grouped into organizational/human factors and process/technical factors.

4.3.1 Organizational and Human Factors

The human and organizational elements of an implementation are widely considered the most challenging. A foundational success factor is the consistent and visible support of top management. Bradford (2020, p. 8) notes that a lack of executive support can be a "major problem" if leaders do not establish a convincing "tone at the top" that the ERP project is a corporate priority. This support must extend beyond initial financial approval to include the active allocation of sufficient resources, such as the time of key employees, and providing continuous encouragement for the cultural changes necessary for the project's success (Bradford, 2020, p. 8).

Closely related to leadership is the need for effective Organizational Change Management (OCM). An ERP system fundamentally changes how people perform their daily tasks, a reality that is often met with resistance from employees who may be comfortable with long-standing legacy systems (Bradford, 2020, p. 9; Monk & Wagner, 2013, p. 206). The practice of managing these human behavior aspects is known as OCM (Monk & Wagner, 2013, p. 206). If not managed properly, employee resistance can lead to counterproductive workarounds or "shadow IT" (Bradford, 2020, pp. 9-10). The key to effective OCM is to foster a sense of ownership; as noted by Monk and Wagner (2013, p. 206), people do not mind change, they "mind being changed". Involving employees in the process improvement effort increases the likelihood that they will support the implementation.

A failure in leadership commitment is a frequently cited reason for implementation difficulties (Nestell & Olson, 2017, p. 50). This buy-in is facilitated by a strong internal project team. A successful implementation cannot be entirely outsourced; it requires the dedication of key people from within the company who have detailed, practical knowledge of its business processes (Monk & Wagner, 2013, p. 205). This represents a significant challenge for SMEs, as pulling key individuals away from their daily duties can place a major strain on operations. Therefore, a critical success factor is management's formal allocation of these employees' time to the project.

Finally, a further critical human factor is comprehensive training. The costs associated with training are significant, consuming both time and money, but are essential for user adoption (Monk & Wagner, 2013, p. 37). Training is required for both the project team, so they can work effectively with consultants, and for all end-users who must learn new processes (Monk & Wagner, 2013, p. 205). This is especially true when adopting the system's best practices, which often involves the most change and thus the most complications for training (Nestell & Olson, 2017, p. 51).

4.3.2 Process and Technical Factors

Beyond the human element, the implementation's success also depends on how the processes and technology are managed. A successful implementation requires a firm commitment to Business Process Re-engineering (BPR). An organization will not realize the benefits of an ERP system if it is not prepared to change its underlying business processes to make them more efficient (Monk & Wagner, 2013, p. 38). According to Nestell and Olson (2017, p. 47), for an ERP to provide a benefit, "at least some of the ways in which that organization does business must change”. A common and costly mistake is to heavily customize the new software to match outdated processes, rather than adopting the streamlined "best practices" embedded within the system (Bradford, 2020, p. 10; Monk & Wagner, 2013, p. 205).

While human factors are paramount, the technical aspects of implementation must also be managed competently. A particularly challenging technical task is data migration. As part of the implementation, the company must manage the transfer of data from its old computer systems to the new ERP system (Monk & Wagner, 2013, p. 205). This includes not only static master data, such as material data, customer data, and vendor data, but also dynamic transaction data, such as open sales orders and purchase orders. This transfer is a challenging task that, if handled poorly, can corrupt the new system from its first day of operation (Monk & Wagner, 2013, p. 205).

While these success factors provide the framework for managing a successful implementation project, the quality of the project's outcome is ultimately determined by the design of the new business processes themselves. The following section concludes the literature review by pointing to the selected best practices for aligning the selection of ERP with the business processes in the key areas of purchasing, inventory, manufacturing, and delivery.

4.4 Business Process Alignment with ERP

A successful ERP implementation is not a simple technology-for-technology replacement; it is a fundamental opportunity for Business Process Re-engineering (BPR). The greatest benefits are realized when a company is prepared to change its business processes to make them more efficient (Monk & Wagner, 2013, p. 38). When selecting an ERP, an organization is "buying into" that vendor's view of "best practices”, which are processes recognized as more effective and efficient than others in a particular industry (Bradford, 2020, p. 3).

This presents a core strategic choice: "clean-slate reengineering," where processes are designed from scratch and software is chosen to support them, or "technology-enabled reengineering," where the organization adopts the ERP's embedded best practices (Nestell & Olson, 2017, p. 51). For an SME, adopting the system's standardized best practices is often the faster, cheaper, and more effective route to establishing a scalable operational foundation, though it requires a firm commitment to managing organizational change (Nestell & Olson, 2017, p. 51).

This section reviews the established best practices for the case company's key functional areas and discusses how an ERP system specifically enables their alignment.

4.4.1 Purchasing

In modern business, the purchasing function has evolved from a transactional, administrative task into a strategic component of supply chain management. The procurement process is often considered the backbone of a company’s profitable operation and is critical for its long-term viability (Roßbach, 2021, p. 66). As the cost of materials can account for up to 80 percent of a product's total cost, the role of purchasing has become increasingly important for maintaining profitability and a competitive advantage (Benton, 2010, p. 119).

The core of any purchasing decision involves balancing the three primary criteria: cost, quality, and lead time (Benton, 2010, p. 31). According to Benton (2010, p. 25), the prioritization of these criteria must be directly aligned with the firm’s overall competitive strategy. A fundamental strategic decision in organizing the procurement function is whether to adopt a centralized or decentralized model. The advantages of centralization are significant, with the most prominent benefit being lower costs achieved through purchase quantity discounts and the development of professional expertise (Benton, 2010, pp. 13-14).

A key operational methodology that supports strategic purchasing is Just-in-Time (JIT) Purchasing. The core objective of a JIT system is to minimize inventory levels by ensuring that the right materials are provided to workstations precisely at the right time (Benton, 2010, p. 119). This requires a shift to reduced order quantities, frequent and on-time delivery schedules, and reduced lead times. Since the JIT system operates with minimal buffer stocks, it is non-negotiable that incoming materials are of exceptionally high quality and that suppliers are highly reliable (Benton, 2010, pp. 120-121).

4.4.1.1 Aligning Purchasing with a New ERP: Best Practice

An ERP system aligns these purchasing best practices by moving the function from an informal, manual process to a data-driven, automated one. The system enforces centralization by its very nature, serving as a company-wide computing environment with a shared database (Monk & Wagner, 2013, p. 19). This provides a single, auditable channel for all purchase requests, replacing the untraceable verbal requests and email chains identified in the CSA.

The system directly enables JIT purchasing by integrating the production plan with procurement. The production plan, based on sales orders, dictates the material requirements; the purchasing function then bases its orders on these plans, expected lead times, and real-time inventory levels (Monk & Wagner, 2013, p. 11). This integration allows raw materials to be ordered as needed, keeping inventory low and avoiding both stockouts and overinvestment in safety stock (Monk & Wagner, 2013, p. 11).

Finally, the ERP provides the visibility critical for strategic supplier management. Instead of manually tracking order status, the ERP system provides real-time data for all business functions. This allows for the systematic measurement of supplier performance metrics, such as initial fill rate, order lead time, and on-time performance (Monk & Wagner, 2013, p. 112). This data-driven approach is fundamental to building the reliable supplier partnerships required for a JIT system. The success of this alignment, however, is intrinsically linked to the accuracy of the inventory data within the system.

4.4.2 Inventory Management

Effective inventory management is critical for balancing the costs of holding stock against the risk of production stoppages and poor customer service. It is a key interest of purchasing managers, as the investment in inventory can comprise a substantial share of a firm’s assets (Benton, 2010, p. 83). An inventory system is the set of policies and controls that monitor stock levels and determine when and how much to replenish (Jacobs & Chase, 2017, p. 356). Managing these levels involves balancing four key costs: holding or carrying costs, setup costs, ordering costs, and shortage costs (Jacobs & Chase, 2017, pp. 357-358).

A foundational best practice for managing inventory can be the ABC inventory classification scheme. This method involves categorizing all inventory items into groups (A, B, C) based on their annual dollar volume (Jacobs & Chase, 2017, p. 377). The purpose is to establish an appropriate degree of control, with 'A' items managed very tightly and 'C' items managed with simpler controls. This system only works if it is supported by a high degree of inventory accuracy, which refers to how well the records agree with the physical count (Jacobs & Chase, 2017, p. 379). A widely used best practice to ensure accuracy is cycle counting, a technique where inventory is counted frequently on a rolling basis rather than in a single annual event (Jacobs & Chase, 2017, p. 380).

4.4.2.1 Aligning Inventory Management with a New ERP: Best Practice

An ERP system is the essential tool for achieving inventory accuracy and control, directly solving the CSA finding of inaccurate, disconnected, and manual tracking. The ERP system's core function is to provide a single source of truth by integrating all business areas into a "company-wide computing environment that includes a shared database" (Monk & Wagner, 2013, p. 19). When the production team consumes a part or the receiving team accepts a delivery, the inventory record is updated in real-time for all departments, making manual tracking obsolete.

Modern ERP systems are designed to execute best practices like ABC analysis and cycle counting. The system can be configured to automate ABC classification by calculating the annual dollar volume (unit cost multiplied by annual usage) for every item. Based on this classification, the system can then be programmed to automate cycle counting schedules (Jacobs & Chase, 2017, p. 380). For example, the system can automatically generate a "cycle count notice" for specific 'A' items daily or weekly, while scheduling 'C' items to be counted only quarterly. This systemic, data-driven approach to inventory control is what provides the reliable data needed for effective manufacturing alignment.

4.4.3 Manufacturing

Aligning the manufacturing process with an ERP system begins with defining the core production strategy. The three general approaches are Make-to-Stock (MTS), Make-to-Order (MTO), and Assemble-to-Order (ATO) (Monk & Wagner, 2013, pp. 78-79). MTO items are produced only to fill specific customer orders, which is common for expensive or highly customized equipment. An integrated ERP system is the critical tool that enables the management of MTO and ATO strategies, which require tight coordination between sales, purchasing, and production.

A core process enabled by an ERP system is Sales and Operations Planning (S&OP). Successful S&OP depends on developing a culture of cooperation between sales and manufacturing, enforced by top management. By using the relevant tools in an integrated ERP, all parties can agree on sales forecasts and production plans, preventing the common problem of overstocking some items while running out of others (Monk & Wagner, 2013, p. 92). Operationally, this alignment is achieved through the principles of Lean Production, which aims to achieve production using minimal inventories by eliminating waste (Jacobs & Chase, 2017, pp. 401-403).

4.4.3.1 Aligning Manufacturing with a New ERP: Best Practice

An ERP's manufacturing module aligns these concepts by replacing fragmented planning tools like the whiteboards and spreadsheets identified in the CSA with a single, integrated planning and execution system. The ERP serves as the central platform for S&OP, allowing both sales and production to work from the same sales forecast and production plan, which is based on accurate, real-time inventory data (Monk & Wagner, 2013, p. 92). The system is configured to execute the chosen production strategy. For an MTO company, the ERP creates a direct link from a new sales order to the manufacturing module. This can automatically generate a production order and run a

Material Requirements Planning (MRP) calculation to determine which components are needed, triggering purchase requisitions for any shortfalls. This integration provides the end-to-end visibility that manual systems lack.

Furthermore, the ERP digitizes Lean and JIT production concepts. The Kanban pull system, rather than being just a physical card, becomes a digital transaction within the ERP that signals a "pull" from a downstream work center, authorizing an upstream center to produce more (Jacobs & Chase, 2017, p. 412). The production schedule within the ERP acts as the level schedule, which provides the stable, uniform plant loading necessary to make JIT flows possible (Jacobs & Chase, 2017, pp. 411-412). This can create a seamless flow from manufacturing completion to the final delivery process.

4.4.4 Delivery

The principles of alignment extend beyond manufacturing into the physical distribution and delivery of the final product. The goal is to apply lean concepts to the functions associated with the movement of material through the system, often referred to as Lean Logistics (Jacobs & Chase, 2017, p. 405). Best practices in Lean Warehousing focus on eliminating non-value-added steps in product storage, such as excess motion, handling, and waiting for parts (Jacobs & Chase, 2017, pp. 404-405). This includes streamlining the core warehousing functions: receiving, put-away, picking, packing, and shipping (Jacobs & Chase, 2017, p. 405). For the delivery process itself, lean logistics practices are enabled by managing complex information, such as optimizing shipping routes and managing import/export transportation processes (Jacobs & Chase, 2017, p. 405).

4.4.4.1 Aligning Delivery with a New ERP: Best Practice

An ERP system, particularly one with a Sales & Distribution (S&D) or Warehouse Management (WMS) module, aligns the delivery process by connecting it directly to sales and manufacturing. This provides the end-to-end visibility and control: when a manufacturing team marks a production order as complete in the ERP, the system can automatically notify the delivery team. The system can then manage the entire Lean Warehousing flow; it generates a pick list for the warehouse team, facilitates the packing process, and, upon shipment, automatically updates the inventory of finished goods. (Jacobs & Chase, 2017, p. 405)

Crucially, the ERP system automates and standardizes documentation. Instead of manually creating proforma invoices in separate applications, the ERP generates all required shipping documents (packing lists, bills of lading, proforma invoices) by pulling data directly from the sales order (Benton, 2010). This ensures data consistency and eliminates human error. Finally, the system can be integrated with logistics partners to automate shipment tracking and capture a digital Proof of Delivery (POD), providing the real-time status visibility that was a key missing element in the CSA. (Monk & Wagner, 2013).

Having reviewed these best practices for aligning the PIMD processes, the next section will synthesize these concepts, along with the selection and implementation factors, into a cohesive conceptual framework to guide the proposal for the case company.

4.5 Conceptual Framework of This Thesis

This section synthesizes the key findings from the literature review into a conceptual framework. This framework presents the steps of system selection based on the operational best practices for some core business processes (here, Purchasing, Inventory, Manufacturing, and Delivery (PIMD). The conceptual framework, presented in Table 5, maps the steps of the ERP selection process to the key business processes, their associated concerns from literature, and the focus areas for alignment with a new ERP.

Table 5. Conceptual Framework for ERP Selection and Its Alignment with Key Business Processes.

ERP selection and its alignment with key business processes			
ERP selection process (steps)	**Business process**	**Key concerns**	**Focus areas to align with a new ERP**
Step 1. Pre-Evaluation (forming team, defining requirements & IT assessment) (Turulja et al., 2025)	**Purchasing**	1. **Strategic Alignment:** Aligning purchasing criteria (cost, quality, lead time) with corporate strategy (Benton, 2010) 2. **Structure:** Centralizing purchasing to gain buying power and expertise (Benton, 2025) 3. **Methodology:** Implement Just-In-Time (JIT) purchasing (Benton, 2025)	• Automate purchase requisitions based on production needs (Monk & Wagner, 2013) • Provide a central, shared database for all vendor and PO data (Monk & Wagner, 2013) • Enable supplier performance tracking (on-

			time delivery, etc.) (Monk & Wagner, 2013)
Step 2. Evaluation (Defining criteria, vendor research, issuing RFP) (Turulja et al., 2025)	**Inventory**	1. **Accuracy:** Maintaining high inventory accuracy (records vs. physical count) (Jacob & Chase, 2017) 2. **Classification:** Implementing ABC analysis to focus control on high-value items (Jacob & Chase, 2017) 3. **Methodology:** Using cycle counting instead of annual counts (Jacon & Chase, 2017)	• Use a single database to provide a real-time "single source of truth" for stock (Monk & Wagner, 2013); (Bradford, 2020) • Automate inventory transactions (consumption, receiving) to maintain accuracy (Monk & Wagner, 2013) • Automate ABC classification and cycle counting schedules (Jacobs & Chase, 2017)
Step 3. Evaluation (Vendor demos & due diligence) (Turulja et al., 2025)	**Manufacturing**	1. **Strategy:** Aligning with a Make-to-Order (MTO) or hybrid strategy (Monk & Wagner, 2013) 2. **Planning:** Implementing Sales & Operations Planning (S&OP) for a stable schedule (Monk & Wagner, 2013) 3. **Execution:** Adopting Lean Production and a JIT/Kanban (pull) system (Jacobs & Chase, 2017)	• Link sales orders directly to production orders (for MTO) (Monk & Wagner, 2013) • Use the MRP module to manage the Bill of Materials (BoM) and material needs (Benton, 2010) • Digitize the Kanban system to "pull" materials from work centers (Jacobs & Chase, 2017)
Step 4. Final Selection & Contract Negotiation (Turulja et al., 2025)	**Delivery**	1. **Logistics:** Implementing Lean Logistics to eliminate waste in transport (Jacobs & Chase, 2017) 2. **Warehousing:** Using Lean Warehousing to streamline pick, pack, and ship (Jacobs & Chase, 2017) 3. **Integration:** Managing the complete Order Cycle and documentation (POD) (Benton, 2010)	• Automate notification to delivery team upon production completion (Monk & Wagner, 2013) • Generate all shipping documents (proforma, packing list) from the sales order (Benton, 2010) • Integrate with carriers for shipment tracking and digital Proof of Delivery (POD) (Monk & Wagner, 2013)

This conceptual framework, as presented in Table 5, is built on the key themes from the literature review. First, it outlines the ERP selection process in the first column, following the structured four-step methodology from pre-evaluation to final contract negotiation (Turulja et al., 2025). Second, it maps these steps to the thesis's four key business processes (PIMD), which are the functional areas the ERP must support. Third, it identifies the key concerns for each business process, drawing these directly from the best-practice literature reviewed in Section 4.4. These are the theoretical goals for each process, such as implementing JIT purchasing (Benton, 2010) and Lean Logistics (Jacobs & Chase, 2017). Finally, the framework details the focus areas for alignment with a new ERP. This column operationalizes the "key concerns" by identifying the specific functions and capabilities an ERP system provides, such as automating purchase requisitions (Monk & Wagner, 2013) and linking sales orders directly to production (Monk & Wagner, 2013).

