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Analysis and Design of Website-Based E-Business Information Systems in Heavy Equipment Companies

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Abstract *– This study aims to formulate a framework for designing an e-business information system that is in line with the characteristics of business processes, organizational culture, and stakeholder needs in heavy equipment companies in Indonesia. The companies that focus their business on providing heavy equipment and spare parts, automotive component distributors, and collaborating with financial service providers who are starting a digital transformation. Data was obtained through: (1) in-depth interviews with 10 key informants (marketing managers, operational managers, spare parts managers, financial managers, and financial service providers); (2) observation of ongoing system procedures (3) review of supporting documents. Problem analysis is mapped in detail with a fishbone diagram, then the system design is built using the Rational Unified Process (RUP) method, the results of the construction phase show a 45% increase in order process efficiency and a 60% decrease in stock errors during trials at one branch of the company. The Transition phase involves user training and the migration of 5 years of historical data with zero downtime. The implementation of RUP provides version control for measurable risk management, and enables the adaptation of requirements during iterations, thus ensuring that the resulting e-business information system aligns with the business strategy of the heavy equipment company.*

Keywords**:** *Digital Transformation; E-Business; Information System; Rational Unified Process.*

1. INTRODUCTION

In the era of digital transformation, e-business has become a strategic foundation for companies in almost all industries—including the heavy equipment industry, which is often considered conservative and asset-intensive. E-business is not just about selling products online; it includes the digitalization of end-to-end processes: from market research, spare parts procurement, supply chain management, sales, to data-driven after-sales service. The advances of communication and information technology in today's have brought a big impact in various aspects, especially for the business sector. One of the new concepts offered is e-business or electronic business. Electronic business is a business activity on the internet that not only includes the purchase, sale of goods and services, but includes all things related to the main business activities. E-business can be defined as the process of using IT and communication by groups, individuals or related parties, to carry out and manage a business process. The development of information technology that is increasingly advanced is also one of the driving factors for the development of e-business [1].

The adoption of e-business in industry has opened the door to significant changes in the way companies operate. In the manufacturing sector, e-business allows companies to integrate their supply chains more efficiently, collaborate with suppliers worldwide, and optimize production processes. In the service sector, companies can change the way they interact with customers, provide services through digital platforms, and respond to customer needs more quickly. E-business also provides access to a larger global market, opening up unlimited growth opportunities for companies.

PT Kasana Teknindo Gemilang does not yet have a reliable information system to support its business processes. PT Kasana Teknindo Gemilang needs an e-business information system that can facilitate the company in carrying out business activities such as sales to resellers and end users, inventory and purchases to suppliers, formulating strategies to fulfill customer desires, maintaining trust, and customer satisfaction with

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company services, promotion of new goods, remote payments and transactions, and having a strong business network in supporting business activities so that the company can expand its marketing area and improve the company's image in the eyes of the community [2]. For this reason, this research focuses on a website-based information system implementation project, with the title "Analysis of Website-Based E-Business Information System Design at Heavy Equipment Company".

2. RESEARCH METHODOLOGY

Rational Unified Process (RUP) is a specific and iterative software development methodology focused on architecture (architecture-centric), more directed based on use cases (use case driven) basically RUP is a structured software engineering process with 4 phases in it, namely inception, elaboration, construction, and transition [3].

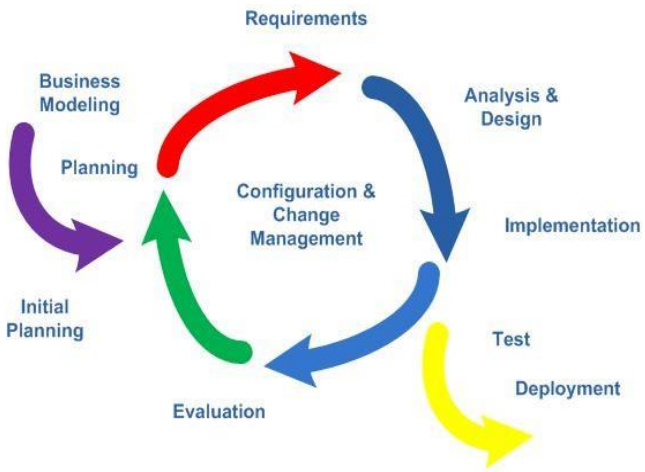

Figure 1. Rational Unified Process (RUP) architecture.

