Development of "VoksConnect" as a Student Complaint Appplication with NLP Chatbot

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Abstract. This study aims to develop a web-based application for collecting complaints from the academic community at the Faculty of Vocational Studies. The Research and Development (R&D) method was employed, involving need analysis, application design, implementation, and evaluation. The application is designed to facilitate reporting and responding to complaints related to various aspects of academic life for students, lecturers, and administrative staff. The development utilized the SDLC method and integrated ChatBot with NLP systems. User testing and feedback collection ensured the application's suitability and quality. The System Usability Scale (SUS) evaluation yielded an average score of 64.47, indicating user acceptance. The comprehensive usability testing results support the application's effectiveness in addressing student complaints efficiently and supportively.

Keywords: Natural Language Processing (NLP), Chatbot, Software Development Life Cycle (SDLC), System Usability Scale (SUS), Complaint Application.

1. Introduction

Over the past few decades, technological advances have changed the way organizations operate and interact with their stakeholders [1]. With the development of technology, the emergence of smartphones has changed the resolution of cellphones, cellphones are no longer just a communication tool, but are also an important part of communication and people's daily lives [2]. Various applications add unlimited fun and convenience to life. The education sector is no exception, where universities and schools use technology to improve their administrative processes and services. One important area of focus in the education sector is managing complaints raised by students, staff, and faculty members [1]. As educational institutions, universities have facilities that support students in their academic endeavors. For example, there are classrooms, libraries and various other supporting facilities.

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In addition to technical issues, there are non-technical problems that can arise, such as losing personal belongings, accidents, and other situations that require prompt response [3]. According to ISO 10002, a complaint is defined as an expression of dissatisfaction towards an organization related to its products or the complaints-handling process itself, where a response or resolution is explicitly or implicitly expected. This implies that after a complaint is received, the organization must acknowledge and resolve each issue brought forth by the customer [4]. The integrated use of applications and websites is an attractive option for considering the potential issues that may arise as a complaint facility. Additionally, the website can facilitate access for application and web administrators to monitor and view all complaint activities. With the use of integrated websites and applications, it is hoped that it will enhance student satisfaction and improve the university's ability to address existing complaints.

The application design process employs the SDLC method, which was chosen for the development due to its ability to facilitate incremental development with continuous evaluation and improvement at each iteration based on feedback received from users [5]. Usability testing is also necessary to evaluate the comfort and ease of use of the application. The usability testing conducted used the maze method and the System Usability Scale (SUS) as the evaluation method based on the SUS standard. In the design of this application, a chatbot was also developed as a supporting system. The development of the chatbot as a computer program that mimics human conversation, including text and spoken language, using artificial intelligence such as Natural Language Processing (NLP), extends beyond just text processing to include image processing, video processing, and audio analysis [6]. The use of NLP enables users to interact with computers in a more natural way. The process of understanding natural language can be broken down into syntactic and semantic analysis.

Syntactic analysis refers to the arrangement of words in a sentence to form a grammatically correct structure. Additionally, syntactic analysis transforms the sequence of words into a structure that shows how the words are related to each other [7]. Our application aims to improve the efficiency and accuracy of complaint handling services. It will allow users to submit complaints more easily and enable administrators to monitor existing complaints effectively. The article is titled "Development of ‘VoksConnect’ as a Student Complaint Application with NLP Chatbot," reflecting our goal to create a system that integrates an application with a website to address both technical and non-technical issues. This approach will enhance oversight of various related problems, ensuring that students can express their concerns and administrators can respond swiftly. Additionally, the integration of an NLP chatbot will enrich the user experience and streamline the complaint resolution process, making it more efficient and user-friendly.

2. Method

The methodology used in writing this article the Software Development Life Cycle (SDLC) as a development methodology, Usability testing uses the System Usability Scale (SUS) method as a testing method to obtain a usability score as a qualitative assessment of user perception and ease of use of the system. Usability testing for mobile apps considers various factors. For example efficiency, memory, errors and satisfaction [8]. The Software Development Life Cycle was chosen as the methodology in writing the article because the SDLC process contains a complete plan to describe how to design, develop, maintain and improve the efficiency of software products. The SDLC process describes a methodology that improves the overall quality of the software and development process [9].

System Usability Score is one of the many testing methods used to test software functionality by displaying systematic calculations. The System Usability Scale, or SUS, was created in 1986 by John Brooke as a "quick and dirty" way to measure product usability [10]. The system usability scale method was chosen in application development to obtain user perceptions of the ease and usefulness of the system with a qualitative assessment. The SUS questionnaire contains 10 items containing statements that represent feelings or responses of the users to a product interface [11].

