CHAPTER 1
INTRODUCTION

1.1. Background

In the current era, amid rapid technological advancement, information systems have become a key element in the operations of modern pharmacies. Without an integrated system such as ERP (Enterprise Resource Planning), pharmacies face a range of problems that can hinder efficiency and service quality. One major issue that arises is the inability to monitor drug stock movements in real-time, which can lead to imbalances between available stock and market demand. This poses the risk of running out of essential medicines or, conversely, accumulating unsold drug inventories that may become expired. Research by Ali et al. [1] indicates that manual inventory management systems often fail to provide sufficient visibility regarding stock status, resulting in errors that can financially harm the pharmacy. Furthermore, Jaju et al. [2] revealed that without an ERP system, transaction records and financial reporting become prone to human error, slowing down financial management processes and introducing inaccuracies that could disrupt the pharmacy's financial stability. On the other hand, manual stock management requires significant time and labor, ultimately causing operational inefficiency and worsening customer service turnaround times. According to Gungor [3], pharmacy management information systems can optimize pharmacy workflows by reducing human error, speeding up processes, and increasing data accuracy. This technology facilitates real-time data management, enabling pharmacies to monitor drug stocks as well as compile financial reports more efficiently and promptly. Therefore, digitalization and automation in pharmacy systems are crucial factors that can enhance competitiveness and improve customer service.

Based on interviews conducted with Pasyha Pharmacy, most of the pharmacy's operational processes currently still rely on manual record-keeping, although some aspects have adopted automated point-of-sale systems. This manual system causes difficulties in stock monitoring and time-consuming financial report management, as well as increasing the risk of errors in data entry.

In this context, a study by Shbaily et al. [4] demonstrates that pharmacy automation systems can significantly reduce medical errors, improve operational efficiency, and optimize stock management in pharmacies. Automated pharmacy systems (PAS) have proven more efficient compared to traditional pharmacy systems (TPS), which are often hampered by limitations in inventory management and unstructured workflows. The implementation of this technology, despite requiring substantial initial investment, has been shown to reduce operational costs in the long term by minimizing medication waste and reducing labor needs, as well as enhancing the quality of customer service [4]. However, to achieve optimal benefits from automation systems, adequate staff training and ongoing technical support are required.

The use of an ERP system is critical for Pasyha Pharmacy to integrate various operational functions, such as sales, inventory management, financial reports, and management of customer and employee data, into a single centralized platform. As explained by Irmayanti et al. [5], the adoption of an ERP system—in which the study utilized ODOO—was shown to help pharmacies improve operational efficiency and reduce recording errors that frequently occur in manual systems. This is consistent with the findings of Firoz et al. [6], who stated that ERP systems in the pharmaceutical industry can enhance integration between various company functions, decrease errors, and improve overall operational efficiency. With an integrated ERP, Pasyha Pharmacy can significantly improve inventory management, financial reporting, and the quality of service to customers. Furthermore, the implementation of a well-structured ERP system will enable Pasyha Pharmacy to make more informed, data-driven decisions, ultimately supporting the pharmacy's long-term growth and sustainability.

The use of an approach combining Behavior-Driven Development (BDD) and Test-Driven Development (TDD) methods in ERP system development at Pasyha Pharmacy is highly relevant to ensuring greater system flexibility and quality. As described by Irshad et al. [7], BDD focuses on collaboration between developers and non-technical stakeholders through clear behavioral specifications, using natural language that can be understood by all parties. This approach helps ensure that business requirements are well understood and implemented according

to user expectations, which is essential in the development of ERP systems that involve many features and must meet the specific needs of pharmacies. On the other hand, TDD emphasizes structured code testing prior to feature development, thereby improving code quality and reducing defects during development [8]. By simultaneously applying both approaches in a hybrid model, developers can gain benefits from both: rapid responsiveness to changing user requirements (from BDD) and maintained code quality through consistent testing (from TDD). This is especially important for developing an ERP system that can quickly adapt to changing business needs while ensuring that the developed system is free of technical errors.

