p–ISSN: 2723 – 6609 e-ISSN: 2745-5254
Vol. 5, No. 12, December 2024 http://jist.publikasiindonesia.id/

Evaluation Of Construction Support Through Business Entities (Case Study: Terbanggi Besar - Kayu Agung Toll Road)

Rafly Farandi Firdaus
Universitas Telkom Bandung, Indonesia
Email: dellaagiaveromica17@gmail.com
*Correspondence

Keywords: UI/UX, web-based learning application, UML class diagram, UCD method, user-driven design.

ABSTRACT

This research aims to design a user interface (UI/UX) for UML Class Diagram learning applications, especially for students who want to explore UML class diagrams, by applying the User-Centered Design (UCD) Method. This method involves students as the main users of the application to understand their needs, preferences, and user experience in depth. The application interface design will be focused on ease of use, attractive aesthetics, and user data security. The development of this application is expected to help students in learning and exploring UML class diagrams.

Introduction

In today's digital era, information and communication technology has become an integral part of various aspects of life, including in the world of education. One of the most important areas in software development is system modeling using Unified Modeling Language (UML) (Putri, 2021). UML is a standard modeling language used to describe, visualize, build, and document object-based software (Pawenrusi, Kamariana, Kasma, Wahyuni, & Aman, 2024). One of the most important diagrams in UML is the class diagram, which depicts the structure of the system by defining classes, attributes, operations, and relationships between objects. (Barbieri, Bruno, & Muzzupappa, 2018).

Based on a survey conducted by researchers on 40 Telkom University students through Google Forms, the results show that 45.4% of students can make UML class diagrams, while 54.6% of them have not mastered it. (Maharani, Durachman, & Ratnawati, 2021). Students experience some of the main difficulties in learning UML class diagrams, including understanding the types of diagram shapes and how to apply them. Students majoring in Informatics at Telkom University expect features such as video tutorials, practice questions to understand the material further, and complete material presented (Bergkulla, 2024).

Learning UML class diagrams is not an easy thing for students or beginners in the field of programming and software engineering. Concepts such as class, object, inheritance, and association are often considered complex and abstract. Traditional learning methods that rely only on textbooks and explanations from teachers are

sometimes less effective in helping students understand this material in depth (Nugraha, Suyanto, & Utami, 2024).

To overcome these problems, a more interactive and interesting learning approach is needed. One of the solutions that can be offered is the development of a website-based UML class diagram learning application designed with user interface (UI) and user experience (UX) aspects in mind. (Almenara et al., 2017). User Interface (UI) refers to the visual appearance and elements that allow interaction between the user and the application or system. A good UI should have an attractive, intuitive, and easy-to-understand design for users. Meanwhile, User Experience (UX) is a broader concept, covering the overall user experience when interacting with a product or service, including aspects of usability, ease of use, performance, and user satisfaction. (Yılmaz & Gözüm, 2023).

In the context of this website-based UML class diagram learning application, a good UI/UX is essential to ensure that users can learn the material comfortably and effectively. Some aspects of UI/UX to consider include a clean, uncluttered, and consistent interface design, intuitive navigation, interactive presentation of material, interactive features such as exercises and quizzes, and a fun and engaging user experience (Braham, Buendía, Khemaja, & Gargouri, 2022).

In this application design process, the User-Centered Design (UCD) method can be used to ensure that the user's needs and preferences are the top priority. (Choirunisa & Ryansyah, 2023). The UCD method is an iterative approach that actively involves users in every stage of product development, starting from initial research, concept design, and prototyping, to evaluation and refinement. By using this method, it is hoped that the resulting application will have an optimal UI/UX and match the needs and expectations of users. (Chen & Tai, 2023).

Thus, this study aims to design a UI/UX of a website-based UML class diagram learning application using the UCD method. This application is expected to be an alternative solution for students or students who want to learn UML class diagrams independently, interactively, and fun so that it can improve their understanding of important concepts in object-oriented system modeling.

The objectives of this study are:

1. Producing financial planning application designs using the UCD (User Centered Design) method
2. Obtain Usability scores from financial planning applications built using SUS

Method

This study uses qualitative methods to gain a deep understanding through student questionnaires, aiming to explore user needs and design learning media that emphasize the interaction aspect.

