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User Interface Redesign for the Course Card Filling Feature in the SIKAD Mobile Web Application using Goal-Directed Design Method

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Abstract−The SIKAD mobile web application is a platform for an online-based Academic Information System developed by the Islamic University of Riau. The primary objective of this application is to facilitate various crucial processes such as Course Card Filling, printing of Study Result Cards, transcript printing, viewing payment history, and leave application. However, after conducting a usability evaluation using the System usability scale (SUS) involving 5 respondents, namely students of the Islamic University of Riau, it was found that the SUS score for this application was 60.0. Additionally, through interviews with the head of the development team and the respondents, issues were identified in the Course Registration interface which involved Course Card Filling and Course Card Printing feature. These issues were related to an untidy layout, unclear information, and inappropriate button placement on the screens of each respondent's device. Consequently, the user experience in using the SIKAD mobile web application was less satisfactory for the students. Therefore, the objective of redesigning the SIKAD mobile web application is to enhance the user experience in the Course Registration on the mobile platform and improve user satisfaction. The method employed for this redesign is Goal-Directed Design (GDD), which is suitable for meeting user needs and objectives. The redesigned interface will be evaluated using the System usability scale (SUS) to measure the extent to which the desired goals have been achieved. Through the GDD approach, it is anticipated that interface issues in this application can be addressed, and the set objectives can be fulfilled, resulting in an overall improvement in the usability of the SIKAD mobile web application.

Keywords: Goal-Directed Design (GDD); Mobile Web Application; Usability; User Interface; System Usability Scale (SUS)

1. INTRODUCTION

SIKAD mobile web is an online-based application system that provides information services for all students of Universitas Islam Riau. SIKAD, as a digital service, serves as a platform for registration Course Plan Card and printing Course Plan Cards. However, according to several interviewed students, the SIKAD mobile web has some shortcomings in terms of user interface that are still less satisfying. This is because certain information, such as class and course details, is challenging to comprehend. The layout arrangement is not well-integrated, lacks appeal, and tends to be less user-friendly that cause many students express confusion when using the application due to these issues. To assess the usability level of the SIKAD application, a usability evaluation and interviews were conducted with five student respondents from Universitas Islam Riau. These respondents were selected based on the criterion of having used the application a minimum of 3-5 times. After conducting a usability evaluation using the System Usability Scale (SUS), a SUS score of 60.0 was obtained. The SUS results reveal a significant disparity between the usability level of the SIKAD mobile web application (SUS score = 60.0) and the usability level of a well-designed website or application (SUS score = 68.2) [1]. After conducting the usability assessment utilizing SUS, short interviews were carried out with respondents to discuss the primary concerns related to the interface of the SIKAD mobile web application. Issues in usability were identified within the dashboard menu and information for choosing course. In Dashboard menu (Figure 1) there is a problem where the images used for information are too large, leading to confusion among students when viewing them. Additionally, the button arrangement on the dashboard appears to be disorganized.

Figure 1. Dashboard Menu

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In Course Plan Card Registration menu (Figure 2) there is a problem where the presented information is cut off, and the table arrangement seems disorderly. Moreover, the registration process involves a considerable number of tasks, and the user interface is not very informative.

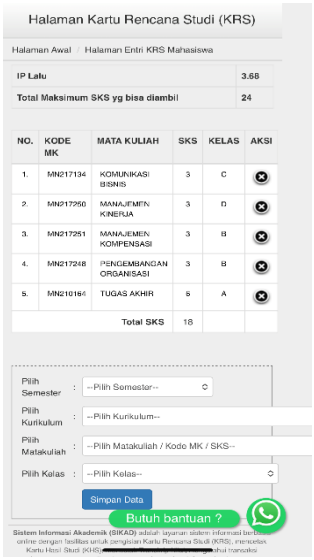

Figure 2. Course Plan Card Registration Menu

In Print Course Plan Card menu (Figure 3) there is a problem where the presented information is truncated and does not align with the device screen, causing the page display to be disorganized. Additionally, the layout arrangement is also not tidy.

