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Redesign the user interface (UI) and user experience (UX) for websites using the design thinking method

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ABSTRACT

The Samudra University Informatics Study Program website serves as a vital information hub for students and other users. The comfort and experience users gain when accessing a website are critical factors to consider when designing a user interface. Currently, the Informatics Study Program website is underutilized. Redesign efforts are necessary to optimize its functionality by developing an improved user interface. Data collection was conducted using evaluations and questionnaires to enhance the user-centered approach. The redesign was carried out using the design thinking method, with the interface designed using Figma tools. Design thinking is a solution-oriented design approach that aids in problem-solving and understanding user needs. Initial evaluations indicate that the average user satisfaction score was at a "Bad" level. After implementing the design thinking process, the new design achieved "Above Average" ratings in attractiveness, perspicuity, efficiency, and dependability, a "Good" rating in stimulation, and an "Excellent" rating in novelty. A comparison of average values reveals significant improvements between the old and new designs: attractiveness improved by 1.14, perspicuity by 1.34, efficiency by 1.52, dependability by 1.57, stimulation by 1.69, and novelty by 1.67. These results demonstrate that the website redesign is effective and enhances the user experience.

1. Introduction

In the current digital era, disseminating information via the internet and websites has become crucial for academic administration. Academic institutions are formal educational entities that provide education in specific branches of science, technology, or art. With technological advancements, a structured data-driven academic system is essential for all educational institutions, particularly universities in Indonesia today [1]. This includes disseminating information about study programs, curricula, lectures, student activities, and the latest updates. The Informatics Study Program at Samudra University recognizes this need and uses its website as a primary tool for

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sharing information with students, prospective students, and the general public. The number of users accessing the website reflects their trust and comfort in its functionality. However, an evaluation of user satisfaction reveals that the Informatics Study Program website currently scores poorly.

Several studies have explored user interface redesign. For instance, the application of the design thinking method in redesigning the UI/UX of Sriwijaya University's SIMAK (Academic Information System) for a mobile platform focused on a design thinking approach. Testing with the User Experience Questionnaire (UEQ) categorized the redesigned interface as "Good." However, the study did not compare user satisfaction before and after the redesign, making it impossible to assess significant improvements [2]. In contrast, this research uses UEQ to measure user satisfaction at two stages, enabling a comparison of satisfaction score improvements. The average UEQ scores for the Informatics Study Program website show 0.34 for attractiveness, -0.06 for perspicuity, -0.02 for efficiency, -0.10 for accuracy, -0.09 for stimulation, and 0.03 for novelty [2].

The application of the design thinking method in redesigning the UI/UX of the Ngaji.AI application positively impacted user assessments. Testing with the System Usability Scale (SUS) showed significant improvements. Initially, the application scored an average of 50.25, indicating room for improvement in usability and satisfaction. After the redesign, the average score increased to 83.75, earning a "B" grade and an "excellent" rating, reflecting high user satisfaction [3]. Similarly, the UI/UX redesign of PT MNO's company profile website used detailed design thinking steps, including user personas, affinity diagrams, "how-might-we" statements, sitemaps, and user flows to thoroughly map user needs. The redesign resulted in a five-page design solution. Testing showed average scores of 6.2 for task 1, 5.6 for task 2, 6.0 for task 3, 6.0 for task 4, and 6.4 for task 5. According to Single Ease Question (SEQ) theory, scores above 5.5 indicate that tasks are considered successful or easy to perform [4].

Despite the advancements in UI/UX redesign studies, existing research often lacks comprehensive comparisons between pre- and post-redesign user satisfaction levels, as seen in the SIMAK study [2]. This study contributes to the field by providing a comprehensive evaluation of the Informatics Study Program website's UI/UX redesign using the design thinking method, with a focus on quantifiable improvements in user satisfaction. By employing the UEQ to measure satisfaction at two stages—before and after the redesign—this research offers a clear comparison of user experience metrics, addressing the gap in prior studies [2]. Additionally, it provides a practical application of design thinking tailored to the context of Indonesian academic websites, offering insights into optimizing user-centered design for educational institutions. The findings, including significant improvements in attractiveness (1.14), perspicuity (1.34), efficiency (1.52), dependability (1.57), stimulation (1.69), and novelty (1.67), serve as a benchmark for future UI/UX redesigns in similar contexts.

Given these findings, redesigning the Informatics Study Program website is necessary to meet user needs and enhance its functionality. This study employs the design thinking method, which consists of five stages: Empathize, Define, Ideate, Prototype, and Test [5]. Design thinking provides a solution-based approach to problem-solving [6] and is effective for addressing complex issues by prioritizing user needs. Its advantages include fostering innovative ideas during the inspiration phase and allowing iterative implementation to explore solutions [7]. Research highlights that design thinking's human-centered approach—emphasizing empathy, ideation, and iterative prototyping—creates aesthetically pleasing and functional interfaces that align with user preferences [8]. Thus, design thinking is well-suited for UI/UX design, as it ensures user needs are met, enhancing satisfaction when using the website [9].

