Redesign User Interface and User Experience on a New Student Admission Website Using a Design Thinking Method

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Abstract. Politeknik Caltex Riau is a private campus in Riau Province that offers registration for prospective new students on an annual basis. The registration process can be done through the PMB PCR website, which provides information about registration details and tuition fees. After interviewing three students, it was discovered that there were certain difficulties in obtaining information about program paths and confusion during the registration process. To address these issues, a redesign of the New Student Admission website was carried out using the design thinking method. This involved empathizing with the users, mapping out the problems, creating a prototype, and testing it with prospective students. The result of this research was a redesigned prototype for the New Student Admission website, which achieved a good usability rating of 92.67%. This indicates that the new design has a high level of learnability, memorability, efficiency, and user satisfaction.

Keywords: User Interface, User Experience, Design Thinking, Usability Testing, PMB PCR

1 Introduction

Information technology is one of the technologies that is developing right now. The need for information technology greatly affects the development of an institution. Not only in institutions but information technology also has a significant impact on the world of education. In such a fast-paced world of education, the new student registration system is a system designed to conduct registration and provide registration information. Through the website of new student registration, registration information may be more communicated and effective than the registration carried out at the campus location.

Polytechnic Caltex Riau (PCR) is one of the private campuses in the province of Riau that opens registration for new candidates every year. The registration can be accessed through the website https://pmb.pcr.ac.id/, where on the website of New Student Admissions (PMB), this consists of several tracks such as Regional Students Admission (PSUD), Caltex Riau Polytechnic Entry Test (UMPCR) I and II, and Computer Based Test (CBT). In addition, the PMB website displays a variety of information about registration, registration terms, schedules of registration, and education costs.

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The results of interviews with three students who have enrolled in the Polytechnic Caltex Riau concluded that the appearance on the PMB PCR website is more dominated by the writing, giving the impression of being monotonous and rigid, as on the pages of the study program and the registration path. Two out of three students who have been interviewed find it difficult to understand the information on the website due to several factors, such as the layout, color, icons, or typography used. Not only that but to know information such as whether files have been received or approved, students should often check the website due to the absence of notifications if they have been processed.

Based on the results of interviews with Mr. Rizardi as the PMB chief and Ms. Gita as the PMB administrator, information was obtained that, according to the PMB website team, PMB still has deficiencies in terms of appearance. The first problem is that at the time of registration on the PMB website, new students need to enter a password after obtaining the verification code obtained from registering a phone number or email, so the registration process becomes inefficient. The second problem is that no feature can accommodate the frequently asked questions by students, so the PMB team is overwhelmed with similar questions. The third problem is that the appearance of the admin page needs to be corrected because, on the dashboard section, graphics and statistics need to be drawn so that they are easier to understand and read.

Based on the above description, the solution expected for the appearance of the Caltex Riau Polytechnic Student Admissions website corresponds to the user interface and user experience by redesigning using the Design Thinking method with reference features from the previously existing PCR PMB website. Design Thinking has several processes: empathy, definition, ideation, prototyping, and Testing. In the design thinking method, each process is used to find the needs and problems of the user, which are then transformed into solutions in the form of design and interaction. Therefore, the study is titled "Redesign User Interface and User Experience on New Student Admissions Websites Using Design Thinking Approaches". The objectives of this final project are: 1) Redesigning the user interface and user experience of the PCR New Student Admissions website using the design thinking method. 2) Produce a website display design that can facilitate prospective new students according to user needs.

2 Research Methods

2.1 Literature Study

Literature study is done by studying articles, journals, and books related to this research. Looking for references to interrelated theories about user interface, user experience, and design thinking.

2.2 Interview

This method is carried out with the PMB team and students who want to register for Politeknik Caltex Riau to find out what is needed and the problems experienced.

2.3 Design

After conducting literature studies and interviews, detailed designs will be made regarding how the system will be redesigned using the design thinking method.

2.4 System Implementation

The design results will be implemented using Figma.

2.5 Testing

This method is used to test whether the system created is in accordance with the needs of the user or not. Then the testing stage will be carried out, where a questionnaire will be carried out to find out the results of the prototype, and if it is not appropriate, improvements will be made.

