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# Analysis Impact of Rapid Application Development Method on Development Cycle and User Satisfaction: A Case Study on Web-Based Registration Service

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**Abstract.**
**Purpose:** This research was conducted to respond to obstacles and inefficiencies in the new student registration system at RA Plus Rabbani. Currently, the conventional method of using physical documents for registration is vulnerable to damage and data loss. Therefore, the proposed solution is implementing a website-based online registration system using the Rapid Application Development (RAD) method. This aims to simplify the process, increase accessibility for prospective students, and reduce the costs and time required.
**Methods:** This research commenced by identifying constraints within the conventional student registration system at RA Plus Rabbani through observations and interviews. The development, following the RAD methodology, involved testing with PHPUnit and Blackbox Testing to ensure the functionality of the system aligned with specifications. In addition, usability evaluation was conducted based on the ISO 9126 standard.
**Result:** The research results show that testing on MVC indicated a 100% success rate for each architectural feature. Referring to expectations with a "valid" conclusion on functionality using Blackbox testing, based on ISO 9126 percentage displayed, it is known that the criterion with the most significant value is the understandability characteristic with a value of 83%.
**Novelty:** This research makes a significant contribution by improving student registration services at RA Plus Rabbani through the implementation of various testing techniques, following the research flow offered by RAD. The study also provides substantial references for further research in web-based system development.

**Keywords**: Education industry, Rapid application development, Registration service, Unit testing, Web
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## INTRODUCTION

Technological advances and the increasing Internet use have impacted all aspects of life [1]–[3], including education [4]. Educational organizations have a responsibility towards society as users of their services. Education is an industry that produces products and services based on scientific knowledge and skills [5]. One effort to achieve better education is to innovate [6], [7].

Raudhatul Athfal (RA) Plus Rabbani is a school in eastern Indonesia, in Flores, Maumere, Sikka Regency. One of the main processes at school is to provide administrative facilities such as a new student registration service system. Student registration services are one of the mechanisms for organizing education ahead of the new school year, where the education unit selects prospective students. RA Plus Rabbani has provided new student registration services using a conventional system that includes registration tools in the form of files, making them vulnerable to physical damage and data loss. The difficulty with this offline service also lies in the registration results file, which is inputted manually by the management staff in Excel. A paper-based registration system means that prospective students must come to school to carry out the registration process, which can affect time efficiency and accommodation costs for school travel [8]. The solution is to use an online registration system [9], [10].

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Online registration allows students to register without having to physically visit the school and provides registration status in the online registration application [11]. Research conducted by Styawati et al. [12] proves that online information processing systems make it easier for users to access information compared to offline systems. A study by Suraseth and Koraneekij [13] found that using a computer would be more interesting, timesaving, and cost-effective, could help minimize the possibility of errors, and could store a variety of information. Furthermore, it is safe, suitable for long-term studies, and more efficient than paper-based methods.

System development with student goals can be categorized as a complex system because it consists of many software modules that may be interdependent [14], [15]. Advanced software engineering skills will be indispensable for analyzing, designing, developing, and maintaining systems [16]. Currently, when developing a software system, many developers follow certain stages commonly called "methodologies" in software development [17], [18]. This study aims to develop a conventional-based student registration system into a website-based computerized registration service. The method used is Rapid Application Development (RAD) [19], [20].

Several previous studies have applied the RAD method in developing their systems. For instance, the research conducted by Saraswati et al. implemented the RAD method in developing a web-based payroll information system. The system's design and functionality were depicted using Data Flow Diagrams (DFD), while Blackbox testing was employed to evaluate each feature and menu's functionality within the system. The study concluded that the testing was valid for all requirements [21]. A study by Sani and Kurniawan [22] applied the RAD method in developing a paperless-based tryout system for evaluating students' learning outcomes. The system modeling was conducted using the Unified Modeling Language (UML). The framework used is Codeigniter, chosen for its ease of implementing Object-Oriented Programming (OOP) concepts. Blackbox testing was utilized, resulting in a 90% usability score. Moreover, Kartarina et al. [23] applied the RAD method to the marketing information system of Batu Mekar Village products. The application's design consisted of the database, data flow diagram, and sitemap. Usability testing was carried out by distributing questionnaires to 94 users. On the other hand, Ripanti's [24] study implemented the RAD method in the online learning reporting system of Tanjungpura University, utilizing the Learning Management System (LMS) as a tool. User design was developed using the Joint Application Development (JAD) and Computer-Aided Software Engineering (CASE) approaches. The research focused on Object-Oriented Analysis and Design (OOAD) with class and use case diagrams. This study primarily centered on the validation process, conducted through a Focus Group Discussion (FGD), inviting users to try the system during a socialization event.

The software development model included in the incremental technique is Rapid Prototyping, commonly called RAD [25]–[27]. RAD includes several methods that emerged as an answer to the weaknesses of the waterfall development method and its variations [28]. Suryadi and Zulaikhah [29] applied the waterfall method to design a web-based mail archive management system. The stage starts with needs analysis, design, testing implementation, The last stage is maintenance, where the software is managed, repaired, and improved according to feedback. Setyabudhi and Hasibuan [30] conducted a study that applied the SDLC method to a web-based online shop information system. The research stages start from planning, analysis, design, implementation, testing, and maintenance. In the waterfall method and SDLC, the inability to respond to changing needs flexibly and a high risk of project failure if the initial analysis is not in-depth. Dhir et al. [31] examined the factors of success and failure in the implementation of software development. The waterfall and spiral methods were analyzed from several processes in the study. The analysis is based on efficiency, accuracy, time management, and risk analysis. It concludes that the two methods are equal to the technique that emphasizes time speed and repetition of the initial investigation in its development.

