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Designing a PPDB System Using the Rational Unified Process (RUP) Method: Case Study at: Pakenjeng ICT High School

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Abstract: New Student Admissions (PPDB) is a crucial process in educational administration that requires a structured, user-friendly, and secure system. Digitizing web-based PPDB is necessary to improve the efficiency of school administration and minimize errors in processing prospective student data. This research aims to design a web-based PPDB information system at the Pakenjeng Islamic Education (ICT) Center using the Rational Unified Process (RUP) method. The scope of the research is limited to the system design stage, specifically the Inception and Elaboration stages, without system implementation and testing. The main outputs of this research are a system requirements specification document (functional and non-functional requirements), a system architecture design, and system modeling using the Unified Modeling Language (UML), including use case diagrams, activity diagrams, sequence diagrams, and class diagrams. The main contribution of this research lies in the design of a PPDB system integrated with a system-based selection mechanism and a data security design using the Playfair Cipher cryptographic algorithm to protect prospective students' personal data. It is hoped that the results of this design can serve as a reference and foundation for developing a web-based PPDB system that is safer, more structured, and more efficient in the next implementation stage.

Keywords: PPDB, System Design, Rational Unified Process, UML, Information Systems.

Introduction

New Student Admissions (PPDB) are an important part of the annual education cycle in Indonesia. This process determines which prospective students will participate in the learning process at school, while also serving as an indicator of good school administration. Nationally, the implementation of PPDB is regulated by Permendikbudristek Number 1 of 2021, which emphasizes the application of zoning, affirmation, parental transfer, and achievement pathways as the basis for selecting prospective students. This policy aims to equalize access to quality education throughout Indonesia (Pendidikan et al., 2021). With the development of digital technology, website-based information systems have become a primary requirement in educational administration services, including in the PPDB process. The implementation of this digital-based system provides easy access to information, time efficiency, and data accuracy (Yudahana et al., 2023). The Pakenjeng Islamic Center (ICT) School is a private educational institution with unique characteristics, both in terms of Islamic vision, student outreach, and school administration management patterns. ICT Pakenjeng serves not only prospective students from the Pakenjeng area, but also from outside the region, so the registration process requires a system that is widely accessible and flexible. Furthermore, as a religious-based school, ICT Pakenjeng requires neat, secure, and structured student data management to support ongoing academic and administrative activities. Based on initial observations,

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the information technology infrastructure within ICT Pakenjeng is considered adequate, equipped with the availability of a stable internet network and sufficient hardware support. Measurement results using the speedtest application showed internet speeds in the range of 10.81 Mbps to 18.22 Mbps, which is considered sufficient to support web-based activities such as filling out online forms, uploading documents, and accessing the PPDB system simultaneously. This condition indicates that ICT Pakenjeng is technically ready to implement a website-based PPDB system.

Although the government has provided an online PPDB system as an effort to digitize education services, in practice, various obstacles remain (Apriwulan et al., 2025). Observations indicate that prospective students often experience difficulty understanding the registration process, especially during the initial stages of filling out the form (Azzahra et al., 2025). Furthermore, technical issues such as failed document uploads due to incompatible file formats and sizes remain common. A general, uniform system for all schools also fails to accommodate the specific needs of each educational unit, particularly private schools with varying characteristics and internal policies. Consequently, the registration process is inefficient, creates confusion for users, and requires manual intervention from the school.

These conditions indicate that the government's PPDB system, despite significant progress, still has limitations in terms of flexibility, usability, and adaptability to local school needs. A website-based PPDB system specifically designed for ICT Pakenjeng is expected to address these weaknesses by providing a simpler and more intuitive interface, a registration flow tailored to school policies, and automated class selection and selection features. Thus, the proposed system will function not only as a registration tool but also as a means of supporting faster and more accurate school administrative decision-making.

Beyond functional aspects, the digitalization of the PPDB (School Admissions) also presents serious challenges related to the security and confidentiality of prospective students' personal data. Sensitive data such as personal identification, family data, and supporting documents are at risk of leakage or misuse if not protected by adequate security mechanisms. Therefore, the designed PPDB system must be able to guarantee data security through the implementation of appropriate cryptographic methods, so that only authorized parties can access the information.

