# APPLICATION OF DESIGN THINKING METHOD IN REDESIGNING THE UI/UX OF SIMAK (ACADEMIC INFORMATION SYSTEM) OF SRIWIJAYA UNIVERSITY BASED ON A MOBILE PLATFORM.

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**ABSTRACT**

*Students at Sriwijaya University are having difficulty accessing academic information through SIMAK using their mobile devices due to a user interface that is not optimized for smartphones. In this study, the author used the Design Thinking method because it has stages that are very helpful in creating prototypes, such as the Empathize stage where the author can directly interact with users' personal opinions, up to the testing stage, which helps the author analyze the results of prototype creation so that further development can be more responsive and better. The prototype was tested through Maze, a platform that helps users test product or service prototypes quickly and efficiently. This platform is integrated with various prototype-making applications and allows users to collect qualitative and quantitative data in one place and the User Experience Questionnaire (UEQ) to analyze data from prototype testing. Based on the results of usability testing, the UEQ scores from 26 SIMAK users were above 1.6, with almost all assessment categories such as "Appeal", "Efficiency", "Accuracy", "Stimulation", "Novelty", and 1.3 in "* Perspicuity*". Therefore, it can be concluded that the SIMAK prototype design has a good user experience, and the design can be used as a reference for SIMAK mobile-based displays in the future.*

***Keywords**: Prototype development, responsive interface, and User Experience Questionnaire.*

## I. INTRODUCTION

In today's era of globalization, the rapid advancement of technology and the increasing complexity of information circulation require the education sector to keep up with technological advancements, especially in the academic field. The need for information can now be easily fulfilled with the internet, which allows for the transfer of information in just a matter of seconds [1].

Sriwijaya University, as a leading educational institution, has an academic information system that can handle academic and student affairs issues. This academic information system can be accessed through a desktop computer browser, but it is not yet fully optimized for smartphone displays, making it difficult for users to access information on the academic information system. With this background, the author designed a mobile interface for an Android-based academic information system that can be used to access menus for student roles, allowing them to display information from the academic information system with a more optimized interface on an Android smartphone [2].

From the initial survey conducted, the author concluded that students are having difficulties accessing SIMAK through mobile devices, especially when it comes to accessing class information, schedules, grades, and registering for courses. This should be much easier if only using a mobile device without having to open a desktop PC or laptop. These issues result in user discomfort in using Sriwijaya University's Academic Information System (SIMAK). In addition, some students believe that the user interface of Sriwijaya University's Academic Information System (SIMAK) requires a revamp in terms of page content composition and icons on the website to produce a good user experience.[3]

In this redesign project, the author chose design thinking as an appropriate approach for this research because this method allows for subjective and objective perspectives to be considered in decision-making. By thoroughly understanding the needs and desires of users supported by direct observation and the application of appropriate steps to determine solutions, the process of developing innovation can be effectively carried out [4].

In this research, the author will apply the design thinking method as a recurring approach, with the goal of understanding users, testing assumptions, and reflecting on the research problem. Through this process, the author hopes to discover alternative strategies and solutions that may not be immediately apparent, with a focus on problem-solving and using simple and clear methods for thinking and working in a solution-oriented manner [5]. The definition of Design Thinking is a human-centered innovation method that utilizes design tools to integrate user needs, technical possibilities, and successful business requirements. This approach can provide solutions to complex problems. The design team creates a collaborative work environment that often leads to breakthroughs in problem-solving. When the design team combines all stakeholders from various divisions of the company, they often can gain commitment to implement new ideas into solutions. Please note that Design Thinking is not the only method that successfully promotes collaboration and solves all problems [6].

## II. RESEARCH METHODOLOGY

The focus of this research is on the application of Design Thinking as a comprehensive thinking approach to achieve solutions. The process begins by observing user needs in the Empathize stage to discover new innovations. In addition, a literature review is conducted to gather relevant theories and references related to the identified problem. The literature study is used to analyze and provide reviews of the problem through a collection of theories and references appropriate to the research.

### *A. The research object*

This research aims to improve the quality of the user interface (UI) in the Design prototype for the SIMAK (Academic Information System) mobile application of Sriwijaya University. The researcher will use the Design Thinking method to understand the needs and desires of users, gather information, create ideas and prototypes, and test the redesigned UI. The goal is to make it easier for students to access SIMAK in terms of the information they need and to facilitate students in taking courses through a better-designed mobile SIMAK prototype that is visually appealing and user-friendly, thus reducing difficulties for students in accessing SIMAK on their smartphones. [7].

