CHAPTER 2
LITERATURE REVIEW AND BASIC THEORY

2.1 Literature Review

This section contains an explanation of previous research that has similarities with this final project. This is done to obtain information about the research methods that have been carried out previously and how researchers solve the problem. This information is used to find the best method that can be applied in this final project. Previous research with the keywords 'order fulfilment' and 'business process' was obtained by searching for journals and other literature via the internet from google scholar, scopus, etc. Literature review can be seen in Table 2.1.

Table 2.1 Literature review

No	Researchers	Research Object	Problems	Method and Tools	Research Results	Use In
1	Setiyani et. al. (2021)	Sales transaction business process at Toko Erni Karawang	Manual system causes inefficiencies, data inaccuracies, and high risk of stock/transaction errors.	Qualitative method, interviews, BPMN, Bizagi Modeler.	BPMN model of sales process created using Bizagi Modeler, identifies actors, documents, and subprocesses to improve efficiency and service quality.	Alternative Solution, Method
2	Maulana (2023)	Business process planning in Academic Administration at Universitas Dinamika	Previous improvement studies lacked structured implementation, monitoring, and control.	BPM lifecycle: identification, analysis, redesign, implementation, monitoring.	BPM-based model developed with two stages: improvement formulation and implementation until evaluation, provides structured guide for business process planning.	Alternative Solution, Method
3	Azhari et. al. (2021)	Customer service business processes at PT. PGAS Telekomunikasi Nusantara	Absence of structured BPM leads to inefficiencies, redundancies, bottlenecks, and unmeasured strategies.	BPM lifecycle, RCA, Pareto, Swimlane, simulation.	BPM framework developed using CPI and BPR to improve efficiency, productivity, service quality, and risk mitigation via multilevel process models.	Alternative Solution, Method
4	Ningtiyas et. al. (2018)	Business Process of Executing and Managing Sales Plans in the Commercial Division of PT PJB Services	Manual, non-standardized processes caused unmeasurable performance and unclear improvement paths.	BPM using ProcessMaker.	BPM reduced sales process time and cost by 64% (26,400 to 9,480 min/month) and customer settlement time and cost by 38% (23,040 to 14,400 min/month).	Alternative Solution, Method
5	Waluyo et. al. (2018)	The business processes of Toko Buku Galuh	Lack of standardized written processes caused long cashier queues, slow updates, and delayed processing.	BPI Framework, BPMN, process validation.	BPI reduced process times of sales transactions by 64.37%, purchasing by 77.9%, price fulfilment by 30%, and item data editing by 25.9%.	Alternative Solution, Method

Table 2.1 Literature review (continuation)

No	Researchers	Research Object	Problems	Method and Tools	Research Results	Use In
6	Dewantari (2018)	UMKM XYZ which operates in the garment sector	Order fulfilment delays caused by poor capacity estimation and high dependency on raw material suppliers.	BPM, value-added analysis, root cause analysis, Bizagi simulation.	Four redesigned models proposed (contact reduction, activity elimination, automation-integration, parallelism); automation-integration gave best performance.	Alternative Solution, Method
7	Ishfaq and Raja (2017)	The study evaluates different order fulfilment options for online orders in retail supply chains, using data from a major U.S. retail company.	Inefficiencies in aligning online and in-store order fulfilment due to small order sizes and complex delivery needs.	Modeling framework and empirical analysis.	DCs and DTCs offer better efficiency; DTCs suit high online demand; fulfilment strategy should be chosen based on cost thresholds.	Problem Identification
8	Hidajat and Subagyo (2022)	Production of Product X at a plastic injection manufacturing company PT XYZ	Product defect rate reached 4.75%, exceeding the company's maximum allowed threshold of 3%.	Six Sigma DMAIC, SIPOC, Pareto, Fishbone.	Sigma level of 4.82; defect causes include human error, machine settings, materials, and methods; improvements: maintenance, training, SOP updates, and material QC.	Alternative Solution, Method
9	Zaripova et al (2021)	Energy supply companies on an electronic trading platform	Manual procurement was highly inefficient, non-transparent, and prone to corruption risks.	Web-based system development (HTML, PHP, MySQL).	Web-based system improved procurement transparency, supplier matching, and cost efficiency while eliminating intermediaries.	Alternative Solution
10	Muttaqin and Utami (2023)	The business process of shuttlecock production at UD. Sadex Shuttlecock	Unstructured processes, unallocated responsibilities, and manual labor caused operational inefficiencies.	BPMN, observation, interviews, Bizagi simulation.	BPMN model reduced production time from 6h 50m to 3h 11m; recommended mechanization, role specialization, and divisional structure.	Alternative Solution, Method

Table 2.1 Literature review (continuation)

No	Researchers	Research Object	Problems	Method and Tools	Research Results	Use In
11	Christianti and Saputra (2013)	Business processes at Bank X	Absence of structured process models reduced transaction consistency, efficiency, and quality evaluation capabilities.	IDEF0 framework.	IDEF0 provided structured, hierarchical representation of financial transactions, improving clarity, coordination, and efficiency.	Alternative Solution
12	Haerudin and Devianto (2023)	Business process at PT. Agusta Dryer	Sudden product demand spikes caused major delays due to manual data handling and unclear stock statuses.	BPR, BPMN, Bizagi Modeler.	BPR redesign automated online ordering, inventory checks, and admin tasks, eliminating manual workflows and improving response time.	Alternative Solution, Method
13	Novian et al (2022)	Business process at SHM Motor Purwokerto	Existing inventory system lacked automated stock updates and return management, leading to frequent data errors.	BPMN, Value Chain Analysis, GAP Analysis.	Improvements suggested: return goods feature, price-setting module, and enhanced stock tracking aligned with Odoo ERP.	Alternative Solution, Method
14	Wahyudi et al (2024)	Youth organization of Desa Sumberejo, Kecamatan Plandaan, Kabupaten Jombang, Jawa Timur	Core structural issues: ineffective organizational structure, poor communication, and low participation.	Participatory approach and collaborative planning.	Redesigned organizational structure with clearer roles, improved communication, and increased participation, resulting in a more active youth organization.	Alternative Solution

