



Double Diamond Approach for Mobile-based UX: Connecting Students to Professional IT Projects

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Abstract

Students at UAD can join various projects offered by their lecturers, including research, internships, assignments, and competitions. These opportunities are typically communicated through research workshops or WhatsApp groups. Currently, more lecturers are getting research projects that require students as technical members, but they need to be sure about the students' sufficient abilities. On the other hand, not all students receive this information, and project monitoring is often done informally via WhatsApp. All students should get projects so they can graduate from project management courses or internships. To address this, lecturers can help speed up the process of students getting projects by inviting students to join their projects. An application was proposed to streamline information dissemination, student selection, and project monitoring. The study employed the double diamond method—Discover, Define, Develop, and Deliver—to design the app's UI/UX prototype. Usability and user experience testing showed high success rates for both lecturer and student applications, with 91.81% and 84.54% respectively. The student app scored well on attraction (1.63), clarity (1.45), efficiency (1.70), accuracy (1.70), stimulation (1.95), and novelty (1.40). The lecturer app scored even higher on attraction (2.47), clarity (1.45), efficiency (2.25), accuracy (1.95), stimulation (2.65), and novelty (2.45).

Keywords: Double Diamond; User Interface; User Experience; UEQ; Prototype

1. INTRODUCTION

At Present, technological advancements ease people in carrying out daily activities. In a campus environment, technology can facilitate various activities, such as enrolling new students, registering for courses, borrowing books, and the learning process. Activities that can be done by students are participating in projects offered by instructors. This can increase students' experience and relationships.

Based on interviews with 7 instructors of Informatics, in 1 semester instructors have an average of 3 projects. Projects are offered to students through media



such as a WhatsApp group, which contains students supervised by the concerned instructors. Not all active students in the major can know this information. According to a survey using Google Forms on 55 IT students at Ahmad Dahlan University, 32.7% of students felt infrequent and 47.3% occasionally received project information from instructors. This indicates that information accessibility is still lacking, resulting in not all students having suitable qualifications for offered projects. Currently, instructors monitor the project progress of students by confirming project achievements in the WhatsApp group. 3 instructors mentioned cases where students rarely respond and consult with instructors, which will affect project progress.

The use of mobile devices can be an alternative solution to assist students in accessing information about a project offered by instructors. According to data from Statista on mobile device internet usage in Indonesia from 2015 to 2025, statistics show that in 2021, 198.88 million people accessed the internet on mobile devices and are estimated to increase to 249.16 million people in 2025 [1]. This technology will take the form of a mobile application. The application is expected to facilitate students in registering for a project according to their interests and skills and make it easier for instructors to select students based on predetermined qualifications.

This research aims to produce a design prototype for a project offer application in the form of a high-fidelity prototype using the Double Diamond process, with IT students and instructors at Ahmad Dahlan University as the target users. In 2005, Double Diamond was first introduced by the British Design Council as a design framework. Double Diamond is used as a design process to explore existing problems in a broad way (divergent thinking) and to identify them precisely (convergent thinking) to find the right solution [2]. Double Diamond has 4 stages, in the first diamond there are discover and define to understand a problem, then in the second diamond, develop and deliver to find potential solutions, and finally in the third diamond, deliver and refine to produce a final solution [3].

2. METHODS

2.1. Research Methods

The Double Diamond method is a design process framework developed by the Design Council that will be applied in the design of a prototype application offering projects to students by professors. This method allows the designer to focus on problem analysis as a foundation in finding the right solution. It enables expanding 12 existing problem scopes (divergence) and finding existing problems deeply (convergence), then expanding the solution space found (divergence) and finding the optimal solution (convergence), the divergence and

convergence pattern forms a Double Diamond [4]. Figure 1 is the stage of the double diamond method.

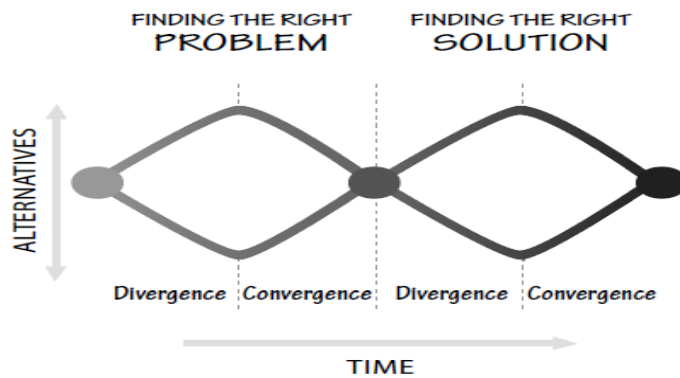


Figure 1. Stage of Double Diamond

In each stage of this double diamond method, it will be carried out according to the recommendations of 3 articles entitled "The Double Diamond Design Thinking Process and How to Use it", "How to Apply a Design Thinking, HCD, UX or Any Creative Process from Scratch", and "Why the Double Diamond is the Most Precious Diagram in UX Design" [5], [6].

