International Journal Software Engineering and Computer Science (IJSECS)
4 (2), 2024, 745-757
Published Online August 2024 in IJSECS (http://www.journal.lembagakita.org/index.php/ijsecs)
P-ISSN : 2776-4869, E-ISSN : 2776-3242. DOI: https://doi.org/10.35870/ijsecs.v4i2.2778.

RESEARCH ARTICLE Open Access

Evaluation of Design Thinking in Logistics Management: A Case Study of the Double Diamond Method at PT Jamu Jago Semarang

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Received: June 28, 2024; Accepted: July 30, 2024; Published: August 20, 2024.

Abstract: In the era of globalization and increasing competition, an efficient logistics management system is crucial to ensuring the smooth operation of a company. PT Jamu Jago Semarang, a leading herbal medicine company in Indonesia established in 1918, faces challenges in managing production data, which is still handled semi-manually. This process often leads to recording errors and inaccuracies in inventory information regarding commodities and raw materials. To address these issues, this study recommends the adoption of the Design Thinking approach and the Double Diamond method to enhance the company's competitiveness and operational efficiency. The design of the logistics management system, based on Design Thinking and the Double Diamond method, resulted in a website prototype developed through the stages of Discover, Define, Develop, and Deliver. This prototype was subsequently evaluated using the User Experience Questionnaire (UEQ), which yielded high scores in the aspects of attractiveness, clarity, efficiency, accuracy, stimulation, and novelty, indicating the design's success in meeting user needs effectively.

Keywords: Design Thinking; Double Diamond; User Experience Questionnaire; Logistics Management.

1. Introduction

In the era of globalization and rapidly increasing business growth, efficient logistics management has become crucial for the operational success of companies. According to Wijaya and Andriani (2023), logistics management plays a vital role in overseeing all operational aspects related to the movement of goods, receipt of goods, stock control, and distribution, all of which are essential for the smooth functioning of a company [1]. PT Jamu Jago Semarang, a traditional herbal medicine company founded in 1918, has grown into one of Indonesia's leading herbal medicine producers. The company has a long history that began with T.K. Suprana, who learned the art of making herbal medicine from his mother and successfully created more than 138 types of herbal remedies, which have been produced and distributed across generations. However, PT Jamu Jago faces significant challenges in managing its production data, which is still handled semi-manually using a combination of handwritten records and Microsoft Office Excel. Although this method may appear simple and quick, it often leads to various issues related to the quality and accuracy of data. These challenges include the loss of important records, delays in accessing necessary data, and inefficiencies in managing raw materials, which frequently result in data discrepancies and inventory document errors.

Recent internal data reveals that issues in stock management and product quality affect approximately 30% of monthly transactions, leading to operational inefficiencies and significant potential financial losses. This situation necessitates the development of innovative solutions to address the existing problems. According to the latest internal reports, errors in stock management and production reporting contribute to operational inefficiencies, resulting in negative financial impacts on the company. In response to these challenges, this study adopts the Design Thinking approach combined with the Double Diamond method, which consists of four main stages: understanding, defining, exploring, and materializing [2]. The Design Thinking approach, which focuses on meeting user needs, is considered an effective method for solving problems in innovative ways [3]. As noted by Roudhotul Rohmah *et al*. (2023), the Design Thinking approach enables researchers to gain a deeper understanding of user needs and issues, leading to the creation of effective and relevant solutions that enhance user experience and customer satisfaction [4].

Furthermore, the Double Diamond method has proven effective in increasing user engagement, particularly in the development of academic portals, by implementing the four main stages of systematic design processes [5]. This methodology has also been adapted across various operational contexts, leading to significant innovations in information system design [6]. Therefore, the Double Diamond method can be effectively adapted to address complex problems in various industrial sectors, including, but not limited to, education and logistics management. Previous research underscores that the Design Thinking and Double Diamond methodologies offer a robust framework for innovation and improvement in system and product design [7]. Experiences from various industries demonstrate that the application of these methodologies can have a substantial impact on enhancing performance and user satisfaction, while also providing valuable insights for implementation at PT Jamu Jago Semarang. These studies support the adoption of this approach in the company's efforts to address complex operational issues and improve efficiency. This study aims to detail the application of the Design Thinking approach in designing a logistics management system at PT Jamu Jago Semarang. It will also explain how this methodology can be used to identify and solve the company's logistics problems, while simultaneously enhancing the efficiency and competitiveness of PT Jamu Jago in the industry.

2. Research Method

This study employs a qualitative approach with a case study design to gain an in-depth understanding of how the implementation of the Double Diamond methodology can enhance logistics management at PT Jamu Jago Semarang. This method was chosen as it allows the researcher to explore in detail the processes, experiences, and challenges faced by the company in managing its logistics, as well as to develop targeted solutions. In the data collection process, the study utilized various complementary techniques, including in-depth interviews, direct observation, and document analysis. In-depth interviews were conducted using purposive sampling, where participants were selected based on predetermined criteria. According to Sugiyono (2017) in the study by Derianto and Qorib (2018), purposive sampling is a sampling method based on considerations or criteria relevant to the research objectives [8]. The criteria used were substantial knowledge and experience in logistics management at PT Jamu Jago Semarang. A total of 10 respondents participated in this study, including logistics managers, operational staff, and data analysts. The selection of these respondents aimed to obtain rich and relevant insights into the logistics management practices at the company.