While Sections 4.2 (Selection Factors) and 4.3 (Implementation Factors) provide critical guiding principles for the management of the project, this conceptual framework focuses on the core conceptual link between the selection process and the technical alignment of the business. This framework will now be used to guide the development of the concrete proposal for the case company in Section 5.

5 Building the ERP Proposal for Selecting ERP and Aligning it with Core Business Processes of the Company

This section presents the proposal developed for the case company. It merges the key findings from the Current State Analysis in Section 3 with the theoretical best practices from the Conceptual Framework in Section 4. The resulting proposal, which includes new process designs and a strategic roadmap for an ERP system, is built from the internal co-creation (Data 2a) and the structured vendor analysis (Data 2b) that constitute Data 2 of this study.

5.1 Overview of the Proposal Building Stage

This section presents the steps and logic used to build the proposal for the case company. The proposal is guided by the selected focus area identified at the conclusion of the Current State Analysis: addressing the "severe lack of end-to-end operational visibility and control" caused by fragmented, manual processes.

Therefore, the proposal is built to directly address these weaknesses. It creates a strong fit between the company's identified needs (Data 1 from Section 3) and the established best practices synthesized in the Conceptual Framework (Section 4). The proposal aims to establish a single source of truth and automate key processes.

The proposal building (Data 2) was a two-part process: (1) Internal Co-Creation (Data 2a): New "to-be" process maps were designed in collaboration with the Process Engineer and key Process Owners. These new standardized processes were designed specifically to solve the immediate pain points from the CSA, establish standardized workflows, and be tested using existing tools. (2) Vendor Capability Analysis (Data 2b): The full list of 18 PIMD requirements (derived from the CSA and the new process analysis) was used to conduct a structured review of vendor documentation and market analysis. This review compared four potential ERP systems (Odoo, NetSuite, Monitor ERP, and ERPNext) on their "out-of-the-box" (OOTB) capabilities.

This section will first detail the findings from this data collection in Section 5.2. Following this, the Initial Proposal will be presented. The literature review in Section 4.1 established that a credible selection requires "live, scripted vendor demonstrations". Since the Data 2b analysis is based on vendor documentation ("claims") alone, a final selection cannot be credibly made. Therefore, the proposal is not a single selected ERP, but a more realistic, two-part strategic solution: (A) An immediate short-term process solution (the new standardized process maps); (B) A long-term strategic roadmap for a final ERP selection, including a "Finalist Shortlist" based on the Data 2b analysis.

5.2 Findings from Stakeholder Co-creation

This section reports on the main inputs gathered for building the proposal. As per the research design, this proposal is inspired by three inputs: the findings from the Current State Analysis (Data 1), the best practices from the Conceptual Framework (CF), and the suggestions from key stakeholders gathered in a co-creation round (Data 2).

Data Collection 2 (Data 2a) concentrated on identifying these stakeholder suggestions. This was an iterative, co-creation process with the Process Engineer and key Process Owners to design new, standardized "to-be" processes. These processes represent the stakeholders' proposed solutions to the issues identified in the CSA. Table 6 below provides a summary of these inputs, relating the key pain points from the CSA (Data 1) to the guiding best practices from the literature (CF) and the corresponding practical solution suggested by the stakeholders (Data 2).

Table 6. Input from the Stakeholders for the Initial Proposal (Data 2).

Key focus area from CSA (from Data 1)		**Input from literature (CF)**	**Inputs from Data 2 (stakeholders for the Proposal building)**
Purchasing			
1	The system must provide a formal, auditable channel for creating and approving purchase requisitions replacing informal verbal requests.	An ERP provides a "single, auditable channel for all purchase requests", enforcing centralization (Benton, 2010).	Co-created the “Purchasing Process (PR.SO.02)”, mandating that all requests *must* be based on a “Project BoM” or formal “Material Request” in the ERP.
2	The system must centralize all purchasing data (requisitions, POs, vendor details, and order status).	A core ERP function is to integrate and coordinate information in every area of business using a common database (Monk & Wagner, 2013).	Defined rule that all production purchases *must* be strictly based on the BoM and recorded in Odoo to ensure a single data source.
3	The system must provide real-time status tracking for all open Purchase Orders, eliminating the need to search emails.	An ERP provides the "visibility critical for strategic supplier management" and "real-time data for all business functions" (Monk & Wagner, 2013).	Suggestion to use the ERP’s native status field; stakeholders noted that this requires disciplined data entry which the new process enforces.
4	The system must directly link the item receiving function to the original Purchase Order, allowing for automated matching and the management of partial shipments.	An integrated information system (Monk & Wagner, 2013) ensures data is shared between functions like purchasing and receiving.	Co-created “Receiving & Inspection (PR.SO.04)”, where the Facility Manager *must* physically match incoming goods to the PO before acceptance.
Inventory			
1	The system must provide a centralized, real-time view of inventory levels.	A core ERP benefit is a single source of truth (Monk & Wagner, 2013). This requires high inventory accuracy (Jacobs & Chase, 2017).	Co-created “Inventory Management (PR.SP.03)”, requiring immediate logging of receipts and consumption to update the master stock view.

2	The system must allow users to log material consumption against a specific project or task.	Best practice is to link consumption to production orders for cost-tracking and planning (Jacobs & Chase, 2017).	Proposed “Stock Take (PR.SO.09)”, which allows material withdrawal only via a “picking list” that linked to a specific job/task.
3	The system must maintain a history of material movements (receipt, consumption, adjustments) for traceability.	This is a fundamental feature of an "integrated information system" (Monk & Wagner, 2013) that provides an auditable trail for all transactions.	Suggestion to assign unique locations and IDs for *all* items to record every movement (receipt, move, and consume) which will create transaction history.
4	The system must support a searchable catalog of materials, including common names, specifications, and storage locations.	This relates to managing material master data, which is a core component of an inventory system (Jacobs & Chase, 2017) and "ABC analysis".	Suggestion to clean up the master data in Odoo to include accurate specifications and location codes.
5	The system must have the ability to set minimum stock levels and automatically trigger alerts or replenishment requests when levels are low.	An inventory system is the "set of policies and controls that determine when and how much to replenish" (Jacobs & Chase, 2017, p. 356). This is a key enabler for JIT purchasing.	Stakeholders proposed checking stock at the BoM release stage to manually trigger replenishment Pos if stock is below required levels.
6	The system must include a formal process for task owners to request production time and specify all required materials and instructions upfront.	This aligns with an MTO strategy, where an ERP "creates a direct link from a new sales order to the manufacturing module" (Monk & Wagner, 2013) and runs an "MRP calculation" for materials (Benton, 2010).	Designed the “Production Planning (PR.PR.01)” process to act as the formal request mechanism. A picking list is generated from this plan to authorize material withdrawal.
7	The system must support a weekly inventory count/check process to ensure data accuracy.	This is precisely "cycle counting," a best practice where "inventory is counted frequently on a rolling basis" (Jacobs & Chase, 2017, p. 380).	Co-created the “Stock Take (PR.SO.09)” process. While weekly counts are not yet mandatory, this process enforces a formal stock-check whenever a picking list is executed.
8	The system must provide a way to manage and track leftover materials from projects,	This aligns with "Lean Warehousing" which focuses on "eliminating non-value-added steps"	Co-created “Inventory Management (PR.SO.03)” that includes specific steps

	including their status (e.g., for reuse, for storage, to be sold).	(Jacobs & Chase, 2017, pp. 404-405) and managing all materials.	for “Return to same shelves” and updating Odoo to remove items from Work-In-Progress (WIP) if not consumed.
9	The system must provide a forward-looking shipping plan with clear instructions.	This is enabled by "Sales & Operations Planning (S&OP)" which develops stable "production plans" (Monk & Wagner, 2013, p. 92) and "Lean Logistics".	Co-created “Delivery Planning (PR.SO.06)” that now integrates directly with the production plan to determine delivery dates and requirements *before* production finishes.
10	The system must provide simple dashboards or reports on current stock levels and material availability.	An ERP delivers "consistent data across all functions in real time" (Monk & Wagner, 2013) enabling automated reporting.	To rely on the standard Odoo master stock view. Stakeholders noted that this requires configuration (IT resource) rather than a specific new process map.
11	The system must allow the Project Manager to see the status of materials procured for their projects, including expected arrival dates.	This is a direct benefit of an integrated system providing "real-time data for all business functions" (Monk & Wagner, 2013) and "end-to-end visibility".	Stakeholders determined that strict adherence to the new “Materials Planning (PR.SO.05)” process would ensure availability and reduce the need for Project Managers to micro-manage procurement status.
Manufacturing			
1	The system must provide a single, integrated module for production planning and scheduling.	S&OP (Monk & Wagner, 2013) and Lean Production (Jacobs & Chase, 2017) rely on a single, integrated production schedule.	Proposed a hybrid to use “Production Planning (PR.PR.01)” for scheduling but create a Work Order in Odoo to strictly reserve materials.
2	The system must link production orders to real-time inventory data to verify material availability before release.	JIT/Lean Production (Jacobs & Chase, 2017) and MRP systems (Monk & Wagner, 2013) are designed to verify material availability before production starts.	Co-created “Material Planning (PR.SO.05)”, proposed a physical kitting process where materials are picked or verified *before* the plan is released.

3	The system must automate critical notifications and handoffs, such as informing the delivery team of completion.	Integrated information systems improve communication and workflow between functional areas (Monk & Wagner, 2013).	Suggestion to use the “Delivery Planning (PR.SO.06)” to trigger logistic notifications as soon as production is scheduled.
4	The system must provide a centralized, real-time dashboard to track the end-to-end status of a customer order from sales to production to final delivery	An ERP system serves as a company-wide computing environment that delivers consistent data across all functions in real time (Monk & Wagner, 2013).	Stakeholders noted the current ERP dashboard is unconfigured and underutilized. The interim proposal (Data 2a) relies on the “Master Production Plan” in Google Sheet as the central status tracker until the ERP is fully implemented.
Delivery			
1	The system must automatically generate all required shipping and export documents.	An integrated Order Cycle (Benton, 2010) and ERP system automates the flow of information (like billing) from the order.	Suggestion to gather all delivery info such as address and contact in the “Delivery Planning” phase to prepare documents early on.
2	The system must provide a formal process for capturing and tracking Proof of Delivery (POD).	The Order Cycle (Benton, 2010) is not complete until delivery is confirmed.	Co-created “Delivery (PR.SO.07)” that requires the signed CMR to be physically returned and scanned into the system immediately.
3	The system must provide real-time shipment visibility by capturing tracking numbers.	Supply chain management best practices involve tracking on-time performance (Monk & Wagner, 2013).	Analysis showed the current Odoo only supports major carriers such as FedEx or DHL alike. The Data 2a input confirmed the need to continue manual tracking for niche carriers, identifying this as a key requirement for the Long-Term Roadmap (Data 2b).

4	The system must allow for the digital attachment of key documents directly to the sales or delivery order record.	An information system includes people, procedures, and software to store and organize information (Monk & Wagner, 2013).	The current ERP lacks this functionality. The Co-creation team designed the “Delivery (PR.SO.07)” process to manually scan and archive the signed CMR to the Project Google Drive as a mandatory step.

As shown in Table 6, the co-creation process (Data 2a) translated the key ideas from literature and best practice into solutions for the company. These stakeholder suggestions were pragmatic, often designing manual or semi-automated processes using existing tools (like Jira and Google Suite) to mimic the best practices identified in the literature.

For example, the stakeholder suggestion to implement a physical "kitting" process where all materials for a job are picked before it is released is a direct, practical solution to the CSA finding of production halts. It manually enforces the best practice of verifying material availability, which an ERP system would automate via an MRP module. Similarly, the suggestion to create formal Work Orders in the ERP to reserve materials, even while planning in Jira, is a hybrid solution that bridges the gap between the current fragmented state and a fully integrated system.

These co-created processes (Data 2a) form the foundation for the "Inventory Action Plan," the immediate, short-term component of the proposal. The full list of requirements, now refined by both the literature and stakeholder input, also serves as the evaluation criteria for the long-term strategic solution. The analysis of vendor capabilities against these criteria (Data 2b) will be used to develop the "Strategic ERP Roadmap”.

Thus, based on the inputs from the Current State Analysis (Section 3), the best practices from the Conceptual Framework (Section 4), and the co-creation process with stakeholders (Section 5.2), a two-part Initial Proposal was developed. The development of this proposal was aligned with a concurrent, high-priority business initiative: a company-wide project to achieve Factory Production Control (FPC) certification. This FPC project mandated the immediate formalization and standardization of all key operational processes. This provided the opportunity and urgent driver for the first part of this proposal. The following sections will now synthesize these inputs (Data 2a and 2b) into the formal, two-part Initial Proposal that was presented to stakeholders for final validation

5.3 Initial Proposal

The Proposal is presented in two parts to meet both this immediate business need and the long-term strategic goals of the company.

Part 1: The Short-Term "Inventory Action Plan." This consists of a set of standardized "to-be" processes (Data 2a), co-created with the Process Engineer to meet the immediate requirements of the FPC certification project. This plan is designed for immediate internal implementation using existing tools to solve the most critical operational pain points identified in the CSA.

Part 2: The Long-Term "Strategic ERP Roadmap." This part addresses the full PIMD scope. As the project timeline did not permit the resource-intensive steps of vendor interviews and live demos, a final selection was not made. Instead, a structured market analysis was conducted (Data 2b) based on vendor documentation ("claims") measured against the 18 validated functional requirements. This analysis results in a "Finalist Shortlist" of vendors recommended for the next phase of evaluation.

These parts of this proposal are detailed below, beginning with the long-term strategic roadmap.

5.3.1 Long-Term Strategic ERP Roadmap and Finalist Shortlist

This section presents the second part of the Initial Proposal: the long-term strategic roadmap for a new ERP system. The Current State Analysis (Section 3) and stakeholder co-creation (Section 5.2) resulted in a validated list of 18 core functional requirements (FRs) for a new, integrated system.

As the project timeline and resources, the final selection was not yet made. Instead, a structured selection analysis (Data 2b) was conducted to evaluate four potential ERP candidates (Odoo, NetSuite, Monitor ERP, and ERPNext) based on their publicly available documentation and claimed features. The goal of this analysis was not to select a winner, but to create a "Finalist Shortlist" of vendors to advance to the next phase of formal, scripted demonstrations. The section results, detailed in Table 7, came from the analysis of the 18 PIMD requirements.

Table 7. Selection Results for the Functional Requirements and ERP Vendors' Comparison.

