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Usability Engineering Approach for Simantep Unimed Learning Management System Optimization Using User-Centered Design

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Abstract

SIMANTEP UNIMED is a web-based Learning Management System used to support academic and administrative activities within the Faculty of Mathematics and Natural Sciences, Universitas Negeri Medan. This study aimed to improve the user interface and user experience of the system by identifying user needs and implementing a gallery feature through a User-Centered Design (UCD) approach. The research employed interviews, observations, usability testing, Think-Aloud sessions, and Analysis of Verbal Behavior to evaluate the existing system and the proposed design prototype. A prototype was developed in Figma and assessed using usability attributes, including effectiveness, efficiency, and satisfaction. The results demonstrated substantive improvements in usability. The redesigned prototype achieved effectiveness and efficiency scores of 100%, while the satisfaction score reached 89.5 on the System Usability Scale. Verbal behavior analysis recorded 24 user comments, consisting of 58.3% positive, 29.2% neutral, and 12.5% negative comments. Compared with the initial evaluation, positive comments increased by 40.1%, while neutral and negative comments decreased by 13.2% and 26.9%, respectively. These findings indicate that the User-Centered Design approach successfully addressed usability issues and enhanced the overall user experience of SIMANTEP UNIMED. The proposed design can serve as a reference for future system development.

Keywords: *Analysis of Verbal Behavior; System Usability Scale; User-Centered Design; User Experience; User Interface*

1. Introduction

Learning Management Systems (LMS) have become an essential component of modern educational institutions by supporting learning activities, academic administration, communication, and information dissemination through online platforms. LMS platforms facilitate interactions between lecturers and students while providing tools for managing learning materials, assessments, and administrative processes [1]. Therefore, the quality of the user interface (UI) and user experience (UX) plays a crucial role in ensuring that users can efficiently access and utilize the available services.

SIMANTEP UNIMED is a web-based LMS developed for the Faculty of Mathematics and Natural Sciences (FMIPA), Universitas Negeri Medan. The system serves not only as an academic administration portal but also as an information service platform for various faculty activities, including academic announcements, student document services, seminar information, graduation information, and other administrative processes. As the primary platform used by students and academic staff, SIMANTEP UNIMED is expected to provide a user-friendly and engaging experience to support its diverse functions [2].

However, preliminary observations and user interviews indicated that the existing interface did not adequately address user expectations. Although the system functioned properly, users perceived the interface as outdated and lacking engaging features. Furthermore, the design process had not sufficiently involved end users, resulting in a mismatch between system design and user needs. Consequently, a user-based evaluation was required to identify usability issues and determine appropriate design improvements.

User-Centered Design (UCD) is a design approach that actively involves users throughout the development process to ensure that products are aligned with their needs, characteristics, and goals [3]. By focusing on users during design and evaluation activities, UCD can improve usability and overall user satisfaction. In addition, usability testing methods such as Think-Aloud, Analysis of Verbal Behavior (AVB), and System Usability Scale (SUS) provide valuable insights into user perceptions and interaction experiences.

This study aims to redesign the UI and improve the UX of SIMANTEP UNIMED by applying the UCD approach and introducing a gallery feature to enhance user engagement. The proposed design was evaluated through usability testing based on effectiveness, efficiency, satisfaction, and verbal behavior analysis. The results are expected to provide design recommendations that better accommodate user needs and contribute to the future development of the SIMANTEP UNIMED platform.

2. Literature Review

2.1. Learning Management System

A Learning Management System (LMS) is a software platform designed to facilitate the management, delivery, and monitoring of learning activities through digital technologies. LMS platforms support communication, content distribution, assessment, and academic administration in educational institutions. The implementation of LMS technology has become increasingly important in higher education because it enables efficient access to academic services and learning resources regardless of time and location [1].

SIMANTEP UNIMED is a web-based LMS used within the Faculty of Mathematics and Natural Sciences, Universitas Negeri Medan. The system provides various services, including academic information dissemination, student administration, and document management. As a system that serves a large number of users, its usability and user experience are important factors affecting user satisfaction and system acceptance.

