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Elevating 'TutorYuk' Online Peer Tutoring Services Through Information System: A Design Thinking Framework Approach

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Abstract

Through applications supporting informal education services, the development of information technology during the fourth industrial revolution has promoted the growth of the education industry in Indonesia. This study uses the Design Thinking framework to design and analyze information systems for the online peer tutoring services known as TutorYuk. The stages in system design are as follows: empathize stage, namely the process of identifying user needs and classifying practical problems related to requirements in the informal education sector; define the location, analyze the priority of user needs and issues that need to be solved through information systems; the idea stage, the process of networking aspirations related to solutions to problems in the education sector that shows the urgency of system design; prototype stage, design system flow and function and visualization of application interfaces; Testing stage, testing system performance. The findings of this study demonstrate that TutorYuk is built to suit student needs for learning help based on course names and instructor qualities chosen by users. The duration and experience of the instructor are considered when providing tutoring services so that they can be tailored to the client's needs. Consequently, by offering digital media to service suppliers (tutors) and service recipients, TutorYuk can become a commercially successful application (tutees).

Keywords: Design Thinking; Information System; TutorYuk; Online Peer Tutoring Services

1. INTRODUCTION

Through digital innovation in the form of website-based learning applications, the rise of information technology has sparked changes in the education industry. [1] demonstrates the necessity for information technology as a helpful teaching tool to foster students' interest in learning and motivation to work on science-related challenges. Instead, [2] suggests that a teacher's ability to use the appropriate

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elements pertinent to the lesson plan also determines how well technology is used in the classroom. Using information technology in Indonesia's teaching and learning process modifies several knowledge transfer processes that enhance students' cognitive, emotional, and psychomotor abilities. This demonstrates that digital technology innovation in education needs to be promoted to enhance the learning process in educational institutions. Given this, this study aims to create the TutorYuk application as a provider of online peer tutoring services.

Through an adaptable, successful, and effective learning process, information technology in education makes communication easier. [3] demonstrates how online course applications need to be developed based on the difficulty level relevant to learners' desires; doing so considerably enhances the learning experience outside of formal schooling. But then [4] Shows how the creation of online course applications for college students at the upper level of education can enable interpersonal communication via the technology used and help students understand the context of their learning based on the learning objectives and alignment created by the course organization. This demonstrates the necessity for online course applications as an adjunct to traditional education to enhance learning and help students develop their knowledge and abilities. This reflects a change in the educational landscape, where technology may effectively and efficiently enhance students' knowledge and skills. Because of this, the analysis and design of the TutorYuk application, an online course application case study, are the main emphasis of this study.

The challenges facing the education industry in the disruptive era are the technical infrastructure support and the degree of student acceptance of the technology utilized by formal education service provider institutions. Regarding Indonesia, [5] reveals that the Covid-19 epidemic has significantly raised the demand for technology-based informal education services or online courses. Due to a lack of internet networks and communication technology infrastructure, not all areas can access the internet. As opposed to that, [6] demonstrates how the design of online course apps is based on a learning strategy that adjusts for student level and includes pedagogical components. This indicates that equitable distribution of communication technology infrastructure and the internet must first be established to control and enhance the quality of learning materials in online course applications. As a result, managing the quality of learning materials to the needs of students and ensuring fair access to skilled technology infrastructure represent the critical challenges associated with employing technology as a learning medium.

Indonesia has seen a considerable increase in the development of online course applications. [7] develops Virtual Community Digital Learning Nusantara (VCDLN) applications using waterfall frameworks, which benefit group-based learning or interdisciplinary communities. On the other hand, [8] designed a

website-based learning course system based on the Rapid Application Development (RAD) method. This demonstrates how effective business management may boost competitiveness and financial rewards through digital innovation in informal education service providers. [9] illustrates how the Learning Management System (LMS) is a learning model that draws enthusiasts and applies business methods to profit monetarily from each educational service on the website. As a result, the advancement of technology for digital online courses serves as both a platform for offering educational services and a successful business model. In light of this, the business strategy for TutorYuk, which provides online education services, was developed. TutorYuk's software was produced utilizing the Design Thinking methodology.