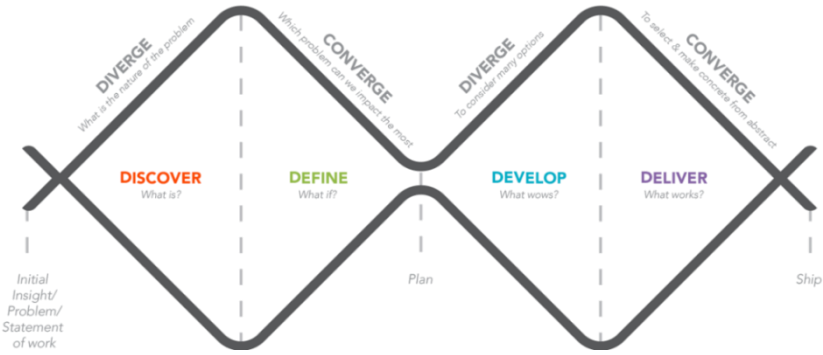


Figure 1. Research Method

In addition to interviews, direct observations were conducted to gain a more detailed understanding of the logistics processes taking place on the ground. These observations used a checklist designed to systematically record the logistics activities occurring within the company. The checklist was developed based on a review of the literature and input from industry experts, enabling it to capture key details that are relevant to the research objectives. The data collected from the interviews and observations were then analyzed using a thematic approach. The analysis process began with a full transcription of the interviews, followed by coding and categorization of the data to identify emerging patterns and key themes. This coding process aimed to systematically organize the data, facilitating the researcher in drawing meaningful conclusions. The reliability of the analysis was enhanced through source and method triangulation, which involved comparing findings from interviews, observations, and document analysis. This approach ensured that data interpretations were grounded in multiple perspectives, thereby improving the accuracy and validity of the findings. In implementing the Double Diamond methodology, this study followed four main stages: Discover, Define, Develop, and Deliver. In the Discover stage, the researcher focused on identifying problems through literature review, interviews, and observations. This stage aimed to gain a deep understanding of the root causes of the issues faced by PT Jamu Jago in its logistics management. In the Define stage, the data collected was thoroughly analyzed to define the specific problems that needed to be addressed. The outcome of this stage was a clear understanding of the needs and challenges faced by the company. In the Develop stage, the researcher designed solutions based on the identified needs. This process involved creating digital sketches, planning design workflows, and developing design elements that would form the foundation of the new logistics management system. This stage was crucial as it marked the transition from conceptual ideas to more concrete forms. The Deliver stage, the developed prototype was tested using the User Experience Questionnaire (UEQ) with the assistance of Figma. This testing aimed to evaluate the effectiveness and success of the design from the end-user's perspective. The feedback obtained from this testing was then used for design iterations, ensuring that the solution developed truly aligns with the needs and expectations of the users at PT Jamu Jago Semarang.

3. Result and Discussion

3.1 Results

This study successfully developed a prototype website for logistics management at PT Jamu Jago Semarang, designed to address issues related to efficiency and accuracy in logistics management. The prototype was the outcome of implementing the Double Diamond methodology, which emphasizes four key phases: Discover, Define, Develop, and Deliver.

3.1.1 Discover Phase

The initial phase, Discover, involved comprehensive data collection through in-depth interviews and direct observations of the logistics operations at PT Jamu Jago Semarang. The findings from this phase revealed that the current system is overly reliant on manual processes, which not only slows down operations but also increases the risk of errors in record-keeping.

3.1.2 Define Phase

Based on the data gathered, we defined specific issues that the new system needs to address, segmented into three stages: user persona, pain & gain, and information architecture. These stages include the need for automation in record-keeping and reporting, as well as a more intuitive interface for users across different levels within the organization. Additionally, we mapped out the current production process at PT Jamu Jago Semarang to better understand the operational challenges.

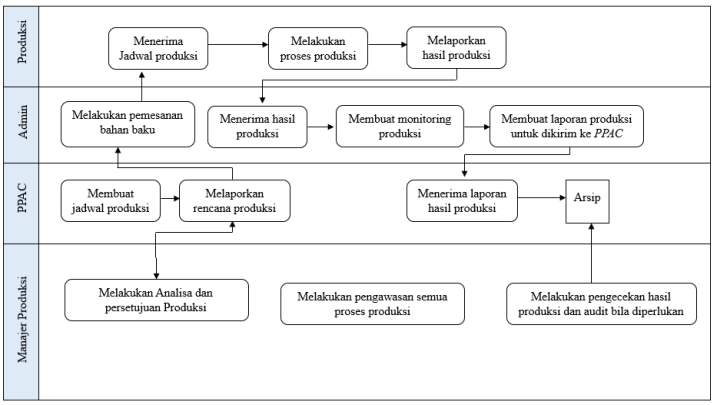


Figure 2. Current Logistics Management Process at PT Jamu Jago Semarang

After mapping the logistics management process at PT Jamu Jago Semarang, we defined the problems into three stages

1) User Persona (Production Manager)

The user persona stage involved documenting detailed descriptions or characteristics of users derived from the research, integrating their goals, needs, and interests as target users [9]. The target users of the logistics management website at PT Jamu Jago include the Production Manager, PPAC, and Admin.