Figure 3. Print Course Plan Card Menu

Following the usability evaluation using SUS, a subject matter interview was conducted with one of the stakeholders recognized as a subject matter expert, namely the Head of Sistem Informasi dan Akademik (SIMFOKOM), who oversees SIKAD. The primary goals for the SIKAD application was successfully established, which is to enhance the user experience in the Course Plan Card registration feature on the mobile platform. The primary goal is to provide students with a more intuitive, efficient, and error-minimizing experience in the Course Plan Card registration process. With a focus on user comfort factors, it is expected that the developed design solutions can offer clear guidance, simple navigation, and well-organized layouts, thereby reducing potential barriers that students may encounter during the Course Plan Card registration process.

The method to be employed in the redesign process of the user interface is Goal-Directed Design (GDD). GDD is an approach in user experience design that aims to achieve desired goals by focusing on users' needs and goals while also addressing business/organizational and technical imperatives [2]. In this case, the primary goal is to enhance the usability of the SIKAD mobile web application, particularly in the Course Plan Card registration feature. GDD enables researchers to guide the design towards achieving this goal.

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Drawing upon the prior study conducted by Siti Nur Laila in 2016, titled "UI Design of Collaborative Learning App for Final Assignment Subject Using Goal-Directed Design," which serves as a foundational reference for shaping the structure and details of this research. The findings of this research indicate that employing the Goal-Directed Design method yields a user interface design that successfully aligns with users' objectives. The final design testing, attains a usability rating of 84.14%, signifying a "very good" level, while the students' user persona achieves an average usability rating of 88.05%, also categorized as "very good.". Goal-Directed Design method can be roughly divided into six phases: Research, Modeling, Requirements Definition, Framework Definition, Refinement, and Support [3]. Therefore, the use of the GDD method is expected to address the user interface issues in this application and fulfill the desired objectives, leading to an improvement in the usability of the SIKAD mobile web application.

2. RESEARCH METHODOLOGY

2.1 Research Stages

Goal-Directed Design (GDD) is a method centered on users' goals, needs, and preferences, aiming to understand how users want to use a product and the outcomes they seek through its use. With a deep understanding of user goals, designers can identify and eliminate irrelevant tasks and activities, thus creating a more efficient and user-centric experience. The GDD process comprises six stages: Research, Modeling, Requirements, Framework, Refinement, and Support aimed at discovering a user interface solution that meets the requirements and objectives of users. The depiction of the GDD process stages used in completing this research is illustrated in Figure 4.

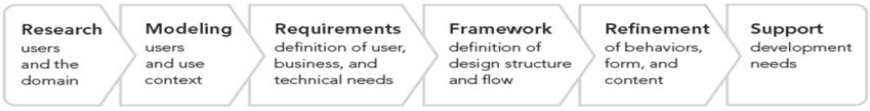

Figure 4. Goal-Directed Design Stages

The research completion flow is a diagram or sequence of steps that illustrates the stages or processes carried out in the study to address previously identified problems. This research adopts the Goal-Directed Design (GDD) method, involving several interconnected stages. The first stage is Research, where in-depth information and understanding of the context, users, and business goals are gathered. The next stage is Modeling, where a conceptual model or visual representation of the desired system or solution is developed. The Requirements stage involves identifying and specifying user and business needs that the design solution must meet. The Framework stage involves developing a framework or basic structure for the design solution. The Refinement stage involves iteration and improvement of the design based on user feedback and performance evaluation. Finally, the Support stage involves the implementation, maintenance, and support of the developed design solution. By following this research completion flow, it is expected to achieve an effective design solution aligned with the established objectives. An overview of the research flow can be seen in the schematic representation in Figure 5.

