

AR Application Design for SV IPB Software Engineering Technology Study Program using Design Thinking Method

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Augmented reality (AR) applications have undergone rapid development in modern software development. By blending virtual and real-world elements, AR provides an in-depth user experience. The continuity of this development is relevant to the Software Engineering Technology Program at IPB University. In order to create innovative solutions that meet the needs of users, the research adopted the Design Thinking methodology. This process ensures a comprehensive understanding of the user's needs while encouraging creative ideas. The research aims to develop an AR application that not only meets the needs of users, but also displays interesting and meaningful interactive multimedia features. The design process involves steps such as user experience analysis, ideation, prototyping, as well as software testing and evaluation. Thus, the results of the development and research of these applications are expected to strengthen the appeal of the Software Engineering Program at IPB University, in attracting the interest of prospective students who are looking for innovative and up-to-date learning experiences.

Keywords: Application, Augmented Reality, User Experience, Design Thinking

INTRODUCTION

The rapid advancement of technology has made smartphones an integral part of our daily lives, with Augmented Reality (AR) emerging as a transformative technology in the realm of smartphone applications (Siskandar, Fadhil, Kusumah, Irmansyah, & Irzaman, 2020; Yoridho, Adi, & Siskandar, 2020). AR, by merging the real world with virtual elements, offers immersive and interactive experiences through smartphone cameras and applications (Jumarlis, 2018). However, the development of effective AR applications presents several challenges and complexities, necessitating a systematic design process with a focus on user experience and interactive multimedia (Arianto, Hidayati, & Pratama, 2023).

To address these challenges, this paper proposes the use of the Design Thinking method in the development of AR applications. Design Thinking, a human-centered approach, facilitates a profound understanding of user needs and fosters innovation in the solutions produced (Haq & Baskoro, 2020). By leveraging Design Thinking, application designers can create AR applications that not only meet user expectations but also offer innovative and user-centric features (Azmi, Kharisma, & Akbar, 2019).

In addition to Design Thinking, this paper also advocates for the use of the waterfall method in the development of Android-based AR applications for the Software Engineering Technology study program. The waterfall method, suitable for small-scale projects with well-defined specifications, ensures organized and sequential development stages, providing clarity and understanding at each step (Darma, Yusron, & Huda, 2021). However, while the waterfall method offers stability, it's crucial to remain adaptable to changes during the development process (Alwahdi et al., 2023).

This paper aims to introduce a mobile application using AR to showcase the Software Engineering study program, offering a more immersive understanding compared to previous approaches. The app provides details about career opportunities post-graduation and incorporates multimedia experiences to enrich the learning process (Sanjaya & Febriandirza, 2023). This research approach seeks to ignite interest and engagement among learners, highlighting the potential for AR in educational contexts (Sayudin, Hadinata, Suarna, & Basysyar, 2020).

In conclusion, this paper will delineate the process of developing AR applications using the Design Thinking method, emphasizing user experience and interactive multimedia. It will also discuss the implementation of Android-based AR applications for the Software Engineering Technology study

program using the waterfall method. The research approach aims to address shortcomings in previous methods and enhance the educational experience for Software Engineering students (Ikhsandi, Laili, Akbar, & Efendi, 2022).

METHODS

The author uses the Design Thinking method, an approach used in designing and developing products or solutions that focus on an in-depth understanding of user needs and encouraging innovation in the solutions produced (Haq & Baskoro, 2020). This approach involves empathy for users, team collaboration, and a focus on creative problem-solving (Razi, Mutiaz, & Setiawan, 2018). Design Thinking is often used in various fields, including application development because it can help developers understand user needs better and produce more relevant and innovative solutions (Untoro & Maharani M, 2022)

In the context of application development, the author leverages development platforms Unity3D which provide robust environments for creating immersive and interactive experiences. These platforms support multiple programming languages, including C#, enabling the development of applications for various platforms and device (Hidayat, Setiawan, & Arisandi, 2023). Additionally, the author incorporates augmented reality (AR) technologies into the development process. The use of AR SDKs Vuforia allows for the implementation of advanced AR features (Renaldi et al., 2023). Specifically, the author employs marker-based AR, which involves recognizing predefined markers using image recognition algorithms. This technology enhances the user experience by overlaying virtual information onto real-world objects through the detection of markers (Riskiena, 2022).