RAD is a software development model with shorter design stages resulting in better system development [32], [33]. RAD emphasizes rapid development, even with small work teams [30]. Moreover, RAD applies an iterative approach in developing the system, and in the early stages of development, a working model of the system is formed to accommodate user needs [34]. The information system planning process usually takes at least 180 working days. However, by applying the RAD method, system development can be completed within 30-90 working days [35], [36]. The RAD method succeeded in making module boundaries in a system so that it does not come out of the librarian's needs, and development can run according to the wishes of its users [37], [38].

## METHODS

### Research Object

The research object is the new student registration service system developed at RA Plus Rabbani. The usability test was carried out by distributing ten questionnaires to 40 registered users using the online system.

### Research Tools

This study requires some computer hardware and software to develop expert systems. The devices needed can be seen in Table 1. The method used should be accompanied by references; and the relevant modification should be explained. The procedure and data analysis technique should be emphasized in a literature review article. The stages and analysis of the research must be explained in detail.

Table 1. Tools and devices for research

| No. | Tools and Device | Version | Function |
|---|---|---|---|
| 1. | Laptop Asus Vivobook E410MAB | Windows 11, 64 Bit, 4 GB RAM | System planning |
| 2. | Sublime Text | 4143 | Writing lines of code |
| 3. | Codeigniter | 3.1.13 | Framework |
| 4. | PHPUnit Testing | 3.7.21 | Functional testing |
| 5. | Google Forms | - | Questionnaire distribution |
| 6. | IBM SPSS | 29.0.1.0 | Validity and Reliability Test |

### Research Stage

In this study, the development of student registration services adopts the working stages recommended by the RAD method. Testing was carried out using Unit Testing and Blackbox Testing to ensure that every function in the student registration service runs correctly and follows the expected specifications. In addition, the system evaluation process includes usability testing concerning the ISO 9126 standard to assess the level of usability of student registration services. The methods and procedures of the research phase are illustrated in Figure 1.


Figure 1. Research stage

Figure 1 shows the research method with several stages. The research problem is the initial stage in obtaining and determining research subjects. This starts at examining various occurrences, incidents, and information collected by multiple methods such as observation and interviews. The literature review is expected to dig up all information related to the problems to be faced and studied regarding research methods and objects, as well as provide a basis for the direction of research to be carried out. Development is carried out by applying the RAD method. Finally, the analysis is carried out involving the processing and interpretation of data from each functional test and system usability. Development stages using RAD can be seen in Figure 2.

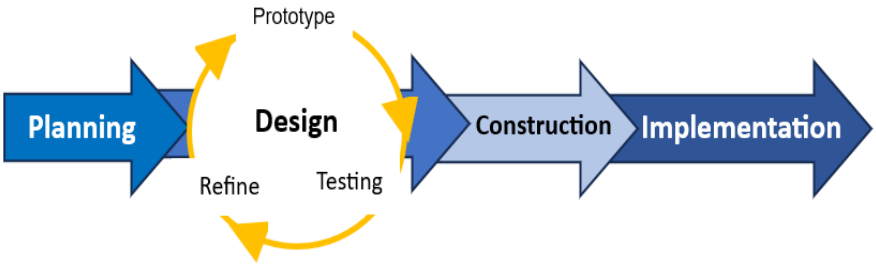


Figure 1. Stages of the RAD method

Figure 2 shows the RAD development method with several stages according to Afriansyah et al. [38]. Planning is the stage of identifying information needs and problems to determine goals, system limitations, constraints, and solutions for solving problems. This stage also identifies the behavior and activities the system requires. At the design stage, a series of processes occur, including business process design, programming design, testing, and refinement. This stage involves collaboration between the development team and the client to ensure the application result meets requirements. Construction is the stage where each part of the coded application will be tested separately and integrated as a whole to ensure that the entire application functions correctly. The implementation phase serves as the testing and introduction stage of the application. This is the phase where the system is ready to run.

**Rapid Application Development**

1. Planning

The planning stage includes identifying system needs and requirements, gathering information about the existing enrollment process, and gathering input from related parties, such as schools, parents, and prospective students. In addition, this stage determines the technology and platform to be used in the development of the system, the allocation of resources such as budget, workforce, and time, and the scheduling of the development stages. The planning stages aims to ensure that the development of the registration service system at RA Plus Rabbani can run smoothly and on time, following the needs and objectives of the school.

Student Registration Service Workflow is a planning process that is carried out systematically and automatically in registering or accepting new students. This workflow includes a series of actions, from registration, collection of information and documents, data verification, and approval of registration to the creation of acceptance confirmation by the admin, as described in Figure 3.

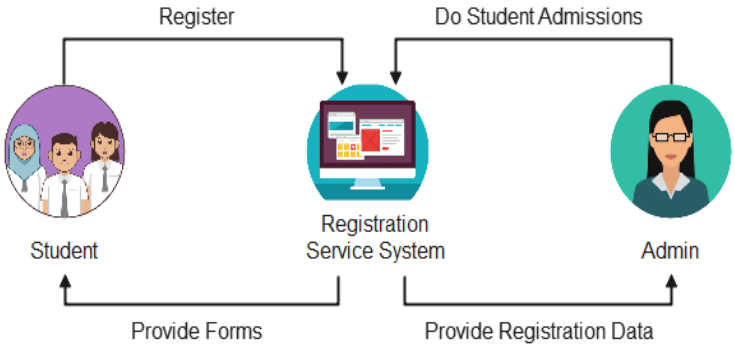


Figure 3. Student registration service workflow

Figure 3 shows the workflow of the registration procedure for the RA Plus Rabbani registration service application. It maps the workflow of each actor involved in the system. Based on the process simulation, two users interact with each other using the system: User A (a student) carrying out activities as a registrant and User B (an administrator) acting as a recipient of registration for prospective students.

