

Design Thinking Approach for User Interface and User Experience on Campus Online Learning Platform

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ABSTRACT

Online learning methods are still the main way to access learning resources. The SPADA UPI platform is essential in supporting the academic and non-academic activities of Universitas Pendidikan Indonesia. In supporting these activities, user experience must also be considered when using online learning platforms. The results of the user experience survey of UPI students stated that all aspects assessed, such as attractiveness, perspicuity, efficiency, dependability, stimulation and novelty, responded poorly. To overcome these problems, it is necessary to redesign the SPADA UPI website to make it an intuitive website. In designing an intuitive website, a design thinking approach is used with output as a prototype of the SPADA UPI website. The User Experience Questionnaire (UEQ) is a user experience evaluation tool that outputs quantitative values. Comparing the UEQ results of the SPADA UPI website and the SPADA UPI website prototype will help determine whether the website prototype design provides a better user experience. The initial UEQ results that have been carried out and compared with the results of the prototype test of the SPADA UPI website show a good increase in value. With initial UEQ results averaging poor or less than 0.8, they improve by providing a score of more than 0.8 or excellent. Therefore, the design thinking approach is beneficial for designing an intuitive product that produces a better user experience.

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1. INTRODUCTION

Learning is an essential activity in the educational process. A learning process can develop students' cognitive abilities by transferring or processing information from teachers to students. The learning process can also be interpreted as an interaction between students and the environment that makes the process of processing captured information into knowledge [1]. According to Putra, in line with the development of information technology, the current learning method has developed from the conventional beginning, now it can be done without any distance barriers to carry out the learning process [2]. From these developments emerged an online learning process that provides innovative learning methods that are more inclusive and flexible to improve students' quality and make them relevant to the needs of society in the 5.0 era.

As shown by [3] and research conducted [4], online learning methods and media greatly assist learners in improving their skills, interests, creativity and digital literacy. Although face-to-face learning is still the main choice, online learning is still the main option for access to educational resources [5]. Online learning platforms such as SPADA, discussed by [6] and other research from [7], play an essential role in supporting distance education in various institutions. An example of an online learning platform is SPADA UPI, an online learning platform from the Indonesian University of Education (UPI). Not only does SPADA UPI provide access to academic information, but it also serves as a place for academic discussion and assessment. In addition, SPADA UPI is also used to support programs and activities outside the educational environment, such as KMMI, PPG, certification training, and various other programs that require distance-learning platforms.

Along with the development of technology, SPADA UPI will continue developing features to meet the demands of changing times according to the purpose of developing the SPADA UPI website. As the website progresses, user experience must also be considered to provide interest, comfort, and motivation when using the SPADA UPI website. In research [8], some things offer user convenience, such as the completeness of the features that have been developed and then a good system that can affect the product's user experience for the better. User experience also greatly influences user motivation or interest in using the website, so it is important to make the user experience good for a digital platform [9].

In analysing the use of the SPADA UPI website, a survey was conducted first on user experience conducted by the author to 40 Indonesian University of Education students who had accessed the SPADA UPI website. All aspects assessed, such as attractiveness, clarity, efficiency, accuracy, stimulation, and novelty, respond poorly. This shows that the SPADA UPI website is still less intuitive, and this affects user interest or comfort in using the website. The impact of inconvenience of using the SPADA UPI website is not only felt by students, but lecturers as educators becomes a challenge in operating the website. A website with an intuitive design will provide more efficient value for organising a website for its

users [10]. The lack of intuitiveness of the SPADA UPI website impacts the poor user experience of the website, even though when used optimally, the website provides great benefits.

Building a website with a good user experience, must be considered human-computer interaction (HCI) or UI / UX Design. In addition, design with a deeper understanding of users will create a more intuitive, efficient, and satisfying website design [11]. Intuitive design is fundamental in human-computer interaction (HCI) or UI/UX Design. Intuitive design is not just a principle or theory but a commitment to designing a user-friendly design [12]. To create an intuitive or user-friendly design, an innovation-focused approach is needed to improve the quality of the user experience. Research [13] states that the design thinking method can answer a user-centred problem or challenge with iterative development.

In research and development, according to [14], the most important thing in improving or innovating a product is to consider users' needs, desires and aspirations. So that by carrying out a design thinking approach, all of these things can be considered well in research. His research hypothesis also states that a user experience-based approach or design thinking can produce a product with better feasibility than just a request/preference from users. Conducting research and development is a good strategy to develop and validate an educational product [15].