The integration of these technologies and tools aligns with the iterative stages of the Design Thinking method. By understanding user needs and fostering creativity, developers can leverage Unity3D, C#, and AR SDKs to create innovative and user-centric applications. The collaborative and empathetic aspects of Design Thinking complement the technical capabilities of the chosen platforms and programming languages, resulting in a holistic approach to application development (Alex, Muslih, & Arianti, 2023).

To understand user needs and evaluate the developed AR application, developers employ various data collection methods:

- Surveys: These are used to gather both quantitative and qualitative data from users about their preferences and experiences with AR applications
- Observations: By observing user interactions with AR applications, developers can identify usability issues and areas for improvement
- Interviews: In-depth insights and feedback on the AR application are obtained through user interviews
- User Testing: This involves observing and interviewing users as they interact with the AR product to collect feedback and insights

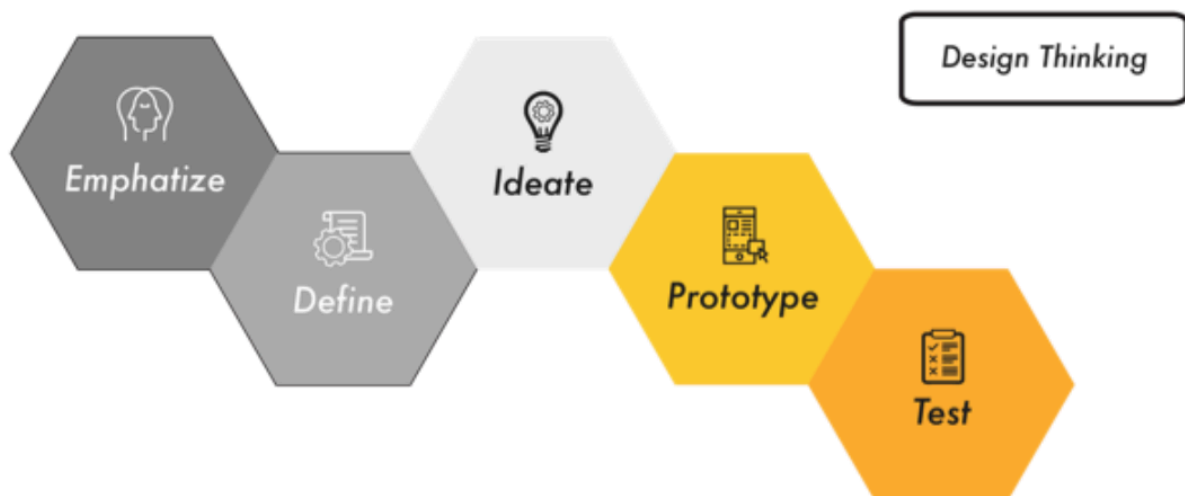


Figure 1. Design Thinking Method

1. Empathize

The first stage in Design Thinking is the Empathize stage, where designers try to understand the problem users face deeply. At this stage, designers must be able to enter the user's world and

understand their perspective on the problem. By understanding the problem from the user's perspective, designers can produce solutions that genuinely suit the user's needs (Haq & Baskoro, 2020).

2. Define

Define is a stage in Design Thinking that involves a deep understanding of user needs and getting views from users. In this stage, a user persona is created as a basis for product or application design (H. D. Putra, Asfi, & Fahrudin, 2021).

3. Ideate

Ideate is a stage in the Design Thinking method where various solution ideas are generated to solve existing problems. These ideas are collected through brainstorming and then depicted as concepts or sketches. This stage aims to produce as many creative and innovative ideas as possible as a first step in designing a product or application (Razi et al., 2018).

4. Prototypes

Prototype is a stage in the UI/UX design process that aims to make it easier for users to operate the interface design, which can be evaluated at the testing stage. The prototyping process is also a user interaction with the system designed to obtain response information regarding the application design. A prototype is an initial concept or standard size of a model used to determine the design created (Madawara, Tanaem, & Bangkalang, 2022).

5. Test

The test is a stage in the UI/UX design process that involves testing and evaluating the prototype created. The purpose of this stage is to get feedback from users regarding the design and functionality of the application that has been designed. Prototype testing is done by testing existing features and collecting user usability and satisfaction data. The results of this testing will be used to improve and optimize the application design before it is officially launched (Bhakti, Ahmad, & Adrian, 2022).