Place and Time of Research

This research was conducted at Telkom University and several other institutions, with the author currently pursuing an S1 education in the Department of Informatics. This research lasts for a certain period, starting from the analysis stage to implementation and evaluation.

Research Stages

This research consists of several stages or processes that can be used to solve existing problems, as well as help produce user interface designs that suit the needs through the User-Centered Design (UCD) method.

Design Solution

A "design solution" is a part of a research or design project that describes the resulting design solution to address an identified problem. In the context of research involving User-Centered Design (UCD).

LowFidelity

In the early stages of design, Low Fidelity was created, which is the first step in this design process. Low Fidelity is just a skeleton with no elements such as fonts, colors, logos, or other design components.

High Fidelity

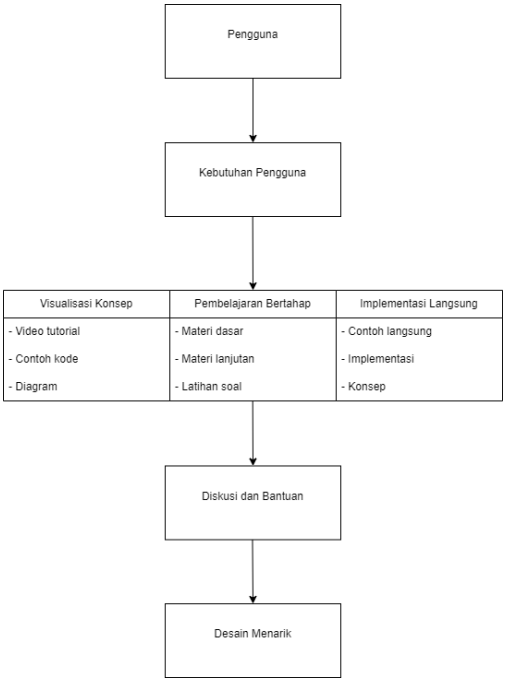
After the Low Fidelity stage is completed, the next step is to design High Fidelity so that the design that has been created is easier for users to understand. In this High Fidelity design, elements such as images, icons, and colors will be added to clarify the design that has been prepared.

Results and Discussion

At this stage, user needs will be explained based on the data that has been collected from the results of the user persona questionnaire that has been created. This explanation aims to help users achieve their desired goals.

Mental Model

A mental model is a representation of how a person understands, illustrates, or explains his beliefs about how things work. In the context of user experience (UX), a mental model refers to how a user or designer visualizes how a system or product works. Here is the mental model of the system designer for the UML CLASS DIAGRAM APPLICATION:



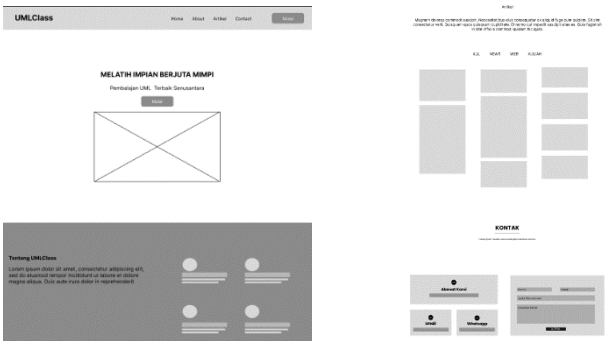
Hierarchical Task Analysis

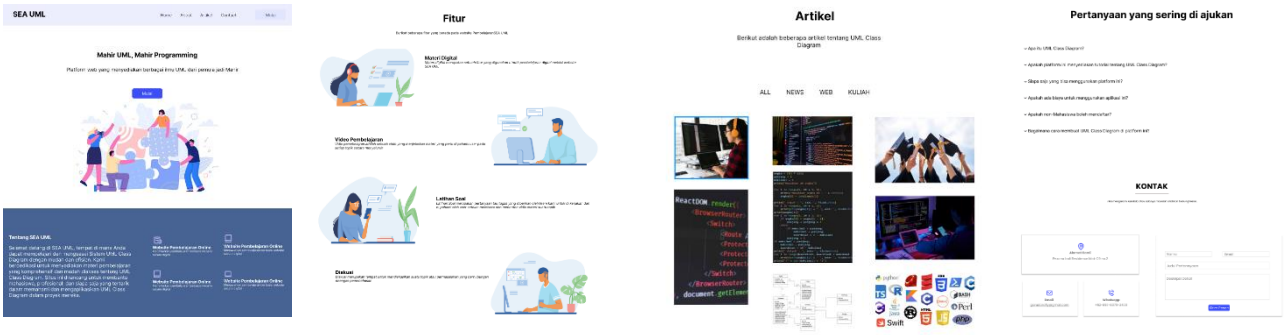
User task analysis using Hierarchical Task Analysis (HTA) is carried out to map the activities or workflows required by users to achieve their goals. In this study, HTA is used to describe how users access learning materials and practice instruction videos in the UML learning application. (Dananjaya, Prathama, & Darmaastawan, 2024).