The comfort and experience users gain when accessing a website are critical factors in user interface design. A product's design should not only focus on appearance or assumed issues but also address the root problems faced by target users, including students [10]. Currently, the Informatics Study Program website is underutilized, necessitating a redesign to optimize its functionality through an improved user interface. This aims to enhance the user experience. To achieve this, research is conducted to identify user needs, ensuring the redesigned website interface meets those needs effectively. Based on this, the author undertakes this research by applying the design thinking method.

2. Material and method

The research process begins with a literature review, which involves identifying references to inform the design. These references may include journals, books, and prior studies. The process then proceeds to the Design Thinking methodology, which consists of five stages: empathize, define, ideate, prototype, and test. After completing the Design Thinking stages, the research concludes with drawing conclusions and adding footnotes related to the title or other relevant details.

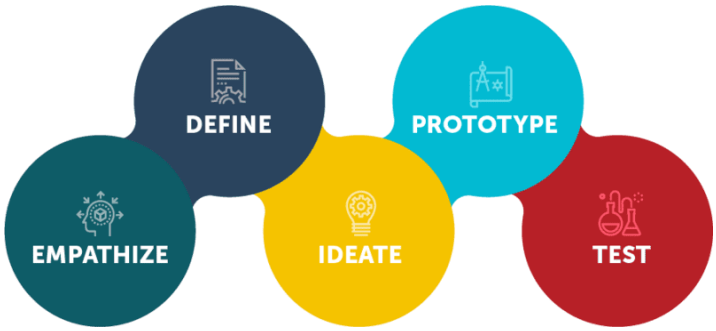

Fig. 1. The Design Thinking methodology.

	1	2	3	4	5	6	7		
annoying	○	○	○	○	○	○	○	enjoyable	1
not understandable	○	○	○	○	○	○	○	understandable	2
creative	○	○	○	○	○	○	○	dull	3
easy to learn	○	○	○	○	○	○	○	difficult to learn	4
valuable	○	○	○	○	○	○	○	inferior	5
boring	○	○	○	○	○	○	○	exciting	6
not interesting	○	○	○	○	○	○	○	interesting	7
unpredictable	○	○	○	○	○	○	○	predictable	8
fast	○	○	○	○	○	○	○	slow	9
inventive	○	○	○	○	○	○	○	conventional	10
obstructive	○	○	○	○	○	○	○	supportive	11
good	○	○	○	○	○	○	○	bad	12
complicated	○	○	○	○	○	○	○	easy	13
unlikable	○	○	○	○	○	○	○	pleasing	14
usual	○	○	○	○	○	○	○	leading edge	15
unpleasant	○	○	○	○	○	○	○	pleasant	16
secure	○	○	○	○	○	○	○	not secure	17
motivating	○	○	○	○	○	○	○	demotivating	18
meets expectations	○	○	○	○	○	○	○	does not meet expectations	19
inefficient	○	○	○	○	○	○	○	efficient	20
clear	○	○	○	○	○	○	○	confusing	21
impractical	○	○	○	○	○	○	○	practical	22
organized	○	○	○	○	○	○	○	cluttered	23
attractive	○	○	○	○	○	○	○	unattractive	24
friendly	○	○	○	○	○	○	○	unfriendly	25
conservative	○	○	○	○	○	○	○	innovative	26

Fig. 2. User Experience Questionnaire (UEQ) questiotionaire.

We employ the Design Thinking methodology, which generally involves the stages of empathize, define, ideate, prototype, and test [11]. This method generates ideas and solutions to address common issues faced by digital product users [12]. Before entering the Design Thinking process, the researcher conducts a literature review to identify previous studies as a reference for the research.The Design Thinking method provides a solution-based approach to problem-solving. It is highly effective in addressing complex problems by understanding user needs [6]. This approach focuses on potential users, prioritizing their desires and needs before proceeding to the next production phase. The Design Thinking process consists of five stages—empathize, define, ideate, prototype, and test—with three of these stages focused on determining user needs to establish system requirements (see Fig. 1).

In this study, the application of Design Thinking helps researchers gain a deep understanding of user needs. During the empathize stage, questionnaires are used to gather user insights. The define stage helps formulate the problem accurately by creating user personas, which are then organized using affinity mapping. The ideate stage translates these insights into an initial application prototype. The prototype is then evaluated during the test stage through user questionnaires to measure improvements in user satisfaction. This approach ensures that the final results of the study are relevant and aligned with user needs.