1) Discover

The method begins with the discover stage, in which user research is conducted to gather information to gain insight from potential users. This stage makes us experience what the potential users are experiencing. The data obtained from the user research process will be represented in a visual form such as sticky notes that can be arranged in the next stage [7].

2) Define

The information obtained from the discover process will be analyzed to narrow down the space of existing problems to determine the problems to be solved. This process can be done by analyzing, managing, and comparing the notes of each respondent from the previous research stage. The result of the data management can be grouped into user personas and a summary of the difficulties (pain) and desires (gain) of the respondents [4].

3) Develop

In this stage, researchers focus on designing ideas and solutions through brainstorming. The ideas are designed into a navigation flow, and the design becomes a reference for low-fidelity and medium-fidelity designs, which are then implemented into a prototype form [3].

4) Deliver

The developed prototype will be tested on potential users through usability testing to measure task completion time and task completion success rate as well as the User Experience Questionnaire (UEQ) tools. The purpose of the UEQ test is to assess a user's experience quickly and directly [8]. The focus in this stage is the product completion process to produce a design that meets the Minimum Viable Product (MVP) and continues with the product testing process [2].

3. RESULTS AND DISCUSSIONS

A questionnaire was distributed to students of the Informatics undergraduate. The questionnaire successfully received 55 respondents, with 96.4% of students very interested in participating in the instructor's project. The information dissemination process of the project is 47.3% of students feel they occasionally receive project information, while 32.7% of students feel they rarely receive project information. The most frequently obtained information dissemination medium was through a WhatsApp group.

The data collection process using the interview method was conducted on two types of respondents, instructors, and students. The following is a summary of the data obtained from the instructor interview results. (1) The average number of projects owned by one instructor is 3 projects. (2) The projects owned are usually related to work subjects such as internships, project management, and research. (3) Instructors usually provide information about projects through a WhatsApp group. Some instructors choose to offer it directly through a private message on WhatsApp about the project they own to students. (4) There are qualifications/requirements for students to participate in instructor projects. The selection process of students who follow instructor projects is chosen based on experience, academic transcript, and portfolios that students have. However, instructors who offer directly to students conduct selections independently to ensure competence and commitment to students. (5) Instructors monitor the progress of projects carried out by students by having students directly confirm the progress of their project via WhatsApp. The challenges faced are that some students do not report on the progress of the projects they have completed.

Student interviews were divided into 3 criteria of respondents and the following is a summary of the data obtained from student interviews. Students participate in an instructor's project to fulfill the course grades (such as Project Management or Internship) and to add experience in directly working on a project and receive guidance from an instructor. The reason students do not participate in a project is due to the students' abilities not being in line with the project needs desired by the instructor and the time for completion determined by the instructor cannot

be fulfilled by the students. Students receive information about project offerings in different ways.

3.1 Define

In this stage, the interview data obtained in the discover stage will be processed using the affinity diagram and user persona. Afterwards, the obtained data will be developed into user persona (Figure 2) and How-Might-We. The Define phase is conducted in accordance with the recommendation of three articles entitled "How to Apply a Design Thinking, HCD, UX or Any Creative Process from Scratch" [6]. The following are results from Affinity Diagram: (1) The target of information receipt is not evenly distributed to all students, while students in need are overwhelmed during trying to find out the information about availability of open projects from the lecturers. (2) Lecturers do not want it to be too difficult in searching for competent students while Students want projects that match their needs and interests. (3) The type of projects usually offered are recognizable for internships, project task management, research, personal, or competition projects. (4) Lecturers want to check the progress of the project work done by the students so that they can determine whether the project is running smoothly or if there are obstacles. (6) Students need guidance from the lecturers when encountering obstacles in the project completion process.

