BUSINESS PROCESS REDESIGN OF VMEDIS ERP BASED PHARMACY SOFTWARE SYSTEM IMPLEMENTATION: CASE STUDY CORE PROCESS IN APOTEK MATARAM KLATEN

UNDERGRADUATE THESIS

Submitted to the International Undergraduate Program in Industrial Engineering in Partial Fulfilment of Requirement for the Degree of Sarjana Teknik at the Faculty of Industrial Technology Universitas Islam Indonesia

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2025

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Penelitian tugas akhir merupakan kesempatan yang baik bagi mahasiswa untuk dapat mengetahui secara langsung dan mendapatkan data yang akurat. Sehubung dengan telah berjalannya proses penelitian yang sudah dilaksanakan mahasiswa/i Universitas Islam Indonesia di Apotek Mataram dengan detail sebagai berikut:

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Demikianlah surat ini kami sampaikan, atas perhatian dan kerja samanya kami ucapkan terima kasih

Pemilik Apotek Mataram

Didik Abdul Rosyid S.E.

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DEDICATION PAGE

This undergraduate thesis is dedicated to Allah SWT, Lord of the universe, as a form of worship as a servant. To my beloved parents who have facilitated this education, supported, and provided everything. Also, to my own self, who has survived until the last chapter of college life. Additionally, with profound respect, I am grateful to my supervisor, Mr. Bambang Suratno, S.T., M.T., Ph.D., who provided the guidance, knowledge, and patience for the author throughout this undergraduate thesis.

MOTTO

“A single endeavor (of fighting) in Allah's Cause in the afternoon or in the forenoon is better than all the world and whatever is in it.”
(Sahih Al-Bukhari 2796)

“Indeed, We have granted you a clear triumph.”
(QS. Al-Fath: 1)

PREFACE

Bismillahirrahmanirrahim
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The author expresses gratitude for the presence of Allah SWT, the Lord of all worlds, who has given blessings, love, and guidance. Blessings and peace are continuously sent to Prophet Muhammad SAW, the best role model who has led humanity to an era of greatness. With all of the permission and will of Allah, the author has completed the undergraduate thesis titled "Business Process Redesign of Vmedis ERP-Based Pharmacy Software System Implementation: Case Study Core Process in Apotek Mataram Klaten". Additionally, the author would like to express gratitude to:

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11. All parties involved in assisting the author during the study, especially during the undergraduate thesis research, cannot be mentioned individually.

The author realizes that this undergraduate thesis report has a lot of things that could be improved. Therefore, the author expects suggestions and criticism for improvement in this research report. The author hopes that this report could benefit and be developed further.
Wassalamu'alaikum Warahmatullahi Wabarakatuh

ABSTRACT

The implementation of Enterprise Resource Planning (ERP) systems in the healthcare sector, especially in pharmacy, has become essential for improving operational efficiency and business process integration. However, shifting from the conventional system to the new ERP integrated system is impeded by problem occurrence due to the system gaps, particularly in the business process, thus the ERP cannot be performed well. Therefore, it becomes important to analyse and identify the business process, thus it can be adjusted to accommodate the ERP system. This research focuses on the business process redesign of Vmedis (ERP-based software for pharmacy) implementation in Apotek Mataram Klaten. The primary objective of this research is to solve the problem regarding the Vmedis business process alignment by adjusting the core business processes—stock management, procurement, and order fulfillment—thus the Vmedis system can be improved to enhance efficiency. This research employs Design Thinking methodology, which includes Empathize, Define, Ideate, Prototype, and Test phases, in addressing implementation challenges by fostering a human-centred approach. Data collection was conducted through interviews, direct observations, and employee surveys. The findings reveal several pain points, including difficulties that caused longer order processing times, stock management synchronization problems, and procurement inefficiencies. To address these issues, business process adjustments were proposed using Business Process Model and Notation (BPMN), and the effectiveness of these improvements was assessed using processing time analysis, process simulation, and User Acceptance Testing (UAT). The results indicate that the redesigned business process significantly improves operational efficiency, enhances workflow automation, and reduces process cycle time.

Keywords: ERP, Business Process Management, Pharmacy Management, Design Thinking, BPMN, Process Simulation, User Acceptance Testing.

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CHAPTER I
INTRODUCTION

1.1 Background

Healthcare is one of the most fundamental aspects of human life. A person's primary objective needs to be living a healthy life, as it is directly related to their quality of life (Shukla et al., 2023). The healthcare industry comprises a number of organizations and including healthcare delivery methods, support services, clinical research, healthcare technology, healthcare exchanges, and healthcare information flows. Commonly, pharmaceutical companies do not provide medications and pharmaceuticals directly to patients, yet focus on drug manufacturing and medicine development research. Delivering drugs from the pharmaceutical manufacturer to the consumer's hand cannot be performed directly by a single party; it needs multiple roles and organizations, sectors are involved, such as logistic provider, B2B trader, and drug retailer. Therefore, to complete the success of the medicine supply chain at the downstream level, the organization level involved in the lower level of medicine plays a crucial role in which is popularly known as pharmacy.

A pharmacy is an organization in healthcare that is vital to countries, as it is an agent to transfer pharmaceuticals legally from drug manufacturers to customers. Pharmacy's revenue growth is increasing over the year, as referred to Statista (2024), the Indonesian pharmacy market is projected to have a revenue of US$14.41 billion by 2024. The compound annual growth rate (CAGR) from 2024 to 2029 is anticipated to be 4.54%, resulting in a market volume of US$17.99 billion by 2029. (Mizranita et al., 2024) mentioned in their research that community pharmacy practice in Indonesia has substantially progressed in recent years, shifting from a conventional, product-oriented model to a more integrated, patient-centered perspective. Since the consequences of higher competition, pharmacy also needs a good system and continuous improvement to gain more profit and achieve a better targeted condition, so the business can be well sustained. The alternative to developing a pharmacy system is by utilizing information technology, such as an ERP system. This ERP technology can help to perform the business efficiently, as explained in the previous study (Ramadhani M et al., 2023). As mentioned (AlMuhayfith & Shaiti, 2020) in their research, it concluded that the implementation of ERP significantly enhances the organization's business process performance.

One of those software enablers is Vmedis, which established an enterprise system software exclusively for the healthcare sector, including pharmacy, to accommodate the uniquity needs of their business process. Several benefits are offered by Vmedis, such as increasing the efficiency of the pharmacy's management system, integrating aspects within the pharmacy, such as payment, shipping, and billing process, managing stock, and controlling the financial aspect. Because of its numerous valuable advantages, many pharmacies, currently reaching 3,705 across Indonesia, have decided to adopt Vmedis as their software to perform the firm system.

However, the presence of information technology or enterprise systems in the business sector, including Vmedis, needs an initiation to install and integrate it into the current business system. Referring to several preceding studies, the failure rate of ERP deployment in organizations is notably high, with outcomes indicating that the failure ranges from 67% to 90%. Another study indicates that 70% of ERP implementations were unsuccessful in project delivery. Furthermore, the percentages of failure or rejection in ERP adoption exceed 77% (Alaskari et al., 2019; Rajapakse & Thushara, 2023). Panorama Consulting Group (2018) reports that the failure or rejection rate exceeds 60%.

The Vmedis software installation in the pharmacy also needs a well-designed preparation to achieve the target. Integrating the Vmedis system into the current business process, especially core processes, in the pharmacy is quite complicated since there are gaps between the conventional and modern Vmedis software system. One of the pharmacies that wants to install Vmedis software in its firm is Apotek Mataram, a pharmacy located in Klaten, Central Java, established in 2006. Over these, Apotek Mataram grows well and their scope is getting larger, so their business process becomes more complicated, so the management of Apotek Mataram intends to improve their business system by adopting enterprise system software. Through careful consideration, the owner of Apotek Mataram has been strategically decided to adopt Vmedis as their enterprise system software to enhance the business process performance. They expect the implementation of Vmedis can improve the condition of the pharmacy through automation and integration of information among the business processes, since Apotek Mataram applies a conventional method in performing core business processes. Some of the components that are concerned to be developed utilizing Vmedis are such as stock management, procurement, and fulfillment system as part of the core business process.

Currently, Apotek Mataram has subscribed to Vmedis and is ready to shift to using the expert

enterprise system software. However, integrating the Vmedis system into the current business process in Apotek Mataram is not easy. The new Vmedis integrated business process has not been implemented yet because they are facing several problems regarding the implementation of Vmedis software, such as the differences of activities in performing a process by employees. As the owner stated, the firm has difficulties in applying the new Vmedis integrated system, and it needs an adjustment to the business process to shift from the previous conventional procedures to the enhanced business process. It is confirmed by the employee survey data, that shown in the figure below.

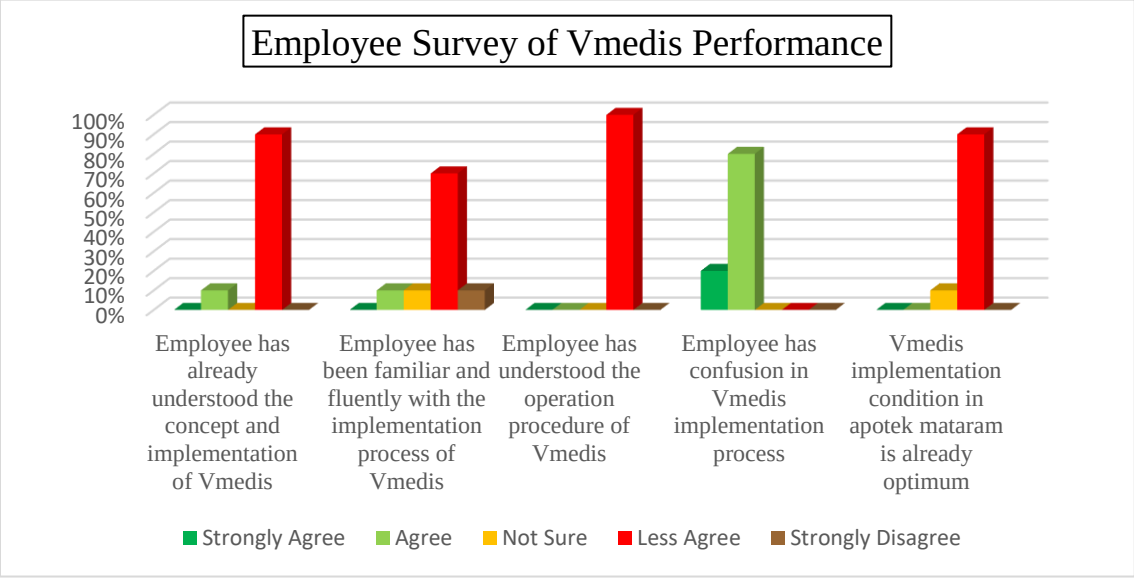

Figure 1. 1 Employee Survey of Vmedis Performance Data

The figure represents the result of employee survey data regarding the implementation process of Vmedis in the Apotek Mataram business process. The employees are asked to vote based on their opinion about several statements. Based on the data, it can be confirmed that the Vmedis implementation in Apotek Mataram is facing problems as discussed.

Therefore, it needs deeper analysis to establish the new procedure of business process integrated with Vmedis software in Apotek Mataram so that the new system can be performed well, existing problems can be eliminated, and the employees can work optimally. In analyzing the problems to achieve the best solution, it can utilize several methods, as the previous research has been conducted.

In the preceding research conducted by (Anjani et al., 2024) has already succeeded in fostering Odoo software implementation in PT. Tiara Fajar Transportindo through the Accelerated SAP (ASAP) method. Yet that study does not have concern for the business process

alignment, and it does not consider the user's requirements due to the limitation. Another study carried out (Azhari et al., 2021) has succeeded in improving the business process management at PT. PGAS Telekomunikasi Nusantara by utilizing the business process management (BPM) method. That research comprehensively covers the analysis and steps to improve certain processes within the organization. However, the research's limitations are that it has not included the alignment process to integrate enterprise system software into it, also, rather than concern and accommodating the users' needs, the study focuses more on the object. In industrial engineering studies, human factor becomes an important thing that should be accommodated in designing a certain thing, whether a product, process, or system. Therefore, considering users' needs is crucial so that the enhancement can fit properly with the operator or user, and an ideal condition can be attained. A methodology that has a uniqueness in considering users' requirements as its main focus, since it started with the empathize stage, is called design thinking.

Design thinking refers to a distinctive methodology for addressing challenges through new solutions. Brown (Brown, 2008), in his article, explained that design thinking is a recognized methodology employed by organizations to address challenges and foster innovation. It offers advantageous benefits for developing products and services because design thinking is strongly concerned with users' needs. Its concepts are applied by researchers in multiple disciplines to figure out the solution to a problem. As stated (Kimbell, 2011), the design thinking approach is utilized in broad sectors such as business and science. Furthermore, the research (Pusca & Northwood, 2018) mentioned that the design thinking can also be utilized in engineering as a problem-solving tool and in the education field to develop a curriculum system; this statement supports that the design thinking method is very agile. In the business sector, design thinking has been commonly applied to develop new strategies or innovations in certain businesses to enhance profitability and pertinent competitiveness, so the business can sustain (Volkova & Jākobsone, 2016) itself.

Based on the problem explained in the previous section, this research concerns to aligning the core business process in Apotek Mataram in installing Vmedis as their enterprise system software to boost efficiency. The employed method in designing the business process alignment in this research is the design thinking method as a human-centered problem-solving tool. This research becomes important because it is needed to solve the problem as mentioned by providing the solution that can make the Apotek Mataram perform its system, integrated by

Vmedis, run smoothly.

1.2 Problem Formulation

Based on the background of the research above, the problems can be briefly stated that the Apotek Mataram is facing an issue in performing the Vmedis enterprise system software on their business system, especially on the core business processes, including stock management, procurement, and fulfillment system as part of the core business process. Thus, the research questions can be formulated into several points as follows:

a. What are the Apotek Mataram employees' needs and complaints about the Vmedis implementation on the core business process system?

b. What are the gaps and defined problems of the core business process in Apotek Mataram in Vmedis implementation?

c. How are the adjustments to the business process alternatives of the core process in Apotek Mataram in Vmedis implementation?

d. How is the proposed business process model of the core process aligned with Vmedis in Apotek Mataram?

e. How is the result of the business process improvement of the core process in Apotek Mataram in Vmedis implementation?

1.3 Research Objectives

The objective of this research is to provide the implementation of Vmedis software planning in Apotek Mataram, which is based on the determined problem formulation, including:

a. To identify the Apotek Mataram employees' pains and complaints about the Vmedis implementation on the core business process system

b. To identify the gaps and defined problems of the core business process in Apotek Mataram in the Vmedis implementation

c. To specify the adjustment on the business process alternatives of the core process in Apotek Mataram in the Vmedis implementation

d. To design the business process model of the core process in Apotek Mataram, which is aligned with the Vmedis implementation

e. To measure the result of the business process improvement of the core process in Apotek Mataram in the Vmedis implementation

1.4 Research Limitations

The limitations in conducting this research in accordance with the problem formulation can be determined as follows:

a. This research is limited to analyzing the initiation implementation gaps of Vmedis enterprise system software on the Apotek Mataram business process.

b. This research is focused on the Vmedis software performance on core business processes, which comprise stock management, procurement, and system fulfillment.

c. The data of this research was obtained from November 2024 to January 2025.

d. This research focused on the business process alignment on Vmedis enterprise software implementation.

e. The financial sector business process is not discussed since it includes on support process, while this research is concerned with the core business process because of the complexity scope consideration.

f. The implications caused by the business process redesign, such as additional costs, are not addressed in this research because of the limited time and scope constraints.

1.5 Research Benefits

This research provides several benefits for several parties. Benefits are:

1. For SMEs (Apotek Mataram)

    a. This research can help the implementation of Vmedis software in Apotek Mataram, so that the Vmedis software can be performed in Apotek Mataram effectively and efficiently.

    b. This research provides the developed business process integrated with Vmedis software, which can be utilized in Apotek Mataram.

    c. This research provides the guidelines for Vmedis software implementation in Apotek Mataram.

2. For Researcher

    a. This research helps the researcher in implementing the body of knowledge of industrial engineering in a real field.

    b. This research fosters the researcher to understand more deeply about Enterprise Resource Planning, Enterprise Analysis and Design, and Innovation and Organization Development subjects in the real world.

    c. This research gives the experience to researchers in applying the knowledge and theories within the industrial engineering subjects, such as Enterprise Resource Planning, Enterprise Analysis and Design, and Innovation and Organization Development.

CHAPTER II
LITERATURE REVIEW

2.1 Literature Study

A literature review is an academic work that shows knowledge and understanding of scholarly literature regarding a certain subject within its context. A literature review encompasses a critical assessment of the content. A literature review typically comprises an analysis of several dissertations, research projects, articles, or essays. The related previous articles on this research include several topics such as the healthcare sector industry, pharmacy, enterprise resource planning, business process, and design thinking. This literature review is carried out to support this research by providing wider knowledge and understanding related to the topic areas. Furthermore, the literature review functions to analyze the differences of the previous research's variables and also identifies and compares the uniqueness of this research variable, which will be examined.

The research was carried out by (Laksmana & Wahyuni, 2022) examining the pharmacy management system enhancement. A pharmacy provides pharmaceutical products and services. Several business processes inside the pharmacy are such as managing drug data, including stocks, procuring drugs from distributors, selling drugs to consumers, controlling drug prices, and generating sales reports. The articles also highlight that some pharmacies employ manual management methods in their business process, which are prone to errors. Conventional and manual control are also less efficient in their implementation such as it takes a longer time to record stock and sales reports. This study found that to improve quality, employee performance, and data processing, management can be achieved through the establishment and utilization of an integration management system software. Some benefits are such as helps owners and employees to access drug information, employee records, supplier details, procurement records, and sales data generation.

(AlMuhayfith & Shaiti, 2020) had conducted research with the title "The Impact of Enterprise Resource Planning on Business Performance: With the Discussion on Its Relationship with Open Innovation", which aimed to analyse the impact of ERP application on business process performance. This research employs the positivist paradigm method in analysis and uses interviews and questionnaires as the tools to obtain the data. The object of this research is focused on SME organizations. The findings reveal that the ERP system

significantly impacts the business performance. Also, it stated that the successful ERP utilization is not only in the implementation phase, but also the usage stage needs to be controlled carefully. Some of the factors that significantly contribute to the successful utilization of ERP are management support, user satisfaction, and training.