Table 1
UEQ modification questions

No	Variable	Questions
1	Attractiveness	What is your response regarding the layout placement on the Informatics study program website?
2	Attractiveness	Does the Informatics department website, overall, display good content?
3	Attractiveness	When you look at the appearance of the Informatics department website, does it improve your mood?
4	Attractiveness	Is the color composition on the website comfortable to look at, or does it instead cause eye strain?
5	Attractiveness	How attractive is the user interface design of the Informatics department website?
6	Attractiveness	Are you familiar with the icons used on the website?
7	Perspicuity	How well do you understand the navigation flow of the Informatics department website?
8	Perspicuity	Do you find it difficult to learn how to use the Informatics department website when accessing it?
9	Perspicuity	Is the navigation flow of the Informatics department website clear and easy to understand?
10	Perspicuity	In your opinion, are the menus and sub-menus on the Informatics department website well organized?
11	Efficiency	How quickly can you obtain the latest academic information on the website?
12	Efficiency	Are the sizes of the contents on the website pages efficient to use and comfortable to view?
13	Efficiency	Is it practical to search for information on the Informatics department website?
14	Efficiency	In your opinion, do you find the layout placement on the Informatics department website complicated?
15	Dependability	Do you feel that this website is lacking innovation in predicting user needs or preferences?
16	Dependability	Does the Informatics department website support obtaining the latest news about the department?
17	Dependability	Do you feel secure when your data is on the Informatics department website?
18	Dependability	How complete are the features of the Informatics department website?
19	Stimulation	How helpful do you find the Informatics department website when using it?
20	Stimulation	Do you feel satisfied and happy when browsing the Informatics department website?
21	Stimulation	How interested are you in the color choices on the Informatics department website?
22	Stimulation	Do the motivational words on the Informatics department website motivate you?
23	Novelty	How appealing is the color composition between the background, text, and other components on the Informatics department website?
24	Novelty	Does the Informatics department website provide you with a new experience when browsing it?
25	Novelty	How often do you see other website designs that are similar to the Informatics department website?
26	Novelty	Does the Informatics department website have its own distinctive (unique) characteristics?

Design Thinking is an integrative approach that considers the framework conditions to solve problems effectively [7]. In the testing stage, researchers used the User Experience Questionnaire (UEQ) evaluation method, which enables quick and direct measurement of user experience in the redesign of the Informatics Study Program website interface [13]. The questionnaire items are shown in Fig. 2. The results will be analyzed using data analysis tools available on the official UEQ website (https://www.ueq-online.org/). The testing process involves several students accessing the prototype via a browser-accessible link. Students are asked to complete the UEQ questionnaire provided by the researchers to assess the design quality, user experience, and provide feedback for further development to enhance user comfort.

3. Results and discussion

The website of the Informatics Study Program requires a redesign to optimize its performance, as the current display and navigation structure are less intuitive, making it difficult for users to find important information. This questionnaire employs the User Experience Questionnaire (UEQ) by modifying its questions while still addressing six aspects: attractiveness, perspicuity, efficiency, dependability, stimulation, and novelty. The questioners modifiee from UEQ can be found in Table 1.

To evaluate a system, service, or product using the UEQ, a minimum of 20 to 30 respondents is sufficient to produce relatively stable results [14]. This research involved 49 respondents, consisting of active students from the classes of 2020–2023 in the Informatics Study Program. The design process was conducted using Figma, a cloud-based design and prototyping tool for digital projects. Figma is designed to facilitate collaboration, enabling users to work as a team in real time from anywhere [15]. The research process consists of five stages based on the design thinking method.

Table 2
Questionnaire result data.

No	Scale	Mean	Comparisson to benchmark
1	Attractiveness	0.34	Bad
2	Perspicuity	-0.06	Bad
3	Efficiency	-0.02	Bad
4	Dependability	-0.10	Bad
5	Stimulation	-0.09	Bad
6	Novelty	0.03	Bad

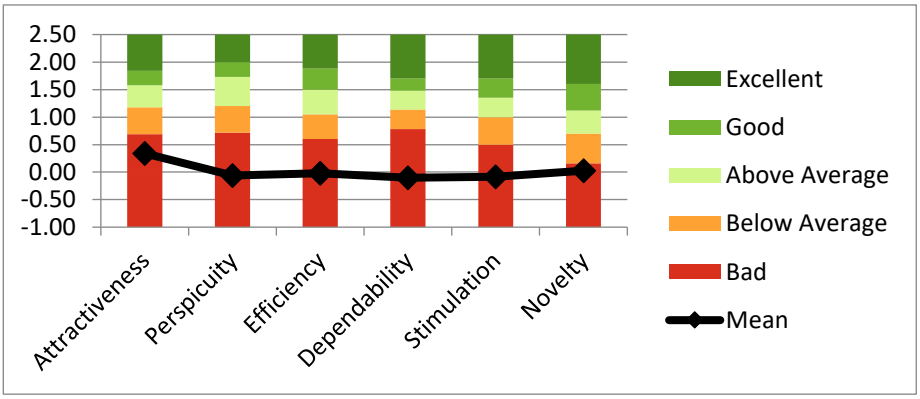

Fig. 3. Website evaluation benchmark results.

3.1. Empathize

The empathize stage is the phase where an approach is taken to understand users' wants and needs [16]. At this stage, research involves collecting data by distributing an initial questionnaire to gather information and identify issues with the website. User Experience (UX) is analyzed using the User Experience Questionnaire (UEQ), which consists of six variables: attractiveness, perspicuity, efficiency, dependability, stimulation, and novelty [17]. Modifications were made to the questionnaire to clarify the assessment, enabling users to evaluate the website in greater detail for optimal results.