2.1 Identification of Problems

This research begins with the problem analysis stage which is the first step in the research process. This analysis includes topic selection, determining the problem formulation, and determining research objectives, which will be supported by literature studies related to the topic of complaints or complaints using the Chatbot model. This problem analysis stage is an important foundation that will guide the next steps in this research.

2.2 Study Literature

This article employs a literature review as the theoretical foundation for solving the problem. The use of a literature review is conducted to gain insights and knowledge about the issues being discussed and to identify the appropriate methods for resolving the issues. In this study, various journal sources and book sources are used to support this research and serve as references or benchmarks for the study.

2.3 Software Development Life Cycle

The method employed in designing the student complaint application in the Faculty

of Vocational Studies utilizes the Software Development Life Cycle (SDLC) approach .

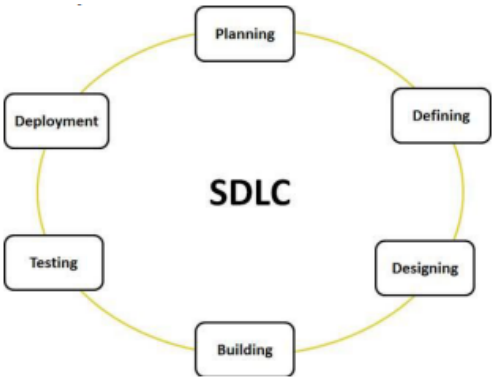


Fig 1 Software Development life Cycle Method

Source : [9]

2.3.1 Planning

The first stage of the development process using the SDLC method is planning. This stage encompasses planning and estimating the general resource requirements used in the development of the application. These may include an Acquisition Plan, Concept of Operations, and Project Management Plan, but there are many more that may be relevant to different projects [12].

2.3.2 Defining/System Analysis

This stage involves several processes, including identifying the needs of students in submitting their complaints, identifying system requirements such as technological infrastructure and resources, and conducting technical feasibility analysis to ensure that the application meets system needs.

2.3.3 Design

In this process, the functionality of the application and how users will interact with the system are determined. The required features of the application are identified, such as registration, login, data entry, and handling until completion.

The required systems for integration, including registration, login, complaint, and handling systems, are depicted in Figure 2. These systems are essential components of the complaint application workflow, ensuring seamless user interaction and efficient complaint.

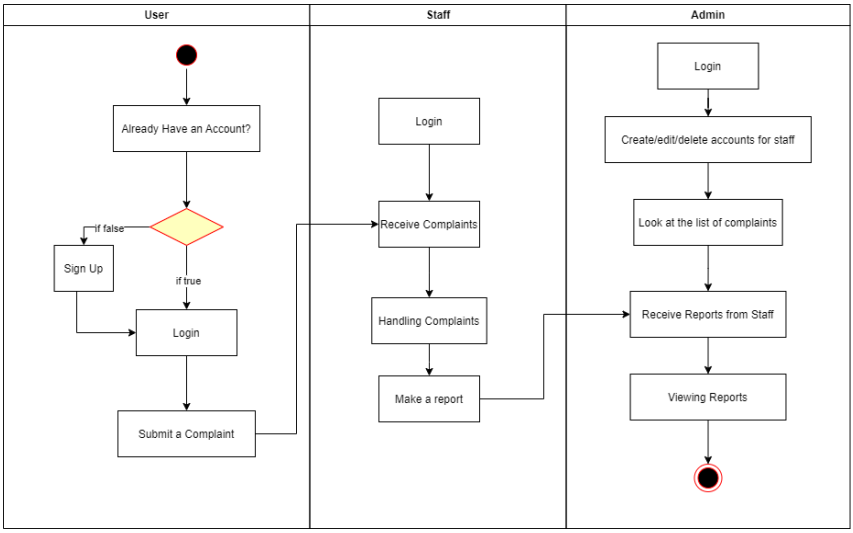


Fig 2 Bussines Process Design

Figure 2 illustrates the process owned by users, staff, and administrators. Users who have the application but have not registered in the system must register first to receive a password and username used to log in to the application. To define the system used, Unified Modeling Language (UML) can be employed to facilitate a more comprehensive understanding of the application system [3].