2.2. User Interface and User Experience

User Interface (UI) refers to the visual elements through which users interact with a system, including layouts, navigation structures, colors, typography, and interactive components. A well-designed UI enables users to perform tasks efficiently and reduces cognitive effort during interaction[4].

User Experience (UX) encompasses users' perceptions, emotions, and responses resulting from the use of a product or system. UX is influenced by various factors, including usability, accessibility, functionality, and visual appeal. According to ISO 9241-210, UX reflects a person's perceptions and responses resulting from the use or anticipated use of a product, system, or service (International Organization for Standardization[5]. Therefore, improving both UI and UX is essential to ensure a positive interaction experience.

2.3. User-Centered Design

User-Centered Design (UCD) is a design approach that places users at the center of the development process. The approach emphasizes understanding user characteristics, needs, and goals through continuous user involvement during analysis, design, and evaluation activities. According to [5] UCD is an iterative process aimed at developing systems that are useful, usable, and satisfying for users.

The UCD process generally consists of understanding the context of use, specifying user requirements, producing design solutions, and evaluating designs against requirements. Through iterative evaluation and refinement, UCD helps ensure that design decisions are based on actual user needs rather than designer assumptions [3].

2.4. Usability Testing

Usability Testing is an evaluation method used to assess how effectively, efficiently, and satisfactorily users can interact with a system while performing specific tasks. During usability testing, participants are asked to complete predefined scenarios while researchers observe their behavior and identify usability issues [6].

According to ISO 9241-11, usability consists of three primary attributes: effectiveness, efficiency, and satisfaction[7]. Effectiveness measures the extent to which users successfully complete tasks, efficiency evaluates the resources required to achieve goals, and satisfaction reflects users' perceptions regarding system usability.

Usability Testing was conducted to evaluate the usability of the SIMANTEP UNIMED system based on three attributes: effectiveness, efficiency, and satisfaction. Effectiveness and efficiency were measured using performance measurements, while satisfaction was evaluated using the System Usability Scale (SUS)[8].

2.4.1. Effectiveness

Effectiveness measures the extent to which users successfully complete the assigned tasks. In this study, effectiveness was calculated using the Completion Rate formula:

$$CR = \frac{\sum_{i=1}^{N} n_i}{N \times R} \times 100\%$$

Where:

- n_i = number of successfully completed tasks,
- $N =$ total number of tasks,
- R = total number of participants.

A higher completion rate indicates better task success and greater usability [9].

2.4.2. Efficiency

Efficiency evaluates the resources required by users to complete tasks and was measured using the Overall Relative Efficiency (ORE) formula:

$$ORE = \frac{\sum_{j=1}^{R}\sum_{i=1}^{N} n_{ij}t_{ij}}{\sum_{j=1}^{R}\sum_{i=1}^{N} t_{ij}} \times 100\%$$

Where:

- R = total number of participants,
- N = total number of tasks,
- t_{ij} = time required by participant j to complete task i,
- n_{ij} = task completion value (1 if successful, 0 if unsuccessful).

Only successful task completion times are included in the numerator of the equation. A higher ORE value indicates greater efficiency in completing tasks.

2.4.3. Satisfaction

User satisfaction was measured using the System Usability Scale (SUS), System Usability Scale (SUS) is a standardized questionnaire developed by John Brooke [10] to measure users' perceived usability of a system. SUS is widely used because it is simple, reliable, and applicable to various types of interactive systems. The questionnaire consists of ten statements rated using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The final SUS score is obtained using:

$$SUS = \left(\sum Score_i\right) \times 2.5$$

Where $Score_i$ represents the adjusted score for each SUS item. The final score ranges from 0 to 100, the score is calculated by subtracting 1 from the responses to odd-numbered items and subtracting the responses to even-numbered items from 5. The adjusted scores are summed and multiplied by 2.5 to obtain the final SUS score. Higher scores indicate better perceived usability and user satisfaction. The ten SUS statements proposed by Brooke are presented in Table 1.