3 Result and Discussion

Penerimaan Mahasiswa Baru Politeknik Caltex Riau (PMB PCR) provides various information regarding registration information for new student candidates. The registration can be accessed through the website https://pmb.pcr.ac.id/. However, the website needs to be redesigned because it still has shortcomings in terms of the user interface and user experience. The UI/UX process of PMB PCR uses the Design Thinking method, which is expected to solve the problems faced by users. Design thinking is a human-centric approach to innovation taken from a designer's perspective to integrate people's needs, technological possibilities, and requirements for business success [1].

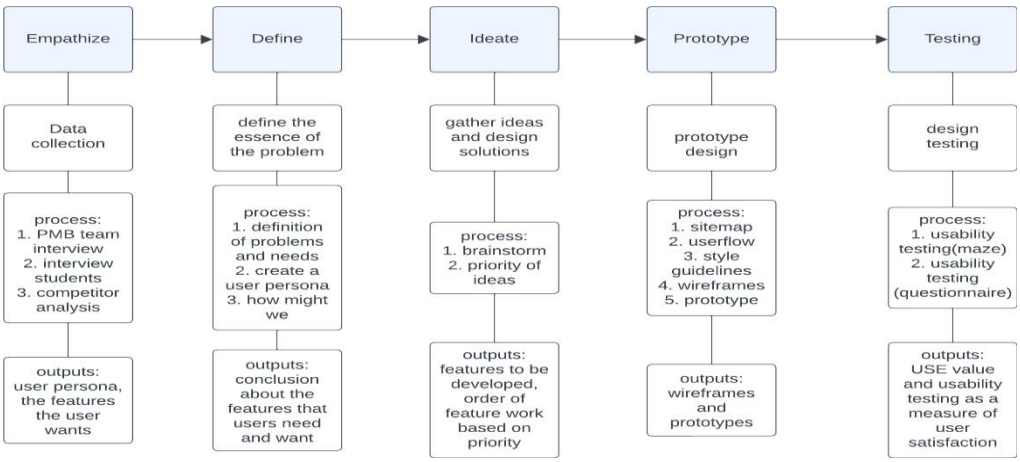

Fig.1. Stage of design thinking

The use of the Design Thinking method is more suitable for use in this final project because the output produced can help the user's experience in the problem mapping process and can adapt to user needs. So that the Design thinking approach with the application of the user interface and user experience on the website is expected to help the user experience in getting the desired information.

3.1 Empathize

At the empathy stage, a design thinker should be able to recognize the user or targeted user, then analyze the experience, emotions, and situations of the user [1]. What is discussed at this stage is the collection of data. At the data collection stage, the authors conducted observations and interviews with the PMB's team and students who wanted to enroll in Politeknik Caltex RIau. The interview was conducted at the Caltex Riau Polytechnic campus on Friday, March 31, 2022, in the PMB's room. The question asked to Mr. Rizadi as PMB PCR 2022 chairman and Mother Gita as Admin PMB PMR was as follows:

- What barriers are frequently faced by new student candidates?
- What are the expectations related to the obstacles facing them?
- What's less than the PMB PCR website?
- What are the expectations or suggestions for the website to be designed?

After conducting an interview with the chairman and administrator of the PMB PCR, the following data was obtained:

- Students have difficulty making registrations.
- Video tutorial on registration
- The submission of information on the website is less informative.
- Student candidates are still confused about graduation information due to the lack of clear graduation statements.
- Make a good impression and look different from other universities.
- There is an automatic payment feature to validate.
- Adding inactive information to the input path in the admin dashboard
- The study program information on the admin dashboard is in statistical form.

Then an interview was conducted with students who wanted to enroll at Caltex Riau Polytechnic. Before conducting the interview, students are assigned the task of trying out the PMB PCR website. The process aims to find out the problems experienced by the students. There were three students who tested directly: Muhammad Faiq Al-Baihaqi (S1), Muhammad Arif Hamidi (S2), and Haikal Khotomi. (3). Five scenarios are created based on the registration process and features that exist on the PMB PCR. The scenario shown in Table 1:

Table 1. Scenario

ID	Goals	Scenario
T1	Registration and verification of accounts	You have never registered, so you need to register. Please register, and the system will send you a verification code via the email you have registered, and you will be asked to enter the validation code you have provided.
T2	Login	You have already made an account registration on the PMB website, and you are asked to make a login to log in to the program selection page.
T3	Choose a program and make payments	You choose one of the available programs. After that, you buy the form from the program you chose. Then you make the payment, and you are asked to wait until the payment verification has been successful.