The development of the system built uses the Rational Unified Process (RUP) method. The stages of the RUP are as follows [4]:

2.1. Inception Phase

At this stage initial preparations are conducted such as collecting the data needed in developing the system, namely by:

a. Observation Study
b. Interview Study
c. Literature Study

2.2. Elaboration Phase (expansion / planning)

This phase focuses on planning the system architecture by conducting several analyses, namely problem analysis and needs analysis. Problem analysis is carried out using Ishikawa Diagram analysis, and the design used is object-oriented design consisting of: use case diagram, class diagram, object diagram, activity diagram, and sequence diagram.

2.3. Construction Phase

At this phase, implementing and testing a system that focuses on implementing software in program code which then produces software products to be introduced to users.

2.4. Transition Phase

This phase starts at installation of the system so that it can be understood, which also includes training users as well as maintenance and testing of the system whether it meets the expectations and needs of users.

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3. RESULTS AND DISCUSSION

An analysis of the existing system (the running system) at PT Kasana Teknindo Gemilang Palembang is conducted by collecting information from observations and interviews that had been performed, then finding problems, causes of problems and consequences of these problems using a fishbone diagram [5]. An Ishikawa diagram, also known as a fishbone diagram or cause-and-effect diagram, is a visual tool used to systematically identify and analyze the root causes of a specific problem or effect. Developed by Kaoru Ishikawa in the 1960s, this diagram helps teams delve into the various factors contributing to an issue, facilitating structured brainstorming and problem-solving [6]. The main problems that were successfully identified were as follows:

a. There is no facility for searching for product information, ordering, payment, and transactions online.
b. Delays in providing goods to customers due to the inaccuracy of the timeliness of the distribution of goods both into the company, namely from the head office and outside the company, namely to customers.
c. There is no system that can help the company in providing after-sales services such as maintenance information and product service and choosing the most potential or most profitable customers for the company because the collection, storage, and processing of customer profile data is not carried out in detail.

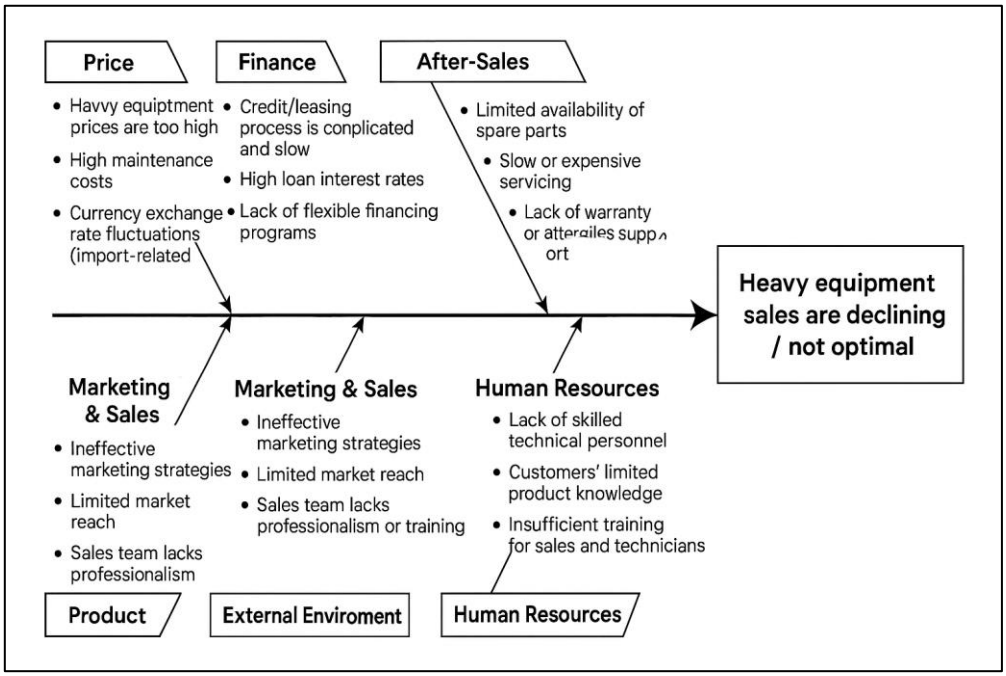

Figure 2. Fishbone diagram.