Table 1: System Usability Scale (SUS) Questionnaire

No	Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	*I think that I would like to use this system frequently*	1	2	3	4	5
2	*I found the system unnecessarily complex*	1	2	3	4	5
3	*I thought the system was easy to use*	1	2	3	4	5
4	*I think that I would need the support of a technical person to be able to use the system*	1	2	3	4	5
5	*I found the various functions in this system were well integrated*	1	2	3	4	5
6	*I thought there was too much inconsistency in this system*	1	2	3	4	5
7	*I would imagine that most people would learn to use this system very quickly*	1	2	3	4	5
8	*I found the system very cumbersome to use*	1	2	3	4	
9	*I felt very confident using the system*	1	2	3	4	5
10	*I needed to learn a lot of things before I could get going with this system*	1	2	3	4	5

The SUS score can be interpreted using benchmark scales, where a score above 68 is generally considered acceptable, while higher scores indicate better usability performance and user satisfaction. In this study, SUS was used to evaluate the satisfaction attribute of the redesigned SIMANTEP UNIMED prototype.

2.5. Think-Aloud and Analysis of Verbal Behavior

Think-Aloud is a usability evaluation technique in which participants verbalize their thoughts, feelings, and decision-making processes while interacting with a system. This method provides valuable insights into user behavior and helps identify usability problems that may not be revealed through quantitative metrics alone [6]. During the usability testing sessions, participants completed a series of predefined tasks while continuously describing their experiences and reactions. The verbal responses were recorded and subsequently analyzed to identify user perceptions toward the interface and interaction design.

Analysis of Verbal Behavior (AVB) is an analysis method based on the Verbal Behavior theory introduced by B.F. Skinner in 1957. Skinner explained that verbal behavior refers to behavior that is reinforced through the mediation of other individuals and can be used to understand a person's thought processes, perceptions, and responses to particular situations or stimuli [11]. In usability evaluation, AVB is applied to analyze users' verbal expressions produced during Think-Aloud sessions, enabling researchers to gain deeper insights into users' experiences and perceptions while interacting with a system.

In this study, verbal statements obtained during usability testing were transcribed and categorized into three groups: positive, neutral, and negative comments. Positive comments reflected satisfaction, ease of use, or favorable perceptions of the interface. Neutral comments described observations or actions without indicating positive or negative judgments. Negative comments represented difficulties, confusion, dissatisfaction, or usability problems encountered by users

2.6. Related Works

Several previous studies have applied User-Centered Design (UCD) and usability evaluation methods to improve the quality of user interfaces and user experiences in digital systems.

Ravelino [12] conducted a UI/UX redesign for the Bank Jago mobile application using a user-centered approach. The study reported positive usability outcomes, including 65% learnability, 50% memorability, 70% satisfaction, and 55% efficiency. The results demonstrated that involving users during the design process can improve overall usability and user acceptance. Anggitama [13] designed the UI/UX of the Ezyschool application using the Human-Centered Design approach combined with Heuristic Evaluation. Their study successfully reduced usability issues from seventeen identified problems to only seven problems after implementing the proposed design improvements, indicating a significant enhancement in user experience. Anggoro [14] emphasized the importance of user-based analysis in website development. Their findings showed that systems designed through user-centered approaches better accommodate user needs and reduce the need for users to adapt their behavior when interacting with the system.

Different from previous studies, this research focuses on the optimization of the SIMANTEP UNIMED Learning Management System through the addition of a gallery feature and a redesigned user interface based on the UCD approach. Furthermore, the evaluation combines quantitative usability measurements (effectiveness, efficiency, and System Usability Scale) with qualitative methods through Think-Aloud and Analysis of Verbal Behavior, providing a more comprehensive understanding of user experience and system usability. Although previous studies have demonstrated the effectiveness of user-centered approaches in improving usability, limited research has focused on Learning Management Systems that combine interface redesign, feature enhancement, Think-Aloud evaluation, Analysis of Verbal Behavior, and System Usability Scale measurements. Therefore, this study addresses this gap by integrating these methods within the context of SIMANTEP UNIMED.

3. Research Methods

This study employed the User-Centered Design (UCD) methodology to improve the User Interface (UI) and User Experience (UX) of the SIMANTEP UNIMED Learning Management System. UCD was selected because it emphasizes active user involvement throughout the design process to ensure that the resulting design aligns with user needs and expectations. The research consisted of four stages: understanding the context of use, specifying user requirements, producing design solutions, and evaluating the design against user requirements.