The implementation of an integrated ERP system at Pasyha Pharmacy is expected to increase operational efficiency and support the pharmacy's business growth. With an ERP system integrating inventory management, sales, financial reporting, and Customer Relationship Management (CRM), Pasyha Pharmacy can manage customer relationships more effectively. Through CRM, customer data can be managed in a more structured way, enabling personalized services, increasing customer satisfaction, and accelerating transaction processes. Moreover, the implementation of an integrated payroll system allows for automated management of employee data, attendance, and payroll, reducing human error and increasing transparency in human resource management [9]. Studies show that implementing ERP systems can improve organizational performance by automating data management, facilitating interdepartmental communication, and enabling better management of transactions and employee payroll [10]. Additionally, by integrating ERP with e-commerce platforms, Pasyha Pharmacy can efficiently serve online transactions, streamline customer shopping experiences, and speed up transaction processes that previously consumed significant time. Thus, the implementation of an integrated ERP system is expected to optimize all pharmacy operational processes, enhance efficiency, and strengthen the pharmacy's competitiveness in the digital market [11].

1.2. Problem Statement

Based on the background described previously, the issues to be examined in this study can be formulated as follows:

1. How can the implementation of Behavior-Driven Development (BDD) and Test-Driven Development (TDD) methods in the development of an integrated ERP system optimize the management of all operational sectors of the pharmacy, as well as improve operational efficiency and service quality at Pasyha Pharmacy?
2. How can the integration of the ERP system with an e-commerce platform increase the efficiency of online transactions, improve stock management, and strengthen Pasyha Pharmacy's competitiveness in the digital market?

1.3. Objectives

Based on the problem statement outlined above, the objectives of this study are as follows:

1. To implement Behavior-Driven Development (BDD) and Test-Driven Development (TDD) methods in developing an integrated ERP system at Pasyha Pharmacy, in order to optimize the management of all operational sectors of the pharmacy, as well as to improve operational efficiency and service quality.
2. To design and build the integration between the ERP system and the e-commerce platform at Pasyha Pharmacy, to increase the efficiency of online transactions, improve stock management, and strengthen the pharmacy's competitiveness in the rapidly developing digital market.

1.4. Benefits

This research is expected to provide significant benefits to various parties, including:

1. For Pasyha Pharmacy
    a. Increase operational efficiency by integrating inventory management, sales, financial reporting, and customer data into a

single centralized ERP system, which can reduce manual errors, expedite workflows, and ensure more accurate management.

b. Improve service quality for customers through the implementation of an ERP system that enables faster and more accurate transactions, and facilitates customer data management for personalized services and enhanced satisfaction.

2. For Pharmacy Owners and Staff
    a. Reduce the burden of manual administrative tasks and optimize human resource management through an integrated payroll system capable of managing salaries, attendance, and employee data automatically, thereby increasing transparency and efficiency in HR management.
    b. Facilitate financial and inventory management and reporting, as well as provide clearer insights into the pharmacy's performance to support faster and more accurate decision-making.
3. For Pasyha Pharmacy Customers
    a. Enhance service quality by expediting transactions, ensuring more accurate drug availability, and providing more transparent information regarding stock and drug prices.
    b. Deliver a faster and more efficient shopping experience, with services more responsive to customer needs.
4. For Academic Development
    a. Serve as a reference for ERP system development in the pharmaceutical sector, particularly for SMEs, and can be used as a case study regarding the implementation of integrated ERP technology with an e-commerce platform.
    b. Provide new insights into the application of the BDD (Behavior-Driven Development) and TDD (Test-Driven Development) methods in ERP software development, which can be further researched in the fields of software and information systems development.

1.5. Scope of Study

1. The system developed focuses on implementing an integrated ERP at Pasyha Pharmacy to manage various operational sectors, such as inventory management, sales, financial reporting, customer data management, and human resource management.
2. This study does not include the separate development of an e-commerce system, but rather integrates the e-commerce system into the existing ERP platform to expedite online transactions and customer data management.
3. The payment process is not conducted through the system. The system only directs customers to WhatsApp for further communication, including order confirmation, payment methods, and other transaction details. There is no implementation of a payment gateway or an automatic payment module.
4. This research does not discuss the implementation or integration of ERP systems outside the scope of Pasyha Pharmacy, and focuses on the development and application of ERP in small to medium-scale pharmacies.