Evaluation and Design of UI/UX in Purchasing ERP Module for Usability Optimization Using Heuristic Evaluation, User-Centered Design, and System Usability Scale

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ABSTRACT
Cloud-based enterprise resource planning (ERP) information systems are integrated solutions that are relied on to manage company resources from various parts. One factor that influences ERP's success is the integration of the interface, namely UI/UX. One method used in usability evaluation is heuristic evaluation (HE), user-centered design (UCD) and SUS. Based on the evaluation that has been carried out, there are 74 problem findings from three evaluators. The problems consist of nine problems in the H1 Visibility of System status category, nine problems in the H3 User Control and Freedom category, sixteen problems in the H4 Consistency and Standard category, five problems in the H5 Error prevention category, two problems in the H6 Recognition rather than recall category, seven problems in the H7 Flexibility and Efficiency of Use category, four problems in the H8 Aesthetic and minimalist design category, twenty four problems in the H9 Help user Recognize, Diagnose, and Recover from Error category, and one problem in the H10 Help and Documentation category. In addition, the SUS value obtained was 60, which was in the D grade scale range; the adjective rating was OK and had a Marginal acceptability range. The usability problems found by the evaluators have been optimized to improve usability, so only 15 problems remained after the improvements were made. The results of the second stage SUS score also showed an increase with a score of 81.6, and there was an increase in usability acceptance from the Marginal acceptability range to Acceptable.

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1. INTRODUCTION

Aspects of today's life are inseparable from using information systems and information technology. The relentless forces of globalization, cyber threats, e-commerce, and ever-increasing client demand are compelling companies to adopt technology that functions to increase automation and digitalization. This urgent need can be met by integrating data from one part to another to exchange information. The right information system can be used in every company's decision-making process, quickly, precisely, and accurately.

Cloud-based enterprise resource planning (ERP) information systems are integrated solutions that are relied on to manage company resources from various parts. Cloud-based ERP technology allows all data to be integrated well in a centralized manner. The business processes are related to the company's operations, production, distribution, inventory, payments, logistics, and manufacturing. The ERP module, a key component of this technology, plays a crucial role in improving and streamlining operations in all companies (Tavana et al., 2020). Many companies have used ERP modules in various industries to integrate various business processes into one integrated platform. The advantage of this ERP module is that it significantly enhances the company's business operational performance, making it more effective and efficient.

The ERP module is designed from upstream to downstream and integrated through a common database. These ERP modules are arranged following the business process from the beginning, including raw material logistics, production, finished materials, and marketing. The right module to accommodate the process of purchasing raw materials is the ERP purchasing module. The ERP purchasing module is a method used by companies to purchase products or services. This module contains various processes in carrying out the procurement of goods as a whole, namely requests, purchases, receipt of products, and payments. The creation of this module is needed to meet the needs of production materials and suppliers, so the functionality of this ERP purchasing module is very important. The importance of the existence of this ERP purchasing module may not be felt because its implementation is not easy. Implementation requires a lot of resources, such as time, people, and funds. One of the factors that influence the success of the ERP purchasing module is interface integration.

Many companies face obstacles in implementing and using this module due to complex and less intuitive interface designs. Users often have difficulty navigating and understanding features, and operational efficiency is decreasing due to unoptimized UI/UX design. Based on various studies, more than 50% of ERP implementations experience obstacles in the user adoption stage due to less-than-optimal UI/UX

(Gottschewski-Meyer et al., 2024). In addition, study conducted by Queiroz & Spitz (2019) found that improving UI/UX design in ERP modules can increase work efficiency by up to 30% and reduce user error rates in accessing and processing important information. This finding emphasizes the importance of optimizing UI/UX to improve user experience and productivity of ERP purchasing modules.

The appearance of this UI/UX plays an important role in the process of creating products that can be heard, seen, and touched. UI itself is important because it acts as a liaison between the system and its users. If the appearance of the UI/UX created is boring and unattractive, then it can be said that the creation of the application has failed. UI/UX is the visual appearance of a product that can increase the brand owned by an organization or company. UI is the main component because it connects the information needed by the user with the system itself (Pakarbudi et al., 2022). UX itself tries to find user needs to be made into useful, meaningful, and enjoyable products. Knowledge of UI/UX is very useful and has a tremendous contribution to local companies (Kadir et al., 2020). However, not all users who use information systems or applications feel comfortable.