Requirement ID	Functional Requirement	ERP Vendors			
		Odoo	NetSuite	Monitor ERP	ERPNext
FR-I1	Centralized, real-time inventory view.	Fully supported	Fully supported	Fully supported	Fully supported
FR-I2	Log material consumption per project.	Fully supported	Fully supported	Fully supported	Fully supported
FR-I3	QC for received materials (Quarantine).	Fully supported	Fully supported	Fully supported	Fully supported
FR-P1	Formal, auditable purchase requisitions.	Fully supported	Fully supported	Fully supported	Fully supported
FR-P2	Centralized PO& vendor data.	Fully supported	Fully supported	Fully supported	Fully supported
FR-P3	Real-time PO status tracking.	Fully supported	Fully supported	Fully supported	Fully supported
FR-P4	Link receiving to original PO.	Fully supported	Fully supported	Fully supported	Partial support – needs customization
FR-M1	Single, integrated production schedule.	Fully supported	Fully supported	Fully supported	Fully supported
FR-M2	Verify material availability before release.	Fully supported	Fully supported	Fully supported	Fully supported
FR-M3	Automate notifications (e.g., to Delivery).	Partial support – needs customization	Fully supported	Partial support – needs customization	Partial support – needs customization
FR-M4	Real-time, end-to-end order status.	Fully supported	Fully supported	Fully supported	Fully supported
FR-D1	Auto-generate shipping/export documents.	Not supported	Partial support – needs customization	Partial support – needs customization	Fully supported
FR-D2	Formal POD tracking process.	Not supported	Not supported	Not supported	Not supported

FR-D3	Real-time shipment visibility (tracking).	Partial support – needs customization	Fully supported	Partial support – needs customization	Fully supported
FR-D4	Digital attachment of documents to order.	Partial support – needs customization	Fully supported	Partial support – needs customization	Fully supported

The analysis of vendor claims (Data 2b) revealed several insights:

First, as for the core Purchasing, Inventory, and Manufacturing functionality, all four candidates fully support the core functional requirements for Purchasing, Inventory, and Manufacturing (FR-I1 through FR-M2). This indicates that the primary pain points from the CSA (e.g., lack of inventory view, no formal purchasing) are standard, "out-of-the-box" features for modern ERPs.

Second, as for the Delivery & Automation are Key Differentiators, the significant gaps and differences appear in the advanced Delivery (FR-D) requirements and automated notifications (FR-M3).

Third, as for the Critical Gap (FR-D2), a major finding was that none of the vendors, based on their documentation, offer a standard, out-of-the-box module for a formal Proof of Delivery (POD) tracking process. This was a key stakeholder requirement and will require customization or a third-party plug-in, regardless of the chosen system.

Fourth, as for Odoo, this candidate was eliminated from the shortlist. It failed to support the critical FR-D1 (Auto-generate shipping documents) and FR-D2 (POD tracking) and showed only partial, customization-required support for most other automation and delivery functions.

As for the Finalist Shortlist, NetSuite, Monitor ERP, and ERPNext are recommended to proceed to the demo stage. NetSuite appears to be the most comprehensive "out-of-the-box" solution, particularly in automation and shipment visibility (FR-M3, FR-D3). ERPNext shows significant strength in documentation (FR-D1, FR-D4). Monitor ERP, while requiring customization, remains a viable candidate.

These selection results form the basis of the long-term "Strategic ERP Roadmap," which recommends the company allocate resources to conduct scripted, live demonstrations with these three finalists.

5.3.2 Re-designed Processes: Purchasing and Inventory

This section details the first part of the "Inventory Action Plan," which consists of new "to-be" process maps (Data 2a) co-created to meet the immediate needs of the FPC project. These processes are designed to be implemented using existing tools and directly solve the critical weaknesses identified in the Current State Analysis.

PROCESSES 1 & 2. Purchasing and Receiving

The CSA identified the purchasing process as highly informal, relying on untraceable "verbal requests” and a disconnected receiving process. The new, standardized "Purchasing Process" (Figure 6) and "Receiving and Inspecting Incoming Goods" (Figure 7) solve these issues.

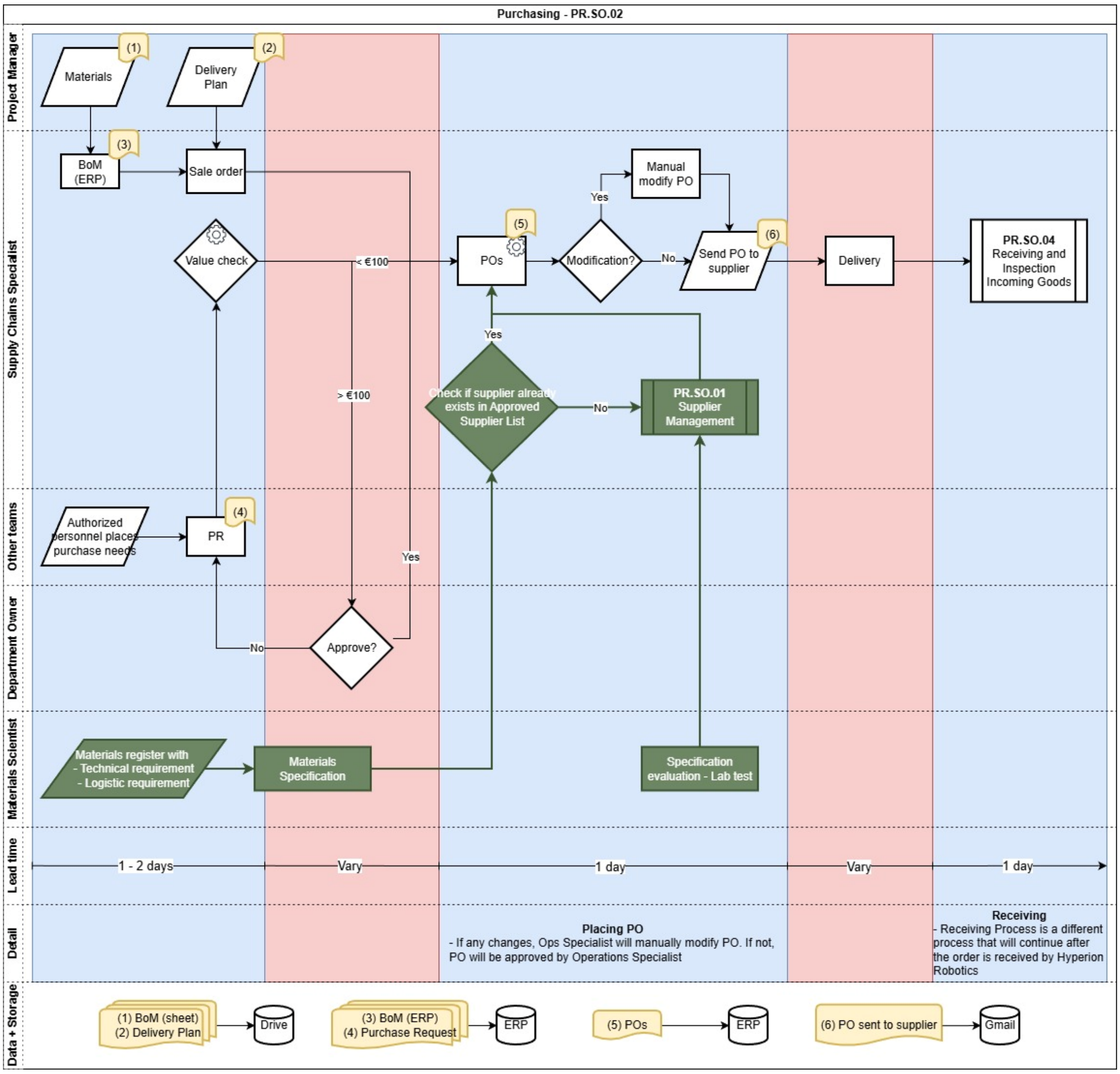


Figure 6. The ‘To-Be’ Purchasing Process, a map.

As shown in Figure 6, the new process mandates that all procurement actions begin with a formal "Purchase Request," which is based on either a "Project Bill of Materials (BoM)" or a "Material Request" for non-project items. This creates the auditable, centralized channel that stakeholders required.

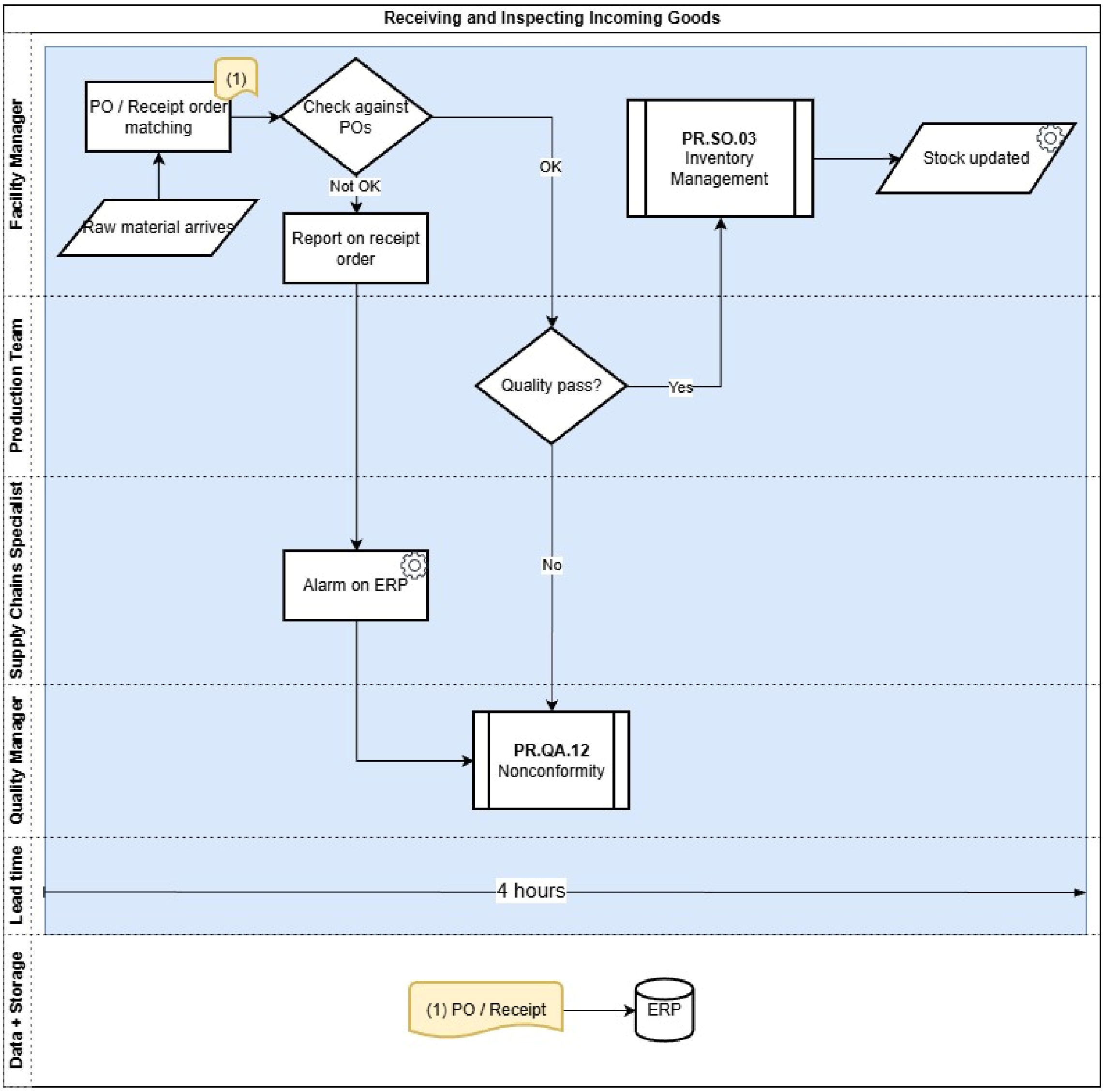


Figure 7. The ‘To-Be’ Receiving and Inspecting Incoming Goods Process, a map.

Furthermore, the new receiving process (Figure 7) explicitly links incoming goods to the "Purchase Order" (PO) from the purchasing process. It formalizes inspection (QC) and ensures that all received materials are immediately logged before being moved to their designated storage location, which was a key gap in the old workflow.

PROCESSES 3 & 4. Inventory and Materials Planning

The most critical weakness identified in the CSA was the "absence of a formalized inventory system”, which led to inaccurate stock levels and reactive "panic buying". The new "Inventory Management" (Figure 8) and "Materials Planning" (Figure 9) processes directly address this.

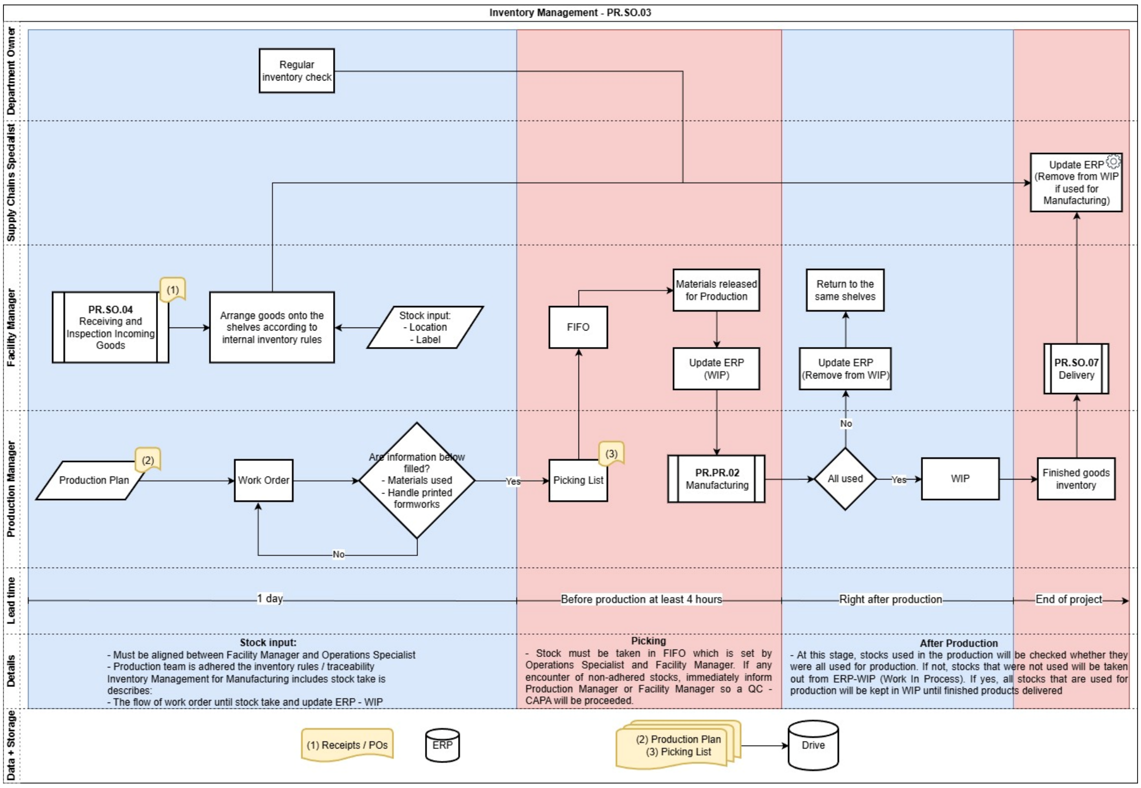


Figure 8. The ‘To-Be’ Inventory Management Process, a map.

The "Inventory Management" process (Figure 8) establishes a formal system for all stock movements, including "Receiving," "Consumption," "Adjustments," and "Dispatch," creating a single, centralized log of transactions.