RESULTS AND DISCUSSION

1. Empathize Stage

In the empathize stage, the testing is a stage in the UI/UX design process that involves testing and evaluating the prototype created. The purpose of this stage is to get feedback from users regarding the design and functionality of the application that has been designed. Prototype testing is done by testing existing features and collecting data regarding usability and user satisfaction (Fatwa & Candra, 2023). The results of this testing will be used to improve and optimize the application design before it is officially launched (Madawara et al., 2022). writer defines a problem. After conducting interviews regarding the TPL SV IPB study program and job prospects, the following are the problems found

- a. The level of interest and knowledge about the TPL SV IPB study program could be higher: In interviews, many respondents revealed that they needed more knowledge about the TPL SV IPB study program. This shows that efforts are needed to increase understanding and awareness of this study program.
- b. Lack of available information about job prospects: Many respondents expressed ignorance about the job prospects that can be followed after completing the TPL SV IPB study program. In the empathize stage, it is necessary to understand more about the respondents' concerns, desires, and needs regarding job prospects to present relevant information clearly and interactively.

From the data the author has obtained and concluded, the author creates a user persona whose data and needs can be seen in Figure 2. The function of this user persona is so that the author can understand that this persona will represent the TPL SV IPB application user.



Tuti

Age:18
Education:Siswa SMA
Hometown:Jakarta
Family:Married couple
Occupation:Siswa kelas 12 yang sedang persiapan masuk perguruan tinggi

“Saya ingin kuliah tentang teknologi, tapi bingung pilih jurusan apa”

Goals

- Menjadi tahu tentang sebuah program studi beserta prospek kerja program studi tersebut

Frustrations

- Jenuh jika membuka brosur atau portal perguruan tinggi dan ingin mendapatkan experience yang lebih interaktif

Tuti Susanti seorang siswa yang sedang menjalani tahun terakhir di SMA, sedang mencari jurusan atau program studi untuk pendidikan tingginya. Tuti tertarik pada IT sehingga dia berfokus pada program studi dengan prospek kerja di bidang IT.

Figure 2. User Personas

2. Define Stage

The define stage in the design thinking process is a step to narrow the focus of the results of the empathize stage (P. Putra, Irfa, Sazaki, & Yunika, 2023). This stage is similar to the "How Might We" (HMW) method, which aims to turn problems into questions that can be solved (Raschintasofi & Yani, 2023). The define stage also helps the writer gain insight, answer user needs, and manage the information obtained from the empathize stage (Zukhri & Ikhlas, 2022). The following are some of the pain points found by users:

- a. Low level of knowledge about the TPL SV IPB study program.
- b. Lack of information regarding job prospects after graduating from the study program.

3. Ideate Stage

The writer can use wireframes to design and illustrate these ideas at this stage. A wireframe is a simple visual representation of a user interface or layout of a web page or application (Wahyu et al., 2023). Wireframes help authors plan the developed solution's overall structure, layout, and navigation. Wireframes usually focus on organizing key elements without paying much attention to graphic design or intricate details (Hartawan, 2022). Figure 3 shows the wireframe of the TPL SV IPB application.