2. Design

a. Business Process Design

In this stage, the developer works with RA Plus Rabbani to design an efficient and structured business process for the student registration service system. The business process includes the steps for registration, student data collection, document verification, and setting up a schedule for admitting new students. In addition, the aspects such as communication between parents and the school, approval flow, and student data management are taken into account, so that the system can accommodate a smooth and accurate registration process.

b. Programming Design

The design of programming in the development of the student registration service system at RA Plus Rabbani refers to the stage of designing in depth how the code and logic of the program are implemented to create applications that suit the needs and goals determined. Developers pay attention to technical aspects, such as choosing the appropriate programming language, database structure, and system architecture. In addition, programming design include creating functional modules, managing the interaction between the user and the system through the user interface, and optimizing application performance so that it runs efficiently and responsively.

c. Unit Testing

The next stage is unit testing, a software testing method that tests small units of program code isolated from other parts of the program. The goal is to ensure that each program unit, such as a function or method, functions correctly according to predefined specifications [39]. Unit testing is significant in software development because it helps find and fix bugs early, improves code quality, and makes it easier to change or fix future code sign phases [40].

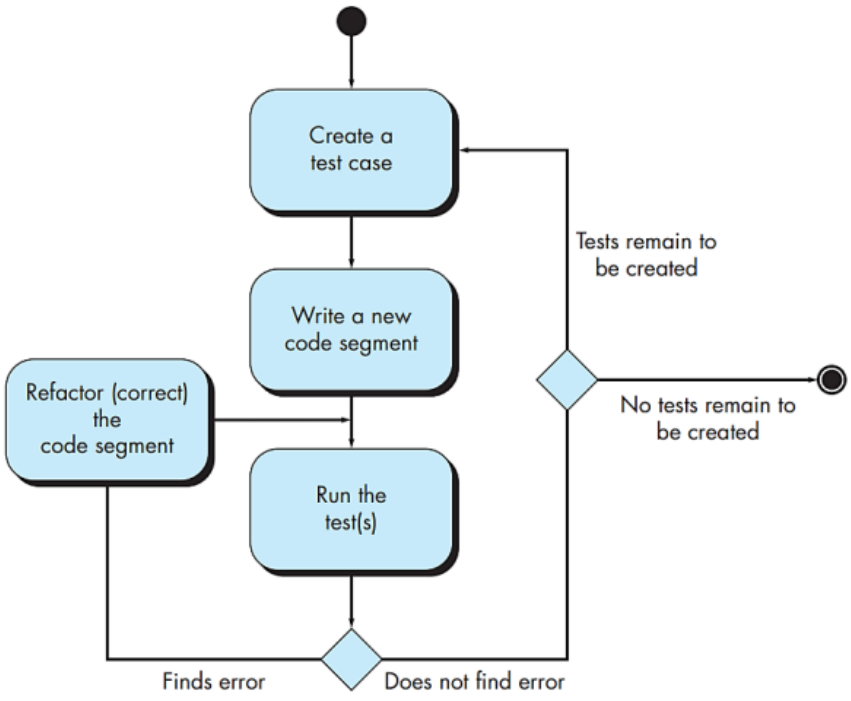


Figure 4. Unit test procedure

The unit test process adheres to a straightforward procedural flow as depicted in Figure 4. Prior to generating the initial code snippet, the developer formulates a test to execute the code (to intentionally make the code fail). Subsequently, the code is crafted to satisfy the test. Upon successful completion, a new test is devised for the subsequent code segment in the development phase. This iterative procedure persists until the entire component is coded, and all tests are executed without errors. Should any test detect an error, the existing code is rectified, and all tests formulated up to that point are rerun. This cyclic process continues until no tests remain, indicating that the component satisfies all the specified requirements [41].

3. Construction

At the construction stage, each part of the application that has been coded is tested separately using the Blackbox testing method. This testing is done without detailed knowledge of how the application code is implemented like the previous unit testing. The focus is on the inputs and outputs and the functionality that should be generated. By testing each part of the application separately, the development team can identify and address potential errors that may occur. If an error is found in the testing, the developers make improvements and enhancements to the section before integrating it into the whole system. This process is repeated until the entire application functions correctly and is ready to be integrated into a complete approach to be implemented and continue at the usability testing stage.

## RESULTS AND DISCUSSIONS

This study aims to create a system that can facilitate the availability of registration services in managing the running of the online registration system, make it easier for students to access school information and carry out registration, and be developed following the RAD development flow. Thus, the result achieved by the author is a new web-based student registration service system.

### Pseudecode System

This section covers all stages of the system for classifying online student enrollments and illustrate them using pseudocode, which can later be translated into other computer programming languages. In the first stage, the registration process, students register and log into the system. The system pseudocode workflow can be described as follows:

```
BEGIN
    INPUT Username
    INPUT Password
    IF (Username = True & Password = True)
        THEN
                    OUTPUT “Login Success”
          ELSE
                    OUTPUT “Failed”
END
```

The prototype is a programming language design flow for the login page. This prototype description algorithm requires students to enter a username and password. If the entered username and password are correct, the login will be successful. However, if the username or password entered is incorrect, the login attempt will fail, and the student will remain at the login page to re-enter the username and password. This login page can be seen in Figure 5.

