

Heuristic Evaluation on Interface of Thesis Management Information System in Vocational Environment

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ABSTRACT

In this study, we used Nielsen's heuristics to analyze the user interface of a thesis management information system in the vocational education environment. This system environment is designed to assist students in managing and organizing all processes related to thesis writing. The main framework in this study is Nielsen's heuristics, supplemented with experiments to evaluate the extent to which the user interface of the system meets user preferences (user-friendly). The population involved in this research consists of faculty members and students, with a sample size of 50 individuals. Analysis and discussion were conducted through the distribution of questionnaires to the participants. Based on the research findings, it was discovered that the Visibility of system status achieved a score of 163.5. Overall, this study concludes that the thesis management information system in the vocational education environment that we developed successfully achieves its main objective by having a user-friendly interface.

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1. INTRODUCTION

User Interface (UI) is a technological advancement that utilizes digital and internet technologies to design products with the aim of improving user comfort and ease of use [1]. User interface encompasses the visual aspects of an application that can be directly seen,

including the layout and design [2]. The appearance of the User Interface can present appealing elements through a combination of colors, shapes, and typography [3]. Designing User Interface, also known as user interface design, relates to the interaction and presentation of products. A good UI design is capable of providing a satisfying user experience when using a system. On the other hand, if the design is not effective, users may experience discomfort in accessing various functions and tools within the information system on a website. Therefore, the user interface is a part of the system that enables users to access and execute various system functions. The user interface also integrates system elements, user elements, and interactions between them [4].

Every system designer, programmer, and developer is expected to create the best user interface (UI) that fits the mentioned problem to make the information system more user-friendly. The term "user-friendly" in the context of the user interface means "pleasant to use," and the designed system should be available in various languages and utilize simple language [5]. Furthermore, the application should have qualities or functions that facilitate system operation. Generally, many information systems have complex user interfaces that can potentially lead to user errors and Causing difficulties for users. As a result, the success of a system depends on the user interface used. Generally, usability is considered one of the key features in the quality of an information system. Usability can be defined as the level of user-friendliness and the extent to which a product can be used effectively, efficiently, and satisfactorily by users in achieving various different goals [6]. There are various methods available for evaluating the usability of an information system, including heuristic evaluation methods [7].

Thesis management information system is a system that enables students to manage and organize all processes related to thesis writing. The purpose of developing the thesis management information system is to enable professors and students to continue interacting directly, explaining, and discussing the guidance process in thesis development. The thesis management information system currently available in the Electronics Department of FT UNP assists students and faculty members in scheduling and task management, as well as facilitating collaboration with advisors and monitoring research progress. Every user has a unique user interface (UI) for each action they take, just like the overall system. The system's user interface (UI) is always dynamically changing during the system development process. The interface design facilitates interaction or communication between the UI or system and their end-users [8].

The research is conducted with the aim of assessing the extent of user satisfaction with the developed system's user interface and assisting the developers in evaluating the user interface of the thesis management information system in the vocational education environment. Nielsen's heuristics technique is used to design the user interface, with a focus on the Human-Computer Interface (HCI) principles. For instance, interaction design integrates more internet service features into the aesthetics of user-focused thinking and interface design, such as incorporating service design methods into the Human-Computer

Interface [9]. Nielsen's heuristics typically serve as a starting point for creating new rules and guidelines regarding usability [10]: Visibility of System Status, Match between system and the real world, User control and freedom, Consistency and standards, Error prevention, Recognition rather than recall, Flexibility and efficiency of use, Aesthetic and minimalist design, Help users recognize, diagnose, and recover from errors, and Help and documentation. These are just some of the rules formulated by Rolf Molich and Jakob Nielsen when creating this technique. Subsequently, a study on the thesis management information system in the vocational education environment is conducted, considering these opportunities.

2. THE CORE COMPONENTS

2.1. Heuristic evaluation

Heuristic evaluation is one of the methods that aims to identify problems related to interface design [11]. This study utilizes Nielsen's heuristics to assist designers in addressing various design-related issues. Some heuristics describe specific contexts and examples that are not covered by Nielsen's heuristics. In this regard, this information helps draw a line between the relevant heuristics and the specific context [12]. Nielsen's heuristics provide significant benefits for this purpose through its ten heuristics [13].