Table 1. User Persona (Production Manager)

Biodata	Needs	Goals
Name: Yehuda	Requires a website that can accommodate all logistics management processes at PT Jamu Jago Semarang.	To facilitate monitoring of production processes and ease the logistics management at PT Jamu Jago Semarang.

The Production Manager is responsible for overseeing all production processes at PT Jamu Jago Semarang.

Table 2. User Persona (PPAC)

Biodata	Needs	Goals
Name: Reny	Requires a website that can monitor reports from ongoing production. Additionally, it should ease the logistics management process for the admin.	To monitor production reports, stock levels, and streamline all logistics management activities.

PPAC's responsibilities include production planning, scheduling, inventory management, quality control, and monitoring the overall production process to ensure efficiency and optimal performance.

Table 3. User Persona (Admin)

Biodata	Needs	Goals
Name: Elfa Montella	Requires a website for stock recording, production scheduling, report generation, and other logistics management tasks at PT Jamu Jago.	To facilitate logistics management processes at PT Jamu Jago Semarang.

The Admin's tasks include managing all production processes, including ordering raw materials, monitoring stock, generating production reports, and organizing the production flow.

2) Pain & Gain

This activity involved mapping the user's needs into pain & gain data. This data includes explanations of the concerns and expectations of the users, compiled from the results of the user persona. The preparation of pain & gain required results from interviews and user persona analyses.

Table 4. Pain & Gain

No.	PAIN	No.	GAIN
1	Stock recording, raw materials, and logistics management are still semi-automatic.	1	The use of an application or website for logistics management.
2	Ineffective bookkeeping in logistics management.	2	The creation of an informative and effective website.
3	If there is an error in stock management, finding the error takes too long.	3	The creation of a user-friendly website with comprehensive features.
4	Logistics management processes are outdated and time-consuming.	4	The development of a website with features that aid in logistics management for PT Jamu Jago Semarang.

3) Information Architecture

After developing the user personas and mapping pain & gain, the next step was to create a sitemap of menus and features for the website. The sitemap was developed based on feedback from the previous stage, ensuring that the menu or features necessary for the users would be appropriately displayed on the website.

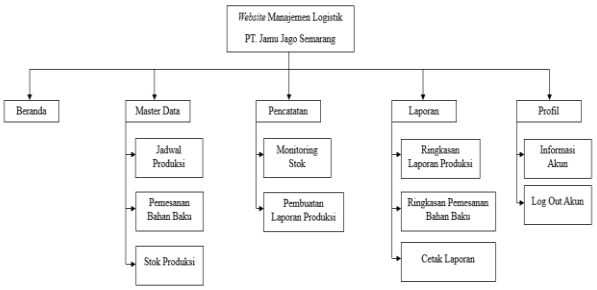


Figure 3. Admin Page

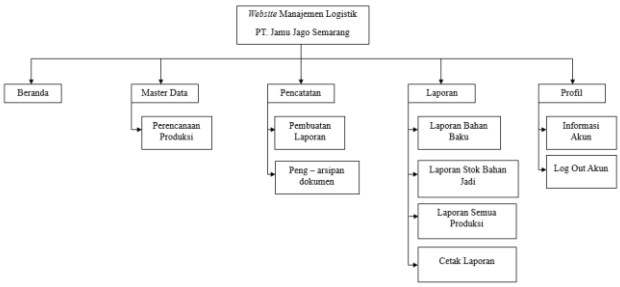


Figure 4. PPAC Page

3.1.3 Develop Phase

The development phase involved designing and implementing a technology-based solution that addresses the problems defined earlier. The prototype website was equipped with features that enable real-time automation and data integration, including a dashboard for monitoring stock levels and generating reports. The design and implementation phase comprised four key steps:

1) Digital Sketching (Wireframe)

Figure 5. Admin Wireframe

Figure 6. PPAC Wireframe

2) Workflow Design (Storyboard)
Based on discussions with PT Jamu Jago Semarang regarding the wireframe, it was determined that the design meets the logistics management needs for the production department. The next step was to design the workflow to illustrate the primary processes within the company. The output of this phase was a storyboard.