The next step is to create a class diagram, which includes a static view as part of the system development process. In other words, the class diagram can support system development by utilizing the concepts of forward or reverse engineering [3]. The next step is to determine the Activity Diagram. This diagram includes three actors: User Activity, Staff Activity, and Admin Activity.

The User Activity Diagram illustrates the user's workflow, starting with the initial step of logging in or signing up if the user does not have an account, as depicted in Figure 3. This ensures that users can submit complaints and engage with the system effectively.

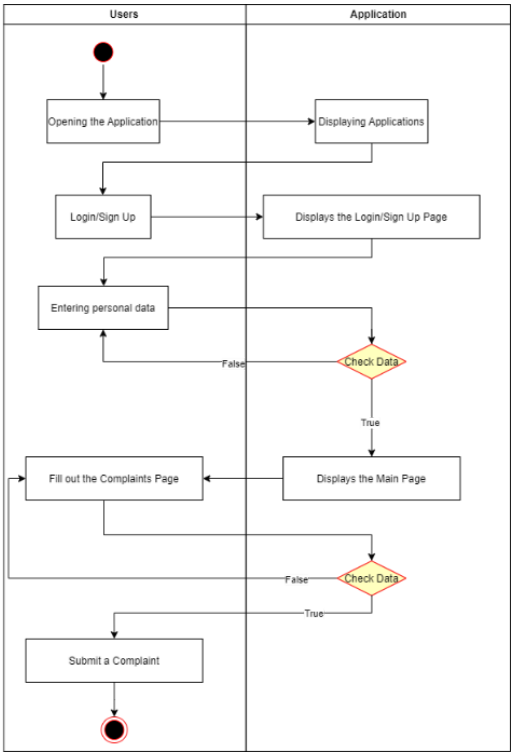
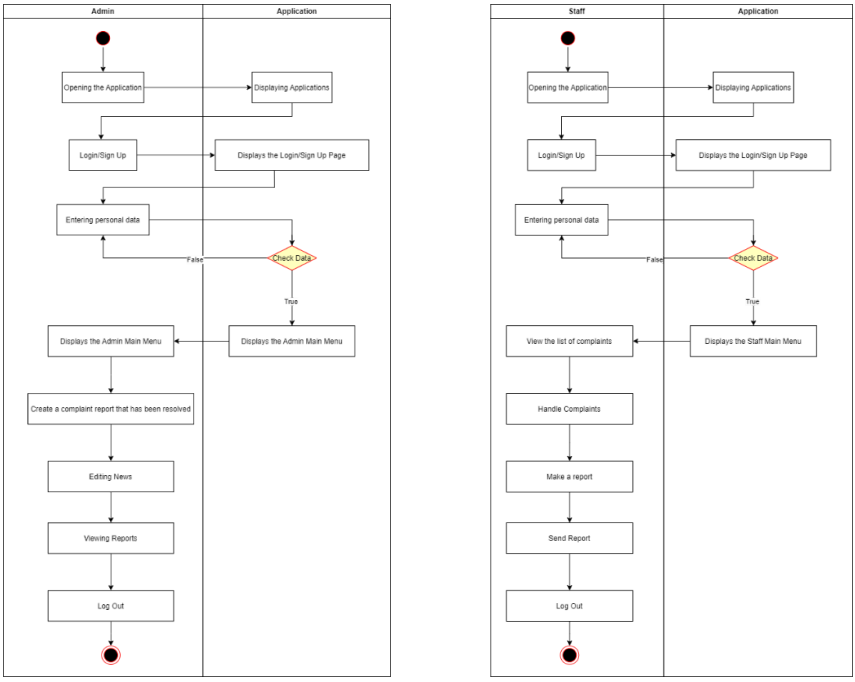


Fig 3 User Activity Diagram

The Staff Activity Diagram illustrates the workflow of staff members, who must first log in to access the system. Staff can view incoming reports, view detailed complaints, respond to complaints, update complaint status, view a list of stored complaints, and generate reports on the results of resolved complaints for administrators.



The Administrator Activity Diagram, as depicted in Figure 4, shows the administrative workflow, which involves logging in to gain access. Administrators can add, edit, delete, and view reports from staff regarding resolved complaints, manage staff members handling complaints, and view all stored and in-progress complaints.

The next step is the creation of Sequence Diagrams, which depict interactions between objects. The Sequence Diagrams in the planning phase are divided into three categories: User, Staff, and Administrator, the staff and administrator have similar sequence, as shown in Figures 5 and 6.