(Anjani et al., 2024) has carried out research about the implementation of ERP using Odoo software, utilizing accelerated SAP as a method, and the black box testing method was used to examine the system. Interviews and observation were employed in collecting data. The research focuses on the ERP implementation phase in PT. Tiara Fajar Transportindo. The findings show that the Odoo ERP system matched the needs of the organization, especially in three main business processes of documenting, recruitment, and employee management. The black box testing result also indicated that the features of the Odoo ERP system are aligned with the organization's system.

The previous study carried out by (Azhari et al., 2021) has accomplished improving the business process management on PT. PGAS Telekomunikasi Nusantara by utilizing the business process management (BPM) method. That research comprehensively covers the analysis and steps to improve certain processes within the organization. This research employs the BPM method to identify and evaluate the business process in PT. PGAS Telekomunikasi Nusantara, thus the recent condition can be clearly defined, and the improvement plan can be developed correctly. The output of this research is the enhancement of efficiency and productivity in several aspects, such as time, cost, also on product and service quality improvement.

The article established by (Carmignani, 2014) titled "Process Modelling and Problem Solving: Connecting Two Worlds by BPMN" discusses the business process and its improvement, as well as the framework and supporting tools involved in carrying problem problem-solving and enhancing business processes. Three phases are used in the modelling process, including *Frame the process*, *Understand the current (as-is) process*, and *Design the new (to-be) process.* As shown in the figure as follows.

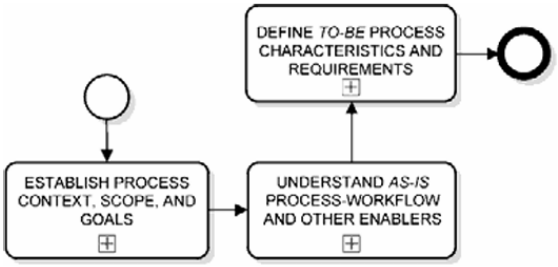

Figure 2. 1 BPMN Development Phases Diagram

The figure above, which was obtained from the (Carmignani, 2014) research, represents the three phases used in business process modelling. The tools involved in this article are business process modelling notation (BPMN) to depict the processes and fishbone diagram to analyze the significant factors or enablers that affect the business process. This research covers six enablers as their consideration to develop business process, those are workflow design, information systems, motivation and measurement, human resources, policies and rules, and facilities. Each enabler was assessed by using Critical-To-Quality (CTQ).

The article, titled "Design thinking and its application to problem solving," carried out by (Pusca & Northwood, 2018) was discussed the design thinking method implemented in the problem-solving process. The object of this research is the challenges in higher education. Within the research, it was stated that the design thinking method is a solution-based approach to producing creative solutions for complicated problems. Furthermore, this study examines the problems in the education field as its case study, which involves several aspects such as curricula, teaching model, examination method, and pedagogy to enhance the quality of graduates. Ultimately, the researcher claimed that the solution resulting from design thinking is highly suitable in address the solution is answering the problem because design thinking is characterized by a strong user orientation.

(Malynovska et al., 2021) conducted a study titled "Design Thinking Method Implementation in Personnel Certification Procedures," which aimed to justify, test, and evaluate the personnel certification process through a design thinking approach. This study adopted both quantitative and qualitative methods, such as statistical tools and psychological tools. The object of the study is the processes of oil and gas enterprises' personnel certification against international standards. The result of the study shows the success of process enhancement and procedures efficiency of international certification through the design thinking approach. Furthermore, the finding proved that design thinking has practical feasibility and effectiveness on process improvement by involving all stakeholders of the object.

The research carried out by (Hehn et al., 2018) which entitled “Design Thinking Methods for Service Innovation: A Delphi Study,” reviewed the design thinking method, which focused on its implementation in developing service innovation. The method employed in this research is a Delphi Study. The result of this study is a comprehensive view about the application of design thinking in service sector in which concluded in three points including the research supported that design thinking is highly suitable to be applied in service area, give fundamental knowledge about design thinking application in service innovation, and lists of tools and methods that can be utilized in developing service using design thinking approach.

In utilizing the design thinking approach might need supported tools to achieve the optimal result. In the research titled “How Might We? From Design Challenges to Business Innovation” by (Siemon et al., 2018). This research analyzes the utilization of the “How Might We” (HMW) tool in the design thinking application. The HMW method is one of the most common tools used in design thinking in the define phase. This tool supports the ideation process by writing questions to build the design ideas. The research findings of the experiment show that the HMW tool is beneficial in developing design ideas. Another output of this research is a developed HMW framework prototype that can be used in the design process.

The research entitled with “Designing Personas with Empathy Map”, which was carried out by (Ferreira et al., 2015) discussing about the importance of empathy map as the tool in designing personas. The personas method is a technique to identify the user’s characteristic, requirements, pain, and gain. This method offers a comprehensive result to understand the user needs thus the designing process can covers the compliance features and deliverables. The tool which can be utilized in this method is empathy map (EM). Empathy map is a tool that support the design process in depicting the user’s requirements by providing a structured framework thus the user can deliver the ideas clearly. This research found that the empathy map (EM) is considered useful and easy to use in defining personas thus it is significant in design process.

Table 2. 1 Statement of Art

No.	Title	Authors	Topic	Methods	Output
1.	Integrasi Manajemen Apotik	(Laksmana & Wahyuni, 2022)	Pharmacy management system	Research and Development	Pharmacy integration software system
2.	The Impact of Enterprise Resource Planning on Business Performance: With the Discussion on Its Relationship with Open Innovation	(AlMuhayfith & Shaiti, 2020)	ERP evaluation	Exploratory Study & Contingency Theory	Evaluation result and suggestion about ERP implementation
3.	Implementasi ERP Odoo untuk Peningkatan Sistem Informasi Bisnis Perusahaan menggunakan Metode Accelereted SAP	(Anjani et al., 2024)	ERP implementation	Accelerated SAP & Blackbox Testing	Successful ERP implementation method
4.	Analisis Dan Rancangan Manajemen Proses Bisnis Untuk Layanan Pelanggan Di Pt. Pgas Telekomunikasi Nusantara	(Azhari et al., 2021)	ERP implementation	Business Process Management	Enhancement on efficiency and productivity in business process

5.	Process Modelling and Problem Solving: Connecting Two Worlds by BPMN	(Carmignani, 2014)	Process modelling	Business Process Model Notation (BPMN) & Pilot Scenario	Framework in improving process workflow
6.	Design thinking and its application to problem solving	(Pusca & Northwood, 2018)	Design thinking implementation in education	Design Thinking	Successful design thinking application in designing and solving problem in improving curriculum education
7.	Design Thinking Method Implementation in Personnel Certification Procedures	(Malynovska et al., 2021)	Design thinking implementation in process	Design Thinking	Successful design thinking application in improving certification procedures
8.	Design Thinking Methods for Service Innovation: A Delphi Study	(Hehn et al., 2018)	Design thinking review in service	Delphi Study	Comprehensive review of design thinking application in developing service innovation and its tools
9.	How Might We? From Design Challenges to Business Innovation	(Siemon et al., 2018)	"How might we" application in design thinking	How might we and Design Science Research Methodology (DSRM)	Examining the application of "how might we" tool in design thinking and proved that HMW tool is significant in achieving better result

10.	Designing Personas with Empathy Map	(Ferreira et al., 2015)	Empathy map in design process	Empathy Map & Feasibility Study	Evaluate the feasibility of empathy map in design process which resulted that EM is useful in design process
11.	Comparison Between Usability and User Acceptance Testing on Educational Game Assessment	(Vanesha et al., 2024)	Testing method: SUS & UAT	SUS & UAT	Successful application of software testing through SUS and UAT method
12.	Root Cause Analysis Using Fishbone Diagram: Company Management Decision Making	(Holifahtus Sakdiyah et al., 2022)	Application of fishbone diagram in root cause analysis	RCA: Fishbone Diagram	Successful application of fishbone diagram in analyzing the root cause of problems

2.2 Theoretical Basis

2.2.1 Healthcare Sector Industry

Healthcare is essential to public safety, serving as a vital aspect of state functions and a key element of national security, with the objective of organizing and providing accessible medical care for citizens. The state's capacity to protect national interests in healthcare from potential threats and to guarantee the realization of the human right to life, health, medical assistance, and medical insurance, in order to mitigate dangers to life and health, is essential for safety (Tkachenko et al., 2024). Providing sufficient healthcare facility is an effort to ensure country's healthcare conditions including to concern against healthcare regulation, ensuring medicine supplies, and enhance healthcare industry.

The healthcare sector includes many industries, sub-industries, and a wide variety of companies. Any company involved in products and services related to health and medical care are represented in the healthcare sector and further categorized under six main industries. These industries include pharmaceuticals, biotechnology, equipment, distribution, facilities, and managed health care. As its importance, several national regulations established to covers healthcare industry sectors such as Law No. 36 of 2009 on Health (Chapter on Pharmaceuticals) which emphasize the importance of ensuring high-quality and safe medications also regulate the production, distribution, pharmaceuticals utilization, and medical devices.

2.2.2 Pharmacy

Distribution is a fundamental component of the healthcare sector supply chain. It encompasses all distributors and wholesalers of healthcare products. This may involve organizations that vary from pharmacies to equipment suppliers. Since medicine manufacturer do not reach and deliver the drugs directly to the people, the downstream organization, named as pharmacy, serves as an agent to distribute medicine to consumer.

Pharmacies are enhancing public health by administering immunizations, performing screenings for diverse acute and chronic conditions, and advocating for appropriate medication usage; furthermore, they act as health and prevention educators in numerous clinical and community environments (Strand et al., 2016). On the other hand, the pharmacy sector also impacts the economy; as pharmacies are classified as small and medium-sized enterprises (SMEs), their advancement will help to the economic prosperity of nations.

2.2.3 Enterprise Resource Planning

Enterprise resource planning (ERP) systems are software packages consisting of various modules to cover the business process within the enterprise, including human resources, sales, finance, and production, to facilitate cross-organizational integration of information via integrated business processes. The term "ERP" was introduced in 1990 by Gartner to describe a new generation of material requirements planning (MRP) systems (Nazemi et al., 2012). Comprehensive systems named as MRP were created in the 1970s, with advancements in the ability to integrate financial and manufacturing processes, which was initiated by the development of a simple computing system to manage the inventory in about 1940s to 1950s. These mainly focused on product integration and planning to comply with a master manufacturing schedule in which this system was developed by SAP, the pioneer of ERP, in the early 1970s (Katuu, 2020). In the 1990s, ERP became more advanced with the development of client-server architecture within the software, and in the 2000s, ERP covered a wider scope by extending its features, such as Supply Chain Management (SCM) and Customer Relationship Management (CRM).

Along with the technology development, ERP keeps developing and in the 2010s, ERP utilizes modern features such as a modular and flexible system, cloud-based, and artificial intelligence (AI) integrated, and automation decision-making tools. These developments show that ERP is agile and adaptive to the demand requirements (Katuu, 2020).

2.2.4 Business Process

The term “business process” refers to a sequence of activities or a collection of tasks that are carried out by a group of stakeholders to accomplish a certain organizational objective starting from input continued by adding value to obtain the output in as consumers’ requirements with clear steps of the beginning process, end process, inputs and outputs (Harmon, 2014). In order to accomplish a goal that has been established in advance, the processes are carried out by individuals or systems in a systematic way. One of the most important factors that directly contributes to the success of business operations and growth is the efficient and streamlined execution of business procedures.

Business process is the key within the organization or company in performing activities and integrating the flow within it. The performance of business processes, such as effectiveness and efficiency, will directly affect the organization in achieving its target. Thus, controlling and evaluating business processes to ensure the performance runs well becomes important (Maulana, 2023).

2.2.4.1 Business Process Model Notation (BPMN)

Business Process Model Notation (BPMN) is a standard tool to communicate business process language (Recker, 2010) due to its understandable and ability to comprehensively describe business flow and technical process, also an ISO certified (ISO/IEC 19510:2013) (Ritter et al., 2011). It can describe and communicate entire things within the business, such as business rules, business events, and costs. Another benefit is that numerous applications and software tools can be used to create BPMN (Kocbek et al., 2015). The objective of BPMN is to support the business process by establishing a model of business process flow in a comprehensive and easy-to-understand way. In delivering business process language, BPMN has specific elements to represent each occurrence within the business, The elements are explained as follows:

1. Flow Objects

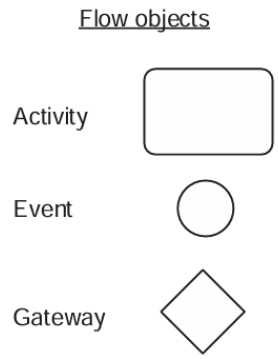

Figure 2. 2 BPMN Flow Object

The figure above shows the element group of the flow object. A flow object is an element that is flowing within a process, as a compiler of a process. The elements that are included in the flow object type are “activity”, “event”, and “gateway”. “Activity” is a type of flow object to represent an active action, in another word is something to do. “Event” is to depict an occurrence that has a passive characteristic or something that happened. “Gateway” is to illustrate a certain condition that might cause a branch in the flow because of choices.

2. Connecting Objects

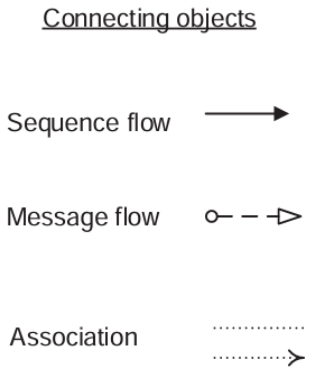

Figure 2. 3 BPMN Connecting Object

The figure above provides the connecting object elements. Connecting objects in BPMN are used to represent the dependencies, relationships, and flows within the business process. The "Sequence flow" functionates to explain the flow or connectivity order among activities, tasks, or events within a single pool. While "message flow" is the opposite of the sequence flow, it represents the connectivity among the activities, tasks, or events across the pools or different pools. The "association" is a connector to explain the attachment of artifacts.

3. Artifacts

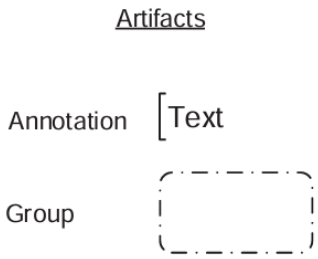

Figure 2. 4 BPMN Artifacts

The above figure provides an example of artifacts in BPMN. The "artifacts" are a supplementary element utilized in BPMN to add additional information within an element or process. Some of the examples are "annotation", used to give additional explanations or notes in a flowing object, and "group" is utilized to associate some flowing objects that represent a sub-process or categorize several objects within a process.

4. Participants

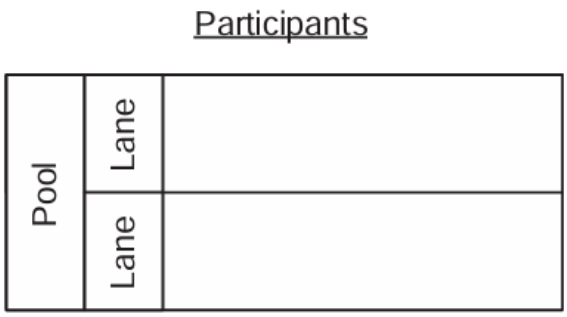

Figure 2. 5 BPMN Participants

The figure above displays the participants' object in BPMN. The "participants" are a type of object in BPMN that is used to manage and separate roles, departments, positions, or companies in which involved in the business process. Participants consist of two elements: the "pool" is a container of a certain process, and the "lane" is utilized to separate the roles within a pool or as a sub-container of a certain process.

5. Data

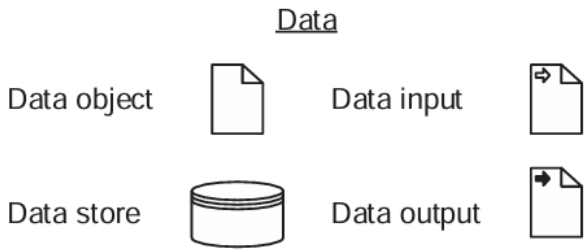

Figure 2. 6 BPMN Data

The figure above illustrates the data object type. Data are tangible or informational entities generated, transformed, or utilized throughout the execution of a process. Data objects can be generated within an interaction along with process diagrams.

2.2.5 Business Core Process

Core process, also commonly referred to as primary or operational process, is the fundamental business process that forms the basis of the business to accomplish its objectives and generate the main revenue stream. These core processes are connected to each other and become a value chain, the interconnected essential processes within an organization, all of which contribute value added to the product or service. The value chain generates and provides the product or service to be delivered to the customer. Core processes are fundamental operations that facilitate the delivery of service by providing the organization's outputs and value to external customers through products, services, support, or information. It does not contribute to internal managerial services. The instance of core business processes is typically such as purchasing, manufacturing, and fulfillment (Jeston & Nelis, 2006).

2.2.6 Design Thinking

Design thinking is a recognized methodology employed by organizations to address challenges and foster innovation. It offers advantageous benefit for developing product and service because design thinking is strongly concerned on users' needs. Its concepts are applied by researcher in multiple disciplines to figure out the solution to a problem (Brown, 2008). Design thinking methodology that has a strong customer orientation in developing solutions by fostering innovation based on customer aspirations.

Design thinking begins with humans rather than technology or company targets. The client should ultimately have a significant influence on the selections within the design process. This methodology is highly applicable for all kinds of problems and all types of business fields, whether in developing products or services. The problem-solving processes are systematic and comprehensive in a determined framework to ensure that the proposed solution is aligned with the problem requirements (Mueller-Roterberg, n.d.). Design Thinking consists of five stages to facilitate the problem-solving process. The phases are Empathize, Define, Ideate, Prototype, and Test. These phases might be performed many times to obtain a proper solution. The phases of design thinking are as follows:

2.2.6.1 Empathize

Empathize is a phase in design thinking that is very crucial and will determine the success of the problem-solving process. The focus of this phase is understanding the user's "pain" or gap, which becomes a problem, and finding out the user's needs. The empathize phase can be carried out through direct interviews, questionnaires, and observation of the user's behaviour (Roddy & Polfuss, 2020). Another tool that can be implemented to support the empathize phase in design thinking is by utilizing an empathy map. Empathy map is a tool that helps the identification process, such as identifying the user's needs, pain, behaviour, thoughts, and aspirations, become easier and comprehensive (Ferreira et al., 2015). The success of this phase is when the user's problems, pains, and gains can be encompassed comprehensively and confirmed by the user.