T4	Complete the registration form	You have logged into the dashboard page. You have previously purchased the registration form, and then you are asked to complete the entire phase of the application form.
T5	Check the graduation	You check the approval results from the news page, then select the announcement according to the chosen path. Then download the announcement and see the endorsement results.

Here is Table 2 for the description of the task symbol, where "green" means the task has been successfully completed by the user and "red" means that the task failed to be completed.

Table 2. Symbol of task

Symbol	Description
	Success
	Fail

Table 3 contains data from the outcome of the solution scenario given to the respondents as a whole and the obstacles encountered.

Table 3. Constraint on the website PMB PCR

Task	Students			Constraint Reason
	S1	S2	S3	
Registration				Respondents felt confused when searching for the registration button.
Login				There is confusion between the login button and registration.
Choose a program and make payments				Respondents find it difficult to get detailed information about the existing path, and it takes a long time to understand it.
Complete the registration form				Respondents are confused about whether they understand the obligatory statement or not at the time of filling out the form.
Check the graduation				Respondents have difficulty seeing approval information.

3.2 Define

At the define stage, once a design thinker understands the needs and desires of the user, a mapping of their ideas is carried out. Mapping ideas is done by defining the problem more clearly so that it can focus on the core of the problem [1]. Before the problem is defined, the user persona is developed with the target student, who is registered in the PCR. The charm explains identities such as name, age, and status. Then there are frustration, goals, platform, and personality. The user name of the student is as follows:

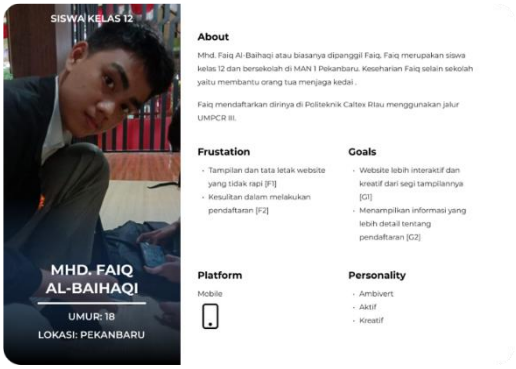

Fig. 2. User persona of student 1

After that, in the process of making definitions, solutions will be sought for each problem found at the time of performing the empathize stage. In this phase, to expand the perspective of problem solving, we used the method How Might We (HMW). The How We Might Method works by turning a statement into a question. The question of how to solve such a problem can be answered by referring to any possible way of doing so. The How Might We method is used to obtain information and solution steps. The result of the process How Might We? is as follows:

Table 4. Definition and problem solving

Num.	Map of Persona	Problem/Need	How?	Might?
1	F1, G1, G3, F6, G5	Respondents want the website to look more attractive, interactive, easy to use, and simple.	How do I create an interesting, user-friendly, and simple website?	Rearrange the appearance of the website by paying attention to aspects of visual hierarchy.
2	F2	Difficulty making registration	How can we make it easier for users to register?	Provide video tutorials as a guide to signing up.
3	F3	Respondents want to get information when passing the selection.	How do users get to know the results?	Prepare to check for approval.
4	F5	Respondents want to make online registration payments.	How do I pay for online registration?	Provide online payments synchronized with the New Student Admissions website.
5	G6	Respondents want an FAQ (Frequently Asked Questions).	How do you answer the frequently asked questions of users?	Create an FAQ page (Frequently Asked Questions).
6	G4	Respondents want the information displayed to be a picture.	How do users view information by displaying images?	Showing images as supporting content
7	G2, F4	Respondents want to see detailed information about	How do I display detailed information	By displaying detailed explanations of

Num.	Map of Persona	Problem/Need	How?	Might?
		the registration path or other information.	about the registration path?	registration schedules, education fees, and registration information

3.3 Ideate

At the ideation stage, after knowing the desired needs, the designer needs to map out the right solution according to the needs [1]. At this stage, the process of gathering ideas through brainstorming is carried out with the aim of obtaining ideas for the solution of existing problems.