Data collection was conducted through observations, interviews, and usability testing involving active users of SIMANTEP UNIMED from the Faculty of Mathematics and Natural Sciences, Universitas Negeri Medan. Initial observations and interviews were performed to identify usability problems and gather user requirements. Based on the findings, user personas, wireframes, and high-fidelity prototypes were developed using Figma. The redesign process also included the addition of a gallery feature intended to enhance user engagement and overall experience.

The prototype evaluation was conducted through usability testing with five participants, following Nielsen's recommendation that five users are sufficient to identify the majority of usability issues[6]. Participants were asked to complete predefined task scenarios while applying the Think-Aloud method to express their thoughts and experiences during interaction. Verbal responses were recorded and analyzed using Analysis of Verbal Behavior (AVB) to classify comments into positive, neutral, and negative categories.

Usability was measured using three attributes defined in ISO 9241-11: effectiveness, efficiency, and satisfaction. Effectiveness was calculated using the Completion Rate, efficiency was measured using Overall Relative Efficiency (ORE), and satisfaction was assessed using the System Usability Scale (SUS). The evaluation results from the redesigned prototype were then compared with the findings from the initial system assessment to determine the impact of the proposed design improvements. The research methodology used in this study is illustrated in Figure 1.

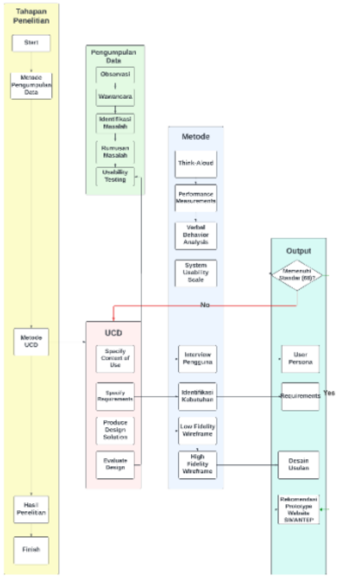

Figure 1: The research methodology

4. Results and Discussion

4.1. User Requirement Analysis

The initial stage of the study involved observations and interviews with five active SIMANTEP UNIMED users from FMIPA Universitas Negeri Medan. The findings indicated that although the system functions properly, users perceived the interface as outdated and less attractive. Participants also reported difficulties in locating certain information and expressed the need for a more modern interface and additional features to improve engagement. These findings were used to develop user requirements and guide the redesign process.

Table 2: Summary of User Requirements Analysis

User Needs	Design Requirements
Consistent features between login and logout states	Implement the same navigation and information access in both login and logout conditions
Consistent content across website pages	Ensure information displayed in login and logout modes remains consistent
Ability to view password characters during password changes	Add a password visibility toggle feature
Clear feedback when login fails	Provide informative error messages for invalid credentials and inactive accounts
More attractive and interactive interface	Add image-based content and improve visual design elements
Additional features to improve engagement	Introduce a gallery feature that allows users to view activities and documentation

Based on the identified requirements, the redesign focused on improving visual appearance, navigation structure, information accessibility, and introducing a gallery feature intended to enhance user experience and engagement.

4.2. Usability Testing Stage 1

4.2.1. Analysis of Verbal Behavior

During the first usability testing session, participants interacted with the existing SIMANTEP UNIMED website while applying the Think-Aloud method. A total of 33 verbal comments were recorded, consisting of 6 positive comments (18.2%), 14 neutral comments (42.4%), and 13 negative comments (39.4%). The high proportion of negative comments indicated several usability issues related to navigation, information accessibility, and interface design. The comments are shown in Table 3:

Table 3: Examples of comments stage 1

Category	Comment
Positive	“The menu is clear.” (Henny)
Positive	“The website is simple and easy to use.” (Hadi)
Positive	“The table is good and the information is clear.” (Cristina)
Negative	“The schedule is not available here, it's troublesome because I have to log out first.” (Henny)
Negative	“I cannot see the password characters. it is difficult when I make a mistake.”
Negative	“The registration button placement is confusing.”

These findings revealed that users experienced difficulties accessing seminar schedules, viewing announcements, and changing passwords. The identified issues became the basis for the redesign recommendations.