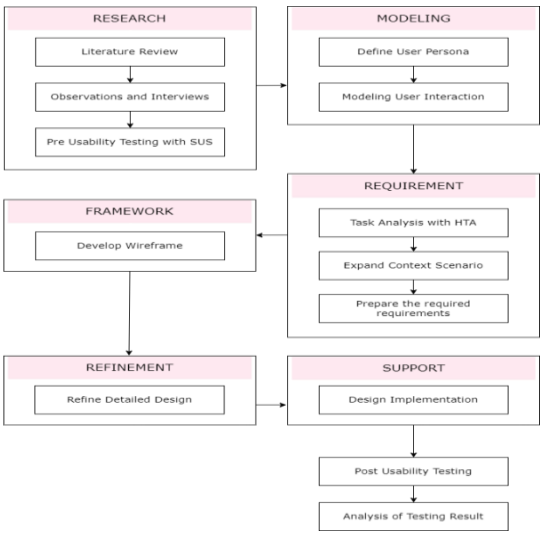

Figure 5. 6 Research Stages

2.2 Research

In this stage, initial research data will be collected through methods such as observation, interviews, Subject Matter Interviews (SME), literature reviews, and usability testing using the System Usability Scale (SUS). The objective is to gather qualitative data about actual users.

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2.3 Modeling

In this stage, the selection of personas plays a central role in the design of the mobile web. Personas are detailed representations of various user types, encompassing in-depth information about how these user groups behave, their thought patterns, demonstrated attitudes, capabilities, underlying motivations, and the goals they seek to achieve [4]. This information is identified and gathered during the research phase, enabling the development of a comprehensive understanding of the diverse needs and preferences of users.

2.4 Requirements

In this stage, the situation or context of the user's interaction with the design solution to be developed is depicted through Hierarchical Task Analysis. This is done by illustrating the sequence of steps taken by the user from the beginning to the end when using the developed design solution [5]. It also involves creating contexts scenario that provide an overview of how users will interact with the design solution in real life and various usage situations. The goal is to understand a broader context of use and ensure that the design solution meets user needs and objectives [6]. Then, it proceeds to compile the required elements by specifying in detail the functional requirements and technical requirements of the design solution to be developed. This stage aims to identify all the features, functions, and characteristics needed for the design solution to achieve the set goals.

2.5 Framework

In this stage, an interaction framework is created to depict the structure of the display and layout of the SIKAD mobile web application pages with wireframes. A wireframe is a foundational visual interface guide that illustrates the structure of the interface and the relationships between its pages. Essentially, a wireframe can be likened to a blueprint defining the structure, content, and functionality of each page [7]. Wireframes are created before the design phase begins, allowing a more focused approach to layout without the distraction of colors and visual elements[7]. This process yields a design concept that meets user needs and objectives.

2.6 Refinement

In this stage, the created design undergoes adjustments and refinements through evaluation. It is similar to the framework process but with a greater focus on developing details for each component of the user interface, such as visual elements, icons, color selection, and other visual elements designed to match the needs and characteristics of users [8].

2.7 Support

In this stage, the implementation step of the design is the final part of the process, where a working prototype is created to demonstrate how the design solution will interact with users. Its functionality is tested before actual implementation [9].

3. RESULT AND DISCUSSION

3.1 Research

During the research stage, data collection was conducted using questionnaires with literature reviews, interviews with subject matter experts and students to identify needs, goals, motivations, and behaviors when using the mobile web, and System Usability Scale (SUS) to measure the usability level of the mobile web application.

3.1.1 Literature Review

To delve deeply into this research, information and data were collected from various relevant literature sources, such as related journals, recent articles, and books addressing topics such as the SIKAD Mobile Web Application, User Interface, Goal-Directed Design, User Persona, Wireframe, and application testing using the System Usability Scale method. The information obtained from these sources serves as a comprehensive foundation of references and benchmarks throughout the entire research process currently underway.

3.1.2 Obsevations and Interviews

To gain a deeper understanding, a series of interviews was conducted using the subject matter interview method, targeting the Head of Sistem Informasi dan Akademik (SIMFOKOM). Furthermore, to enrich perspectives within this research, interviews were carried out with five students from the Islamic University of Riau, selected as respondents. Below are the interview results summarized in Table 1.