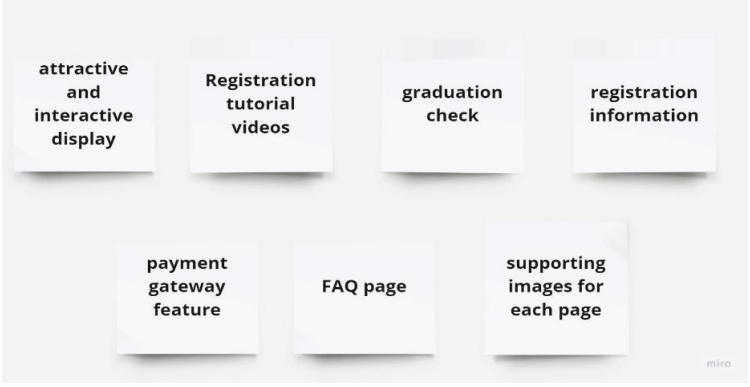

Fig.3. Brainstorming results

The set of ideas presented in Figure 3 Brainstorming results have been selected first in the brainstorming process. Once all the ideas have been gathered, each idea is grouped according to its impact on the user and website design. Creation of priority ideas as a form of finalization of ideas that will be made into a design The results of the process of grouping ideas can be seen in Figure 4 Results of Priority Ideas.

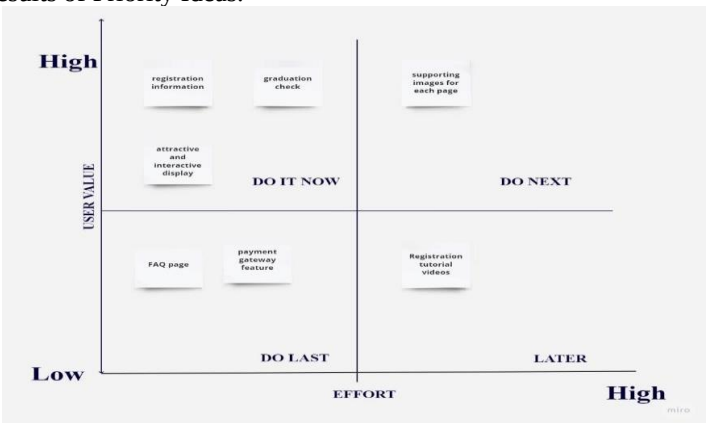

Fig. 4. Results of prioriy ideas

The priority of the idea comes from the brainstorming results that have previously been created and then grouped based on the results of the discussion of the author, Mr. Mahrus, and several teams from the PMB PCR adapted to the needs and impact of the user. With this idea's priority, it will determine what features/pages to do, do next, do last, and do later.

3.4 Prototype

The re-design process will be carried out in this stage by creating a sitemap, user flow, style guideline, wireframe, and prototype. The results of the prototype stage will be re-tested with the respondent or prospective user to validate whether the design has been made to meet the needs of the user or not.

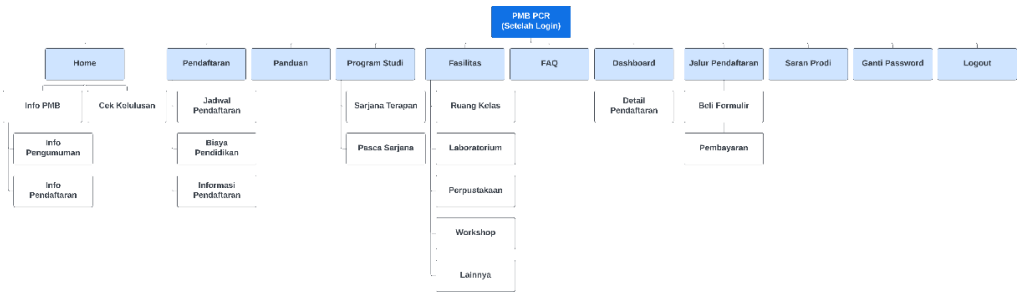

Fig. 5. Sitemap before registration [after redesign]

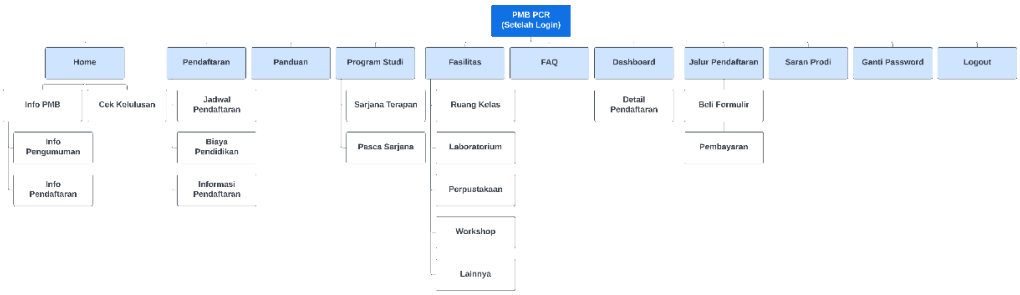

Fig. 6. Sitemap after registration [after redesign]