Several studies have focused on the use of formal fulfilment frameworks to document and visualize business processes. Setiyani et al. (2021) applied BPMN with Bizagi Modeler to map the sales transaction process at Toko Erni Karawang, identifying actors, documents, and subprocesses to address manual inefficiencies. Muttaqin and Utami (2023) also used BPMN and simulation to model badminton shuttlecock production at UD. Sadex Shuttlecock, successfully reducing production time from 6 hours 50 minutes to 3 hours 11 minutes through role specialization and mechanization. Christianti and Saputra (2013) took a different approach by using the IDEF0 framework to build a hierarchical model of business processes at Bank X, improving transactional consistency and coordination. Collectively, these studies underscore the value of structured fulfilment notation as a prerequisite for diagnosing inefficiencies and driving meaningful process improvements.

Several studies have adopted the complete BPM life cycle, encompassing process identification, analysis, redesign, implementation, and monitoring, as a guiding framework for organizational improvement. Maulana (2023) developed a two-stage BPM model for academic administration at Dinamika University, addressing the lack of structured monitoring and control in previous studies. Azhari et al. (2021) applied the BPM life cycle in combination with RCA, Pareto analysis, and Swimlane simulation to redesign customer service processes at PT. PGAS Telekomunikasi Nusantara, resulting in a multi-level framework that improved productivity, service quality, and risk mitigation. Ningtiyas et al. (2018) implemented BPM using ProcessMaker in the context of the commercial division, achieving a 64% reduction in sales process time and a 38% reduction in customer resolution time. These studies collectively demonstrate that a phased, lifecycle-based BPM approach enables organizations to systematically address the root causes of inefficiencies and achieve measurable and sustainable improvements.

A large body of literature addresses targeted improvements or complete redesigns of existing business processes across various industries. Waluyo et al. (2018) applied the BPI Framework to the business processes of Toko Buku Galuh, achieving reductions of up to 77.9% in purchase time and 64.37% in sales transaction time. Dewantari (2018) explored four redesign strategies for MSMEs in the garment sector, including contact reduction, activity elimination, automation integration, and parallelism, with the automation integration model yielding the best overall performance. Haerudin and Devianto (2023) used BPR and Bizagi Modeler to reengineer the ordering and inventory management workflows at PT. Agusta Dryer, eliminating manual processes and improving response time to demand spikes. Novian et al. (2022) conducted a value chain and gap analysis for SHM Motor Purwokerto, recommending process improvements

including automated returns and ERP-aligned stock tracking. Overall, these studies highlight that structured improvement, and reengineering methodologies can provide substantial gains in terms of speed, accuracy, and operational flexibility across a variety of business contexts.

Quality management research focuses on the reduction of defects and variability in production processes through stringent, data-driven methodologies. Hidajat and Subagyo (2022) applied the Six Sigma DMAIC approach to address a product defect rate of 4.75% at a plastic injection manufacturing company, which exceeded the organization's unacceptable threshold of 3%. Using analytical tools such as SIPOC, Pareto analysis, and Fishbone diagrams, the study identified key root causes including human error, improper machine settings, substandard materials, and inadequate methods, eventually achieving a sigma level of 4.82. The study recommends targeted corrective actions including preventive maintenance, employee training, SOP updates, and stringent material quality control. This study demonstrates the effectiveness of Six Sigma as a structural framework for diagnosing quality failures and implementing evidence-based improvements in manufacturing environments.

Studies in the topic of Supply Chain, Order Fulfillment & Digital Procurement examine how organizations can optimize procurement and order fulfilment through strategic fulfilmen and digital systems development. Ishfaq and Raja (2017) analyzed the trade-offs between various fulfilment options, including distribution centers (DCs) and direct-to-consumer (DTC) channels, in the context of a large US retail company, finding that DTC is better suited to high online demand scenarios, while the choice of fulfilment strategy should ultimately be guided by cost thresholds. Zaripova et al. (2021) addressed the risks of transparency and corruption in manual procurement by developing a web-based e-commerce platform for an energy supply company, using HTML, PHP, and MySQL to improve supplier matching and eliminate intermediaries. Together, these studies show that effective supply chain management and procurement require a strategic decision-making framework and supporting digital infrastructure to achieve efficiency, transparency, and scalability.

The literature on organizational development recognizes the importance of structural clarity and participatory governance in maintaining organizational effectiveness. Wahyudi et al. (2024) conducted a study on a youth organization in Sumberejo Village, East Java, identifying fundamental structural challenges including ineffective role allocation, poor communication between members, and low levels of participation. Through a collaborative and participatory planning approach, the study resulted in a redesigned organizational structure with clear responsibilities and better communication

channels, resulting in a more active and engaged membership base. This study expands the scope of improvement research by showing that organizational performance is determined not only by process efficiency, but also by structural and human factors that govern how members coordinate, communicate, and contribute.

Based on the literature review above, Business Process Management (BPM) has been widely recognized as an effective approach for analyzing, redesigning, and improving organizational business processes. Previous studies have shown that integrating process fulfilment techniques such as BPMN, root cause analysis tools, and simulation methods can successfully identify process inefficiencies and improve operational performance. Furthermore, the implementation of integrated information systems and organizational improvements have been shown to improve process coordination, information accuracy, and overall business efficiency. Studies specifically related to order fulfilment show that delays and inefficiencies are generally caused by unclear procedures, poor planning, lack of coordination between departments, and limited information integration. Various improvement initiatives, including business process redesign, automation, and information systems implementation, have proven effective in reducing processing times and improving service quality. However, most existing research focuses on process redesign or technology implementation separately, while studies that integrate business process analysis with the development of standard operating procedures (SOPs) to support consistent process execution are still limited.