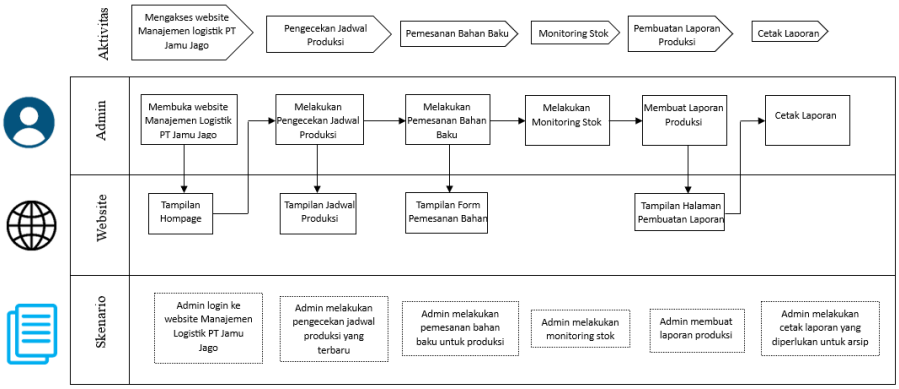


Figure 7. Admin Storyboard

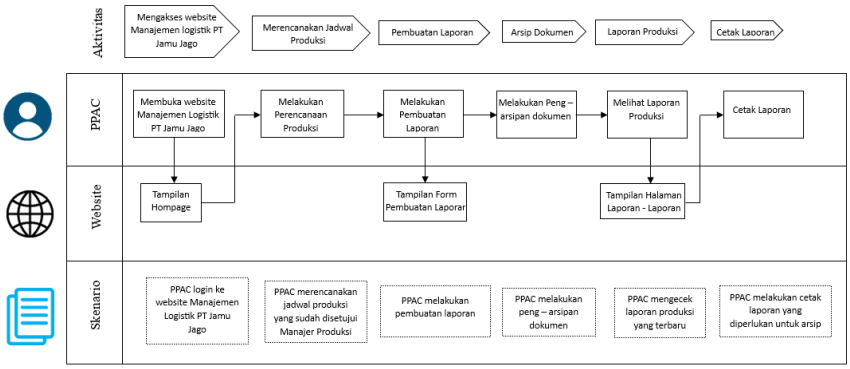


Figure 8. PPAC Storyboard

3) Design Guidelines
For this research, typography suitable for the logistics management website at PT Jamu Jago Semarang was identified as Poppins. Fonts like "Inter" and "Times New Roman" were also considered due to their dynamic appearance and readability.

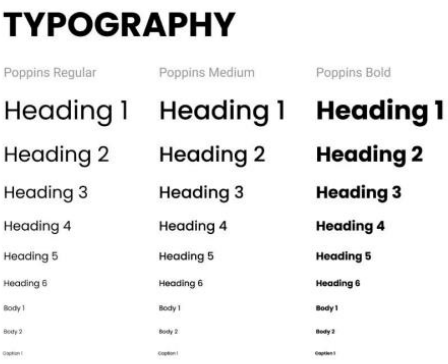


Figure 9. Typography Guidelines

Figure 10. Color Guidelines

The following image shows the color guidelines used for the logistics management website at PT Jamu Jago Semarang. The color choices were based on interviews with representatives from PT Jamu Jago Semarang, including the production admin and PPAC.

4) Prototype Design
At this stage, the prototype design for the logistics management website at PT Jamu Jago was created based on the initial sketches from the previous phase. The prototype aimed to illustrate how users would interact with the system, allowing for validation with potential users. The tool/software used for this purpose was Figma.

3.1.4 Deliver Phase

The final phase involved testing the prototype with end-users to gather feedback and iterate the design. Testing using the User Experience Questionnaire (UEQ) indicated a significant increase in user satisfaction, with positive feedback on aspects such as attractiveness, clarity, and efficiency.

1) GUI Testing

In this study, the stages were carried out according to the Double Diamond method, which includes the Discover, Define, Develop, and Deliver phases. In the final Deliver phase, GUI testing was conducted.

Table 5. GUI Testing

Iteration	Testing	User	Task	Key Metrics	Iteration 1 Results	Iteration 2 Results
1	GUI	Admin and PPAC	Access "Login" page	Logo and Background	Plain Logo and Background	Logo & background are aligned with PT Jamu Jago Semarang.
2	GUI	Admin and PPAC	Access "Home" page	Layout of notification, message, and profile icons	Icons misaligned	Icons are now aligned.
3	Usability Testing	PPAC	Access "Reports" page	Print feature	Print feature not available for every report	Print feature added for all reports.
4	Usability Testing	Admin and PPAC	Access "Home" page	Main page features	No calendar or production statistics	Calendar and real-time production statistics added.

Following the GUI testing, several suggestions and critiques were provided by respondents, including simplification of menu layouts, the addition of features, and other improvements. Feedback was gathered during offline testing and consolidated into a summary.

Table 6. Feedback Summary

No	Feedback
1	The login and home pages should feature the company logo.
2	The home page should include a calendar and production statistics.
3	The PPAC reports page should have a print feature for each report column to allow single report printing.
4	The notification, message, and profile icons at the top right should be aligned.

2) Iteration

This stage presents the results from the GUI tests and the feedback summary for the prototype logistics management website at PT Jamu Jago Semarang. The GUI test results and feedback summary were used to improve the prototype design, which was then subjected to further testing using the User Experience Questionnaire (UEQ) method.