Create design solution

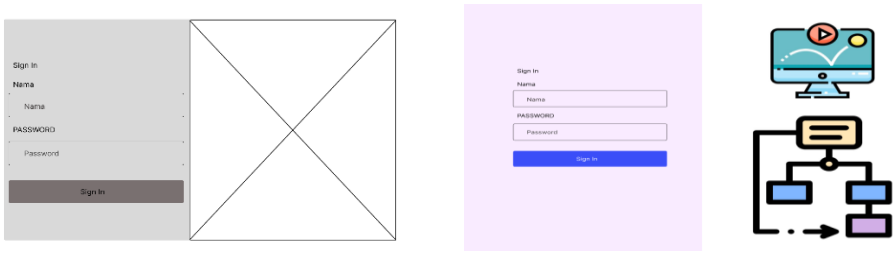
At this stage, the researcher focuses on designing interface design for UML learning applications. This process begins with the creation of a low-fidelity prototype in the form of an initial wireframe sketch. (Frans, Dominica, Lucky, Lilik, & Eva, 2024). After the wireframe is completed, it is followed by the development of a high-fidelity prototype that includes elements such as images, icons, typography, themes, interactions, and functionality that is close to the shape of the final product.

a. Low-fidelity and high-fidelity Landing Pages

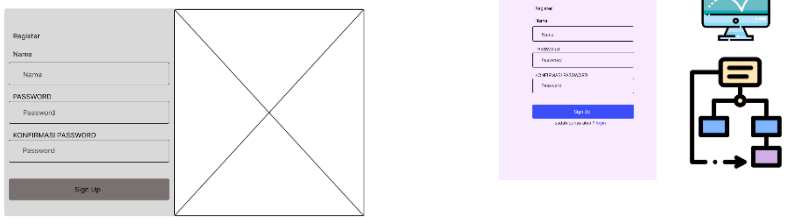




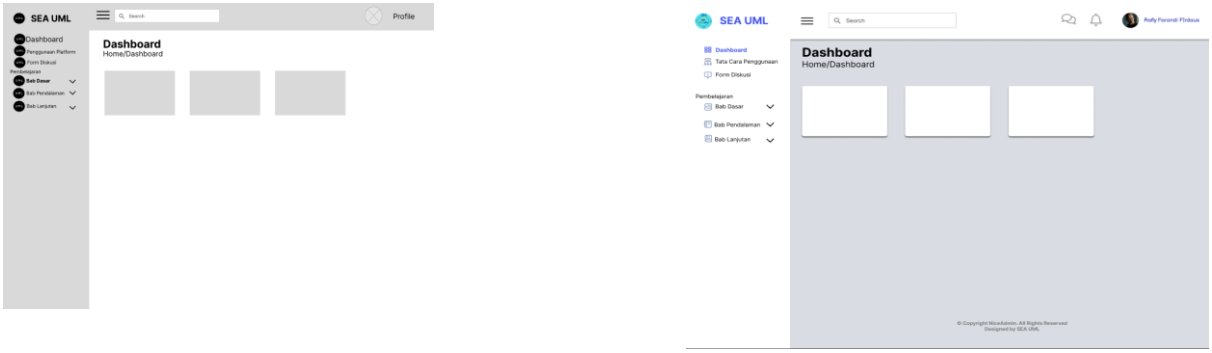
b. Low fidelity and high fidelity Login User