The data obtained from the affinity diagram and user persona will be used to formulate "How Might We" statements. The successfully formulated "How Might We" statements are as follows: (1) How Might We provide lecturers with ease in finding students with the required competence for a project? (2) How Might We facilitate the delivery of information about the availability of projects by lecturers to the general IT students? (3) How Might We facilitate project monitoring so that lecturers can be aware of the progress made by students. (4) How Might We make it easier for students to find projects that are suitable for their qualifications as determined by lecturers and their abilities. (5) How Might We provide easy guidance for students so that they can report any difficulties encountered during the project work.

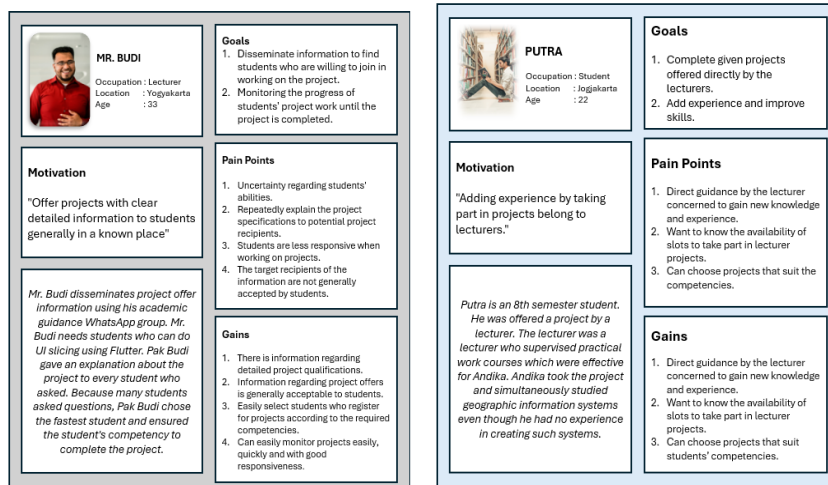


Fig 2. User Persona for Lecturers and Students

3.2 Develop

The solution development process will be initiated with the process of determining the potential of ideas that can become solutions for the problems that have been identified, organizing the information structure or information architecture, organizing the task flow, and creating low-fidelity wireframes.

Here are proposed solutions or potential idea for Lecturers: (1) Providing a medium for filling in detailed information (e.g. title, project type, description) about the lecturer's project so that the lecturer can easily disseminate information about the availability of the project they have. (2) Providing a medium for lecturers to see a list of students who have registered for the available projects. (3) Providing a medium for lecturers to monitor the work progress of students regularly and provide performance ratings based on the students' responses.

In the Students' point of view, the ideas can be: (1) Providing a medium that displays information about the projects available from a lecturer so that students can find out about the project's qualifications and register for the desired project. (2) Providing a medium for students to form a group if the project type is a group project. (3) Providing a data input form (academic transcript and portfolio) as a requirement for students to register for a project. (4) Providing a daily record (logbook) to students so they can report on the progress of the project they have completed. (5) Providing a medium to inform about the existence of a consultation request to the lecturer.