1) Userflow

User Flow is the flow passed by the user while running a website or application. User flow is a visual representation, both written and digital, of the flow or way that can be passed by the user while using a website [2].The user flow results from the new student candidate side are as follows:

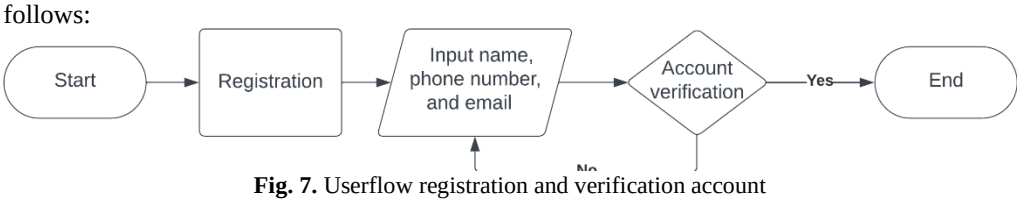

Fig. 7. Userflow registration and verification account

Figure 7 describes the flow to complete the registration form. The user performs from the stage of completing self-data, report values, files, registration data, waiting for an announcement,

making payments, re-registering, choosing shirt sizes, and completing personal documents.

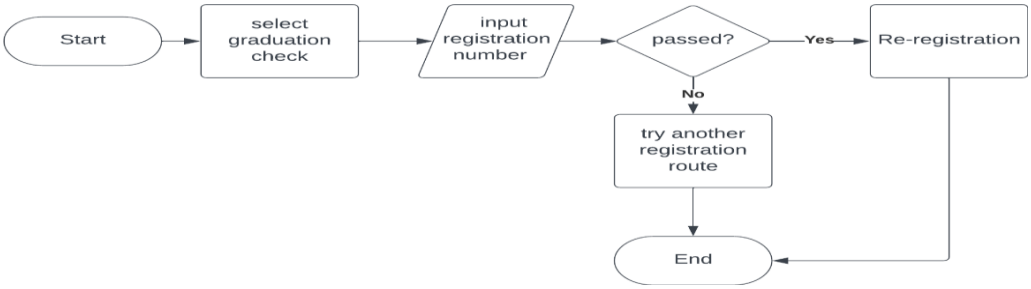

Figure 8. Userflow check the graduation

Figure 8 describes the flow for the user to check approval. The user selects the approval check and enters the registrar number obtained at the time of registration. Then display the selection results if the user passes, then do the re-registration, and if it fails, the user can register another path.

2) Style Guideline

A style guideline is a document that consists of a number of design rules. The style guide contains specific implementation guidelines, visual references, and design principles for creating interfaces or other design results[3]. Creation of style guidelines to maintain the consistency of each visual element created in wireframe design. The style guidelines created in this study include colors, typography, icons, spacing, and components.

3) Wireframe

A wireframe is an important stage in designing digital media. This is done in order to determine the hierarchy of information on a design and is easier to understand when planning the layout of the information structure so that it meets the needs of the user [4]. Here is the wireframe display that can be seen in Figure 9.

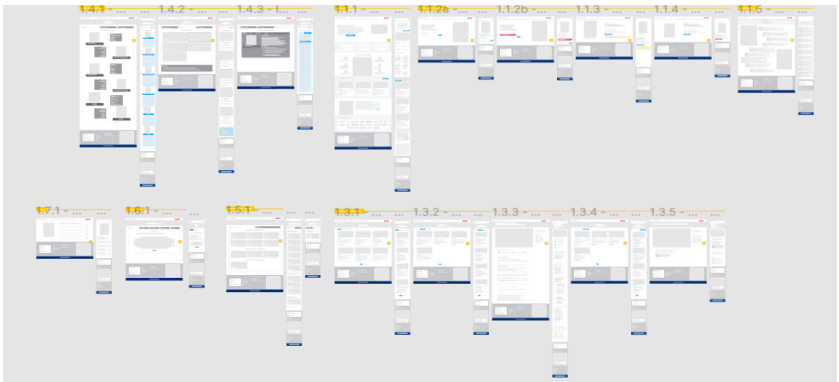

Fig. 9. Wireframe results

4) Prototype

The redesign consists of the display on each page of the low-fidelity wireframe design that has been made into the high-fidelity prototype. The result of the high-fidelity prototype is made

using the Figma application, which is used to create designs and prototyping tools for the projects we have. Figma is one of the design tools used to create the appearance of mobile applications, desktops, websites, and others. Figma is generally used by someone who works in the fields of UI/UX, web design, and other similar fields [5]. The prototype shown in Figure 10.