Table 1. Summary of The Interview with Students

Question	Answer
What is your opinion on the user interface of this application as an academic information system?	The appearance is nearly identical to the website version, albeit scaled down, and some interface

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Question	Answer
	elements are cropped, making it difficult to understand.
What kind of design do you need in an academic information system application to support your academic activities?	It possesses simple application features, yet it adds measured color elements as distinguishing factors.
If a redesign is carried out for the course plan card registration feature, which part do you think needs to be changed to maximize the application's support for students' academic activities in the future?	Changes are needed in the course selection information to avoid confusion, and the curriculum feature should not be presented as an option since there is only one curriculum available.

Based on the research findings, the goal was clearly identified to enhance user interaction in the mobile platform's Course Plan Card registration feature, aiming to provide a more user-friendly and streamlined experience while minimizing errors in the process.

3.1.3 System Usability Scale (SUS)

System Usability Scale (SUS) is a tool or quantitative measurement method used to evaluate the usability or ease of use of various types of systems, including software applications, websites, and hardware devices [10]. The SUS method consists of 10 statements used to assess user satisfaction with the tested system and the system's ability to meet user needs [11]. The following are the 10 statements [12]:

1. I think that I would like to use this system frequently
2. I found the system unnecessarily complex.
3. I thought the system was easy to use.
4. I think that I would need the support of a technical person to be able to use this system.
5. I found the various functions in this system were well integrated.
6. I thought there was too much inconsistency in this system.
7. I would imagine that most people would learn to use this system very quickly.
8. I found the system very cumbersome to use.
9. I felt very confident using the system.
10. I needed to learn a lot of things before I could get going with this system.

From the responses to the SUS questionnaire above, the evaluation results will be calculated using several rules [13]. for each statement with an odd number, the respondent's answer scale is subtracted by 1 [13]. For each statement with an even number, 5 is subtracted from the respondent's answer scale [13]. The respondent's answer scale is then summed and multiplied by 2.5[13]. The average of the answers from all respondents is then determined. After obtaining the final assessment results from the respondents, the next step is to determine the grade of the assessment results. According to Brooke (2013), there are two ways to determine the grade of the research results. First, it can be viewed from the user acceptance level, which is divided into three categories: not acceptable, marginal, and acceptable. The second perspective looks at the grade scale level, which consists of six scales: A, B, C, D, and F. Adjective ratings also provide insights, consisting of worst imaginable, poor, ok, good, excellent, and best imaginable, as seen in Figure 6.

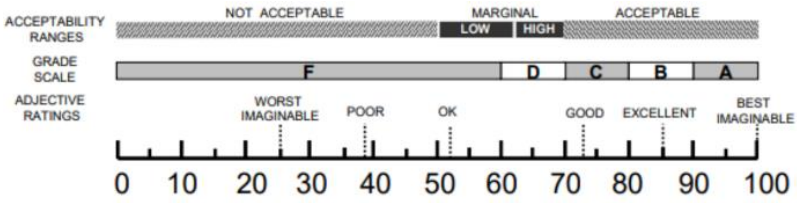

Figure 6. Usability Assessment Score with SUS

Usability evaluation was conducted twice, both before the redesign process and after the redesign process [14]. The evaluation involved 5 respondents, namely students from Universitas Islam Riau. Nielsen [15] suggest that a minimum of 5 respondents is needed to achieve accuracy above 75% in testing. In the initial evaluation, the System Usability Scale (SUS) was used on the SIKAD mobile web, resulting in a SUS score of 60.0. This score falls within the range of inadequate acceptance, with a grade D on the grade scale and an "Ok" on adjective ratings. The results of the initial usability evaluation can be seen in Table 2.