4.2.2. Performance Measurements

The first usability testing was conducted on the existing SIMANTEP UNIMED website involving five participants. Participants were asked to complete several task scenarios while their performance and completion times were recorded. Effectiveness was evaluated using the Completion Rate (CR), which measures the proportion of participants who successfully completed the assigned tasks. A binary scoring method was applied, assigning a value of 1 for successful task completion and 0 for failure. Following the recommendations of [8] and [9], a score of 78% or above indicates acceptable effectiveness. A task was considered successful when participants completed the target task without unnecessary navigation, whereas failure occurred when participants could not locate the target task or required additional navigation to reach it. The task completion results are shown in Figure 2.

Task	Completion Rate				
	R01	R02	R03	R04	R05
1	1	1	1	1	1
2	1	1	1	1	1
3	1	1	1	1	1
4	1	1	1	1	1
5	1	1	1	0	1
6	1	1	1	1	1
7	1	1	1	1	1
8	1	1	1	1	1
9	0	0	0	0	0
10	0	0	0	0	0

Where:
1 = successful
0 = unsuccessful

Success

Succeed with difficulty

Unsuccessful

Figure 2: Task Completeness usability testing 1

The task completion results shown in Figure 2 can be interpreted as follows:

$$Completion\ Rate = \frac{40}{50}\ x\ 100\% = \ 80\%$$

The effectiveness results, measured using the Completion Rate (CR), exceeded the recommended usability threshold of 78% proposed by [9]. As shown in Figure 2, tasks 9 and 10 could not be completed successfully by all participants. In contrast, tasks 1, 3, 4, 5, 7, and 8 were completed successfully by all participants without any observed difficulties. These results indicate that most system functions were accessible and understandable to users, although certain tasks still presented usability challenges.

Efficiency was assessed using task completion time, measured in seconds for each participant. The recorded times were subsequently used to calculate the Overall Relative Efficiency (ORE), as presented in Figure 3.

Task	Overall Efficiency				
	R01	R02	R03	R04	R05
1	13	24	16	6	20
2	27	42	60	29	65
3	43	52	16	15	78
4	35	49	38	23	52
5	57	72	37	25	61
6	46	60	43	19	69
7	25	38	43	31	58
8	22	35	39	26	45
9	40	25	69	27	81
10	75	80	73	78	86

Success

Unsuccessful

Figure 3: Execution time (second) usability testing 1

Based on the execution time data presented in Figure 3, system efficiency was evaluated using the Overall Relative Efficiency (ORE) metric. The calculation was performed by comparing the total time spent on successfully completed tasks with the total time spent on all task attempts. The cumulative time for successfully completed tasks across all participants was 1,554 seconds, while the total execution time for all tasks was 2,188 seconds.

$$Overall\ Relatives\ Efficiency = \frac{1554}{2188} x100\% = 71{,}02\%$$

The resulting ORE score was 71.02%, indicating that a considerable portion of the participants' time was spent completing tasks successfully. However, the score also suggests the presence of usability issues that affected task efficiency, particularly in tasks that could not be completed successfully by all participants.

4.2.3. System Usability Scale

User satisfaction was evaluated using the System Usability Scale (SUS). The SUS questionnaire consists of ten standardized statements that were completed by each participant after finishing the usability testing session. The collected responses were then analyzed to determine the overall satisfaction and perceived usability of the system. The SUS questionnaire and participants' responses are presented in Table 4.

Table 4: SUS answer results

No	Questions	Response				
		R01	R02	R03	R04	R05
1	*I think that I would like to use this system frequently.*	4	4	2	3	2
2	*I found the system unnecessarily complex.*	4	3	5	4	5
3	*I thought the system was easy to use.*	2	5	1	2	1
4	*I think that I would need the support of a technical person to be able to use this system.*	3	3	4	3	4
5	*I found the various functions in this system were well integrated.*	3	5	3	4	2
6	*I thought there was too much inconsistency in this system.*	4	3	3	4	5
7	*I would imagine that most people would learn to use this system very quickly.*	3	3	2	2	2
8	*I found the system very cumbersome to use.*	2	4	4	4	4
9	*I felt very confident using the system.*	5	5	3	4	3
10	*I needed to learn a lot of things before I could get going with this system.*	3	2	4	3	4
	Total	33	37	31	33	32
	Final Score	52.5	67.5	32	45	20
	Average Score			**43.4**		

The SUS score was calculated by converting participant responses according to the standard SUS scoring procedure. For positively worded statements (odd-numbered items), the score contribution was obtained by subtracting 1 from the participant's response. For negatively worded statements (even-numbered items), the score contribution was calculated by subtracting the response value from 5. The adjusted scores for all ten items were then summed and multiplied by 2.5 to obtain the final SUS score for each participant.