From this description, this research will analyze and design solutions by applying a design thinking approach. By analysing the user experience in-depth and with iterations carried out, solutions will be obtained to overcome these problems and create a more intuitive design. From these results, it is hoped that the experience of using SPADA UPI will be better and can be properly functionalized.

2. RESEARCH METHOD

This research uses design thinking as a method in intuitive UI/UX design. According to Kalley, design thinking is a methodology that focuses on finding innovations in users and understanding how the needs of these users to create an innovation or appropriate design [16]. Conducting research and development will provide analysis and output of a website product prototype that can be tested for effectiveness [17]. The stages of design thinking are shown in Figure 1 below.

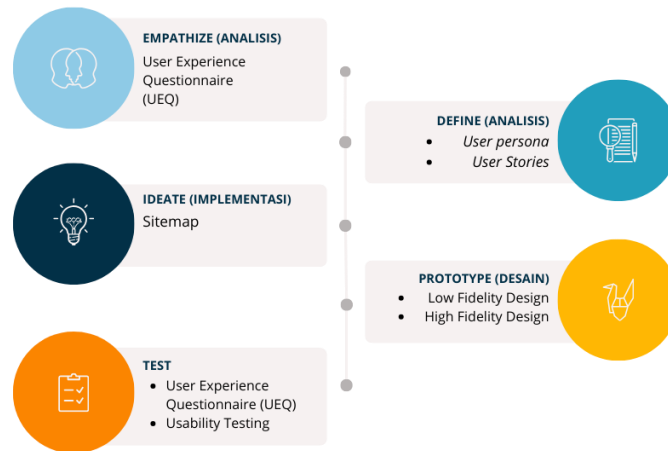


Figure 1. Design thinking process.

2.1. Empathize

In this empathise or analysis stage, the author uses a user experience questionnaire (UEQ) to measure user experience. UEQ, according to [18], is used to assist researchers, especially in collecting data that understands how users experience a digital platform. UEQ consists of 26 question items relating to 6 dimensions of user experience assessment: attractiveness, perspicuity, efficiency, dependability, stimulation and novelty [19].

The user experience questionnaire (UEQ) results will be processed using UEQ tools. Jelantik explains the categorisation of user experience assessment results in Table 1 [20].

Table 1. UEQ categorisation.

Assessment Aspect	Category				
	Excellent	Good	Above Average	Below Average	Bad
attractiveness	>1,75	>1,52	>1,17	>0,7	≤0,7
perspicuity	>1,9	>1,56	>1,08	>0,64	≤0,64
efficiency	>1,78	>1,47	>0,98	>0,54	≤0,54
dependability	>1,65	>1,48	>1,14	>0,78	≤0,78
stimulation	>1,55	>1,31	>0,99	>0,5	≤0,5
novelty	>1,4	>1,4	>0,71	>0,3	≤0,3

The UEQ results or evaluation will be conducted on students by purposive sampling or Indonesian University of Education students who have accessed the SPADA UPI website. The number of samples taken is based on suggestions from [21] on the NNG (Nielsen Norman Group) website as a platform, and the theoretical basis of forming interface design or user experience is 40. When validating the problem, using the correct sample count guidelines will produce simple quantitative data that will most likely give good results.

2.2. Define

The second stage of analysis in design thinking is defined. This research will define each previous stage finding to produce a representative user for the SPADA UPI website. Therefore, this study uses user personas to create fictitious representatives of users and then uses user stories to define personas that have been created. Research [22] states that user personas can explore information in the form of user desires or problems so that the author will find it easier to design ideation from the persona.

2.3. Ideate

In the ideate stage, the user flow is formed by considering the results of the define stage to address the problems emphasised in the user experience analysis. Implementing information system design will facilitate information from user analysis into a product or prototype [23]. According to Almakry, when starting or before designing a user interface, a designer needs to pay attention to how the behaviour of prospective users. By considering this, at this stage, we will produce an innovative or solutive idea to solve user problems [24].

2.4. Prototype

Based on the results of feature ideation or user flow influenced by user problems and goals, the implementation of low-fidelity and high-fidelity interfaces or designs is carried out to create a prototype of the SPADA UPI website. According to [25] as well as other research by [26], interface implementation is the implementation of communication to the interface that is used to assess user experience and get user feedback on prototypes

2.5. Testing

This testing stage is useful for validating solutions to problems from each user. Kous explained that usability testing is done with actual users of the platform. The testing is carried out to determine the user experience in completing a flow so that results prove that the design follows the research's purpose [27].