### *B. The Data Analysis Method*

The author used the UEQ (Usability Evaluation Questionnaire) Method as a data analysis method as the basis for redesigning the User Interface Design prototype of the SIMAK UNSRI mobile application. UEQ is a method used to assess the quality of User Interface in prototype design development by distributing assessment questionnaires to respondents to measure the level of effectiveness and comfort in using the Design prototype. The UEQ method was applied to examine the level of User Interface quality and ensure that the developed Design prototype meets the expectations and needs of its users [8].

### *C. Design Thinking*

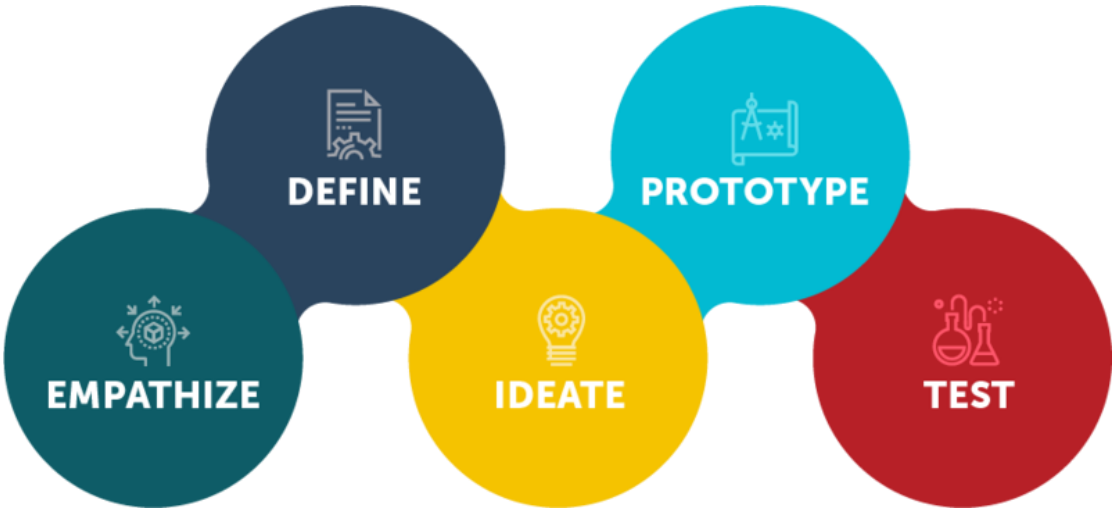


*Figure 1. Stages of Design Thinking*

The Design Thinking method is one way to find solutions to existing problems. This research focuses on how to improve user comfort in using the Sriwijaya University Academic Information System (SIMAK) application through mobile devices. The five steps of Design Thinking, namely empathize, define, ideate, prototype, and test, are carried out based on user needs.

1. *Empathize*

   In the initial stage of the research, the author conducted the Empathize process to understand the perspectives, expressions, feelings, and actions of users. This process consists of Observation, Interview, and Empathy Map. Empathy is the first stage in the Design Thinking method and is the core of all stages. In this stage, there is a process of interviewing, observing, and asking questions using predetermined scenarios. The goal is to identify user problems and desires for future system development. From this stage, problems and solutions will be obtained.

Table 1. List of questions to be asked during the first interview

| No. | Question |
|---|---|
| 1. | What makes you feel difficult or uncomfortable when using SIMAK on mobile devices? |
| 2. | What features do you think need to be added or removed to make the SIMAK interface on mobile devices easier to use? |
| 3. | Do you have any bad experiences when using SIMAK on a mobile device? If yes, can you explain what made you feel bad? |
| 4. | What do you think is the best way to improve the SIMAK interface on mobile devices to make it easier to use? |

The resulting design prototype will be relevant to the needs of users, so the solution will be appropriate to their problems and needs. The interaction between decision-makers and users will result in a good understanding of the needs and problems in the making of the SIMAK UNSRI design prototype on mobile devices.

2. *Define*

In the Define stage, the problems identified in the Empathize stage are further explored. Designers will gather information to plan the system related to features, functions, and elements that can solve the problems. This stage also involves creating a list of user needs and determining the problems that need to be solved to improve user comfort in using the SIMAK UNSRI prototype design.

3. *Ideate*

The Ideate stage is part of the process of discovering solutions to the problems identified in the previous stage. This is the brainstorming stage, recording every idea that is considered valuable and beneficial. Ideas for system development should use digital technology, such as web applications. The workflow for addressing problems will be based on existing frameworks. This stage focuses on ideas and alternative solutions to improve user comfort in using the SIMAK UNSRI prototype design.