The design thinking framework can be applied to creating user-centered, engaging, and interactive applications for online courses that address user demands and offer fresh experiences. [10] creates interfaces for online course applications by following a framework based on empathizing, defining, ideating, prototyping, and testing. Each site offers a summary of user requirements, critical difficulties or issues, and suggestions or remedies pertinent to user issues. As opposed to that, [11] confirms that using the Design Thinking Framework when designing applications simplifies developers to define objectives and take tactical actions to finish applications on schedule. This demonstrates the benefits of using the design thinking framework for determining timelines and introductory courses of action for application development. In light of this, a design thinking framework based on the stages of empathize, define, ideate, prototype, and testing was used to create the TutorYuk application.

The TutorYuk application elaborates on the business methods employed by education service providers in a higher education context. The demand for peer mentoring services is the foundation of TutorYuk's business approach to providing lessons for particular courses. The stages of empathizing, defining, ideating, prototyping, and testing serve as the basis for user need assessment, problem classification, and analysis of suitable solutions. This highlights the potential for empirical contributions to education and information technology. On the other hand, the selection of a theoretical contribution demonstrates the users' intent to adapt to the digital transformation process in the education sector by utilizing online peer tutoring services. This highlights the crucial fact that both theoretical and empirical contributions are needed for this topic. The Design Thinking framework must be applied when analyzing and developing the online information system course TutorYuk offers.

2. METHODS

The design thinking framework used in this study includes the stages of empathizing, defining, ideating, prototyping, and testing. After determining user

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wants and challenges at the empathize and define settings, an online information system is introduced at the ideate step. Application interface design and experiments are also performed to assess whether TutorYuk deployments are ready for commercial reasons. However, TutorYuk is a program that still requires development to modify features and functionalities to user needs occasionally. The design thinking framework for application design has a stage shown in the figure below.

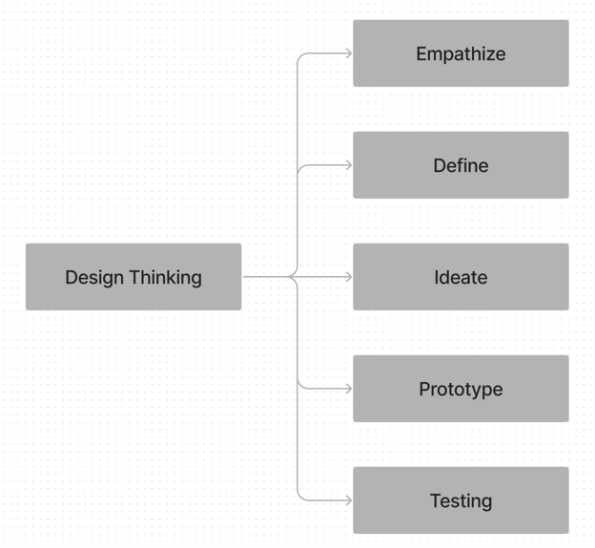

Figure 1. Design Thinking

Figure 1 is a design thinking framework used to create the TutorYuk application. At the empathy stage, user demands are determined by asking students to complete an application networking survey. The survey's findings indicate the following issues with the learning process and student expectations for online peer tutoring management systems: Students need peer mentoring from peers who have mastered skills or knowledge in a specific field of science or topic. Assistance is required based on a relatively short time adjusted to the period students need. The data is analyzed at the defined stage to filter the core concerns and needs that can be supported by the system based on the findings of identifying needs and categorizing challenges students confront.