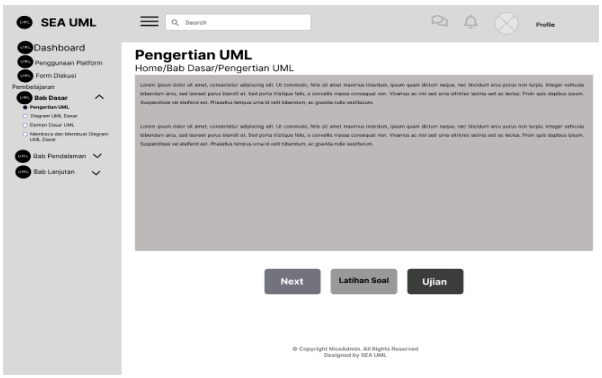
c. Low fidelity and high fidelity Register User

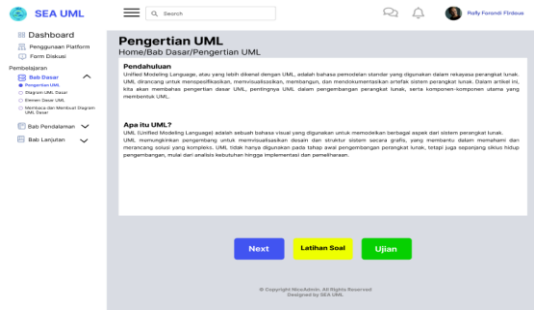


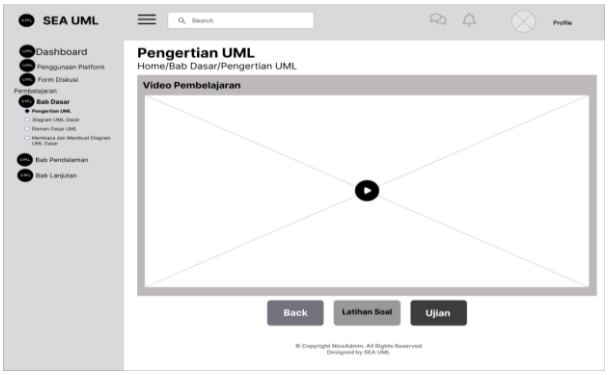
d. Low fidelity and high fidelity Dashboard