The next stage carried out by the author is a needs analysis. Needs analysis describes what is needed by the user and what the user can do with the system. The tool used in this needs analysis is the case model. Use case is a model that describes and analyzes the needs in the system by preparing the models needed to communicate the perspective of system use then a system design needs to be used to describe how a system will be built [7]. The next tool used is deployment diagrams to emphasize their role in expressing the physical components of a system and their organization, describe physical deployment of software artifacts to hardware devices and summarize configuration of hardware and software devices. It includes examples related to web applications [8].

Class diagrams serve as an essential visual representation of a system's architecture by depicting its core components referred to as classes and the relationships between them. These diagrams provide developers and stakeholders with a clear overview of the system's structure and the interactions required to fulfill its functional goals. It is crucial that class diagrams are drawn meticulously and free from errors. Any inaccuracies in the diagram can propagate downstream, leading to faulty or inefficient code implementations. Since class

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diagrams act as blueprints for software development, their correctness ensures the software system can be built consistently and reliably [9].

Building a dynamic website using PHP and MySQL involves developing a server-side application that interacts with a relational database to manage data such as user information, products, or transactions. PHP acts as the backend language that processes user requests, performs database operations, and dynamically generates HTML content, while MySQL stores and organizes the site's data efficiently. The development process begins with planning and designing the database schema, followed by implementing key functionalities such as user authentication, data CRUD operations, and session management. On the frontend, HTML, CSS, and JavaScript are used to create visually appealing and interactive interfaces. However, creating a successful website requires more than just functionality; it demands careful attention to UI (User Interface) and UX (User Experience) design. UI focuses on the visual layout, ensuring consistency, clarity, and responsiveness across devices, while UX emphasizes ease of use, intuitive navigation, and seamless interactions to provide an enjoyable and efficient experience for users [10].

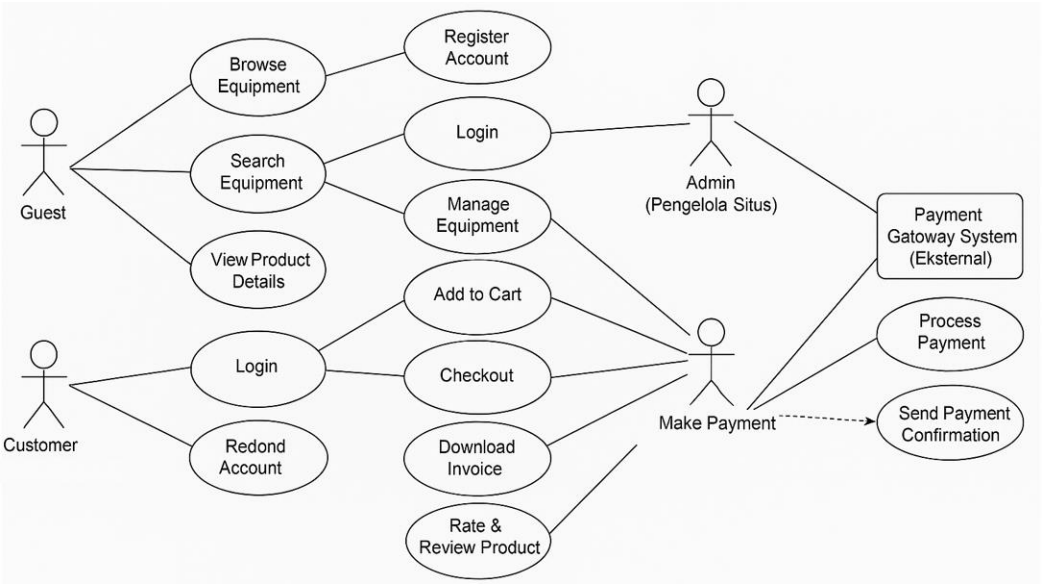

Figure 3. Use case diagram.

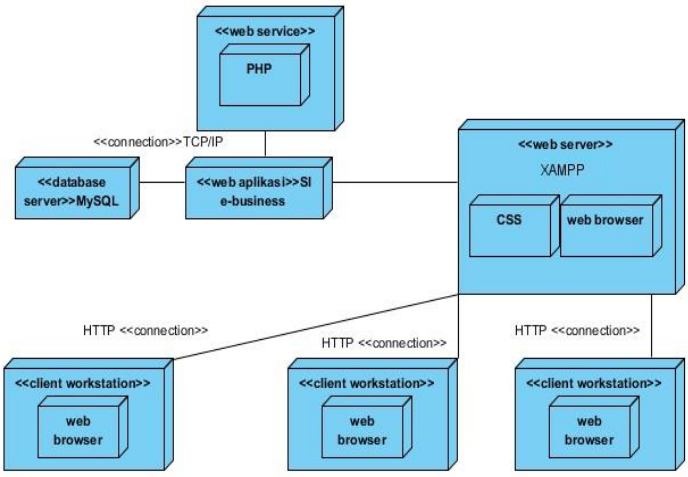

Figure 4. Deployment diagram.