4. *Prototype*

The prototype is a stage of creating an initial model or prototype of the solution developed in the Ideate stage. In this stage, a context diagram or use case diagram will be created to represent the actual scale before being returned or specially made for development. The "fall quickly" principle is also applied to fix errors as quickly as possible and determine the next steps. The purpose of this stage is to ensure that the solution developed in the Ideate stage can function properly and meet the needs of users before being applied on a real scale.

5. *Test*

This stage involves testing the prototype that has been created. The testing will use the UEQ (Usability Evaluation Questionnaire) method, which is used to assess the level of ease and comfort of users in using the application. This method will involve distributing questionnaires containing specific questions to measure the level of ease and comfort of users in using the application. Respondents will evaluate several aspects, such as navigation, User Interface display, and system performance. The results of this stage will indicate whether the solution developed is in line with the needs and expectations of users, and if necessary, improvements will be made before implementation.

Table 2. Example of questionnaire questions using UEQ.

| No. | Question |
|---|---|
| 1. | How easy was it for you to navigate the newly created SIMAK mobile application? |
| 2. | Do you feel assisted by the UI design changes that have been made to the SIMAK mobile application? |
| 3. | How effective is the new layout and design of the SIMAK mobile application in facilitating your academic processes? |
| 4. | How often do you use the redesigned UI of the new SIMAK mobile application? |
| 5. | Do you feel satisfied with the experience of using the new mobile SIMAK application after the UI redesign? |
| 6. | How useful do you think the new features added in the SIMAK mobile application after the UI redesign are for your academic activities? |

## III. RESULT AND DISCUSSION

Based on the results of applying the design thinking method in designing UI/UX for the mobile-based Academic Information System (SIMAK) prototype, the following results were obtained:

### *A. Empathize*

The Empathize stage aims to understand the problems faced by the users and identify the target users for the UI/UX prototype design of the Mobile-Based Academic Information System (SIMAK) that is being developed. Based on interviews with several users mapped into the empathy map can be seen in Figure 2. [9].

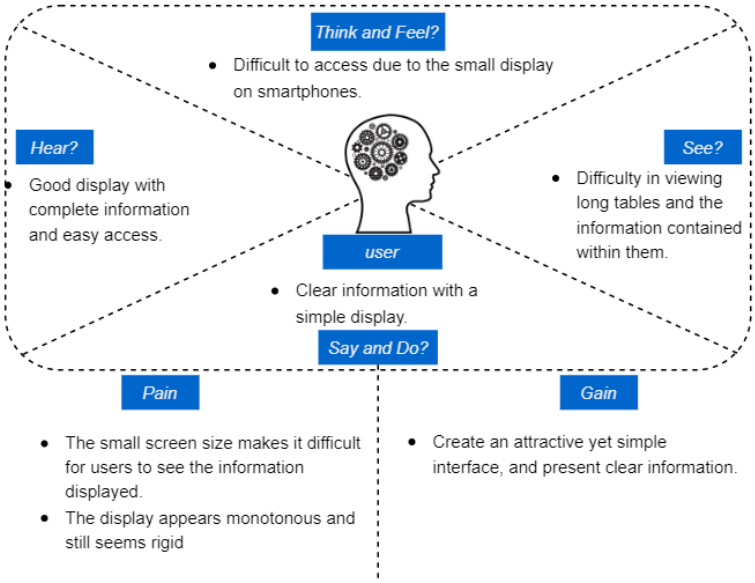


Figure 2. Empathy maps SIMAK users.

### *B. Define*

During the Define stage of the design thinking process, the author conducted an in-depth observation of the prototype display that will be created to help students access SIMAK more efficiently and to identify problems and shortcomings in the current desktop version of SIMAK that are often accessed on smartphones. The author used the Point of View (POV) method, as listed in the table below [10].

Table 2. Point of View (POV).