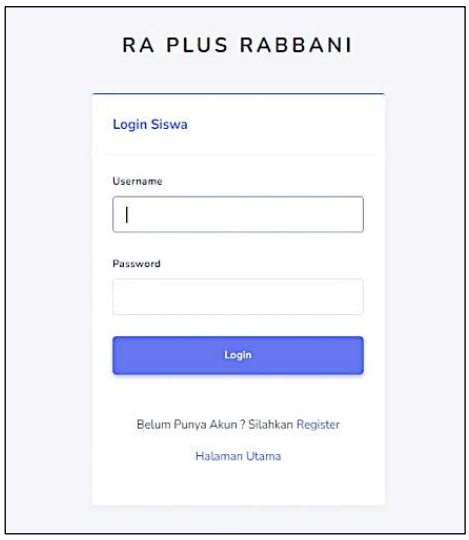


Figure 5. Login page

Figure 5 that the login page is a menu containing a login form each user can access. The system has two types of user login access: admin logins for admins and student logins for students. Users have different access rights to the registration service dashboard. The registration page is a listing page regarding the registrant data required for the registration process. The process flow on the registration menu is explained using pseudocode, as shown below.

```
BEGIN
        INPUT Student Data
        INPUT Data Information
        INPUT Father Data
        INPUT Mother Data
        UPLOAD Letter of Willingness
            IF (Saved Data= Done) THEN
                PRINT Registration Card
            ELSE
                OUTPUT "Failed"
END
```

The pseudocode system prototype above illustrates the process flow of filling in the student registration form in a system that has been developed online, as shown in Figure 6.

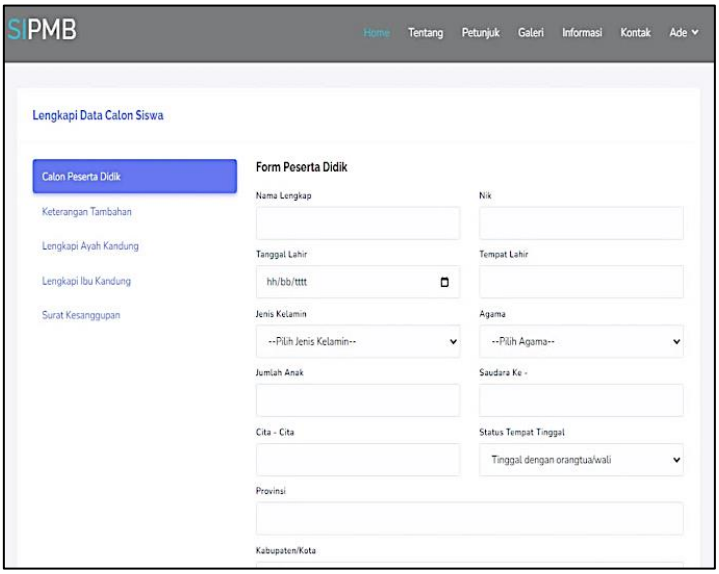

Figure 6. New student registration form

Figure 6 illustrates how to fill out the registration form, which consists of five parts. In the first part, students input personal data in the form of their name, National Identity Number, place and date of birth, gender, religion, number of siblings, aspirations, status of residence, address, birth certificate, and family card. In the second part, students input additional information about special needs for children. In the third and fourth sections, students input data on their biological father and mother's legal guardians by name, place, date of birth, education, occupation, and address. The fifth part shows a letter of intent to fulfill school rules.

**Functional Testing**

1. Model

Tests on the model check the validity and consistency of the data and ensure that the implemented business logic runs appropriately. Table 2 shows the total number of tests on this module.

Table 2. Number of model module tests

| Feature | Test Case | Result |
|---|---|---|
| M_admin | 6 | 100% |
| M_groove | 5 | 100% |
| M_auth | 4 | 100% |
| M_file_student | 15 | 100% |
| M_gallery | 5 | 100% |
| M_information | 5 | 100% |
| M_Message | 3 | 100% |
| M_profile_school | 3 | 100% |
| M_register | 2 | 100% |

Table 2 shows the unit testing results for each feature in the Architecture module, consisting of nine features. Unit testing is the number of coding functions tested in this module. Each feature has a different number of test cases, and all test cases achieve 100% results.

2. Architecture Controller

Testing on the controller checks the validity and consistency of the data and ensures that the implemented business logic runs appropriately. Table 3 shows the number of tests on this module.

Table 3. Number of architecture controller tests

| No. | User | Feature | Test Case | Result |
|---|---|---|---|---|
| 1. | Admin | Dashboard | 1 | 100% |
| | | Data_admin | 4 | 100% |
| | | Data_flow | 4 | 100% |
| | | Data_gallery | 4 | 100% |
| | | Data_information | 4 | 100% |
| | | Data_received | 1 | 100% |
| | | Data_rejected | 1 | 100% |
| | | Data_Registration | 3 | 100% |
| | | Data_Massage | 1 | 100% |
| | | Data_profile_school | 2 | 100% |
| 2. | Student | Data_detail_File | 6 | 100% |
| | | Auth | 11 | 100% |
| | | home | 3 | 100% |

Table 3 shows the unit test results for each feature in the architecture controller. The user table consists of 10 functional features, 3 must be tested in the student features. Unit testing is the number of coding functions tested in this module. Each feature has a different number of test cases, and all test cases achieve 100% results.

3. BlackBox Testing

At this point, the process is tested using the Blackbox testing method on a system. This is done by testing the functionality of the feature system created. Table 1 shows a Blackbox testing scenario of all interaction processes that the user can carry out on the system. Details of the ∫lackbox testing scenario carried out can be seen in Table 4.