At the define stage, the outcomes of categorizing user problems and identifying wants are evaluated based on the developer's capacity to offer suggestions or solutions that can be implemented as system flows or functions. A system that provides informal education services as support for formal education is needed by students as students, as can be observed from the findings of the user needs definition. The necessity for peer tutors with adjustable service duration is another

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problem to consider. The desired flexibility, meanwhile, refers to how simple it is to purchase and cancel services, arrange learning timetables, and pay for services. The ideation process establishes the system's flow and function by identifying the primary issues and requirements that must be prioritized. The process of networking aspiration about the system's shape, function, flow, user wants, issues, and potential solutions occur during the ideate stage. TutorYuk is a concept that can address user demands by creating system processes, functions, and forms based on the use case model below.

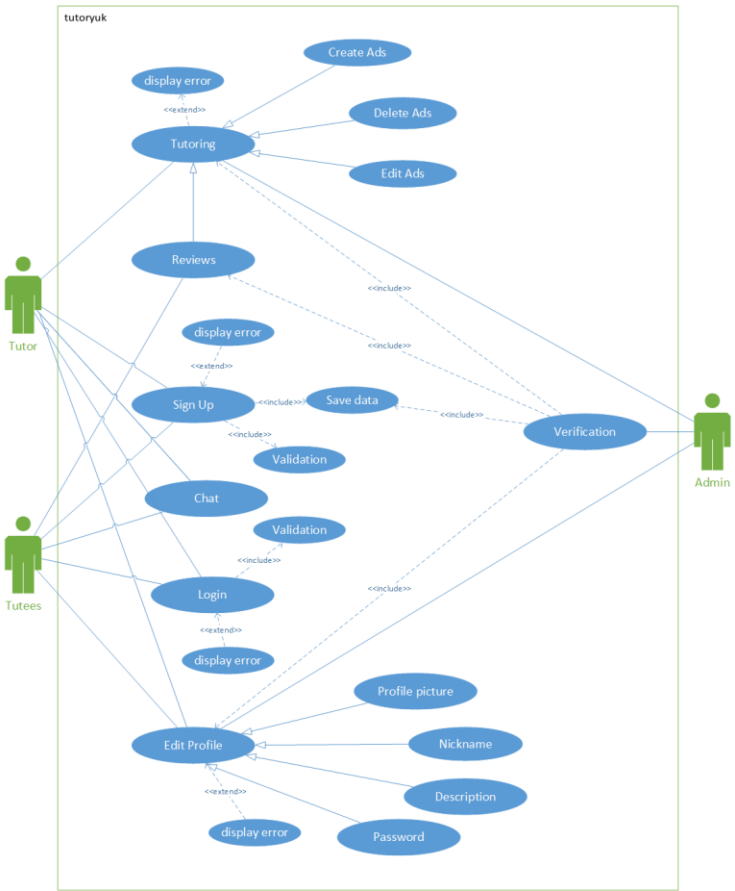

Figure 2. Usecase Diagram of Online Peer Tutoring Services "TutorYuk"

Figure 2 is a use case diagram of the online peer tutoring service "TutorYuk," which is determined based on the ideation results to meet user needs and solve problems. Three main actors can operationalize the TutorYuk application: first, users as tutors who register themselves as service providers with rates and expertise in particular scientific fields or scientific topics; second, the admin as the application manager and a verifier who validates the knowledge and rates of tutors,

as well as the availability of tutor time in providing services; and third, users as students who use the application as tutors. Thirdly, students' users get access to service data such as information about tutors, their backgrounds and ratings, their levels of expertise, their rates, and their availability. Users can communicate directly using the chat function as instructors and pupils to confirm the study time and material used.

At the prototype stage, the application interface is designed so that it is easy to use by each actor as a TutorYuk user. The Figma application, where each page is built based on a mobile application through the user's smartphone, is the supporting tool used in interface design. Black box testing is the technique used to test applications, and it involves registering, logging in, adding and saving data, deleting data, updating data, and viewing detailed data that can be effectively operationalized for each application function. Overall, professionally growing online peer tutoring services through the TutorYuk application is necessary by offering digital payment services, changing tax regulations, and creating alluring peer tutoring programs to encourage students to use TutorYuk frequently. This study is restricted to Tutoryuk's design and analysis using the design thinking paradigm. However, it will continue to be developed regularly to provide theoretical and empirical support for business needs.