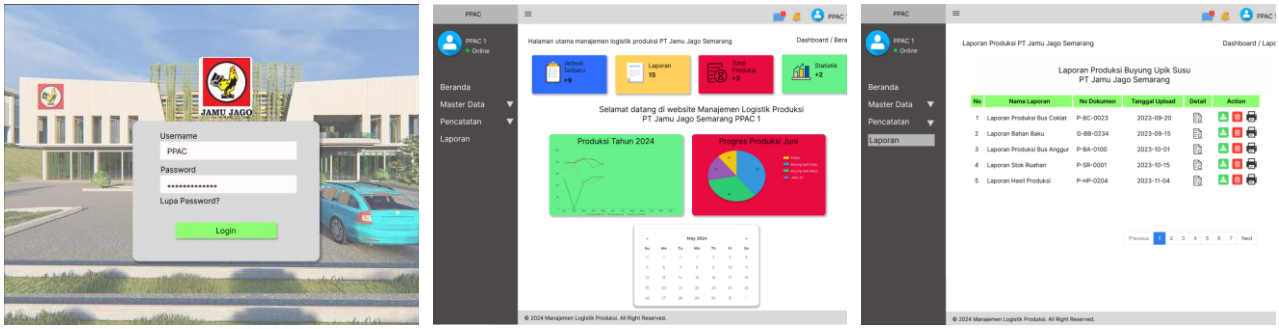


Figure 11. Iteration Results

3) Analysis and Results of UEQ Testing

In the testing phase, the User Experience Questionnaire (UEQ) method was used by conducting a demo of the prototype logistics management website for PT Jamu Jago Semarang, which had been iterated based on the company's feedback. The UEQ testing involved 10 respondents, including 6 admins & PPIC and 4 sub-section heads and section heads. The table below shows the results from the six aspects tested.

Table 7. Average Scale Scores per Respondent

No	Attractiveness	Clarity	Efficiency	Accuracy	Stimulation	Novelty
1	2.00	2.00	1.75	1.75	2.00	1.75
2	2.33	2.00	1.50	1.50	2.25	1.75
3	1.50	1.25	2.50	2.00	1.75	2.50
4	2.00	2.00	1.75	1.50	1.75	1.75
5	1.83	1.75	1.75	2.00	2.25	1.75
6	1.83	2.50	2.50	2.25	2.00	2.75
7	1.67	1.50	2.00	2.25	2.00	2.00
8	1.83	2.25	1.75	1.25	2.00	1.75
9	2.50	2.00	1.75	2.75	2.00	1.50
10	2.00	2.00	1.75	2.50	1.75	2.00

The table above illustrates the final design results in the form of the prototype logistics management website at PT Jamu Jago Semarang. The prototype was evaluated using the User Experience Questionnaire (UEQ). According to the research findings, the evaluation showed positive results across all aspects, with an average score exceeding 0.8 for all 10 respondents. A positive result was defined as an average score exceeding 0.8, while a negative result was indicated by a score below 0.8 [10].

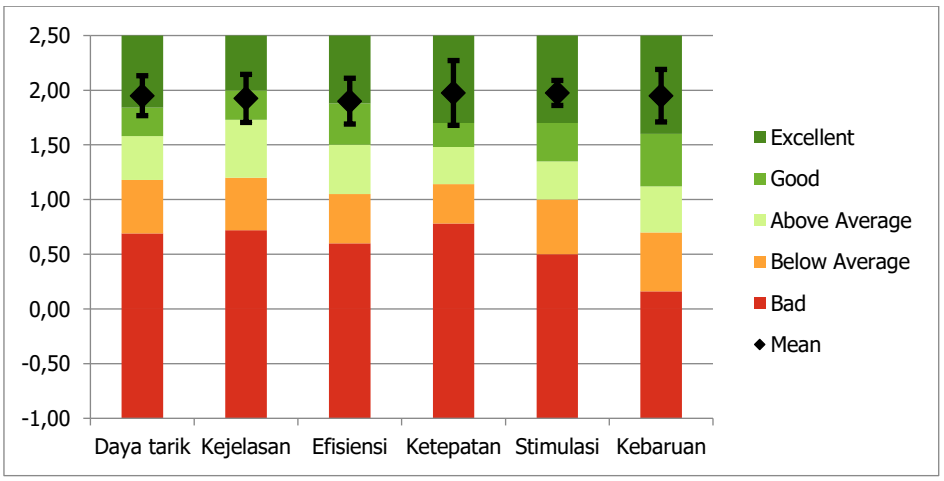


Figure 12. Prototype Aspect Diagram

Figure 12 above shows the diagram of the scores obtained from the prototype logistics management website for PT Jamu Jago Semarang after iteration. The average impression score exceeded one across all aspects, indicating that the prototype logistics management website at PT Jamu Jago Semarang received positive feedback overall.

Table 8. Final UEQ Method Results

Scale	Mean	Comparison to Benchmark	Interpretation
Attractiveness	1.95	Excellent	In the range of the 10% best results
Clarity	1.93	Good	10% of results better, 75% worse
Efficiency	1.90	Excellent	In the range of the 10% best results
Accuracy	1.98	Excellent	In the range of the 10% best results
Stimulation	1.98	Excellent	In the range of the 10% best results
Novelty	1.95	Excellent	In the range of the 10% best results

The scale for each respondent was then correlated with the items within the six aspects of the User Experience Questionnaire (UEQ). The interpretation for each aspect varied, with five aspects—attractiveness, efficiency, accuracy, stimulation, and novelty—receiving an "excellent" rating, meaning they were in the range of the top 10% of results. The clarity aspect received a "good" rating, indicating that 10% of results were better, while 75% were worse.

4) Efficiency Improvement After Prototype Implementation

Based on the benchmark in Table 10, the evaluation results after implementing the logistics management website prototype for PT Jamu Jago Semarang showed positive scores across six UEQ aspects. Attractiveness received an "excellent" rating, clarity received a "good" rating, efficiency received an "excellent" rating, accuracy received an "excellent" rating, stimulation received an "excellent" rating, and novelty received an "excellent" rating.