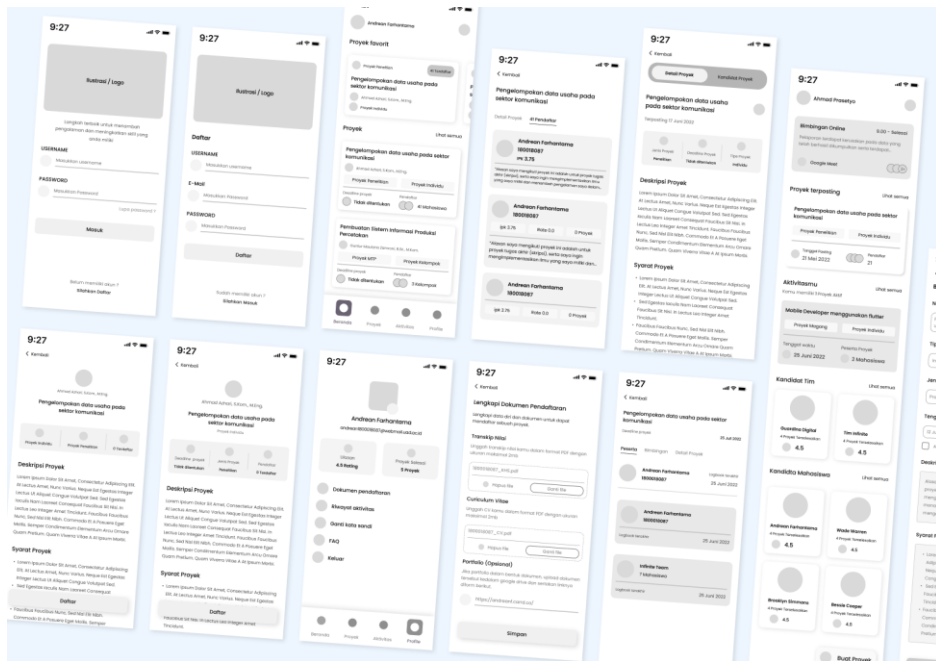


Fig 3. Low-Fidelity Wireframe

All solution ideas offered for lecturers and students are selected based on the possibility of being integrated into a mobile application. An information architecture is organized in the form of a sitemap that aims to map out every detail of the pages in the application [9], [10]. A wireframe design is based on the analysis results and is in accordance with the information architecture that was previously established. Figure 3 shows the result of the wireframe design for the application.

3.3 Deliver

1) High Fidelity Wireframe

In this part, the wireframe will be further refined into a more attractive and interactive design based on the task flow that was formulated in the previous stage [11]. The prototype is made interactive so that potential users can directly interact and get an idea if the features and design that have been developed meet their needs. Some illustrations used in the development of high-fidelity prototypes are taken from the storyset.com and manypixels.co websites. Here is the high-fidelity prototype that has been successfully developed for the application for students and lecturers. Figure 4 some excerpts from the developed high-fidelity prototype.

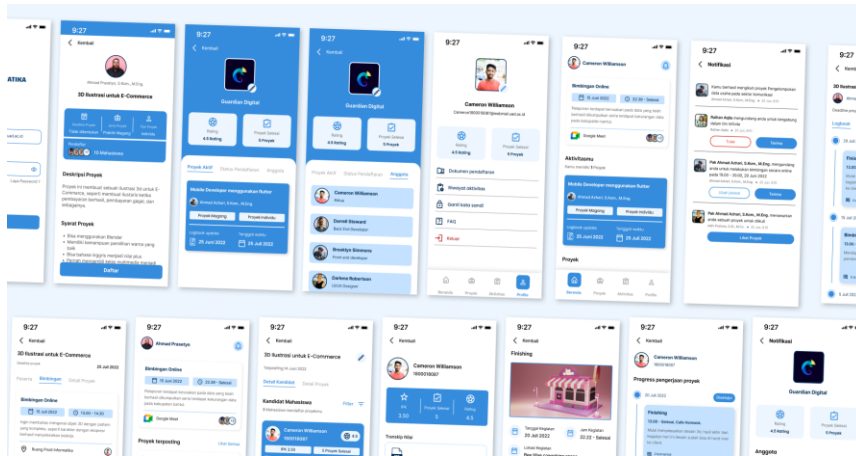


Fig 4. High-Fidelity Prototype

2) Usability Testing

In testing with the usability testing method, the respondents will complete several tasks from the scenario given to achieve a specific goal. Tasks given for students resulted in the number of successful tasks = 40 (1 point), partially successful tasks = 13 (0.5 points), and failed tasks = 2 (0 points), makes the Successful Task Rate in the student application is 84,54%. This result indicates that each task assigned to students can be completed within the ideal time expectation for 40 tasks. Then, tasks that can be completed by students even though they exceed the ideal time expectation for too long for 13 tasks. In this test, only 2 tasks failed to be completed by students. Table 1 shows the result of the students' completion time for each task. *Std* shows the ideal time measured from pre-testing observations using the research team's peer review technique.

Table 1. Time Completion Task for User Students

#R/#T	T1	T2	T3	...	T9	T10	T11
Std	.06	.10	.50	...	.20	.25	.07
R1	.06	.10	.39	...	.47	.46	.04
R2	.06	.15	.39	...	.21	.48	.04
R3	.03	.10	3.18	...	1.44	.46	.12
R4	.06	.06	1.16	...	.31	.15	.10
R5	.05	.06	.33	...	.20	.09	.10
AVG	.05	.10	1.16	...	.45	.33	.08

Meanwhile, in the application for lecturer users, the results obtained from testing 11 tasks include: number of successful tasks = 47, partially successful tasks = 7,

and failed tasks = 1. The result obtained from the calculation of the task successful rate in the test on the lecturer's application is 91.81%. This result shows that every task assigned by the lecturers can be completed before the ideal expected time of 47 tasks. Then the task that can be completed by the lecturers even though it exceeded the ideal expected time is 7 tasks. In this test, only 1 task failed to be completed by the lecturers. Table 2 shows the result of the lecturers' completion time for each task.