The calculated SUS scores for participants R01, R02, R03, R04, and R05 were 52.5, 67.5, 32.0, 45.0, and 20.0, respectively. The average SUS score obtained for the existing SIMANTEP website was 43.4.

To interpret the usability level, the average SUS score was evaluated using three assessment categories: Acceptability Ranges, Grade Scale, and Adjective Ratings. Based on these criteria, the SIMANTEP website was classified as Not Acceptable in the Acceptability Range, received a Grade F in the Grade Scale, and was categorized as Poor in the Adjective Ratings.

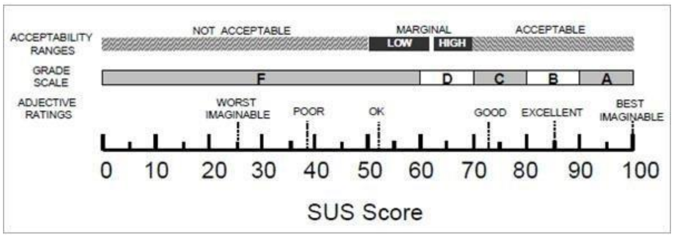

Figure 4: System Usability Scale (SUS) assessment.

According to Brooke [10], the average benchmark score for SUS is 68. Since the obtained score of 43.4 falls below this benchmark, the results indicate that the existing system does not adequately meet user expectations in terms of usability. Therefore, a redesign of the user interface and user experience, along with the addition of new features, was proposed to improve overall system usability and user satisfaction.

4.3. Prototype Development

The redesign process began with the development of user requirements derived from observations, interviews, and usability testing results. These requirements were then translated into wireframes and subsequently developed into high-fidelity prototypes using Figma. The redesigned prototype focused on improving navigation structure, enhancing information accessibility, modernizing the visual appearance, and introducing a gallery feature to support user engagement.