2.2.6.2 Define

Define is the second phase in design thinking that is performed after the empathize phase has been carried out successfully, when the information regarding the user's pain and gain has been encompassed, where the information will be formulated and synthesized into problem statements. In the problem formulation process, the problem statements must be aligned and based on the empathy result (Roddy & Polfuss, 2020). In the problem formulation process, it can be carried out by using root cause analysis as an approach. Root cause analysis (RCA) is a series of processes to identify the factors contributing to the problem. A fishbone diagram, also known as an Ishikawa diagram, is an example of a tool that is employed in the root cause analysis approach to depict the relationships of cause and effect. This tool is able to decompose and figure out the main factors that caused the problem's occurrence (Holifahtus Sakdiyah et al., 2022). The result of the define phase should be confirmed with the users to ensure that the problem statements are appropriate and align with the result of the empathize phase.

2.2.6.3 Ideate

The third phase of the design thinking framework is the ideate phase. This phase starts after the problem statements have been clearly identified. The ideate phase is where the potential solutions are generated by fostering creativity and a wide range of ideas (Roddy & Polfuss, 2020). In supporting the ideate phase, it can apply several tools to facilitate idea generation, such as using a mind map, a task analysis grid, and SWOT analysis. Another of the most commonly used tools in the ideate phase is the How Might We (HMW) approach, which generates questions to facilitate design ideas.

The generated number of ideas is not limited, although the scope of ideas must align and relate to the formulated problem statement that had been established in the define phase. The generated ideas should be specified into two or three solutions or potential answers to the related problems, which will be processed further.

2.2.6.4 Prototype

The fourth phase of design thinking is creating a prototype. The prototype phase is needed to depict the concept of determined ideas, thus it can be demonstrated. The established prototype should represent the concept of the determined ideas and be able to display the performance conceptualization (Roddy & Polfuss, 2020). Several ways to develop a prototype vary; one of the most common approaches is are paper prototype (Hehn et al., 2018), where the ideas are developed in the form of a sketch or a drawing design to visualize the flow process of the idea and the architecture component concept of a certain idea.

2.2.6.5 Test

The test phase becomes the final stage of design thinking, where the prototype of the solution to inspected problem is examined by the user. This phase will determine and validate whether the proposed solutions are compatible or not through user confirmation and feedback. Testing phase can be performed through multiple methods; the common testing methods that are utilized in design thinking are feedback capture grid, usability testing, and role playing (Hehn et al., 2018). Another commonly used testing method is user acceptance testing (UAT), this tool provides a framework to examine whether the system meets the user’s needs or not (Vanesha et al., 2024). This method allows the researcher to get the user’s perspective on the resulting output.

CHAPTER III
RESEARCH METHOD

3.1 Research Object

The object of this research is the implementation of Vmedis ERP-based software system business process on core process, specifically on stock management, procurement, and fulfillment system in Apotek Mataram, a pharmacy located in Wedi, Klaten, Jawa Tengah. The research focused on the alignment of the existing business process with the advanced system provided by Vmedis software, thus the new procedures of the business process can be established.

3.2 Data Collection Method

The data involved in this research is primary data, the data which is obtained directly from the source without any intermediary. The primary data in this research is obtained through direct interview with the subject, questionnaire that is spread to the subject, and direct observation in Apotek Mataram. The primary data that are processed in this research are including:

a. Employee difficulties complain observation data
b. Business process flow information of stock management, procurement, and fulfillment system observation data
c. Stock management information observation data
d. Fulfillment process observation data
e. Procurement process observation data

3.3 Research Flow

The flow in carrying out this research is depicted in the following figure as an overview the research implementation from start to finish. The research flow is displayed as follows:

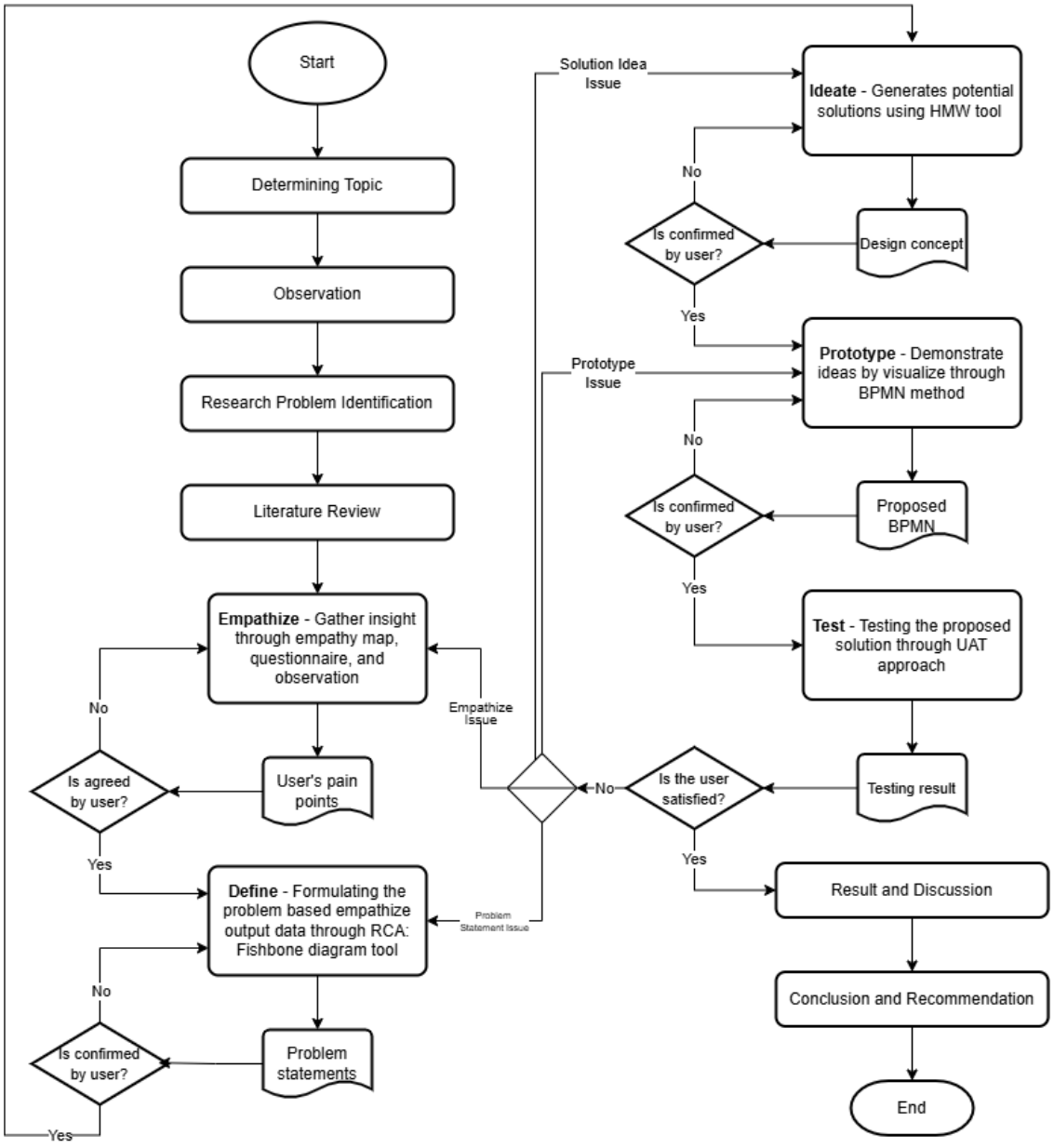

Figure 3. 1 Research Flow

The figure above shows the overview of the research flow. The explanation is clarified as follows:

1. Start
2. Determining Topic

   The researcher identifying and determines the specific topic for the conducted research. The topic has been determined in which about business process engineering in designing the alignment of business processes.
3. Observation

   The researcher observes the object of the research, Apotek Mataram, to understand more about the condition and situation of the pharmacy.
4. Research Problem Identification

   The researcher identifies the problems based on the observation to know the problems faced by Apotek Mataram.
5. Literature Review

   The researcher conducted a literature review to explore previous studies that had the related variables to the research topic. This will be used as reference material for this research.
6. Design Thinking:

   a. Empathize

      The researcher gathers the complaints and difficulties from the user regarding the inconformities of the existing business process with the Vmedis system implementation through the empathy map tool to acquire the potential problems. The result is identified user's pain points, and the success indicators of this phase are based on the user's confirmation.

   b. Define

      After collecting the user complaints, the researcher identifies and analyzes the obtained difficulties in the Vmedis implementation utilizing RCA: Fishbone diagram tool, thus the business process problems can be formulated into several key points. The problem statement is analyzed and will be confirmed by the user.

c. Ideate

At this phase, the researcher develops the potential solution to answer the emerged problems by establishing the concept of a new business process flow integrated with Vmedis software through the HMW tool by considering the result analysis of the previous phase.

d. Prototype

The researcher creates the result of the ideate phase, the new business process concept, in the prototype phase by depicting the concept ideas utilizing a BPMN diagram to establish the new process model, thus it can be examined. The success of the prototype is measured by the user agreement opinion.

e. Test

The designed Vmedis integrated business process model prototype result is assessed in the test phase by performing the new business process arrangement through the user acceptance testing (UAT) method to acquire the user acceptance result. The testing result will be evaluated and confirmed by the user as the success indicator of the problem-solving solution.

7. Result & Discussion

Researcher explaining and discussing the result of each phase of the design thinking process regarding the business process alignment. The result includes users' complaints and requirements from the empathize stage, detailed key problems from the define stage, proposed business process design alignment alternatives from the ideate stage, design of the proposed business process alignment solution from the prototype stage, and the user acceptance assessment from the test stage.

8. Conclusion

The researcher concludes the final result of the research in answering the previous research questions.

9. End

CHAPTER IV
DATA COLLECTION AND PROCESSING

4.1 Pharmacy Profile

Apotek Mataram is a pharmacy located in Jalan K.H. Ahmad Dahlan No. 1, Wedi, Klaten, Central Java, that has been established since 2006. This pharmacy offers various products such as medicine, herbal, vitamin, medical tools, also medical check-up service. The superiority of Apotek Mataram is that the pharmacy is merged with a clinic, thus people tend to choose this pharmacy as their choice because Apotek Mataram provides complete service. Apotek Mataram prioritizes affordable prices and customer service engagement, thus people love this pharmacy. The pharmacy has 15 employees to run its operation which each of whom has their role. The roles are the order-fulfillment section, the financial reporting section, the stock management section, the procurement section, and the resources maintenance section. Apotek Mataram evolves along the period by applying enhancements. The current enhancement is to implement supporting software using Vmedis to enhance their efficiency across business processes.

4.2 Initial Business Process

The core business process in Apotek Mataram consists of the order-fulfillment process, the stock management process, and the procurement process. The information about the core business process in Apotek Mataram is gathered through the interview process with the owner and employee of Apotek Mataram, as the operator and the subject who are competent and understand the data related. Analyzing the business process requires a clear depiction, thus it can be analyzed correctly; it can be depicted through utilizing the BPMN tool. The initial core business process in Apotek Mataram is provided by the following figures.

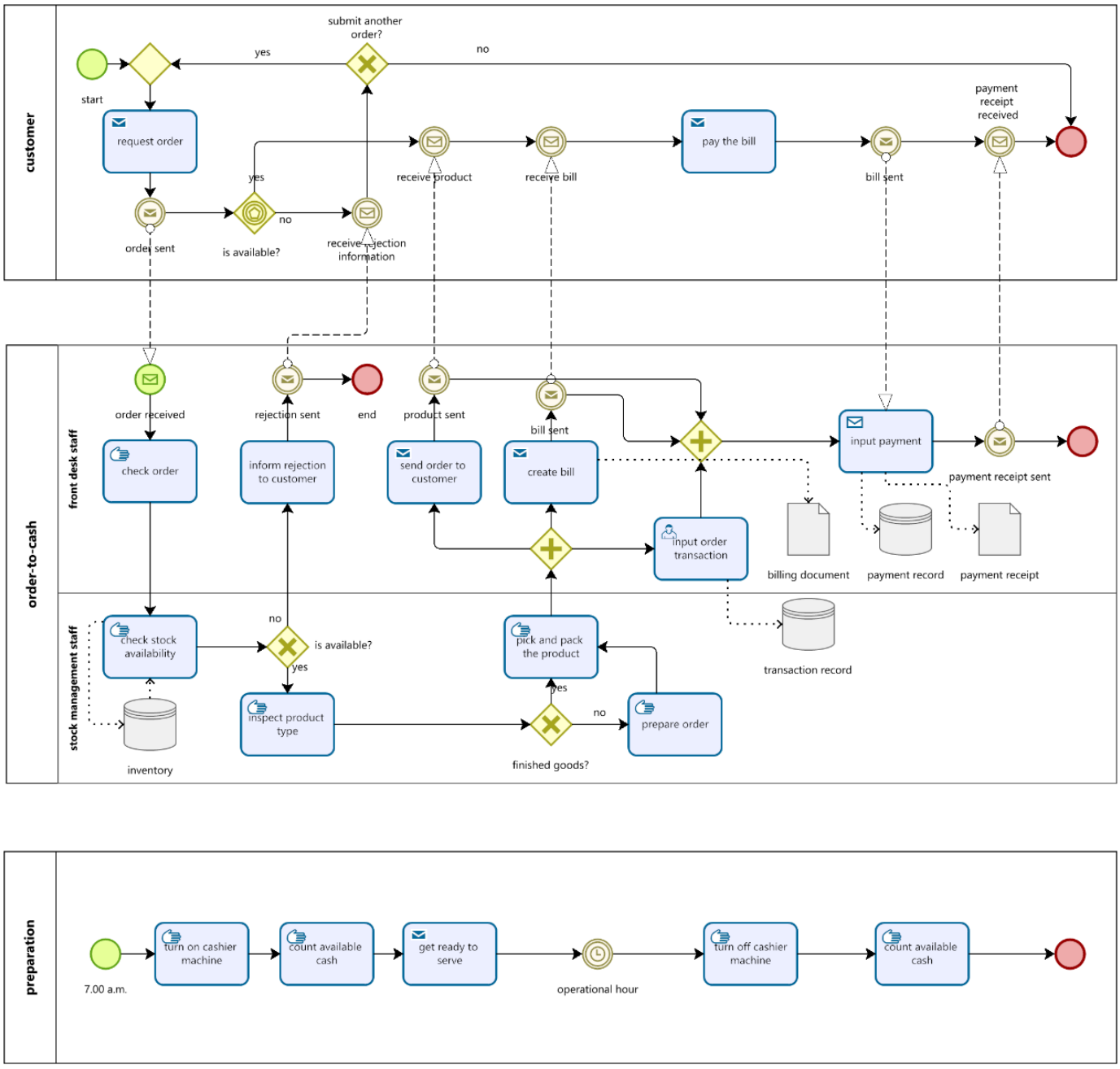

Figure 4.1 BPMN of Order-Fulfillment Original Process

The figure above provides the BPMN of the current order-fulfillment process in Apotek Mataram. The process involves three parties: the customer, the order fulfillment, and the stock management section. It starts with the customer's arrival at the pharmacy, then requests an order, which will be processed by the seller, including the order-fulfillment section, which involves stock management activities within the process. In the process, if the order request is not available, then the seller will inform the customer about the order rejection, which is followed by the customer's decision to submit another order or terminate the transaction. Otherwise, the order will be processed by preparing, picking, and packing the goods, then handing them to the customer. Furthermore, the seller will generate a billing document and forward it to the customer. Next, the customer pays the bill to the seller, and the seller will proceed with the payment by giving the payment receipt to the customer.

The transaction in the current order-fulfillment process is recorded using a conventional single-cashier machine. In this process, a customer is served by a front-desk seller to handle the order, and another employee to prepare the ordered stock. The cashier transaction record system does not integrate with the stock management system, its function is limited to recording the transaction and generating payment receipts. Thus, the flows of stock cannot be controlled automatically.

In addition, there are two process groups within the order-fulfillment, those are: the preparation and closure process groups. Preparation is a series of activities that is conducted at the start of every day to start the order-fulfillment process. It comprises opening the pharmacy, turning on the cashier machine, and counting the initial cash. This process functions to start and prepare the pharmacy to handle the fulfillment transaction of the day. In contrast to preparation, the closure process group is carried out at the end of the day, while they are closing the pharmacy. This includes turning off the cashier machine and counting the available cash resulted on that day.