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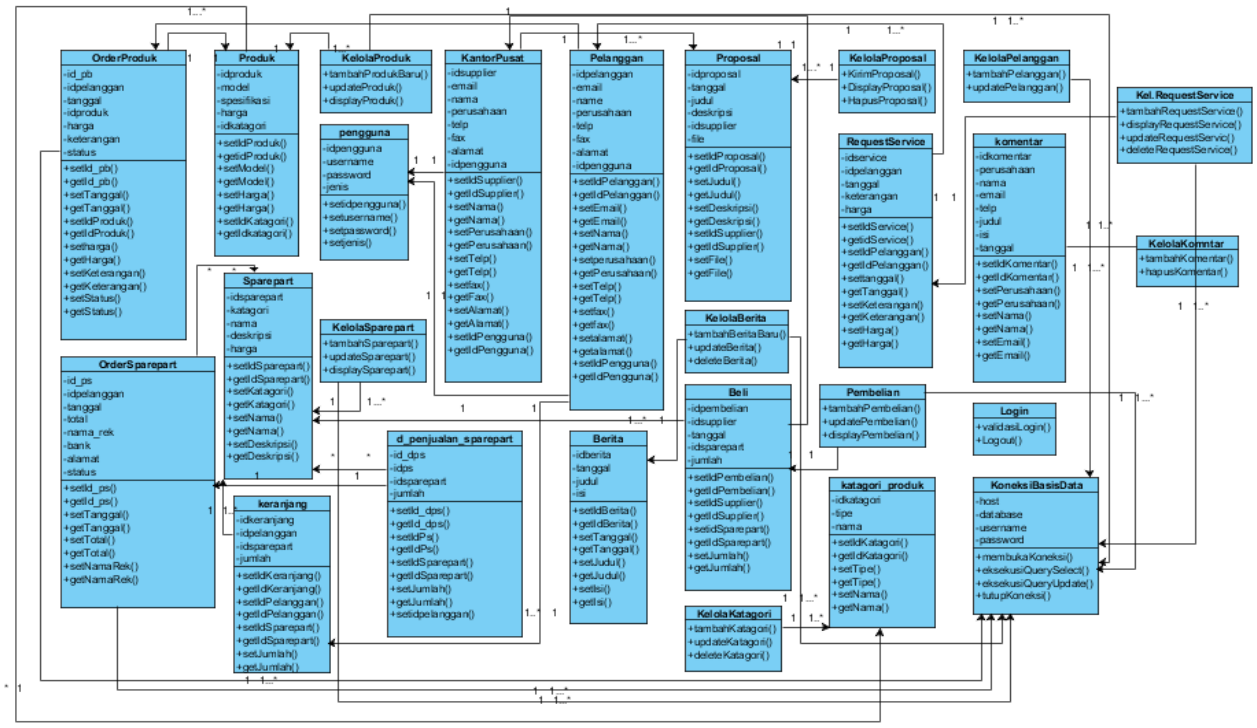

Figure 5. Class diagram.

To access this system, users must first log in by entering a username and password to determine the distribution of user access rights. The system login form can be seen in Figure 6. After successfully performing the login process, the system will display the admin/user/supplier main page as presented in Figure 7.