Table 4. Blackbox testing of student registration services

| Testing | Scenarios Testing | Expected Results | Testing Results | Conclusion |
|---|---|---|---|---|
| Student Registration Page | Enter first name, last name, username, password, and password confirmation | The data will be stored and updated in the database. Otherwise, an error notification will appear in the application | According to expectations | Valid |
| Student Login Page | Enter the correct username and password | Enter the Home page | According to expectations | Valid |
| | Entered the wrong username and password | Login failure notification appears; wrong username and password! | According to expectations | Valid |
| Admin Login Page | Enter the correct username and password | Enter the Home page | According to expectations | Valid |
| | Entered the wrong username and password | Login failure notification appears; wrong username and password! | According to expectations | Valid |
| Registration Form page | Completing data on prospective students, additional information data, data on biological fathers, data on biological mothers, and a letter of intent | The data will be stored and updated in the database. If not, a notification appears to complete the data in the application | According to expectations | Valid |
| Registration Results Form page | Press the print details button | Displays information in the form of a registration card to be printed | According to expectations | Valid |
| admin Dashboard Page | Log into the system | Information appears on the number of applicants, students accepted, and students rejected | According to expectations | Valid |
| School Profile Data Page | Enter the school's name, vision, mission, email, telephone number, Facebook, Instagram, address, and description | Data is stored on the school web page dashboard | According to expectations | Valid |
| Gallery Data Page | Click add data, choose file, and save data | Data is stored on the school web page dashboard | According to expectations | Valid |
| Registration Flow Data Page | Click edit file, title, flow description, then save data | Data is stored on the school web page dashboard | According to expectations | Valid |
| Information Data Page | Updated information about schools, the information presented in the form of articles | Data is stored on the school web page dashboard | According to expectations | Valid |
| Registration Data Page | Student edits can be accepted or rejected | The data is stored on the student dashboard page | According to expectations | Valid |
| Report Data Page | Export of student data is accepted in Excel and pdf forms | Data can be exported | According to expectations | Valid |
| Logout | Press logout button | Back to dashboard | According to expectations | Valid |

The Blackbox testing approach in Table 4 is one of the methods to ensure the quality and suitability of the student registration service system. The Blackbox approach refers to tests performed without knowledge of how the system code is implemented but focus on the input and output generated by the system. The test table has a predefined list of key features that need to be checked to ensure the system functions according to the predefined requirements. Each feature is tested separately by providing certain inputs that test the functionality and limitations of each feature. These results are tested to ensure that the system produces the expected output and is in accordance with predetermined specifications. If the system provides an output meeting expectations, the feature has passed the test. However, if the system produces inappropriate output,

the feature is deemed to have failed the test, and a fix is required. The test results using the Blackbox approach in the feature table show that the system has passed the test correctly. This can be seen from the conclusion of the test results for each feature, i.e., "Valid." Successful testing provides confidence that the student registration service system at RA Plus Rabbani is functioning properly and meets the predefined user requirements.

**Usability Testing**

Usability testing is an assessment method used to evaluate the extent to which users can use a product or system effectively, efficiently, and satisfactorily. The primary purpose of usability testing is to identify users' problems and difficulties using the product or system [42]. Usability testing of this system is carried out concerning the International Organization for Standardization (ISO) 9126 standard. This standard assesses the software's overall quality, including usability aspects. In this test, the usability characteristics of ISO 9126, such as clarity, ease of learning, operability, and attractiveness, are the main focus in evaluating how users interact with the system [43].

Table 5. Characteristic ISO 9126

| Sub-Characteristics | Question | Code |
|---|---|---|
| Understandability | • This system is easy to use. | Q1 |
| | • The use of this system is too complicated. | Q2 |
| Learnability | • There are no problems in using this system. | Q3 |
| | • I feel confused about using this system. | Q4 |
| Operability | • I feel like I need help from other people in using this system. | Q5 |
| | • I feel that other people will quickly understand how to use this system. | Q6 |
| | • I need to learn many things before using this system. | Q7 |
| Attractiveness | • All features work according to their function. | Q8 |
| | • I feel like I will use this system again. | Q9 |
| | • I feel there are a lot of inconsistencies or mismatches in this system. | Q10 |

Table 5 contains 10 statements from the ISO 9126 questionnaire that must be answered by respondents using a Likert scale with the options "Strongly Disagree," "Disagree," "Neutral," "Agree," and "Strongly Agree." Respondents were measured using a Likert scale. The results of the Likert scale measurements based on ISO 9126 can be seen in Table 6.

Table 4. Calculation of ISO 9126

| Q | Characteristic | | | | | Total Value | Score Min | Score Max | Percentage (Total/max) |
|---|---|---|---|---|---|---|---|---|---|
| | SD | D | N | A | SA | | | | |
| Q1 | 0 | 0 | 3 | 28 | 9 | 166 | 40 | 200 | 83% |
| Q2 | 0 | 0 | 0 | 26 | 11 | 159 | 40 | 200 | 80% |
| Q3 | 0 | 0 | 0 | 28 | 7 | 147 | 40 | 200 | 74% |
| Q4 | 0 | 0 | 0 | 20 | 13 | 145 | 40 | 200 | 73% |
| Q5 | 0 | 0 | 0 | 32 | 7 | 163 | 40 | 200 | 82% |
| Q6 | 0 | 0 | 0 | 18 | 16 | 152 | 40 | 200 | 76% |
| Q7 | 0 | 0 | 0 | 36 | 3 | 159 | 40 | 200 | 80% |
| Q8 | 0 | 0 | 0 | 21 | 13 | 149 | 40 | 200 | 75% |
| Q9 | 0 | 0 | 0 | 30 | 6 | 150 | 40 | 200 | 75% |
| Q10 | 0 | 0 | 0 | 21 | 14 | 154 | 40 | 200 | 77% |

Table 6 presents information about $Qn$, which is $n$ question, characteristic based on a Likert scale. The Likert scale is an assessment method that allows respondents to state their agreement or disagreement with certain statements on an ordinal scale. Based on the ISO 9126 percentage displayed, it is known that the criterion with the most significant value is the Understandability characteristic, with a value of 83%. The

characteristic with the lowest value is attributed to learnability, scoring at 73%. The results of the recapitulation of the assessment with ISO 9126 can be seen in Figure 7.