This affects the user-friendly aspect of the ERP purchasing module. As for how to find out the level of product quality, it is necessary to listen directly to the opinions of users using the UI/UX approach. In addition to the user-friendly aspect, user satisfaction also plays a significant role in the usability of ERP modules. This is why it is necessary to conduct a usability evaluation. Usability analysis is particularly constructive because it has a direct relationship with users (Lengkong et al., 2021). Usability, viewed from several aspects, including satisfaction, can be interpreted as a technique for determining how satisfied users are using qualitative analysis. By focusing on user satisfaction, companies can ensure that their ERP modules not only meet the functional needs of users but also provide a positive and enjoyable user experience.

While many studies have discussed usability in ERP modules, most of them have focused solely on usability evaluation without implementing user-needs-based design solutions. Many studies have only tested systems using the heuristic evaluation (HE) or system usability scale (SUS) methods, without a more systematic user-centered design (UCD) approach. The integration of these three methods in one research framework is still very rare. Therefore, there is a clear need for research that not only evaluates usability but also produces user-needs-based design solutions. This approach is crucial for improving the effectiveness of the ERP purchasing module, as it ensures that the system is designed with the user's needs and preferences in mind.

Poor UI/UX design in the ERP purchasing module can have various negative impacts on the company, including obstacles to user effectiveness, increased

cognitive load, and slowed down business processes due to navigation errors and lack of clarity of information in the ERP module. This has implications for low user satisfaction, which can affect the adoption rate of the ERP module in the work environment. The application of UCD is a solution that can increase module efficiency, reduce usage errors, and improve the overall user experience. Therefore, companies need a more systematic approach to optimizing usability in ERP modules to increase user satisfaction and productivity.

The HE method is one of the usability evaluation approaches carried out by analyzing modules based on a series of established interface design principles. HE allows for quick and efficient identification of usability issues, although it still requires confirmation through other methods. On the other hand, UCD is a design approach that emphasizes user involvement in every stage of module development, ensuring that the resulting solution truly meets their needs (Ndizihiwe et al., 2015).

Several previous studies have compared the effectiveness of HE, UCD, and SUS methods on ERP modules. Talero-Sarmiento et al. (2024) showed that the use of HE is effective in identifying early usability issues but does not always reflect the actual user experience. In contrast, the UCD approach provides deeper insight because it involves users directly in the design process. In addition, Wong et al. (2016) argued that measurement with SUS provides numerical metrics that can be compared between iterations of ERP module development so that it can be the basis for decision-making for UI/UX improvements.

Meanwhile, SUS is used to measure user satisfaction with the module based on a series of standardized statements. SUS has been proven to be a reliable tool in measuring usability quantitatively, providing insight into how easy or difficult a system is to use. By combining the three methods, this study can provide a more comprehensive and data-driven usability analysis.

The three methods will be used in an integrated manner to evaluate and redesign the UI/UX of the ERP purchasing module. He will be used as an initial step to identify key usability issues, which will then be validated through the UCD approach by involving users in the redesign process. After the proposed design is implemented, SUS will be used to measure usability improvements.

Based on this background, this study aims to evaluate the usability of the ERP purchasing module using the HE and SUS methods, identify key issues in the UI/UX, and develop a UCD-based design solution to improve the usability of the module. In addition, this study will also compare the evaluation results between the initial design and the proposed solution design in order to ensure the effectiveness of the UI/UX improvements implemented. Through this approach, it is hoped that this research can

contribute to the development of a more user-friendly ERP purchasing module and improve operational efficiency in the company.

2. RESEARCH FRAMEWORK

2.1 User Interface

UI means when the system can interact with other users through commands. The standard set by ISO states that UI is all interactive parts of the system that have control and information for the user to end specific tasks with an interactive system. Good UI design is seen from the visuals and its function. Ntoa (2024) argued a good UI must prioritize readability, accessibility, and comfort for users to increase work efficiency and user satisfaction. This statement also aligns with research conducted by Cremonesi & Elahi (2017) where UI design must follow the principles of simplicity, readability, consistency, and accessibility so that various groups of users can easily use it. Atoum (2023) also emphasized that good UI design should reduce the cognitive burden of users by displaying clear and easy-to-understand information.