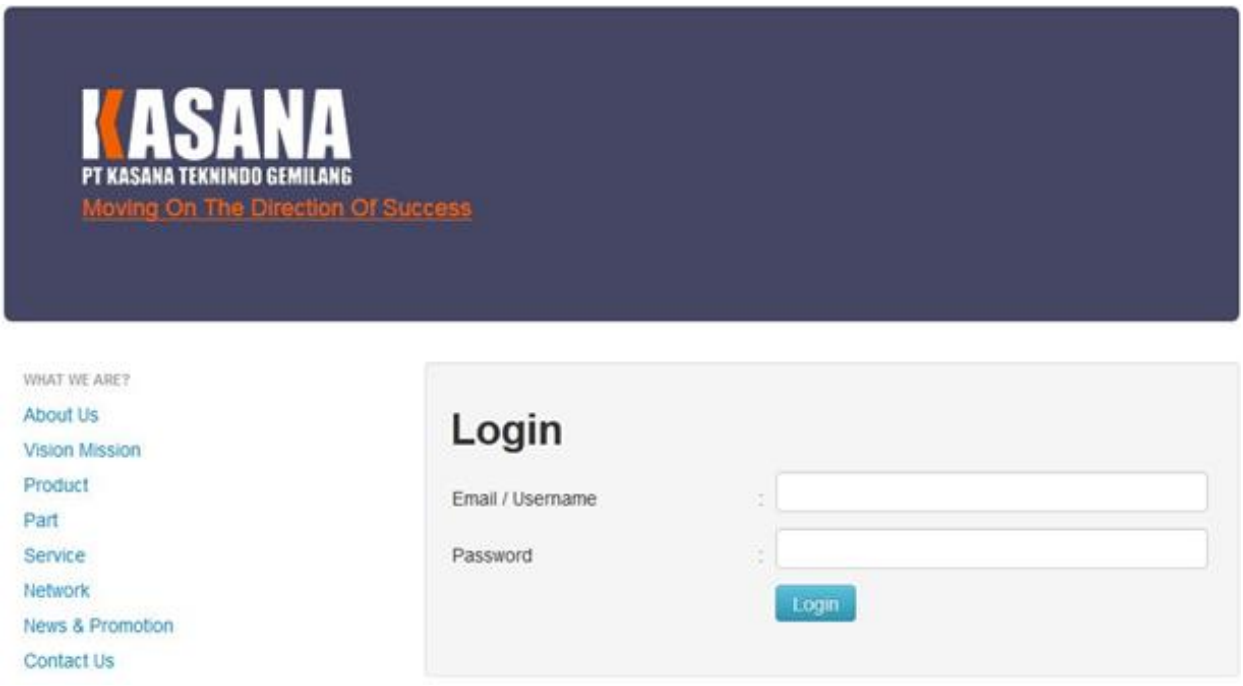

Figure 6. Login form.

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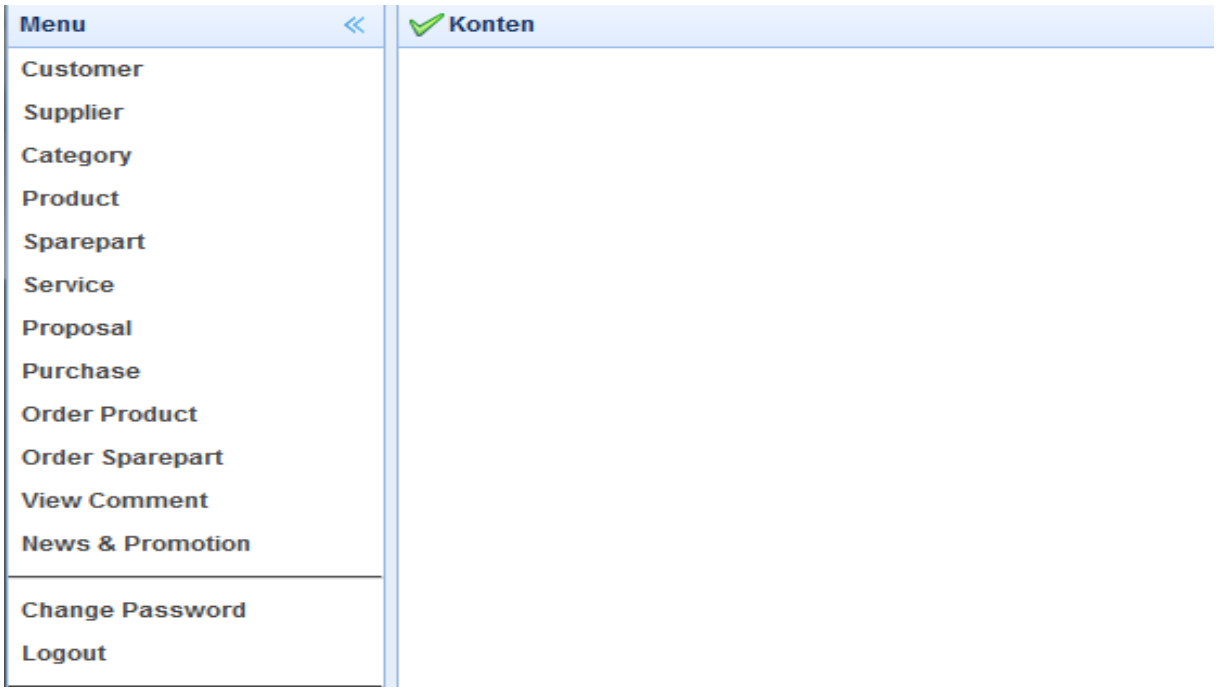

Figure 7. Main menu.