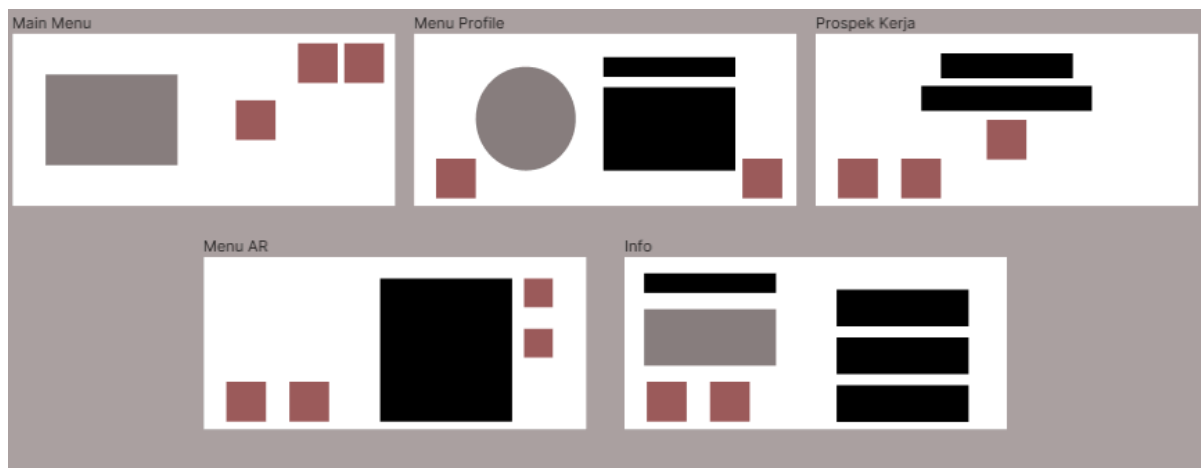


Figure 3. Wireframe

4. Prototype Stage

The prototype stage in Design Thinking is where previously generated ideas are transformed into models or prototypes that can be tested (Mahhendra & Irawan, 2023). This prototype is used to test product performance and get feedback from users. In this stage, the author can make improvements and improvements before continuing to the next stage. Figure 4 is a prototype for the TPL SV IPB application.

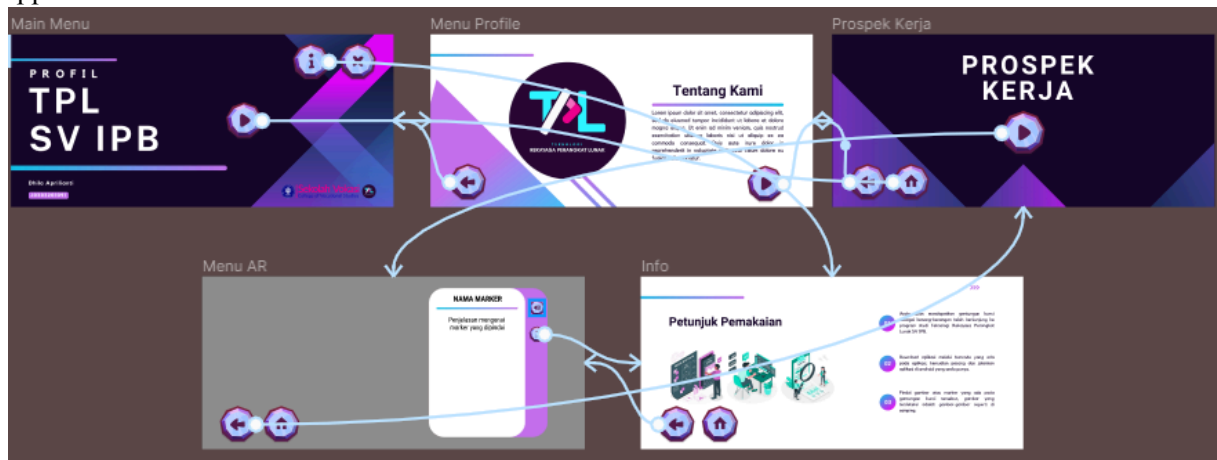


Figure 4. Prototype

5. Test Phase

This test uses usability testing, a testing method for evaluating the user experience of a product to find out how much value is obtained from an interface so that it can be used by users when running the system (Prabowo, Hardinata, & Fuad, 2023). After getting the final results of the overall score on the usability testing test, the next step is data analysis, which aims to find scores from the learnability, efficiency, and memorability aspects of using the TPL SV IPB application (Aprilianti et al., 2023). The following are the results of data analysis that have been obtained through questionnaires distributed to 3 evaluators.

Table 1 Questionnaire Results

No	Question	P1	P2	P3	Yes
Learnability					
1	Is the text in the application easy and clear?	Y	Y	Y	100%
2	Is the application easy to operate?	Y	Y	Q	66%
3	Is the display on the application easy to understand?	Y	Y	Y	100%
Total learnability score					89%
Efficiency					
4	Does the button or feature display or run quickly	Y	Y	Y	100%
Total efficiency value					100%
Memorability					
5	Are the icons and buttons easy to understand?	Y	Y	Y	100%
6	Can you remember the menu you have visited before?	Y	Q	Q	33%
7	Is the website page menu easy to remember?	Y	Y	Q	66%
Total memorability value					66%
Total					85%

This stage of implementation in the development of Augmented Reality (AR) based applications is a crucial stage that transforms designs and concepts into real products. In this context, the implementation refers to the process of developing Android-based AR applications with Unity as the main platform, using the C# programming language. This stage involves the manufacture of functions, modules, and components that have been previously described at the design stage. In addition, AR elements such as three-dimensional models and virtual objects are well integrated into applications to project goals consistently.