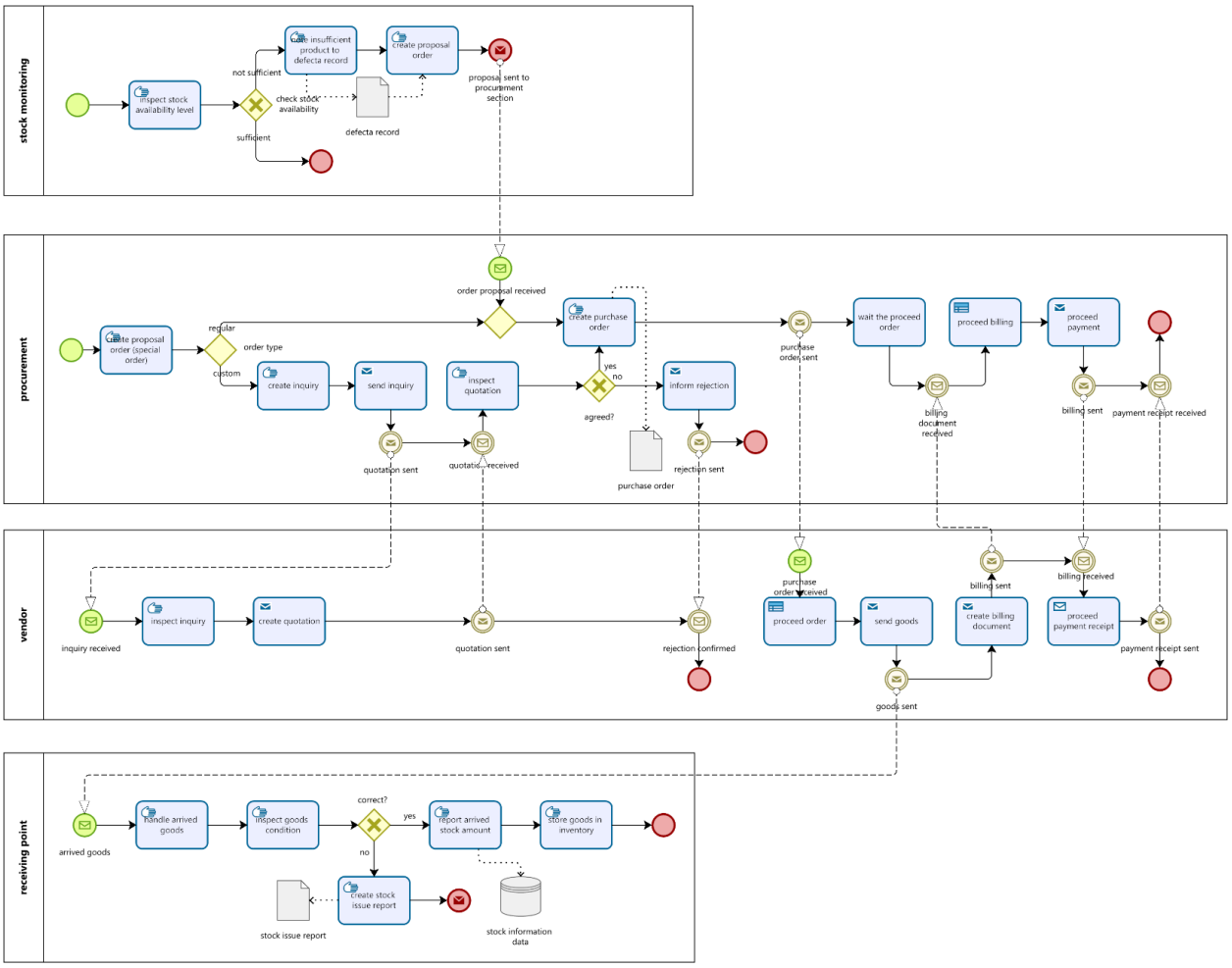

Figure 4. 2 BPMN of Stock Management and Procurement Original Process

The figure above shows the capture of the stock management and procurement business process in Apotek Mataram. This business process consists of several process groups, which are stock monitoring, receiving stock, and procurement, which interact with the vendor business process. The stock monitoring process group is dealing with controlling stock flow, including measuring the stock level, noting the empty stock, and requesting to procure stock. This process group is initiated by the employee to check the stock level in inventory, If the stock level is empty, insufficient, or below the standard availability level, then the employee will note the stock as a defective record, an account to note the empty or insufficient stock. Next, the employee will continue to process the empty stock by creating the proposal for the empty stock at the order batch period. Stock monitoring process is carried out conditionally without a determined time, usually it is conducted in a complete for multiple times, depending on the employee shift conditions.

The second is the receiving goods process group, a series of activities that are performed to ensure the procured goods are received correctly. This process includes handling goods from vendor shipment, checking the goods' condition, report the issue if it is any issues, recording the stock amount received, and storing the goods in inventory. This process is executed undeterminably based on the goods' arrival from the vendor. All activities of the process are performed by the employee manually, including recording the arrived goods. The manual record of arrived goods is required by the financial section related to the accounting report.

The procurement process group is a series of activities to support and conduct goods procurement from the vendor. The procurement process is conducted at the order from the stock monitoring process, with consideration of stock availability for the regular order or based on the needs of the doctor or managerial decision for a special order. It starts with the creation of a proposal from the stock management process, or alternatively, it can be started directly by the procurement section to create the order proposal. If it is a regular order, then the procurement section will create a purchase order and send it to the related vendor. Otherwise, the special or customized order needs a pre-sales activity to ensure that the offer matches the desired order. The procurement section will create an inquiry, then send it to the related vendor, and continue to inspect the quotation after the vendor gives the answer. If the offer is accepted, then it will continue to create the purchase order; if it is not accepted, then the procurement section will consider canceling or submitting another desired offer. Next, the vendor will ship the order back to the Apotek Mataram. The arrived products will be handled by the receiving goods section to be processed further. After the product has been received, the procurement section finishes up the billing and payment of the transaction to the vendor as the end step of the procurement process.

4.3 Design Thinking Implementation

This section discusses the design thinking implementation in problem problem-solving process to find a solution. Design thinking is a recognized methodology to address challenges and foster innovation, which is strongly human-centered in developing solution by fostering innovation based on user aspirations. It consists of 5 phases, in which every phase serves to decompose the problem, which leads to finding the desired solution.

The design thinking process is applied in the Apotek Mataram during the transition and trial conditions of Vmedis implementation. The involved users or subjects of this design thinking implementation research are the employees and the owner of Apotek Mataram. The design thinking process is discussed further as follows.

4.3.1 Empathize

Empathize is the first phase in design thinking that serves to understand the user's pain or gap, which becomes a problem. This research uses an empathy map to guide the empathize stage. The data of the empathy map was gathered through a focus group discussion (FGD) session with the owner and employees. The empathy map results for each component of a core business process are shown in the following tables.

Table 4. 1 Empathy Map of Order-Fulfillment Process

No	Empathy Map Statement Result List of Fulfillment Process with Vmedis			
	Thinks	Feels	Does	Says
1	wants to connect the Vmedis easily	confused	currently using a single manual cashier, an employee serves a single customer from beginning to the end of process including serve as the cashier for the customer	does this feature can accommodate multiple cashiers at once? How is the system?
2	wants a clear and easy to understand procedure to proceed the transaction	vague	process the transaction conventionally, using an individual software to note the transaction, the conventional software has very simple feature thus does not need several actions (only takes few steps)	how to operate the Vmedis system? sometimes the steps are forgotten
3	Desires for fulfilling the optimal scenario to accommodate fulfillment with Vmedis	ambiguous	in a crowded situation, employee in a rush condition because single cashier system will make long and unconditioned queue.	Vmedis can't be executed yet because the employee still doubts about the procedures to perform it
4	wants to optimally perform Vmedis easily	frustrated	still unable to implement Vmedis software in crowded situation because the employee performs Vmedis software slowly	is it literally need a long time to execute Vmedis?
5		doubt	some of buyers are running out	

No	Empathy Map Statement Result List of Fulfillment Process with Vmedis			
	Thinks	Feels	Does	Says
			of patience because the employees are slow in serving using Vmedis software, especially in crowded condition	
Pain point	"Performing Vmedis in order-fulfillment is difficult and requires long processing time"			

The above table is based on the empathy map result of an order-fulfillment process in Apotek Mataram. The contents of the empathy map in the table above represent what the user thinks, feels, does, and says about the implementation of Vmedis related to the order-fulfillment process. From the table content, it can be inferred that the pain of the user is "To perform Vmedis in order-fulfillment process is difficult and requires a long time".

Table 4. 2 Empathy Map of Stock Management Process

No	Empathy Map Statement Result List of Stock Management Process with Vmedis			
	Thinks	Feels	Does	Says
1	wants to improve the stock management become more efficient	confused	input the stock data one by one because there are no data in initial implementation	this process supposed to be more effective if the Vmedis has been performed properly
2	Vmedis can be implemented properly in stock management	bored	check the stock amount for every product because the data is still empty in initial phase	importing the stock data to Vmedis requires a long time
3	confused on what to be performed first	doubt	synchronizing the stock amount with the filled data	still do not familiar on how to use Vmedis in performing stock monitor
4	still do not sure how to effectively and efficiently run Vmedis in stock management		regularly check the defecta note to indicate the low stock level	how to easily perform stock monitor using Vmedis software
5				do not know what the correct scenario is to perform Vmedis in stock management
Pain point	"The process of Vmedis in stock management system is unclear and not efficient because of unutilized software features"			

The table figures out the empathy map of stock management process. The table content shows the result of user's complaints regarding the stock management process integrated with Vmedis software. Based on those complaints, it can be formulated that the pain of the user is "The process of Vmedis in stock management system is unclear and not efficient due to unutilized software features".

Table 4. 3 Empathy Map of Procurement Process

No	Empathy Map Statement Result List of Procurement Process with Vmedis			
	Thinks	Feels	Does	Says
1	using Vmedis in procurement will make the procurement easier and efficient	exited	input the vendor data to Vmedis	this is interesting but still not sure how to perform it optimally
2	cannot determine what should be done to use Vmedis in existing procurement process	confused	input and synchronize the stock and vendor data	still do not familiar with the Vmedis utilization in procurement
3		curious	checking the defecta list	This Vmedis is not optimal in managing procurement process
4		interested	set the order level	
Pain point		"The features of Vmedis could not be implemented in procurement process"		

The above table is the empathy map for the procurement process integrated with Vmedis. The table contains users' complaints through what users think, feel, do, and say about the process. The pain point that can be concluded from those is "The features of Vmedis could not be implemented in the procurement process".

4.3.2 Define

Define phase is the second stage in design thinking that is performed after the empathize phase had been carried out. In this stage, the problem will be formulated further thus the key point of the problem can be identified and processed further. The problem formulation process of this research is assisted by the fault tree analysis to figure out the root cause of the problem or pain

which has been obtained through empathize phase. Following is the fault tree analysis result.

1. Fault Tree Analysis of Order-fulfillment Process

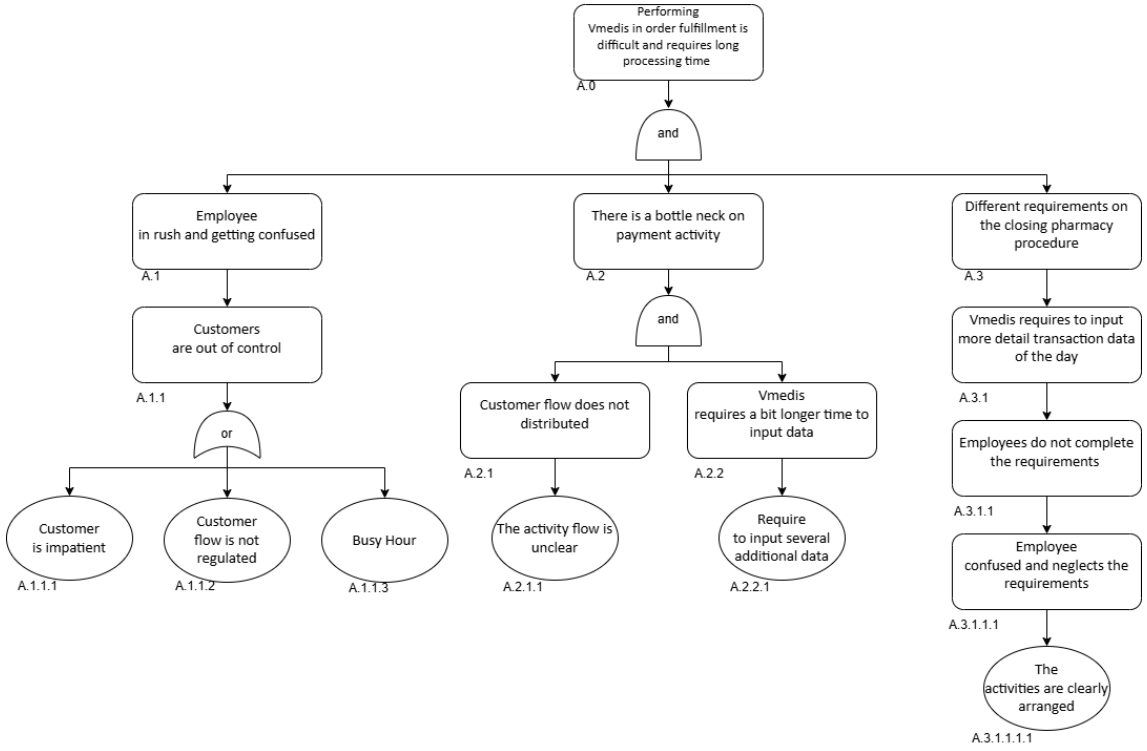

Figure 4. 3: Fault Tree Analysis of Order-Fulfillment Process

The above diagram shows the fault tree analysis of order-fulfillment process in Apotek Mataram. The pain in order-fulfillment process that resulted in empathize phase is “Performing Vmedis in order-fulfillment is difficult and it requires a long time”. The analysis of the pain point using fault tree analysis diagram identifies 6 root causes, those are the impatient customer, unregulated customer flow, busy hour, unclear activity, require inputting several data, and the activities are not clearly arranged.

After the root cause has been revealed, it will be continued to identify the activity that is related to the problem root cause, thus the problem can be solved by the proper business process adjustment. The table below is the identification of root cause and the related activity.

Table 4. 4 Activity and Root Cause Relationship Table of Order-Fulfillment Process

Order-fulfillment Process		
Level	Fault Tree Analysis Root Causes	Related Activity
A.1.1.1	Customer is impatient	1. Receive bill 2. Pay the bill 3. Receive payment receipt
A.1.1.2	Customer flow is not regulated	1. Receive bill 2. Pay the bill 3. Receive payment receipt
A.1.1.3	Busy Hour	1. Input order transaction 2. Create bill 4. Send order to customer 5. Input payment 6. Receive bill 7. Pay the bill 8. Receive payment receipt
A.2.1.1	The activity flow is unclear	1. Receive bill 2. Pay the bill 3. Receive payment receipt
A.2.2.1	Require inputting several additional data	1. Input order transaction 2. Create bill 3. Input payment
A.3.1.1.1.1	The activities are not clearly arranged	1. Close service 2. Preparation 3. Turn off cashier machine

The table provides the root cause of the order-fulfillment process with the related activity. There are 6 root cause points which each of which occurs in several activities in the order-fulfillment process.

2. Fault Tree Analysis of Stock Management Process

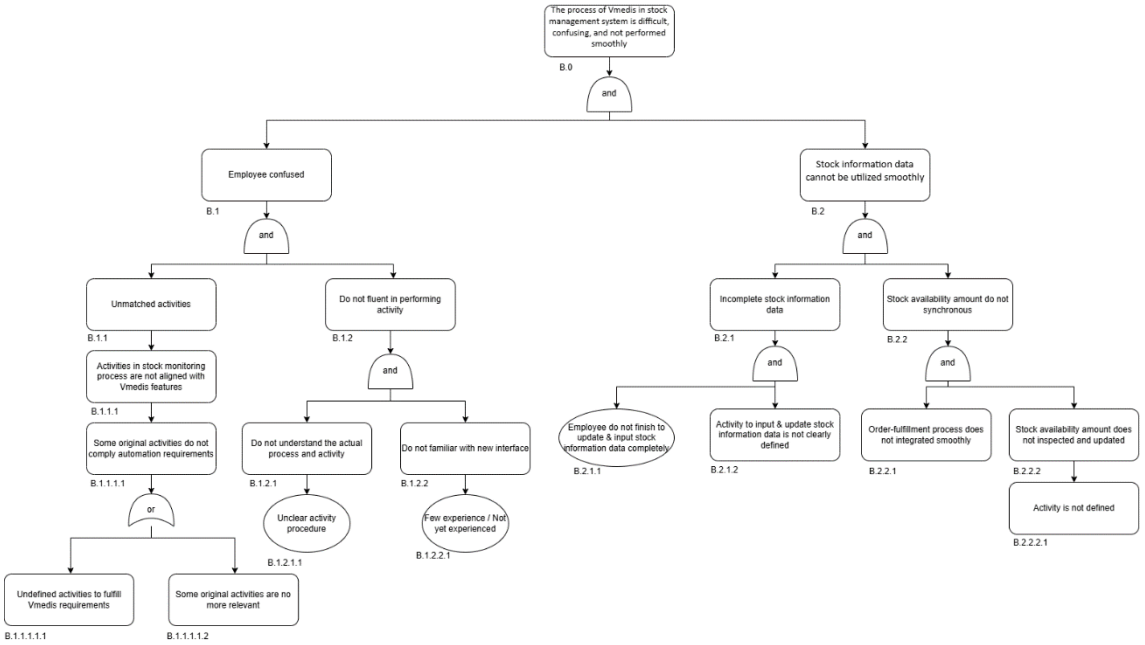

Figure 4. 4 Fault Tree Analysis of Stock Management Process

The above figure depicts the fault tree analysis diagram of the stock management process. The identified pain point of the stock management process is “The process of Vmedis in stock management is difficult, confusing, and not performed smoothly.” Based on the analysis, there are two main branches that reveal 8 points as the root cause of the problem.

Table 4. 5 Activity and Root Cause Relationship Table of Stock Management Process

Stock Management Process		
Level	Fault Tree Analysis Causes	Related Activity
B.1.1.1.1.1	Undefined activities to fulfill Vmedis requirements	1. Receiving goods process needs to input detail data of arrived goods 2. Stock monitoring process needs activity to synchronize the true stock availability with the software availability data
B.1.1.1.1.2	Some original activities are no more relevant	1. Inspect stock availability level 2. Create proposal order 3. Send proposal to procurement section 4. Save insufficient product to defecta record
B.1.2.1.1	Unclear activity procedure	1. Inspect stock availability level 2. Create proposal order 3. Send proposal to procurement section 4. Note insufficient product to defecta

Stock Management Process		
Level	Fault Tree Analysis Causes	Related Activity
		record 5. Order proposal received 6. Check goods condition 7. Store goods in inventory
B.1.2.2.1	Few experience / Not yet experienced	1. Automatic related activities
B.2.1.1	Employee do not finish to update & input stock information data completely	1. Undefined activity to update and complete the stock data to software
B.2.1.2	Activity to input & update stock information data is not clearly defined	1. Undefined activity to update and complete the stock data to software
B.2.2.1	Order-fulfillment process is not integrated smoothly	1. Ensure the order-fulfillment process is performed correctly in Vmedis
B.2.2.2.1	Activity is not defined	1. Undefined activity to update and synchronize the Vmedis stock availability data with the real amount

The table above presents the root cause of the pain point which is identified through fault tree analysis diagram and the activity in stock management process that is affected by each of the root causes. Identification of affected activity to the root cause will be used in the adjustment of business process to solve the paint point regarding the stock management business process in stock management integrated with Vmedis software system.