3. RESULTS AND DISCUSSION

Online peer tutoring services in the form of the TutorYuk application are a form of solutive as well as digital innovation in informal education services that can accommodate user needs and solve problems related to teaching and learning activities. [12] shows peer tutoring is a practical learning approach to increasing student motivation. On the other hand, [13] suggests that the relationship between tutors and tutees in peer-teaching speeds up the knowledge transfer process. This indicates that peer-teaching models are becoming more effective in mastering specific skills. Considering this, TutorYuk is designed to meet user needs (tutors and tutees) and is a profitable informal education service provider business.

The effectiveness of peer-tutoring learning triggers developers to design application forms that suit the learning model in each educational institution. [14] created the Mobile Online Peer Tutoring Application Mentor as a medium for exchanging knowledge between tutors and tutees. On the other hand, [15] shows that the learning process based on peer tutoring becomes a place for interaction between tutors and tutees more effectively, forming a more complex social network. This indicates that peer tutoring is an effective learning model and needs to be developed using technology contextually. The design of the peer-tutoring application known as TutorYuk is tailored to the context of the Atma Jaya Catholic University of Indonesia students. The following is the Entity-Relationship Database (ERD) design of the TutorYuk application.

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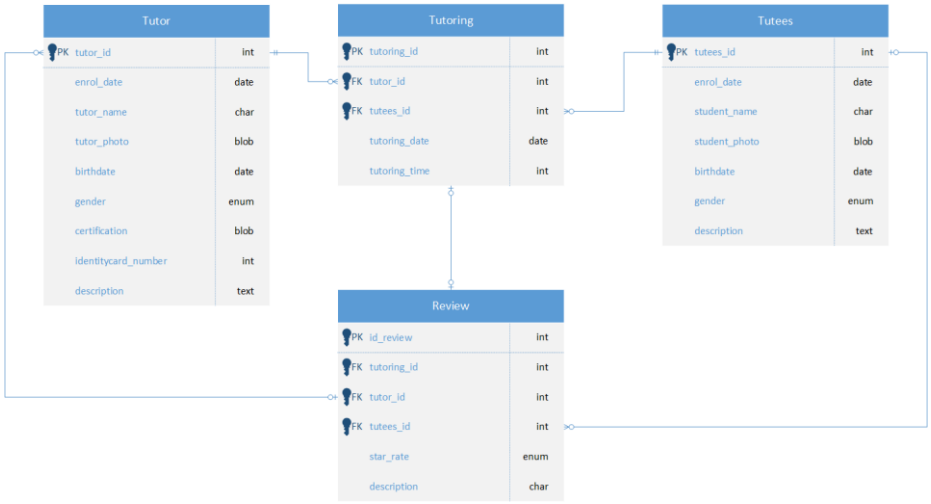

Figure 3. Entity Relationship Database (ERD) of TutorYuk Application

Figure 3 is a visualization of tutor and tutees data in the peer tutoring information system "TutorYuk," where each actor needs to add data or input personal data such as full name, photo, place and date of birth, gender, and id-card. Especially for users as tutors, information about certificates in specific fields of knowledge or skills is needed to increase personal credibility and be a consideration for tutees in making decisions to use the services of tutors. Furthermore, the system will store data related to the enrollment date, tutoring date, and time-based on the tutor id and tutees. After the tutoring process, the system provides a review page where tutees can rate the tutor during the tutoring process and write a detailed description. The tutor's credibility will increase and attract tutees if the assessment is positive.

Based on the results of identifying user needs in this case, students within the scope of the Atma Jaya Catholic University of Indonesia, the learning process in class has limited time to study a lecture topic thoroughly. Considering this, peer tutoring is one of the learning approaches that train teamwork and understanding an issue from different perspectives, unlike the learning process carried out individually without brainstorming, which forms a learning atmosphere that could be more conducive and exciting. Peer tutoring is an effective learning model that increases learning motivation, expands social networks, and includes characters who can provide wise responses to different perspectives or opinions.