2.2 Basic Theory

A basic theory is a scientific basis that incorporates theories and concepts from previous research. It is used to explain and support analysis and design, as well as to help find solutions to the problems encountered. The following is the theoretical foundation used in this final project.

2.2.1 Order Fulfillment

Order fulfilment is a critical operational process in any organization that involves managing the steps required to deliver products or services to customers. This process starts with receiving an order, verifying inventory availability, processing payment, picking and packing items, shipping, and often includes handling returns or exchanges when necessary. The primary goal of order fulfilment is to ensure that customers receive their orders accurately, in good condition, and within the expected timeframe.

Efficient order fulfilment processes are vital for maintaining customer satisfaction, reducing operational costs, and building a competitive advantage in the marketplace. Companies that optimize their order fulfilment processes often experience higher

customer retention rates and operational scalability. Conversely, inefficient processes such as delays in order processing, inventory mismanagement, or shipping errors can result in customer dissatisfaction, increased operational costs, and reputational damage.

In modern supply chains, technology plays a pivotal role in improving order fulfilment. For example, warehouse management systems (WMS) and order management systems (OMS) automate and streamline processes such as inventory tracking, order picking, and shipping. Additionally, the use of real-time data and analytics allows organizations to monitor order status, identify bottlenecks, and make informed decisions to enhance efficiency. Chopra and Meindl (2019) emphasize that the success of order fulfilment relies on coordination across multiple departments, including sales, inventory, logistics, and customer service.

In a globalized economy, meeting customer expectations for fast and reliable delivery has become more challenging, with increased demand for same-day or next-day shipping services. Organizations must therefore continually evaluate and improve their order fulfilment strategies to stay competitive, particularly in industries such as e-commerce, where timely delivery is a key differentiator (Chopra & Meindl, 2019).

2.2.2 Business Process

A business process is a series of structured and interrelated activities designed to achieve specific organizational objectives, such as delivering a product or service, generating revenue, or improving customer satisfaction. These processes are fundamental to how an organization operates, as they define workflows, allocate resources, and establish communication channels between stakeholders.

Business processes can be classified into three main categories: operational processes (e.g., manufacturing, sales, and logistics), management processes (e.g., planning, decision-making, and budgeting), and support processes (e.g., human resources and IT services). Each type of process plays a distinct role in ensuring that the organization functions efficiently and effectively.

Effective business processes are characterized by clarity, consistency, and alignment with organizational goals. They reduce redundancies, improve resource utilization, and enable organizations to respond more quickly to changes in the business environment. On the other hand, poorly designed or undefined business processes can lead to inefficiencies, such as duplication of work, delays, and miscommunication among team members (Davenport, 2013).

Improving business processes typically involves analyzing existing workflows, identifying bottlenecks, and redesigning processes to eliminate inefficiencies. Methodologies such

as Lean, Six Sigma, and Business Process Reengineering (BPR) are often used to guide process improvement initiatives. These approaches focus on streamlining workflows, reducing waste, and enhancing value creation for customers. Technology also plays a critical role in modernizing business processes by automating repetitive tasks and enabling real-time collaboration and data analysis (Hammer, 2010).

Business process mapping is a tool used to visualize and analyze the steps involved in a business process. Standardized symbols are commonly used to represent different elements of the process to ensure clarity and consistency. One widely accepted standard for process mapping symbols is the Business Process Model and Notation (BPMN). Below are the primary symbols used in business process mapping:

- Events: Represented by circles, events signify the start, intermediate stages, or the end of a process.
- Activities: Depicted as rectangles with rounded corners, activities indicate tasks or work performed within the process.
- Gateways: Shown as diamonds, gateways represent decision points or branching paths in the process flow.
- Arrows: Arrows indicate the flow of the process, showing the sequence in which tasks are performed.

According to van der Aalst (2016), these symbols are integral to business process mapping as they provide a standardized framework to analyze, improve, and communicate processes effectively. By visualizing a process using these symbols, organizations can identify inefficiencies, streamline workflows, and ensure consistency in operations.

2.2.3 Business Process Management

Business Process Management (BPM) is a systematic approach to analyzing, optimizing, and automating an organization's workflows to improve efficiency and achieve strategic objectives. BPM involves the continuous monitoring and improvement of business processes to ensure they remain effective, adaptable, and aligned with organizational goals.

BPM typically follows a lifecycle that includes several stages:

1. Design: Identifying and mapping the existing process and designing an improved version.
2. Model: Simulating and analyzing the process to identify potential improvements.
3. Execute: Implementing the process changes and automating tasks where possible.

4. Monitor: Tracking process performance using key performance indicators (KPIs).
5. Optimize: Refining the process based on performance data and feedback.

A key aspect of BPM is the integration of technology, such as BPM software, which automates workflows, tracks progress and provides data-driven insights for decision-making. Effective BPM enables organizations to reduce operational costs, improve productivity, and maintain a competitive edge in rapidly changing markets. According to Hammer (2010), BPM also fosters organizational agility by enabling companies to respond quickly to evolving customer demands and market conditions.

Additionally, BPM emphasizes cross-functional collaboration, ensuring that all stakeholders involved in a process work together seamlessly. This approach minimizes communication gaps and ensures that processes are executed efficiently. Organizations that adopt BPM often see significant improvements in customer satisfaction, employee productivity, and overall operational performance.

2.2.4 Business Process Re-Engineering

Business Process Re-Engineering (BPR) is a strategic and transformative approach that organizations adopt to achieve significant improvements in their performance by fundamentally rethinking and redesigning existing business processes. Rather than making incremental changes or superficial enhancements, BPR calls for a radical overhaul of the way business is conducted. It focuses on starting from a clean slate to develop new workflows that better align with organizational goals and customer expectations. The main objective of BPR is to eliminate inefficiencies, reduce costs, increase operational efficiency, and enhance overall customer satisfaction by leveraging innovative solutions and technologies. It is a comprehensive strategy that not only addresses the technical aspects of processes but also considers the human and organizational elements that influence performance.