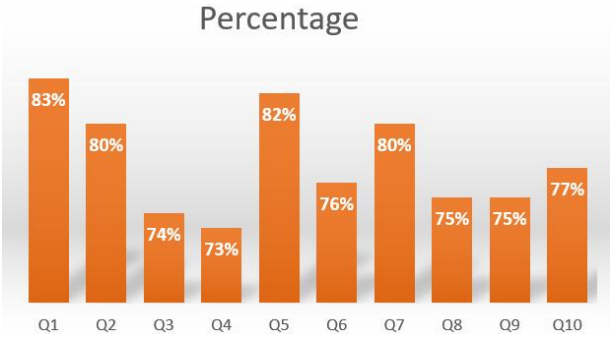


Figure 7. Results with ISO 9126

## DISCUSSION

This section discusses research results based on the findings previously described and links them with relevant references in the scientific literature. Our research aims to evaluate the use of the RAD Method in developing an online student registration system. The results show that applying the RAD method resulted in a high success rate (100%) for each architectural feature in the online registration system. This is in line with the findings of Ardhana et al. [44], stating that RAD has successfully reduced development cycle time and increased user satisfaction by implementing a fast and iterative development approach. Analysis of the results of functionality testing using the Blackbox approach and finding "valid" conclusions based on each desired result. Furthermore, this is in line with Chrismanto et al. [23] findings, indicating that RAD encourages active user involvement in development to ensure that user's needs and expectations are appropriately met. Analysis of the system's characteristics based on ISO 9126 shows that the ability to understand (Understandability) has the highest value, with a percentage of 83%. This shows that the system developed using the RAD method is more accessible for users to understand. This is in line with Qodim et al. [45], stating that development by actively involving users can improve the quality of use and strengthen their understanding of the system.

## CONCLUSION

The functional testing on the model and controller architecture showed that all features were thoroughly tested and achieved a success rate of 100%. Blackbox testing yielded valid conclusions for each category, demonstrating that the system successfully passed functional testing and produced the expected outputs. Regarding usability, ISO 9126 testing revealed that the system received a high score in the "understandability" characteristic at 83% but slightly lower in "learnability" with a score of 73%. Nevertheless, overall testing indicated that the student registration system provided a good user experience. The primary contribution of this research is developing a web-based student registration system using the RAD method, which schools can utilize. The research achieved its objectives successfully. However, there is a lack of long-term evaluation of the system's impact on the long-term efficiency of schools. For future research, conducting further studies involving system users over an extended period is recommended to assess its long-term impact. Additionally, further research could explore integrating this system with other school systems and using the RAD method in software development.

## REFERENCES

[1] Y. Yustikasari, H. Mubarok, and R. Rianto, "Comparative Analysis Performance of K-Nearest Neighbor Algorithm and Adaptive Boosting on the Prediction of Non-Cash Food Aid Recipients," *Sci. J. Informatics*, vol. 9, no. 2, pp. 205–217, 2022, doi: 10.15294/sji.v9i2.32369.

[2] R. Rofik, R. Aulia, K. Musaadah, S. S. F. Ardyani, and A. A. Hakim, "Optimization of Credit Scoring Model Using Stacking Ensemble Learning and Oversampling Techniques," *J. Inf. Syst. Explor. Res.*, vol. 2, no. 1, pp. 11–20, 2023, doi: 10.52465/joiser.v2i1.203.

[3] N. A. Haqimi and R. T. Kusuma, "Timeline reminder system bot and telegram assistant chatbot for a university student and lecturer," *J. Soft Comput. Explor.*, vol. 4, no. 4, pp. 186–194, 2023, doi: 10.52465/joscex.v4i4.221.