The ideation process to capitalize on the commercial potential for informal education services through the TutorYuk application was launched by adopting

the peer tutoring learning technique based on the findings of the description of user needs. The verification process for tutors, which has numerous requirements, including accreditation in a particular scientific field, presents a management issue for peer tutoring services. Certificates of recognition are used to identify programming language and network skills in the context of study programs for information systems. This can be used as proof of credentials when registering as a tutor on the TutorYuk program. However, because the business manager of TutorYuk determines the cost of services, the services offered to tutees are still reasonably priced. Each instructor will be categorized according to their expertise in a specific subject or skill, allowing students who require tutoring services to select tutors from that category. The application's login and home views interface is depicted in the image below.

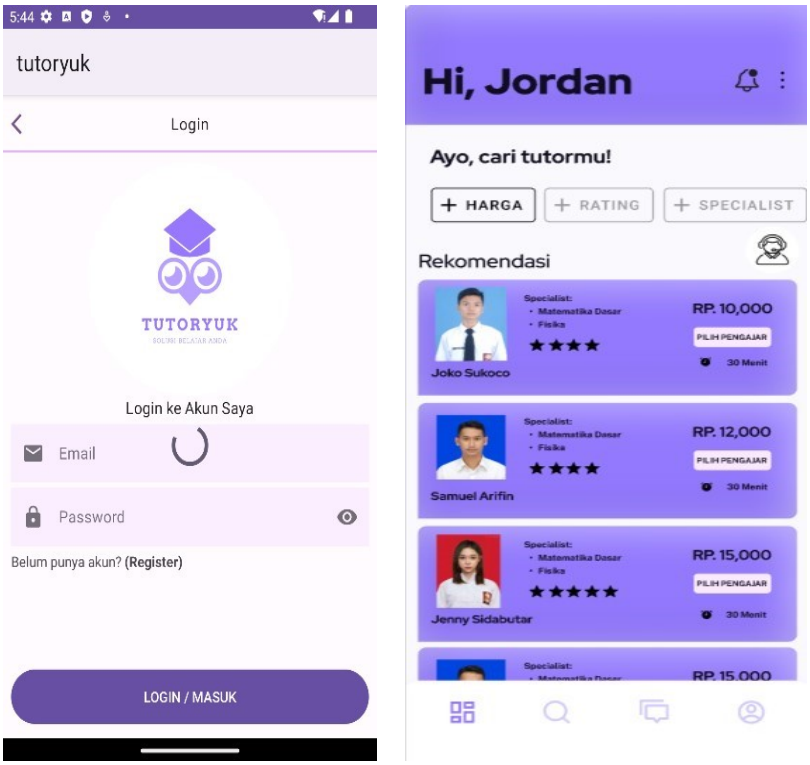

Figure 4. User Interface of TutorYuk Application

Figure 4 shows the application interface design for the TutorYuk application's homepage and login page. The application's site will propose tutors who have signed up by offering their photographs, names, specialties, ratings, and service costs (per hour). Students can select an instructor based on their needs, then contact the tutor to work out technical details like the material used and any

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software that must be set up before the learning process starts. According to the tutoring time, tutees can make reservations or appointments and then contact the tutors to confirm the service. At the same time, the Tutor will also receive a message detailing the number of benefits that need to be processed or approved, the number of services that tutees have unilaterally canceled, ongoing services (processed), and the number of benefits that tutees have assessed. An illustration of the TutorYuk application's notification page, tutor dashboard, and chat feature can be found as follows.