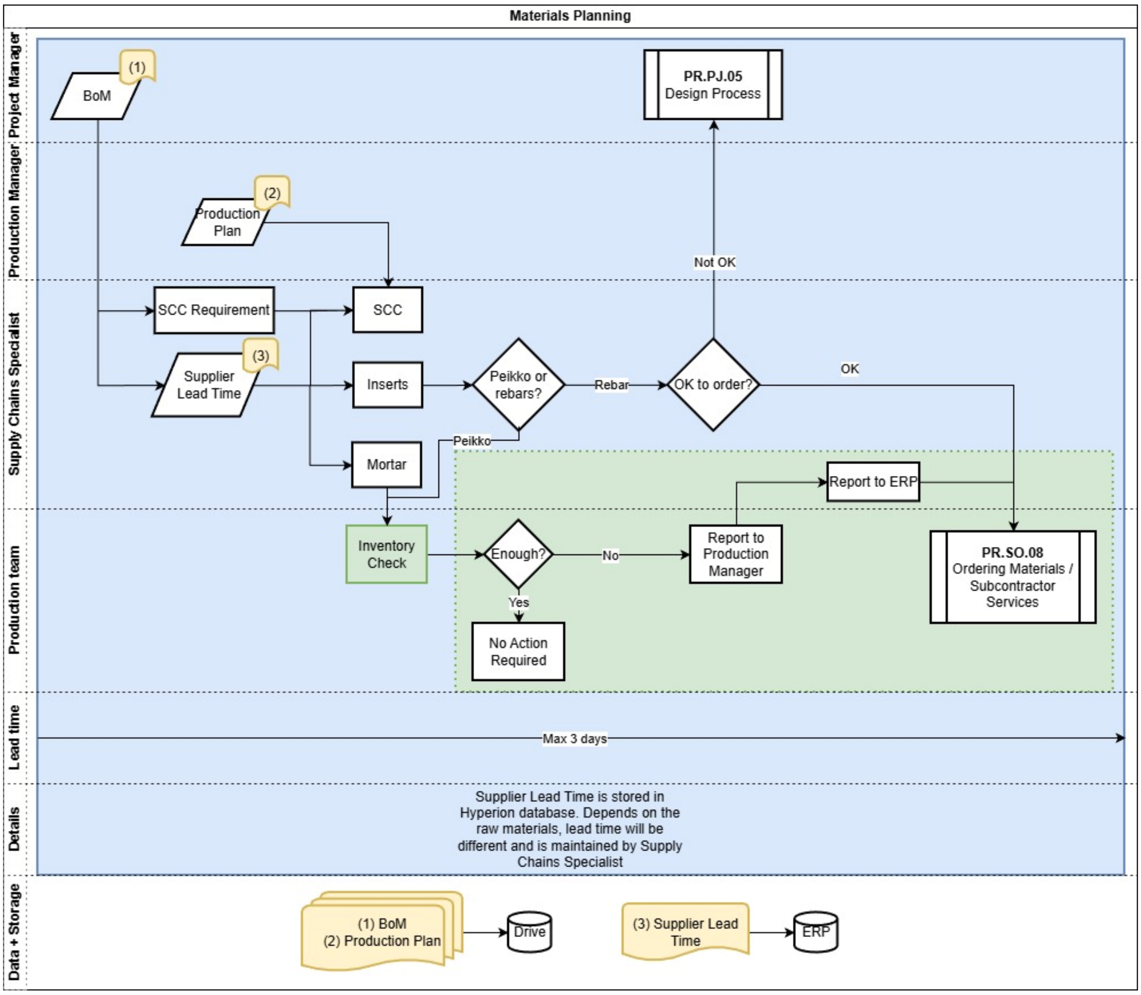


Figure 9. The ‘To-Be’ Material Planning Process.

This provides the foundation for the "Materials Planning" process (Figure 9), which is a significant operational improvement. This new process formally links the "Master Production Plan" to inventory, forcing a check for material availability before a production order is released. If materials are unavailable, it triggers a formal "Purchase Request," effectively changing the company's procurement from a reactive, "panic" model to a proactive, plan-driven one.

5.3.3 Re-designed Manufacturing and Delivery

This section details the remaining "to-be" processes from the "Inventory Action Plan," which standardize the flow of information and materials from production planning to final delivery.

PROCESS 5. Production Planning

The CSA found the manufacturing process was managed by a "disconnected array of digital and physical tools" (Google sheets, whiteboards), which led to production halts when material shortages were discovered too late. The new "Production Planning" process (Figure 10) aims to solve these problems.

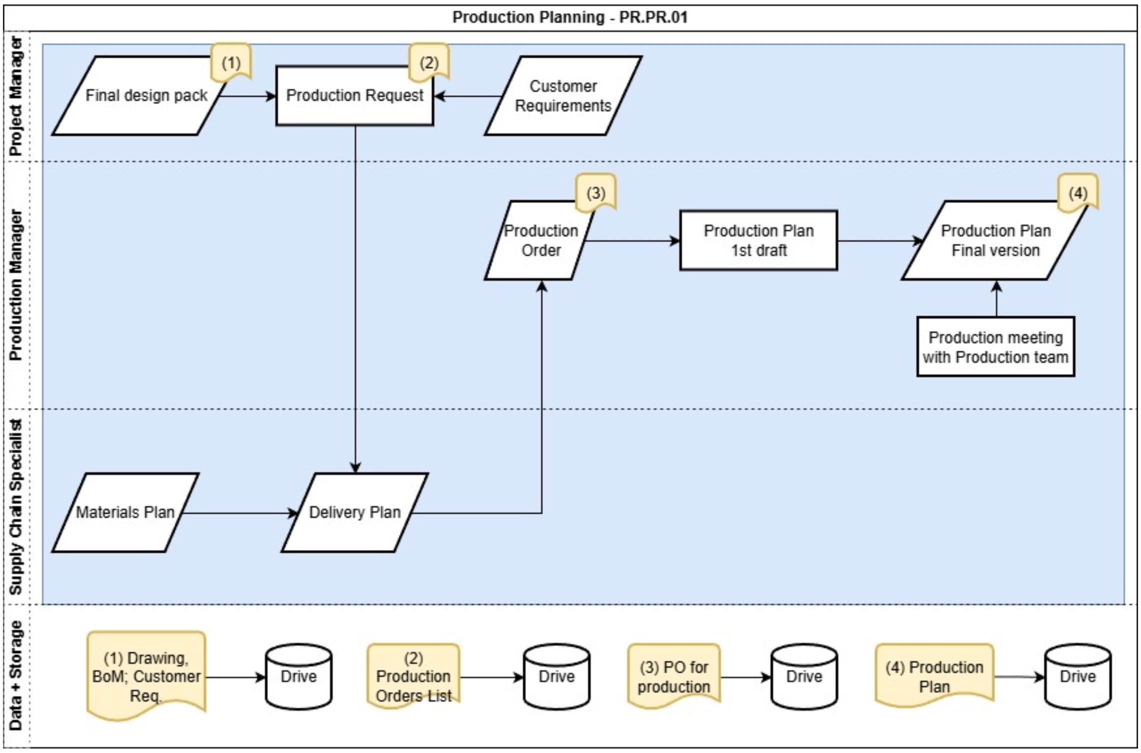


Figure 10. The 'To-Be' Production Planning Process.

As shown in Figure 10, the new process replaces the whiteboard and disconnected files with a formal "Master Production Plan" and "Weekly Production Plan." This creates a single, published plan for all stakeholders (Project, Production, Procurement, and Supply Chain). The plan's most critical new step is the formal "Material Planning" check, which requires the Production Manager to verify material availability before releasing the weekly plan. This directly prevents the production halts identified in the CSA.

PROCESSES 6 & 7. Delivery Planning and Execution

The CSA identified the delivery process as reliant on "manual coordination" and informal "email" and "Gmail" communication. The new "Delivery Planning" (Figure 11) and "Delivery Process" (Figure 12) formalize these workflows.

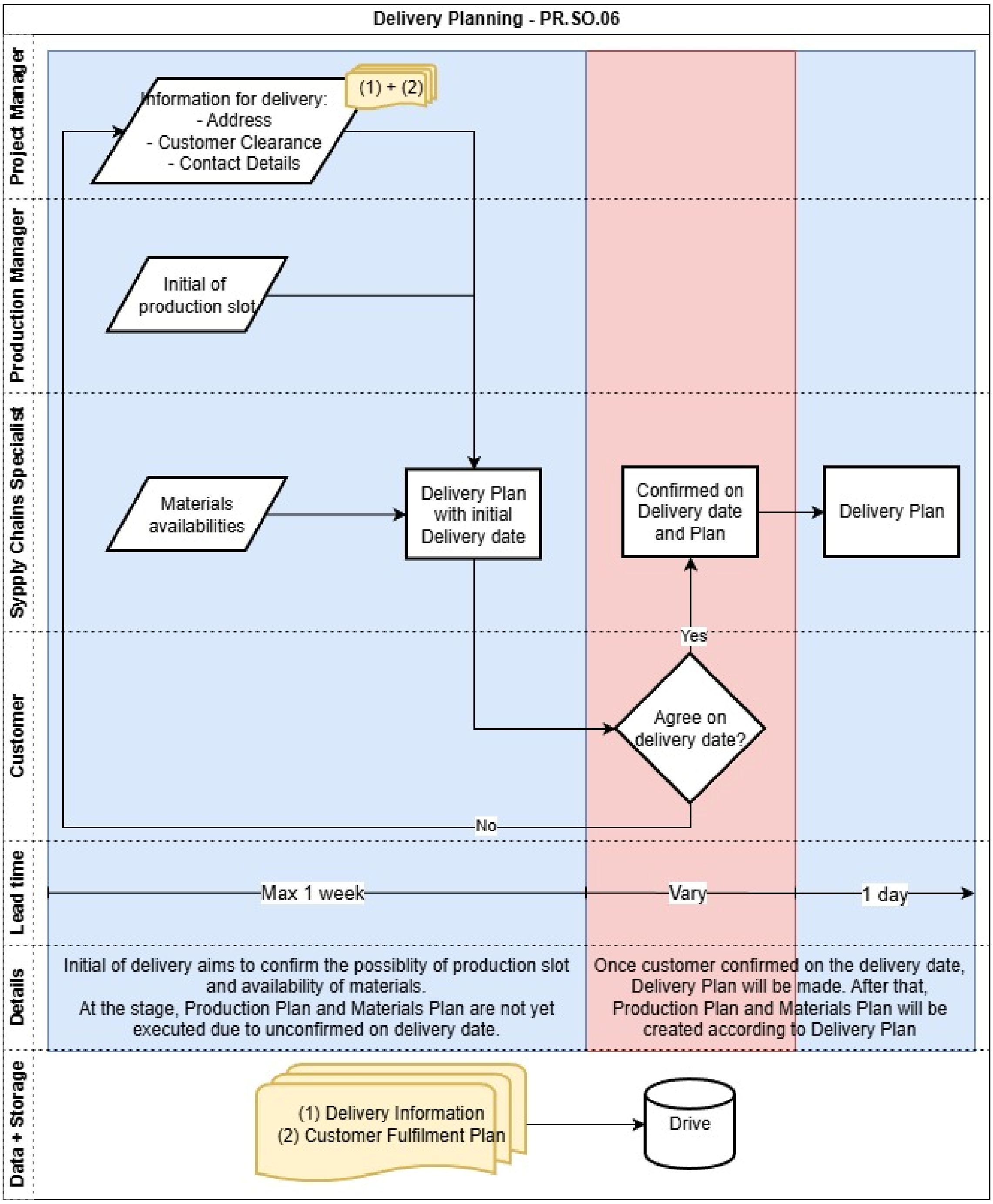


Figure 11. The 'To-Be' Delivery Planning Process.

The "Delivery Planning" process (Figure 11) is now formally triggered by the "Production Plan," creating a seamless handoff. It centralizes the collection of all necessary information ("Delivery information," "Packing list," "Proforma invoice") before contacting the shipping company.

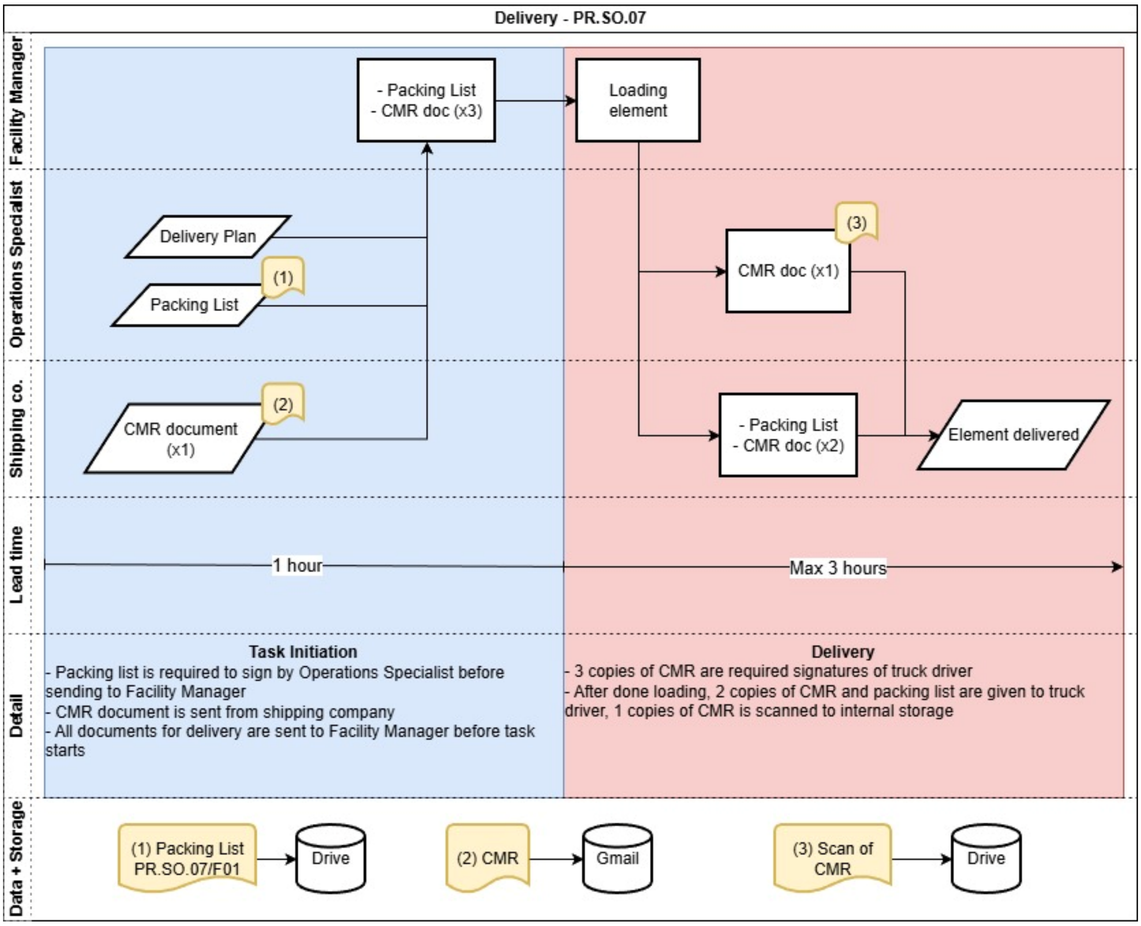


Figure 12. The 'To-Be' Delivery Process.

The "Delivery Process" (Figure 12) then formalizes the execution, ensuring all documentation is correctly handled and archived. Together, these new standardized processes form a comprehensive, immediate solution that stabilizes operations and meets the company's urgent FPC project goals.

5.4 Risk Assessment for ERP Implementation

While the proposal in Section 5.3 creates a path forward, the literature review in Section 4 repeatedly warns that the greatest challenges in such projects are not technical, but human and organizational. The "soft stuff" is more likely to determine the project's outcome (Bradford, 2020). Therefore, a formal risk assessment is critical for both parts of the proposal.

Risks for Part 1: The Short-Term "Inventory Action Plan"

This immediate, "no-cost" implementation of new processes for the FPC project carries significant, non-technical risks:

First, *the Risk of Employee Resistance (OCM):* The new processes demand a shift from informal, verbal communication to formal, system-based data entry. As the literature notes, employees often "mind being changed" (Monk & Wagner, 2013). There is a high risk that staff will view the new standardized workflows as bureaucratic or inefficient, leading to poor adoption, data entry failures, or the creation of "shadow IT" workarounds.