Michael Hammer and James Champy, in their groundbreaking 1993 book *Reengineering the Corporation: A Manifesto for Business Revolution*, defined BPR as “the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary measures of performance, such as cost, quality, service, and speed.” Their definition emphasizes that BPR is not about making minor adjustments but about reimagining how work is done to deliver better results. Hammer and Champy proposed several guiding principles for BPR, starting with the importance of focusing on outcomes rather than individual tasks. Processes should be designed with the end goal in mind, ensuring that every step contributes meaningfully to the desired result. They also stressed the need to work backward from customer needs, meaning that the voice

of the customer should be central to the redesign process. Another key principle is the elimination of non-value-adding activities—steps that do not contribute to customer value or business outcomes should be removed to streamline operations. Additionally, BPR encourages organizations to use technology not just for automation but as an enabler of new ways of working. Finally, empowering employees is crucial; BPR promotes a culture of teamwork, decentralization, and decision-making at lower organizational levels to foster responsiveness and innovation.

The implementation of BPR typically follows a series of structured steps, as outlined by Davenport and Short (1990). The first step is identifying which business processes are suitable for redesign. These are usually processes that are critical to business performance or customer satisfaction. Next, organizations must thoroughly analyze the current state of these processes to uncover inefficiencies, bottlenecks, and redundancies. This diagnostic phase is essential for understanding what needs to change and why. The third step is the actual redesign of workflows. This involves simplifying complex procedures, eliminating waste, and reorganizing tasks to create a more efficient and effective process. The fourth step is implementation, which often requires the deployment of new technologies, employee training, and change management initiatives to ensure smooth adoption. Finally, the fifth step is continuous monitoring and optimization. Even after implementation, processes must be regularly evaluated to identify areas for further improvement, ensuring that the benefits of BPR are sustained over time.

The benefits of BPR are extensive and can have a profound impact on organizational performance. Companies that successfully implement BPR often experience significant increases in operational efficiency, as redundant tasks and process delays are eliminated. Cost savings are another major advantage, as streamlined operations reduce resource consumption and labor expenses. BPR can also lead to faster order fulfilment and quicker response times, enhancing the overall customer experience. Improved service quality and greater flexibility in adapting to market changes further strengthen an organization's competitive position. Moreover, by empowering employees and fostering a culture of innovation, BPR can improve employee morale and engagement, contributing to a more dynamic and resilient organization.

In conclusion, Business Process Re-Engineering is more than a set of tools or techniques—it is a philosophy of radical improvement that challenges organizations to rethink how they operate. By embracing BPR, companies can break free from outdated practices and realign their operations with the demands of a rapidly changing business

environment. The result is not just better performance metrics but a more agile, customer-focused, and innovative organization capable of sustaining long-term success.

2.2.5 Business Process Improvement

Business Process Improvement (BPI) is a structured and methodical approach aimed at enhancing business performance by analyzing and refining existing workflows. Unlike Business Process Re-Engineering (BPR), which involves radical redesign, BPI focuses on making incremental yet impactful improvements that boost efficiency, effectiveness, and overall quality without completely overhauling the current process. This approach allows organizations to gradually optimize their operations, ensuring consistent progress while minimizing disruption. According to Harrington (1991), in *Business Process Improvement: The Breakthrough Strategy for Total Quality, Productivity, and Competitiveness*, BPI is defined as "a systematic approach to help an organization optimize its underlying processes to achieve more efficient results." This definition underscores the importance of structure and strategic alignment in improving business operations.

BPI is guided by several key principles that help shape effective improvement strategies. One of the most important principles is customer focus, which emphasizes that business processes should be aligned with and driven by customer needs and expectations. Continuous improvement is another foundational concept—organizations must be committed to ongoing efforts to refine processes in response to changing market conditions, customer feedback, or internal performance insights. Eliminating waste is also critical; by identifying and removing non-value-adding activities, businesses can reduce inefficiencies and improve productivity. Additionally, data-driven decision-making is essential for ensuring that improvements are grounded in objective analysis rather than assumptions. Lastly, employee involvement plays a vital role in BPI, as engaging team members in the process fosters a sense of ownership, encourages innovation, and ensures practical insights are considered during implementation.

The BPI methodology, as described by Dale (2007), provides a clear framework for executing improvement initiatives. The first step is to identify a business process that is essential to the organization's performance or has shown signs of inefficiency. Once identified, the current performance of that process must be thoroughly analyzed to uncover bottlenecks, delays, or other issues that hinder productivity. Based on these insights, improvement strategies are developed—these may involve adjusting procedures, enhancing communication, implementing new technologies, or streamlining tasks. After crafting solutions, the changes are implemented through appropriate means

such as training, process revisions, or system updates. The final step is to monitor the outcomes and continuously optimize the process by gathering performance data, evaluating results, and making iterative adjustments as necessary.

The benefits of implementing BPI are numerous and far-reaching. One of the most immediate advantages is improved operational efficiency, which allows businesses to accomplish more with fewer resources. Cost reductions naturally follow, as streamlined operations minimize waste and reduce unnecessary expenditures. Enhanced customer satisfaction is another key outcome, as optimized processes typically lead to quicker service delivery, fewer errors, and better quality. Moreover, BPI can significantly speed up product or service delivery, giving companies a competitive edge in fast-paced markets. The approach also contributes to greater employee engagement, as individuals feel more involved and valued when they are part of meaningful change initiatives, ultimately leading to higher productivity and morale.

In conclusion, Business Process Improvement is a valuable strategy for organizations seeking sustainable growth and competitiveness. By focusing on gradual yet effective enhancements, BPI enables companies to refine their operations without the risks associated with complete process overhauls. Through systematic analysis, strategic planning, and employee collaboration, businesses can continuously improve their performance, respond agilely to challenges, and deliver superior value to customers.