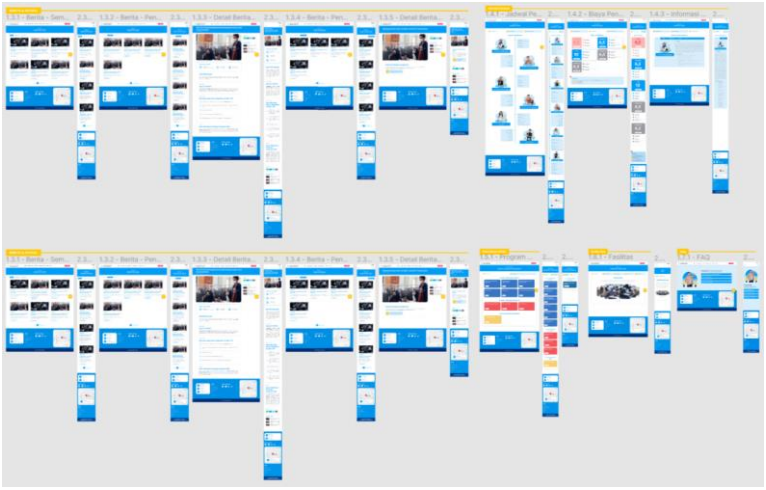

Fig. 10. Prototype results

As a prototype is created, a mockup map describes the relationship between one page and the other. The mockup map shown in Figure 11.

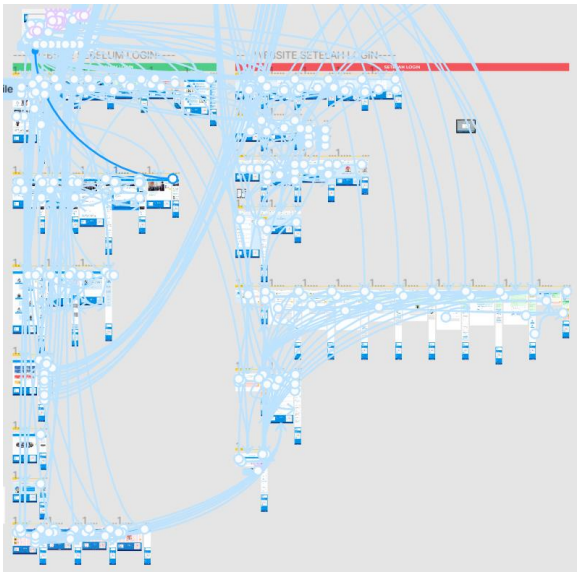

Fig. 11. Mockup map testing

Testing is a validation of the solution based on the problem already defined at the definition stage. This test phase is carried out by testing the prototype to get feedback. This phase is done to validate the design solution that has been made. Feedback from respondents is used to fix design solutions in prototypes that do not match the user's problems and needs.

1) Usability Testing with Maze

A test scenario is performed to see to what extent respondents can run a prototype to complete the task. Before conducting the test with the respondents, the author sets out a number of tasks that the respondent is obliged to do. During the test, respondents will work on five task scenarios.

Table 5. Scenariio [After Redesign]

ID	Goals	Scenario
T1	Registration and verification of accounts	You have never registered, so you need to register. Please register, and the system will send you a verification code via the email you have registered, and you will be asked to enter the validation code you have provided.
T2	Login	You have already made an account registration on the PMB website, and you are asked to make a login to log in to the program selection page.
T3	Choose a program and make payments	You choose one of the available programs. After that, you buy the form from the program you chose. Then you make the payment, and you are asked to wait until the payment verification has been successful.
T4	Complete the registration form	You have logged into the dashboard page. You have previously purchased the registration form, and then you are asked to complete the entire phase of the application form.
T5	Check the graduation	You select the approval check by entering the registrar number you obtained at the time of registration. Then your selection results will be announced in the system.