[4] S. Mehrolia, S. Alagarsamy, and M. Indhu Sabari, "Moderating effects of academic involvement in web-based learning management system success: A multigroup analysis," *Heliyon*, vol. 7, no. 5, p. e07000, 2021, doi: 10.1016/j.heliyon.2021.e07000.
[5] J. Miranda *et al.*, "The core components of education 4.0 in higher education: Three case studies in engineering education," *Comput. Electr. Eng.*, vol. 93, no. September 2020, 2021, doi: 10.1016/j.compeleceng.2021.107278.
[6] L. Mishra, T. Gupta, and A. Shree, "Online teaching-learning in higher education during lockdown period of COVID-19 pandemic," *Int. J. Educ. Res. Open*, vol. 1, no. June, p. 100012, 2020, doi: 10.1016/j.ijedro.2020.100012.
[7] A. Yudhana, I. Riadi, and T. Abe, "Measuring The Success of E-Learning In Universities Using The Technology Acceptance Model," *INTENSIF J. Ilm. Penelit. dan Penerapan Teknol. Sist. Inf.*, vol. 6, no. 2, pp. 167–183, 2022, doi: 10.29407/intensif.v6i2.17509.
[8] M. Rosmiati, "Sistem Informasi Penerimaan Peserta Didik Baru Berbasis Web," *IJSE – Indones. J. Softw. Eng.*, vol. 6, no. 2, pp. 182–194, 2020, doi: 10.31294/ijse.v6i2.9003.
[9] M. Al-Okaily, H. Alqudah, A. Matar, A. Lutfi, and A. Taamneh, "Dataset on the Acceptance of e-learning System among Universities Students' under the COVID-19 Pandemic Conditions," *Data Br.*, vol. 32, p. 106176, 2020, doi: 10.1016/j.dib.2020.106176.
[10] S. A. Salloum, A. Qasim Mohammad Alhamad, M. Al-Emran, A. Abdel Monem, and K. Shaalan, "Exploring students' acceptance of e-learning through the development of a comprehensive technology acceptance model," *IEEE Access*, vol. 7, pp. 128445–128462, 2019, doi: 10.1109/ACCESS.2019.2939467.
[11] J. M. Hudin, Y. Farlina, R. A. Saputra, A. Gunawan, D. Pribadi, and D. Riana, "Measuring Quality of Information System Through Delone Mclean Model in Online Information System of New Student Registration (SISFO PPDB)," *2018 6th Int. Conf. Cyber IT Serv. Manag. CITSM 2018*, no. Citsm, pp. 1–6, 2019, doi: 10.1109/CITSM.2018.8674310.
[12] S. Styawati, F. Ariany, D. Alita, and E. R. Susanto, "Pembelajaran Tradisional Menuju Milenial : Pengembangan Aplikasi Berbasis Web Sebagai Penunjang Pembelajaran E-Learning Pada Man 1 Pesawaran," *J. Soc. Sci. Technol. Community Serv.*, vol. 1, no. 2, pp. 10–16, 2020, doi: 10.33365/jsstcs.v1i2.816.
[13] C. Suraseth and P. Koraneekij, "Development of a sociometric web application to study the relationship among secondary school learners," *Heliyon*, vol. 8, no. 8, p. e10105, 2022, doi: 10.1016/j.heliyon.2022.e10105.
[14] B. Setyo Nugroho *et al.*, "Penerapan Sistem Manufacturing, Inventory, dan Purchasing Berbasis Enterprise Resource Planning (ERP) Odoo," *J. Ilm. Bid. Ilmu Ekon.*, vol. 21, no. 2, pp. 530–542, 2023.
[15] T. Li, K. A. Douglas, H. P. Le, A. K. Raz, W. J. Huang, and A. W. Fentiman, "Applying Social Constructivism in Model-Based Systems Engineering Online Instructional Module for Engineering Professional," *IEEE Front. Educ. Conf.*, 2020, doi: 10.1109/FIE44824.2020.9274251.
[16] F. Al-Hawari, "Software design patterns for data management features in web-based information systems," *J. King Saud Univ. - Comput. Inf. Sci.*, vol. 34, no. 10, pp. 10028–10043, 2022, doi: 10.1016/j.jksuci.2022.10.003.
[17] I. B. K. Manuaba, "Combination of test-driven development and behavior-driven development for improving backend testing performance," *Procedia Comput. Sci.*, vol. 157, pp. 79–86, 2019, doi: 10.1016/j.procs.2019.08.144.
[18] A. Fadlil, I. Riadi, and A. Basir, "Integration of Zachman Framework and TOGAF ADM on Academic Information Systems Modeling," *INTENSIF J. Ilm. Penelit. dan Penerapan Teknol. Sist. Inf.*, vol. 5, no. 1, pp. 72–85, 2021, doi: 10.29407/intensif.v5i1.14678.
[19] T. Radillah and P. Pauzun, "Implementasi Metode RAD (Rapid Application Development) Pada Proses Pendaftaran dan Test seleksi Penerimaan Mahasiswa Baru Secara Online," *I N F O R M a T I K a*, vol. 12, no. 2, p. 7, 2020, doi: 10.36723/juri.v12i2.223.
[20] S. Rustam and S. Sumarni, "E-Commerce untuk Penjualan Arang Tempurung berbasis Android," *Ilk. J. Ilm.*, vol. 12, no. 3, pp. 200–207, 2020, doi: 10.33096/ilkom.v12i3.657.200-207.
[21] N. W. S. Saraswati, N. W. W. Wardani, K. L. Maswari, and I. D. M. K. Muku, "Rapid Application Development untuk Sistem Informasi Payroll Berbasis Web Rapid Application Development for Web-based Payroll Information System," *MATRIK J. Manajemen, Tek. Inform. dan Rekayasa Komput.*, vol. 20, no. 2, pp. 213–224, 2021, doi: 10.30812/matrik.
[22] R. R. Sani and D. Kurniawan, "Rancang Bangun Sistem Try Out Berbasis Paperless untuk Evaluasi Hasil Belajar Siswa dengan MVC," *J. Teknol. Inf. dan Ilmu Komput.*, vol. 6, no. 3, pp. 277–286,