2.2.6 Difference between BPM, BPR, and BPI

Business Process Management (BPM), Business Process Re-engineering (BPR), and Business Process Improvement (BPI) are three fundamental methodologies used to enhance and optimize business processes, each differing in their scope, objectives, and implementation strategies. According to Dumas et al. (2018) in *Fundamentals of Business Process Management*, these approaches serve distinct but complementary roles in process management. Business Process Management (BPM) is defined as a continuous and structured method of overseeing, analyzing, and refining business processes over time. It provides an overarching framework for maintaining efficiency and alignment with organizational goals through ongoing monitoring and improvement. In contrast, Business Process Re-engineering (BPR) is characterized by its radical and transformative nature. It involves completely redesigning core processes to achieve dramatic gains in key performance metrics such as cost, quality, service, and speed. BPR is typically adopted when existing processes are fundamentally flawed or outdated and require a complete overhaul to meet modern demands. Meanwhile, Business Process Improvement (BPI) takes a more incremental and systematic approach. Rather

than overhauling entire systems, BPI focuses on making targeted enhancements to existing processes to improve performance without introducing major structural changes. Together, these three methodologies offer organizations a range of options for process enhancement, from gradual refinements to sweeping transformations, depending on their specific needs and strategic goals.

2.2.7 SIPOC Diagram

The SIPOC diagram is a strategic process mapping tool widely used in quality management and process improvement methodologies such as Six Sigma, Lean, and Total Quality Management (TQM). The term SIPOC is an acronym that represents the five key components of a process: Suppliers, Inputs, Process, Outputs, and Customers. Each of these components plays a critical role in ensuring that organizational processes are efficient, customer-focused, and aligned with business goals. The suppliers are the individuals, organizations, or systems that provide the necessary inputs, such as raw materials, data, or information, which initiate the process. These inputs are then transformed through a sequence of activities or steps, collectively referred to as the process. The process results in outputs, which are the products, services, or results delivered to the customers, the end-users, or stakeholders, who receive value from the process.

The primary function of the SIPOC diagram is to provide a high-level overview of a process from end to end, without diving into excessive detail. It is particularly valuable during the Define phase of the DMAIC (Define, Measure, Analyze, Improve, Control) cycle in Six Sigma projects. By clearly outlining each element, a SIPOC diagram helps teams and stakeholders to develop a shared understanding of the process and its scope. It also facilitates communication across departments, aligns objectives, and ensures that the process is designed to meet customer requirements. Moreover, the SIPOC model aids in identifying potential problem areas, inefficiencies, or misalignments between what is provided by suppliers and what is expected by customers. It encourages organizations to evaluate whether the inputs are adequate and whether the outputs 25ulfil the needs of the customer.

According to Sokovic et al., (2010), SIPOC diagrams are crucial for establishing a clear process structure and aligning it with quality improvement goals. The authors emphasize that SIPOC helps bridge the gap between technical process details and customer expectations, thereby supporting better decision-making and continuous improvement. By making complex processes more understandable and manageable, SIPOC diagrams contribute significantly to the success of organizational improvement initiatives. Their

simplicity, combined with their strategic clarity, makes SIPOC a fundamental tool for any organization seeking to enhance efficiency, quality, and customer satisfaction. Table 2.2 is an example of a SIPOC Diagram for an online ordering process.

Table 2.2. SIPOC diagram of online order process

Suppliers	Inputs	Process Steps	Outputs	Customers
Customers	Order details	1. Receive customer order	Order confirmation	Customers
Payment gateway	Payment information	2. Validate payment	Payment receipt	Customers
Inventory system	Product availability data	3. Check inventory	Inventory status	Fulfillment team
Warehouse team	Packaging materials	4. Pack order	Packaged order	Shipping provider
Shipping provider	Shipping information	5. Ship order and notify customer	Shipment tracking info	Customers

2.2.8 Value Added Analysis

Value Added Analysis (VAA) is an analytical technique in business process management that aims to evaluate each step in a process to determine its contribution to generating value for customers and the organization (Dumas et al., 2018). This analysis is an integral part of continuous process improvement efforts, focusing on identifying and eliminating waste that does not contribute to the result.

Value Added Analysis (VAA) is a key concept in business process improvement, used to analyze the contribution of each activity in a process to the value generated for customers. In the context of process improvement, VAA serves as a tool for streamlining processes by identifying value-added and non-value-added activities (Andersen, 2007).

The basic concept of value-added stems from the understanding that as a product or service is processed within an organization, there is an increase in value, which can be measured as the difference between the post-process value and the pre-process value. Mathematically, added value is expressed as:

$$AV = Va - Vb \quad (2.1)$$

Where Va is the value after the process and Vb is the value before the process. This value does not depend solely on production costs, but rather on customer perceptions of the benefits, functions, and quality of the product or service (Andersen, 2007).

In Value Added Analysis, each activity in the process is classified into three main categories, namely:

- Real Value-Adding (RVA)

Activities that directly add value from the customer's perspective, such as transformation processes that improve product functionality or quality.

- Organizational Value-Adding (OVA)

Activities that do not provide direct value to customers, but are still necessary for the organization, such as production planning or administration.

- Non-Value-Adding (NVA)

Activities that do not provide value to either the customer or the organization, such as waiting, storage, and rework, should be eliminated (Andersen, 2007).

Through VAA, each activity in the process is analyzed to determine its contribution to value added. The primary goal of this analysis is to minimize OVA activities and eliminate NVA activities, thereby increasing the proportion of activities that truly add value (Andersen, 2007).

In practice, Value Added Analysis results are often visualized in the form of a color-coded flowchart, where RVA activities are marked as the main part of the process, while OVA and NVA activities are marked for further evaluation. This analysis often shows that only a small portion of the total process time and costs actually provide added value, so there is a significant opportunity for process improvement (Andersen, 2007).

Thus, Value Added Analysis becomes an important tool in improving the efficiency of business processes, reducing waste, and increasing the value provided to customers through optimizing activities in the process.

Value Added Analysis can be visualized in the form of a diagram showing the classification of activities into RVA, OVA, and NVA. This illustration is shown in Figure 2.1.