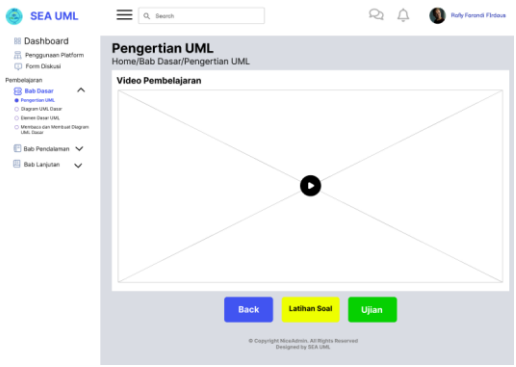


e. Low fidelity and high fidelity Courses

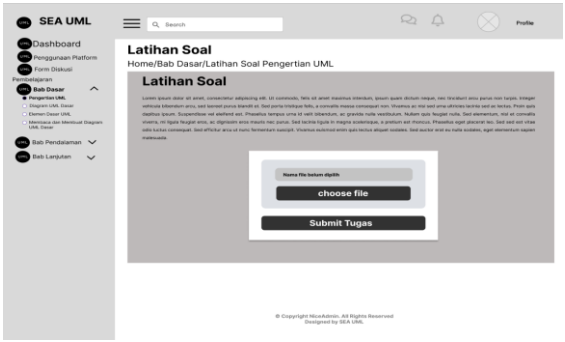


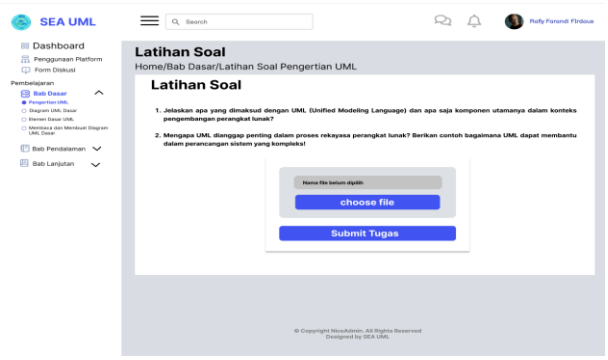




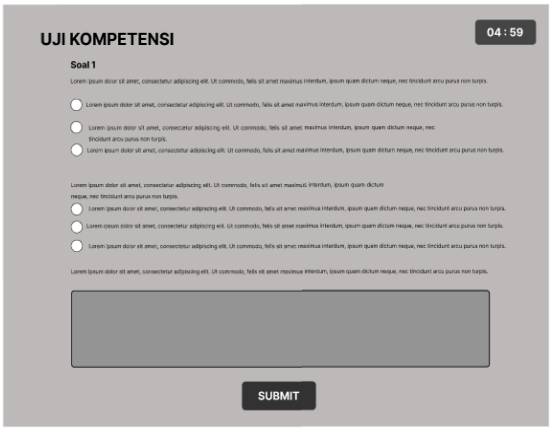


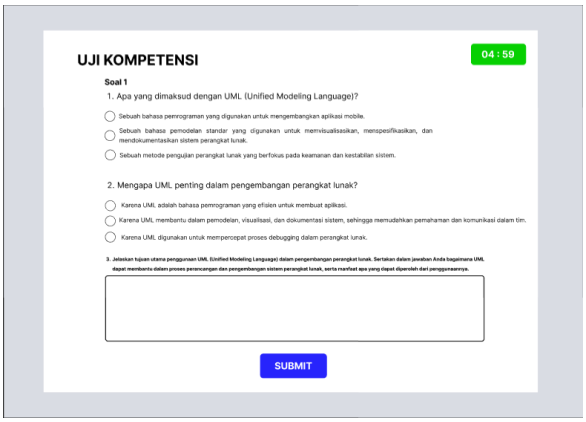
f. Low-fidelity and high-fidelity Practice questions



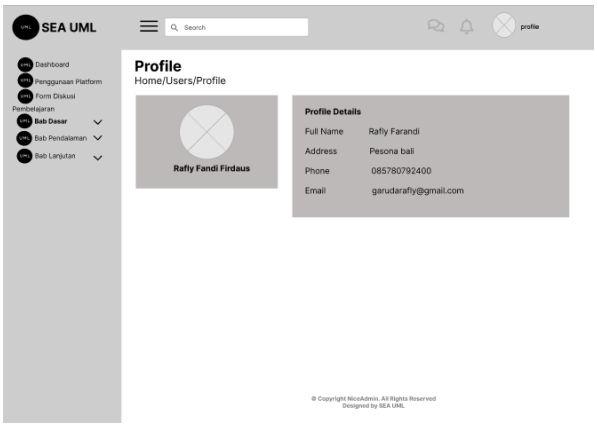


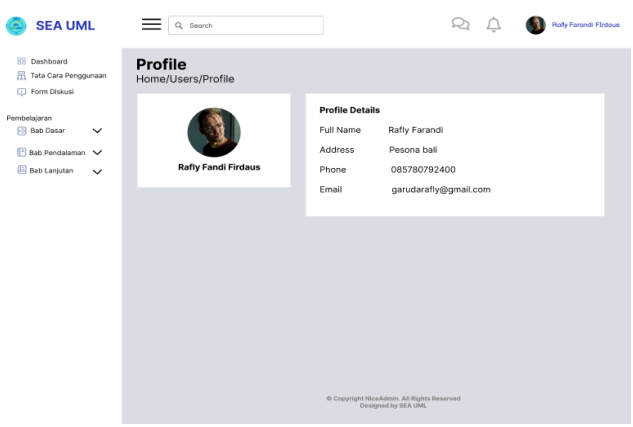
g. Low Fidelity and High Fidelity Tests





h. Low fidelity and high fidelity Profile





Usability Testing

Table 1
Original score

Original Score (Sample Data)									
Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
5	3	4	4	4	2	5	4	3	5
4	2	5	1	4	2	5	1	4	3
4	1	2	1	4	1	4	1	5	2
4	2	3	2	4	2	4	2	4	4
1	3	2	3	4	4	2	5	4	4
5	2	4	2	5	1	4	2	4	3
5	2	2	3	5	3	5	2	4	5
5	2	4	2	4	2	4	2	4	2