Data from UEQ was analyzed by calculating the mean for each scale (Attractiveness, Efficiency, Perspicuity, Dependability, Stimulation, and Novelty). This approach enables researchers to quantitatively assess user perceptions of each aspect of the user experience. The mean is calculated by summing the scores from each question item and dividing by the total number of items to obtain an average score per respondent. The final calculation aggregates these scores to compute an overall mean for each of the six UEQ aspects across all respondents, as shown in Table 2. The results are presented as benchmarks to provide an overview of user satisfaction levels with the website (see Fig. 3). The evaluation of user satisfaction with the website design indicates that the informatics study program's benchmark is poor. This suggests that the website requires a redesign to optimize the user experience.

3.2. Define

The Define stage is the phase where problems identified during the Empathize stage are analyzed and clearly articulated [18]. This stage focuses on synthesizing data collected from users to identify relevant pain points and clarify the issues at hand. To establish connections, we must externalize our insights by displaying them visually—such as posting pictures of users, notes with quotes, maps of user journeys, or other materials that capture their impressions and experiences [19]. The Define stage involves creating user personas (see Fig. 4), conducting affinity mapping (see Fig. 5), and formulating "How Might We" (HMW) questions (see Table 3). Creating user personas involves collecting data to define user characteristics, which guide software development [20]. Unlike the UEQ used in the Empathize stage to evaluate the website's user experience, user personas are developed using questionnaires designed to explore users' backgrounds, needs, preferences, and desired website features. The resulting data is organized through affinity mapping, which groups findings into themes or categories. This process helps identify key user needs and areas requiring special attention in the design. Based on the affinity mapping results, ideas are formulated into HMW questions, which guide the development of creative and relevant design solutions. HMW questions transform problems or challenges into opportunities for ideation [21].

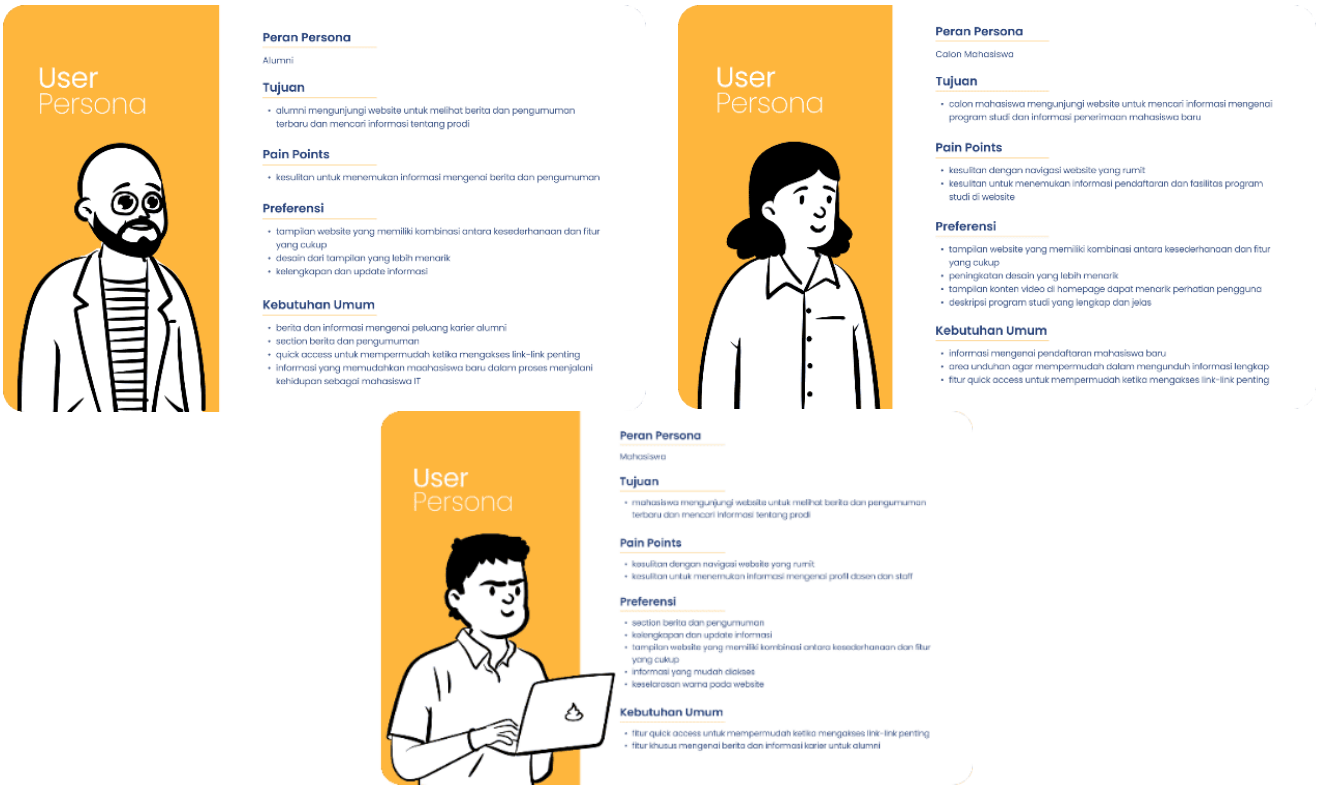

Fig. 4. User Persona.