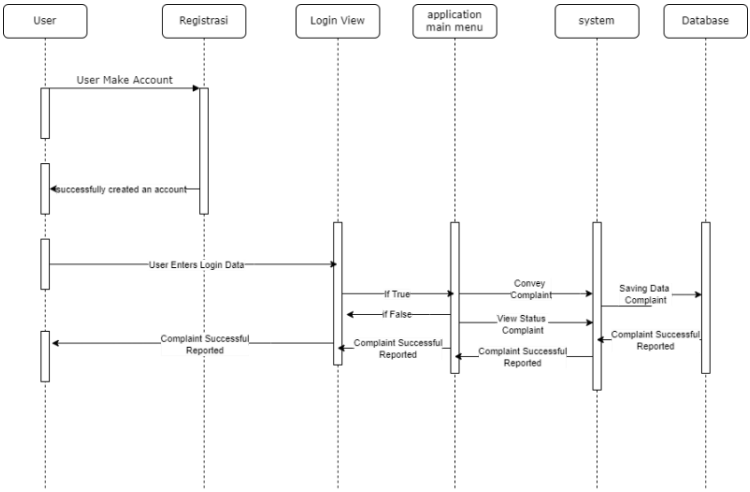


Fig 5 User Sequence Diagram

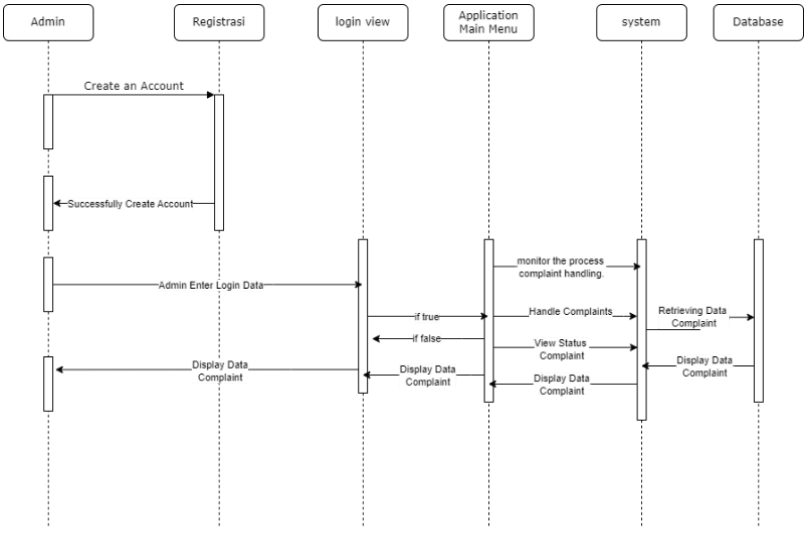


Fig 6 Admin Sequence Diagram

2.3.4 Building/Implementation

This stage involves the implementation of the planning and design processes that have been carried out. The Flutter software was chosen as one of the software tools used to implement the planning process of the application.

2.3.5 Testing

In this phase, the developed product is thoroughly tested to ensure it meets the documented user requirements outlined in the software requirement specification document. Any defects found are reported, tracked, and corrected through a series of tests to guarantee the product's high quality [9].

2.3.6 Deployment and System maintenance

The maintenance process of the application in the future will include security, system improvement, and enhancement of existing systems within the application. After the application development process at the web site development stage experiences the same process as the application development stage with the use case diagram, UML diagram, Sequence Diagram, and Activity Diagram. In the development process, the web site development uses the PHP framework Laravel 11, Bootstrap, and MySQL for database development.

Following the completion of the application and website development process, the next step is to create a chatbot using PHP MyAdmin and MySQL to store and manage data from the chatbot. This data is processed using natural language processing (NLP) tools, such as NLTK, to convert human language into machine language. Sentiment Analysis (SA) is also employed to assign scores to each complaint based on its priority level [13].

On the website, a chatbot was developed to record complaints and create a FAQ chatbot using dialog flow for basic questions such as after a complaint is submitted, users will receive a response indicating the estimated time required to resolve the complaint [13].

In the process of using Natural Language Processing (NLP) to understand human language in machine language, this process employs NLTK to collect all data. After the data is collected, it is analyzed by identifying all key words as a description of a problem given, and then a score is provided as a scale of priority for each complaint to identify which complaint has high priority [13].