In testing the latest design of the SPADA UPI website, the authors selected 20 participants from the previous 40 who filled out a user experience questionnaire. According to Norman Nielsen, 20 respondents is an excellent number for user experience testing practices [28].

3. RESULTS AND DISCUSSION

The findings about the SPADA UPI website redesign process will be outlined at this stage. The implementation of these results is carried out using a design thinking approach, as described below.

3.1. Empathize

In this empathy stage, respondents must fill out a questionnaire using a Google Form with a processing time of under 5 minutes starting in December 2023. The questionnaire results were processed using the UEQ data analysis tool so that an analysis in the form of mean & variance was produced. The preliminary UEQ results are shown in Table 2 below.

Table 2. Initial UEQ results SPADA UPI website.

Aspects	Mean	Variance	Interpretation
attractiveness	0,358	1,13	Bad
perspicuity	0,338	1,36	Bad
efficiency	0,300	0,88	Bad
dependability	0,363	0,95	Bad
stimulation	0,275	0,77	Bad
novelty	-0,350	1,14	Bad

The initial UEQ results of the SPADA UPI website show poor or negative results. The interpretation of the value scale when <0.8 is called a negative result [29]. These results show that the SPADA UPI website is still less intuitive, has less appeal to visitors, and has a less efficient flow. This is also illustrated in the preliminary UEQ results chart of the SPADA UPI website, as shown in Figure 2 below.

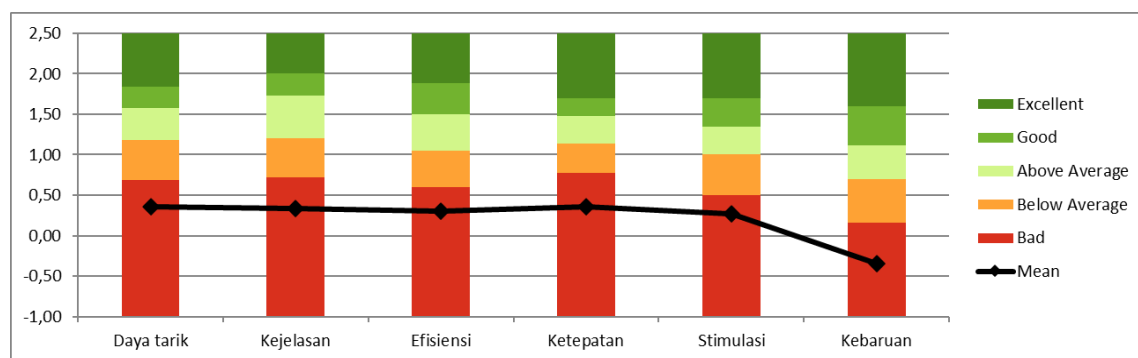


Figure 2. Standard graph of initial benchmark dataset.

Figure 2 is a graph and an interpretation of the initial UEQ results of the SPADA UPI website. The evaluation results have a bad interpretation value, which can lead to the need to improve the user interface (UI) and user experience (UX) on the SPADA UPI web.

3.2. Define

The first step is to create a user persona to provide an ideal user representative for the SPADA UPI website. The persona will describe students of Universitas Pendidikan Indonesia who are or will take online courses on campus using SPADA UPI as their learning platform. Here is a picture of a persona or a fictitious user description for the SPADA UPI website.