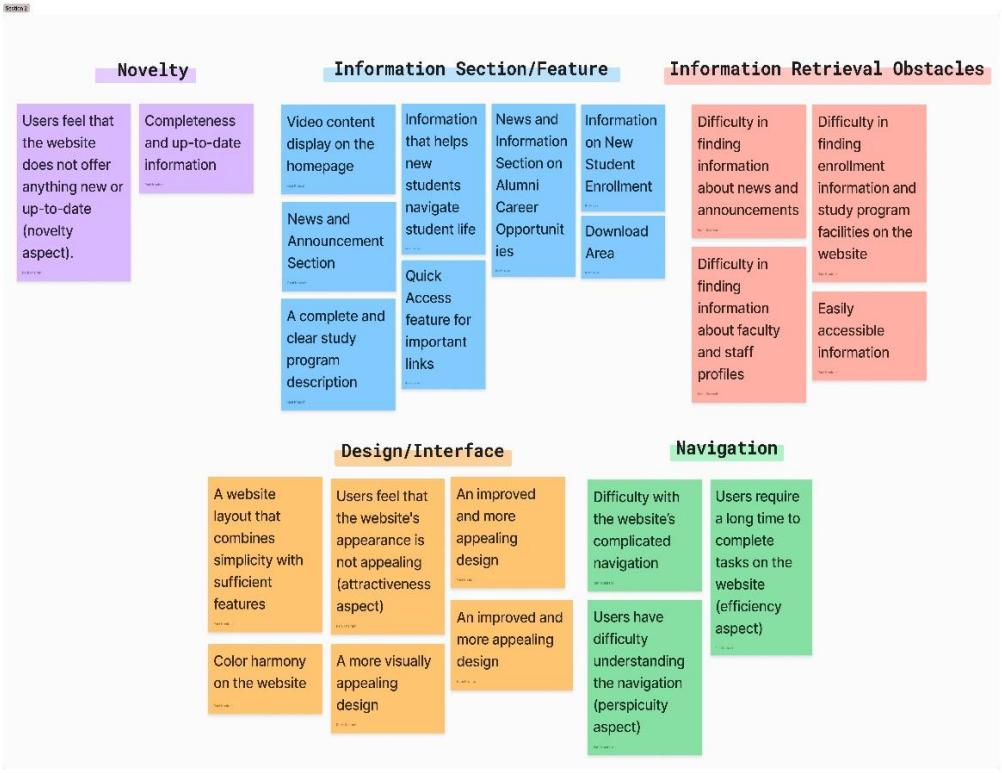

Fig. 5. Affinity Mapping.

Affinity mapping is a technique used to externalize, interpret, and organize large amounts of unstructured, diverse, and seemingly dissimilar qualitative data [22]. It groups findings from the UEQ questionnaire and user personas into categories or themes based on identified patterns, relationships, or issues. This process transforms complex problems into targeted challenges, fostering creative ideas for design solutions. The "How Might We" (HMW) method is an innovative technique that generates novel approaches by formulating questions. Starting each question with “How might we ...” ensures a consistent framework for addressing the Design Challenge [23]. This process ensures that each question accurately reflects user needs, providing a solid foundation for ideation and solution development.

Table 3
"How Might We" questions and solutions

No	Pain points	"How Might We" questions	Solution
1	Users feel a lack of completeness and updated information	How to ensure that news and announcements are easily accessible to users?	Place the news and announcements section at the beginning of the website homepage
2	Difficulties in finding information	How to help users find relevant information quickly?	Placing a search feature in the top bar of the website to make it easier for users to access
3	Difficulty understanding navigation	How to simplify the navigation structure to make it more time-efficient?	Reorganizing the site map for more structured navigation
4	Lack of design consistency in the visual and functional elements of the website	How to create a visually consistent and appealing website design?	Using a consistent layout design across all pages
5	The website's appearance feels unappealing to users	How to create a harmonious color combination to enhance aesthetics and user experience?	Establishing a primary, secondary, and neutral color palette as the website's color identity
6	The color harmony and design do not create an enjoyable experience	How to ensure color harmony and aesthetics to enhance the user experience?	Using colors according to the gradient of the color palette that has been defined.
7	The balance between simplicity and adequate features has not been achieved	How to create a combination of simple visual elements and adequate features?	Consistent in design and providing functional features
8	Lack of structured and clear information about the study programs, registration, and campus live	How to present information about study programs, registration, and campus life clearly and make it easily accessible for students/prospective students?	Presenting information about study programs on the website's homepage so that users can easily find and access it
9	Difficulty accessing information about alumni career opportunities	How to present information about student affairs and alumni?	Creating a dedicated page for information about alumni and career opportunities
10	Difficulty accessing when downloading important documents	How to make it easier for users to access and download important documents?	Creating a dedicated page for document downloads and important information
11	Difficulty finding and accessing important academic links	How to create quick access to important links so users don't have to search manually?	Adding a top bar that functions as quick access to important academic links frequently visited by users