2.2 User Experience

UX design is the behavior and attitude of users when using a system that relies on individual perceptions that have benefits when felt and are easy to obtain. The characteristics of good UX are that users are interested in considering reusing applications that have been used (Saleh et al., 2021). In addition, the basic principle in UX design is that users have experience and a level of satisfaction, namely when they feel satisfied and comfortable (user-friendly) when interacting with a product, system, or service. If the UX design is running well, but no end-user feels satisfied and comfortable, then the value of the UX design will be low (Krisnanik & Rahayu, 2021).

Good UX can increase user retention and reduce error rates. Ntoa (2024) argued that UX designed with user psychological factors in mind tends to be more effective in enhancing a pleasant interactive experience. Research conducted by Alomari et al. (2020) also emphasized that UX is not just a visual appearance but also about how users can achieve their goals efficiently and without obstacles.

2.3 Modul Purchasing ERP

ERP is an information system that can integrate all forms of information in a company. ERP can also mean a method used to integrate all divisions and functions of a company to automate all business processes to increase efficiency and effectiveness. ERP enables businesses to operate with superior productivity and service levels and makes inventory and costs much lower. One of the modules in ERP is the purchasing module. This module is used to search for and purchase facilities that support the smooth running of the production process.

ERP purchasing module allows companies to manage purchase requests, vendor selection, purchase orders, receipt of goods, and invoice payments in an integrated manner. The existence of the ERP purchasing module allows companies to reduce manual errors and increase supply chain efficiency. Implementing an ERP module that includes a purchasing module can improve procurement control and transparency in inventory management. Companies can easily make better purchasing plans, avoid waste, and ensure the availability of raw materials needed for production.

2.4 Usability

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2.5 Heuristic Evaluation

HE is a technique initially discovered by Nielsen in 1994 to review prototypes or products by several internal or external experts. Therefore, it is sometimes also referred to as the expert review method. This distinguishes it from other evaluation methods, such as user interviews or user analysis involving real users. In addition, HE does not require many people to conduct the evaluation, and the evaluators have experience and insight into the evaluation.

HE is a usability evaluation technique that requires UI/UX experts to review and provide feedback on the system display based on a guideline. HE is one of the usability inspection methods by experts used for software development (Lee & Song, 2019). HE will help identify usability problems. Research conducted by Caro-alvaro et al. (2025) shows that HE is very effective in finding usability problems in the early stages of system development, thereby reducing the cost of design improvements later. In

addition, research by Khan et al. (2024) states that this method can be applied in various fields, from web interface design to mobile applications and AI-based systems.

2.6 User-Centered Design

UCD is a method used to design interface designs that focus on user needs. The approach used in UCD helps obtain new solutions to various problems, starting with the user and ending with the answers needed by the user. He et al. (2020) argued that the basic principles of UCD consist of several important elements, such as understanding the context of use, user involvement, and repeated evaluation of the proposed solution. Implementing the UCD method allows the development team to ensure that the system being developed is intuitive and easy to use. Applying the UCD method in software design can increase user satisfaction and the efficiency and effectiveness of user interaction with the system. The UCD method has become widely used in developing websites and mobile applications to ensure the solution meets user expectations.

The design process that places the user as the primary focus aims to provide an experience that meets expectations and needs. The UCD method was chosen because it has a specific target market in building the product. The principles that need to be present in this UCD method are the user, integrated design, interactive design, and user testing.

2.7 System Usability Scale

One of the existing usability methods is SUS. SUS uses a questionnaire to measure the test results. SUS can also be interpreted as a method that measures ease of use in evaluations. The easy SUS computation process is used as input to improve UI desig. Considering the amount of time, cost, and small sample, SUS can produce adequate results. The calculation results will be converted into a value that can be used to consider whether a system is suitable for implementation.

Ronaldo & Oliveira (2024) argued SUS has high reliability and validity. This makes SUS often combined with other evaluation methods, such as HE and usability testing. The advantages are practical and easy to apply, making SUS the industry standard in measuring the usability of various digital systems. The process begins with conducting usability testing on the system and then continues by answering the statements available in the questionnaire. The values obtained from the SUS come from ten user assessment statements using a Likert scale of 1-5 as the answer.