| No. | *Problem* | *Need* | *Insight* |
|---|---|---|---|
| 1. | The majority of students complain about similar issues, namely the SIMAK display at login that appears poorly formatted on the desktop version when accessed via a mobile phone. | Students want a new display when logging in through a mobile phone to make it easier in terms of system and also appearance. | Students require a change in the login display when accessed via mobile phones to make it easier to view and use. Currently, many students have to enlarge the display and zoom in to write their username/NIM and password and also select their faculty, even though the system should be able to detect the faculty from the student's username or NIM. |
| 2. | It is difficult to view information on the study plan card display in order to obtain information about schedules, the lecturers who teach the courses, and the rooms where the learning activities will be conducted. | Students need information presented in a good layout when accessing their study plan card to make it easier for them to know which lecturers teach their courses, their schedules, and which rooms the classes will be held in. | The difficulty in viewing the display on SIMAK when accessed via mobile makes it difficult for students to obtain information that should be easily accessible. |
| 3. | Upon entering the university, students find it difficult to take the available courses because not every student owns a laptop or desktop PC. Even when they are taught how to take courses, the situation and place for using a laptop are not always conducive. | Students need a better interface for course registration to easily access and search for the courses they want to take. | The suboptimal display of course registration makes it difficult for students to access and select courses, causing some students to encounter obstacles in taking their desired courses. |

### *C. Ideate*

In the third stage of the design thinking method, known as the ideate stage, the step is to gather as many creative ideas as possible to solve a problem or create a new solution. The goal is to generate a range of options to improve the product or service being designed.

After the ideas have been collected, the next step is to evaluate and select the best and most potential ideas to be developed as a solution. The selection criteria may include effectiveness, feasibility, and affordability. In certain cases, such as in designing a better desktop and mobile interface, the ideate stage can be done through brainstorming or group discussion with team members or stakeholders. The ideas collected are then evaluated, and the best ones are chosen to be revised in the desktop display and used as a direct reference for creating a mobile version display with a better interface for users/students. After the revision, the next step is to create a prototype that can be tested and given feedback. [11].

### *D. Prototype*

In the prototyping stage, it is necessary to design a solution prototype to test and evaluate the previously designed solution. According to Isadora, there are two types of prototyping stages: high-fidelity and low-fidelity. A low-fidelity prototype is a design of a system that is incomplete and has low accuracy due to the limited use of colors such as black, white, or gray. On the other hand, a high-fidelity prototype is a design of a system that is approaching the final system and has added details such as images, icons, colors, and others [12].

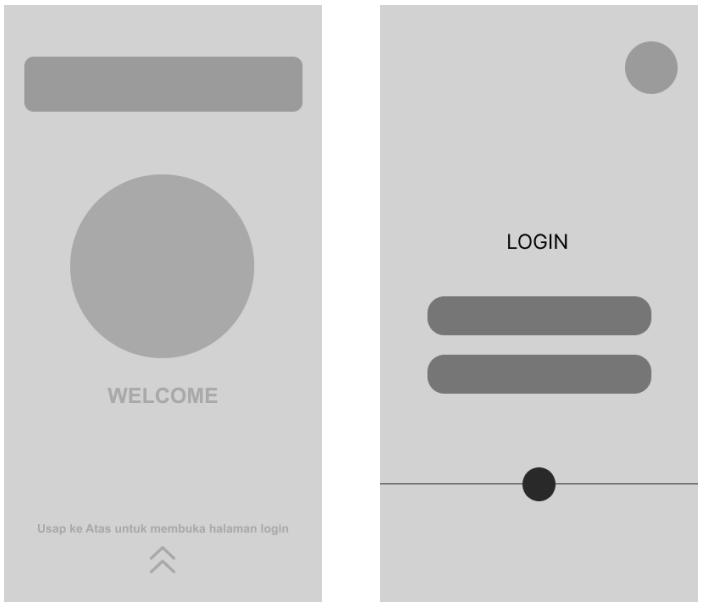


Figure 3. Low-fidelity Splash-Screen and Login Page.

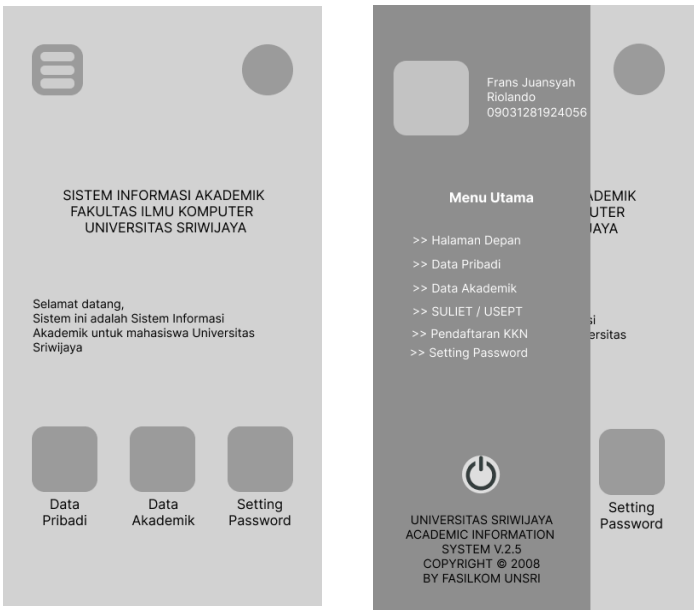


Figure 4. Low-fidelity Home and Ellipsis.