Usability Testing uses tools called Maze and is carried out online. Maze Design is the testing of a browser-based interface design. Testing is carried out by inserting the prototype results into the labyrinth application and then sharing the link with the user for testing. Aspects tested in the labyrinth are the usability breakdown and heatmap [6]. Here are the details of the usability breakdown and Click Heatmap obtained from 7 respondents using Maze by doing iterations as many as twice.

Table 6 .Usability breakdwon first iteration

Scenario Task	Direct Sucsess	Mission Unfinished	Avg. Time	Missclick Rate
T1	100%	0%	15,2 detik	27,8%
T2	100%	0%	9,5 detik	9,5%
T3	71,4%	28,6%	24,59 detik	55,4%
T4	71,4%	28,6%	30,7 detik	41,1%
T5	100%	0%	15,2 detik	27,8%

Table 7. Results of iteration scenario 1

Tasks	Students (S) S1	S2	S3	S4	S5	S6	S7
Registration [T1]							
Login [T2]							
Selecting a Program and Payment [T3]							
Completing the Registration Form [T4]							
Viewing Exam Results [T5]							

In the first iteration of Table 7, it can be seen that in T3 and T4, the outcome of unfinished missions was 28.6%, where there were 2 respondents who failed to complete the task. After re-designing several pages, the writer performed a second iteration test using the same tools: Maze. Changes and results can be seen in Table 8.

Table 8. Usability Breakdwon Second Iteration

Scenario Task	Direct Sucsess	Mission Unfinished	Avg. Time	Missclick Rate
T1	100%	0%	15,2 detik	27,8%
T2	100%	0%	9,5 detik	9,5%
T3	71,4%	28,6%	24,59 detik	55,4%
T4	71,4%	28,6%	30,7 detik	41,1%
T5	100%	0%	15,2 detik	27,8%

Table 9 Results of Iteration Scenario 2

Tasks	Students (S) S1	S2	S3	S4	S5	S6	S7
Registration [T1]							
Login [T2]							
Selecting a Program and Payment [T3]							
Completing the Registration Form [T4]							
Viewing Exam Results [T5]							

Based on the usability breakdown of the second iteration, the seven respondents had successfully completed the third and fourth tasks. In Table 9 is the result of the second iteration

of the usability breakdown, where the authors made changes to T3 and T4. The change resulted in good results, as reflected by the Maze Usability Score of 82 and a Direct Success score of 100% on all missions with "Responses" or respondents of 7 and "# of block" or scenarios of 5. Maze tools include usability score, usability breakdown, and heatmap as part of the process of determining the results of Usability Testing.

2) Usability Testing with USE Questionnaire

Once the user has completed all the existing tasks, the next step is to share the questionnaire with potential new students by using the USE Questionnaire to see the user's response to the already designed prototype. The weight of the value is described in Table 10.

Table 10. Value score

No	Questions	Score
1	Strongly Agree (SA)	5
2	Agree (A)	4
3	Neutral (N)	3
4	Disagree (DA)	2
5	Strongly Disagree (SDA)	1

After recapitulating the questionnaire against the respondents in the table above, then the recapitulation query is calculated. In Table 11 can be seen the results of the recapitulation of 7 respondents.

Table 11. Usability testing results

No	Assessment					Total Value	Min Score	Max Score	Persentage (total/max)*100%	Category
	SA	A	N	DA	SDA					
1	6	1	0	0	0	34	7	35	97.14%	Strongly Agree
2	4	3	0	0	0	32	7	35	91.43%	Strongly Agree
3	5	2	0	0	0	33	7	35	94.29%	Strongly Agree
4	6	1	0	0	0	34	7	35	97.14%	Strongly Agree
5	5	2	0	0	0	33	7	35	94.29%	Strongly Agree
6	4	3	0	0	0	32	7	35	91.43%	Strongly Agree
7	4	3	0	0	0	32	7	35	91.43%	Strongly Agree
8	5	2	0	0	0	33	7	35	94.29%	Strongly Agree
9	5	2	0	0	0	33	7	35	94.29%	Strongly Agree
10	3	4	0	0	0	31	7	35	88.57%	Strongly Agree
11	4	3	0	0	0	32	7	35	91.43%	Strongly Agree
12	4	3	0	0	0	32	7	35	91.43%	Strongly Agree
13	3	4	0	0	0	31	7	35	88.57%	Strongly Agree
14	4	3	0	0	0	32	7	35	91.43%	Strongly Agree
15	5	2	0	0	0	33	7	35	94.29%	Strongly Agree