Table 2. System Usability Scale Initial Score

User	q1	q2	q3	q4	q5	q6	q7	q8	q9	q10	Score
1	5	3	4	3	4	2	3	2	5	3	70
2	5	5	3	2	2	4	2	3	4	2	50
3	4	5	4	2	2	4	3	2	4	2	55
4	5	4	2	4	3	2	4	2	5	1	65

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User	q1	q2	q3	q4	q5	q6	q7	q8	q9	q10	Score
5	5	5	2	4	3	4	5	2	5	1	60
Average											60

3.2 Modeling

In the modeling stage, after obtaining sufficient data from questionnaire results and interviews with respondents who are students from the Islamic University of Riau, an analysis was conducted by creating a user persona based on one of the respondents that can be seen in Table 3.

Table 3. User Persona

User Persona	
Demographic	Age: 20-21 years Gender: Female/Male Occupation: Student at the Islamic University of Riau
Behavior	Utilizing technology in daily life involves using a smartphone for academic purposes.
Goals	- Simplify and improve access to the Course Plan Card Plan registration process. - Enhance user-friendliness in both the registration and printing processes.
Pain Points	- Address confusing user interface elements, especially for new users. - Resolve server downtime issues in the web application.
Motivations	An application that can be easily used and provides informative content.

3.3 Requirements

In the requirements stage, the process begins with creating a user flow through Hierarchical Task Analysis (HTA), identifying potential obstacles. The next step involves illustrating real-life user interactions through contextual scenarios to understand broader usage contexts. The stage then moves on to compiling necessary requirements.

3.3.1 Hierarchical Task Analysis (HTA)

Hierarchical Task Analysis (HTA) is created to break down and understand the tasks users perform to achieve their goals into smaller subtasks for SIKAD and to achieve the goals. This process aids in comprehending how users execute their tasks within a specific system or environment. The following is the HTA for Course Registration where it has 3 tasks to accomplish that has been created, as depicted in Figure 7.

Figure 7. HTA for SIKAD Mobile Web Application

3.3.2 Context Scenario

Context scenarios depict situations when a persona interacts with the system, encompassing the persona's main objectives. The persona, such as "Hani" in this context, represents a university student using the SIKAD application. Hani, a seventh-semester student at the Islamic University of Riau, opens the SIKAD application to face the Course Plan Card registration period.

1. Hani, a seventh-semester student at the Islamic University of Riau, opens the SIKAD application to face the Course Plan Card registration period. Upon logging in, Hani is informed that the registration period has commenced.

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2. Hani navigates to the "Course Plan Card Registration" section in the application, selects courses, checks recommendations, and adds courses to the according to her major.
3. Hani reviews a summary of her, including the total credits taken and available. With confidence, Hani confirms her through the "Print Course Plan Card " menu and receives a notification that her has been successfully printed.
4. Feeling relieved for successfully registration out the according to the schedule, Hani, with newfound enthusiasm, closes the SIKAD application, ready to face the new semester with the hope that she created will help her achieve her academic goals.

3.3.3 Required Requirements

In the Required Requirements section, there is a summary of functions in the Course Plan Card registration and printing menu. The following are details of these functions and the required data shown in Table 4.

Table 4. Required Requirements

Feature	Description	Data Identification
Course Plan Card Registration	- Displays student information such as the previous semester's GPA, maximum credits that can be taken, and the current curriculum. - Allows for searching and adding/removing courses.	Student data and course data.
Print Course Plan Card	- Displays student information such as name, student ID, faculty, academic year, semester, study program, instructor, completed credits, cumulative GPA, and previous semester's GPA for the selected semester. - Shows information on the selected courses during the Course Plan Card registration. - Facilitates the printing process of the Course Plan Card.	Student data and course data.

3.4 Framework

In the Framework phase, the process involves creating an interaction framework to outline the structure of the display and layout of the SIKAD mobile web application. This phase produces an interaction framework and a redesigned concept for the SIKAD mobile web application that meets user needs and established objectives. The process in this stage is facilitated by creating wireframes or rough sketches to illustrate the layout and structure of the user interface. The aim is to provide guidance on the placement of elements, navigation, and interactions within the design solution [16]. Below are the wireframes that have been created, which can be viewed in Figure 8.