3. Method

3.1 Research Methods

The research method employs a mixed analysis approach, incorporating both qualitative and quantitative elements. The qualitative analysis is derived from the HE method, while the quantitative analysis is based on the SUS measurement. The HE and SUS methods are instrumental in problem identification and evaluation. The UCD method, which consists of four stages, is used to enhance the design of the ERP purchasing module. The four stages include context of use analysis, user needs analysis, solution design, and solution design evaluation. The UCD method's design improvement process is significantly influenced by the HE method, particularly in the first, second, and fourth parts, which involve analyzing the context of use, user needs analysis, and solution design evaluation. Additionally, the SUS measurement is conducted during the fourth part, the solution design evaluation stage. This research process is depicted in Figure 1.

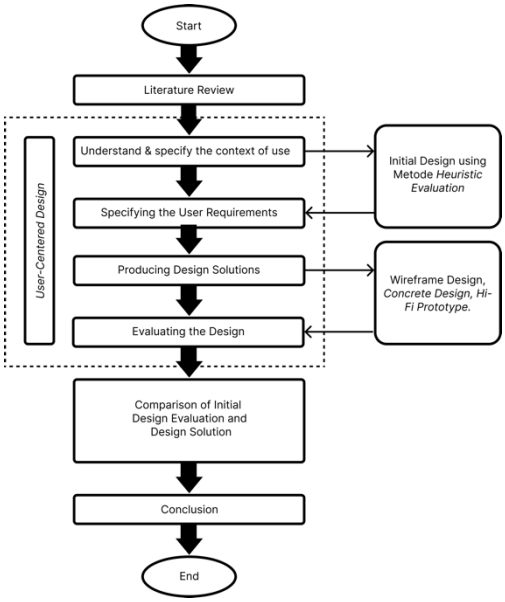

Figure 1. Research Flow

Based on the research flow in Figure 3.1, the research combination uses the HE method, UCD, and SUS, which are expected to optimize the usability of the ERP purchasing module. This process is based on the rapid identification of usability problems using HE and SUS and the improvement of solution design based on user needs, resulting in an intuitive and efficient interface design.

3.2 Literature Review

A literature review is a method for collecting information from various scientific sources. The scientific sources studied are related to the discussion on UI, UX,

usability, guidelines, HE, UCD, and SUS. HE effectively identifies usability problems in ERP modules. Meanwhile, the UCD method can improve user experience by meeting specific user needs in interface design (Talero-Sarmiento et al., 2024).

3.3 Understand and Specify the Context of Use

Understanding and specifying the context of use is the first stage in implementing the UCD method. This is done to identify the context so that the use is known based on previously existing information. This identification aims to identify the user and stakeholder groups related to the function, the characteristics of the activities to be carried out, and the system environment itself. The user and stakeholder groups that play a role in this study are evaluators.

3.3.1 Evaluator

The HE method is carried out on an interface design by making observations so that the evaluator can obtain good or bad impressions. The advantage of this evaluation method is that it does not require users to carry out the evaluation, so it does not take a long time or cost. The evaluator assesses by testing usability and recording any problems found in the ERP purchasing module.

Evaluators are selected based on the criteria of educational background and experience. Where they must have a minimum background of a computer science degree or other related degrees and have experience in website development or research and understanding in the field of usability (Murdiaty et al., 2019). Evaluators can also be selected based on having a bachelor's degree, understanding the concept of ease and comfort in human-computer interaction, and being an application developer with a minimum of three people. These three people are the ideal number of evaluators. The large number of evaluators in the HE method will cause many problems and testing costs. The ideal number of evaluators is three to five because they can produce faster feedback.

The evaluators chosen for this research are highly qualified professionals. The first evaluator, a software engineer at Shopee, brings a wealth of experience in software development. The second evaluator, also a software engineer, is from Azuralabs.id, a reputable software company based in Semarang. The third evaluator is the CEO of CV. Techarea Indonesia Jaya, with expertise in project management, system analysis, and software development. Their collective knowledge and experience ensure the thoroughness and reliability of our research.

After careful consideration, we identified three evaluators based on the criteria mentioned above. We then proceeded with the heuristic evaluation tests and SUS to identify various problems and design solutions in the ERP purchasing module. This thorough evaluation process ensures the validity and reliability of our findings.