1. Task 1 - Login page

Before entering the login page, there will be a splash screen that must be swiped up by students to access the login page. The login page will display the usual username and password fields, but the difference in SIMAK Desktop version is that we don't need to select the faculty or department because the system is expected to detect it from the username or NIM.


Figure 5. High-fidelity Splash-Screen and Login Page.

2. Task 2 - The main page of the application

After logging in, the main page of the prototype for the mobile-based SIMAK application will appear, featuring three main icons that are similar to those in the desktop version of SIMAK: Student Data, Academic Data, and Password Settings. Other pages can be accessed by clicking on the Ellipsis icon located in the top left corner of the page.


Figure 6. High-fidelity Home and Ellipsis.

3. Task 3 - A page for student personal data

The personal data page for students is divided into three pages: student's personal data, family data, and educational data. Each page has a sidebar that is similar to the one on the Home page.

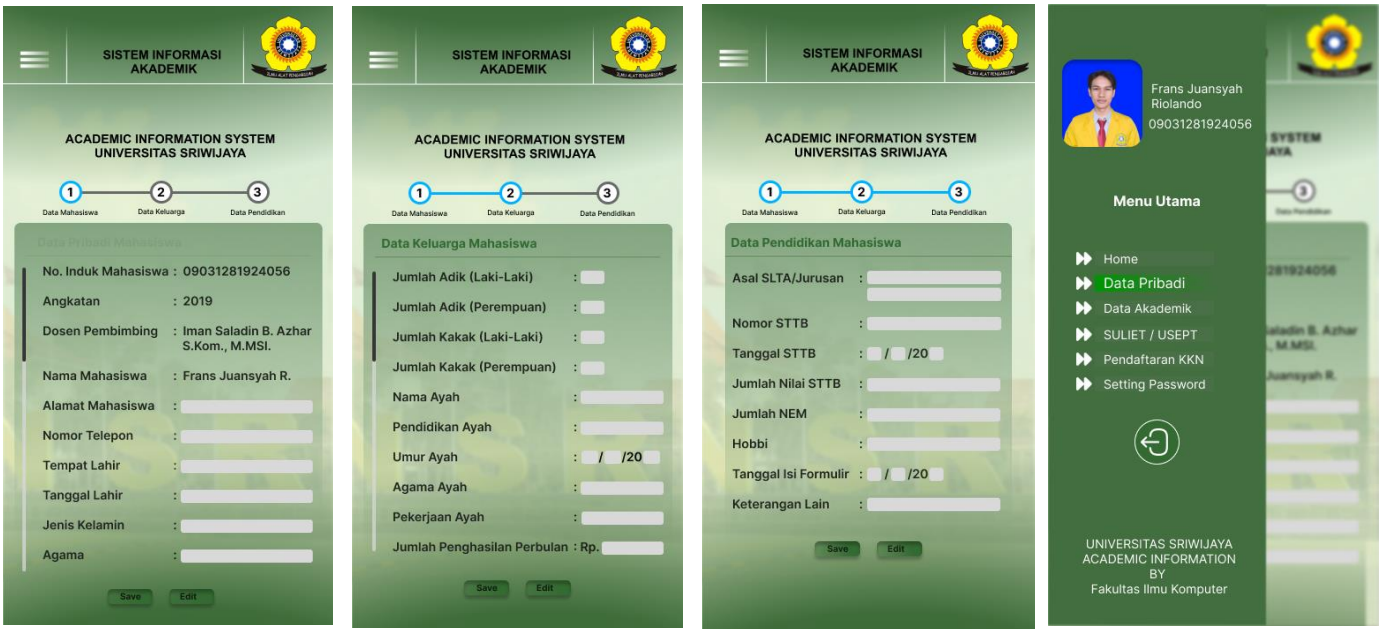


Figure 7. The page for personal information, family information, and educational information of a student.

4. Task 4 - A page for academic data

In the academic data display, there are several pages that are quite numerous such as the academic data main page, and tables on the study plan card, study results card, and transcript of academic records.


Figure 8. The main pages in the Academic Data section of the Student are the Academic Data Main Page, The Study Plan Card, The Study Result Card, And The Academic Transcript.