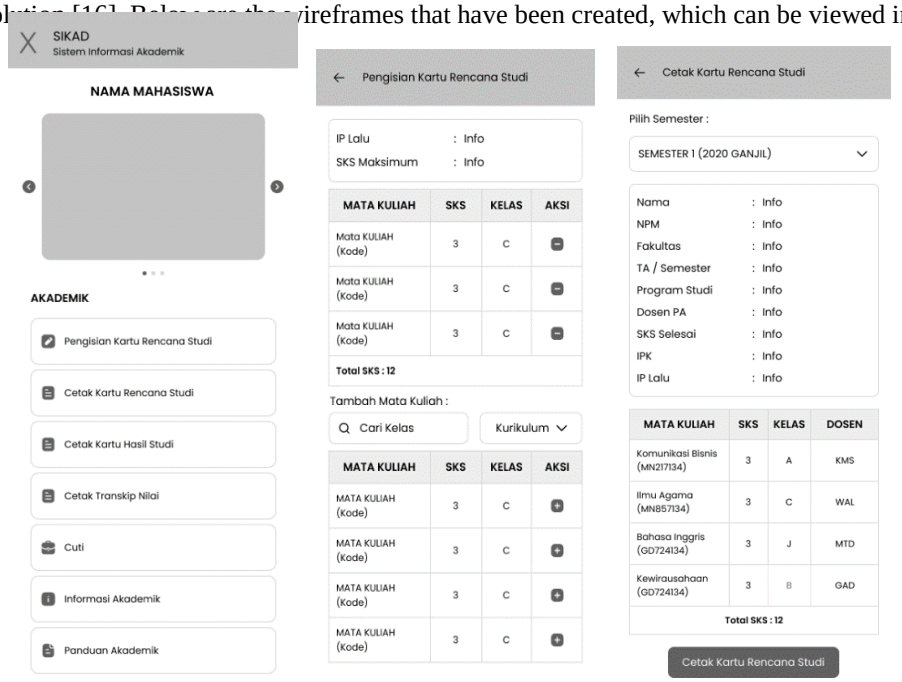

Figure 8. Wireframe for Dashboard, Course Plan Card Registration, and Print Course Card Plan Page

3.5 Refinement

In the refinement stage the visual style of these sketches was refined in the design improvement process to depict the layout and structure of the user interface, aiming to provide guidance on the placement of elements, navigation,

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and interactions within the design solution [17]. The implemented visual style in the user interface design of the supervision application aligns with the research scope. In the prototype design, a total of 5 colors were employed. The selection of this color palette is based on the official visual identity of the SIKAD website, with the addition of some extra colors intended to provide clearer distinctions between various elements and menus. The font used is Poppins. The decision to use the Poppins font was made due to its modern and clean design, conveying a minimalist impression and placing emphasis on clarity and functionality. This selection is anticipated to create an aesthetically pleasing appearance while fulregistration design needs[18]. The predetermined color and font choices can be seen in Figure 9.