This implementation phase is also a response to the outcomes of previous phases such as Empathize and Define. At the empathize phase, the developer team understands the needs of the user

and how the AR application can meet those needs. The Define phase then formulates the problems that the application will solve. The results of these two phases are then reflected in the implemented application. For example, if at the Empathize stage it is found that users need a more interactive and visual way to understand abstract concepts, then at the implementation stage, an AR application will be developed with a focus on visualizing three-dimensional models and virtual objects. Thus, users can interact with such abstract concept in a more intuitive and interesting virtual environment.

Furthermore, the implementation phase also ensures that the AR application developed is in line with the goals and targets set in the previous phase. For example, if the goal of the project is to enhance the learning experience of the student, then at implementation stage, AR applications will be developed with features that support those goals, such as interactive learning simulation and three-dimensional model visualization. Overall, the implementation stage plays an important role in ensuring that the developed AR application not only meets the needs of the user, but also achieves the goals and objectives of the project effectively and consistently.

1. Main Menu Page Implementation



Figure 1. Main Menu

2. Implementation of the Profile Menu Page



Figure 2. Profile Menu

3. Implementation of Job Prospects Page



Figure 3. Work prospect

4. AR Menu Page Implementation (Marker 1)

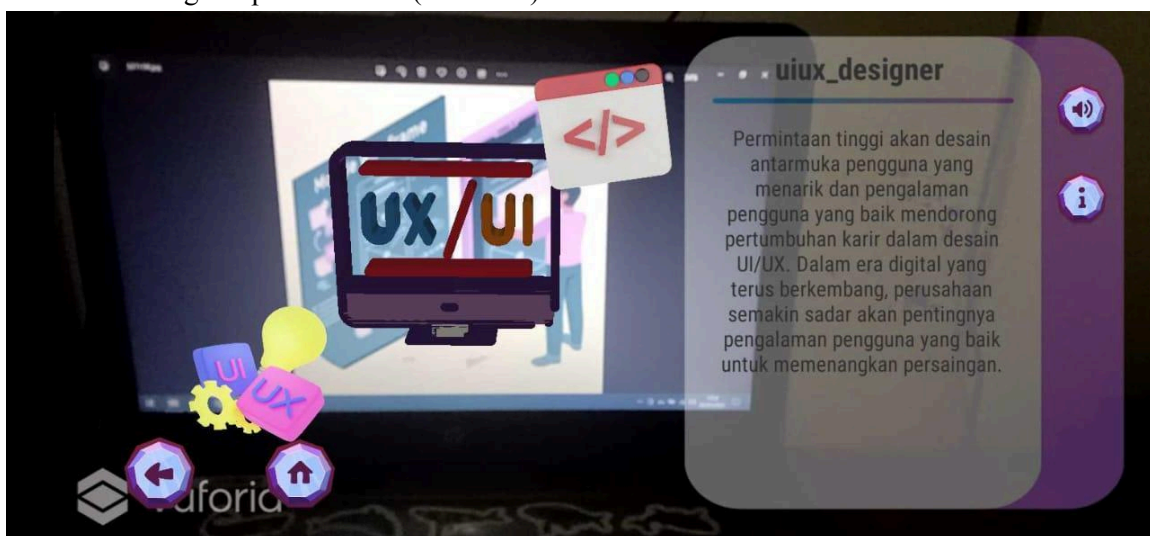


Figure 4. AR Menu (Marker 1)