3. Fault Tree Analysis of the Procurement Process

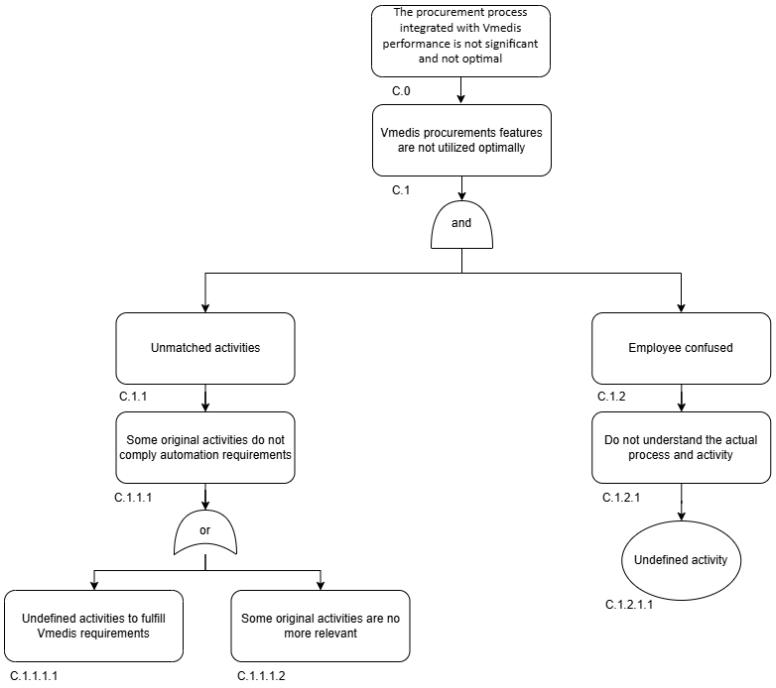

Figure 4. 5 Fault Tree Analysis of Procurement Process

The figure above is the fault tree analysis diagram of the procurement process from the user pain point. The user pain point that is revealed through empathy map at previous phase for procurement process is "The procurement process integrated with Vmedis performance is not significant and not optimal". The problem identification revealed that the features of Vmedis software are not utilized optimally. The root causes of the problem are undefined activity to fulfill Vmedis requirements and some of the original activities are no longer relevant. The correlation of those root cause to the activities within the procurement process is shown in the next table.

Table 4. 6 Activity and Root Cause Relationship Table of the Procurement Process

Procurement Process		
Level	Fault Tree Analysis Causes	Related Activity
C.1.1.1.1	Undefined activities to fulfill Vmedis requirements	1. Automatic order proposal needs to be checked and proceeded
C.1.1.1.2	Some original activities are no more relevant	1. Create order proposal 2. Create purchase order
C.1.2.1.1	Undefined activity	1. Create order proposal 2. Create purchase order

The table content shows the identified root cause of the procurement process pain point and the related activity within the procurement process to the root cause. The related activities are in

the creation of the order proposal, purchase order, and an undefined activity in checking the order proposal.

4.3.3 Ideate

The ideate phase is to generate the potential solutions by fostering creativity and wide range of ideas to solve the problem that is identified in the define phase. This research employs How Might We (HMW) tool to assist the ideate section in generating the ideas. The HMW tool will support the generation of alternatives designs of business process adjustment.

1. How Might We (HMW) of Order-Fulfillment Process

Table 4. 7 How Might We of Order-fulfillment Table

Order-Fulfillment Process			
Level	Fault Tree Analysis Causes	Related Activity	How Might We (Ideation)
A.1.1.1	Customer is impatient	1. Receive bill 2. Pay the bill 3. Receive payment receipt	1. Do nothing (Accept)
A.1.1.2	Customer flow is not regulated	1. Receive bill 2. Pay the bill 3. Receive payment receipt	1. Make a queue system 2. Change the customer flow 3. Change the receive goods, billing, & payment scheme
A.1.1.3	Busy Hour	1. Input order transaction 2. Create bill 4. Send order to customer 5. Input payment 6. Receive bill 7. Pay the bill 8. Receive payment receipt	1. Add more server device 2. Faster the processing time by automate check availability
A.2.1.1	The activity flow is unclear, and bottle neck occurred	1. Receive bill 2. Pay the bill 3. Receive payment receipt	1. Modify the flow by separate cashier system 2. Design new flow with the separate cashier payment system
A.2.2.1	Require inputting	1. Input order	1. Separate role for

Order-Fulfillment Process			
Level	Fault Tree Analysis Causes	Related Activity	How Might We (Ideation)
	several data	transaction, 2. Create bill 3. Input payment	payment and service section
A.3.1.1.1.1	The activities are not clearly arranged	1. Close service 2. Preparation 3. Turn off cashier machine	1. Define new activity to evaluate today transaction at the end of shift 2. Define new activity to setting up the Vmedis software in the opening

The table above presents the How Might We (HMW) ideas for the related activity of the root cause of fault tree analysis. The first and second row shows the root cause and the related activity of the order-fulfillment process that is generated in the define phase, while the fourth row contains the alternative ideas, which are facilitated through the HMW approach. The ideas that are generated through the HMW approach are the alternative solutions that will be proposed for the adjustment of business process design.

2. How Might We (HMW) of the Stock Management Process

Table 4. 8 How Might We of Stock Management Table

Stock Management Process			
Level	Fault Tree Analysis Causes	Related Activity	How Might We (Ideation)
B.1.1.1.1.1	Undefined activities to fulfill Vmedis requirements	1. Receiving goods process needs to input detail data of arrived goods 2. Stock monitoring process needs activity to synchronize the true stock availability with the software availability data	1. Define activity to record and input the data after handling the arrived goods
B.1.1.1.1.2	Some original activities are no more relevant	1. Inspect stock availability level 2. Create proposal order 3. Send proposal to procurement section 4. Save insufficient product to defecta record	1. Eliminate manual proposal creation activity 2. Move order proposal creation by Vmedis software to procurement section
B.1.2.1.1	Unclear activity procedure	1. Inspect stock availability level 2. Create proposal order 3. proposal sent to procurement section 4. Note insufficient product to defecta record 5. Order proposal received 6. Check goods condition 7. Store goods in inventory	1. Eliminate creation of proposal order 2. Eliminate manual record on defecta list 3. Automate the defecta record by the Vmedis
B.1.2.2.1	Few experience / Not yet experienced	1. Automatic related activities	1. Do nothing (accept)
B.2.1.1	Employee do not finish to update & input stock information data completely	1. Undefined activity to update and complete the stock data to software	1. Define activity to update and complete stock data
B.2.1.2	Activity to input & update stock information data is not clearly defined	1. Undefined activity to update and complete the stock data to software	1. Define activity to update and complete stock data

Stock Management Process			
Level	Fault Tree Analysis Causes	Related Activity	How Might We (Ideation)
B.2.2.1	Order-fulfillment process does not integrated smoothly	1. Stock amount update	1. Ensure the order-fulfillment process is performed correctly in Vmedis
B.2.2.2.1	Activity is not defined	1. Undefined activity to update and synchronize the Vmedis stock availability data with the real amount	1. Define activity to synchronize the stock amount data

The table above shows the HMW in supporting the ideate phase of the stock management process. There are 8 point of root causes which each of which has at least 1 related activity that is affected by the root cause. The ideation process of the stock management process that is assisted with the HMW tool is shown on the fourth row, in which those ideas serve as the basis of the proposed business process design.

3. How Might We (HMW) of the Procurement Process

Table 4. 9: How Might We of Procurement Table

Procurement Process			
Level	Fault Tree Analysis Causes	Related Activity	How Might We (Ideation)
C.1.1.1.1	Undefined activities to fulfil Vmedis requirements	1. Automatic order proposal needs to be checked and proceeded	1. Define activity to check and proceed the order proposal
C.1.1.1.2	Some original activities are no more relevant	1. Create order proposal 2. Create purchase order	1. Automate order proposal creation 2. Automate purchase order creation
C.1.2.1.1	Undefined activity	1. Create order proposal 2. Create purchase order	1. Automate order proposal creation 2. Automate purchase order creation

The table exposes the alternative solution ideas which is generated through the HMW approach to the root cause problem and its related activity that has been identified in the define phase. In the procurement process, there are 3 root causes identified, and the related activity is about the creation and automation of order proposal and purchase order document, which is revealed in the define phase. The fourth row of the table contains the proposed ideas as the design adjustment of the business process in the procurement process.

4.3.4 Prototype

Prototype phase is the process to depict the concept of determined ideas, thus it can be demonstrated, and the ideas become clearer. The type of prototype in this research is a paper prototype through the Business Process Model Notation (BPMN) framework. BPMN is used to illustrate the ideas that have been proposed in the previous phase by adjusting the original business process. The following is the proposed BPMN design of the core business process in Apotek Mataram.

1. BPMN of Order-Fulfillment Process

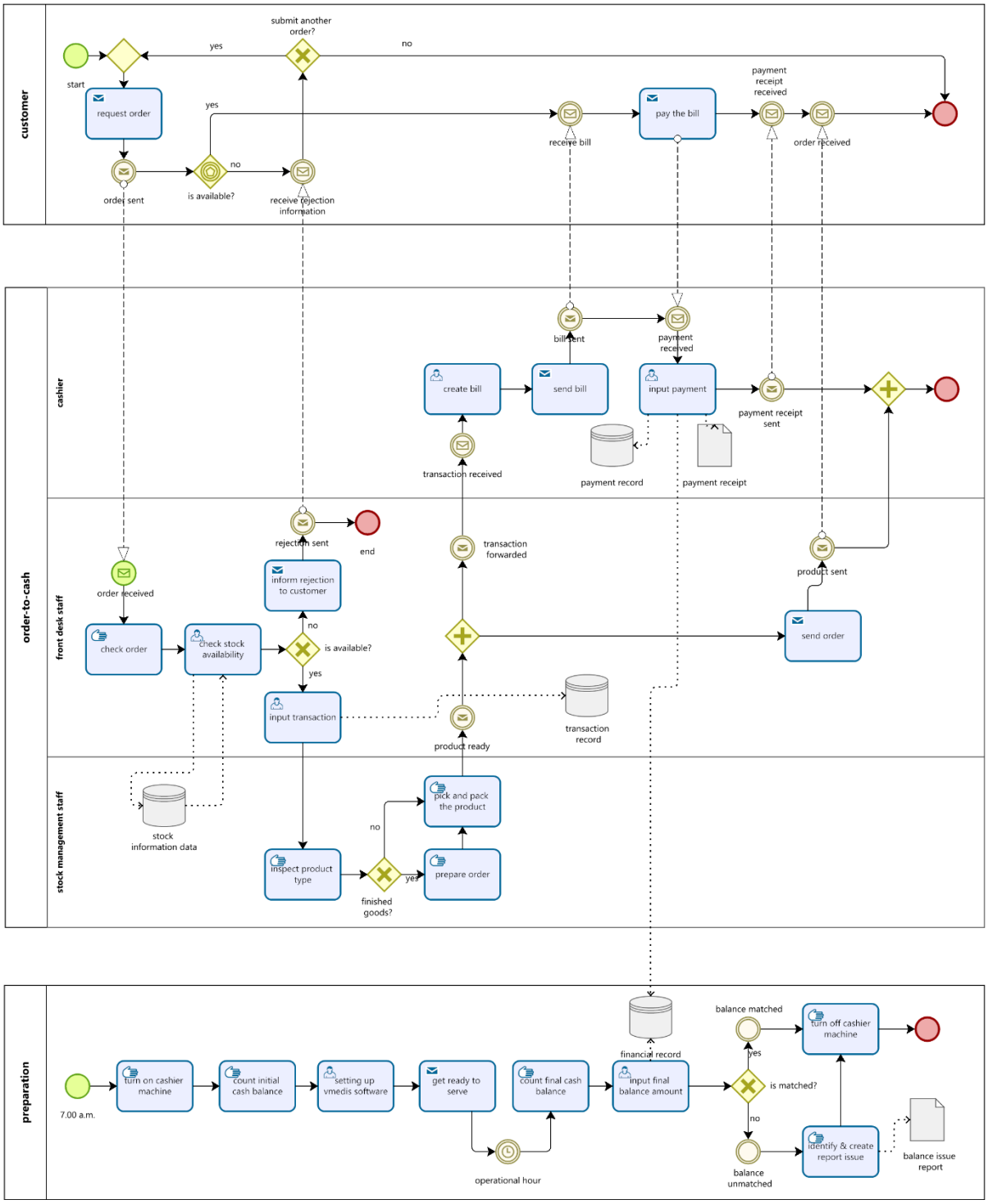

Figure 4. 6 BPMN of Order-Fulfillment Proposed Process Design

The figure above shows the proposed BPMN of the order-fulfillment process in Apotek Mataram that is adjusted to accommodate the Vmedis software system. There are some differences with the original process. The adjustment is considered based on the ideas that have been discovered in the ideate phase through the HMW approach. The adjustment is intended to accommodate the Vmedis features and the employee's ability to process, thus the new business process can be performed conveniently.

There are several differences between the original and the proposed BPMN design on the order-fulfillment process. The significant difference is in the handling separation between the cashier and the order service. Originally, the front-desk staff were responsible for serving the customer's order and the payment process. In the proposed business process, the front-desk staff will be focused only on handling the customer order, while billing and payment will be handled by the cashier. The change affects the customer flow, where in the original process, after the customer submits the order, they will wait and receive the product when it is ready and pay the bill to the same staff. In the proposed business process, after the customer submits the order, they will be directed to pay the bill at the cashier while waiting for the product to be ready, then they will receive the product it.

The other change is on the check product availability. The conventional process does not have real-time stock data, thus, the staff should check and ensure the stock availability manually. The proposed process will utilize the Vmedis feature, which will automate the availability check by the Vmedis stock record system. Thus, the staff can directly know the availability through the device while serving a customer and input the transaction into the system. After that, the staff directly prepare the product while the billing and payment will be handled by the cashier. Next, after the customer finishes the payment to the cashier, they will receive the goods that are given by the front-desk staff.

The change also occurs in the preparing process group, which is still related to the order-fulfillment process. This process is conducted at the beginning and end of the operational hours. It functions to prepare the system before the transaction can be started, and also closes the transaction at the end of the operational hours. The original process needs a simple preparation, while Vmedis needs some input to run the process. The absence of activity to fulfill the Vmedis requirements will cause a problem. Therefore, in the proposed business process, there are several additional activities in this process. The activities are setting up Vmedis software, inputting the final balance amount, and identifying the balance gap. Setting up Vmedis software

functions to prepare the software before the operational hours start by inputting the initial cash and the staff on duty, thus the transactions for the day can be traced. Input the final balance amount and identify the balance gap activity is performed at the end of working hours, intended to know if there is a balance gap to the actual, thus it can be traced and proceed further. The changes that are referred to ideate phase are depicted in the figure below.