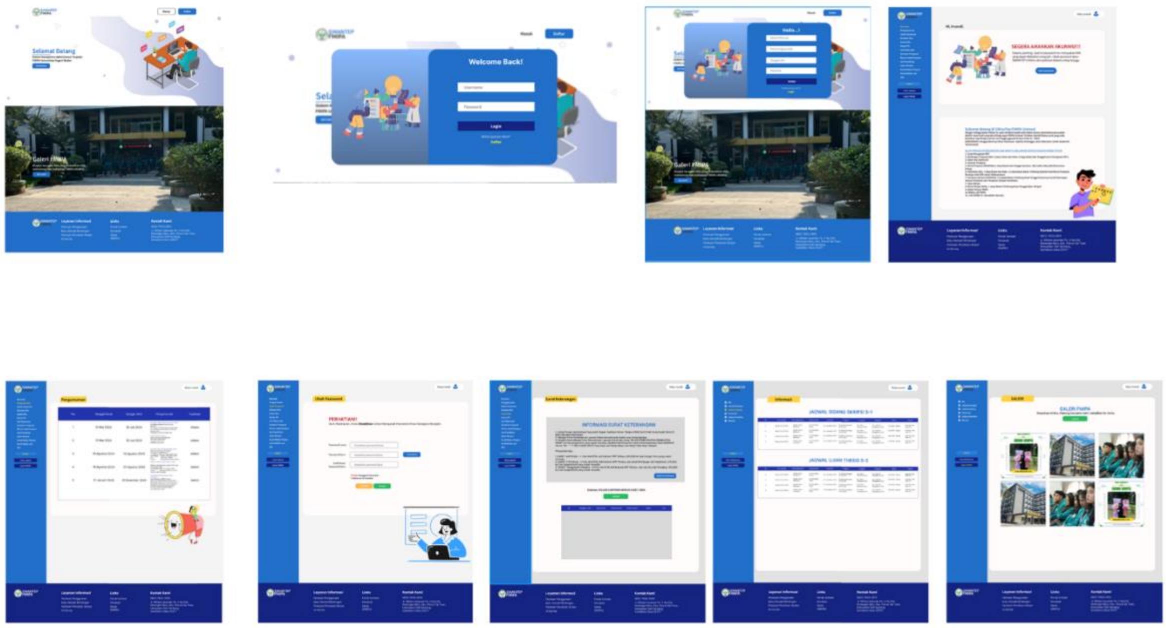

Figure 5: High-Fidelity Prototype

Figure 5 presents several high-fidelity prototype screens developed during the redesign process. The prototype includes the login page, homepage, announcement page, seminar schedule page, profile page, and gallery page. These interfaces were designed to provide a more intuitive, visually appealing, and user-friendly experience compared to the existing SIMANTEP website. The resulting prototype was subsequently evaluated through a second usability testing session involving the same participants who participated in the initial evaluation.

4.4. Usability Testing Stage 2

4.4.1. Analysis of Verbal Behavior

Following the implementation of the User-Centered Design approach, a second usability testing session was conducted using the redesigned prototype. The analysis recorded 24 comments consisting of 14 positive comments (58.3%), 7 neutral comments (29.2%), and 3 negative comments (12.5%). Compared with the first evaluation, positive comments increased substantially, while negative comments decreased significantly. The comments are shown in Table 5:

Table 5: Examples of comments stage 2

Category	Comment
Positive	“The login page looks much better now.”
Positive	“Now the login form is clearer and no longer too small.”
Positive	“The homepage looks more professional.”
Positive	“Now I can view the schedule without logging out first.”
Positive	“The gallery feature is nice and interesting to browse.”
Negative	“The announcement table is still difficult to read.”
Negative	“This page is similar to the original website, only the colors are different.”
Negative	“The text size in the table is still too small.”

The results indicate that the redesign successfully addressed most usability issues identified during the first evaluation. Participants particularly appreciated the improved login interface, schedule accessibility, password visibility feature, and the newly added gallery feature.

4.4.2. Performance Measurements

The second usability testing session was conducted to evaluate the extent to which the redesigned prototype improved the effectiveness and efficiency of the SIMANTEP system. The same task scenarios used in the first usability testing session were applied to ensure consistency and enable a direct comparison between the existing system and the redesigned prototype. Effectiveness was measured using the Completion Rate (CR), which represents the percentage of tasks successfully completed by participants. The Completion Rate results for the redesigned prototype are presented in Figure 6.

Task	Completion Rate				
	R01	R02	R03	R04	R05
1	1	1	1	1	1
2	1	1	1	1	1
3	1	1	1	1	1
4	1	1	1	1	1
5	1	1	1	1	1
6	1	1	1	1	1
7	1	1	1	1	1
8	1	1	1	1	1
9	1	1	1	1	1
10	1	1	1	1	1

Success

Unsuccessful

Figure 6: Task Completeness Prototype

$$Completion\ Rate = \frac{50}{50}\ x\ 100\% = 100\%$$

The results of the second-stage usability testing showed that all participants successfully completed all assigned tasks, yielding a completion rate of 100%. As the task completion criteria remained consistent with those used in the first-stage evaluation, this outcome suggests that the interface redesign based on the User-Centered Design (UCD) approach improved the effectiveness of the SIMANTEP website. Furthermore, the effectiveness score exceeded the average benchmark of 78% recommended by Sauro and Lewis (2005). Compared to the original system, the redesigned prototype demonstrated a substantial improvement in effectiveness, with the completion rate increasing from 80% to 100%, representing a 20% improvement.

The Efficiency value was calculated based on the task completion time of the SIMANTEP prototype, as presented in Figure 7. Using the task execution times obtained during the usability testing, the Efficiency value was determined using the Overall Relative Efficiency (ORE) formula. The calculation resulted in an Efficiency score of 100% for the redesigned prototype.