5. AR Menu Page Implementation (Marker 2)

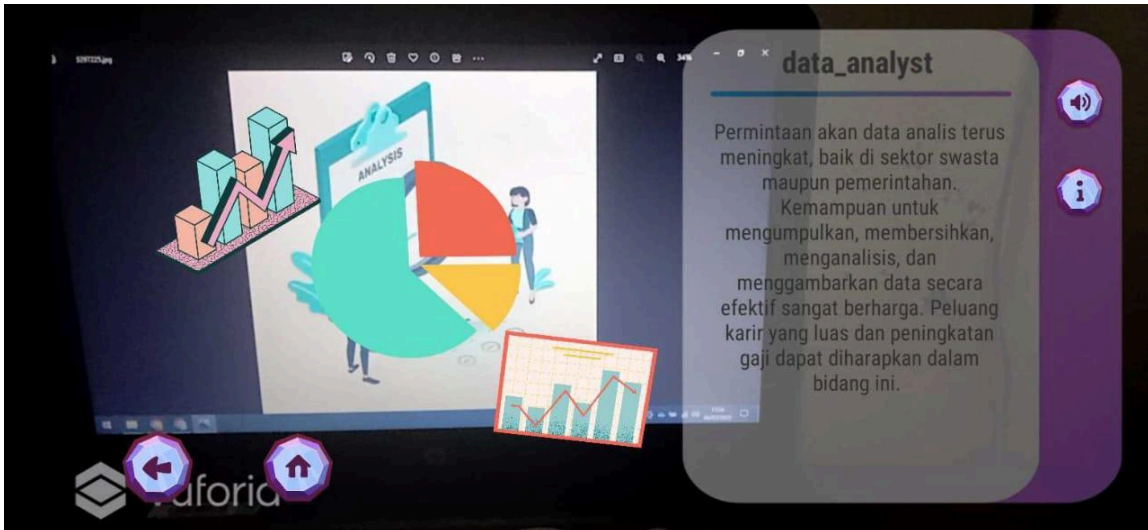


Figure 5. AR Menu (Marker 2)

6. AR Menu Page Implementation (Marker 3)

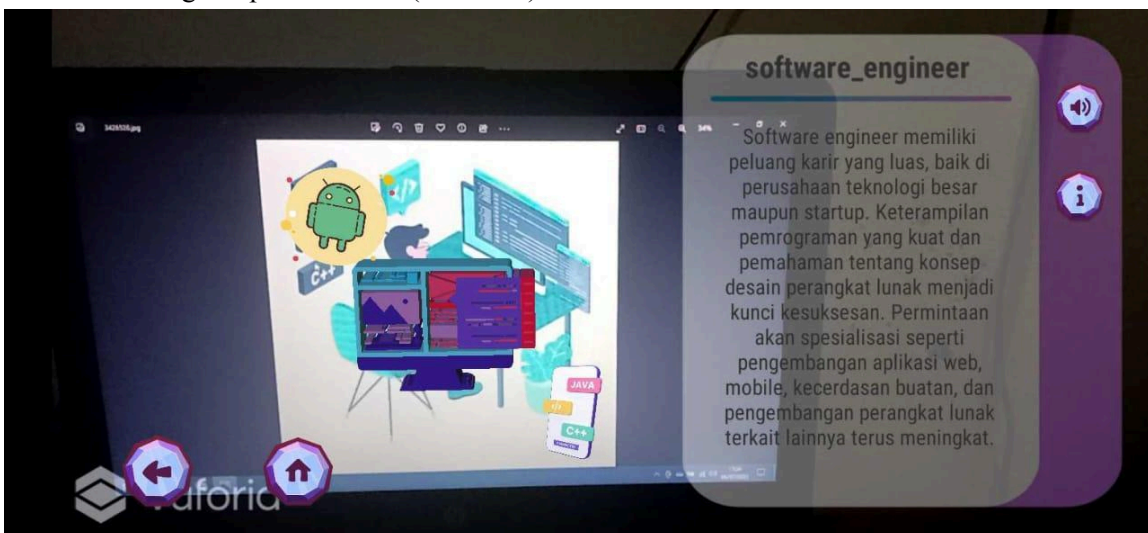


Figure 6. AR Menu (Marker 3)

7. Info Page Implementation



Figure 7. Info

CONCLUSION

In the realm of UI/UX design, our application of Design Thinking to the TPL SV IPB app has yielded a notable 85% approval rating in usability testing. This figure reflects the success of our strategies in developing prototypes that align with the true desires and needs of potential users as they make critical decisions about their higher education journey. This achievement is not just a statistical victory but a validation of our meticulous methodology, ensuring the application resonates with the users' aspirations. Moving forward, our approach will go beyond simply listening to users; we will delve into their stories to enhance the software with empathy and understanding. Our future plans are ripe with the promise of innovation. We envision a world where augmented reality is integrated with personalized guidance, pushing the envelope of traditional educational app design. This vision is not just about adding features; it's about enriching the user experience and providing comprehensive support for those navigating the complexities of educational choices. The impact of our work extends beyond immediate benefits. Longitudinal studies will allow us to track user interactions and satisfaction over time, offering a complete view of the application's development. In this ongoing conversation with users, we are not just refining an app; we are crafting an educational companion that evolves and adapts, delivering lasting value to its users. As we embark on this dynamic journey, the TPL SV IPB application stands as a testament to the power of design and testing, and a herald of transformative educational technology.

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