Table 2. Time Completion Task for User Lecturers

#R/#T	T1	T2	T3	...	T9	T10	T11
Std	.13	.20	.40	...	.25	.15	.17
R1	.15	.23	.28	...	.25	.14	.54
R2	.11	.16	.20	...	.23	.09	.22
R3	.05	.23	.33	...	.48	.08	.10
R4	.05	.15	.38	...	.34	.12	.20
R5	.11	.21	.36	...	.26	.16	.22
AVG	.09	.20	.31	...	.31	.12	.26

The answers to questions after the usability testing process to get feedback from the lecturers were impressed and satisfied with the features developed in the Profin Informatics application. The interactions and flows developed can be easily understood by lecturers, this is proven by the success rate values obtained. The lecturer suggested a feature like the following: 1) There is a live chat feature that allows students and lecturers to communicate; 2) Students can offer personal topics to the lecturers; 3) Addition of independent project types, this project can be a competition project, or a personal project owned by a lecturer.

3) User Experience Questionnaire

The UEQ testing was carried out after the usability testing. This method enables users to express their attitudes and feelings when using a product [12]. The testing was conducted by requesting the respondents to fill out a questionnaire with the help of an online form containing 26 questions with 7-point answer scale representing the respondent's feelings during the prototype testing process [13]. The following is the result of the UEQ benchmark in the student and lecturer application testing.

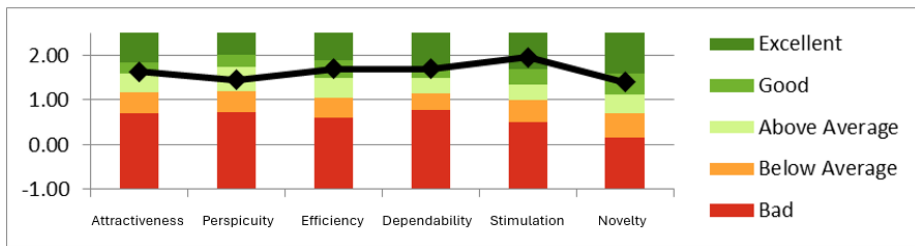


Figure 5. User Students' Benchmark Result

As shown in Figure 5, the scales of attractiveness, efficiency, dependability, and novelty received a "good" result. The stimulation scale received an "excellent" score. The perspicuity scale received an "above average" score. From the results, it can be concluded that each evaluation scale shows satisfactory results, and each scale has reached the initial target of above average. The developed solution and design ideas have already met the user's needs, but there is a need to improve from the perspicuity scale to achieve better results.

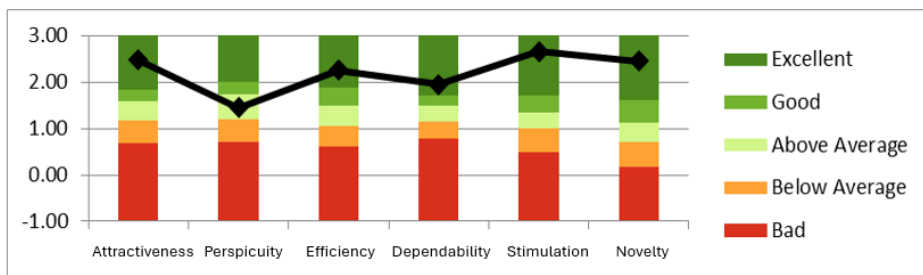


Figure 6. User Lecturers' Benchmark Result

As shown in Figure 6, the scales of attractiveness, efficiency, dependability, and novelty received a "good" result. The stimulation scale received an "excellent" score. The perspicuity scale received an "above average" score. From the results, it can be concluded that each evaluation scale shows satisfactory results, and each scale has reached the initial target of above average. The developed solution and design ideas have already met the user's needs, but there is a need to improve from the perspicuity scale to achieve better results.

4. CONCLUSION

Double diamond method can be applied as the design process in prototyping UI/UX of the application for students and lecturers to access project information. The validation of double diamond method in the design of Profin Informatika's UI/UX application shows that the results of the testing indicate that the design solution developed in the application is in line with user needs.

This can be seen from the calculation of the task successful rate in the application for students and lecturers which is 84.54% and 91.81% and seen from the benchmark results of the UEQ scale which has an average value of good and excellent. Further research can be done on the application to optimize the clarity scale and add features of offering personal topic to lecturers, live chat feature, and adding skills for students.

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