This study is also based on previous research, the first study by (Satria et al., 2023) on the Design of a New Student Admission Information System (PPDB) for Telkom 2 Vocational High School in Medan Using Codeigniter. The result of this study is a well-integrated PPDB website that facilitates the new student registration process and helps schools manage student data efficiently.

The second study by (Muhammad & Ibrahim, 2024) on the Design of an Online PPDB System: A Case Study of SMK Muhammadiyah Gamping Using the Extreme Programming Method, the results of this study are as follows: This study successfully designed and implemented a web-based New Student Admission (PPDB) system using the PHP programming language, the CodeIgniter 4 framework, and the MySQL database. The system was developed using the Extreme Programming (XP) approach, which allows for iterative and flexible system development in response to changing requirements (Darwish, 2011).

The third study was conducted by (Melati et al., 2024) on the Design of a Website-Based New Student Admission Information System (Ppdb) at SMK Muhammadiyah Salawati Using the Waterfall Method. The result of this study was that a website-based new student admission information system was developed using PHP, MySQL, HTML, and CSS. The feasibility test results obtained a score of 91.3% with a rating of Very Feasible.

The fourth study was conducted by (Maisyaroh et al., 2021) on the Design of an Information System for New Student Admissions (PPDB) for students at SMK Merah Putih. The result of this study was the successful development of a web-based PPDB information system using the Waterfall method. This system simplifies the online student registration process, which was previously done manually at the school (Iskandar & Retnawati, 2024).

The fifth study was conducted by (Prasetyo et al., 2024) on the Design of the Mandala Entrepreneur Vocational School PPDB. The result of this study was that the PPDB information system for Mandala Entrepreneur Vocational School was successfully developed using the prototype method. This system replaces the manual process and supports integrated, transparent, and efficient data management. Based on the results of the User Acceptance Testing, users of this design found it to be very efficient in terms of time, with a score of 90.66%, easy to use for information and transactions with a score of 86.6%, and in line with user expectations with a score of 90.66%.

Based on previous research references, it can be concluded that the development of a website-based PPDB system has consistently been proven to improve efficiency, data accuracy, selection transparency, and user satisfaction. Methodological approaches such as Waterfall, Extreme Programming, and Prototype

demonstrate flexibility in adapting to the needs of schools and end users.

The results of various studies also show that the designed system can provide high feasibility test scores, support automatic student data processing, and meet user needs in terms of access speed, data security, and ease of use. Even in user acceptance testing, the system showed an excellent satisfaction level with an average score above 85%.

However, based on several previous studies, the system that was developed still did not use a security system to secure prospective students' personal data and did not have automatic selection and class selection features. The website-based PPDB system developed in this study has advantages over previous studies, namely that it is equipped with automatic selection and class selection features for prospective students who are accepted. With this feature, the PPDB committee can immediately determine classes for each prospective student efficiently, reducing placement errors and speeding up the registration administration process.

Therefore, this study focuses on designing a website-based PPDB information system at the Islamic Center School (ICT) Pakenjeng using the Rational Unified Process (RUP) method and also implementing a cryptography security system to ensure the security and confidentiality of prospective new students' personal data. The RUP method was chosen because of its iterative and architecture-oriented approach, making it highly suitable for designing medium-scale systems with complex requirements and involving multiple actors. Compared to other methods, such as the linear Waterfall method, RUP is more flexible in accommodating changing needs. Meanwhile, compared to Agile methods that emphasize rapid implementation, RUP is stronger in documentation and system design, which aligns with the focus of this research, which is limited to the design stage.

Thus, the objectives of this research are:

1. To identify the functional and non-functional requirements of a website-based PPDB system at the Pakenjeng Islamic Center (ICT) School.
2. To design the PPDB system architecture and model using the Rational Unified Process (RUP) method in the Inception and Elaboration phases.
3. To produce a system design document and UML model as a reference for developing a website-based PPDB system.
4. To design a security concept for prospective student data using a cryptographic approach to ensure data confidentiality and integrity.

The results of this research are expected to provide a strong foundation for the development and implementation of a website-based PPDB system that is more secure, efficient, and tailored to the needs of the Pakenjeng Islamic Center (ICT) School.