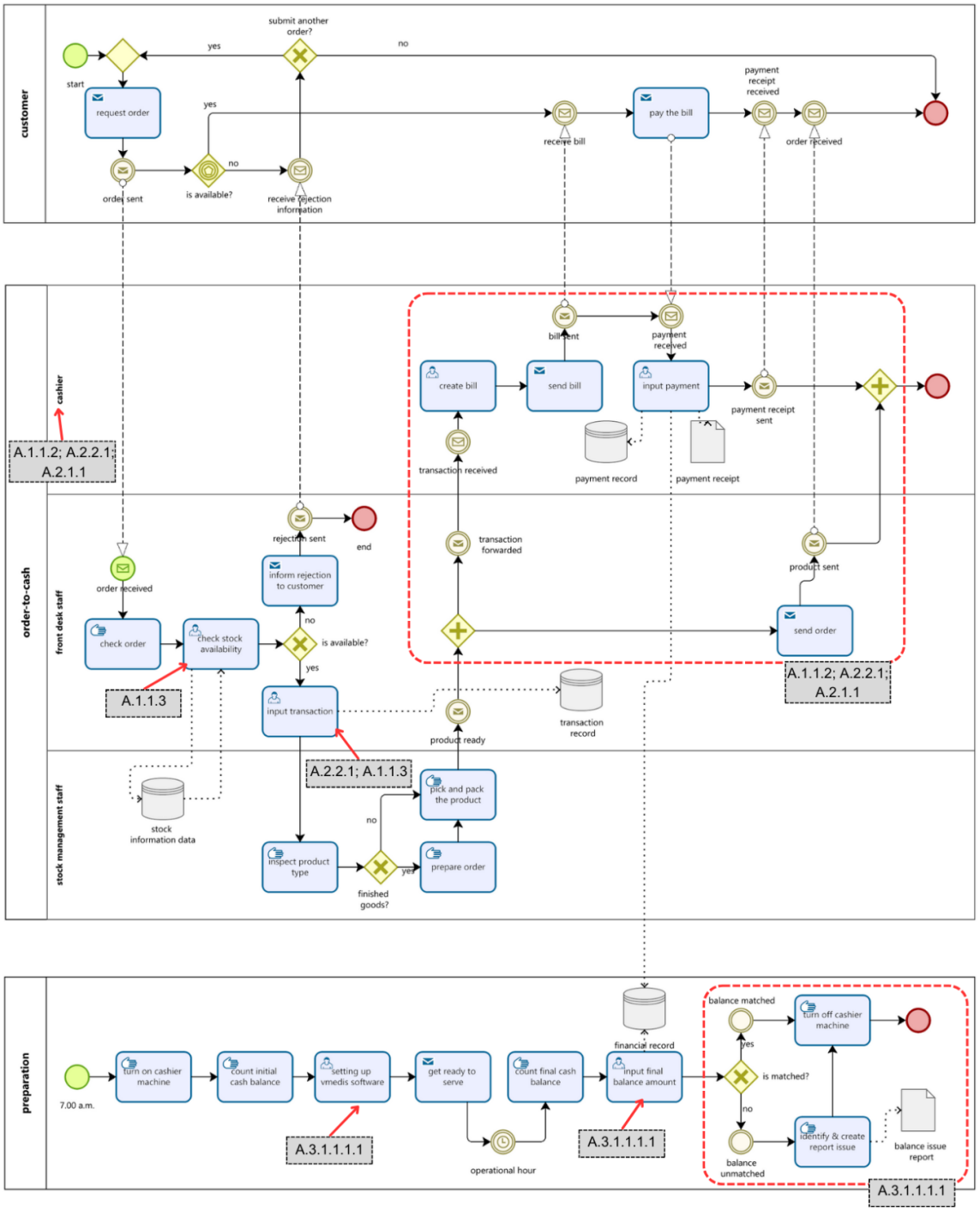

Figure 4. 7 Changes Point of the Order-Fulfillment Business Process

2. BPMN of Stock Management and the Procurement Process

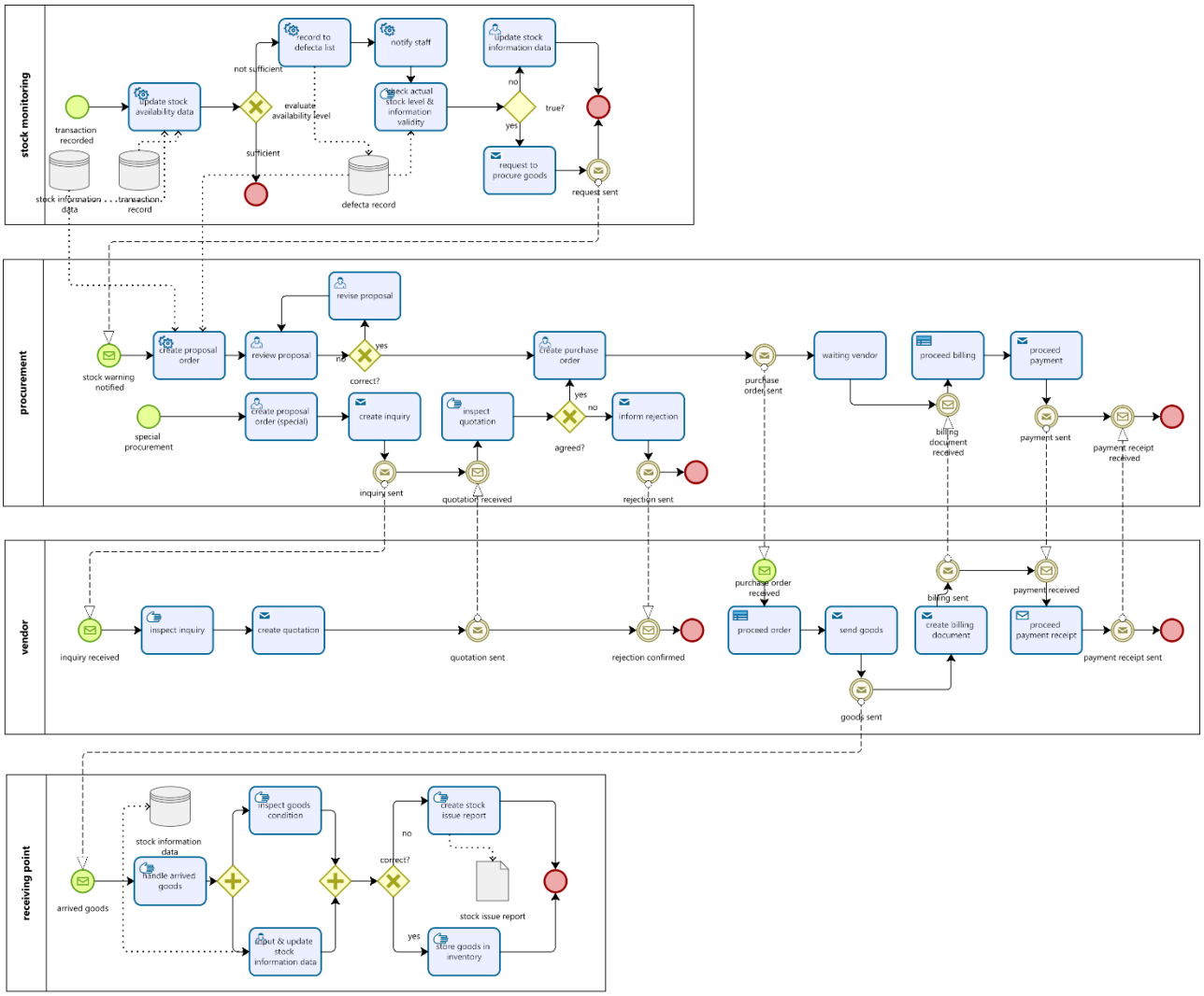

Figure 4. 8 BPMN of Stock Management and Procurement Proposed Process Design

The figure presents the BPMN of the proposed design of the stock management and procurement process. The proposed design is aligned to accommodate the features of Vmedis, thus the system can be integrated with Vmedis smoothly. The design adjustment is based on the proposed solution of the ideation phase through the HMW approach. There are slight differences in some activities between the original process and the proposed process design.

Unlike the order-fulfillment process that has differences in pools between the original and proposed design, this proposed design of stock management and procurement process contains 4 pools as in the original design, those are stock monitoring, procurement, vendor, and receiving point. There is no change in pools in this process because the sections or departments within this process are still the same and relevant, thus there is no need to adjust the arrangement of those pools. However, there are some differences in activities among those processes.

The contrast change is on the stock monitoring section, the activities mostly are changed to be an automatic process by the software, such as updating the stock availability data based on the transaction record database, and recording the unavailable product to the defect list. Furthermore, there are some activities added, such as updating stock information data and checking the actual stock availability amount to the stock availability data, which are performed by the user. Also, some of the activities are eliminated from this section, such as the creation of a proposal order. Previously, this section performed that activity manually, while in the proposed design, that activity is eliminated by utilizing the Vmedis feature and moving that activity to the other section.

In the procurement pool, there are slight differences in its activities, such as the automation of proposal order creation and the automation of purchase order creation. While the vendor section remains the same since it is an external entity thus there is no proposed process design for this section. Furthermore, the receiving point section also has differences from the original design. In the proposed design, there is a new activity defined that is to input and update the stock information data, since it is required for the Vmedis system, thus it can be performed properly. The changes in the stock management and procurement business process design are exposed in the picture below.

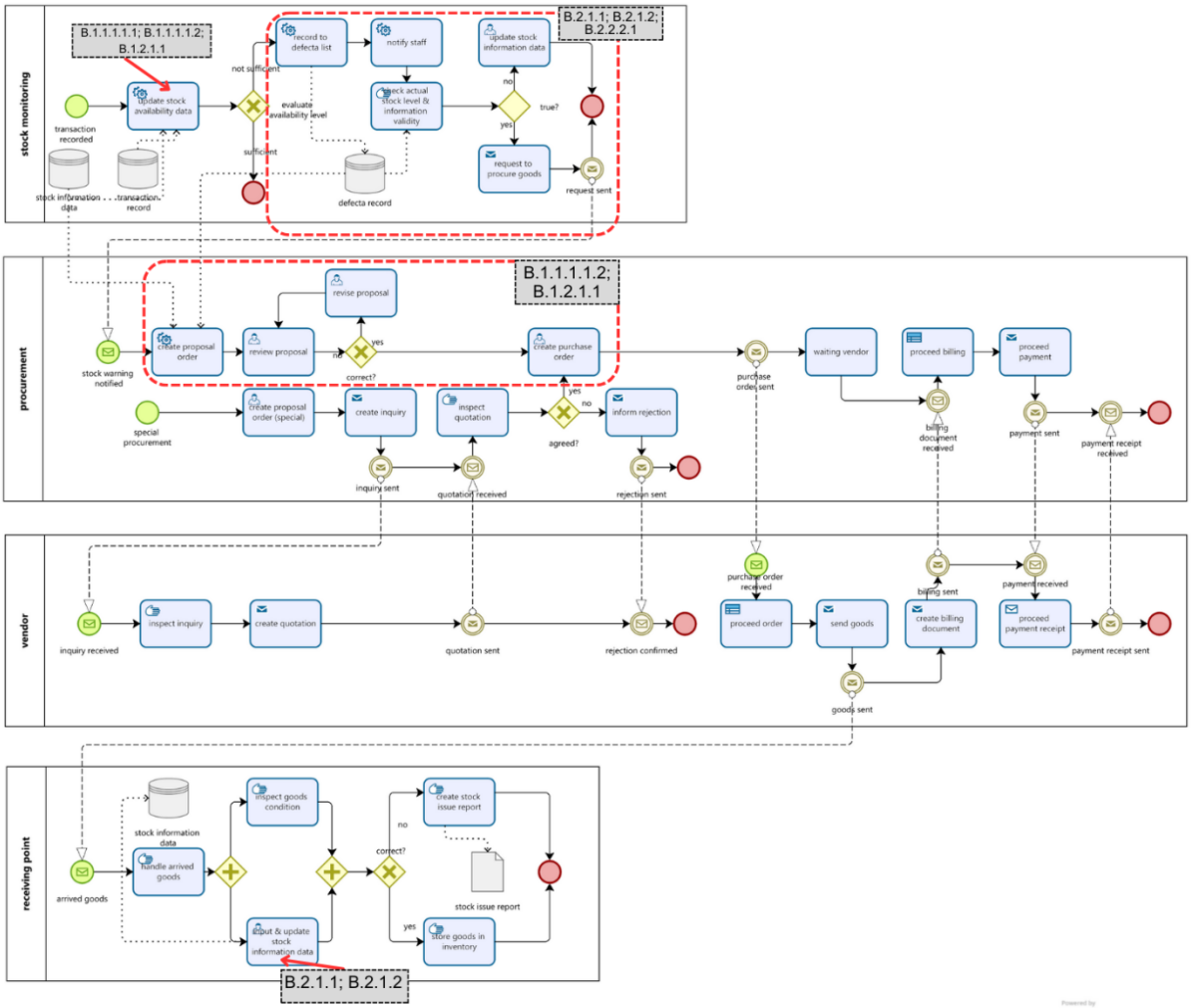

Figure 4. 9 Changes in Point of Stock Management and Production Business Process

The change of business process design affects the role of employees which follows the business process changes. The difference between the initial and the proposed changes to the employee role is shown in the table below.

Table 4. 10 List of Employee Role

List of Employee Role	
Initial	
Employee Role	Description
Front Staff	Serving customer order, Forward the order, handle the billing and payment process
Back Staff	Checking order availability, preparing order, Pick and pack product
Stock Monitoring Staff	Controlling stock availability, Note empty stock, Create order proposal
Receiving point Staff	Handling goods receipt, check goods condition, Put the goods to inventory
Procurement Staff	Create order proposal & purchase order, dealing with vendor, Check order proposal
Proposed	
Employee Role	Description
Cashier	Handle the billing and payment process
Front Staff	Serving customer order, Forward the order, Input transaction
Back Staff	Checking order availability, preparing order, Pick and pack product
Stock Monitoring Staff	Controlling stock availability, Check stock synchronization data, Update stock
Receiving point Staff	Handling goods receipt, check goods condition, Put the goods to inventory, Update stock data
Procurement Staff	Check purchase order, dealing with vendor, Check order proposal

The table above provides the list of employees' roles and their descriptions between the initial business process design and the proposed business process design of order-fulfillment, stock management, and procurement.

4.3.5 Test

The test phase is the final stage of design thinking, where the prototype of the proposed solution is examined. This phase will determine and validate whether the proposed solutions are compatible or not through the analysis and user confirmation. In this research, there are two testing methods those are through processing time analysis and user acceptance testing (UAT). Processing time analysis will show the comparison between the initial and the proposed design, thus the difference can be identified through the time aspect. User acceptance testing (UAT) provides the result of the proposed design compatibility from the user perspective.

4.3.5.1 Processing Time Analysis

1. Processing Time Analysis of Order-Fulfillment Original Process

Table 4. 11 Order-Fulfillment Original Process Design Processing Time Analysis Table

Order-fulfillment (Original Process)		
Swimlane / Role	Activity	Processing Time (second)
Customer	Request order	40
	Pay the bill	20
Front-desk Staff	Check order	10
	Inform rejection to customer	30
	Create bill	45
	Send order to customer	30
	Input order transaction	20
	Input payment	10
Stock Management Staff	Check stock availability	80
	Inspect product type	5
	Pick and pack the product	60
	Prepare order	180
Total of Serving 1 Order		530
Preparation	Turn on cashier machine	120
	Count available cash	600
	Get ready to serve	300
	Turn off cashier machine	120
	Count available cash	600
Total of Preparation Cycle		1740

The table above shows the processing time of each activity in the original order-fulfillment process. The time unit of this table is in seconds. There are 17 activities within the original order-fulfillment process, which consist of 4 groups. The activity group that is involved in serving orders includes the customer, front-desk staff, and stock management staff. The preparation activity group is counted separately due to their role is not directly involved in serving the order. The total processing time for the order-fulfillment process in finishing 1 order is 530 seconds. The total processing time for the preparation cycle is 1740 seconds.

2. Processing Time Analysis of Order-Fulfillment Proposed Process

Table 4. 12 Order-fulfillment Proposed Process Design Processing Time Analysis Table

Order-fulfillment (Proposed Process)		
Swimlane / Role	Activity	Processing Time (second)
Customer	Request order	40
	Pay the bill	20
Cashier	Create bill	45
	Calling customer	5
	Input payment	10
Front-desk Staff	Check order	10
	Inform rejection to customer	30
	Check stock availability	5
	Input transaction	20
Stock Management Staff	Inspect product type	5
	Pick and pack the product	60
	Prepare order	180
	Send order	5
Total of Serving 1 Order		435
Preparation	Turn on cashier machine	120
	Count initial cash balance	600
	Setting up software	60
	Get ready to serve	300
	Count final cash balance	600
	Input final balance amount	10
	Turn off cashier machine	25
	Notify & create report issue	60
Total of Preparation Cycle		1775

The above table presents the activity processing time of the order-fulfillment process in the proposed business process design. In the proposed design of the order-fulfillment process integrated with the Vmedis system, there are 21 activities and are divided into 5 groups or pools. The groups are the customer, cashier, front-desk staff, stock management staff, and preparation section. The difference is an additional pool, which is the cashier pool, that is added as defined in the ideation phase. The total number of activities has increased from 17 to 21 in the overall order-fulfillment process. The total processing time for serving an order is 435 seconds, and the total processing time for preparation in a cycle is 1775 seconds.

3. Processing Time Analysis of Stock Management and Procurement Original Process

Table 4. 13 Stock Management and Procurement Original Design Processing Time Analysis

Stock Management & Procurement (Original Process)		
Swimlane / Role	Process Step	Processing Time (second)
Stock Monitoring	Inspect stock availability level	3600
	Note insufficient product to defecta record	1200
	Create proposal order	1800
Procurement	Create proposal order (special order)	2100
	Create inquiry	600
	Send inquiry	300
	Inspect quotation	300
	Create purchase order	600
	Inform rejection	300
	Proceed billing	600
	Proceed payment	300
Vendor	Inspect inquiry	uncounted
	Create quotation	
	Proceed order	
	Send goods	
	Give billing document	
	Receive procurement proof	
Receiving Point	Handle arrived goods	900
	Inspect goods condition	1200
	Report arrived stock amount	3600
	Store goods in inventory	1800
	Create stock issue report	600
Total		19800

The table provides a list of activities and their processing time for the stock management and procurement process in the original condition. These processes contain 16 activities for the stock management and procurement, also 6 activities of the vendor section, thus 24 activities in total to perform the objective. There are 4 sections or pools involved in interaction within these processes those are stock monitoring, procurement, vendor, and receiving point. Since the vendor section is outside of the pharmacy thus the processing time of its activities is not considered to be discussed. Referring to the table, the total processing time of the stock management and procurement process original design for a cycle of all activities, without counting the vendor activities, is 19800 seconds.

4. Processing Time Analysis of Stock Management and Procurement Proposed Process

Table 4. 14 Stock Management and Procurement Proposed Design Processing Time Analysis

Stock Management & Procurement (Proposed Process)		
Swimlane / Role	Process Step	Processing Time (second)
Stock Monitoring	Update stock availability data	10
	Record to defecta list	10
	Check actual stock level and information validity	3600
	Update stock information data	2400
	Request to procure goods	10
Vendor	Inspect inquiry	uncounted
	Create quotation	
	Proceed order	
	Send goods	
	Give billing document	
	Receive procurement proof	
Procurement	Create proposal	10
	Review proposal	900
	Revise proposal	600
	Create inquiry	600
	Inspect quotation	300
	Inform rejection	300
	Create purchase order	300
	Proceed billing	600
	Proceed payment	300
Receiving Point	Handle arrived goods	900
	Inspect goods condition	1200
	Input and update stock information data	3600
	Create stock issue report	600
	Store goods in inventory	1800
Total		18040

The table serves as the activity list of the stock management and procurement process in the proposed design. It also contains the processing time of each activity involved. In the proposed business process design of stock management and procurement process, there are 25 in total which 17 are internal processes (stock management and procurement process) and 6 are vendor sections (external processes). The pools or groups remain the same as in the original condition, those are stock monitoring, procurement, vendor, and receiving point. The total processing time to accomplish the objective of the stock management and procurement process in the proposed design is 18040 seconds.

4.3.5.2 Process Simulation

Process simulation is a method to analyze the business process by running the prototype of the business process utilizing a computer forecast model. The goal of process simulation is to know the performance of the business process in facing scenarios. Thus, the pros and cons of the business process can be identified early. The process simulation in this research was carried out by running the BPMN of order-fulfillment, stock management, and procurement processes by using Bizagi software. Process simulation of this research focused on analysing the process cycle time to compare the initial and proposed business process design. The result of the process simulation is shown below.

1. Process Simulation of Order-Fulfillment Original Process

Table 4. 15 Process Simulation Result of Order-Fulfillment Original Process

Process Simulation Result of Order-fulfillment Original Process					
	Instances Started	**Instances Completed**	**Min. Time**	**Max. Time**	**Average Time**
Customer	104	104	2m40s	10m10s	6m18s
Order-to-cash	108	107	2m	6m50s	5m24s
Preparation	1	1	13h46m	13h46m	13h46m
Simulation Duration:			14h		
Arrival Interval (minute):			Uniform Distribution (min 1; max 15)		

The table above contains the result of the process simulation for the order-fulfillment original process. It shows the minimum, maximum, and average time, as well as the processed instances. The simulation duration is 14 hours and employs a uniform distribution from 1 to 15 for the instance arrival. The simulation of this process has the average time for each customer, order-to-cash, and preparation cycle of 6 minutes 18 seconds, 5 minutes 24 seconds, and 13 hours 46 minutes, respectively.

2. Process Simulation of Order-Fulfillment Proposed Process

Table 4. 16 Process Simulation Result of Order-Fulfillment Proposed Process

Process Simulation Result of Order-fulfillment Proposed Process					
	Instances Started	**Instances Completed**	**Min. Time**	**Max. Time**	**Average Time**
Customer	99	99	1m25s	6m40s	4m44s
Order-to-cash	100	100	45s	6m	4m2s
Preparation	1	1	13h46m30s	13h46m30s	13h46m30s
Simulation Duration:			14h		
Arrival Interval (minute):			Uniform Distribution (min 1; max 15)		

The table shows the process simulation of the order-fulfillment proposed process. The simulation duration and instance arrival interval are the same as the original process simulation, which is 14 hours and a uniform distribution (min 1; max 15). The simulation of this process has the average time for each customer, order-to-cash, and preparation cycle of 4 minutes 44 seconds, 4 minutes 2 seconds, and 13 hours 46 minutes 30 seconds.