3.3.2 Heuristic Evaluation Test and SUS

This testing process is assisted by using the HE and SUS methods. To find out, the evaluator will conduct an assessment using a mixed questionnaire to identify problems and find appropriate suggestions or improvements.

- The evaluator received a paper file containing the HE guidelines, SUS assessment guidelines, an evaluator consent sheet, a mixed heuristic evaluation questionnaire sheet, and a SUS assessment sheet.
- The evaluator fills in the data on the consent worksheet and the SUS assessment guidelines provided.
- The evaluator explored the ERP purchasing module before conducting testing. This is done so that the evaluator is already accustomed to conducting testing.
- After that, testing was conducted by exploring each menu in the ERP purchasing module and conducting inspections using the heuristic evaluation method and 10 SUS statements. At this stage, the moderator is not allowed to make any interruptions.
- After completing the testing process, the evaluator fills out a mixed questionnaire by recording the problem findings and improvement solutions. Provide an assessment in the form of severity ratings for various problems that arise and fill out the SUS assessment sheet based on a Likert scale of 1-5

The heuristic and SUS evaluation tests were conducted in two stages. The output of the first stage evaluation was in the form of various problems and suggestions for improvement for the ERP purchasing module, which would later be sorted based on user needs analysis.

3.4 Specifying the User Requirements

Specifying the user requirements is a crucial stage in the UCD method. This process is necessary to determine the severity of each existing problem. The evaluator considers the suggestions and provides an assessment in the form of severity ratings. This aims to provide appropriate recommendations based on the findings of the existing problem. The results of these recommendations will later be sorted based on the severity of usability so that a priority list of improvements can be found.

This priority list of improvements will be fixed first if there is a time constraint. However, if there is sufficient time in the research process, all problems will be fixed according to the priority list of improvements to the ERP purchasing module. The thoroughness of this stage ensures that all user needs are met, leading to a more user-friendly ERP purchasing module.

3.5 Producing Design Solutions

The third stage of the UCD method is to improve the design of the solution. The improvement of the design of the ERP purchasing module solution is based on the results of the previous user needs analysis, which produces a priority list of improvements. The process of improving the design of the solution consists of four stages. The first is mapping the problem based on the guideline. The second is designing a wireframe. The third step is determining the concrete design, consisting of a combination of colors, typography, icons, and illustrations. The last or fourth is making a high-fidelity prototype.

3.6 Evaluating the Design

Evaluating the Design is the fourth stage of the UCD method implementation process. This fourth stage is used to test the results of improving the solution design design in the previous stage, namely the solution design design stage. In this fourth process, the HE method and SUS measurement are used again as tools for the evaluation. This evaluation is needed to ensure that the previous problems found in evaluation stage I are not found again so that the results of evaluation stage II are successful due to improved usability.

3.7 Comparison of Initial Design Evaluation and Design Solution

Comparative analysis of the initial design results and design solutions will be made in the form of a graph based on the 10 principles of the evaluator's heuristic design inspection. For example, if the problem in the initial design evaluation is still found in the problem in the solution design, then the evaluation is not successful or fails to be implemented, but if the problem in the initial design is no longer found, then the evaluation will be declared successful because it can optimize the usability of the ERP purchasing module.

3.8 Conclusion

The conclusion of this study is to produce optimal usability by evaluating and improving the design using the UCD method, which is assisted by evaluation with the HE and SUS methods. The design uses four steps of the UCD method assisted by the HE and SUS methods in its analysis, comparing the usability evaluation of the first and second stages.

4. Result and Discussion

4.1 Data Collection and Processing

Data is meticulously collected and processed by identifying and analyzing several parts. We initiate the process by thoroughly analyzing the context of use to determine the identification of the evaluator selected to conduct the evaluation. The evaluator will then meticulously analyze the display according to the task and identify the system environment.

4.1.1 Understand and Specify the Context of Use

The first stage in UCD is to understand the context of use, which includes stakeholders and user characteristics, tasks performed, and the system environment. This study's stakeholders consisted of evaluators tasked with assessing the level of system usability using the HE and SUS methods. The next stage was to identify 29 tasks. The task is in the ERP purchasing module, which the evaluator will later test. Each task has a different purpose. This is based on each activity carried out by the evaluator in the

ERP purchasing module. The purpose is the final result that is desired to be achieved from each task. System environment analysis is conducted according to industry standards, using laptop/PC devices equipped with Figma software as a prototype design tool. The availability of an internet network or wireless fidelity is also important in ensuring smooth access to the ERP purchasing module.