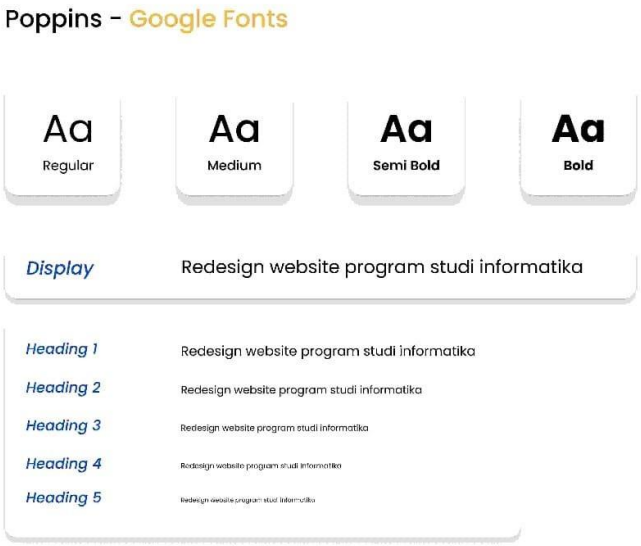

Fig. 6. UI Style Guide.

3.3. Ideate

After the define stage, the process continues with the ideate stage, which focuses on generating ideas and solutions based on the identified problems. These ideas will serve as the foundation for designing the prototype [21]. Ideate is the stage of collecting creative ideas to create new solutions to improve the appearance of user

interface on website based on the results of research at the previous stage. Ideate includes creating a UI style guide (see Fig. 6), color palette (see Fig. 7), and site map (see Fig. 8). UI Style Guide includes elections font and colors to be used in the design. Fonts poppins are chosen because display font, which is clean, modern and well readable in all devices. Poppins It also has great flexibility so that it can be adapted to the appearance of the design to obtain optimal readability [24]. The color selection has also been adjusted to the right composition so that it looks comfortable in the user's eyes. According to various studies in both art and science, color combinations—rather than single colors alone—are necessary to evoke specific emotions [25]. Blue was adopted as the primary color to create a calm and professional appearance. While yellow is the secondary color to highlight important elements and give them a fresh twist. Using black and white as neutral colors aims to increase readability, create strong contrast, and give the impression of a clean and elegant appearance.

Sitemap functions as the main structure for the floor plan depiction on website and to determine flow each page of the menu and sub-menu on website before redesign. A sitemap is important when designing a website so that there is an image of the content of each website page [26]. This design was carried out by evaluating and regrouping menus and menus sub-menu which you already have website informatics study program to be more structured and create clear navigation for users.

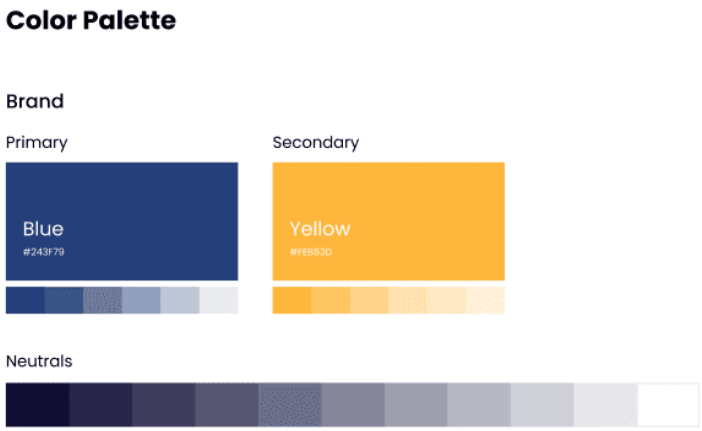

Fig. 7. Color palette.