3. Process Simulation of Stock Management and Procurement Original Process

Table 4. 17 Simulation Result of Stock Management and Procurement Original Process

Process Simulation Result of Stock Management and Procurement Original Process					
	Instances Started	**Instances Completed**	**Min. Time**	**Max. Time**	**Average Time**
Stock Monitoring	11	10	1h	2h10m	1h42m
Procurement	17	16	1h10s	3h20m15s	2h42m3s
Receiving Point	14	14	45m	2h5m	1h19m17s
Simulation Duration:			30d		
Arrival Interval (days):			constant 3d		

The table presents the process simulation result of the stock management and procurement original process. This data covers the instances completed, minimum time, maximum time, and average time of the process simulation. The simulation of this process results in the average time for stock monitoring, procurement, and receiving point for 1 hours 42 minutes, 2 hours 42 minutes 3 seconds, and 1 hours 19 minutes 17 seconds, respectively. The simulation duration is for 30 days, and the arrival interval is constant every 3 days.

4. Process Simulation of Stock Management and Procurement Proposed Process

Table 4. 18 Simulation Result of Stock Management and Procurement Original Process

Process Simulation Result of Stock Management and Procurement Proposed Process					
	Instances Started	**Instances Completed**	**Min. Time**	**Max. Time**	**Average Time**
Stock Monitoring	11	10	10s	1h40s	42m31s
Procurement	13	12	35m10s	2h25m15s	1h14m22s
Receiving Point	6	6	45m	1h5m	51m40s
Simulation Duration:			30d		
Arrival Interval (days):			constant 3d		

The table provides the result of the stock management and procurement proposed process simulation. The simulation duration is similar to the previous simulation, which is 30 days, and the arrival interval is constant every 3 days. The simulation of this process reveals the average time for stock monitoring, procurement, and receiving point for 1 hour 42 minutes, 2 hours 42 minutes 3 seconds, and 1 hour 19 minutes 17 seconds, respectively.

Table 4. 19 Simulation Average Time Comparison

Process Simulation Average Time Comparison				
Process	**Section**	**Original Average Time**	**Proposed Average Time**	**Differences**
Order-fulfillment	Customer	6m18s	4m44s	1m34s
	Order-to-cash	5m24s	4m2s	1m22s
	Preparation	13h46m	13h46m30s	(-30s)
Stock Management and Procurement	Stock Monitoring	1h42m	42m31s	59m29s
	Procurement	2h42m3s	1h14m22s	1h27m41s
	Receiving Point	1h19m17s	51m40s	27m37s

The above table shows the differences between the original and proposed design. The result indicates that most of the proposed designs' average time is faster than the original design's average time. However, the preparation section of the order-fulfillment process shows a slower result for 30s slower result.

Table 4. 20 Resource Utilization Rate Comparison

Resource Utilization Rate		
Process	Initial	Proposed
Order-fulfillment	95,88%	79,70%
Stock Management	86,98%	71,75%

The table above shows the resource utilization rate comparison between the initial and proposed processes. It indicates a decrease in the utilization rate, which is better than the initial state, especially for the order-fulfillment process.

4.3.5.3 User Acceptance Testing (UAT)

User acceptance testing is a testing method that provides user assessment with the aim of understanding whether the output or the system meets the user's requirements or not. The UAT of this research is carried out by spreading the questionnaire, which contains 8 question statements. There are 13 respondents involved in this UAT, including the staff and the owner of Apotek Mataram. The questionnaire results are then calculated to determine the final score of the UAT result. The process of UAT is exposed as follows.

1. User Acceptance Testing of Order-Fulfillment Process

Table 4.21 Order-Fulfillment User Acceptance Testing Table

Order-fulfillment Process						
No	Question Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	The proposed process flow is better than the previous process flow	3	7	3		
2	The process is understandable	10	3			
3	User is comfortable in performing the process	8	4	1		
4	The process covers the overall business scope	1	7	5		
5	The process performs smoothly integrated with Vmedis	2	5	6		
6	Vmedis features can be utilized in the process	11	2			
7	User are satisfied with the proposed process	8	3	2		
8	The process is already complete (no missing activity)	9	3	1		

The table contains the result of user acceptance testing of the order-fulfillment proposed process. There are 8 positive statements about the proposed design of the order-fulfillment process. The result shows most of the staff answered strongly agree, agree, and neutral, which sign of positive feedback for the test.

2. User Acceptance Testing of Stock Management Process

Table 4. 22 Stock Management User Acceptance Testing Table

Stock Management Process						
No	Question Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	The proposed process flow is better than the previous process flow	2	5	6		
2	The process is understandable	10	2	1		
3	User is comfortable in performing the process	11	1	1		
4	The process covers the overall business scope	10	3			
5	The process performs smoothly integrated with Vmedis	8	4	1		
6	Vmedis features can be utilized in the process	7	2	4		
7	User are satisfied with the proposed process	6	4	3		
8	The process is already complete (no missing activity)	9	2	2		

The table presents the results of user acceptance testing, which was gathered from the staff for the stock management process. The result of this testing revealed that many of those strongly agree and agree with the 8 positive statements regarding the proposed design of the stock management process. This result of user acceptance testing indicates a good user response.

3. User Acceptance Testing of the Procurement Process

Table 4. 23 Procurement User Acceptance Testing Table

Procurement Process						
No	Question Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	The proposed process flow is better than the previous process flow	5	6	2		
2	The process is understandable	7	4	2		
3	User is comfortable in performing the process	4	8	1		
4	The process covers the overall business scope	6	7			
5	The process performs smoothly integrated with Vmedis	1	9	3		
6	Vmedis features can be utilized in the process	9	4			
7	User are satisfied with the proposed process	7	4	2		
8	The process is already complete (no missing activity)	3	6	4		

The table provides the result of user acceptance testing in proposed design of procurement process. As the result of the other process, the result of user acceptance testing for procurement process proposed design is mostly strongly agree, agree, and neutral to the 8 positive statements.

Table 4. 24 Weight of UAT Question

No	**Answer**	**Weight**
1	Strongly Agree	5
2	Agree	4
3	Neutral	3
4	Disagree	2
5	Strongly Disagree	1

After the answers have been listed, the next step is to calculate the score of each weighted question through the formula. The weights of each question are shown in the table above. The formula to calculate the question score result is as follows.

$$\boldsymbol{Percentage} = \frac{(\boldsymbol{Total\ Weight})}{\boldsymbol{Maximum\ Weight}} \times \mathbf{100}\%$$

Above is the formula to calculate the percentage score of the UAT result. The input is from the UAT table as shown in the previous section. After the calculation result is obtained, the final score will be identified to be analysis. The final score result will indicate whether the condition is good or poor. The score category is based on a Likert scale, referring to the previous UAT research carried out by (Wulandari et al., 2023). The Likert scale categorization table is shown as follows.

Table 4. 25 Likert Scale

Score (%)	**Criteria**
20%-36%	Very Poor
36.01%-52%	Poor
52.01%-68%	Medium
68.01%-84%	Good
84.01%-100%	Very Good

The above table shows the Likert scale percentage and its category. The ranges are varied for each category. The criteria consist of 5 levels, which are very poor, poor, medium, good, and very good. This will be used to categorize the UAT final score result to identify the category for each business process assessment.

Table 4. 26 Order-Fulfillment UAT Calculation Result

Order-fulfillment Process				
No	Question Statement	Total Weight	Maximum Weight	Result
1	The proposed process flow is better than the previous process flow	52	65	80%
2	The process is understandable	62	65	95%
3	User is comfortable in performing the process	59	65	91%
4	The process covers the overall business scope	48	65	74%
5	The process performs smoothly integrated with Vmedis	48	65	74%
6	Vmedis features can be utilized in the process	63	65	97%
7	User are satisfied with the proposed process	58	65	89%
8	The process is already complete (no missing activity)	60	65	92%
Average				87%

The table above shows the calculation result of UAT in the order-fulfillment process. The final scores calculation reveals that the average score of those 8 questions is 87%, which is considered a good result and indicates that the user is satisfied with the proposed result.

Table 4. 27 Stock Management UAT Calculation Result

Stock Management Process				
No	Question Statement	Total Weight	Maximum Weight	Result
1	The proposed process flow is better than the previous process flow	48	65	74%
2	The process is understandable	61	65	94%
3	User is comfortable in performing the process	62	65	95%
4	The process covers the overall business scope	62	65	95%
5	The process performs smoothly integrated with Vmedis	59	65	91%
6	Vmedis features can be utilized in the process	55	65	85%
7	User are satisfied with the proposed process	55	65	85%
8	The process is already complete (no missing activity)	59	65	91%
Average				89%

The table contains the result of the UAT calculation. Each of the answer are weighted and calculated through the previous formula to find out the percentage score. The final average calculation score for the stock management proposed process design is 89%. This score is categorized as a good, satisfactory rate.

Table 4. 28 Procurement UAT Calculation Result

Procurement Process				
No	Question Statement	Total Weight	Maximum Weight	Result
1	The proposed process flow is better than the previous process flow	55	65	85%
2	The process is understandable	57	65	88%
3	User is comfortable in performing the process	55	65	85%
4	The process covers the overall business scope	58	65	89%
5	The process performs smoothly integrated with Vmedis	50	65	77%
6	Vmedis features can be utilized in the process	61	65	94%
7	User are satisfied with the proposed process	57	65	88%
8	The process is already complete (no missing activity)	51	65	78%
Average				85%

The above table presents the result of UAT in the procurement proposed business process design. The answers of the users of UAT in the proposed procurement process design are then processed. The final average score of the UAT result of the procurement process is 85%. This score indicates good user satisfaction with the proposed design of the procurement process.

CHAPTER V
RESULT AND DISCUSSION

5.1 Discussion of Empathize Result

This research intends to solve the problem regarding the core business process integrated with the Vmedis system in Apotek Mataram through the design thinking method. Understanding the problem is a crucial step in the problem-solving process. The empathize phase in design thinking plays an important role which aiming to gather the user's pain point regarding the core business process performed with Vmedis in Apotek Mataram. The output of the empathize phase is the user's pain point statement about the current business process implementation. Thus, the result of the empathize phase in this research determines the further research output.

In carrying out the empathize phase, this research employs an empathy map as a tool to assist in the collection of users' pain points towards the core business process integrated with Vmedis in Apotek Mataram, as exposed in the previous chapter. The empathy map in this empathize phase is divided into three sections based on the process, which are order-fulfillment, stock management, and procurement process. Each of the empathy maps has 4 main components those are "Thinks", "Feels", "Does", and "Says". Those components function to assist in the identification of the user's pain point by excavating what the user thinks, feels, does, and says about the initial condition of the business process. The identified answers of those components will result in a pain point statement. The empathize process has been carried out in this research which resulting in three user pain point statements.

The result of the empathy map for the order-fulfillment process is the user pain points statements that performing Vmedis in order-fulfillment is difficult and requires a long processing time. The empathy map revealed that the pain point in the stock management process is that the process of Vmedis in the stock management system is unclear and not efficient because of unutilized software features. Subsequently, the user pain point statement of the procurement process is that the features of Vmedis could not be implemented in the procurement process. Those statements are the user's pain point statement, which is summarized from the 4 components of the empathy map in each process. These outputs will be the input of the next phase, which is the define phase.

Since design thinking is a method that strongly accommodates the user's desires, as a human-centric problem-solving method, it is required to assess and ensure that each output is what the user wants. Therefore, the user's pain point statements as a result of the empathize phase are asked of the user to check before the result is processed to the next phase. The verification process was conducted by asking directly to the user representative, the owner of Apotek Mataram. The user has agreed on the result of the empathy map as explained in the previous thus the empathize phase is successfully conducted. After the result of the empathy phase has been stated as valid, the design thinking process can be continued to the define phase.

5.2 Discussion of Define Result

The define phase aims to formulate the problem, which has been gathered from the previous process, thus the problem can be easily analyzed and synthesized to be problem statements. This research applies root cause analysis in facilitating the define phase. The root cause analysis tool involved in this research is fault tree analysis. This tool is applied in this research because it is suitable to analyze the root cause of the problem, and thus it can be eliminated.

There are three fault tree analyses involved in this research; each of the fault tree analysis diagrams assesses each of the processes. It consists of multiple branches and multiple levels, starting from 0 as the top level, which is the broad problem, and the lowest level for the root causes that contribute to the occurrence of the problem. The level 0 is placed by the pain point of the process, which has been revealed in the previous phase. The output of this define phase is the root cause points that will be connected to the affected activity of the business process. The fault tree analysis in this research, as shown in the previous chapter, has been completed, and the root cause has been defined.

As shown in the 4th chapter, the fault tree analysis of order-fulfillment process resulting to 6 root causes that contribute the pain occurrence, those are the customer is impatient, customer flow is not regulated, busy hour, the activity flow is unclear, require to input several additional data, and the activities are not arranged. Another diagram, stock management process fault tree analysis revealed that there are 8 points as root cause contributor, those are the undefined activities to fulfill Vmedis requirements, some original activities are no more relevant, unclear activity procedure, few experience / not yet experienced, employee do not finish to update & input stock information data completely, activity to input and update stock information data is not clearly defined, order-fulfillment process does not integrated smoothly, and activity is not

defined. Next, the procurement process has 3 points of root cause that were identified through fault tree analysis diagram; the root causes are undefined activities to fulfill VMedis requirements, some original activities are no longer relevant, and undefined activities. Those root causes will help find a better way to modify the process.

After the root causes have been figured out, it should be determined whether the activity is affected by the identified root cause. This identification is carried out manually by considering the related activity as presented in the table in the 4th chapter. These results are the output of the define phase, which functions to define what things should be inspected and will be processed further. Before the results of the define phase are continued to the next phase, it is necessary to ensure the validity of the results. The result of the definition phase has been agreed upon by the owner of Apotek Mataram as the user representative; thus, the result is validated and can be continued to the next phase.

5.3 Discussion of Ideate Result

The third phase of design thinking is the ideate phase, which aims to offer a proposed solution to the discussed problem. This phase continues the output of the define phase, which generated a list of root causes and the related activities to be developed further. In this research, the ideate phase was carried out through the How Might We (HMW) tool. The HMW tool addresses to facilitate the generation against the occurred problem. This tool will be applied to the identified root cause and the related activity.

As the result exposed in the 4th chapter, the HMW was applied by combining the output of the previous phase. The root cause and related activity list table are analyzed in this phase by adding possible solution ideas for business process arrangement and activity to solve the revealed root causes. Each point of the root cause will be analyzed, and at least one possible solution idea. The proposed solutions are varied, such as eliminate, automate, substitute, do nothing, and define a new activity. The example of ideation result is that in the order-fulfillment process there is a root cause which has a level code A.2.2.1 is “require to input several data” which the related activities are input order transaction, create bill, and input payment activity then the HMW proposed idea is to separate role for payment and service section.

The output of this ideate phase is a list of the proposed ideas regarding the business process design. That output will be processed in the prototype phase to be developed further. The proposed ideas of the ideate phase were assessed and accepted by the owner of Apotek Mataram as the user representative.

5.4 Discussion of Prototype Result

The prototyping phase is the fourth stage in design thinking, which functions to depict the idea and simulate it, thus the proposed idea can be demonstrated and examined. This research uses a paper prototype as a type of prototyping method to demonstrate the idea. The input of the prototype phase is the result of the ideate phase, which is a list of alternative activity adjustments of the business process through the HMW approach. The aim of prototype creation is to demonstrate the result, thus, the proposed solution of business process arrangement can be inspected and tested by the user before it is implemented.

The paper prototype of this research adopts the Business Process Model Notation (BPMN) framework to assist in the depiction of the proposed business process model. The BPMN prototype was created by using Bizagi Software Modeler. The creation of the proposed BPMN diagram is by considering the result of the HMW table, which contains the list of alternative adjustments of activities within the process. There are 2 BPMN that were created to represent the core business processes in Apotek Mataram, the first is order-fulfillment BPMN, and the second is stock management and procurement BPMN. The stock management and procurement process are merged in a BPMN because their interaction is very related, thus they are more relevant to be depicted in a diagram. There are several differences in the proposed BPMN diagrams compared with the original process design.

As shown in BPMN diagrams in the 4th chapter, the differences are significant. In the order-fulfillment process, the differences are in the pool or section arrangement and in the activity. The original order-fulfillment process involves 4 sections or subjects within the process those are the customer, front-desk staff, stock management staff, and the preparation process group. In the proposed business process design, there are 5 sections which consist of the customer, front-desk staff, stock management staff, preparation process group, and cashier section. The cashier section was added to the process to accommodate the idea that emerged from the problem, such as the occurrence of a bottleneck due to the long processing time in billing and payment activities. Thus, the alternative solution is to separate the involved activities from the

cashier section to reduce the front-desk staff activity and speed up the processing time. In the original process, the customer's order is handled by a front-desk staff from the beginning, input the transaction record, and finish the payment. Since Vmedis software requires to input more additional transaction data, the processing time becomes longer. Fortunately, the Vmedis system has the ability to be performed on multiple devices, thus it can be proposed to separate the billing and payment activities to a focused cashier section. The activities handled by the cashier section are creating a bill, calling the customer, and inputting payment. By separating the billing and payment activities from the cashier, the customer bottleneck can be eliminated because the customer can finish the payment while they are waiting for the product to be prepared by the staff, and the staff only need to input the transaction information, which requires less processing time.

The next difference is in the check stock availability activity. In the original process, the check stock availability is performed manually by the staff. In the proposed process, the activity is eliminated and substituted with the stock information database to check the availability by utilizing the feature of Vmedis software, which can manage the transaction and stock information data in real-time. The other differences are in the preparation process group, the series of activities to prepare the transaction of the day, whereas they are performed at each of early and the end of operational hours. The original order-fulfillment process needs to be adjusted because the Vmedis system requires inputting some requirements, such as setting up the software at the early of the shift and ensuring there is no gap between the recorder balance and the actual cash at the end of the day. Thus, in the proposed adjustment design consist of new activities defined, those are setting up Vmedis software at the opening in aim to input required information about the today shift, input the final balance amount, and identify the cause if there is a gap between the actual and recorder balance at the end of the shift.