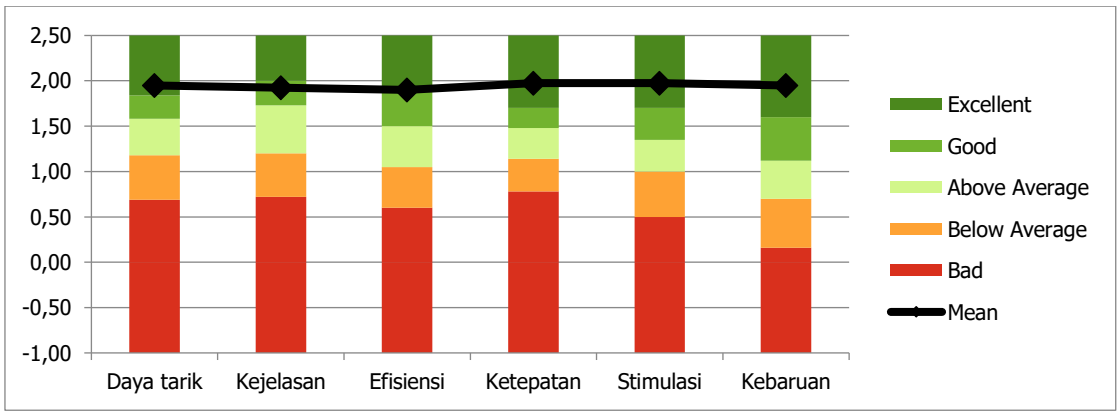
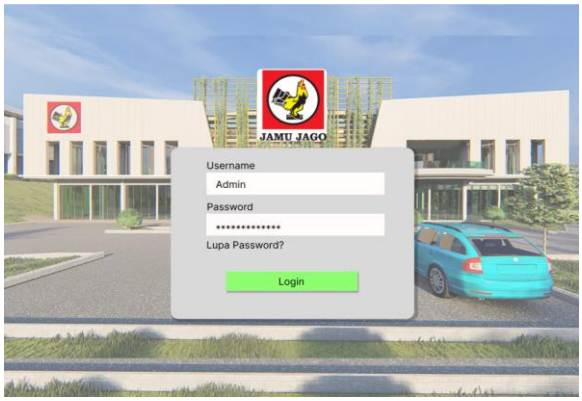


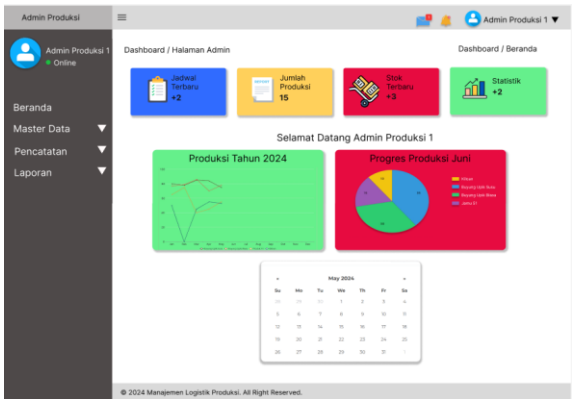
Figure 13. Diagram of Scores After Prototype Implementation

Overall, the evaluation and assessment results indicate that the prototype logistics management website for PT Jamu Jago Semarang meets user expectations and the requirements of PT Jamu Jago Semarang.

5) Final Results

Based on the results of the Double Diamond methodology, which comprises four phases: Discover, Define, Develop, and Deliver, the final prototype logistics management website for PT Jamu Jago Semarang is presented below:





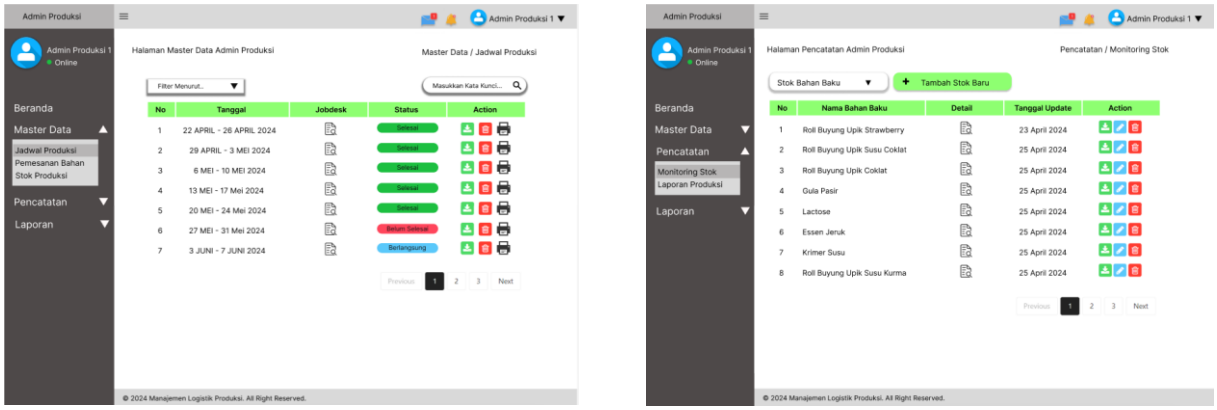


Figure 14. Admin Page

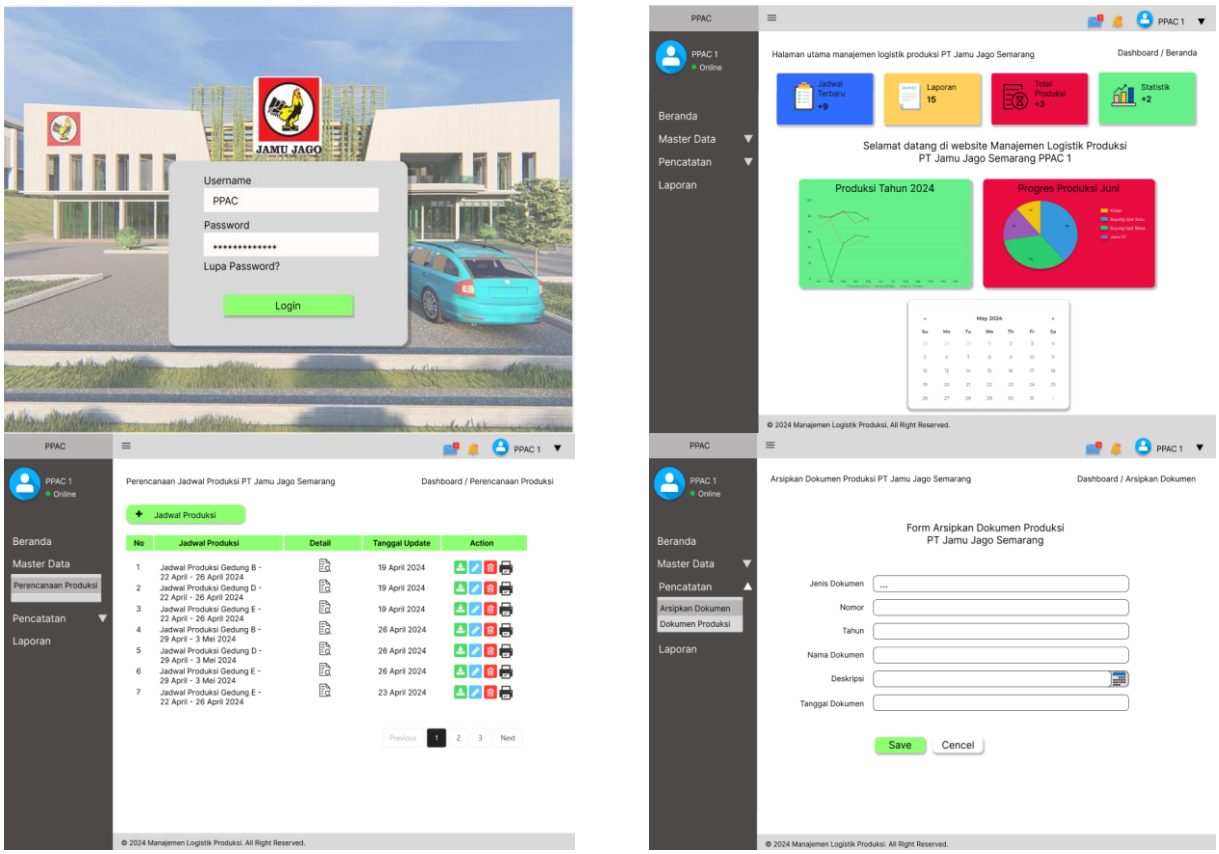


Figure 15. PPAC Page

3.2 Discussion

This discussion elaborates on the results of the logistics management system design at PT Jamu Jago Semarang, developed using the Double Diamond methodology. This research proves to be highly beneficial in enhancing the performance and productivity of PT Jamu Jago Semarang, particularly in the domain of logistics management. The adoption of the Double Diamond design thinking approach has effectively addressed the challenges faced by the company through innovative solutions. The development and testing of the prototype suggest that the application of the Double Diamond methodology in the development of the logistics management system offers several significant advantages. Firstly, this method ensures that all aspects of the problem are thoroughly identified before a solution is designed, leading to more comprehensive and effective solutions. This comprehensive problem identification phase is crucial as it allows the development team to understand the full scope of the issues at hand, ensuring that the solutions provided address the root causes rather than just the symptoms. By doing so, the approach mitigates the risk of developing solutions that are not aligned with the actual needs of the users or that might overlook critical aspects of the operational challenges.

The involvement of users at every stage—from problem definition to solution testing—ensures that the system developed aligns closely with the users' needs and is easy to adopt. This user-centered approach not only improves the usability of the system but also enhances user satisfaction and system acceptance. The iterative feedback loops incorporated in the Double Diamond model allow for continuous refinement of the system, ensuring that the final product is both functional and user-friendly. The implementation of this system at PT Jamu Jago Semarang has demonstrated measurable improvements in operational efficiency. With more accurate stock management and real-time reporting, the company can respond more swiftly to production needs and market demands. This agility in response not only enhances the company's ability to meet customer expectations but also reduces waste and unnecessary costs. Consequently, these improvements contribute to higher customer satisfaction and increased profitability for the company.

Based on the prototype design of the logistics management website for PT Jamu Jago Semarang, the final evaluation of the prototype was conducted using the User Experience Questionnaire (UEQ) technique, focusing on six evaluation criteria. The results showed that the attractiveness aspect received a score of 1.95 (Excellent), clarity received a score of 1.93 (Good), efficiency received a score of 1.90 (Excellent), accuracy received a score of 1.98 (Excellent), stimulation received a score of 1.98 (Excellent), and novelty received a score of 1.95 (Excellent). These scores indicate that the design of the logistics management website prototype for PT Jamu Jago Semarang has effectively met the user needs and expectations.