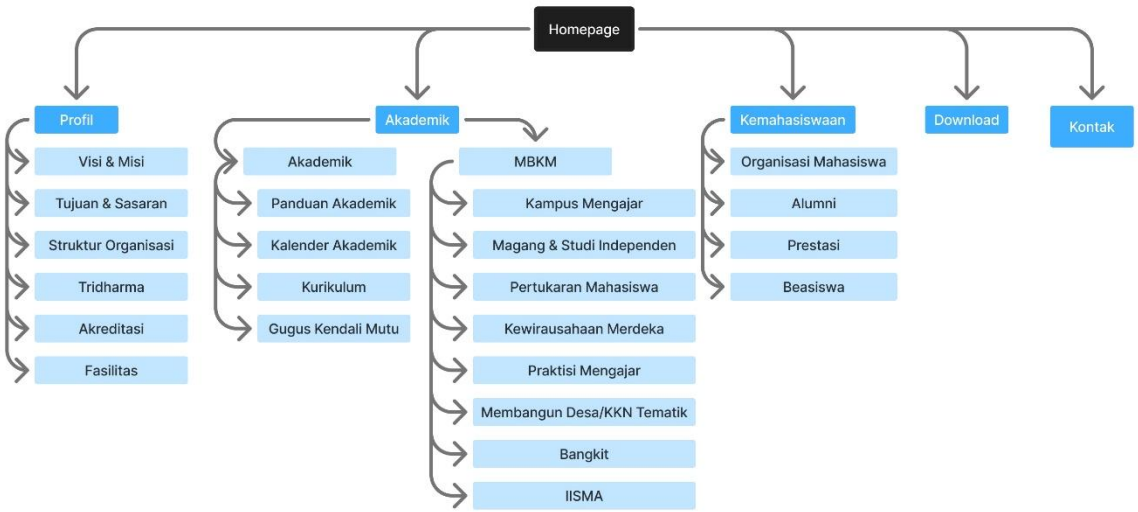

Fig. 8. Sitemap.

Fig. 9. Homepage prototype.

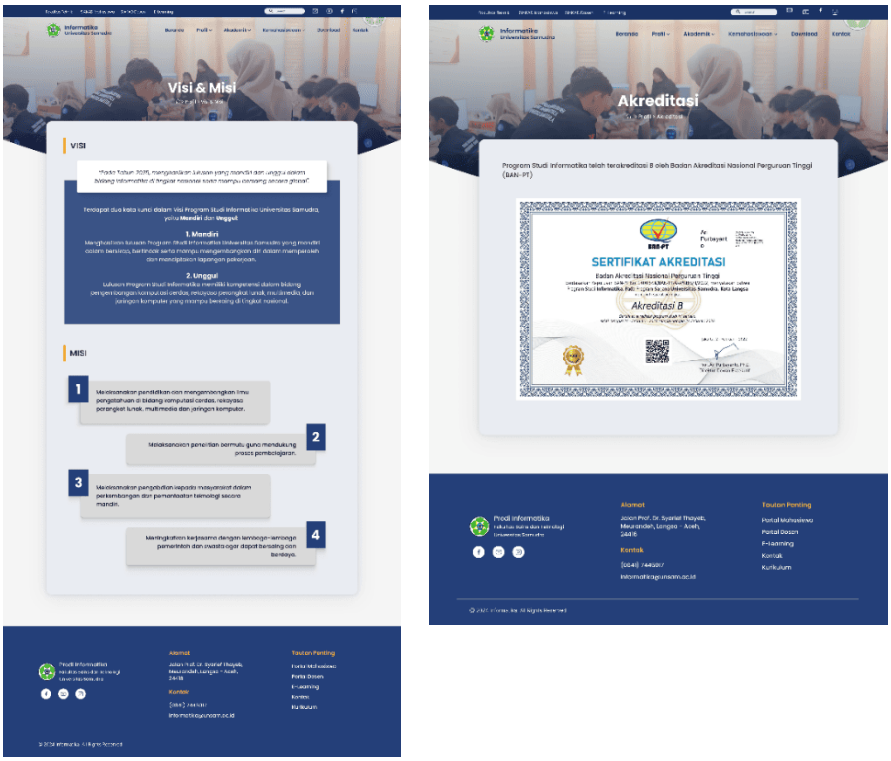

Fig. 10. Content prototype.

3.4. Prototype

After going through four research stages which include problem identification, problem formulation and creating new solutions, this research entered the stage prototype. Prototype is an initial design of an application that aims to detect errors early and to explore new possibilities [27]. At this stage, the results from the previous stages are used to design and develop the user interface to achieve user satisfaction. The prototyping stage is divided into two phases: low fidelity and high fidelity [28]. Low-fidelity prototypes are quick as well as being a flexible set of sketches or storyboards that illustrate conceptual aspects of an application's tasks and task flows [29]. The prototype stage will be divided into creating a mockup and designing a prototype. After building a

wireframe/prototype low fidelity, the next step is to develop a mockup in the form of a hi-fi (high fidelity) design, where in this section is the interface or visual display that has been given color and writing/typography. Then, the final part is designing a prototype based on the results of the design solution or mockup that has been previously created to be tested as validation with potential target users to see whether it meets the user's needs [4]. Fig. 9 and Fig. 10 are the proposed prototype design.

3.5. Test

The test phase is the final stage of the Design Thinking method, determining the success of the website redesign. This phase involves gathering diverse user feedback on the final designs developed during the prototype phase. Although it is the final stage, the process is cyclical, allowing for iteration and revisiting earlier design stages if issues are identified [30]. The test phase included 56 respondents, comprising students and the public, to obtain a broader perspective on user satisfaction.