Another prototype is the BPMN of the stock management and procurement process. This process involves 4 sections or pools in both the original and proposed design, which are stock monitoring, procurement, vendor, and receiving point. The sections in the proposed design remain the same as in the original scheme because those are still relevant, unlike in the order-fulfillment process. The differences are in the activities, with most of the changes being about the automation. In the stock monitoring pool, the differences are in the activity of inspecting the stock availability and the creation of an order proposal. Those two activities are performed manually by the staff in the original process, while in the proposed design, the stock; those

activities are eliminated because of the automation process provided by the Vmedis system through stock information data. The staff's role in the proposed process is to ensure that the stock information data and the actual amount are synchronized. The manual handling in the original process design is also performed in the creation of the proposal order. The proposed design eliminates the manual activity of proposal order creation by utilizing the Vmedis system, thus the proposal order is automatically created by the software. Thus, the stock monitoring section is no longer responsible for the manual creation of proposal orders; this activity is moved directly to the procurement section, since the Vmedis software can integrate across the processes.

Subsequently, the changes in the procurement section are the automation of proposal order creation and purchase order creation. The procurement staff's role is to inspect the proposal order, which is created automatically by Vmedis, before it is processed to the next step. The activities in the vendor section have not changed since this section is not included in the internal environment of Apotek Mataram. The receiving point section is responsible for the handling of arriving goods. There are several new activities defined in this section, such as input and update stock information data. This activity needs to be added to keep updated the Vmedis stock information data, thus the overall process can be performed properly.

Those adjustment to the order-fulfillment, stock management, and procurement process is aimed at making the Vmedis features utilized in the processes perform properly and enabling the user to enjoy carrying out the business process. These prototypes are then explained and submitted to the user, such staff of Apotek Mataram and the owner. After the output of the prototype phase has been reviewed by the Apotek Mataram party, it continues to the testing phase as the final stage of design thinking.

5.5 Discussion of Testing Results

The testing phase is the ultimate stage of design thinking, which is designed to check whether the solution to the problem is valid or not. The output of the prototype phase will be analyzed, tested, and checked in the testing phase, thus the performance of the solution can be known, and to gather user satisfaction with the proposed solution or any feedback if it is. The output of the testing phase is an overall validation of the proposed solution by considering the testing results.

This research employs three testing methods, those are processing time analysis, process simulation, and user acceptance testing (UAT). Processing time analysis is a testing method to analyze the length of time needed to perform a process. In this research, this method is adopted to analyse the processing time of the process. As shown in the 4th chapter, the table contains the result of the processing time analysis of the order fulfillment, stock management, and procurement process. Based on the result of processing time analysis, the original order-fulfillment process requires 530 seconds in serving an order and 1740 seconds in a preparation cycle. While the proposed design of order-fulfillment processing time for serving an order and for preparation cycle is 435 second and 1775 second, respectively. From those results, the processing time difference of the proposed business process design in serving an order is 95 seconds faster than the original state. The processing time needed for performing the preparation process for the proposed design is 35 seconds longer than the original. The proposed design of preparation processing time is longer than the previous one because there are new activities added in the preparation section to accommodate the Vmedis required input. Even though there is a 35-second longer in the preparation section of the proposed design result, it can be tolerated since the additional time is required to accommodate the requirements. The result of processing time analysis of the order-fulfillment process prototype indicates a good result because overall, of order-fulfillment process in the proposed design can be performed faster than the original.

The processing time calculation of the stock management and procurement process in the original state shows that performing a cycle of the process needs 19800 seconds. The processing time required to run the proposed process of stock management and procurement is 18040 seconds. There is an improvement of 1760 seconds for the proposed process. This might happen because there are several activities eliminated and substituted using software automation provided by Vmedis, thus the manual tasks can be reduced. The processing time analysis result of the stock management and procurement process shows that the proposed process design has a better performance in terms of processing time.

From those results, the processing time analysis reveals that the proposed business process design of all processes offers an advancement in terms of processing time, as the proposed design overall is more efficient in processing time calculation. Therefore, the proposed design can potentially improve the state of the core business process in Apotek Mataram.

The process simulation test proved that there are significant differences between the original

and the proposed business process design. As shown in the previous chapter, the process simulation for the order-fulfillment original process has the average time for each customer, order-to-cash, and preparation cycle for 6 minutes 18 seconds, 5 minutes 24 seconds, and 13 hour 46 minutes, respectively. While the proposed order-fulfillment process has an average time for each customer, order-to-cash, and preparation cycle for 4 minutes 44 seconds, 4 minutes 2 seconds, and 13 hour 46 minutes 30 seconds. The simulation was performed with a similar scenario, with a simulation duration is 14 hours and employing a uniform distribution from 1 to 15 for the instance arrival. The results revealed that the proposed business process design significantly enhanced the state, particularly in processing time. The resource utilization rate also indicated that the proposed business process is better than the initial with a decrease in the utilization rate, especially for order fulfillment, with a score of 95,88% to 79,70%, and for the stock management and procurement, with a score of 86,89% to 71,75% for the initial and proposed.

Furthermore, this research also performs user acceptance testing (UAT) in carrying out the testing phase. User acceptance testing (UAT) is a testing method that aims to examine whether the system or the output has already been met the user's needs or not. In this research, the UAT consists of 8 question statements for each of the processes, which are then asked of the user. The user's answers to UAT are then processed through a weighted method and calculation to find out the final score. The final score is the average of all users' answers to the 8 questions of each process. The result of UAT will determine the satisfactory level of the user of the proposed solution.

The average score results of UAT for order-fulfillment, stock management, and procurement process are 87%, 89%, and 85%, respectively. Those revealed scores are considered in a very good category, which indicates that the users are satisfied with the proposed design.

CHAPTER VI
CLOSING

6.1 Conclusion

Based on the research that has been conducted, the results of the research can be concluded as follows:

1. The identification of employees' pains and complaints was carried out through the design thinking method in the empathize stage, assisted with an empathy map, and was conducted by a focus group discussion with the users. The pains and complaints of employees revealed for order-fulfillment, stock management, and procurement process are: performing Vmedis in the order-fulfillment process is difficult and requires a long time; the process of Vmedis in the stock management system is unclear and not efficient because of unutilized software features; the features of Vmedis cannot be implemented in the procurement process. These results have been confirmed to the user to ensure the output of the empathize stage is valid and accepted by the user. The verified output is then continued to be processed in the next stage.
2. The gaps that become the problems of the Vmedis implementation have been successfully defined. The identification process was performed through design thinking in the define stage, where the input is the result of the empathize phase, and fault tree analysis was employed as the supporting tool in defining the problem. The FTA results are unveiled: 6 root causes of the problem for order-fulfilment, 8 problem root causes for stock management, and 2 root causes for procurement. Those root causes are then analyzed to know the affected and related activities within the process. The output of this stage had been accepted by the user representatives of Apotek Mataram.
3. The adjustment alternatives of the core business process in Apotek Mataram had been specified in the ideate phase of the design thinking process. How might we (HMW) approach was applied in assisting the idea generation to specify the adjustment alternatives. Several adjustment ideas for the activity's arrangement had been listed for each of those core business processes. The proposed ideas, as the output of the ideate phase, had been consulted and accepted by the user representative, thus, it can be processed further.

4. The proposed design idea was successfully created in the prototype phase of design thinking. The output of this stage is the depiction of business process arrangements through the use of a BPMN diagram. There are three BPMN diagrams for each order-fulfillment, stock management, and procurement proposed process. The arranged adjustments of activity within each process are based on the ideate phase verified output, which has been determined through the HMW approach.
5. The proposed solution result of the core business process problem has been measured successfully in the design thinking testing phase. The involved methods are processing time analysis, process simulation, and user acceptance testing (UAT). The average processing time of the proposed process design for order fulfillment, stock management, and procurement is significantly faster than the original process. The simulation results show that the proposed process performs significantly better than the original process. Besides that, the UAT indicates the user satisfaction rate as good, proven by the final result of UAT, which are 87%, 89%, and 85% for order-fulfillment, stock management, and procurement proposed process, respectively. Therefore, it can be stated that the design thinking process of this research successfully generates an acceptable solution for the problem.

6.2 Suggestion

Based on the conducted research, the suggestions that might help for future research are as follows:

1. Activity cost analysis might be included in future research related to business processes, thus, the analysis result can provide a comprehensive view.
2. Value added analysis might be performed to identify the activities that contribute to adding more value and unvaluable activities; thus, the unvaluable activities can be eliminated to boost efficiency.
3. The future research might involve other factors besides the business process to enhance Apotek Mataram’s performance.

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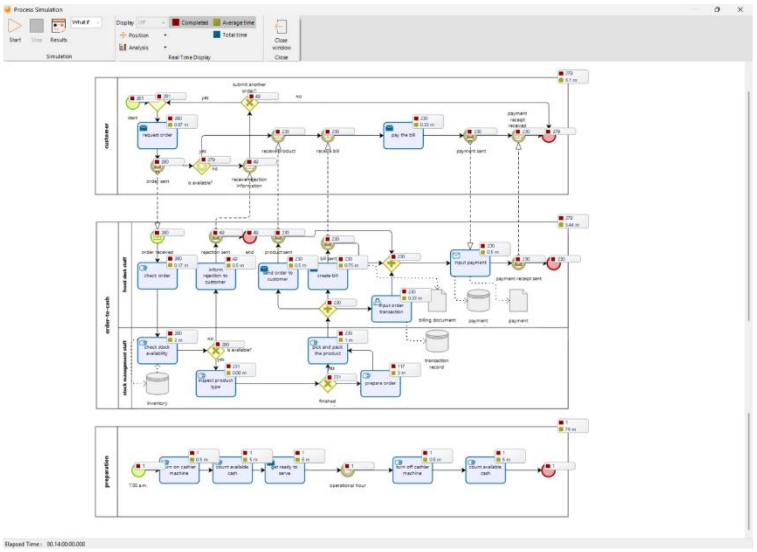
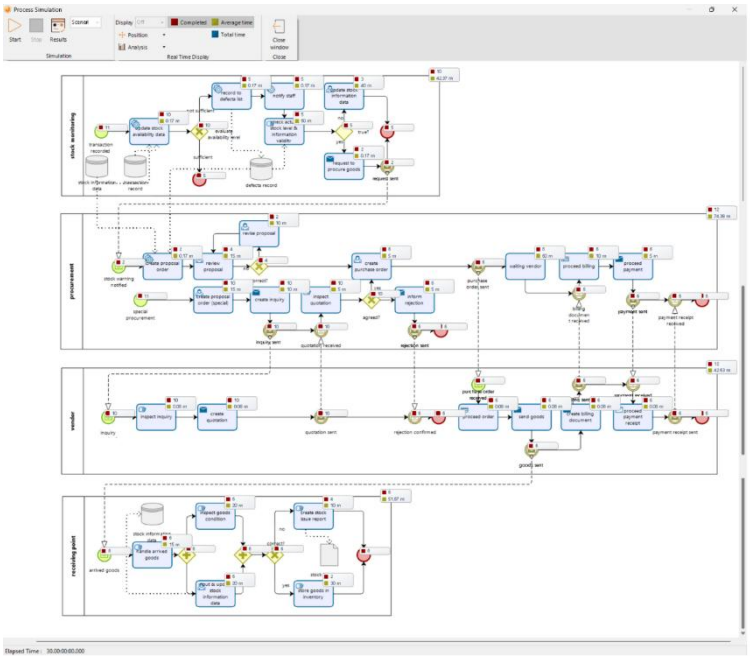
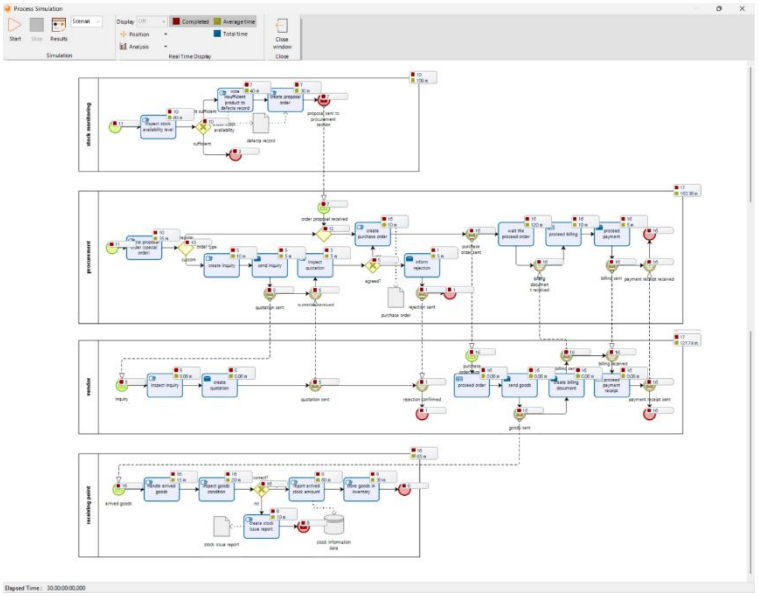
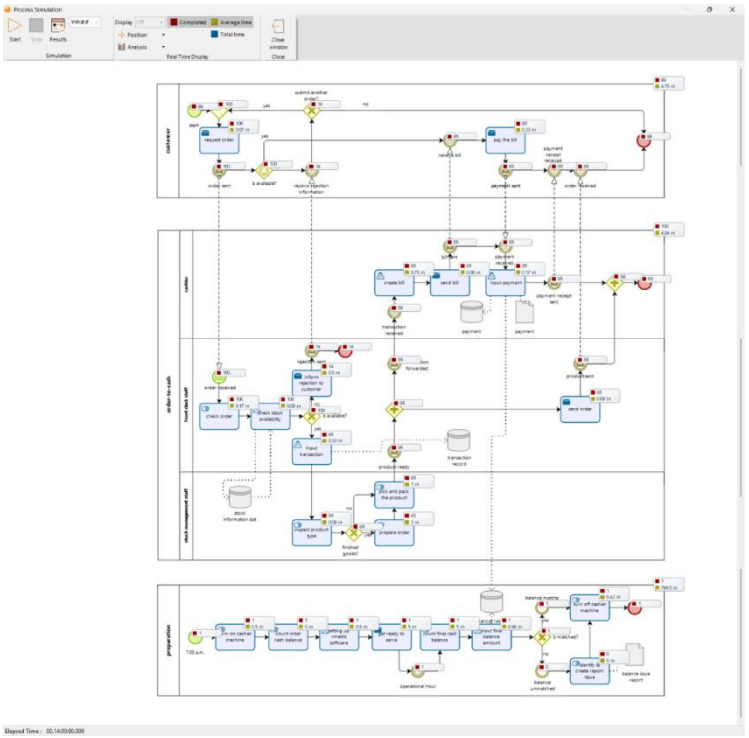
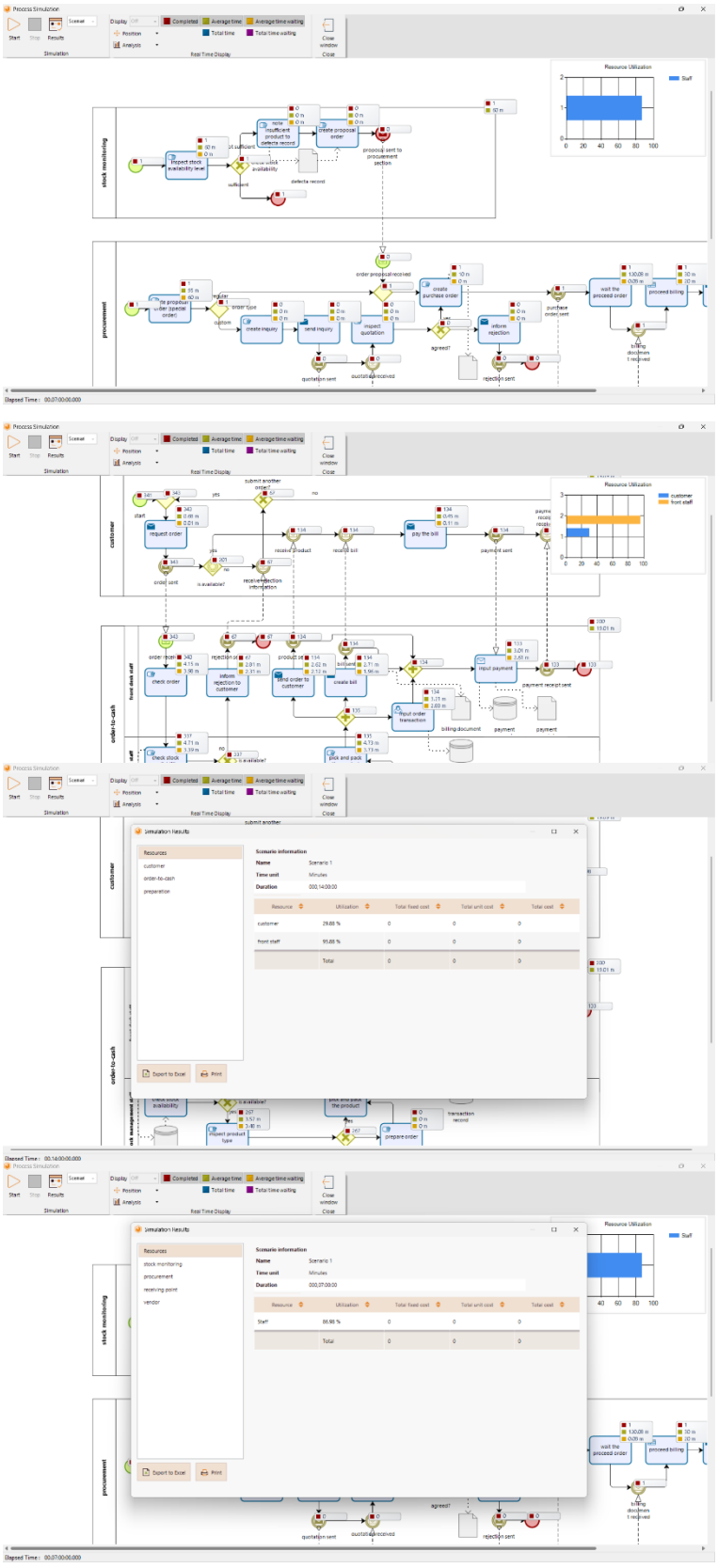
APPENDIX

1. Process Simulation Testing









2. Process Simulation Testing (Resource Utilization Rate)