4.1.2 Result of Heuristic Evaluation Phase 1

The first stage of the heuristic evaluation was conducted to identify various usability issues in the ERP purchasing module based on Nielsen's heuristic principles. The following is Table 1, which displays the results of the first stage heuristic evaluation.

Table 1. Results of HE Phase I

	Evaluator 1	Evaluator 2	Evaluator 3	Total
H1	2	4	3	9
H2	0	0	0	0
H3	2	0	4	6
H4	4	6	6	16
H5	2	1	2	5
H6	1	1	0	2
H7	0	7	0	7
H8	3	0	1	4
H9	9	9	6	24
H10	0	0	1	1
Total	23	28	23	74

Based on the evaluation results presented in Table 1, seventy-four usability problems were found spread across various heuristic categories. The category with the highest number of problems was H9, which helps users recognize, diagnose, and recover from errors. Twenty-four problems were identified, indicating that the system did not provide precise feedback to users in handling errors. In addition, the H4 consistency and standards category also showed many findings, indicating inconsistencies in interface design that could confuse users. The results of this evaluation are the basis for developing improvement strategies to improve the user experience in using the ERP purchasing module.

4.1.3 Specifying the User Requirements

After conducting the analysis of the usage context in UCD, the second stage is to identify user needs based on the problems found in the first stage of heuristic evaluation. This analysis aims to understand the main problems users face in the ERP purchasing module and to determine improvement priorities based on the severity of the problem with the severity rating value.

There are thirteen similar problems in heuristic categories three, four, five, six, and nine. The thirteen problems are sorted based on the improvement priority from the three evaluators' average severity rating. The first problem lies in the detail and

print features that are in error. Second, I cannot export files to Excel. Third, the module cannot be opened, and the programming code appears. Fourth, the Excel button feature does not work. Fifth, the 'excel' export feature is not working yet. Sixth, there is no notification message if the user makes a mistake or fails to enter the ERP purchasing module. Seventh, unable to save new data and error features. Eighth, an error occurs in one of the features. Ninth, there is no message when submitting a failed payment. Tenth, the display on the notification menu cannot be seen at all. Eleventh, there is no confirmation message when data is deleted. Twelfth, the consistency of color and font is not appropriate, so the information is difficult to read. Thirteenth, the number of notifications does not decrease when it has been viewed.

4.2 Producing Design Solutions

User needs that have been identified, the third stage in UCD is to design a solution that can overcome the usability problems found.

4.2.1 Guidelines

Guidelines are helpful for users as a guide by synthesizing sound design principles and creating innovative visual language according to science and technology.

4.2.2 Problem Mapping Based on Guidelines

Guidelines serve as the primary reference framework in developing more effective UI/UX solutions that meet user needs. The guideline covers aspects of information clarity, efficient navigation, design consistency, and system effectiveness in providing user feedback. The model owned by DeLone & McLean (2003) emphasizes the importance of information quality, while in material design, Nielsen Norman Group provides basic principles for creating intuitive and easy-to-use navigation. In addition, the UXPin concept ensures that the resulting design has a high level of flexibility and efficiency to increase user productivity and reduce errors in interaction with the ERP purchasing module.

4.2.3 Wireframe

Wireframe is a basic framework that provides a general overview of the layout and simple interface components. Wireframe can also be interpreted as the basic framework of each website display. The ERP purchasing module has various pages users use, such as division admins, managers, purchasing, and others. These pages must be made in wireframe form before becoming an actual design.

4.2.4 Concrete Design

Concrete design creates a concept for the interface applied to the ERP purchasing module. The concept for the design interface consists of color, typography, icons, and illustrations. Colors used in the ERP purchasing module consist of three parts, namely background colors, primary and accent colors, and system colors. Background colors create a comfortable background for the user: pure white (#FFFFFF) and light gray (#FAFAFA). Primary and accent colors are the main and accent colors used to create a visual identity and provide visual contrast, namely solid black (#222222), dark gray

(#686C78), dark light gray (#A1A4AC), and light gray close to white (#ECEEF2). System colors are colors used to provide visual indicators of certain statuses or actions, such as buttons and status elements, namely Purplish blue (#4845D5), Green (#5BCF0D, #EBFFDF), Lavender blue (#687BEC, #D4DAFF), Yellow (#FEC02F, #FFF7E5), Red (#FE2A2A, #FFDBDB).