Based on the results of the recapitulation in Table 12, we can calculate the percentage of success of each criterion with the average as follows:

1. Usefullness

$$= \frac{97,14\%+91,43\%+94,29\%}{3}$$

$$= 94,29\%$$

2. Easy of Use

$$= \frac{97,14\%+94,29+ 91,43\%}{3}$$

$$= 94,29\%$$

3. Easy of Learning

$$= \frac{91,43\%+94,29\%+94,29\%}{3}$$

$$= 93,33\%$$

4. Memorability

$$= \frac{88,57\% + 91,43\%)}{2}$$

$$= 90\%$$

5. Statisfaction

$$= \frac{91,43\% + 988,57\% + 91,43\% + 94,29\%}{4}$$

$$= 91,43\%$$

Total

$$= \frac{94,29\% + 94,29\% + 93,33\% + 90\% + 91,43\%}{5}$$

$$= 92,67\%$$

Usability testing was carried out against the PCR PMB prototype using the USE Questionnaire, with a total of 7 respondents. There are 5 variables that are tested with a total of 15 questions: Usefulness, ease of Use, ease of Learning, Memorability, and satisfaction. From the test results of the questionnaire that can be seen in Table 4.12, we obtained a total average of indicators of 92.67% with a score of 94.29% on the aspect of Usefulness, a rating of 94,29% on the aspect of ease of Use, a value of 93.33% on this aspect, a valuation of 90% on the aspects of Memorability, and a note of 91.43% on satisfaction. With the average results of the questionnaire, it can be concluded that the results of the redesign of PMB PCR have successfully facilitated new candidates in obtaining the desired information.

4 Conclusion

Based on the research conducted, several conclusions can be drawn, as follows:

1. This research has resulted in the design of the prototype website of Caltex Riau Polytechnic from the side of new students and administrators with design thinking methods starting from the stages of empathize, define, ideate, Prototype, and test.

2. Usability Testing results with Maze were obtained by giving five tasks to respondents. Based on the results of the test, it was concluded that the test obtained good results and received a total score of 82%; the value is taken from the average results such as the usability score, usability breakdown, and heatmap.
3. The results of Usability Testing with a questionnaire using the USE Questionnaire are carried out to find out the results of each usability indicator. Based on the PMB website design prototype, PCR yields an overall indicator average of 92.67% with a value of 94.29% on the aspect of usefulness, a score of 94,29% in the easy-of-use aspect, a rating of 93.33% on the aspect of easy-to-learn, a valuation of 90% on the aspect of memorability, and a number of 91.43% on the satisfaction aspect. Based on the category of the qualification table, the result of the UI website has a good level of learnability, memorability, efficiency, and satisfaction.

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References

[1] Kelley, D. and T. Brown, "An introduction to Design Thinking," 2018, [Daring]. Tersedia pada: https://doi.org/10.1027/2151-%0A2604/a000142%0D.

[2] Kathleen, A. R. P. Sutanto, and A. P. K, "Analisis Perbandingan User Flow dari Aplikasi E-Catalogue Ifurnholic," *J. DKV Adiwarna*, vol. 1, no. 18, hal. 1–9, 2021.

[3] T. Fessenden, "Design System 101," *Nielsen Norman Group*, 2021. https://www.nngroup.com/articles/design-systems-101/ (diakses Jun 20, 2022).

[4] A. Segara, "Penerapan Pola Tata Letak (Layout Pattern) pada Wireframing Halaman Situs Web," *J. Magenta, STMK Trisakti*, vol. 3, no. 1, hal. 452–464, 2019.

[5] M. A. Muhyidin, M. A. Sulhan, and A. Sevtiana, "Perancangan Ui/Ux Aplikasi My Cic Layanan Informasi Akademik Mahasiswa Menggunakan Aplikasi Figma," *J. Digit*, vol. 10, no. 2, hal. 208, 2020, doi: 10.51920/jd.v10i2.171.

[6] A. R. Pradana, M. Idris, S. Kom, and M. Kom, "Implentasi User Experince Pada Perancangan User Interface Mobile E-learning Dengan Pendekatan Design Thinking (Studi Kasus: Amikom Center)," *Automata*, vol. 2, no. 2, 2021.