Due to the large amount of table data on the desktop version of SIMAK, the author uses a pop-up system to display detailed data in order to reduce the size of the displayed data. However, the data displayed remains detailed, just like on the SIMAK desktop version.


Figure 9. The complete display of student information, including comprehensive data on lecturers, classrooms, and class schedules, as well as a complete view of student grades, including the name of the corresponding lecturer.

On the transcript page, there is an icon in the bottom right corner that functions to request a signature and send an email to the department's responsible party, which is directly connected to SIMAK. This makes it easier for those responsible for signing the existing grade documents, so students do not have to wait one to two weeks for the grading process, which is currently very difficult for students to collect documents in the required requirements.


Figure 10. The page for requesting a signature on the transcript of grades.

5. And Several other pages.

And several other pages are available on SIMAK, such as the display of Suliet/USEPT scores, the registration page for students who will participate in KKN, and resetting the password.


Figure 11. The pages for SULIET Test Results, KKN Registration, and resetting the password for student accounts.

## *E. Testing*

User Experience Questionnaire (UEQ): UEQ has six evaluation components, including "Attractiveness", "Perspicuity", "Efficiency", "Dependability", "Stimulation", and "Novelty" [13]. Figure 11 shows the UEQ questionnaire that was used.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | |
|---|---|---|---|---|---|---|---|---|---|
| menyusahkan | ○ | ○ | ○ | ○ | ○ | ○ | ○ | menyenangkan | 1 |
| tak dapat dipahami | ○ | ○ | ○ | ○ | ○ | ○ | ○ | dapat dipahami | 2 |
| kreatif | ○ | ○ | ○ | ○ | ○ | ○ | ○ | monoton | 3 |
| mudah dipelajari | ○ | ○ | ○ | ○ | ○ | ○ | ○ | sulit dipelajari | 4 |
| bermanfaat | ○ | ○ | ○ | ○ | ○ | ○ | ○ | kurang bermanfaat | 5 |
| membosankan | ○ | ○ | ○ | ○ | ○ | ○ | ○ | mengasyikkan | 6 |
| tidak menarik | ○ | ○ | ○ | ○ | ○ | ○ | ○ | menarik | 7 |
| tak dapat diprediksi | ○ | ○ | ○ | ○ | ○ | ○ | ○ | dapat diprediksi | 8 |
| cepat | ○ | ○ | ○ | ○ | ○ | ○ | ○ | lambat | 9 |
| berdaya cipta | ○ | ○ | ○ | ○ | ○ | ○ | ○ | konvensional | 10 |
| menghalangi | ○ | ○ | ○ | ○ | ○ | ○ | ○ | mendukung | 11 |
| baik | ○ | ○ | ○ | ○ | ○ | ○ | ○ | buruk | 12 |
| rumit | ○ | ○ | ○ | ○ | ○ | ○ | ○ | sederhana | 13 |
| tidak disukai | ○ | ○ | ○ | ○ | ○ | ○ | ○ | menggembirakan | 14 |
| lazim | ○ | ○ | ○ | ○ | ○ | ○ | ○ | terdepan | 15 |
| tidak nyaman | ○ | ○ | ○ | ○ | ○ | ○ | ○ | nyaman | 16 |
| aman | ○ | ○ | ○ | ○ | ○ | ○ | ○ | tidak aman | 17 |
| memotivasi | ○ | ○ | ○ | ○ | ○ | ○ | ○ | tidak memotivasi | 18 |
| memenuhi ekspektasi | ○ | ○ | ○ | ○ | ○ | ○ | ○ | tidak memenuhi ekspektasi | 19 |
| tidak efisien | ○ | ○ | ○ | ○ | ○ | ○ | ○ | efisien | 20 |
| jelas | ○ | ○ | ○ | ○ | ○ | ○ | ○ | membingungkan | 21 |
| tidak praktis | ○ | ○ | ○ | ○ | ○ | ○ | ○ | praktis | 22 |
| terorganisasi | ○ | ○ | ○ | ○ | ○ | ○ | ○ | berantakan | 23 |
| atraktif | ○ | ○ | ○ | ○ | ○ | ○ | ○ | tidak atraktif | 24 |
| ramah pengguna | ○ | ○ | ○ | ○ | ○ | ○ | ○ | tidak ramah pengguna | 25 |
| konservatif | ○ | ○ | ○ | ○ | ○ | ○ | ○ | inovatif | 26 |

Figure 12. UEQ Questionnaire

In this testing phase, SIMAK will be tested by students as users using the design that was created in the previous stage. This testing will be conducted on several student samples from various departments through a prototype link that can be accessed via a browser on a smartphone. Students will be asked to give their feedback through a UEQ-based questionnaire (User Experience Questionnaire) that has been prepared to assess how good the design is, and students can also provide input for further development and revise some parts to make it more comfortable for students to use [14].