An inconsistent user interface in terms of design, layout, colors, icons, or usage patterns can lead to confusion for users [14]. If a user interface in an application is easy to use, users are more likely to continue using it. Conversely, if an application has a complicated user interface, users are more likely to abandon it [15]. For example, buttons with different designs for similar actions can confuse users. The user interface should be designed to be simple and efficient, which can be seen in the organization and implementation of consistent layout elements, typography, colors, imagery, and control and affordance to make it easy for users to understand [16]. When users perform actions, the system should provide clear and informative feedback. In conclusion, a well-designed and user-friendly interface enhances usability from the user's perspective. Considering the aforementioned benefits, we have chosen this method comprehensively as the main reference to analyze the user interface design for the thesis management information system in the vocational education environment.

2.2. Research Questions and Technique

The Nielsen's heuristics method used to analyze the interface design in the thesis management information system in the vocational education environment created for the Electronics Department of FT UNP is a key component of this research. This method is used to create visually appealing user interfaces while achieving various specific goals. Therefore,

when designing a system interface, ten factors must be considered. These ten components have been included in the interface design process the thesis management information system in the vocational education environment by conducting surveys among electronics engineering students. Here is the core of the questions in this paper :

1. Visibility of system status
Excessive status information, where the system provides an overload of status information, can also disrupt users when using the system.
2. Match between system and the real world
Inconsistency between function and icon symbols in the system.
3. User control and freedom
Lack of a button to go back to the previous page in the system.
4. Consistency and standards
Fonts, numbers, texts, and dates are all in Indonesian language.
5. Error prevention
System performance failures, for example, lack of confirmation message after completing a process.
6. Recognition rather than recall
Lack of good visual feedback and user manuals that do not provide useful content for using the system.
7. Flexibility and efficiency of use
Long loading or refreshing times when accessing the system.
8. Aesthetic and minimalist design
Unattractive design and poor layout in the system.
9. Help users recognize, diagnose, and recover from errors
Inability of the system to cancel or revise entered data.
10. Help and documentation
The system does not have any features related to this principle, as there is already good documentation available in the system.

3. RESEARCH METHOD

In this study, the Research & Development (R&D) development strategy with a Development & Operations (DevOps) approach was utilized [17]. The R&D approach was used to create a specific product and test its effectiveness. This approach was reinforced by the implementation of the DevOps development model, which allows cooperation between developers and IT professionals during the development stages.

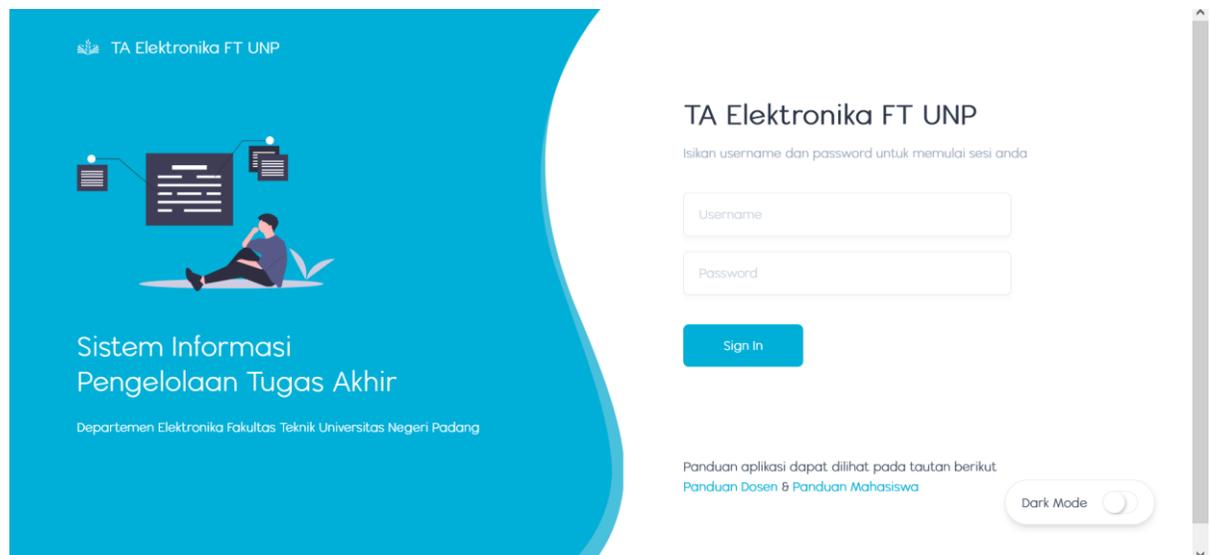
The effectiveness measurement of this system's user interface is conducted by applying Nielsen's Heuristics as the evaluation method. Nielsen's heuristics aim to identify problems or shortcomings in the user interface that may hinder users from achieving their goals or disrupt their overall user experience. This evaluation provides valuable feedback

to the development team to improve the user interface and enhance the overall quality of the product or system.