2.4 System Usability Scale Testing

Usability testing can be employed to assess the practicality and user experience of a system [12]. The tester will ask specific questions. This is useful to fulfill the purpose of creating an application or web created. This test is used to verify that the functionality of the software interface runs properly, accepts input properly, and produces the correct output. System Usability Scale (SUS) is an evaluation method

used to assess the usability of a product, application or system. The System Usability Scale (SUS), commonly described as a “quick and dirty” way of measuring usability, is a short 10-item questionnaire used in the system usability scale (SUS) method approach [14]. The assessment in this method consists of three aspects, namely acceptability, grade scale, and adjective rating.

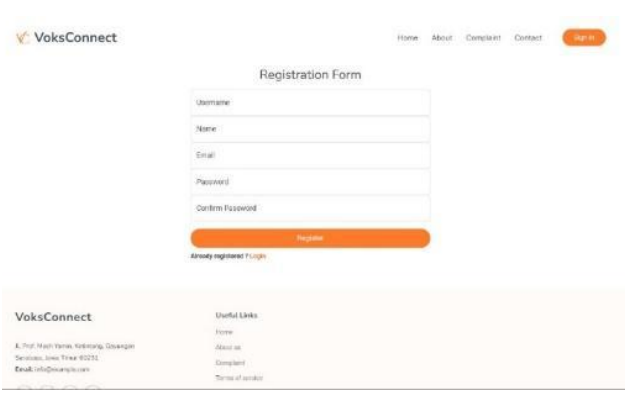
3. Result and Discussion

At this stage, the results of the research conducted by the researcher are discussed. Some of the things explained are the implementation stage and also the testing stage. The implementation phase contains the application interface. The testing phase was carried out with the system usability scale (SUS).

3.1. Implementation

The interface of the complaint application at Universitas Negeri Surabaya will display several menus. Upon opening the application, users will be presented with a loading screen. The initial interface of the website displays a range of options for students who wish to submit their complaints. Similar to the main menu of the website, the "About" section, "Contact" section, and "Complaint" section are available for students to submit their grievances. However, users must log in first to gain access to these features.

Subsequently, the application will display a menu for users to register by filling out the available data fields. After registration, users will log in using their username and password, which were used during the registration process.



The login menu, as depicted in Figure 7, is used to validate user data for security purposes, ensuring that not everyone can access the application. By entering a valid username and password, users will gain access to proceed to the next menu.

Upon login, the main menu will be displayed, as shown in Figure 8. In this complaint menu, users can submit their grievances. Subsequently, users must select one of the available complaint types. Additionally, users can attach images to provide detailed explanations of the problems they are facing.

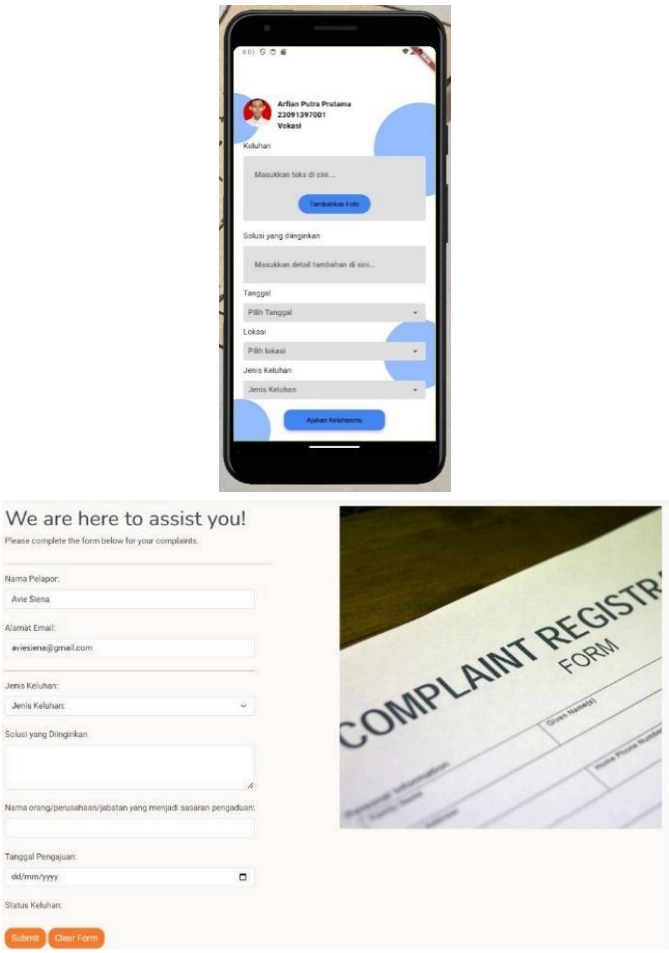


Fig 8 Complaint App and Website Main Menu

Upon submission of a complaint by a user, the designated staff member responsible for addressing campus issues receives an incoming report via a staff dashboard display that presents detailed information about the complaint, including a description, date, time, and location, as provided by the user. The administration and

staff dashboard displays the daily number of complaints received, the most common types of complaints, and their locations. The complaint is then assigned to the relevant staff member for handling.