Second, *the Risk of Lack of Management Enforcement*: The literature identifies "consistent and visible support of top management" as a foundational success factor. The primary risk to the short-term plan is a failure of leadership to enforce compliance. If the new processes are presented as optional, or if managers do not hold their teams accountable, employees will revert to the old, comfortable habits, and the FPC project goals will not be met.

Third, *the Risk of Poor Data Integrity*: The "Inventory Action Plan" is entirely dependent on the accurate and timely logging of all material movements (receipts, consumption, adjustments). A major risk is that busy employees, unaccustomed to this level of rigor, will fail to log transactions. This would corrupt the data in the existing Odoo system from day one, rendering the new "single source of truth" unreliable and defeating the plan's core objective.

Risks for Part 2: The Long-Term "Strategic ERP Roadmap"

The risks for the long-term roadmap are more strategic and relate to project management and financial planning:

First, *the Risk of Project Fatigue and Lost Momentum*: The greatest risk is that the short-term "Inventory Action Plan," if successful, can be seen as "good enough." Management may then de-prioritize the long-term strategic solution to avoid the cost and disruption of a full ERP implementation, leaving the company's deeper-rooted scalability issues unsolved.

Second, *the Risk of Resource & Team Allocation*: A successful ERP selection requires a dedicated, empowered, and "cross-functional project team" (Monk & Wagner, 2013).

A key risk is that the company will fail to formally allocate the time of its key process owners (from production, supply chain, and operations) to manage the complex vendor demo and evaluation phase.

Third, *the Risk of Underestimating Total Cost of Ownership (TCO):* The literature warns that a selection process focused only on initial license fees is a "precursor to failure”. There is a significant risk that the company will underestimate the full TCO, which must include implementation partner fees, comprehensive training, data migration, and critical customizations (such as the POD tracking module that all vendors lacked).

5.5 Required Resources for ERP Implementation

Addressing the risks identified in Section 5.4 requires the formal allocation of specific resources. These resources are not just financial but are primarily related to management focus and personnel time, as supported by the literature.

Resources for Part 1: The Short-Term "Inventory Action Plan"

While this is a "no-cost" software solution, it has significant human resource costs:

First, the Active Management Sponsorship: The primary resource required is the "consistent and visible support of top management" (Bradford, 2020). This includes leadership time spent communicating the non-negotiable importance of the new FPC processes and enforcing their adoption.

Second, the Internal Project Team Time: The literature emphasizes the need for an internal team with "detailed, practical knowledge" (Monk & Wagner, 2013). For this phase, this includes:

Third, the Process Owner Time: The Process Engineer, Production Manager, and Supply Chain Specialist (the researcher) must be allocated time to lead training sessions and audit the new workflows.

Fourth, the IT / Odoo Configuration Time: Resources must be allocated to configure the existing Odoo system to support the new processes (e.g., setting up fields, user permissions, and basic reports).

Fifth, the Formal Employee Training: A "comprehensive training" program is essential for user adoption. This requires allocating employee time away from daily duties to attend formal training sessions on the new standardized "to-be" processes.

Resources for Part 2: The Long-Term "Strategic ERP Roadmap"

This phase requires a formal capital investment and the chartering of a dedicated team:

First, the Cross-Functional Evaluation Team: The company must formally charter the evaluation team identified in the literature, including the CTO, Head of Ops, Process Engineer, Production Manager, and Supply Chain Specialist. This team must be given the authority and time to manage the vendor demo and selection process.

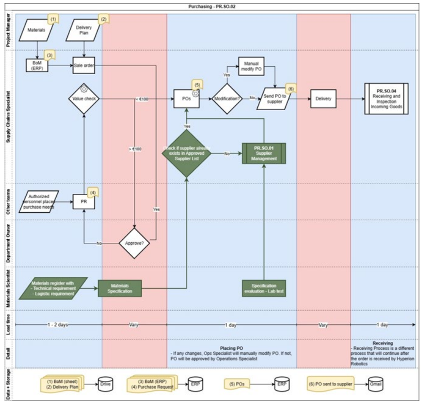
Second, the Capital Expenditure Budget (TCO): A formal budget must be approved that accounts for the full Total Cost of Ownership. This budget must include the software (license or subscription), implementation partner fees, customization, data migration, and internal/external training resources.

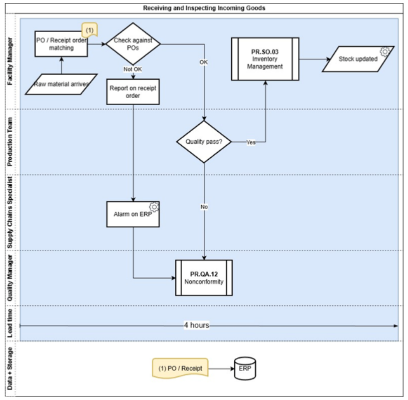
Third, the External Implementation Partner: As an SME lacking deep in-house ERP expertise, the company must "hire an external team of software consultants" (Monk & Wagner, 2013). Resources must be allocated to find, vet, and contract a suitable implementation partner whose expertise matches the company's needs.

5.6 Summary of the Initial Proposal

The Initial Proposal, developed from the CSA (Section 3) and co-creation workshops (Data 2a/2b), is a two-part solution designed to meet the company's immediate operational needs (FPC certification) and its long-term strategic goals (scalability). The proposal, summarized in Table 8, was presented to key stakeholders for validation.

Table 8. Summary of All the Initial Proposal Elements.

<table>
<tr><th>ERP Section results</th><th>Maps of 7 re-designed processes</th><th>Risks (for Parts 1 & 2)</th><th>Resources (for parts 1 & 2)</th></tr>
<tr>
<td>
Table 7. Selection Results for the Functional Requirements and ERP Vendors' Comparison.
<table>
<tr><th rowspan="2">Requirement ID</th><th rowspan="2">Functional Requirement</th><th colspan="4">ERP Vendors</th></tr>
<tr><th>Odoo</th><th>NetSuite</th><th>Monitor ERP</th><th>ERPNext</th></tr>
<tr><td>FR-I1</td><td>Centralized, real-time inventory view.</td><td>Fully supported</td><td>Fully supported</td><td>Fully supported</td><td>Fully supported</td></tr>
<tr><td>FR-I2</td><td>Log material consumption per project.</td><td>Fully supported</td><td>Fully supported</td><td>Fully supported</td><td>Fully supported</td></tr>
<tr><td>FR-I3</td><td>QC for received materials (Quarantine).</td><td>Fully supported</td><td>Fully supported</td><td>Fully supported</td><td>Fully supported</td></tr>
<tr><td>FR-P1</td><td>Formal, auditable purchase requisitions.</td><td>Fully supported</td><td>Fully supported</td><td>Fully supported</td><td>Fully supported</td></tr>
<tr><td>FR-P2</td><td>Centralized PO& vendor data.</td><td>Fully supported</td><td>Fully supported</td><td>Fully supported</td><td>Fully supported</td></tr>
<tr><td>FR-P3</td><td>Real-time PO status tracking.</td><td>Fully supported</td><td>Fully supported</td><td>Fully supported</td><td>Fully supported</td></tr>
<tr><td>FR-P4</td><td>Link receiving to original PO.</td><td>Fully supported</td><td>Fully supported</td><td>Fully supported</td><td>Partial support – needs customization</td></tr>
<tr><td>FR-M1</td><td>Single, integrated production schedule.</td><td>Fully supported</td><td>Fully supported</td><td>Fully supported</td><td>Fully supported</td></tr>
<tr><td>FR-M2</td><td>Verify material availability before release.</td><td>Fully supported</td><td>Fully supported</td><td>Fully supported</td><td>Fully supported</td></tr>
<tr><td>FR-M3</td><td>Automate notifications (e.g., to Delivery).</td><td>Partial support – needs customization</td><td>Fully supported</td><td>Partial support – needs customization</td><td>Partial support – needs customization</td></tr>
<tr><td>FR-M4</td><td>Real-time, end-to-end order status.</td><td>Fully supported</td><td>Fully supported</td><td>Fully supported</td><td>Fully supported</td></tr>
<tr><td>FR-D1</td><td>Auto-generate shipping/export documents.</td><td>Not supported</td><td>Partial support – needs customization</td><td>Partial support – needs customization</td><td>Fully supported</td></tr>
<tr><td>FR-D2</td><td>Formal POD tracking process.</td><td>Not supported</td><td>Not supported</td><td>Not supported</td><td>Not supported</td></tr>
<tr><td>FR-D3</td><td>Real-time shipment visibility (tracking).</td><td>Partial support – needs customization</td><td>Fully supported</td><td>Partial support – needs customization</td><td>Fully supported</td></tr>
<tr><td>FR-D4</td><td>Digital attachment of documents to order.</td><td>Partial support – needs customization</td><td>Fully supported</td><td>Partial support – needs customization</td><td>Fully supported</td></tr>
</table>
</td>
<td>




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Risks for Part 1: The Short-Term "Inventory Action Plan"

1.1 Risk of Employee Resistance (OCM)

1.2 Risk of Lack of Management Enforcement

1.3 Risk of Poor Data Integrity

Risks for Part 2: The Long-Term "Strategic ERP Roadmap"

2.1 Risk of Project Fatigue and Lost Momentum

2.2 Risk of Resource & Team Allocation

2.3 Risk of Underestimating Total Cost of Ownership (TCO)

</td>
<td>

Resources for Part 1: The Short-Term "Inventory Action Plan"

1.1 Active Management Sponsorship

1.2 Internal Project Team Time

1.3 Process Owner Time

1.4 IT / Odoo Configuration Time

1.5 Formal Employee Training

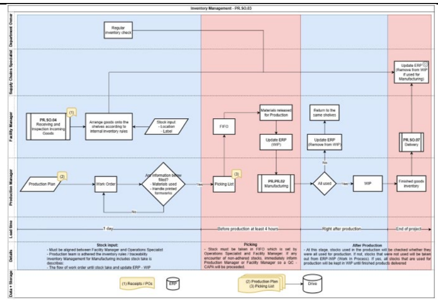
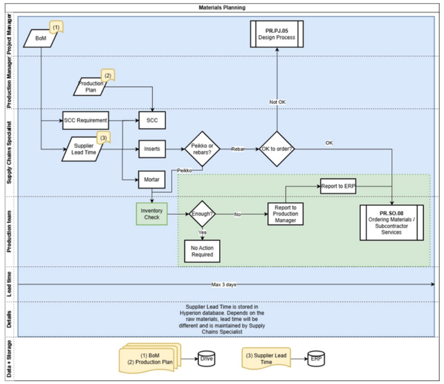
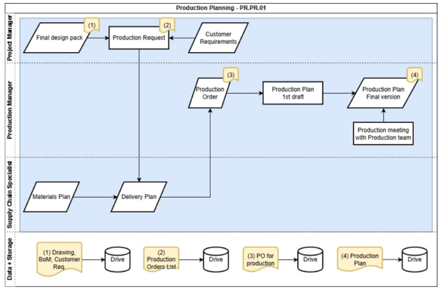
Resources for Part 2: The Long-Term "Strategic ERP Roadmap"

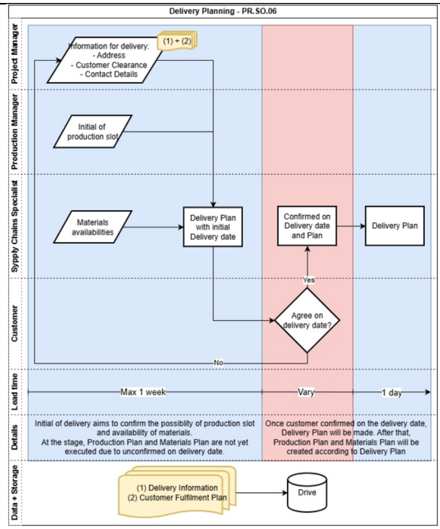
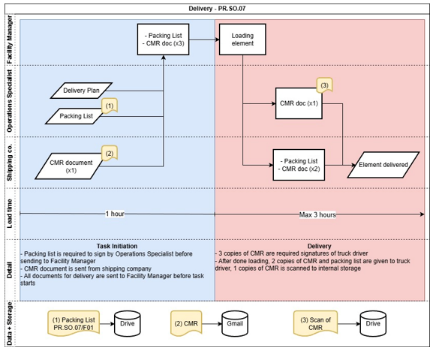
2.1 Cross-Functional Evaluation Team

2.2 Capital Expenditure Budget (TCO)

2.3 External Implementation Partner

</td>
</tr>
</table>

	Inventory Management - PR.SO.03 Department Owner Supply Chains Specialist Facility Manager Production Manager Lead time Details Data + Storage Regular inventory check Update ERP (Remove from WIP if used for Manufacturing) PR.SO.04 Receiving and Inspection Incoming Goods (1) Arrange goods onto the shelves according to internal inventory rules Stock input: - Location - Label FIFO Materials released for Production Update ERP (WIP) Return to the same shelves Update ERP (Remove from WIP) PR.SO.07 Delivery Production Plan (2) Work Order Are information below filled? - Materials used - Handle printed formworks Yes No Picking List (3) PR.PR.02 Manufacturing All used WIP Finished goods inventory 1 day Before production at least 4 hours Right after production End of project Stock input: Picking After Production (1) Receipts / POs ERP (2) Production Plan (3) Picking List Drive Materials Planning Project Manager Production Manager Supply Chains Specialist Production team Lead time Details Data + Storage BoM (1) PR.PJ.05 Design Process Production Plan (2) Not OK SCC Requirement SCC Supplier Lead Time (3) Inserts Peikko or rebars? Rebar OK to order? OK Mortar Peikko Report to ERP Inventory Check Enough? No Report to Production Manager PR.SO.08 Ordering Materials / Subcontractor Services Yes No Action Required Max 3 days Supplier Lead Time is stored in Hyperion database. Depends on the raw materials, lead time will be different and is maintained by Supply Chains Specialist (1) BoM (2) Production Plan Drive (3) Supplier Lead Time ERP Production Planning - PR.PR.01 Project Manager Production Manager Supply Chain Specialist Data + Storage Final design pack (1) Production Request (2) Customer Requirements Production Order (3) Production Plan 1st draft Production Plan Final version (4) Production meeting with Production team Materials Plan Delivery Plan (1) Drawing, BoM, Customer Req. Drive (2) Production Orders List Drive (3) PO for production Drive (4) Production Plan Drive		

Delivery Planning - PR.SO.06
Project Manager
Production Manager
Sypply Chains Specialist
Customer
Lead time
Details
Data + Storage
Information for delivery:
- Address
- Customer Clearance
- Contact Details
(1) + (2)
Initial of production slot
Materials availabilities
Delivery Plan with initial Delivery date
Confirmed on Delivery date and Plan
Delivery Plan
Yes
Agree on delivery date?
No
Max 1 week
Vary
1 day
Initial of delivery aims to confirm the possiblity of production slot and availability of materials.
At the stage, Production Plan and Materials Plan are not yet executed due to unconfirmed on delivery date.
Once customer confirmed on the delivery date, Delivery Plan will be made. After that, Production Plan and Materials Plan will be created according to Delivery Plan
(1) Delivery Information
(2) Customer Fulfilment Plan
Drive

Delivery - PR.SO.07
Facility Manager
Operations Specialist
Shipping co.
Lead time
Detail
Data + Storage
- Packing List
- CMR doc (x3)
Loading element
Delivery Plan
Packing List
(1)
CMR document (x1)
(2)
CMR doc (x1)
(3)
- Packing List
- CMR doc (x2)
Element delivered
1 hour
Max 3 hours
Task Initiation
- Packing list is required to sign by Operations Specialist before sending to Facility Manager
- CMR document is sent from shipping company
- All documents for delivery are sent to Facility Manager before task starts
Delivery
- 3 copies of CMR are required signatures of truck driver
- After done loading, 2 copies of CMR and packing list are given to truck driver, 1 copies of CMR is scanned to internal storage
(1) Packing List PR.SO.07/F01
Drive
(2) CMR
Gmail
(3) Scan of CMR
Drive

6 Validation of the Proposal

This section reports on the results of the validation stage, which is the final "reflection" and "evaluation" phase of the Applied Action Research cycle. It details the feedback received from key stakeholders on the Initial Proposal (presented in Section 5) and outlines the final adjustments made to create the Final Proposal.