During this stage, the prototype is tested with users and the results are shown in Table 4. The average scores from user testing of the prototype website design showed improvements across all six aspects. The attractiveness score increased to 1.48 after establishing the primary, secondary, and neutral color palette as the website's color identity. The perspicuity aspect reached 1.28 after reorganizing the site map. Presenting information by category improved user efficiency, achieving a value of 1.50. The dependability aspect rose to 1.47 after standardizing the website layout for a more consistent appearance across pages. Placing the news and announcements section at the top of the homepage increased the stimulation value to 1.60. The novelty aspect reached 1.70 after adding a top bar for quick access, enhancing user convenience.

A benchmark comparison between the old design and the redesigned version showed significant improvement. The old design was rated as poor, while the redesigned version achieved above-average ratings, classified as good to excellent. The results of the benchmark are shown in Fig. 11.

Table 4
Final calculation result of the test from the UEQ average

Scale	Mean	Comparisson to benchmark
Attractiveness	1.48	Above Average
Perspicuity	1.28	Above Average
Efficiency	1.50	Above Average
Dependability	1.47	Above Average
Stimulation	1.60	Good
Novelty	1.70	Excellent

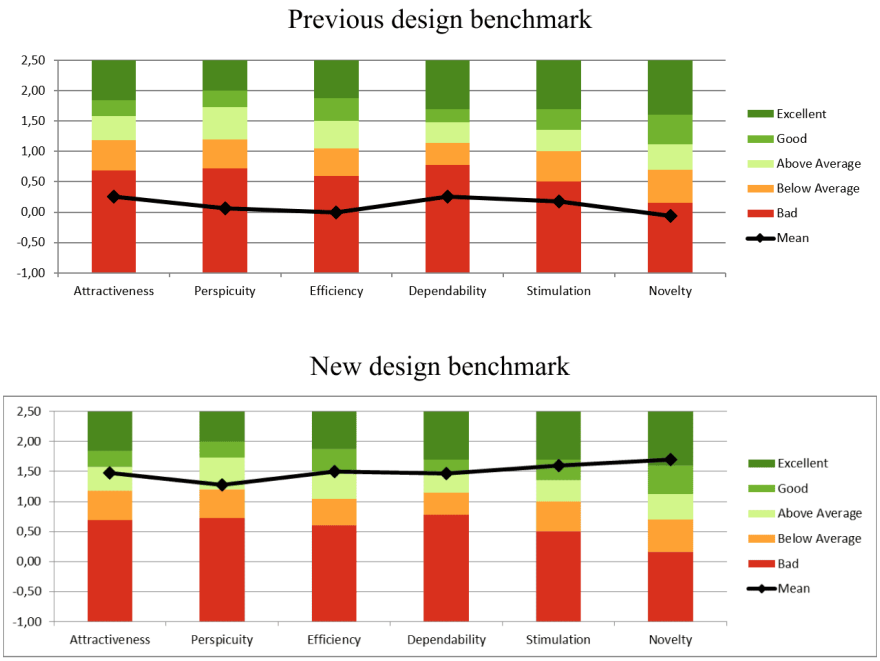

Fig. 11. Comparison between the two benchmarks.

4. Conclusions

This study utilized the Design Thinking methodology to redesign the user interface (UI) and user experience (UX) of the Informatics Study Program website. An evaluation based on the six core aspects of the User Experience Questionnaire (UEQ) indicated that the original website design was rated in the "Bad" category, necessitating a comprehensive redesign. Consequently, a prototype was developed to deliver an enhanced, dynamic user experience.

Testing of the redesigned prototype revealed significant improvements across all six UEQ aspects. The prototype achieved "Above Average" ratings for attractiveness, perspicuity, efficiency, and dependability, a "Good" rating for stimulation, and an "Excellent" rating for novelty. A comparative analysis of mean scores between the original and redesigned designs showed substantial improvements: attractiveness increased by 1.14, perspicuity by 1.34, efficiency by 1.52, dependability by 1.57, stimulation by 1.69, and novelty by 1.67. Overall, the mean scores for the redesigned prototype across all six UEQ aspects were markedly higher than those of the original design.

For future development, it is recommended that the prototype be implemented as a fully functional website to realize its full potential. Additional refinements in attractiveness, perspicuity, efficiency, dependability, and stimulation are necessary to optimize performance and user satisfaction. These findings affirm the efficacy of the Design Thinking approach in improving website usability and user experience, laying a robust foundation for ongoing advancements in web design for academic programs.

Declaration statement

Rani Khairani: Conceptualization, Methodology, Writing-Original Draft. **Khairul Muttaqin**: Collecting data. **Nurul Fadillah**: Writing-Review & Editing.

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Data availability statement

All data generated or analyzed during this study are included in this published article and its supplementary materials.

AI Usage Statement

Generative AI and AI-assisted tools were used to enhance the language and readability of this manuscript. The authors have reviewed and revised all AI-generated content to ensure its accuracy and alignment with the research. The authors remain fully responsible for the work's scientific content, conclusions, and integrity, and disclose the use of AI to ensure transparency and adherence to publisher guidelines.

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