3.2. Testing

In this research, the testing phase of the VoksConnect application was carried out using a testing method using the System Usability Scale (SUS) test to assess the system and user perceptions of the application system.

3.2.1 System Usability Scale (SUS)

The SUS testing methodology is one of the testing methodologies used to test user perceptions of the usability and convenience of the VoksConnect application. This method is used to obtain qualitative assessments from users. The questionnaire was created and distributed after the user carried out testing with Google Forms to respondents to assess respondents by answering ten questions prepared using the system usability scale method, each of which has a scale of 1 to 5. The targets tested in this application are students, college students or the academic community. university. There are 10 questions given to examiners in accordance with the provisions of the SUS methodology:

1. I felt ease when registering or signing up.
2. I find it easy to understand the homepage display.
3. I found it easy to submit a complaint.
4. I find it easy when I want to view profiles.
5. I find it easy when I want to view pages other than the home page by just pressing the navigation bar button.
6. I found it difficult to submit a complaint.
7. I find it easy to understand the appearance or interface of the application.
8. I find it difficult to find features in the application.
9. I would recommend this app to friends or fellow students.
10. I am satisfied with the process of sending complaints through this application.

At this stage questionnaire data processing was carried out using the SUS method for 49 respondents. In collecting data, the average SUS score is calculated with the calculation rules, namely odd value minus 1 and even value, minus 5. Because of that, it is multiplied by 2.5 to get the SUS score, as well as the average SUS calculation [14]. Average of SUS calculations. SUS test results can be shown in Figure 9.

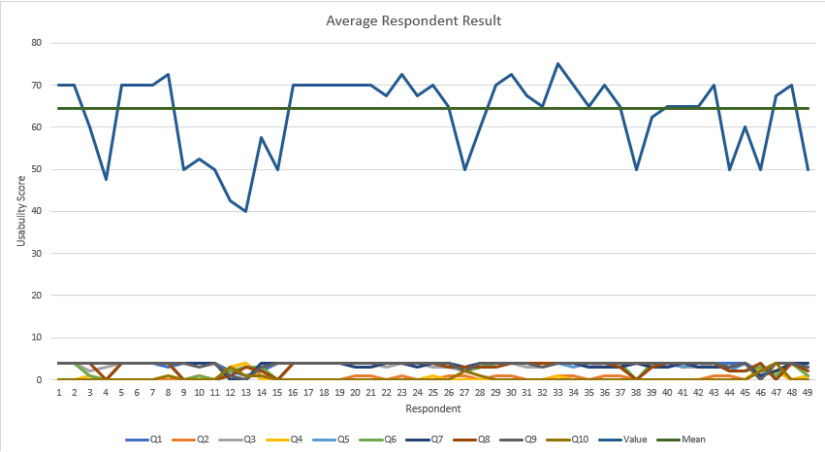
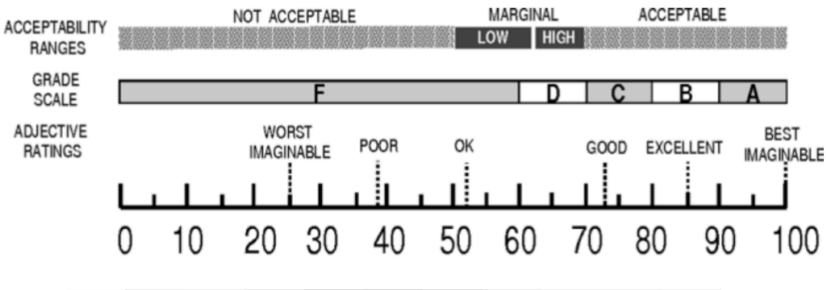


Fig 9 Average result of respondents

Based on the SUS method testing in the table above, it proves that this satisfaction questionnaire test was distributed to 49 respondents to evaluate the profile that had been filled out. Then the average SUS score is calculated. As for the rules, odd points minus 1 and number 5 minus even points. Then multiply by 2.5, get some points. Based on the test results, the SUS average shows the results of application testing conducted by 49 respondents. So, from the results of the above calculations, giving an average SUS score of 64,47. It is concluded that the application can be accepted by users, the application is at the rating category level between ok and good which can be seen in Figure 10.