Method

In this study, the method used is the Rational Unified Process (RUP). RUP is an approach in software engineering designed to provide structured and systematic guidance in managing activities, tasks, and responsibilities in the software development process. This approach aims to produce high-quality software that meets end-user requirements and can be developed in a controlled manner within a specified time and budget. In addition to being a development process model, RUP is also a process product developed and managed by Rational Software(Kruchten, 2004).

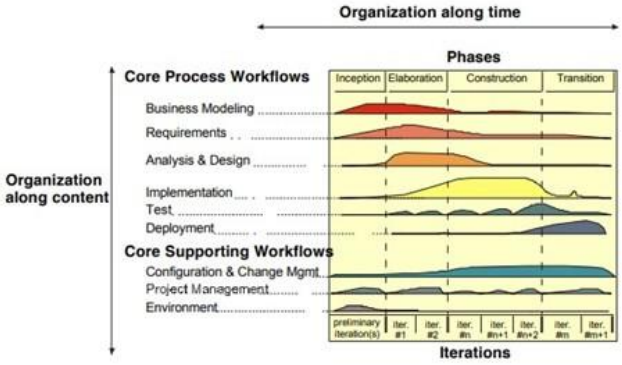

Figure 1. Method RUP

RUP has iterative and incremental characteristics, is object-oriented, and emphasizes risk management from the early stages of development. In its application, RUP is divided into four main phases, namely Inception, Elaboration, Construction, and Transition, each of which has different objectives and deliverables.

1. Inception Phase
   The Inception Phase is the initial phase in RUP, which aims to define the scope of the system and understand the problems to be solved (Mohd et al., 2016). At this stage, initial system requirements are identified, business processes are analyzed, actors are determined, and PPDB system development objectives are formulated. The outputs of the Inception Phase are an overview of the system, initial functional requirements, and the limitations and feasibility of the system to be developed.
2. Elaboration Phase
   The Elaboration phase aims to deepen and validate the system requirements defined in the Inception phase (Cederbladh et al., 2024). At this stage, a more detailed system analysis and system architecture design are carried out. System modeling is performed using Unified Modeling Language (UML), such as use case diagrams, activity diagrams, sequence

diagrams, and class diagrams. In addition, this stage also involves designing the system security concept, including the design of personal data protection mechanisms for prospective students using a cryptographic approach. The results of the Elaboration stage are system design documents and UML models that serve as a reference for development in the next stage.

3. Construction Phase
   The Construction phase focuses on the system implementation process, namely coding, functional testing, and system component integration based on the design that has been created. At this stage, the system is developed iteratively to produce an application that is ready for use. However, in this study, the Construction phase was not carried out because the scope of the study was limited to the system design phase.
4. Transition Phase
   The Transition Phase is the final phase in RUP, which aims to implement the system in the user environment, including the deployment process, user training, and system evaluation. This phase also includes improvements based on user feedback. In this study, the Transition phase was not the focus because the research only covered the system design and modeling phases.

Based on the above description, it can be concluded that the application of the RUP method in this study is limited to the Inception and Elaboration stages. The focus of the study is directed at analyzing the requirements and designing a website-based PPDB information system, so that the results of the study are in the form of a system design and modeling model that can be used as a basis for the development and implementation of the system in further research or development.

3.1 Research Workflow

This research follows a systematic workflow according to the following RUP stages:

1. ***Inception Phase***
   a) Identification of the problem and system scope.
   b) Collection of requirements data through observation and interviews with stakeholders.
   c) Analysis of the current PPDB business process.
   d) Formulation of functional and non-functional requirements.
2. ***Elaboration Phase***
   a) Development of a system model using UML.
   b) Designing the system architecture and workflow of the PPDB system.
   c) Designing a data security concept using a cryptographic approach.
   d) Preparation of the final design document as a research output.

3.2 Data Collection Techniques

In the Inception phase, data was collected to deeply understand the needs and business processes of the PPDB program and identify user issues. The data collection techniques used included:

1. Field Observation
   Direct observation of the current PPDB registration process at Pakenjeng ICT School was conducted to determine the workflow, user challenges, and technical requirements (Sari et al., 2025).
2. Semi-Structured Interviews
   Interviews were conducted with school officials (such as the PPDB committee, IT administrators, and prospective users) to explore functional requirements and user experiences with the current system (Norhikmah et al., 2026).
3. Document Study
   Reviewing national PPDB regulatory documents and registration forms used at the school supported the system needs analysis.