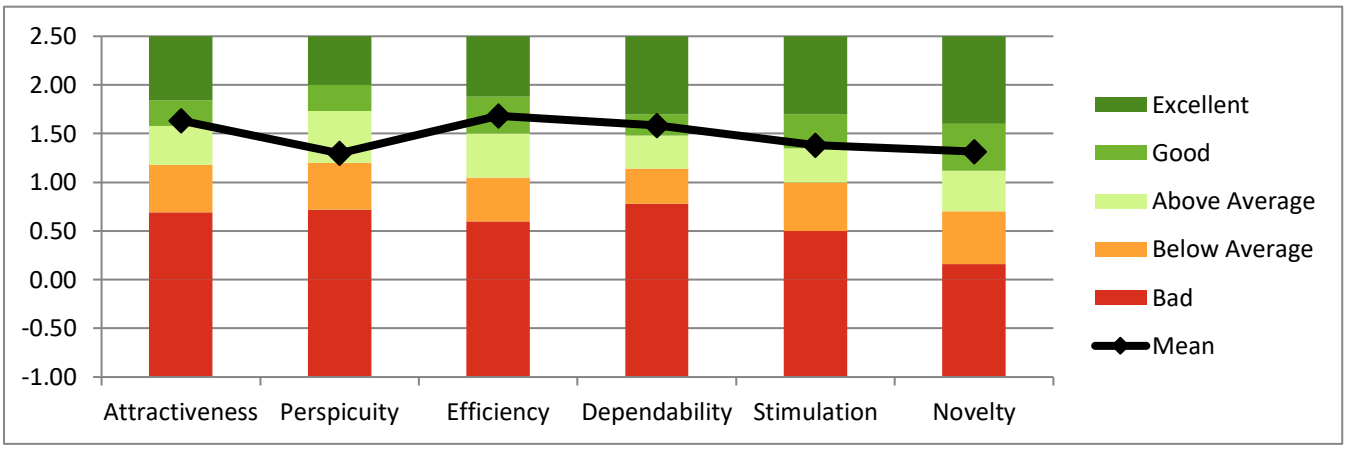


Diagram Graph 1. Graph of Student Assessment Results from Prototype Testing.

| Scale | Average | Category |
|---|---|---|
| Attractiveness | 1.63 | Good |
| Perspicuity | 1.30 | Above Average |
| Efficiency | 1.68 | Good |
| Dependability | 1.59 | Good |
| Stimulation | 1.38 | Good |
| Novelty | 1.32 | Good |

Table 3. The result of the calculation from the evaluation data of the UEQ (User Experience Questionnaire) based questionnaire.

The above graph is the result of the questionnaire assessment by the students on the existing prototype testing from the graph results. It can be concluded that the User Experience design prototype that has been made received a Good category for Attractiveness with a mean score of 1.63, above average for Perspicuity with a mean score of 1.30, Good for Efficiency with a mean score of 1.68, Good for Dependability with a mean score of 1.59, Good for Stimulation with a mean score of 1.38, and Good for Novelty with a mean score of 1.32. [15]

## IV. CONCLUSION

Based on the results of the research conducted by the author, there are two conclusions as follows:

1) A solution has been designed to address the issues in the academic information system at Sriwijaya University, which involves creating a mobile-based design prototype using Figma software to improve user experience (UX) when accessing SIMAK on mobile devices, with information that is easier for students to access. Several prototype screens have been created, including login pages, main pages, student data pages, academic data pages, and several other pages.
2) The prototype has also been tested on several student respondents using the UEQ (User Experience Questionnaire) questionnaire tool to assess the quality of the prototype that has been created so that further development can be done to ensure that students, as users of the application, can easily and comfortably access the mobile-based Academic Information System.

## V. SUGGESTION

There are several suggestions for further development from the author during the research:

1) Currently, academic information systems need further development, both in terms of desktop and mobile versions for smartphones, as the existing system is considered very outdated, and the website interface is still very rigid. In the current era, there are many skilled generations of programmers, and they need to be given the opportunity to implement and develop academic information systems to make them more user-friendly and innovative in the future.
2) Several aspects of this system are already quite good, but there are still many algorithms that can be used to improve the performance of the academic system itself. For example, login detection for certain departments can be done using NIM or ID usernames, so there is no need to choose the department option anymore. Additionally, file submissions should already be able to be done online without requiring much time for the student filing process.
3) This prototype was created to facilitate the development of future programs and serve as a reference for the development of a mobile-based SIMAK application in the future. Despite the UEQ evaluation conducted by the author, there are still many shortcomings in the prototype, and it is hoped that it can be further developed in the future.