The typography used in building the ERP purchasing module is Poppins, as shown in Figure 4.21. Poppins is a geometric sans-serif font suitable for minimalist and modern designs. The icon used in the ERP purchasing module comes from Figma's open-source iconsax plugin collection, which has linear and two-tone icon types. Illustrations used in the ERP purchasing module is an open-source plugin from Figma called Streamline Icon, Illustration, and Emoji.

4.2.5 High-Fidelity Prototype

A high-fidelity prototype is the process of designing an interactive interface to provide a more transparent experience to the user. This high-fidelity prototype forms the final design of the website to be built. Based on the seventy-four existing problems, the results of the solution design were obtained for 42 pages.

4.3 Evaluating the Design

The fourth or final stage in UCD is the evaluation of the solution design that has been designed to ensure that the improvements made have succeeded in increasing usability in the ERP purchasing module. This solution design evaluation is carried out in two forms. The second stage is heuristic evaluation. Second, usability measurement using SUS.

4.2.1 Result of Heuristic Evaluation Phase 1

The second stage evaluation was conducted again to find the latest problems. The results of the second stage evaluation showed that three evaluators still found several problems after the improvements were made. There were fifteen new problems shown in Table 2.

Table 2. Results of HE Phase II

	Evaluator 1	Evaluator 2	Evaluator 3	Total
H1	1	1	0	2
H2	0	0	0	0
H3	0	1	0	1
H4	4	1	4	9
H5	0	0	0	0
H6	0	0	0	0
H7	1	0	0	1
H8	0	1	0	1
H9	0	0	0	0

	Evaluator 1	Evaluator 2	Evaluator 3	Total
H10	0	0	1	1
Total	6	4	5	15

Based on the evaluation results shown in Table 2, it can be seen that most of the problems are still found in the H4 consistency and standard aspect, with a total of nine new problem findings, followed by the H1 visibility of system status aspect, which has two problem findings. Other heuristic principles such as H3 user control and freedom, H7 flexibility and efficiency of use, H8 aesthetic and minimalist design, and H10 help and documentation have one problem finding. These findings indicate that even though improvements have been made, aspects of the system still need to be improved to be more optimal.

4.2.2 Comparison of Heuristic Problem Findings

Usability improvements in the ERP purchasing module occurred mainly in H1 visibility of system status, H3 user control and freedom, H4 consistency and standards, H7 flexibility and efficiency of use, and H8 aesthetic and minimalist design. In the first stage, 74 usability problems were found, with the category H9, which helps users recognize, diagnose, and recover from errors, being the most dominant with 24 problems. In comparison, H4 consistency and standards contributed to 16 problems.

After improvements using the UCD method, the number of problems found decreased drastically to 15 new problems in the second stage, indicating that the improvements successfully addressed most of the previously identified usability barriers. No new problems were found in H5 error prevention, H6 recognition rather than recall, and H9 help users recognize, diagnose, and recover from errors, indicating significant improvements in these aspects. However, the H10 help and documentation category still has one problem, indicating that the documentation aspect still needs further improvement to ensure users can access help more effectively.

4.2.3 SUS Evaluation

Evaluation using SUS was conducted twice. The first evaluation was conducted on the ERP purchasing module. Then, the second evaluation was carried out on the ERP purchasing module prototype, which has been fixed.

SUS in stage I was carried out by three previous evaluators, the data obtained will be converted by processing the data using the SUS method. The results of the SUS evaluation score stage I are shown in Table 3.

Table 3. SUS evaluation results scores stage I

	Total	SUS Skor
E1	27	67.5
E2	21	52.5
E3	24	60

	Total	SUS Skor
Total	72	60

SUS evaluation score stage I shows that the SUS score value obtained based on Table 3 is 60. This score is in the grade scale range D, with an adjective rating of OK, and has a Marginal acceptability range.

SUS evaluation in stage II was repeated to determine the comparative results after improvements were made, the data obtained will be converted back by processing the data using the SUS method. The results of the SUS evaluation score stage II are shown in Table 4.