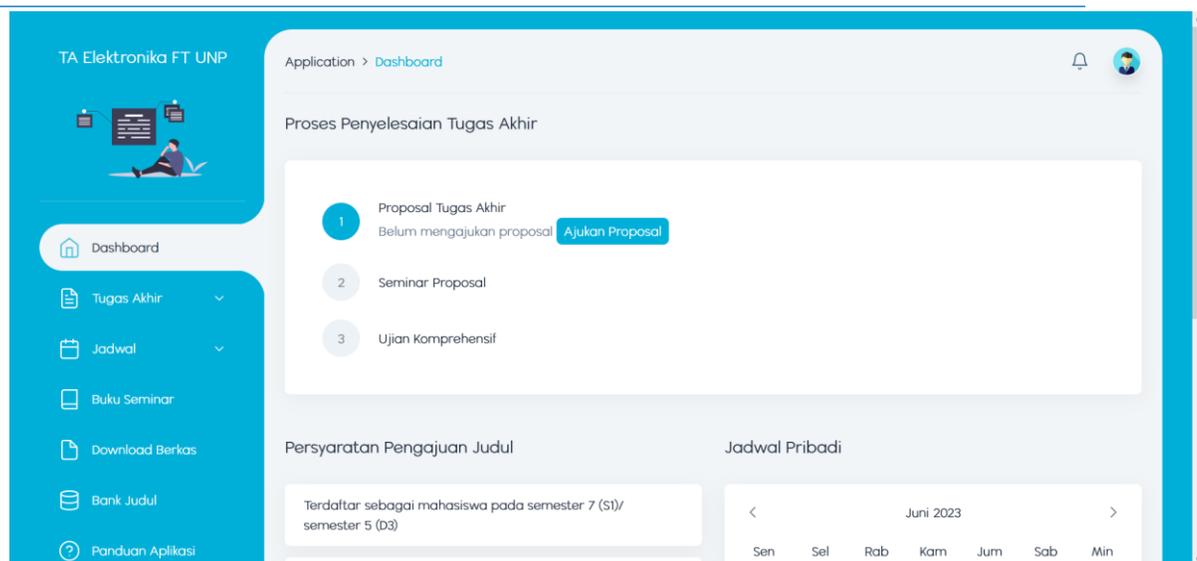
4. SYSTEM APPEARANCES

In this section, we will focus on the interface of the thesis management information system in the vocational environment. We will also provide a brief explanation of several features and functions that have been integrated into the system. At the end, we have outlined the variable names and questionnaire results that refer to Nielsen's heuristics. The questions were selected comprehensively for the population.

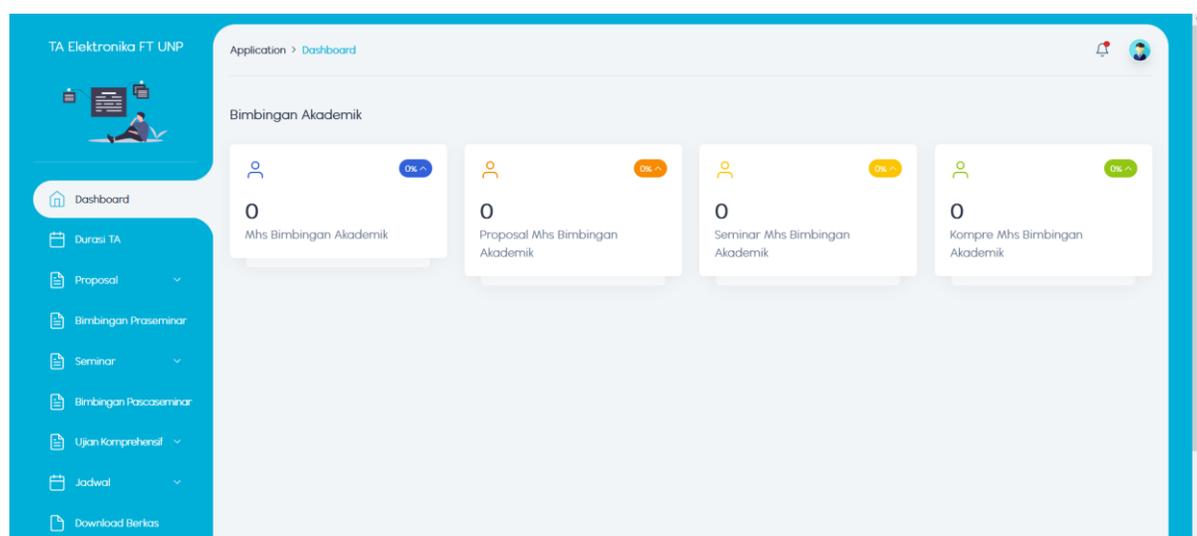
The graphical user interface of the thesis management information system has several features. To access the main menu of the application, students or faculty members need to go through some authentication procedures, such as entering their username and password. There are several menus on the main page of the thesis management information system, such as final project, schedule, seminar book, file download, thesis title repository, application guide, and others, as seen in Figure 1. The features differ for students and faculty members, where the system allows faculty members to view the progress of students in the thesis guidance process.