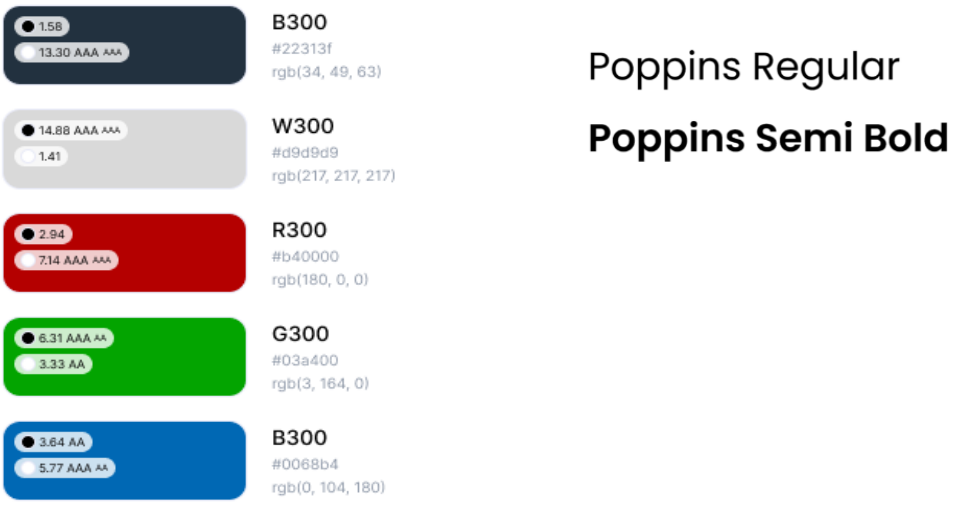

Figure 9. Color and Font Choices for SIKAD Mobile Web

Here is the provides an sample of the user interface in a form of mockup design which can be found in Figure 10.

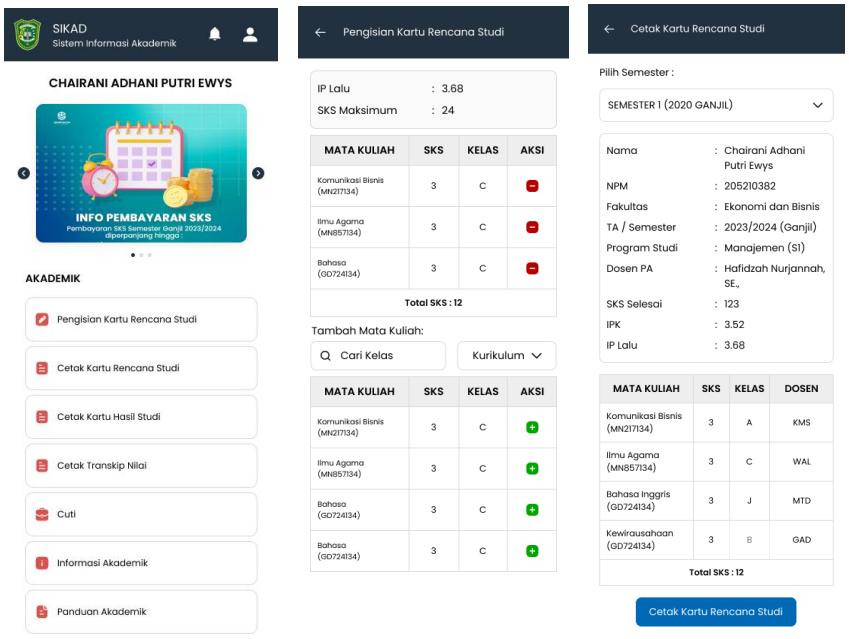

Figure 10. New Design of SIKAD Mobile Web Application

Following the preliminary creation of the mockup, a comprehensive evaluation of the mockup design ensued, encompassing the participation of the identical group of student respondents involved in the initial usability testing. The primary objective was to thoroughly examine the extent to which the design aligned with their expectations and effectively supported the academic processes while utilizing this mobile web application [19]. Detailed insights regarding the feedback provided by student respondents concerning the created design are elaborated upon below:

1. The font size in the course information section is perceived as very small. Therefore, it is advisable to consider enlarging it to provide more comfort to users, especially when accessing the application interface on mobile devices with smaller screens.

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2. Since there is only one curriculum option that can be selected and used, this option may be less relevant. Therefore, it is suggested to consider removing the curriculum selection option to make the interface cleaner and focus on essential elements.
3. It is recommended to increase the spacing between each section on each page to provide more room between each element. This is aimed at creating a more organized and tidy appearance.

After receiving valuable feedback from the students who actively participated as respondents during the evaluation of the initial design, several adjustments and enhancements were implemented. The aim was to address the specific concerns and suggestions raised by the students, with the overarching goal of striving for an optimal outcome in the final testing phase. Through iterative refinement and a keen focus on aligning the design with user expectations [20].