Data from the observations and interviews were analyzed qualitatively to formulate the system requirements for the design.

3.3 UML Modeling Tools

System modeling in the Elaboration Phase is performed using UML (Unified Modeling Language) diagrams to visually depict the system architecture and process flow. The diagrams used include Use Case Diagrams, Activity Diagrams, Sequence Diagrams, and Class Diagrams.

To create these UML diagrams, the tool used is draw.io (now known as diagrams.net). Draw.io is a free, easy-to-use, web-based diagram modeling tool that supports various diagram types, including UML. This tool can be accessed directly through a browser and integrates with cloud storage platforms like Google Drive or OneDrive, allowing diagrams to be easily saved and shared. Draw.io provides a comprehensive UML shape library compliant with the UML 2.5 specification, facilitating the efficient creation of use case, class, and activity diagrams (Capterra, 2025).

3.4 Reasons for Limiting the Study Scope

This research only covers the Inception and Elaboration phases of the RUP because the focus is on requirements analysis and system design, not system implementation and testing. This limitation aims to

produce a well-developed design document as a strong foundation for further research or technical system development in the subsequent phases (Construction and Transition).

The implication of this limitation is that the research will not produce ready-to-use software. However, the resulting design document is expected to:

1. Serve as a technical guideline for developers in building a web-based PPDB system.
2. Reduce the risk of errors during the implementation phase because it has gone through a systematic analysis and modeling process.
3. Provide a comprehensive reference for the structure, functional requirements, system flow, and data security design.

As a recommendation for further research, the Construction phase should be implemented to implement the design, followed by a Transition phase, which includes testing, evaluation, and user training so that the system can be operationalized in a real-world school environment.

Result and Discussion

This section discusses the results of research in the form of designing a website-based New Student Admission (PPDB) information system at the Islamic Center School (ICT) Pakenjeng, which was developed using the Rational Unified Process (RUP) method. In accordance with the scope of the research, the application of the RUP method was limited to the Inception and Elaboration stages, so that the results obtained focused on system requirements analysis and system modeling using Unified Modeling Language (UML).

Unified Modeling Language (UML) is a visual modeling language that serves to describe, visualize, build, and document the design of a software system. UML aims to simplify the description and design of software systems, especially those built using object-oriented programming. UML itself is the result of combining several graphical modeling languages that developed in the late 1980s to early 1990s(Nistrina & Sahidah, 2022). Here is an overview of the various types of diagrams in UML (Unified Modeling Language) version 2.5:

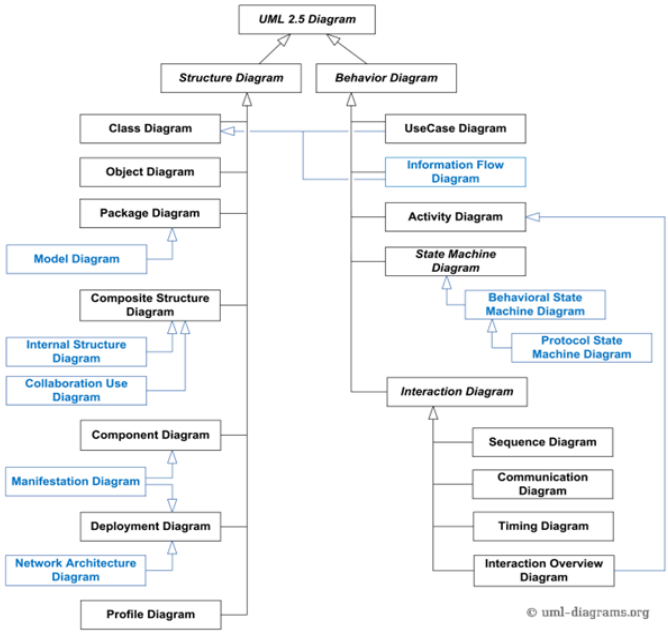

Figure 2. Unified Modeling Language Version 2.5

Figure 2 shows that the UML version 2.5 diagram is divided into three main categories, namely Structure Diagram, Behavior Diagram, and Interaction Diagram(Fakhroutdinov, 2015) . Structure Diagram is a type of diagram used to model the static structure of a system. This diagram describes elements such as classes, objects, components, and packages along with the relationships between these elements.