(a) Login Page and Registration



(b) Student Information Dashboard



(c) Lecture Information Dashboard

Figure 1. (a) Login Page and Registration; (b) Student Information Dashboard; (c) Lecture Information Dashboard (<https://ta.elektronika.ft.unp.ac.id/>)

The 'Dashboard' menu appears when a student successfully logs in. This dashboard menu displays the progress of the final project, title submission requirements, and personal schedule. Under the 'Final Project' menu, students can submit their proposal, which includes the title, type of title, type of submission, field, and reasons for choosing the title. It also covers the process of pre-seminar guidance, proposal seminar, proposal seminar, and comprehensive examination. Moving on to the 'Schedule' menu, it provides information

about the student's seminar and comprehensive examination schedule. In the 'Seminar Book' section, students can track the number of seminars they have attended and participated in. The 'Thesis Title Repository' menu contains a collection of thesis titles from students who have completed their studies.

The analysis findings are summarized in Table 1 to provide a concise and easily understandable overview. This table presents important findings discovered during the analysis process and presents them in a structured format. Through Table 1, readers can directly observe the main results of the analysis and relevant information in a format that is easily categorized and comprehensible.

Tabel 1. Identification of Variables and Questionnaire Data

Rules	Population	Question	Questionnaire Results (Score)				Total	Total Score
			1	2	3	4		
Visibility of system status	Lecture.1	The system's status information works well when a student uploads a thesis guidance file.	1	1	33	15	50	163,5
	Student.1	The system's status information works well when a lecturer provides feedback on thesis guidance revisions.	2	2	25	21	50	
Average*Score			1,5	3	87	72		
Match between system and the real world	Lecture.2	Providing easily understandable icon symbols.	1	1	35	13	50	164,5
	Student.2	Providing easily understandable icon symbols.	1	1	26	22	50	
Average*Score			1	2	91,5	70		
User control and freedom	Lecture.3	The Back, Undo, and Redo icons are functioning properly in the system.	1	2	26	21	50	167
	Student.3	The Back, Undo, and Redo icons are functioning properly in the system.	1	1	28	20	50	
Average*Score			1	3	81	82		
Consistency and standards	Lecture.4	The font, numbers, text, and dates are all in Indonesian language.	1	2	34	13	50	163,5
	Student.4	The font, numbers, text, and dates are all in Indonesian language.	1	2	25	22	50	
Average*Score			1	4	88,5	70		
Error prevention	Lecture.5	The website will provide quick feedback when users make mistakes.	1	1	33	15	50	161
	Student.5	The response will be prompt if the system encounters an error.	1	3	31	15	50	