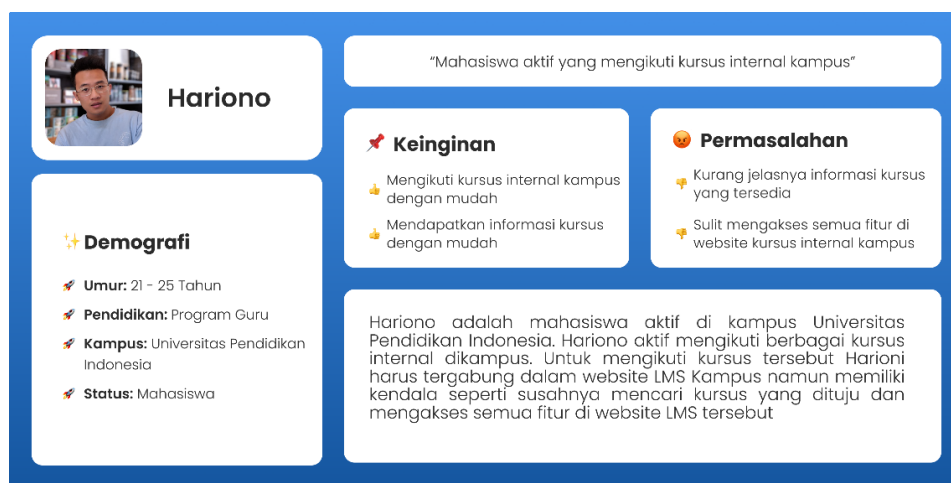


Figure 3. User persona.

Then, the author uses user scenarios to define the problems experienced by users or personas. By using user scenarios, writers can define the persona of the platform, then define what the persona needs and provide an idea of whether these needs can be met. The user scenario can be seen in Table 3 below.

Table 3. User stories.

As	Students of Universitas Pendidikan Indonesia.
I want to	Easily access all SPADA UPI features, have no trouble entering online courses, and interact with features that fit the function.
So that	I could access and use SPADA UPI comfortably without having to go through any difficulties accessing courses and features.
Scenario	When students enter the SPADA UPI website, users are immediately presented with a lot of important information, such as the course being undertaken, course grades, and registering for new courses provided by lecturers or course organisers.

3.3. Ideate

A sitemap is made to produce a solution that can solve the problems obtained from the previous stage. The sitemap should include some of the main features of the SPADA UPI website, such as dashboards, online courses and grades. Here is an image of the SPADA UPI website sitemap designed based on the empathise and define stages results.

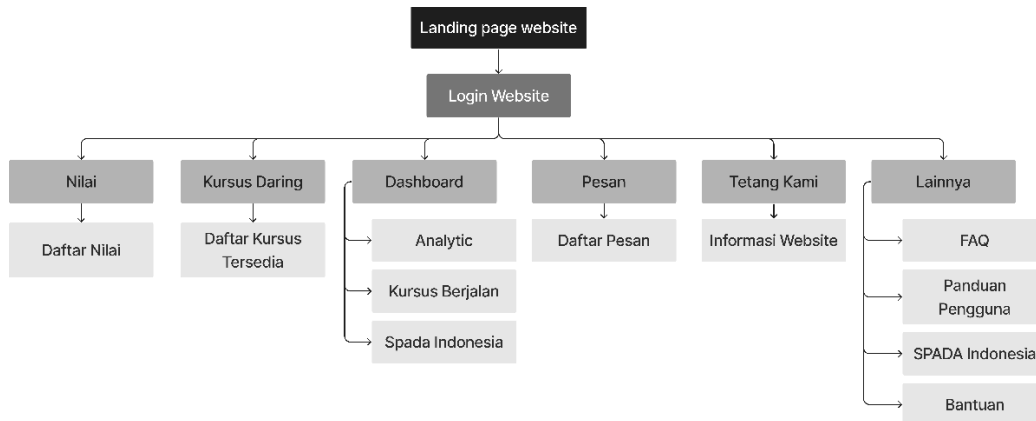


Figure 4. Sitemap website SPADA UPI.

3.4. Prototype

The results of the sitemap that has been created are then made into a low-fidelity wireframe, which aims to provide sketches before making a high-fidelity prototype. This wireframe stage focuses on creating layouts to display important information on the SPADA UPI website, such as course information and analytics. The following results of the low-fidelity design can be seen in Figure 5 below.



Figure 5. Low-fidelity design website SPADA UPI.

After completing the low-fidelity wireframe, the next step is to design with more detailed results. At this high-fidelity stage, several things must be considered, such as

colours, typography, and various other components, to create a SPADA UPI website. The following high-fidelity design results can be seen in Figure 6 below.