6.1 Overview of the Validation Stage

The primary goal of this validation stage was to present the two-part Initial Proposal to the case company's key stakeholders for expert judgment and approval. This step is critical for ensuring the proposed solution is not just theoretically sound but is also practical, feasible, and aligned with the operational realities and strategic goals of the business.

The logic of the validation was structured into three parts. Firstly, the two-part proposal from Section 5 was formally presented in a single group session in November 2025. This session included the core cross-functional team: the Chief of Technology (CTO), Head of Operations, Process Engineer, Production Manager, and Facility Manager. Second, each component of the proposal was systematically reviewed: (A) Part 1: The Short-Term "Inventory Action Plan" (the 7 "to-be" process maps and the plan to re-configure the existing Odoo system). (B) Part 2: The Long-Term "Strategic ERP Roadmap" (the vendor analysis and the "Finalist Shortlist" of NetSuite, Monitor ERP, and ERPNext). Third, stakeholders were asked to provide direct feedback, corrections, and approval for each functional requirement and proposed process. This feedback (Data 3) was captured to serve as the definitive record for approving the plan and identifying mandatory adjustments.

This process ensures that the "Final Proposal" is not just a top-down recommendation but a co-created solution that has buy-in from the individuals who will be responsible for implementing it.

6.2 Inputs from Stakeholders (Data 3)

Data collection 3 was focused on capturing the expert feedback from the stakeholder validation session.

6.2.1 On ERP Recommendations (The Long-Term Roadmap)

The feedback on Part 2 of the proposal, the "Strategic ERP Roadmap," was positive and confirmed the company's long-term needs. Stakeholders universally agreed on all requirements for Manufacturing and Delivery, such as the need for automated document generation and POD tracking. This confirms that the 18 PIMD requirements used for the vendor analysis are a correct and complete representation of the company's immediate strategic needs.

However, the most significant strategic feedback came from the CTO, who expanded the project's long-term vision. The CTO noted that for a full-scale implementation, the scope must eventually expand beyond the initial PIMD focus to include other core departments, specifically Sales and Finance. This would be a large, company-wide undertaking requiring significant cross-team cooperation and careful change management.

This comment was critical for two reasons: (A) It confirmed the technical strategy: The CTO validated the idea of a hybrid approach by confirming the "Possibility to connect two software together using plug-ins or customize". This is especially relevant if the future system must connect to separate, best-in-class tools for Sales (e.g., a CRM) and Finance. (B) It validated the resource model: The CTO stressed that such a large-scale project must be done carefully and that the support of an outside expert would be welcomed. This directly aligns with the literature, which states that SMEs lacking in-house expertise "hire an external team of software consultants to help choose the right software vendor" (Monk & Wagner, 2013).

This feedback effectively finalized the long-term roadmap: the PIMD module is the first phase, but the final vendor selection must account for a future, company-wide integration with Sales and Finance, to be led by an external partner.

6.2.2 On Designed Processes (The Short-Term Action Plan)

The feedback on Part 1, the "Inventory Action Plan," was one of unanimous approval for its direction. The stakeholders validated the new "to-be" processes as the correct solution to the problems from the CSA. The feedback in this area was not a challenge, but rather a "deep dive" into refinement and scope expansion to ensure a successful rollout.

Table 9. Feedback from Stakeholders on Short-Term Action Plan.

Feedback from Stakeholders on Short-Term Action Plan	
1. Refining Granularity	The Production Manager's feedback to link material consumption to a "project instead of task" was a critical clarification to define the correct level of data tracking. This provides the necessary traceability without creating an excessive, time-consuming data-entry burden for the production team.
2. Expanding Scope	The plan's scope was significantly expanded based on key operational insights. The Facility Manager noted that "consumables like timber, screws" must be tracked, and the Production Manager added the requirement to "also track waste generated". This ensures the new inventory system will capture a complete and accurate picture of all material flows, not just high-value components.
3. Adding Process Details	Stakeholders also added minor, practical details, such as the Facility Manager's request to "Look for a way to match trailer ID with the shipping document," which refines the "to-be" delivery process.

6.2.3 On Risks and Resources Estimates

Stakeholder feedback on the resource requirements focused heavily on governance and ensuring the new system would be auditable and robust. The comments from the CTO were most significant, moving the proposal from a simple operational plan to a financially sound one.

Specifically, the requirements to have "at least 2 of approvers for accounting traceability" and to ensure "Accountants, auditors need to have visibility" were added to the Final

Proposal. This feedback directly validates the risk assessment from Section 5, which identified poor adoption and data integrity as key risks. By mandating formal financial controls and auditability from the start, this feedback provides the top-down, management-level enforcement needed to ensure the new, standardized processes are followed by all employees.

6.3 Final Proposal Adjustments

The validation session confirmed the overall direction of the Initial Proposal. The stakeholder feedback (Data 3) was primarily focused on refinement and scope clarification rather than fundamental changes. Based on the specific comments detailed in Table 9 and analyzed in Section 6.2, the following adjustments were incorporated to create the Final Proposal:

Table 10. Adjustments for Final Proposal.

Adjustments for Final Proposal	
1. On Process Granularity	The proposal was adjusted to log material consumption at the "project" level rather than the "task" level. This adjustment, suggested by the Production Manager, provides the required traceability without creating an excessive administrative burden.
2. On Inventory Scope	The scope of the “Inventory Action Plan” was expanded. Per the Facility Manager’s feedback, the plan now includes the tracking of consumables (e.g., timber, screws). Per the Production Manager’s feedback, it also now includes a mechanism to track waste materials generated during production and testing.
3. On Financial Governance	To meet audit and traceability requirements, the “to-be” Purchasing process was modified. Per the CTO’s feedback, all purchase requisitions now require a minimum of two approvers, and the system must be configured to provide “read-only” visibility for accountants and auditors.
4. On Future-State Planning	The Long-Term Roadmap was updated to reflect the CTO's feedback on technical strategy. The evaluation of finalists will now explicitly include the "possibility to connect two software together using plug-ins or customize". This confirms a hybrid approach as a viable alternative to a single, all-in-one system.

6.4 Final Proposal

This section presents the Final Proposal, as validated and adjusted by the key stakeholder team (Data 3). This plan provides the case company with a clear, two-part action plan to solve the weaknesses identified in the current state analysis (Section 3). It addresses both the immediate, urgent needs of the FPC project and the long-term strategic need for a scalable technology platform.

Part 1: The Immediate-Term Action Plan (Implementation: Q4 2025 - Q1 2026)

This plan is focused on immediate, "no-cost" implementation using existing tools (primarily the Odoo ERP) and standardized processes.

Table 11. The Immediate-Term Action Plan.

The Immediate-Term Action Plan	
1. Formally Adopt New Processes	Immediately adopt and enforce the seven "to-be" standardized process maps (Appendices 1-7) for Purchasing, Receiving, Inventory, Materials Planning, Production Planning, and Delivery.
2. Re-Configure Odoo	Allocate IT and Process Owner resources to immediately configure the existing Odoo system to support these new processes.
	a. Enforce the mandatory, two-approver "Purchase Requisition" workflow.
	b. Build the "Inventory Management" module to track all movements, including the newly added consumables and waste streams.
	c. Link material consumption directly to “Projects” as defined by the new “Production Planning” process.
3. Conduct Mandatory Training	Schedule and conduct formal training sessions for all staff in production, procurement, and logistics on the new standardized processes and Odoo workflows.
4. Establish Governance	Formally empower the Production Manager and Facility Manager to act as "Process Owners," responsible for auditing compliance with the new workflows and ensuring data integrity.

Part 2: The Long-Term Strategic Action Plan (Evaluation: Q1-Q2 2026)

This plan focuses on selecting and securing a permanent, scalable ERP solution.

Table 12. The Long-Term Strategic Action Plan.

The Long-Term Strategic Action Plan	
1. Develop Scripted Demos	The team will develop a “scripted demo” based on the 18 validated functional requirements (Table 9). This script must include the specific pain points identified, such as the need for a POD-tracking solution. Per the CTO’s feedback, the script must also evaluate the vendors’ long-term capability to expand the scope to include Sales and Finance modules and to integrate with other software.
2. Execute Vendor Evaluation	Conduct the formal, scripted demonstrations with the three shortlisted finalists: NetSuite, Monitor ERP, and ERPNext.

3. Begin External Partner Vetting	In parallel with the vendor evaluation, and based on the CTO's recommendation for an outside expert, the team will begin vetting external implementation partners. This aligns with the literature (Monk & Wagner, 2013) that SMEs should hire consultants for complex implementations.
4. Secure Final Approval	The team will make a final, data-driven recommendation for both a software vendor and an implementation partner. This will include a full Total Cost of Ownership (TCO) analysis and secure financial approval from management for purchase and implementation, targeted for the second half of 2026.

6.5 Summary of the Final Proposal

The Final Proposal, developed from the Validation session (Section 6) to adjust to the company's immediate operational needs (FPC certification) and its long-term strategic goals (scalability). The Final proposal, summarized in Table 13, is done based on the key stakeholders' validation.

Table 13. Summary of all the Final Proposal Elements.

<table>
<tr><th>Input from Stakeholders (Data 3)</th><th>Final Proposal Adjustments</th><th>Final Proposal</th></tr>
<tr>
<td>
On ERP Recommendation (The Long-Term Roadmap)

Stakeholders universally agreed on all requirements for Manufacturing and Delivery.
The CTO noted that for a full-scale implementation, the scope must expand beyond the initial PIMD focus to include other core departments, specifically Sales and Finance.
The CTO stated that such a large-scale project must be done carefully and should involve the support of an outside expert.

On Designed Processes (The Short-Term Action Plan)

The stakeholders validated the new "to-be" processes as the correct solution to the problems from the CSA.

</td>
<td>
<table>
<tr><th colspan="2">Adjustments for Final Proposal</th></tr>
<tr><td>1. On Process Granularity</td><td>The proposal was adjusted to log material consumption at the "project" level rather than the "task" level. This adjustment, suggested by the Production Manager, provides the required traceability without creating an excessive administrative burden.</td></tr>
<tr><td>2. On Inventory Scope</td><td>The scope of the “Inventory Action Plan” was expanded. Per the Facility Manager’s feedback, the plan now includes the tracking of consumables (e.g., timber, screws). Per the Production Manager’s feedback, it also now includes a mechanism to track waste materials generated during production and testing.</td></tr>
<tr><td>3. On Financial Governance</td><td>To meet audit and traceability requirements, the “to-be” Purchasing process was modified. Per the CTO’s feedback, all purchase requisitions now require a minimum of two approvers, and the system must be configured to provide “read-only” visibility for accountants and auditors.</td></tr>
<tr><td>4. On Future-State Planning</td><td>The Long-Term Roadmap was updated to reflect the CTO's feedback on technical strategy. The evaluation of finalists will now explicitly include the "possibility to connect two software together using plug-ins or customize". This confirms a hybrid approach as a viable alternative to a single, all-in-one system.</td></tr>
</table>
</td>
<td>
Part 1: The Immediate-Term Action Plan (Implementation: Q4 2025 - Q1 2026)
<table>
<tr><th colspan="2">The Immediate-Term Action Plan</th></tr>
<tr><td>1. Formally Adopt New Processes</td><td>Immediately adopt and enforce the seven "to-be" standardized process maps (Appendices 1-7) for Purchasing, Receiving, Inventory, Materials Planning, Production Planning, and Delivery.</td></tr>
<tr><td rowspan="4">2. Re-Configure Odoo</td><td>Allocate IT and Process Owner resources to immediately configure the existing Odoo system to support these new processes.</td></tr>
<tr><td>a. Enforce the mandatory, two-approver "Purchase Requisition" workflow.</td></tr>
<tr><td>b. Build the "Inventory Management" module to track all movements, including the newly added consumables and waste streams.</td></tr>
<tr><td>c. Link material consumption directly to “Projects” as defined by the new “Production Planning” process.</td></tr>
<tr><td>3. Conduct Mandatory Training</td><td>Schedule and conduct formal training sessions for all staff in production, procurement, and logistics on the new standardized processes and Odoo workflows.</td></tr>
<tr><td>4. Establish Governance</td><td>Formally empower the Production Manager and Facility Manager to act as "Process Owners," responsible for auditing compliance with the new workflows and ensuring data integrity.</td></tr>
</table>
</td>
</tr>
</table>

- Refining Granularity from the Production Manager's feedback to link material consumption to a "project instead of task" to define the correct level of data tracking.
- Expanding Scope of the inventory system that should capture a complete and accurate picture of all material flows, not just high-value components.
- Adding Process Details input from the Facility Manager to "Look for a way to match trailer ID with the shipping document," which refines the "to-be" delivery process.

On Risks and Resources Estimates

- Stakeholder feedback prioritized making the system auditable and robust by transforming the proposal from a simple operational plan into a financially sound one.
- The CTO required two critical additions to the Final Proposal to ensure accounting traceability:

Part 2: The Long-Term Strategic Action Plan (Evaluation: Q1-Q2 2026)

The Long-Term Strategic Action Plan	
1. Develop Scripted Demos	The team will develop a “scripted demo” based on the 18 validated functional requirements (Table 9). This script must include the specific pain points identified, such as the need for a POD-tracking solution. Per the CTO’s feedback, the script must also evaluate the vendors’ long-term capability to expand the scope to include Sales and Finance modules and to integrate with other software.
2. Execute Vendor Evaluation	Conduct the formal, scripted demonstrations with the three shortlisted finalists: NetSuite, Monitor ERP, and ERPNext.
3. Begin External Partner Vetting	In parallel with the vendor evaluation, and based on the CTO’s recommendation for an outside expert, the team will begin vetting external implementation partners. This aligns with the literature (Monk & Wagner, 2013) that SMEs should hire consultants for complex implementations.
4. Secure Final Approval	The team will make a final, data-driven recommendation for both a software vendor and an implementation partner. This will include a full Total Cost of Ownership (TCO) analysis and secure financial approval from management for purchase and implementation, targeted for the second half of 2026.

○ A mandatory "2-approver" workflow for purchasing ○ Read-only visibility for "accountants and auditors". • Embedding formal financial controls, the proposal now has management-level enforcement to ensure employees follow new processes.		

7 Conclusion

This final section synthesizes the entire research project, from the initial identification of the business challenge to the final, validated proposal. It begins with an executive summary of the thesis, presents the managerial implications and next steps for the case company, evaluates the thesis process and its limitations, and concludes with closing words.

7.1 Executive Summary

The objective of this thesis was to address critical operational inefficiencies within a 33-person SME in the construction-tech sector by proposing a new Enterprise Resource Planning (ERP) system and an associated implementation plan. The company's operations, particularly in purchasing, inventory, manufacturing, and delivery (PIMD), were characterized by fragmented, manual processes (G-Sheets, whiteboards) and an improperly implemented existing ERP. This resulted in a severe lack of operational visibility, leading to production-halting material shortages, reactive "panic buying", and an inability to track order status.

This study utilized an Applied Action Research (AAR) methodology, enabling the researcher to act as an embedded participant to solve these real-world problems. The research was conducted in stages, gathering qualitative data (Data 1, 2, and 3) through stakeholder interviews, document analysis, co-creation workshops, and a final validation session.

The Current State Analysis (Data 1) identified the root cause of the business challenges: a lack of a centralized, integrated information system. This analysis produced a validated list of 18 functional requirements (FRs) for a new system. The literature review (Section 4) provided the academic foundation, outlining best practices for ERP selection and process alignment, which formed the conceptual framework for the proposal.

The resulting outcome of this thesis is a comprehensive, two-part Final Proposal (Section 6), which was co-developed and validated by key company stakeholders. This dual-track solution is designed to meet both immediate business needs (driven by an FPC certification project) and long-term strategic goals:

In Part 1, the Immediate-Term Action Plan, is a "no-cost" solution that focuses on stabilizing current operations. It consists of seven new, standardized "to-be" process maps (Appendices 1-7) for all PIMD functions. This plan is designed to be implemented immediately by re-configuring and properly utilizing the company's existing Odoo ERP system. This action directly solves the CSA's key problems by formalizing the purchasing process, establishing a centralized inventory log, and integrating materials planning with production to prevent shortages.