In UML version 2.5, Structure Diagrams consist of Class Diagrams, Object Diagrams, Package Diagrams, Composite Structure Diagrams, Component Diagrams, Deployment Diagrams, and Profile Diagrams. In addition, there are additional diagram subtypes such as Model Diagrams, Internal Structure Diagrams, Collaboration Use Diagrams, Manifestation Diagrams, Network Architecture Diagrams, and Behavior Diagrams that describe system dynamics, namely how elements in the system behave and respond to a series of events. In UML 2.5, Behavior Diagrams include Use Case Diagrams, Activity Diagrams, and State Machine Diagrams. Further derivatives of State Machine Diagrams include Behavioral State Machine Diagrams and Protocol State Machine Diagrams, as well as Information Flow Diagrams. Interaction Diagrams are a subcategory of Behavior Diagrams that are specifically used to model interactions between elements in a system. The types of Interaction Diagrams in UML version 2.5 include Sequence Diagrams, Communication Diagrams, Timing Diagrams, and Interaction Overview Diagrams. With this classification, UML 2.5 provides a more comprehensive and modular approach to describing software system architecture, both in terms of structure and behavior.

During the Inception phase, problems were identified, functional and non-functional system requirements were determined, and the actors involved in the PPDB process were identified. This phase provided an initial overview of the scope of the system and user requirements, which formed the basis for system design in the next phase. Next, in the Elaboration stage, a more detailed analysis and design of the system is carried out through UML modeling, including the design of the system architecture and the website-based PPDB process flow. In addition, at this stage, a system security concept is also designed to protect the personal data of prospective students.

Thus, the results of this study are in the form of system design documents and modeling models that are expected to be a reference in the development and implementation of a website-based PPDB system in the next stage.

1. Inception

This inception phase is the initial stage in the system design process, which aims to identify the basic requirements and scope of the system. The results of this phase include business process analysis, actor identification, and the formulation of both functional and non-functional system specifications, which form the basis for the subsequent phases, as all design, implementation, and testing decisions will be based on the requirements formulated in this phase.

1.1. Functional Requirements Of The System

Functional requirements are requirements that describe the functions that must be provided by the system in order to support the PPDB business process in accordance with the roles of each actor.

a. Functional Requirements for Prospective Students
   The system must provide facilities for prospective students to register an account by filling in the required data in order to access the PPDB system. The system must be able to verify registration data and store prospective student account data in a database. After successful registration, the system must provide a login feature so that prospective students can log into the system using their registered accounts.
   The system must provide a selection test feature that can be accessed by prospective students after logging in. The system must be able to display test questions, receive answers from prospective students, and store test results in the database. In addition, the system must be able to display registration results information to prospective students, including their graduation status or predetermined selection results.
b. Functional Requierment for Admin PPDB
   The system must provide a special login feature for PPDB administrators to access the system management page. The system must be able to display a complete and structured list of prospective student registrations. PPDB administrators must be able to validate prospective student registration data, either by approving or rejecting registration data in accordance with applicable regulations.
   In addition, the system must provide a selection management feature, including the arrangement of selection tests and the processing of prospective student test results. The system must be able to store the selection management results and display the selection results information that has been processed by the PPDB admin.
c. Functional Requirment for Super Admin

1.2. Business Process Identification

In the New Student Admission System (PPDB), there are several actors involved, namely Prospective Students, PPDB Admin, and Super Admin. Each actor has interrelated roles and responsibilities in accordance with the functions available in the system.

a. Prospective Student
   Prospective students are the main users of the PPDB system. Prospective students can register an account by filling out a registration form to access the system. After successfully registering, prospective students log in to the system to use all available features. Next, prospective students can take the selection test as part of the admission process. In addition, prospective students can also view their registration results to find out their graduation status or selection results as determined by the school.
b. Admin PPDB
   The PPDB administrator plays a role in managing data and the selection process for prospective students. The PPDB administrator must first log in to access the system. The PPDB administrator has the authority to validate prospective student registration data to ensure the completeness and validity of the data submitted. In addition, the PPDB administrator is also responsible for managing the selection process, including arranging and processing the results of prospective student selection tests.
c. Super Admin
   The Super Admin is the actor with the highest access rights in the PPDB system. The Super Admin logs in to access all system features. The Super Admin is responsible for managing user accounts, both prospective student accounts and

PPDB admin accounts, including the process of adding, changing, and deleting accounts in accordance with system management needs.