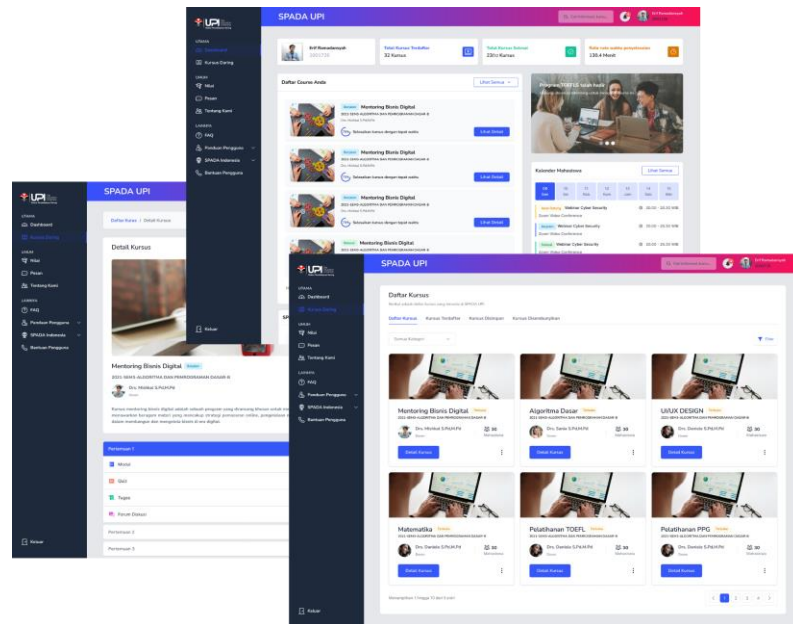


Figure 6. High-fidelity design website SPADA UPI.

Then, the high-fidelity design is made into an animation or interaction flow for further use at the testing stage. The process of providing animation or interaction on high-fidelity SPADA UPI web design can be seen in Figure 7 below.

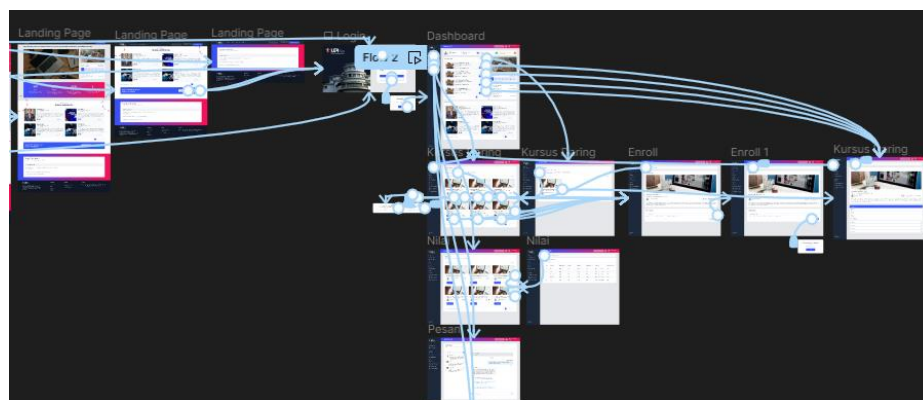


Figure 7. SPADA UPI website animation flow work.

3.5. Testing

In addition to re-conducting UEQ like the empathy stage, this study uses usability testing of the flow created in the prototyping phase. Table 4 contains test plans or scenarios that will be tested based on the results of the prototype that has been made.

Table 4. Test plan usability testing.

Scenario	Task
<i>Login</i>	When the user is on the landing page menu, the user must enter an account and the SPADA UPI dashboard view.
Enroll in a Course	When the user is on the main page of SPADA UPI, the user must go to the online course page, enter the code and join the skin.
Accessing Courses	Once a user is enrolled in a course, the user must access that course.
Save and hide courses	On the online course page, users have to put some courses into the store and then hide the available courses.
View scores	Users must go to the grade page and select a course to see the grade details.

Based on the scenario in Table 4 above, usability testing was evaluated using the maze platform. The following are the results of UPI SPADA web usability testing, which can be seen in Table 5.

Table 5. Usability testing results.

Scenario	Direct Success	Task Unfinished	Time Average
<i>Login</i>	95%	0%	16,9 seconds
Enroll in a Course	60%	0%	47,1 seconds
Accessing Courses	100%	0%	7,8 seconds
Save and hide courses	80%	0%	23,3 seconds
View scores	85%	0%	10,6 seconds

The usability testing results show that all participants can complete the scenario created and indicated by the percentage of tasks not completed by 0%. However, not all participants complete all scenarios according to the path, and only scenario three can be completed according to the path or the evaluator's user expectations when completing the task. This is not an obstacle because a user who has just accessed it will explore, which results in solving scenarios outside the path. Then, when viewed from the average duration of users completing the scenario, it proves that the longer completion duration and complexity of the scenario affect the percentage of direct success because users must understand the new flow created.