Source: [15]

In the test carried out before the user filled out the questionnaire, the following test result data was obtained. In this test we check the functionality of each app button and icon. In testing, we provide detailed directions at each stage so that testers can carry out testing in a structured manner. We use the help of the maze website as a medium for testing system usability. Table 1 has details of each test scenario.

Table 1. Task and Testing Scenario

Scenario	Task	Testing Scenario
S1	Sign-up or Login	Press or tap the Sign-up or login button to enter the designated page.
S2	Open the menu to submit your complaint	Find or look for a way to the menu to submit a complaint for the complaint you have via the plus sign navbar below.
S3	Know the details of the cases presented	Find a way to find out the details of the case in the home menu display by selecting the case in the home display
S4	Find out the list of complaints you have	Find a way to find out the list of complaints you have from the menu via the navbar below to the left of the profile icon
S5	Know your profile	Find a way to view the profile by selecting the profile icon via the navbar below

From the scenario given in table 1, the values obtained from usability testing in table 2 using the maze website are obtained. The score obtained is the average of the results of all tests for each task. Results are obtained in detail from testing each task with success rates up to usability scores.

Table 2. Report of the prototype test

Scenario	Direct Success	Mission Unfinished	Total Tester	Missclick Rate	Average Duration	Usability Score
S1	61,2%	10,2%	49	37,7%	17,8s	75
S2	71,7%	21,7%	46	62,2%	4,0s	71
S3	97,7%	2,3%	43	6,7%	5,7s	96
S4	84,6%	10,3%	39	51,4%	12,9s	86
S5	84,2%	7,9%	38	45,5%	2,4s	87

Usability score in the table is an average calculation based on the number of testers on each task. The data transferred into the table is accurate data obtained from the testers' answers to the tested functions

3.2.2 Testing Documentation

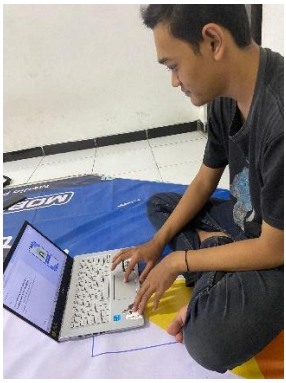


Fig 11 Respondent Documentation

3.2.3 Criticism and Suggestions for Improvement

The application interface is good, easy to understand, and simple, with innovative and appealing ideas to facilitate student complaints. I personally like it because it will provide efficiency and effectiveness in the service. You can also monitor the status of your complaint and see the resolution, making it more attractive. It might be better if additional details were provided, such as feedback when the complaint is handled.

4. Conclusion

This score indicates that the app is rated between "ok" and "good", indicating that the app is well received by users. Application performance in this category indicates that the application is functional and easy to use, meeting the basic requirements for effective complaint resolution. The usability score in the table is an average calculation based on the number of testers on each task. The data transferred into the table is accurate data obtained from the tester's answers to the function being tested. Based on table 2, the application testing results show varying results. “Register or log in” has a usability score of 75 indicating usability testing. Even though some of the tasks have been completed, the click error rate is still quite high (37.7%) and the average duration is quite long (17.8 seconds) indicating that the interface is quite efficient and for the number of people who tested it was 49 people. "Submit Your Complaint" has a usability score of 71 which shows the user's level of difficulty, then the click error rate is at (62.2%) the increase is still quite high with a long average duration (4.0s) with a total of 46 testers and the mission has not yet been completed. amounted to (21.7%). In "Know the details of the case presented" it has a usability score of 96 which indicates test usability. The click error rate is quite low at only (9.6%) with a total of 43 users tested. The "Find out the list of complaints you have" shows a usability score of 86, with a total of 39 testers. In this scenario the click error rate is still quite high at (51.4%). In "Know your profile" the usability

score was obtained at 87 with 38 total tests, in this scenario the click error rate was still quite high at (45.5%) with these findings indicating that the application functions effectively but requires further improvement. Future application developers are advised to incorporate more efficient functions and expand their scope. Collaboration with institutions in the same field is also important in ensuring the relevance of the content.