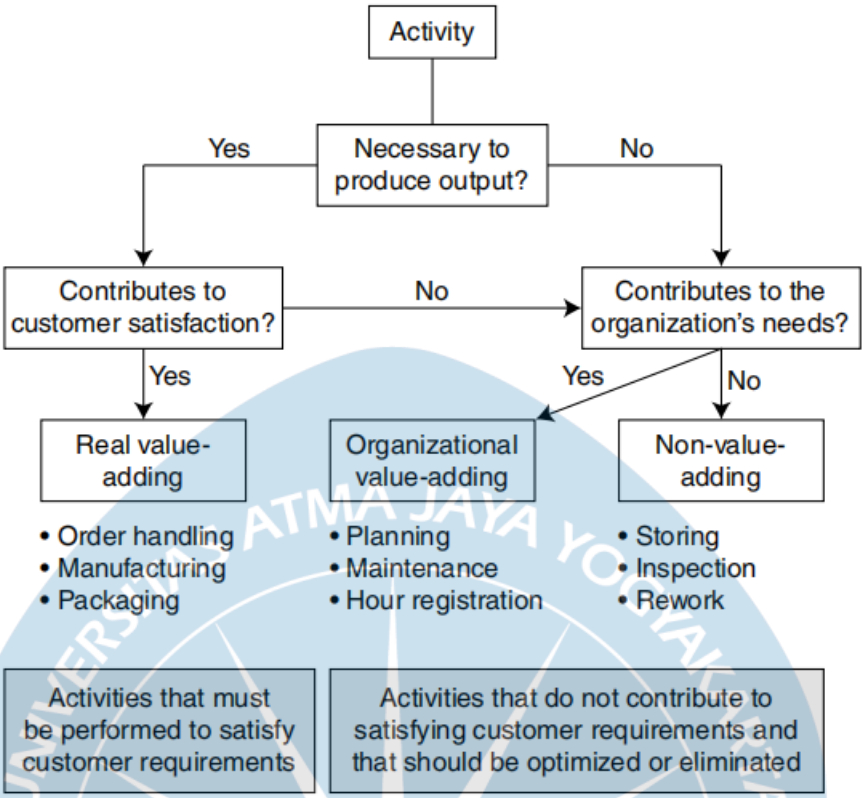


Figure 2.1 Value added analysis framework

2.2.9 Streamlining

Streamlining is an important concept in Business Process Improvement (BPI), focusing on simplifying and increasing the efficiency of business processes. According to Harrington, streamlining is an effort to eliminate waste and excess in a process, by paying attention to every detail that can improve performance and quality. This concept aims to create the smoothest process flow, with minimal obstacles, so that the process can run efficiently with minimal effort (Harrington, 1991).

Similarly, Andersen explains that streamlining is the principle of simplifying a process by eliminating unnecessary activities to make the workflow faster and more effective (Andersen, 2007). Thus, streamlining is not merely a simplification, but also a systematic effort to increase the proportion of value-added activities in a process.

In its implementation, streamlining is carried out using various process improvement techniques or tools. Harrington (1991) proposed 12 streamlining tools used to increase business process efficiency, namely:

1. Bureaucracy Elimination: eliminating administrative activities that do not add value.
2. Duplication Elimination: eliminating activities that are performed more than once without a clear reason.

3. Value-Added Assessment: identifying value-added and non-value-added activities.
4. Simplification: simplifying processes to make them easier to understand and execute.
5. Process Cycle-Time Reduction: reducing the time required to complete a process.
6. Error Proofing (Poka-Yoke): preventing errors in the process.
7. Upgrading: improving the capabilities of human resources or the technology used.
9. Simple Language: using easy-to-understand language in work procedures.
10. Standardization: establishing process standards to ensure consistency.
11. Supplier Partnerships: building strong partnerships with suppliers to increase efficiency.
12. Big Picture Improvement: looking at the process holistically to identify opportunities for greater improvement.
13. Automation and/or Mechanization: using technology to replace inefficient manual work.

These twelve tools are used in an integrated manner to ensure that each activity in the process truly contributes to customer needs and organizational goals. By implementing these tools, organizations can reduce waste, speed up processes, and improve output quality (Harrington, 1991).

Furthermore, streamlining is also the initial stage in broader process improvement efforts. In the BPI approach, streamlining occurs before the prevention and improvement phases, allowing organizations to eliminate sources of inefficiency early on (Andersen, 2007). This makes streamlining a critical foundation for creating effective and efficient business processes.

Overall, streamlining is a systematic approach to improving process performance through simplification, elimination of non-value-added activities, and optimization of workflow. The implementation of streamlining produces various benefits, such as reduced process time, cost efficiency, improved quality, and customer satisfaction (Harrington, 1991; Andersen, 2007).

2.2.10 Business Process Modelling and Notation

Standard Operating Procedures (SOPs) are detailed, written instructions that outline the steps required to complete specific tasks or processes within an organization. SOPs serve as a critical tool for standardizing operations, ensuring consistency, and maintaining quality across various functions and departments. They provide employees with clear guidelines on how to perform their roles, reducing errors and enhancing efficiency.

Business Process Model and Notation (BPMN) is a standardized graphical representation developed by the Object Management Group (OMG) to model and communicate business processes clearly and consistently. It serves as a universal visual language that bridges the gap between the design of business processes and their implementation, facilitating understanding and collaboration among diverse stakeholders, including business analysts, process owners, technical developers, and executives. The central goal of BPMN is to provide a notation that is both intuitive for non-technical users and detailed enough to support the technical requirements of system developers. As a result, BPMN helps organizations model end-to-end workflows that accurately reflect how tasks, decisions, and data flow within a business process.

BPMN is built upon a set of standardized elements, including events (which signal the start, intermediate steps, or end of a process), activities (which describe work to be performed), gateways (which model decisions and branching paths), and sequence flows (which define the order of execution). These elements are organized within pools and lanes to represent different participants and organizational units, thus making it easier to depict interdepartmental or cross-organizational processes. By using BPMN, businesses can visualize the logic and flow of operations, identify redundancies, streamline handoffs, and improve the overall efficiency of processes. This visual representation enables continuous process improvement by revealing inefficiencies, bottlenecks, or unnecessary steps that may not be obvious through textual documentation alone.