Then, to conduct further evaluation, the author gave UEQ questionnaires to 20 participants who had passed usability testing. Here are the UEQ results from the redesigned SPADA UPI website described in Table 6.

Table 6. Final UEQ results SPADA UPI website.

Aspects	Mean	Variance	Interpretation
attractiveness	1,958	0,62	Excellent

perspicuity	1,388	0,73	Above Average
efficiency	1,925	0,73	Excellent
dependability	1,875	0,65	Excellent
stimulation	1,963	0,80	Excellent
novelty	1,188	1,38	Good

The UEQ results show that six assessment aspects give good results with a mean above 0.8. The graph of the final UEQ result is depicted in Figure 8 below.

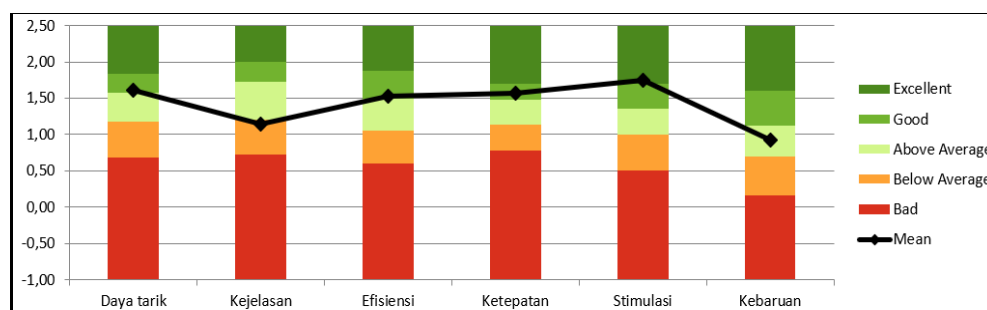


Figure 8 Standard graph of the final benchmark dataset.

Figure 8 describes the graph and interpretation of the UEQ results of the prototype SPADA UPI website. The results show that attractiveness, efficiency, accuracy, and stimulation are excellent value interpretations. Then, other aspects, such as novelty and clarity, get good and above-average interpretation values. In terms of clarity, it did not get a perfect score. Still, it was considered sufficient because 50% of respondents who tried the prototype stated that it needed improvement in terms of readability and navigation.

Based on testing on the prototype of the SPADA UPI website, it shows a good improvement. Of all aspects carried out, the test scored >0.8 according to [29] or the UEQ handbook; if the mean value >0.8, the result is tested positive. Unlike the initial UEQ results, which showed several <0.8 or negative, the final UEQ results provided positive value progress after the creation of the SPADA UPI website prototype by applying a design thinking approach. Table 7 of the following initial and final UEQ comparisons shows a detailed comparison of values

Table 7. Comparison of initial and final UEQ results.

Aspects	Before		After	
	Mean	Comparison to Benchmark	Mean	Comparison to Benchmark
attractiveness	0,358	Bad	1,958	Excellent
perspicuity	0,338	Bad	1,388	Above Average
efficiency	0,300	Bad	1,925	Excellent
dependability	0,363	Bad	1,875	Excellent
stimulation	0,275	Bad	1,963	Excellent
novelty	-0,350	Bad	1,188	Good

4. CONCLUSION

The author uses a design thinking approach to redesign the SPADA UPI website. The process involves empathising, defining, ideating, prototyping, and testing. The results of UEQ analysis at the empathise stage to 40 respondents showed the need for improvement in various aspects such as attractiveness, clarity, efficiency, accuracy, stimulation, and novelty. Then, user problems and needs can be identified by building user personas and scenarios at the defined stage.

After passing the user analysis process, the next step is the ideate stage. At this stage, a low-fidelity sitemap and wireframe are created as a first step for the ideate stage before creating a high-fidelity prototype. The design considers elements such as colour, typography, and other components. Then, in the testing phase, 20 users were involved, who completed most scenarios with varying durations. UEQ evaluation after testing showed good results, with initial UEQ results averaging poor or less than 0.8, now improving by providing a score of more than 0.8 or excellent. Overall, this approach has improved the user experience of UPI's SPADA website, created a solution that better suits user needs, and provided a better online learning experience.

Referring to the output of this research that produces a prototype, further research is needed on designing a complete website or SPADA UPI website information system. It is hoped that the Indonesian University of Education can implement this advanced research to have a good effect on the quality of learning, especially courses organised by the campus.

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