2019, doi: 10.25126/jtiik.2019631181.
[23] P. Irfan, K. Kartarina, and C. Satria, "Sistem Informasi Pemasaran Produk Desa Berbasis Web," *Ilk. J. Ilm.*, vol. 11, no. 3, pp. 214–221, 2019, doi: 10.33096/ilkom.v11i3.471.214-221.
[24] E. F. Ripanti, "Pengembangan Sistem Informasi Pelaporan Pembelajaran Daring dengan Model Rapid Application Development (Studi Kasus: Universitas Tanjungpura)," *J. Edukasi dan Penelit. Inform.*, vol. 7, no. 3, p. 408, 2021, doi: 10.26418/jp.v7i3.49385.
[25] S. Alsaqqa, S. Sawalha, and H. Abdel-Nabi, "Agile Software Development: Methodologies and Trends Blockchain technologies View project Social Media Networks View project," *Artic. Int. J. Interact. Mob. Technol.*, pp. 246–270, 2020, [Online]. Available: https://doi.org/10.3991/ijim.v14i11.13269
[26] A. R. Chrismanto, R. Delima, H. B. Santoso, A. Wibowo, and R. A. Kristiawan, "Developing agriculture land mapping using Rapid Application Development (RAD): A case study from Indonesia," *Int. J. Adv. Comput. Sci. Appl.*, vol. 10, no. 10, pp. 232–241, 2019, doi: 10.14569/ijacsa.2019.0101033.
[27] F. Q. Khan, S. Rasheed, M. Alsheshtawi, T. M. Ahmed, and S. Jan, "A comparative analysis of RAD and agile technique for management of computing graduation projects," *Comput. Mater. Contin.*, vol. 64, no. 2, pp. 777–796, 2020, doi: 10.32604/CMC.2020.010959.
[28] A. Suryadi, "Rancang Bangun Sistem Pengelolaan Arsip Surat Berbasis Web Menggunakan Metode Waterfall (Studi Kasus : Kantor Desa Karangrau Banyumas)," *J. Khatulistiwa Inform.*, vol. 7, no. 1, pp. 13–21, 2019, doi: 10.31294/jki.v7i1.36.
[29] A. L. Setyabudhi and Z. S. Hasibuan, "Sistem Informasi Online Shopberbasis Web Dengan Metode Sdlc," *Eng. Technol. Int. J.*, vol. 2, no. 2, pp. 70–81, 2020, [Online]. Available: https://www.mand-ycmm.org/index.php/eatij/article/view/51
[30] S. Dhir, D. Kumar, and V. B. Singh, *Success and failure factors that impact on project implementation using agile software development methodology*, vol. 731. Springer Singapore, 2019. doi: 10.1007/978-981-10-8848-3_62.
[31] B. A. Matjik and J. F. Andry, "Perancangan Sistem Inventory dengan Metode Rapid Application Development (Studi Kasus PT XYZ)," *JOINS (Journal Inf. Syst.*, vol. 4, no. 2, pp. 140–147, 2019, doi: 10.33633/joins.v4i2.3035.
[32] P. Hohl *et al.*, "Back to the future: origins and directions of the 'Agile Manifesto' – views of the originators," *J. Softw. Eng. Res. Dev.*, vol. 6, no. 1, 2018, doi: 10.1186/s40411-018-0059-z.
[33] P. Rodríguez, M. Mäntylä, M. Oivo, L. E. Lwakatare, P. Seppänen, and P. Kuvaja, "Advances in Using Agile and Lean Processes for Software Development," *Adv. Comput.*, vol. 113, pp. 135–224, 2019, doi: 10.1016/bs.adcom.2018.03.014.
[34] A. G. Safitri and F. Atqiya, "Automatic model transformation on multi-platform system development with model driven architecture approach," *Comput. Sci. Inf. Technol.*, vol. 3, no. 3, pp. 157–168, 2022, doi: 10.11591/csit.v3i3.p157-168.
[35] M. Lubis, F. Dennis, R. Andreswari, and A. Ridho Lubis, "Dashboard information system development as visualization of transaction reports in the application BackInd (backpacker reservation system)," *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 801, no. 1, 2020, doi: 10.1088/1757-899X/801/1/012145.
[36] S. Overview, "Developing Suicide Risk Idea Identi cation for Teenager ( SERII …," 2021.
[37] Maryani, H. Prabowo, F. L. Gaol, and A. N. Hidayanto, "Comparison of the System Development Life Cycle and Prototype Model for Software Engineering," *Int. J. Emerg. Technol. Adv. Eng.*, vol. 12, no. 4, pp. 155–162, 2022, doi: 10.46338/ijetae0422_19.
[38] D. A. Afriansyah, D. Setiawati, and A. R. Bahtiar, "Membangun Website E-commerce di Toko Sean Shoes Menggunakan Metode Rapid Application Development," *JITU J. Inform. …*, vol. 6, no. 1, pp. 1–8, 2022, [Online]. Available: https://www.ejournal.uby.ac.id/index.php/jitu/article/view/634
[39] M. M. Moe and K. K. Oo, "Evaluation of Quality, Productivity, and Defect by Applying Test-Driven Development to Perform Unit Tests," *IEEE 9th Glob. Conf. Consum. Electron.*, pp. 435–436, 2020, doi: 10.1109/GCCE50665.2020.9291950.
[40] K. Ledoux, P. W. Visser, J. D. Hulin, and H. Nguyen, "Starting large synchronous motors in weak power systems," *IEEE Trans. Ind. Appl.*, vol. 51, no. 3, pp. 2676–2682, 2015, doi: 10.1109/TIA.2014.2373820.
[41] M. I. Ananda and W. Ridhoni, "Rancang Bangun Sistem Inventaris Barang Menggunakan Barcode (Studi Kasus: Politeknik Hasnur)," *J. Kaji. Pendidik. Ekon. dan Ilmu Ekon*, vol. 2, no. 5, pp. 1–19, 2019, doi: 10.46365/pha.v5i02.344.

[42] S. Ratna, “Iso 9126 Untuk Pengujian Game Edukasi Membuang Sampah Berbasis Android,” *Al Ulum J. Sains Dan Teknol.*, vol. 6, no. 2, p. 44, 2021, doi: 10.31602/ajst.v6i2.4843.
[43] R. P. Aji, “Analisis Perangkat Lunak Penilaian Digital Pertandingan Pencak Silat Menggunakan ISO 9126,” *STRING (Satuan Tulisan Ris. dan Inov. Teknol.*, vol. 5, no. 3, p. 307, 2021, doi: 10.30998/string.v5i3.7727.
[44] V. Y. P. Ardhana, M. Sapi’i, H. Hasbullah, and E. A. M. Sampetoding, “Web-Based Library Information System Using Rapid Application Development (RAD) Method at Qamarul Huda University,” *IJICS (International J. Informatics Comput. Sci.*, vol. 6, no. 1, p. 43, 2022, doi: 10.30865/ijics.v6i1.4031.
[45] H. Qodim, B. Busro, and R. Rahim, “Islamic Calendar: Prototype of Hijri Calendar Application using Rapid Application Development Method,” *Int. Conf. Cyber IT Serv. Manag. CITSM*, vol. 3, no. 1, pp. 4–10, 2019, doi: 10.1109/CITSM47753.2019.8965410.