Table 4. SUS evaluation results in scores stage II

	Total	SUS Skor
E1	32	80
E2	34	85
E3	32	80
Total	98	81.6

The SUS evaluation score stage II shows that the SUS score value obtained based on Table 4 is 81.6. This score is in the range of grade scale B, adjective rating Excellent, and has an acceptability range of Acceptable. These results indicate that there has been an increase in usability from previously only having a percentile score of 60 to 81.6. In addition, there was also an increase in usability acceptance, with the acceptability ranging from marginal to acceptable.

4.2.4 Concrete Design

Concrete design creates a concept for the interface applied to the ERP purchasing module. The concept for the design interface consists of color, typography, icons, and illustrations. Colors used in the ERP purchasing module consist of three parts, namely background colors, primary and accent colors, and system colors. Background colors create a comfortable background for the user: pure white (#FFFFFF) and light gray (#FAFAFA). Primary and accent colors are the main and accent colors used to create a visual identity and provide visual contrast, namely solid black (#222222), dark gray (#686C78), dark light gray (#A1A4AC), and light gray close to white (#ECEEF2). System colors are colors used to provide visual indicators of certain statuses or actions, such as buttons and status elements, namely Purplish blue (#4845D5), Green (#5BCF0D, #EBFFDF), Lavender blue (#687BEC, #D4DAFF), Yellow (#FEC02F, #FFF7E5), Red (#FE2A2A, #FFDBDB).

The typography used in building the ERP purchasing module is Poppins, as shown in Figure 4.21. Poppins is a geometric sans-serif font suitable for minimalist and modern designs. The icon used in the ERP purchasing module comes from Figma's open-source iconsax plugin collection, which has linear and two-tone icon

types. Illustrations used in the ERP purchasing module is an open-source plugin from Figma called Streamline Icon, Illustration, and Emoji.

4.2.5 High-Fidelity Prototype

A high-fidelity prototype is the process of designing an interactive interface to provide a more transparent experience to the user. This high-fidelity prototype forms the final design of the website to be built. Based on the seventy-four existing problems, the results of the solution design were obtained for 42 pages.

5. Conclusion

Based on the research and discussion that has been carried out above the conclusions are the problem findings in the first stage of evaluation were 74 problems. The problems found were located in 9 heuristic categories, namely nine problems in the H1 visibility of system category, six problems in the H3 user control and freedom category, 16 problems in the H4 consistency and standard category, five problems in the H5 error prevention category, two problems in the H6 recognition rather than recall category, seven problems in the H7 category. Flexibility and efficiency of use, four issues in category H8 aesthetic and minimalist design, 24 issues in category H9 help the users recognize, diagnose, and recover from the errors, and 1 issue in category H10 help and documentation.

The design process, meticulously following the UCD method, progresses through 4 stages: first, a comprehensive analysis of the context of use. This stage is conducted to identify the evaluator's characteristics, tasks, objectives, and the system environment. Additionally, a thorough heuristic evaluation stage is carried out to unearth various problems in the ERP purchasing module. Second, a meticulous user needs analysis is conducted to identify a list of priority problems for improvement. The result is thirteen priority problems for improvement. Third, a detailed solution design is crafted. The design process involves formulating a concrete design, designing a wireframe, and a final prototype that produces 42 pages of design solutions. Fourth, the solution design is rigorously evaluated. The results of the solution design are evaluated at this stage using a heuristic evaluation again and using SUS measurements to obtain the level of usability before and after the ERP purchasing module.

The usability problems identified in the heuristic evaluation phase I have been effectively addressed, as evidenced by the absence of similar problems in the heuristic evaluation phase II. Initially, there were 74 problems in the heuristic evaluation phase I results, which was reduced to only 15 problems in the heuristic evaluation phase II. The evaluation was also carried out using SUS measurements. The results of the SUS measurements in the initial stage produced a value of 60. This score is in the range of grade scale D, adjective rating OK, and has an acceptability range of Marginal. After the improvements were made, there was a significant increase in the SUS value to 81.6. This score is in the range of grade scale B, adjective rating Excellent, and has an acceptability range of Acceptable. This substantial improvement demonstrates the success in resolving usability problems in the evaluation phase I and optimizing usability for user acceptance.

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