5	1	5	1	4	2	4	1	5	1
3	3	3	3	5	3	5	3	5	5
4	5	2	4	5	2	4	2	4	2
4	2	2	4	5	1	5	2	4	1
4	2	1	2	5	2	4	2	4	2
4	2	2	2	5	2	5	2	5	2
4	2	2	2	4	2	4	1	4	1
5	2	1	3	4	2	5	2	1	4
5	3	1	2	4	2	4	2	4	5
5	1	3	2	5	2	4	2	5	4
4	3	2	4	5	2	5	1	4	4
4	2	3	4	5	2	4	1	5	3
4	2	4	2	5	2	5	3	5	3
4	4	5	5	4	4	4	5	5	4
4	5	5	4	4	4	5	5	5	5
5	1	5	1	4	2	4	2	4	2
5	1	5	2	4	2	5	1	5	3
5	2	4	2	5	1	5	1	5	2
5	2	1	2	4	1	4	2	4	3
4	2	2	3	4	2	3	2	4	4
5	1	4	2	4	3	4	2	4	2
4	2	2	3	4	2	4	3	4	2
4	2	2	3	4	2	4	2	4	3
5	1	4	2	4	2	5	1	4	3
4	2	3	4	2	4	2	4	4	4
3	2	2	4	4	2	4	2	4	4
4	2	2	2	4	2	4	2	4	4
4	2	4	2	5	2	5	3	4	2
4	1	4	1	4	1	5	1	5	1
5	2	4	2	4	2	5	2	4	2
4	2	4	2	5	2	5	2	4	2
4	2	4	2	5	2	4	2	4	2

The results obtained still do not fully reflect the actual usefulness value. However, these results do not provide an accurate picture of the true usability value. To determine the true value, the original score on odd-numbered questions must be subtracted by one point, while the original score on even-numbered questions must be subtracted by five points. Next, the number must be multiplied by 2.5. The following formula can be used to calculate the actual average value.

$$\underline{X}\ SUS = \frac{SUM(2{,}5\ \times (SUM\big((Qganjil - 1) + (5 - Qgenap)\big))}{Jumlah\ Peserta}$$

Calculated Score (Sample Data)										Sum	Value (Qty x 2.5)
Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10		
4	2	3	1	3	3	4	1	2	0	23	58
3	3	4	4	3	3	4	4	3	2	33	83
3	4	1	4	3	4	3	4	4	3	33	83
3	3	2	3	3	3	3	3	3	1	27	68
0	2	1	2	3	1	1	0	3	1	14	35
4	3	3	3	4	4	3	3	3	2	32	80
4	3	1	2	4	2	4	3	3	0	26	65
4	3	3	3	3	3	3	3	3	3	31	78
4	4	4	4	3	3	3	4	4	4	37	93
2	2	2	2	4	2	4	2	4	0	24	60
3	0	1	1	4	3	3	3	3	3	24	60
3	3	1	1	4	4	4	3	3	4	30	75
3	3	0	3	4	3	3	3	3	3	28	70
3	3	1	3	4	3	4	3	4	3	31	78
3	3	1	3	3	3	3	4	3	4	30	75
4	3	0	2	3	3	4	3	0	1	23	58
4	2	0	3	3	3	3	3	3	0	24	60
4	4	2	3	4	3	3	3	4	1	31	78
3	2	1	1	4	3	4	4	3	1	26	65
3	3	2	1	4	3	3	4	4	2	29	73
3	3	3	3	4	3	4	2	4	2	31	78
3	1	4	0	3	1	3	0	4	1	20	50
3	0	4	1	3	1	4	0	4	0	20	50
4	4	4	4	3	3	3	3	3	3	34	85
4	4	4	3	3	3	4	4	4	2	35	88
4	3	3	3	4	4	4	4	4	3	36	90
4	3	0	3	3	4	3	3	3	2	28	70
3	3	1	2	3	3	2	3	3	1	24	60
4	4	3	3	3	2	3	3	3	3	31	78
3	3	1	2	3	3	3	2	3	3	26	65
3	3	1	2	3	3	3	3	3	2	26	65
4	4	3	3	3	3	4	4	3	2	33	83
3	3	2	1	1	1	1	1	3	1	17	43
2	3	1	1	3	3	3	3	3	1	23	58
3	3	1	3	3	3	3	3	3	1	26	65
3	3	3	3	4	3	4	2	3	3	31	78
3	4	3	4	3	4	4	4	4	4	37	93
4	3	3	3	3	3	4	3	3	3	32	80
3	3	3	3	4	3	4	3	3	3	32	80
3	3	3	3	4	3	3	3	3	3	31	78
Average Score (Final Result)											71

Conclusion

Based on the results of analysis and testing, the UI/UX design for the UML learning system with the User Centered Design (UCD) method has successfully achieved its goals. This system is able to provide an easy-to-use and efficient learning experience, according to the user's needs.