The high scores across all evaluated aspects underscore the success of the design in providing a user-friendly, efficient, and innovative solution for logistics management at PT Jamu Jago Semarang. The excellent ratings in attractiveness, efficiency, accuracy, stimulation, and novelty suggest that the prototype not only meets the functional requirements but also engages users in a positive way, enhancing their overall experience. The good rating in clarity further indicates that while the system is effective, there may be room for improvement in terms of making the interface even more intuitive and easier to navigate. The successful application of the Double Diamond methodology in this project highlights its effectiveness in creating a logistics management system that is both comprehensive and user-centered. The positive outcomes from the UEQ evaluation confirm that the prototype is well-suited to the needs of PT Jamu Jago Semarang, offering a robust platform for managing logistics operations more effectively and efficiently.

4. Related Work

This section details the evolution of the Double Diamond methodology and its application across various fields, including logistics management, while placing the contributions of this research within a broader framework. The Double Diamond methodology was originally developed to enhance product design processes by focusing on four key stages: Discover, Define, Develop, and Deliver. Farhan and Sujarwo (2022) noted that this methodology has been adapted across multiple sectors to address complex and specific user needs [11]. Arifin and Sagirani (2023) demonstrated its application in increasing user engagement with academic portals, indicating its flexibility in different operational settings [5]. Similarly, Zulfa *et al*. (2022) showed that the evaluation and redesign of an interface using the Double Diamond method for a sales application led to significant improvements and positive user feedback [12]. Further, Faisal Akbar Maulana *et al*. (2023) applied a redesign of a fumigation website's UI/UX with the aim of enhancing customer experience, showcasing the method's versatility in digital environments [13].

In logistics management, the application of the Double Diamond methodology is relatively new but holds significant promise. Jauhari *et al*. (2023) reported its effectiveness in addressing inefficiencies within information systems [6], while Hartawan (2022) integrated it with digital technology to achieve more accurate inventory management [14]. A study by Samudra *et al*. (2023) also applied design thinking to develop CRM, cash flow, and stock management features within the Krealogi application, helping companies navigate operational challenges more effectively, reduce errors, and improve responsiveness to market demands [15].

Traditional research in logistics management often relies on rigid statistical analysis or predictive models that may not fully address dynamic operational conditions. Innovations in methodology, as discussed by Sri Indriyani *et al*. (2023) and Wibowo and Tan (2021), highlight the importance of designing user-centered solutions that can adapt and innovate beyond conventional models [16][17]. For example, Maulana *et al*. (2024) showcased the design of parking system software using the design thinking method, which was initially approached through traditional means [18].

This research introduces the use of the Double Diamond methodology in logistics management at PT Jamu Jago Semarang, emphasizing an approach that focuses on user needs and iterative design aimed at improving operational quality. The successful implementation of this system not only meets logistics requirements but

also enhances internal user satisfaction. This represents a significant shift from traditional practices, offering a flexible framework for broader adoption in similar industries. A related study by Pondaag *et al*. (2023) resulted in the design of an eco-friendly packaging prototype for SMEs in the food and beverage industry, addressing environmental concerns related to plastic packaging [19]. Similarly, Avriel *et al*. (2024) applied design thinking to the UI/UX design of a sales website, leveraging rapid technological advancements [20]. The implications and future research directions discussed in this study suggest that the Double Diamond methodology can be a valuable tool in logistics management, providing key insights for future studies and implementations in other fields. Further testing and evaluation of this methodology's application will support the development of more innovative and responsive solutions moving forward.

5. Conclusion and Recommendations

This study has successfully demonstrated the effectiveness of the Double Diamond methodology in improving the logistics management system at PT Jamu Jago Semarang. Based on the objectives outlined in the introduction, the implementation of this approach has significantly reduced operational errors and enhanced process efficiency, aligning with the initial hypothesis that the use of Double Diamond can modernize and improve logistics management. The application of this methodology has led to substantial changes in how the company manages inventory and logistics by integrating more technology-driven and user-friendly solutions. The results from testing and user feedback indicate significant improvements in operational speed and accuracy, as well as increased internal user satisfaction. These findings suggest that a design-based approach can be effectively adapted to more traditional industries, such as herbal medicine production. Given the success of this research, the next steps should involve a long-term evaluation of the implemented system to assess its sustained impact on the company's operations. Additionally, further research could focus on developing additional features and integrating artificial intelligence (AI) technology for more advanced prediction and automation. As noted by Amri *et al*. (2023), AI technology offers a significant competitive advantage in the market, supporting the creation of sustainable business practices [21]. Integrating this technology could further enhance the logistics management capabilities of PT Jamu Jago Semarang.

Regarding future recommendations, this study on applying design thinking using the Double Diamond methodology in logistics management at PT Jamu Jago Semarang represents an important initial phase. Further research should be conducted on other subjects with similar cases, employing different data analysis methods to obtain more varied and insightful results. This approach will provide broader perspectives and support the development of more effective logistics management solutions across various industry.

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