In Part 2, the Long-Term Strategic Action Plan, is the plan that provides the roadmap for future scalability. It presents a "Finalist Shortlist" of three ERP vendors (NetSuite, Monitor ERP, and ERPNext) based on a structured analysis of their ability to meet the 18 functional requirements. It recommends a formal, scripted demo phase to select a final partner.

This two-part proposal was presented in a final validation session (Data 3) and was overwhelmingly approved by the stakeholder team (CTO, Head of Ops, etc.). The feedback was used to refine the proposal with critical adjustments, such as expanding the inventory scope to include consumables and waste, requiring two approvers for purchase requisitions to ensure financial auditability, and expanding the long-term vision to include Sales and Finance modules.

The final, validated proposal is already in use, with the "Inventory Action Plan" providing the immediate business value required for the FPC certification. The "Strategic Roadmap" provides the company with a clear, data-driven path to select a permanent, scalable system, guided by external experts, to support its future growth.

7.2 Managerial Implications

The Final Proposal presented in Section 6.4 is not just a theoretical outcome but a practical, validated action plan. To ensure this proposal is put into practice and delivers its intended value, the following managerial steps are recommended:

First, formally empower the Process Owners and enforce the short-term plan. The immediate success of the "Inventory Action Plan" depends on top-down enforcement. Management must publicly and visibly support the new standardized processes

(Appendices 1-7) and the Process Owners (Production Manager, Facility Manager) tasked with auditing them. This ensures all employees understand that the new, Odoo-based workflows are mandatory for the FPC certification and are not optional.

Second, charter and resource the "ERP Selection Team." To maintain momentum, management should immediately and formally charter the cross-functional team identified in Section 6.4 (CTO, Head of Ops, etc.). This team must be allocated dedicated time and a budget to execute Part 2 of the proposal: developing the scripted demos and conducting the formal evaluation of the three shortlisted vendors (NetSuite, Monitor ERP, ERPNext).

Third, begin the search for an external implementation partner. The CTO's validation feedback confirmed that a project of this scale, especially one that will eventually include Sales and Finance, requires external expertise. Management should begin the process of vetting and selecting an implementation consultant in parallel with the vendor demos. This expert partner, as supported by the literature (Monk & Wagner, 2013), will be critical for guiding the company through the complex final selection, contract negotiation, and data migration.

7.3 Thesis Evaluation

This thesis set out to solve a practical business problem by selecting an ERP system and designing an implementation plan. The research successfully achieved this objective, but through an adaptive AAR process, the outcome was refined into a more practical, two-part solution that better served the company's immediate needs.

The primary strength of this study is its real-world, practical application. The AAR methodology allowed the research to deliver tangible business value during the thesis process. The "Inventory Action Plan" (Data 2a) was not a theoretical exercise but a co-created, validated solution that the company is using to solve its urgent inventory problems and meet its FPC project goals. The final proposal (Section 6) is therefore not just an academic paper but a fully validated project plan with stakeholder buy-in.

The primary limitation of the study is the pivot made during the vendor analysis. Due to resource constraints, the original plan to conduct live, scripted demos with ERP vendors was not feasible. The analysis in Section 5.3.1 is therefore based on vendor documentation ("claims") alone, not on a hands-on test of the software. This limitation was mitigated by changing the proposal's outcome from a final selection to a validated shortlist for a future demo phase. This is a more honest and academically sound result, as it prevents the company from making a high-stakes financial decision based on incomplete data.

Ultimately, the thesis fulfilled its objective by providing the company with both an immediate, no-cost operational fix and a robust, data-driven, and validated roadmap for its long-term strategic investment.

7.4 Closing Words

This thesis began with a clear objective: to address the operational fragmentation that was hindering the case company's growth. The journey, however, proved to be as much about organizational change as it was about technology selection. The Applied Action Research methodology provided the ideal framework for this, allowing the researcher to be embedded within the company, co-creating a solution rather than simply observing a problem.

The research consistently reinforced the central theme from the literature: the greatest challenges are not in managing the technology, but in "managing the people" (Monk & Wagner, 2013). The "soft stuff" (Bradford, 2020), the negotiation of new processes, the establishment of accountability, and the fostering of a culture that values data integrity is, in fact, the most difficult and most important work.

This study's primary contribution, therefore, is not the "Finalist Shortlist" of vendors. It is the set of co-created and validated "to-be" process maps (Appendices 1-7). These maps represent the company's new, shared understanding of how it will work. They are the essential human and procedural foundation that must be built before any new technology can be successfully deployed. The technology, whether it is the existing Odoo system or a future platform, is merely the tool that enables and enforces this foundation.

As this thesis concludes, the company's implementation journey is truly just beginning. The final, validated proposal (Section 6) provides the map. The immediate "Inventory Action Plan" is the first step, and the "Strategic Roadmap" is the path forward. By successfully navigating the human element of change and prioritizing process over platform, the company is now in a strong position to build the scalable and sustainable operational backbone required for its future growth.

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Appendix 1. Summary of Fieldnotes (Data 1, Production Manger)

Date	June, 2025
Position	Production Manager
Type of Data	Field Note
Duration	1 Hour

Question Type	**Question**	**Answer**

Role Based	Could you walk me through your typical day in the Production process?	No concrete flow. Each day is different.
		• From 8:15 am daily, gives role assignment to all present team members
		• (day before) Coordination with task owners Material Scientist, R&D, Project Manager Side production task when free from project delivery
		  ○ These task requests come to Production Manager latest on Friday of the week before execution
		  ○ Task alignment to seek out special requirements for the task. Still happen on the day of task execution
		  ○ What usually happen is the task owner made Production Manager promise to allocate the time for the requested task but the task owner does not come prepare with task execution instructions or material/tools needed for the task
		  ○ Agree on the time allocation.
		  ○ This flow is done by Production Manager
		• Has his own flow in project delivery:
		  ○ Fridays, look at production schedule, create next week's tasks, allocate time slots
		  ○ Mondays, go through weekly plan with production team and brainstorm of what needs to be done, what can and cannot be done (also, material shortage specifically repair material with no physical inventory check, but rather ask if they can remember if we have repair material in stock)
		  ○ Assign the roles for the week
		  ○ Meet every day of the week, 10 minutes in the morning to check if anything went wrong
		  ○ Then team start to execute the tasks

	What is your role in the material flow, from ordering to production?	• Part of weekly planning in the production board, have a shopping list on the board where technicians come and add items in the shopping list. This applies to all purchase requests even though the main materials have been purchased for the project at the beginning already ○ Review the shopping list once every week to assess the necessities

		◦ Then use the purchasing request created by Igor to place in request and assess the importance, currently done by himself, plans to have his team member to do it in the future ◦ Also approve the purchase by himself
	How do you interact with other teams, like project management or procurement, to get your work done?	• With supply chain, only communicate when it relates to project purchase, last minute purchases to borrow company card ◦ Using Slack, emails (rarely), in person • With project manager, if anything gets delayed, the production schedule (Google Sheet) will get updated otherwise will keep the PM updated in Weekly Meeting ◦ In case of emergency, will Slack the PM • No historical information on the production schedule plan of delayed plans
	Can you describe a specific time when a change in the production plan caused problems for your team?	• Happens too often, almost on the daily but comes from many reasons • Example, the pump broke down due to 2 screws were broken down • Had to empty the pump = material already wasted, change delivery screw, found out another screw is missing • Another replacement screw was not available on site • Wasted time to look for pump parts in the shelf, couldn't find, went to the store to look for the missing screw and had no luck • Had to do the make-shift of cutting down bigger screw to fit the smaller screw for temporary assembly • Due to the pump broke down mid-print and had to continue otherwise, more wasted material • Afterwards, Production manager and team made an replacement request directly then the Project Manager processed the request • Had to continue working with broken down pump until the screws come
	How would you describe the "unwritten rules" or informal communication that is needed to get your work done?	Happens mostly in-person. If the anyone is absent, including himself, will be on Slack or phone calls
Process Pain Points	Could you describe a recent time you faced a challenge with a material shortage or delay? What happened, and how was it resolved?	Two instances came to mind: First: • Shortage of Material A during a project. A team member found out about the shortage (only enough for one more week of production but the lead time of Material A is roughly 10days) • On the next week, coordinate with Supply Chain via Slack and in-person conversations about the shortage • Organized admixture making, by luck, had one downtime that was possible for schedule admixture making there • Could have less people coming into work that day where there's downtime and will have permanent members do maintenance, cleaning, or office work

		• Material A ran out before the new batch arrive by 2 days where production should have happened • Costed us production downtime but no extra stress to the team to try to catch the schedule Second: • M24 stainless steel nuts running out found out by a team member while preparing for the task (hours in advance) • Constraints: preparation work that requires this material has to happen before casting. Casting cannot be delayed. These special nuts are required to keep the anchors in place during the cast • Took it from other elements to perform the casting and return them after • Reached out to supply chain via Slack and in-person conversations to urgently procure the nuts in many rounds of different purchases
	Can you show me what happens when you run out of a critical material? What are the first three things you do?	• Evaluate how the project is going to be impacted • Weekly production plan would take the first impact • Check if can involve supply chain and go through normal purchasing process OR urgently send a production team member to the store for anything that is required within 2 days using company card • After procurement is solved, weekly production plan will have to be reshuffled to accommodate the wait time Indirect impacts: • Frustrations from team for having to work in a rush and constant change of plans • Consumes a lot of production manager to adjust and monitor changing plans, to rethink the plan and communicate the plans to his team again in the same week • Quality of the elements can also be impacted, if anything is delayed it leads to less time for execution
	When a production plan changes, how is that information communicated to your team? What are the biggest challenges with that process?	How? • Gather the team member and make the new plan together and decide how to proceed • Inputs from team member is needed in order to make a plan • Status of the task and what is left to be done and decide if it can be done without this missing material that caused the delay • If the production manager can make that decision on his own, he will make a change and communicate to each of the team member directly Challenges? • Frustrations of time constrain to do things in very limited times and to always have to decide on the spot • Challenging to procure the missing items because he needs to look for an item's specifications before involving supply chain to identify which one he needs (which one is running out) • Had a hard time finding the right item information on ERP even though the information is on ERP but he could not find the right info due to some settings that need to be done in order to see

		○ Because of not using ERP actively because ERP is not reflecting the right amount of inventory so there is no use to consult ERP for inventory level ○ And from not using actively, he forgets how to use it ○ Last training on how to use ERP was done around one year ago
	Can you describe a time when you received incorrect or incomplete information from another department? What was the impact?	Incorrect or incomplete information: • The rods and nuts usage ratio that was miscalculated and in reality needed more to complete an element Impact: • Material shortage and urgent procurements • Costed more money than the first large order at the beginning of the project
Tools & Data	What tools or systems do you currently use to track materials or communicate with other teams?	• Use BoM to track at the beginning of the project • Production calendar (physical calendar) to mark the Material A used this is done by all of the team member who uses the Material A • And then rest of the material tracking is done visually • Used Tools maintenance sheet created for the old location and currently not updated to the new location we are in right now so not currently in use and no more weekly inventory count
	What information is most critical for you to have access to at all times? Where do you find that information today?	• Stock of Material A that currently done visually • Material B inventory that currently done visually
	Could you describe a recent time when you couldn't find the information you needed? What was the consequence?	• Had to fix the Product X and the production manager did not know how and what product to be used for fixing • The task was requested the day before, no material nor instructions were given at the time of requesting • Production manager asked the task owner to provide which the task owner promised but could not deliver and the task owner has fallen sick and was hard to get hold of Consequence: • The task was scheduled for Tuesday morning but at the time of execution, no fixing material nor instructions can be found led to having to reschedule the task and the weekly production schedule consequentially • The task owner’s schedule would also be delayed for this delivery
	If I were to look at the Google Sheet you use, what would I see?	In the production schedule: • How the elements are going through production stages • See which production stage is happening for how many elements and for which project • Element type, which project, amount, which it is happening, and when

<table>
<tr><td></td><td></td><td>No historical data is kept on the production schedule. Recall the from memory and if a report is needed, can provide or look into daily task reports and scroll through</td></tr>
<tr><td></td><td>What are the biggest limitations of the current systems?</td><td>Lack of a system to begin with
No clarity on items, amount, replenishment</td></tr>
<tr><td></td><td>How often do you find yourself looking for information that you can't find? What's the most common type of information you are looking for?</td><td>Looks for material availability at least 2-3 times a week</td></tr>
<tr><td>New Process Design</td><td>If you had a magic wand, what would you change about the current process?</td><td>Would define the responsibilities in inventory maintenance, replenishments, procurement
Establish inventory check before every tasks requested especially for R&D
R&D task requester expects production to have material in place at the time of requesting
Production expects R&D as a task owner to have the right material for the task they are requesting
Would like to have designated, well maintained production inventory, know exactly where things are on the system and physical shelf
Would like to have a common name for a product that is similar to one another to easily identify and refer to when needed
Would like to have inventory maintenance (control) to be on a weekly basis and any of his team member is educated to do so
Used to spend around 1 hour to do
Thinks that we might need 2 hours at the beginning due to the area that has increased in size and more things in the inventory</td></tr>
<tr><td></td><td>What would an ideal process look like for you, from a material request to the start of production?</td><td>Ideally would like to receive the BoMs and to check the BoM for space allocation
Wants to first see the BoMs to decide where to allocate raw materials that are expected to be coming in for the project
Wants to coordinate with the Facility Manager
Ideally wants to be able to gather the tools and material needed for the tasks before the task - currently doing this right now
Right now he is allocating where the Material B are going to be stored and can be all over the available space in the warehouse and before the task, he is required to point out where his team member can find these rebars
After production, would like to know what to do with leftovers from the projects. Needs to find the decision maker and responsible for this decision
Leftovers are currently all over the place because there is no assigned space for them so needed to be stored wherever possible</td></tr>
</table>

	What would be the one thing a new system could do that would make your job significantly easier?	Clear physical sorting of tools and material would save a lot of time from running around
	What would make your team more effective at its job?	Effective inventory control system and sorting that are easy to notice
	When we design the new process, what's the one thing that we absolutely must not lose from the current system?	Designated production areas tools are to stay where they currently are and keeps it that way
	If we were to implement a new system, what would be the biggest challenge for your team?	• The training of a new system • Creating a work culture that helps with putting things back in place, cleaning after use, being tidy

Appendix 2. Summary of Fieldnotes (Data 1, Project Manager)

Date	June, 2025
Position	Project Manager
Type of Data	Interview
Duration	1 Hour

Question Type	Question	Answer

Role Based	Could you walk me through your role in a typical customer project, from initial planning to final delivery?	• Start with preparation of documentation spaces, work on project planning (scheduling, budget planning, identify R&R for the project, risk assessments, gather and finalize client requirements (from customers) during meetings with the client.
		• Sales team approach the production manager to reserve production slot with the production manager when making quotation to potential client
		• There may be 2 phases in project delivery. Prototyping and mass production
		  ○ Designers will decide if prototyping is required and scope
		• Task initiation & Control
		  ○ Engineer (design stage) according to final requirements from client for prototype stage
		  ○ Output: BoM, calculation reports, drawings, KYN (know your numbers), bar bending schedules, manufacturing drawings, toolpath
		  ○ Process Engineer prepares quality plan, final acceptance criteria, manufacturing QC checklist, inspection form
		  ○ Production request → production manager to confirm the production, makes the production schedule
		  ○ Procurement requests done by production manager to supply chain using BoMs + production request
		  ○ Logistics support
		    ▪ Adhoc shipment arrangements communicated by production manager to supply chain
		  ○ Handshake hand-over from Project to Operations
		    ▪ Complete production documents handed over (only if the design is frozen) for mass production
		    ▪ If anything changes, another session for handshake happens
		• Then maintain the schedule & budget if go as planned
		• Client updates, processing any additional requests from clients including feedback

	Can you describe a specific time when a change in	• Delay with two projects because Material B were not delivered in full ordered quantities ○ Production had to be delayed by 1-2 weeks