3.6 Support

In the final stage of Goal-Directed Design (GDD), the implementation of the refined mockup design from the previous phase is executed through the creation of a working prototype, shaping the user interface in the redesign process of the SIKAD mobile web application. The application of the frontend involved the use of HTML, CSS, and Bootstrap. This working prototype will be utilized in testing, which includes selected students as respondents. Through iterative refinement and a keen focus on aligning the design with user expectations. Each student will interact with the working prototype individually, and afterward, they will be asked to fill out the System Usability Scale (SUS) questionnaire based on their experience with the newly created design. Figure 11 provides the final form of the working prototype.

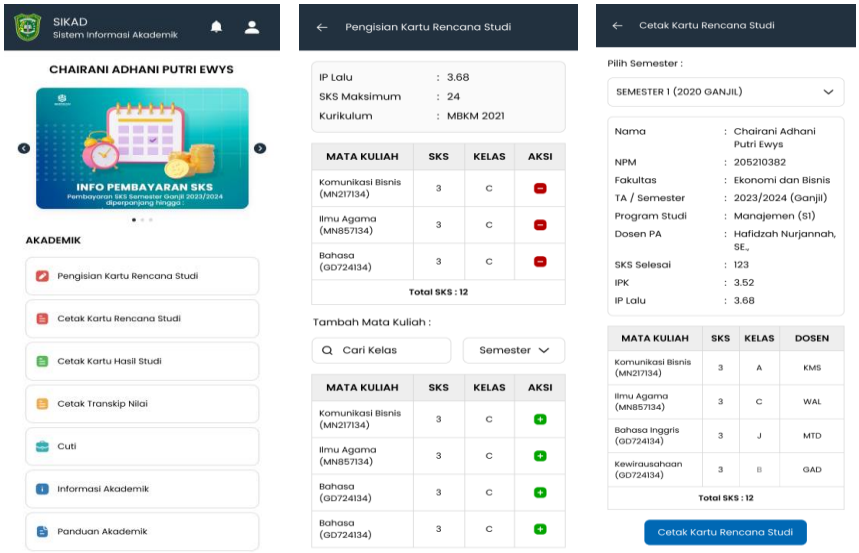

Figure 11. Prototype of SIKAD Mobile Web Application

After conducting testing with 5 respondents, students from Universitas Islam Riau, a final score of 87.5 was obtained. Within the System Usability Scale (SUS) category framework, it is identified that the redesigned interface shows significant improvement compared to the previous interface design. These changes include an increase in the Grade Scale from "F" to "B," an improvement in Adjective Rating from "Ok" to "Excellent," and a shift in the Acceptability Range from "Not Acceptable" to "Acceptable". The results of the final usability evaluation can be seen in Table 5.

Table 5. System Usability Scale Final Score

User	q1	q2	q3	q4	q5	q6	q7	q8	q9	q10	Score
1	5	2	5	2	5	1	4	1	4	3	85
2	5	1	5	2	5	1	4	1	5	3	90
3	5	1	5	2	5	1	5	1	4	1	95
4	5	3	5	2	5	2	4	2	4	3	77.5
5	5	3	5	1	5	1	4	2	5	1	90
Average											87.5

4. CONCLUSION

The comparison of System Usability Scale (SUS) scores before and after the Goal-Directed Design (GDD) method implementation revealed a substantial improvement, rising from 60.0 to 87.5. This positive shift reflects user

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satisfaction and alignment with expectations and academic support needs. The successful GDD method implementation underscores the effective realignment of the SIKAD mobile web application interface with user preferences. The positive reception is evident in the endorsement from the Head of Sistem Informasi dan Akademik (SIMFOKOM), affirming that the interface improvements meet anticipated expectations. The research identified user needs for the SIKAD mobile web application through thorough research and testing. These needs include users' preferences for seamless navigation of course lists, access to course-related information, and efficient completion of the Course Plan Card registration and printing process. Notable changes were made in the dashboard menu, incorporating significant alterations in layout, color, and font to improve the visibility of information that benefits and informs users. Adjustments in the Course Plan Card registration section involve consolidating course information in a table for improved clarity, cleanliness, and data readability. Enhancements were also implemented in the Course Plan Card registration and printing section, refining the layout of the print button for increased user intuitiveness.

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