Task	Overall Efficiency				
	R01	R02	R03	R04	R05
1	13	10	12	9	14
2	19	23	26	18	30
3	11	17	21	15	23
4	20	27	35	21	39
5	15	30	35	21	39
6	10	7	18	11	20
7	18	20	32	27	32
8	16	15	25	20	27
9	20	17	27	21	23
10	10	5	12	6	13

Success

Unsuccessful

Figure 7: Execution Time (second) Prototype

$$Overall\ Relatives\ Efficiency = \frac{995}{995} x100\% = 100\%$$

This result indicates that all participants completed the assigned tasks successfully and efficiently. Compared to the original SIMANTEP website, the prototype showed a substantial improvement in efficiency, with the ORE score increasing by 28.98%, from 71.02% to 100%. These findings suggest that the User-Centered Design (UCD) approach successfully improved system efficiency and enhanced the overall user experience.

4.4.3. System Usability Scale

The SUS evaluation results are shown in Table 6.

Table 6: SUS answer results

No	Questions	Response				
		R01	R02	R03	R04	R05
1	*I think that I would like to use this system frequently.*	4	4	5	4	4
2	*I found the system unnecessarily complex.*	1	1	2	1	2
3	*I thought the system was easy to use.*	5	5	5	5	5
4	*I think that I would need the support of a technical person to be able to use this system.*	1	1	2	1	2
5	*I found the various functions in this system were well integrated.*	5	4	4	5	4
6	*I thought there was too much inconsistency in this system.*	1	1	2	1	2
7	*I would imagine that most people would learn to use this system very quickly.*	5	5	5	4	4
8	*I found the system very cumbersome to use.*	1	1	2	1	2
9	*I felt very confident using the system.*	5	4	5	5	5
10	*I needed to learn a lot of things before I could get going with this system.*	1	2	1	2	2

Total	**28**	**29**	**33**	**29**	**32**
Final Score	90	92.5	87.5	97.5	80
Average Score			**89.5**		

The second-stage System Usability Scale (SUS) evaluation of the SIMANTEP website resulted in a score of 89.5. Based on the SUS interpretation criteria, the SIMANTEP prototype was classified as Acceptable in the acceptability range, received a Grade B rating, and achieved an Excellent adjective rating.

Since the score exceeds the average SUS benchmark of 68 [10], the results indicate a high level of user satisfaction. Compared to the original SIMANTEP website, the prototype showed a substantial improvement in satisfaction, with the SUS score increasing by 46.1 points from 43.4 to 89.5. These findings demonstrate that the redesign successfully enhanced the user interface and user experience of the system.

5. Conclusion

This study applied the User-Centered Design (UCD) approach to redesign the SIMANTEP UNIMED website by identifying user needs through interviews and usability testing. The initial evaluation, conducted using the Think-Aloud method with five participants, revealed several usability issues related to navigation, information accessibility, and user satisfaction. The first-stage usability testing produced effectiveness, efficiency, and satisfaction scores of 80%, 71.02%, and 43.4, respectively. In addition, Analysis of Verbal Behavior (AVB) identified 33 comments, consisting of 18.2% positive, 42.4% neutral, and 39.4% negative comments. These findings indicated that the existing interface did not adequately support user needs, particularly in accessing seminar and thesis schedule information, and highlighted the need for interface improvements based on user feedback.

Based on the identified issues, the website was redesigned by improving login page elements, ensuring consistent access to information pages in both login and logout states, and introducing the FMIPA Gallery feature to enhance user experience. The second-stage evaluation demonstrated substantial improvements across all usability attributes. Effectiveness and efficiency scores increased to 100%, while the satisfaction score measured using the System Usability Scale (SUS) rose to 89.5. AVB results also showed a positive shift in user perceptions, with positive comments increasing to 58.3% and negative comments decreasing to 12.5%. Compared to the original system, the redesigned prototype achieved improvements of 20% in effectiveness, 28.98% in efficiency, and 46.1 points in satisfaction. These results confirm that the UCD approach effectively addressed usability issues and enhanced the overall user experience of the SIMANTEP UNIMED website. Furthermore, the findings contribute to the application of UCD, Think-Aloud, and AVB in UI/UX evaluation and provide practical recommendations for future development of the SIMANTEP UNIMED platform.

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