Avarage*Score			1	4	96	60		
Recognition rather than recall	Lecture.6	The use of color composition in the thesis management system is very impressive.	2	1	32	15	50	162,5
	Student.6	The use of color composition in the thesis management system is very impressive.	1	1	30	18	50	
Avarage*Score			1,5	2	93	66		
Flexibility and efficiency of use	Lecture.7	The loading or page refresh process when accessing the system runs smoothly.	2	1	32	15	50	160,5
	Student.7	The loading or page refresh process when accessing the system runs smoothly.	1	3	30	16	50	
Avarage*Score			1,5	4	93	62		
Aesthetic and minimalist design	Lecture.8	The system has an attractive design and a good layout.	2	1	29	18	50	166
	Student.8	The system has an attractive design and a good layout.	1	1	26	22	50	
Avarage*Score			1,5	2	82,5	80		
Help users recognize, diagnose, and recover from errors	Lecture.9	The system allows canceling or revising the data that has been entered into the system.	1	3	29	17	50	159,5
	Student.9	The system allows canceling or revising the data that has been entered into the system.	1	5	30	14	50	
Avarage*Score			1	8	88,5	62		
Help and documentation	Lecture.10	The system guidebook for faculty is easy to understand.	1	2	28	19	50	164,5
	Student.10	The system guidebook for students is easy to understand.	1	2	29	18	50	
Avarage*Score			1	4	85,5	74		

For each variable in Table 1, there are sub-dimensions assessed through the lecture and student perspectives, with corresponding scores for questions 1, 2, 3, and 4. The "Averaged*Score" and "Total Score" columns provide an overall assessment of each variable's performance.

5. RESULTS AND DISCUSSION

This section provides a detailed analysis of the user interface and discussion about of the thesis management information system in the vocational environment. Data and respondents were obtained from students in the Electronics Engineering department at FT UNP. There are ten variables included in the survey given to the students. In Table 1, the

Identification of Variables and Questionnaire Data is presented. The sampling was conducted using the Systematic Random Sampling method [18], which involves selecting samples at regular intervals from an ordered sampling frame or choosing specific individuals or members from the entire population.

There are 50 lecturers and 50 students who participated as respondents in this study. We carefully selected questions that were appropriate for each variable for both lecturers and students. Additionally, we used a 1 to 4 scale for the questionnaire responses. By calculating the average values from both lecturers and students, we can establish an overall score for each variable. Then, this total score is analyzed to obtain feedback from users. In Table I presents the identification of variables used (based on Heuristic evaluation) and the questionnaire data. The Likert scale is used to assess the values of each variable by presenting a series of statements or items related to the researched topic [19]. The Likert scale measures user perspectives on a particular matter by asking them to indicate their level of agreement or disagreement with specific statements [20]. The score distribution has been created to evaluate how respondents assess the system and generate the acceptance scale. Here is the range of scores used:

$$\begin{aligned}\text{Lowest score} &= (\text{Number of Respondents} \times \text{Minimum score}) \\ &= 50 \times 1 \\ &= 50 \\ \text{Highest score} &= (\text{Number of Respondents} \times \text{Maximum score}) \\ &= 50 \times 4 \\ &= 200\end{aligned}$$

The author created the following grade categories:

- Poor : 50 up to 80
- Not good : 81 up to 110
- Acceptable : 111 up to 140
- Good : 141 up to 170
- Excellence : 171 up to 200

Finally, based on the findings of the user analysis of the thesis management information system in the vocational environment using Nielsen's heuristics method, it can be concluded that the respondents have confidence that the proposed system is adequate. A summary of these findings can be described as follows:

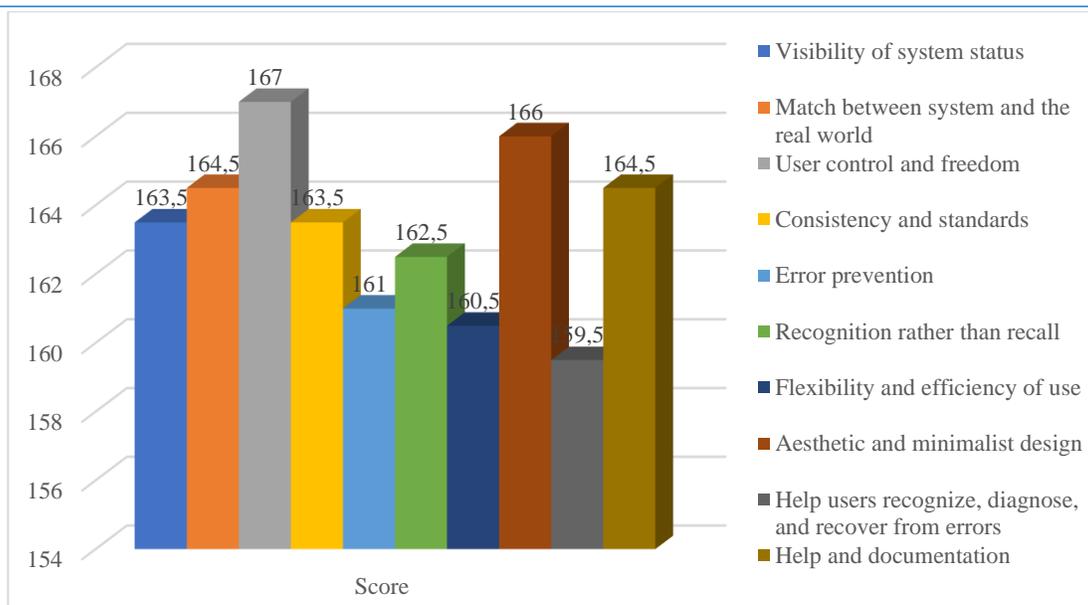


Figure 2. Analysis results using Nielsen's heuristics method.

Visibility of system status	= 163,5
Match between system and the real world	= 164,5
User control and freedom	= 167
Consistency and standards	= 163,5
Error prevention	= 161
Recognition rather than recall	= 162,5
Flexibility and efficiency of use	= 160,5
Aesthetic and minimalist design	= 166
Help users recognize, diagnose, and recover from errors	= 159,5
Help and documentation	= 164,5

To ensure users can easily identify the pages they are accessing while interacting with the application or feature in use, consistency between pages and related features should be maintained as the first variable. Additionally, the use of shortcut variables can serve as a teaching and guiding tool for users in navigating the application. Feedback variables are not only related to user responses but can also be utilized to observe the changes in the user interface resulting from each action.

5.1. Practical Recommendations

- 1) The most important recommendation regarding "Visibility of system status" is as follows:

- The clarity of displayed notification messages needs improvement.
 - The user system manual page should be replaced with a concise and clear user guide.
- 2) The most important recommendation regarding "Match between system and the real world" is as follows:
 - Icon symbols should be easily understandable and convey information about the function of each menu.
 - 3) The most important recommendation regarding "User control and freedom" is as follows:
 - Back, Undo, and Redo icons should be implemented to ensure smooth functioning of the system, as users may want to navigate back to the previous page.
 - 4) The most important recommendation regarding "Consistency and standards" is as follows:
 - The system should use the Indonesian language throughout.
 - 5) The most important recommendation regarding "Error prevention" is as follows:
 - Completion notifications should be displayed after the data input process is completed.
 - The system should provide prompt responses when users make mistakes.
 - 6) The most important recommendation regarding "Recognition rather than recall" is as follows:
 - Appropriate visual feedback should be designed, and the number of pages should be minimized.
 - The use of color composition in the thesis management system is highly impressive.
 - 7) The most important recommendation regarding "Flexibility and efficiency of use" is as follows:
 - The loading or page refreshing process when accessing the system should run smoothly.
 - 8) The most important recommendation regarding "Aesthetic and minimalist design" is as follows:
 - The system should have an attractive design and a well-organized layout.
 - The system should use contrasting colors and appropriate fonts.
 - 9) The most important recommendation regarding "Help users recognize, diagnose, and recover from errors" is as follows:
 - The system should have the ability to cancel or revise entered data.
 - The data correction process should be clear after the initial confirmation.

10) The most important recommendation regarding "Help and documentation" is as follows:

- The addition of a comprehensive user manual that thoroughly explains the system.
- The user guide should be in a single document to provide a beneficial experience with the system.

Finally, our system has successfully created a good interface as a bridge between users and design, providing comfort and satisfaction to users based on those findings. The design of the information system interface that aligns with thesis guidance has resulted in satisfactory outcomes when evaluated using heuristic evaluation. It is important to remember that various aspects of the user interface have been produced and have undergone various methods and techniques of examination.

6. CONCLUSION

In this study, we have used Nielsen's heuristics on various key components of the user interface that has been developed for the management information system of thesis in the vocational environment. According to the feedback from the respondents, our user interface design was rated fairly well for real-world usage, with scores ranging from 50 to 200. We also noted that Nielsen's heuristics proved to be a suitable approach for this research as its principles could be applied to this research topic. Like any different approach, each choice has its own advantages and limitations. In the next effort, we are considering adding more features that will be evaluated using a different methodology. Designing a user interface model becomes more complex as the system features become more intricate. Furthermore, a user interface with good functionality may receive diverse feedback from users. In summary, a case study involving various features and methodologies can still be explored and reviewed. As a final step, it is necessary to pay special attention to the evaluation of this system during the early stages of design and development to encounter fewer issues during the system's implementation.

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