BPMN is particularly valuable in Business Process Management (BPM) initiatives, where organizations seek to analyze, optimize, and automate workflows. It enables the creation of process models that are not only descriptive but also executable when combined with workflow engines and business rules systems. In this way, BPMN supports digital transformation efforts and model-driven development, where changes to a process can be made at the model level and reflected in system behavior without extensive recoding. Moreover, BPMN can be used in conjunction with simulation tools to evaluate how process changes may impact performance metrics such as time, cost, and resource utilization.

In the academic and professional domain, BPMN has been recognized for its contribution to improving process transparency, communication, and alignment between business and IT. According to Dumas, La Rosa, Mendling, and Reijers, BPMN serves as a foundation for formal methods in process analysis and is instrumental in the lifecycle of process modelling—from design and verification to execution and monitoring [1]. Their research emphasizes the importance of BPMN in fostering a shared understanding

across disciplines and enhancing the quality of both manual and automated processes. The authors highlight that BPMN's widespread adoption has led to more coherent and effective process documentation practices, which are critical in today's data-driven and fast-changing business environment.

As organizations strive to become more agile and responsive, BPMN offers a structured yet flexible approach to mapping, analyzing, and improving business operations. Its ability to integrate business logic with technical infrastructure makes it an asset for achieving operational excellence, regulatory compliance, and customer satisfaction. In essence, BPMN not only facilitates better communication and documentation but also drives innovation by enabling scalable and adaptable process design across industries.

The basic constructs of BPMN (Business Process Model and Notation) are core elements used to visually represent and model business processes. These constructs help organize and communicate how a process flows, who is involved, and what data is used or produced. BPMN consists of five main categories of elements:

a. Swimlanes

Swimlanes are graphical containers that represent participants in a business process. They help separate responsibilities and interactions between different roles or departments. There are two types:

i. Pools: Represent major participants (e.g., organizations or external entities).

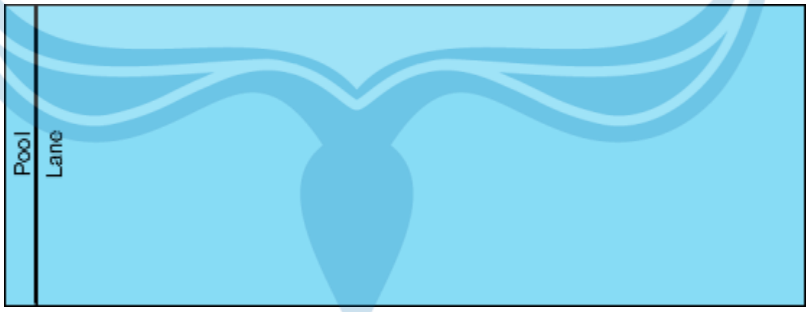


Figure 2.2 Pool in BPMN

ii. Lanes: Subdivisions within a pool, often representing roles or departments within the same organization.

b. Flow Elements

These are the core components that define the behavior of a process. There are three types:

i. Lanes: Subdivisions within a pool, often representing roles or departments within the same organization.

ii. Events: Represent things that happen (start, intermediate, end) that affect the flow.
iii. Activities: Tasks or sub-processes performed in the process.
iv. Gateways: Decision points that control the flow depending on conditions.

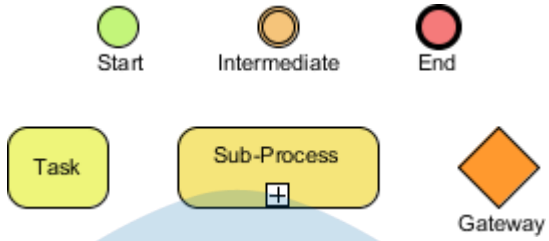


Figure 2.3 Flow elements in BPMN

c. Connecting Objects

These link the flow elements to form a complete process:

i. Sequence Flows: Show the order in which activities are performed.
ii. Message Flows: Show the exchange of messages between participants (across pools).
iii. Associations: Link artifacts like data or text annotations to elements.
iv. Data Associations: Indicate how data is input to or output from activities.

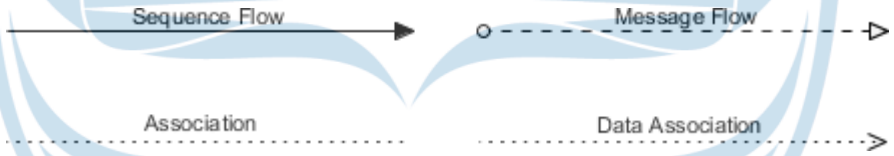


Figure 2.4 Connecting objects in BPMN

d. Data

BPMN allows you to model the data involved in a process:

i. Data Objects: Information used or produced by activities.
ii. Data Inputs/Outputs: Represent inputs to and results from processes.
iii. Data Stores: Represent where data is stored for future use.

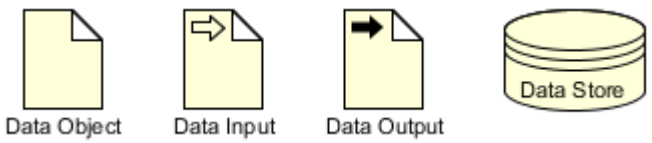


Figure 2.5 Data in BPMN

e. Artifacts

These provide additional information to enrich the model:

i. Groups: Dotted-line boxes used to visually group related elements.
ii. Text Annotations: Notes or comments that explain parts of the process without affecting the flow.

These basic constructs help model a business process in a clear, standardized, and structured way that is understandable to both business and technical stakeholders.