Customers can place an order for heavy equipment as well as apply for financing on credit to PT Kasana Teknindo Gemilang's partner, PT Venera Multifinance. This process is shown in Figure 8.

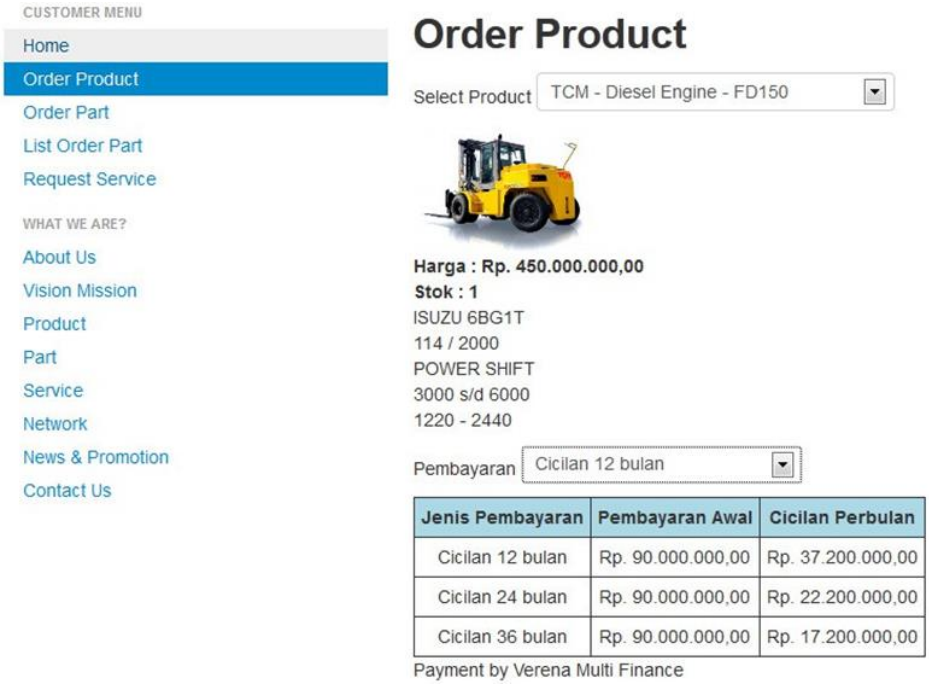

Figure 8. Order form.

This study employed a multi-method approach to gather comprehensive data and develop an effective system solution. The data collection involved: (1) in-depth interviews with 10 key informants, including marketing managers, operational managers, spare parts managers, financial managers, and financial service providers. These interviews provided rich insights into current challenges and user requirements; (2) direct observation of ongoing system procedures allowed the researchers to understand workflow dynamics and identify

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inefficiencies in real time; and (3) review of supporting documents, such as process records and system logs, contributed to validating and enriching the data collected from interviews and observations. To systematically analyze the root causes of identified problems, a fishbone (Ishikawa) diagram was constructed, enabling detailed mapping of potential factors contributing to inefficiencies and errors. Building upon this analysis, the system was designed and developed using the Rational Unified Process (RUP) methodology, which emphasizes iterative development through clearly defined phases: inception, elaboration, construction, and transition. During the construction phase, system implementation and testing at one company branch demonstrated a 45% increase in order process efficiency and a 60% reduction in stock errors, indicating significant operational improvements. The transition phase involved comprehensive user training to facilitate smooth adoption and the migration of five years' worth of historical data, all achieved with zero downtime, thereby ensuring uninterrupted business operations.

4. CONCLUSIONS

The conclusions of this research are that the development of a website-based e-business information system has effectively addressed several issues in product information search, payments, orders, and online transactions by incorporating features such as product catalogs, order management, and transaction processing, resulting in a 45% increase in order process efficiency and a 60% reduction in stock errors during trials at one company branch. Additionally, the system's stock control, delivery status tracking, and receipt recording features have successfully mitigated delays in product distribution caused by lengthy stock control processes and coordination with delivery partners. Furthermore, the introduction of an online after-sales service request facility enables immediate company response, with detailed recording of customer data and transactions that can be accessed anytime as needed.

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