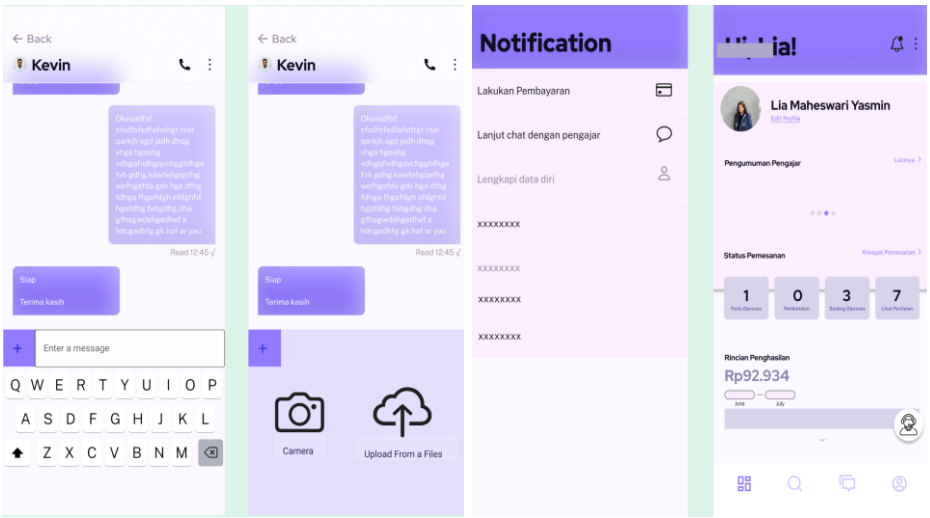

Figure 5. Chat Plugin, Notification Page, and Tutor Dashboard

Figure 5 is an interface design for the chat plugin, notification page, and tutor dashboard of the TutorYuk application. Users can exchange images, photos, or documents between tutors and tutees during the discussion and learning preparation. Digital payment services are included in the current payment system. The synchronization of digital payment services and complaint services in the event of legal infractions are some of the short-term TutorYuk application development plans. By routinely optimizing business procedures, TutorYuk will grow professionally. Long-term, TutorYuk helps the Atma Jaya Catholic University of Indonesia improve the learning environment and enhance students' cognitive, affective, and psychomotor development. The following table illustrates how the black box testing method can be used to test the TutorYuk application internally on campus.

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Table 1. Blackbox Testing for Registration Process

No	Scenarios	Cases	Expected	Results
1	Register an account using an email with a different password confirmation.	Email: yoelstudy@gmail.com Password: Tutor123 Confirm Password: tutor113	The system rejects with an error message ("Confirm Password is incorrect") and the data does not enter firebase.	Succeed
2	Register an account using email normally.	Email: yoelstudy@gmail.com Password: Tutor123 Confirm Passwod: Tutor123	The account is successfully created, and the data is stored in firebase.	Succeed
3.	Register an account using email with registered email	Email: yoelstudy@gmail.com Password: Tutor123 Confirm Password: Tutor123	The system rejects with an error message ("Email already registered") so the data is duplicated in firebase.	Succeed
4	Press the register button with email, password, and confirm password that is still blank	Email: "" Password ""	The system rejects with an error message from firebase directly. ("value_cannot_be_null...")	Succeed
5	Displays the password typed in the password field of the register page.	Press the eye-bearing logo in the password layout section	Text password is inputted into the form of a string.	Succeed
6	Returns the password that has been seen in string form into a return password (****) on the register page	Press the eye-bearing logo in the password layout section	Text password inputted from string form into password form *****	Succeed

Table 1 is the result of testing the account registration process for users. There is no difference in the registration process; the data needed in account registration is email, username, and password. Users can complete personal information after logging into their respective account pages. Based on the test results of each

feature for registration, the account will be successfully created if it has fulfilled all the conditions set. The system will display a notification if it differs from the provisions, so the user must adjust all existing clauses. Overall, the registration process has been in line with expectations and successful. After testing the registration feature, continue with the login feature trial, as shown in the Table 2.

Table 2. Black-Box Testing for Login Process.