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References

[1] Andy P Harianja and Aldo A Moloan, “Developing an E-report System for Complaint Management at Catholic University of St. Thomas using Prototyping Method,” *International Journal of Advances in Computer Science and Technology (IJACST)*, vol. Volume 12. No. 3, pp. 37–44, 2023, doi: 10.30534/ijacst/2023/011232023.

[2] L. Ma, L. Gu, and J. Wang, “Research and Development of Mobile Application for Android Platform,” *International Journal of Multimedia and Ubiquitous Engineering*, vol. 9, no. 4, pp. 187–198, 2014, doi: 10.14257/ijmue.2014.9.4.20.

[3] S. J. Sempurna and D. A. Arfianoris, “Rancang Bangun Aplikasi Keluhan Mahasiswa Berbasis Android,” 2017.

[4] N. Illias, N. H. Abdul Hamid, and Z. A. Shaffiei, “PNSCares: The android based mobile application to manage student complaints,” *Bulletin of Electrical Engineering and Informatics*, vol. 9, no. 3, pp. 1276–1283, Apr. 2020, doi: 10.11591/EEI.V9I3.2065.

[5] I. Maigari Ibrahim, O. Francisca Nonyelum, and I. Rambo Saidu, “ITERATIVE AND INCREMENTAL DEVELOPMENT ANALYSIS STUDY

OF VOCATIONAL CAREER INFORMATION SYSTEMS," *International Journal of Software Engineering & Applications (IJSEA)*, vol. 11, no. 5, 2020, doi: 10.5121/ijsea.2020.11502.

[6] K. Bala, M. Kumar, S. Hulawale, and S. Pandita, "Chat-Bot For College Management System Using A.I," *International Research Journal of Engineering and Technology*, 2017, Accessed: Jun. 01, 2024. [Online]. Available: www.irjet.net

[7] M. Aleedy, H. Shaiba, and M. Bezbradica, "Generating and analyzing Chatbot responses using natural language processing," *International Journal of Advanced Computer Science and Applications*, vol. 10, no. 9, pp. 60–68, 2019, doi: 10.14569/IJACSA.2019.0100910.

[8] M. Kuhnel, L. Seiler, and A. Honal, "Mobile learning analytics in higher education: usability testing and evaluation of an app prototype Dirk Ifenthaler," vol. 15, no. 4, pp. 1741–5659, 2018, doi: 10.1108/ITSE-04-2018-0024.

[9] S. S, "A Study of Software Development Life Cycle Process Models," *SSRN Electronic Journal*, Jun. 2017, doi: 10.2139/SSRN.2988291.

[10] B. Klug, "An Overview of the System Usability Scale in Library Website and System Usability Testing," *Weave: Journal of Library User Experience*, vol. 1, no. 6, Apr. 2017, doi: https://doi.org/10.3998/weave.12535642.0001.602.

[11] M. Z. Uska, R. H. Wirasasmita, M. Fahrurrozi, K. Setemen, J. E. Dewi, and I. K. Purnamawan, "The application of Usability Testing Method for Evaluating the New Student Acceptance (NSA) System PAON usability testing using system usability scale," p. 12009, 2019, doi: 10.1088/1742-6596/1165/1/012009.

[12] E. DigitalCommons and G. Lemke, "The software development life cycle and its application The software development life cycle and its application Recommended Citation Recommended Citation", Accessed: Jul. 23, 2024. [Online]. Available: https://commons.emich.edu/honors

[13] P. Wadkar, A. Raorane, S. Bushra, and shreyas shedge, "AI-Driven Complaint Management System," *SSRN Electronic Journal*, May 2021, doi: 10.2139/SSRN.3866078.

[14] F. Sujito, R. Arifudin, and F. Y. Arini, "An Analysis of User Interface and User Experience Using System Usability Scale and GOMS Method," *Journal of Advances in Information Systems and Technology*, vol. 1, no. 1, 2019, [Online]. Available: https://journal.unnes.ac.id/sju/index.php/jaist

[15] D. A. Putri, ; Denda, R. Hadinata, and ; Siti Nurwahyuni, "WEBSITE USABILITY TESTING ON THE INFORMATION AND COORDINATION CENTER OF COVID-19 IN WEST JAVA USING THE SYSTEM USABILITY SCALE," *JITK (Jurnal Ilmu Pengetahuan dan Teknologi Komputer)*, vol. 6, no. 1, pp. 1–6, Jun. 2020, doi: 10.33480/JITK.V6I1.1355.