## REFERENCES

[1] Anam, Khaerul, and Asep Taufik Muharram. "Analisa Dan Perancangan Sistem Informasi Akademik Berbasis Web Pada Mi Al-Mursyidiyyah Al-'Asyirotussyafi'Iyyah." Jurnal Teknik Informatika 11.2 (2018): 207-217..

[2] Ulfa, Nurul Fauziah, Dana Indra Sensuse, and Yova Ruldeviyani. "Analysis of factors affecting the success of the use of academic information systems on lecturer users: A case study of Sriwijaya University." 2019 International Conference on Advanced Computer Science and Information Systems (ICACSIS). IEEE, 2019.

[3] Fittryani, Yuri Prima, and Made Suci Ariantini. "Perancangan Distribusi Sistem Informasi untuk Optimalisasi Perubahan Jadwal Kuliah Berbasis Mobile Android (Studi Kasus: STIKI Indonesia)." Jurnal Teknologi Informasi dan Komputer 6.2 (2020).

[4] Widodo, Aswal Chusnan, and Elyza Gustri Wahyuni. "Penerapan Metode Pendekatan Design Thinking dalam Rancangan Ide Bisnis Kalografi." Automata 2.2 (2021).

[5] Fariyanto, Feri, Suaidah Suaidah, and Faruk Ulum. "Perancangan Aplikasi Pemilihan Kepala Desa Dengan Metode Ux Design Thinking (Studi Kasus: Kampung Kuripan)." Jurnal Teknologi Dan Sistem Informasi 2.2 (2021): 52-60.

[6] Muhaqiqin, Muhaqiqin, and Rikendry Rikendry. "Alt+ F: Aplikasi Pencarian Lawan Tanding Futsal Berbasis Mobile Android." J-Icon: Jurnal Komputer Dan Informatika 9.1 (2021): 81-87.

[7] Saputra, Very Hendra, Dedi Darwis, and Endi Febrianto. "Rancang bangun aplikasi game matematika untuk penyandang tunagrahita berbasis mobile." Jurnal Komputer Dan Informatika 15.1 (2020): 171-181..

[8] A. R. Pradana and M. Idris, "Implementasi User Experience Pada Perancangan User Interface Mobile E-learning Dengan Pendekatan Design Thinking,"Automata, vol. 2, no. 2, 2021

[9] Indah, Dwi Rosa, et al. "Perancangan UI/UX Pada Prototype Knowledge Management System Pembelajaran SMA Menggunakan Metode Design Thinking." JSI: Jurnal Sistem Informasi (E-Journal) 14.2 (2022).

[10] Reynaldi, Valentino Kristian, and Nina Setiyawati. "Perancangan UI/UX Fitur Mentor On Demand Menggunakan Metode Design Thinking Pada Platform Pendidikan Teknologi." JIPI (Jurnal Ilmiah Penelitian dan Pembelajaran Informatika) 7.3 (2022): 835-849.

[11] Syahrul, Yasermi. "Penerapan Design Thinking Pada Media Komunikasi Visual Pengenalan Kehidupan Kampus Bagi Mahasiswa Baru Stmik Palcomtech Dan Politeknik Palcomtech." Jurnal Bahasa Rupa 2.2 (2019): 109-117..

[12] Karlina, Devi, and Dwi Rosa Indah. "Perancangan User Interface dan User Experience Sistem Informasi E-learning Menggunakan Design Thinking." Jurnal Teknik Informatika dan Sistem Informasi 8.3 (2022): 580-596.

[13] L. A. Abdillah, "Analisis Aplikasi Mobile Transportasi Online Menggunakan User Experience Questionnaire pada Era Milenial dan Z,"J. Sist. Inf. Bisnis, vol. 9, no. 2, p. 204, 2019.

[14] Indah, Dwi Rosa. "Perancangan UI/UX Pada E-Rapor Sekolah Berbabis Prototype Dengan Menggunakan Metode Design Thingking." JUPITER (Jurnal Penelitian Ilmu dan Teknik Komputer) 15.1d (2023): 775-786.

[15] Haque, Miftahurrohmah, and Dwi Rosa Indah. "Design of Digital Library Prototype Using The Design Thinking Method." Jurnal Riset Informatika 5.1 (2022): 451-458.