Usability testing showed a SUS score of 71, which is included in the GOOD category with a grade of C and ACCEPTABLE in the Adjective Ratings. This indicates that the system meets the recommended usability standards and provides comfort in its use. For further development, it is recommended to conduct a more in-depth analysis of each SUS question to identify aspects of usability that can be improved, in order to meet more specific user expectations.

Bibliography

Almenara, Maria, Cempini, Marco, Gómez, Cristina, Cortese, Mario, Martín, Cristina, Medina, Josep, Vitiello, Nicola, & Opisso, Eloy. (2017). Usability test of a hand exoskeleton for activities of daily living: an example of user-centered design. *Disability and Rehabilitation: Assistive Technology*, *12*(1), 84–96.

Barbieri, Loris, Bruno, Fabio, & Muzzupappa, Maurizio. (2018). User-centered design of a virtual reality exhibit for archaeological museums. *International Journal on Interactive Design and Manufacturing (IJIDeM)*, *12*, 561–571.

Bergkulla, Jack. (2024). *Design and development of an interactive mobile application for wearable sensor data collection and visualization: A user-centric approach*.

Braham, Amani, Buendía, Félix, Khemaja, Maha, & Gargouri, Faiez. (2022). User interface design patterns and ontology models for adaptive mobile applications. *Personal and Ubiquitous Computing*, *26*(6), 1395–1411.

Chen, Chung Yang, & Tai, Kuang Yen. (2023). Online ontological quality assessment of converted UML class diagrams in SRE. *Automated Software Engineering*, *30*(2), 18.

Choirunisa, Yasmin Nur, & Ryansyah, Muhamad. (2023). Experience Evaluation Of Online Cinema Ticket Applications With User Experience Questionnaire. *JIKO (Jurnal Informatika Dan Komputer)*, *6*(3), 203–208.

Dananjaya, Md Wira Putra, Prathama, Gede Humaswara, & Darmaastawan, Kadek. (2024). User-centered design approach in developing user interface and user experience of Sculptify mobile application. *Journal of Computer Networks, Architecture, and High Performance Computing*, *6*(3), 1089–1097.

Frans, Sudirjo, Dominica, Maria Ratna Tungga Dewa, Lucky, Indra Kesuma, Lilik, Suryaningsih, & Eva, Yuniarti Utami. (2024). Application of the user-centered design method to evaluate the relationship between user experience, user interface, and customer satisfaction on banking mobile applications. *Jurnal Informasi Dan Teknologi*, *6*(1).

Maharani, Lisa, Durachman, Yusuf, & Ratnawati, Suci. (2021). Systematic Literature Review Method for Evaluation of User Experience on Ticket Booking Applications. *2021 9th International Conference on Cyber and IT Service Management (CITSM)*, 1–7. IEEE.

Nugraha, Bhanu Sri, Suyanto, M., & Utami, Ema. (2024). Innovative Approaches in Child-Friendly User Interfaces: A Systematic Literature Review on Technologies, Motoric Skill and Evaluation. *2024 7th International Conference of Computer and Informatics Engineering (IC2IE)*, 1–6. IEEE.

Pawenrusi, Esse Puji, Kamariana, Kamariana, Kasma, Andi Yulia, Wahyuni, Eka, &

Aman, Andryanto. (2024). UI/UX Design of Stunting Survey Application Prototype User-Centered Design Method. *Brilliance: Research of Artificial Intelligence*, *4*(2), 484–490.

Putri, Silviani Nurlita. (2021). *Analisis Pengalaman Pengguna Pada Aplikasi Moproker Telkom Witel Dengan Menggunakan Metode User Experience Questionnaire (UEQ)*.

Yılmaz, Zeynel Abidin, & Gözüm, Ali İbrahim Can. (2023). Augmented reality app in pre-school education: Children's knowledge about animals. *Southeast Asia Early Childhood Journal*, *12*(2), 130–151.