<table>
<tr><td></td><td>material availability or a production plan affected a project's timeline?</td><td>It was still within delivery timeline but production downtime was made
Production schedule were changed many times when procuring a special material (could not find in FI) from the UK due to long lead time
Material C that can be used in other projects had to be ordered before the project's customer PO were confirmed so that we can commit to the delivery plan
Had to stock in large volume only with assumptions to use in likeable future
Expected Material C will need to be used in future products anyway, can also stock in different diameters, lengths to always have on hand due to long lead time of at least 3 weeks
Suppliers don't carry them on their stocks
Diameter, material, lengths always vary so stocking at site is also not ideal</td></tr>
<tr><td></td><td>What informal communication channels do you rely on to get project updates or solve problems?</td><td>Slack messaging
In-person conversations</td></tr>
<tr><td></td><td>How would you describe the "unwritten rules" of a successful project handoff?</td><td>Chasing people when things are unanswered
Always being reminded what are the blockers, to-dos to keep the progress
Had to create a lot of communication channels to constantly remind people about on-going tasks
Currently no space for stakeholders to report tasks
Cannot assign tasks directly to stakeholders because Jira was not used in customer delivery projects
Reason for not using Jira is because it will be dependent on stakeholders to report the tasks</td></tr>
<tr><td>Process Pain Points</td><td>Could you describe a recent time when a material shortage or delay put a project at risk? What was the ripple effect?</td><td>Currently have no large ripple effect due to buffer were made but production suffered the most with material shortage/delays</td></tr>
<tr><td></td><td>What are the most time-consuming or frustrating parts of your daily workflow when it comes to managing a project's timeline?</td><td>The lack of process/traceability of materials, elements to know which was used in what
Had to create a separate google sheet of materials to know what was order, when would it arrive, how many do we have on hand to make sure the tasks can be done with sufficient material, otherwise delay in production causing 1-2 weeks down time (especially for material like Material B or Material A that have longer lead time)</td></tr>
<tr><td></td><td>Can you describe a recent communication breakdown (when we failed to</td><td>Delivery issues
Proforma invoice issues at the time of a project delivery when the project manager had to cover for supply chain who was on vacation at the time
Consumed material change</td></tr>
</table>

	exchange information effectively) with the manufacturing or purchasing teams? What was the impact on the project and the customer?	• Project manager do not have visibility on this issue usually. Usually goes directly from production manager to designer • Unplanned change of element handling, original BoM did not reflect the actual need to the amount of material that was recognized later on after the mass production stage
	How do you communicate material delays or production setbacks to the customer? What are the biggest challenges with that communication?	• Have been able to meet the delivery deadline so far • Can foresee this to happen with the upcoming project that deadlines have to be pushed away due to BoM readiness and previously committed delivery deadline
Tools & Data	What tools or systems do you currently use to track project progress, material status, or communicate with other teams?	• Slack for communication • MS Project for project planning & progress • Google Sheet for project data • Google Drive for files and documentation • Confluence for central hub to link all the above together and keeps weekly meeting notes or any additional project related stuff
	What information is most critical for you to have at all times to keep a project on schedule? Where do you find that information today?	• Design related tasks if tasks are updated in Google drive. Communicate via slack • Production schedule (Google Sheet) to see how the project is going if according to the plan • Need to understand each key material lead times to realistically ensure the production schedule/timeline whether it is going to deliver on time • Currently relies on production manager to share this information
	Could you describe a recent time when you couldn't find the information you needed? What was the consequence for the project?	• If the mistake (material shortage, etc) that impact production was not spotted, production has to be delayed

	What are the biggest limitations of the current systems you use?	• MS Project is not linked to key stakeholders, no reporting or task assignment because company uses different systems
		  ○ Ended up double working in relaying tasks and plans
		  ○ Currently not a big deal
		• ERP and invoice systems are not linked and cannot reflect the actual project cost
		  ○ Had to manually check with supply chain to provide individual invoices
		• No traceability of labour, not knowing how much time from each stakeholders were spent for the project that links directly to project cost
		  ○ Production labour is currently tracked on Confluence

		o Very hard to extract the information out from Confluence o Can also had human error in reporting their times
	How often do you find yourself looking for information that you can't find? What's the most common type of information you are looking for?	• People hours • Expenses • Delivery estimation (date) POD once the shipment to customer is in transit
New Process Design	If you had a magic wand, what would you change about the current process for managing a project's timeline and material flow?	• Would love to have an app/website similar to Jira to allow consolidation of Jira, Confluence, MS Project o Want to assign tasks to people o Assign costs to the tasks o Store invoices and link them to tasks o Time logging for all parties participating in the task • Jira doesn’t have the interface to plan tasks with visibility of timelines without clicking to specific tasks to get information about its timeline o Cannot assign costs on Jira • MS Project has much better visibility for timeline, cost breakdowns
	What would an ideal process look like for you, from a project being confirmed to the start of production?	• Ideally want to have at least 1 week after confirmed, would like to properly plan the project & set up o Sometimes the project planning happens at the same time of engineering o Led to no time of doing risk assessment • Want to have 1-2 weeks of engineering, whatever time needed for procurement, and only after the necessities are done, production will start
	When we design the new process, what's the one thing that we absolutely must not lose from the current system?	Tracking of consumables that are critical to production and will cause delays

Appendix 3. Summary of Fieldnotes (Data 1, Facility Manager)

Date	June, 2025
Position	Facility Manager
Type of Data	Interview
Duration	1 Hour

Question Type	Question	Answer

Role Based	Could you walk me through your typical day, focusing on when materials arrive and when finished goods leave?	Receiving:
		• Some time somebody might have mentioned that a delivery is happening or finds out when the truck arrive
		• There's no structure in receiving deliveries
		• Jumps into preparing the receipt immediately and had to drop whatever he is doing
		• Currently has many sources of work coming to him that he finds out along the way
		• Deliveries from Posti, for example may be left behind doors for him to find
		    o When confirming the deliveries on ERP, some orders may be there and some not
		    o If orders that do not exist on ERP, had to do extra step into texting Ada and letting her know of the arrival
		• Would look at general condition of the packaging if they are in good condition
		• Checks on ERP to identify who orders it then
		• Leave it to areas of the person who orders the item
		• Usually is easy to identify who orders
		Deliveries:
		• Information comes from both Production Manager and Supply Chain
		• Asks for loading documents or has to wait until it becomes available
		• Load according to the loading plan
		• Production Manager would assist in allocating his team member to help with loading
		• Doesn't have time to prepare for loading at all. Perhaps once, ever
		• Loading instruction would appear to him at the last minute which some time could be a surprise
		• Timber pallets used to delivery can only be stored safely from moisture at around 20-30 pallets so need to be mindful of it when preparing for delivery

	How do you currently interact with the person who requested the items? How do you let them know their materials are here?	Sends Slack messages to notify the requesters or say a word when seeing them in person
	How do you coordinate with the Production and QC teams to get a	Needs to wait for the packing list that may or may not arrive to him at the last minute

	finished product ready for a customer?	

Process Pain Points	Can you describe a recent time when a delivery arrived, and it caused a problem? For example, you didn't know who it was for, where it should go, or the PO information was wrong.	• Received a box from a known supplier with no notes nor PO order for it
		    ○ Opened it up and assess who might be the requester
		    ○ Reached out to the potential requester that was lucky that the first person who he talked to was the requester
		    ○ If not, might need to ask every one until he finds who requested it
		• Doesn't happen often though

	The Production Manager mentioned that materials are often "all over the available space." Can you describe a challenge you've faced with finding space for incoming items or finding items that were already received?	• Biggest problem is we're holding onto items that we no longer use
		• Had some printed items laying on the floor, obstructing the way, and no one was really able to make a decision if we would be using it again
		    ○ An element is currently obstructing the traffic of the forklift
		    ○ It is technically on the shelf but hanging around a couple of centimetres off the shelf so whenever he is trying to access other things on the shelf, he has to move the printed bathtub first, then take the items he originally came for, then move the element back

	You mentioned that you often don't have much time to prepare outgoing shipments. Can you describe a specific time this caused stress or problems? What happened?	• A specific 3 trailers delivery: first trailer arrived 20 mins later, second arrived 1 hour earlier, and the third arrived about 1.5 hour earlier
		• Material A delivery recently arrived when he was alone and late in the work day and it was raining at the time (hazard for the Material A quality)
		    ○ Ideally for the most time-efficient method done in 20 mins, Material A requires big forklift to unload from the truck, then take it inside for someone to pick it up with an electric pallet jack for another person with a small forklift to put it on the shelf safely
		    ○ Otherwise, if one person does it, it will take 60 mins to do but has significant increase in safety

	What are the most time-consuming or frustrating parts of your daily workflow related to materials (both coming in and going out)?	• Not frustrating but currently looking to train a person who can guide a machine operator where the operator couldn't see and have a second person to act as safety person ○ This needs trust building as well as understanding of the seriousness of safe loading and not only putting things on the truck
Tools & Data	You currently use the ERP to verify and receive incoming goods. What other tools do you rely on to get your job done (e.g., email, Slack, paper lists, physical calendars)?	Slack (instant messaging)

	When a delivery arrives, what information is most critical for you to have? Where do you find that information today?	• PO on ERP that specify who requested this item and what was order • PO number on packing list • And/or supplier name on the package and on ERP (Odoo)
	For outgoing shipments, what is the most critical information you need? Where do you find it?	• Just needs to know what is being shipped, if anything big like needs to load on a truck he will need packing list of elements to load • Need to know what is being sent that day/week to direct the drivers or to prepare
	Could you describe a recent time when you couldn't find the information you needed? What was the consequence?	• There was a driver that came to pickup that Material D to the UK that the Facility Manager did not know that it was going o Had to go through 3 people to find out what was happening o Took about 10 minutes to find out o Had to drop what he was doing
	What are the biggest limitations of using the ERP only for receiving? What happens to the information after you've marked an item as "received"?	Would take physical packing list / delivery note from the packages to give it to buyer
New Process Design	If you had a magic wand, what would you change about the current process for receiving, storing, and shipping materials?	Receiving: • Door bell and phone number for delivery drivers to contact him (in process and will happen) Storage: • More problem in what we intend to keep rather than what is coming in • For Material A, there may be extra bags that would be occupying the shelf space and at the time that new batch arrives it won't have enough shelve space to keep it. May result in storing on the floor and risk getting damage by passing forklifts Shipping: • Getting the information in time (at least 1 day in advance)
	What would an ideal receiving process look like for you? Imagine a perfect delivery—what happens, what information do you have, and where do the items go?	• The doorbell rings • Would prefer to meet the driver to receive • Our company's PO number is visible on the outside of the package before moving the package to the requester • Opens it up and verify the delivery note to check whether we have received what we ordered
	What would an ideal shipping process look like? How would you like to be notified, and what information would you have to prepare a shipment?	• Ideally, one day in advance is enough to prepare the elements for shipping given packing list, loading instruction, and assistant for the loading and all the necessary timber pallets needed for loading • Would ideally need to have a box hook to help adjust the pallets when loading on the trailer

Appendix 4. Inputs for the Final Proposal; Summary of the Fieldnotes (Data 3)

Findings from Data 3 (Validation session) are summarized in the table below. This table directly links the proposed requirements to the stakeholders' feedback and specific comments, forming the evidence-based rationale for the Final proposal.

Table 14. Summary of Stakeholder Validation Inputs (Data 3).

Functional Area	***Proposal Element Validated (Requirement)***	***Stakeholder Feedback***	***Specific Comments / Required Adjustments (Data 3)***
Inventory	The system must provide a centralized, real-time view of inventory levels.	Agree	
	The system must allow users to log material consumption against a specific project or task.	Disagree	From Production Manager: Material should be linked to project instead of task (to define granularity). From Facility Manager: Consider material used in maintenance as well
	The system must maintain a history of material movements (receipt, consumption, adjustments).	Agree with comments	From Facility Manager: Consider also tracking consumables like timber, screws
	The system must support a searchable catalog of materials, specifications, and storage locations.	Agree with comments	Make sure to include WIP and Finished Goods in the inventory
	The system must have the ability to set minimum stock levels and automatically trigger alerts.	Agree with comments	From CTO: Consider expiration date. Also need to consider check process if we would still replenish it
	The system must include a formal process for task owners to request production time and materials.	Agree with comments	From Head of Operations: Clarify roles who to make Work Order request
	The system must support a weekly inventory count/check process to ensure data accuracy.	Agree with comments	To review the frequency of cycle count after the first implementation period. Weekly... may not be necessary once the system is robust
	The system must provide a way to manage and track leftover materials from projects.	Agree with comments	From Production Manager: Also track waste generated for either project, task, R&D, test, calibration
	The system must provide a forward-looking shipping plan with clear instructions.	Agree with comments	From Facility Manager: Look for a way to match trailer ID with the shipping document

	The system must provide simple dashboards or reports on current stock levels.	Agree	
	The system must allow the Project Manager to see the status of materials procured for their projects.	Agree	
Purchasing	The system must provide a formal, auditable channel for creating and approving purchase requisitions.	Agree with comments	From CTO: Should have at least 2 of approvers for accounting traceability
	The system must centralize all purchasing data (requisitions, POs, vendor details, and order status).	Agree with comments	From CTO: Accountants, auditors need to have visibility
	The system must provide real-time status tracking for all open Purchase Orders.	Agree	
	The system must directly link the item receiving function to the original Purchase Order.	Agree	
Manufacturing	The system must provide a single, integrated module for production planning and scheduling.	Agree with comments	From CTO: Possibility to connect two software together using plug-ins or customize
	The system must link production orders to real-time inventory data to verify material availability.	Agree	
	The system must automate critical notifications and handoffs.	Agree	
	The system must provide a centralized, real-time dashboard to track the end-to-end status of a customer order.	Agree	
Delivery	The system must automatically generate all required shipping and export documents.	Agree	
	The system must provide a formal process for capturing and tracking Proof of Delivery (POD).	Agree	
	The system must provide real-time shipment visibility by capturing tracking numbers.	Agree	
	The system must allow for the digital attachment of key documents (like the signed CMR).	Agree	

Appendix 5. Written Statement on the Use of AI in This Thesis

WRITTEN STATEMENT

on the use of AI-based tools in this thesis

by Napattra Chaisom, the student of BI Master´s Degree Programme

Thesis title: ERP System Selection and Its Implementation Plan, with the Focus on Purchasing, Inventory, Manufacturing, and Delivery

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
   Google Gemini.

2) In which parts of the thesis which tools were used, and for which tasks
   The tool was used for grammar correction and academic tone adjustment in Chapter 5, 6, and 7. As these chapters describe complex technical processes, I used AI to help me rephrase my original drafting into clearer and more formal English. The tool was also used for conciseness checking to ensure the summaries in the Abstract and Conclusion. Lastly, the tool was used to verify formatting of the reference list to ensure compliance with APA 6th style guidelines.

3) What portion of the text was helped with these tools, for each use
   The linguistic refinement tools were applied to approximately 30-35% of the total thesis text. It was applied to the full drafts of Chapters 5, 6, and 7 for grammar and tone. However, the underlying ideas, data points, and process steps remained unchanged from my original input. The citation formatting assistance was applied to the Reference List (approximately 5% of the thesis) to verify correctness and alignment of the citations.

4) The prompts used were strictly focused on editing and refinement. Including:
   - 'Please review the following text for grammatical errors and suggest improvements for academic tone.'
   - 'Rewrite this paragraph to be more concise and clear.'
   - 'Does this in-text citation follow the APA 6th standards?'
   - 'Check this text for consistency in terminology regarding the FPC project'.

5) Here, I describe what continues an ethical and reliable use of AI-based tools that I used
After using the AI to refine the grammar and academic tone of my drafts, I carefully read the output to ensure that the linguistic changes did not alter or deter from the original meaning of my intended text. I verified that all specific terminology remained accurate and the citations were still placed correctly after the rephrasing.

6) Here, I describe how ethically and reliably I used the AI-based tools in my thesis submission
I utilized AI primarily as a digital editor to improve the flow, clarity, and academic tone of the chapters I wrote, specifically Chapter 5, 6, and 7 where complex and technical processes were described. I provide the toll with my own draft and notes, and it assisted in polishing them into formal and academic English. The core content, data analysis, and conclusions are entirely my work.

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

____09.11.2025, Espoo_________
(Date and place)

____Napattra Chaisom__________
(Signature)