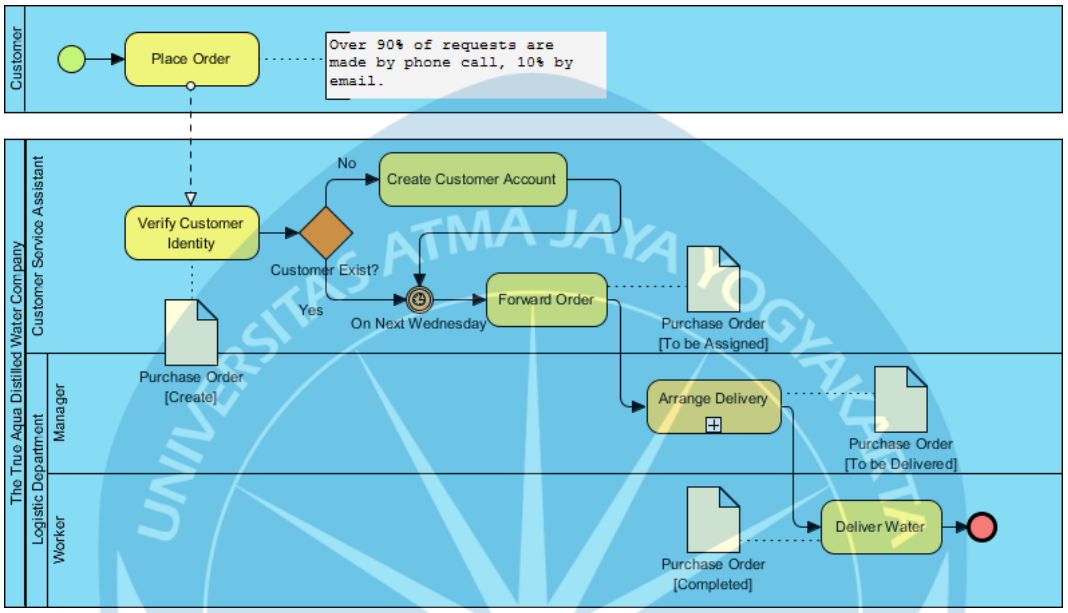


Figure 2.6 BPMN of distilled water delivering process

2.2.11 Standard Operating Procedures

Standard Operating Procedures (SOPs) are detailed, written instructions that outline the steps required to complete specific tasks or processes within an organization. SOPs serve as a critical tool for standardizing operations, ensuring consistency, and maintaining quality across various functions and departments. They provide employees with clear guidelines on how to perform their roles, reducing errors and enhancing efficiency.

SOPs are essential in industries where precision, compliance, and quality control are critical, such as manufacturing, healthcare, and logistics. For example, in a warehouse environment, SOPs may include step-by-step instructions for inventory management, order picking, and shipping processes. By providing a standardized approach, SOPs help organizations minimize variability, improve productivity, and meet regulatory requirements (Madu, 2012).

Moreover, SOPs play a vital role in training and onboarding new employees, as they provide a comprehensive framework for learning job responsibilities. They also act as a reference point for resolving operational issues and ensuring compliance with internal

policies and external regulations. Without clear SOPs, organizations may face inefficiencies, miscommunication, and inconsistent outcomes, which can negatively impact overall performance.

Developing effective SOPs requires input from all relevant stakeholders to ensure they are practical, up-to-date, and aligned with the organization's goals. Regular reviews and updates are also necessary to reflect changes in processes, technologies, or regulations. As Madu (2012) notes, well-designed SOPs are not only a tool for improving operational efficiency but also a foundation for fostering a culture of accountability and continuous improvement.

2.3 Standards and Code of Ethics

In completing this final project, there are standards and codes of ethics that are used as guidelines for final project design. These standards and codes of conduct are used to ensure that final project runs according to applicable standards and codes of conduct. This is carried out so that the final project carried out is guaranteed to be accurate and still implements applicable regulatory standards. The final project author uses the ISO 10244:2010 standard on document management guidelines and business process analysis.

ISO 9001:2015 used on quality management systems used for organizational requirements to build and implement an effective quality management system. The basics used are related to clause 4.4 concerning outlining operational process details, clause 5.3 concerning organizational roles, responsibilities, and authorities, clause 7.5 containing documented information, clause 8.1 concerning operational planning and control, clause 8.2 concerning product and service requirements.

ISO 10013:2021 is used as a guideline in creating a procedure. A key part of ISO 10013:2021 is Clause 4.2.4.5, used as the primary guideline for determining the content and structure of the SOP. Clauses 5.1.4–5.1.6 define document identification, format, review, and approval requirements. Clause 5.2, used to establish document controls, including distribution, revision, storage, and retention.

Table 2.3 Information an SOP should contain based on ISO 10013:2021

SOP Element	Description from ISO 10013:2021
Purpose of the procedure	Describe the purpose of the process or activity being controlled.
Process description	Describe the process using text, flowcharts, photos, videos, or other suitable methods.
Roles and responsibilities (Who)	Identify who performs each activity or the responsible organizational function.
Activities (What)	Explain what activities must be performed.
Reason (Why)	Explain why each activity is carried out when necessary.
Timing (When)	Specify when each activity should be performed.
Location (Where)	Identify where the activity takes place, if applicable.
Resources	Specify the people, infrastructure, equipment, materials, or systems required.
Process controls	Define the controls necessary to ensure the activities are performed correctly.
Risks and opportunities	Address risks and opportunities affecting achievement of process objectives.
Related documented information	Reference related documents, forms, standards, or work instructions.
Inputs	Identify the information or materials required before starting the process.
Outputs	Define the expected results or deliverables of the process.
Measurements and acceptance criteria	Specify performance indicators or criteria used to verify effective process operation.
Records to be retained	Identify any forms or records generated and explain how they are completed, filed, and retained.

The code of ethics in this study is applied in the form of licensing with the Company to be used as the object of final project. This licensing is carried out to the board of directors and stakeholders. In addition, there is an agreement to collect data, cooperate and communicate with stakeholders, and an agreement to implement business processes to complete the final project.