No	Scenarios	Cases	Expected	Results
1	Login using email with email that has not been registered	Email: imgroods@gmail.com Password: Tutor123	The system refuses with an error message ("Your account is not registered") because the account data does not yet exist in firebase.	Succeed
2	Login with email using registered email	Email: yoelstudy@gmail.com Password: Tutor123	Successfully enter the application so that it can access other fragments such as chat, tutoring and profiles.	Succeed
3	Login using email with wrong password	Email: yoelstudy@gmail.com Password: tutor123	The system refuses with an error message ("Invalid Password") so that the user can only see the contents of the home fragments.	Succeed
4	Clicking the login button on the login page with a blank email and password	Email: Password:	The system refuses with an error message that the account has not been registered.	Succeed
5	Display the password typed on the login page	Press the eye-bearing logo in the password layout section	Text password is inputted into the form of a string.	Succeed
6	Restore the password that has been seen in string form into a password again	Press the eye-bearing logo in the password layout section	Text password inputted from string form into password form *****	Succeed

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No	Scenarios	Cases	Expected	Results
	(****) on the login page			

The results of the login procedure test are shown in Table 2. The username and password can access the system after the account registration procedure. After successfully logging in, users will be taken to the TutorYuk application's homepage, where they may view information about tutors in the form of images, complete names, descriptions, ratings, and costs of the services requested. According to the login procedure testing results, all features have exceeded expectations and have been a success. Users can view the application's homepage and service promotions displayed following business procedures or TutorYuk advancements, but to use the service, they must first register and log in; second, the login process will be developed as efficiently as possible by adding a way to log in using a fingerprint or face id to simplify the process of using the service. Third, the system will record information about the time and location of each user login. When system users want to use or access the features and services of the TutorYuk program, this is required to boost their efficiency and effectiveness. The following table also shows how the function of the application fragments was tested.

Table 3. Blackbox testing for Fragments Function

No	Scenarios	Cases	Expected	Results
1	Exit the login option pop up page that appears first when opening the app.	Press the exit button with the (x) logo at the top left corner of the page	The login options page disappears, and the home menu appears	Succeed
2	Select the login by email menu on the login options page that appears first when opening the app.	Press the purple button that says "Login with Email"	Go to the login page with your email.	Succeed
3	Enter the chat menu before logging in	Tap the chat icon at the bottom right	Unable to access the chat menu, a pop-up login option page appears with an errorbar message ("You must log in first...")	Succeed

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4	Go to the Tutoring menu before logging in	Press the Tutoring icon at the bottom left	Unable to access the Tutoring menu, a pop-up login option page appears with an errorbar message ("You must log in first...")	Succeed
5	Go to Profile menu before logging in	Tap the Profile icon at the bottom right	Unable to access the profile menu, a pop-up login option page appears with an errorbar message ("You must log in first...")	Succeed

The testing phase for each feature of the TutorYuk application button that has lived up to expectations and been successful is shown in Table 3. However, there are several issues with the TutorYuk application's design that must be addressed in the creation of the medium- and long-term program, as follows: First, the communication and interaction patterns between tutors and tutees using the TutorYuk platform need to be optimized to prevent misuse for improper purposes or that violate the rules and laws within the purview of universities of the Atma Jaya Catholic University of Indonesia; second, involving stakeholders in terms of operational monitoring of the TutorYuk application to obtain investment for business process sustainability; third, work with Certification; The commercial sustainability of peer tutoring services provided through the TutorYuk application depends on non-functional items.

4. CONCLUSION

The findings of this study demonstrate that when creating the TutorYuk peer tutoring information system, the needs of students must be considered. Applying the design thinking framework at the empathize stage illustrates the advantages of peer tutoring between tutors and students. This type of education is appropriate for acquiring knowledge, developing practical skills, refining specialized expertise in a scientific field, and proactively making up for time missed on other pressing duties. The phases of defining, ideation, prototyping, and testing revealed that the TutorYuk application can be developed into a business unit that increases student income as a tutor and creates an academic environment that supports the learning process within the context of higher education. Research findings in the TutorYuk application contribute practically and conceptually in various ways, including the establishment of information systems that impact the education sector and boost students' incomes as tutors.

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