The following is an illustration of the business process in the designed PPDB system.

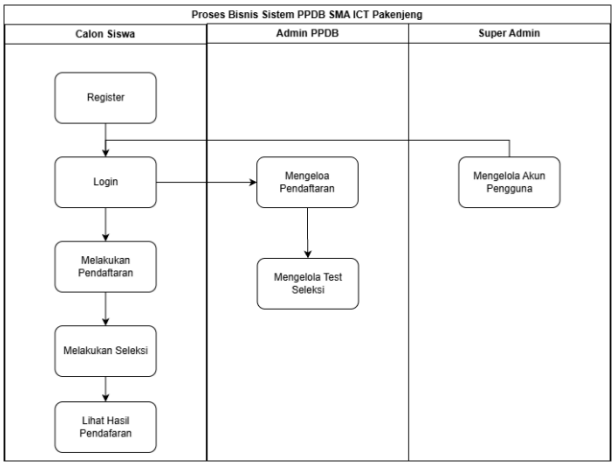

Figure 3. Proccess Bussines System PPDB

2. *Eclaboration*

Based on the results of the Inception phase, such as the identification of business processes, actors, and system requirements, the Elaboration phase focuses on more detailed and structured system design. At this stage, use case diagrams are developed based on the results of business process and actor identification, followed by the creation of activity diagrams, sequence diagrams, class diagrams, and system security designs using the Playfair cipher algorithm. All of these design elements are arranged to illustrate how the system will work technically.

Thus, the Elaboration phase implements the requirements defined in the Inception phase into a technical design that is ready for implementation.

2.1. Use Case Diagram Design

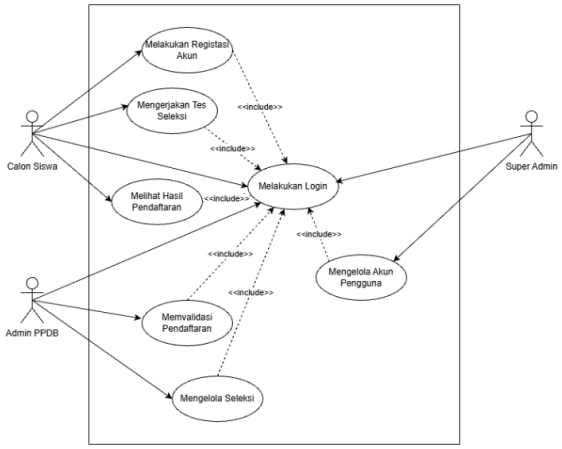

Figure 4. Usecase Diagram System PPDB

This use case diagram shows how the New Student Admission (PPDB) system is used by several types of users, namely Prospective Students, PPDB Admin, and Super Admin. Each user has a different role according to their duties and authorities within the system.

Prospective students are the main users who utilize the system to register. The process begins when prospective students register for an account so they can log into the system. Once they have an account, prospective students must log in before they can use other features. After successfully logging in, prospective students can take the selection test as part of the admission process. In addition, prospective students can also view their registration results to find out whether they have been accepted or not. All activities carried out by prospective students can only be done after they have successfully logged in.

The PPDB admin plays a role in assisting with the selection and registration process. The PPDB admin must log in to the system before accessing the available features. After that, the admin can validate the registration data submitted by prospective students to ensure that the data is complete and correct. In addition to performing validation, the PPDB admin is also tasked with managing the selection process, such as arranging tests and processing selection results.

Super Admin is a user with the highest access rights in the system. After logging in, Super Admin has the authority to manage user accounts. This management includes adding new accounts, changing account data, and deleting user accounts, both for prospective students and PPDB admins.

2.2. Activity Diagram Design

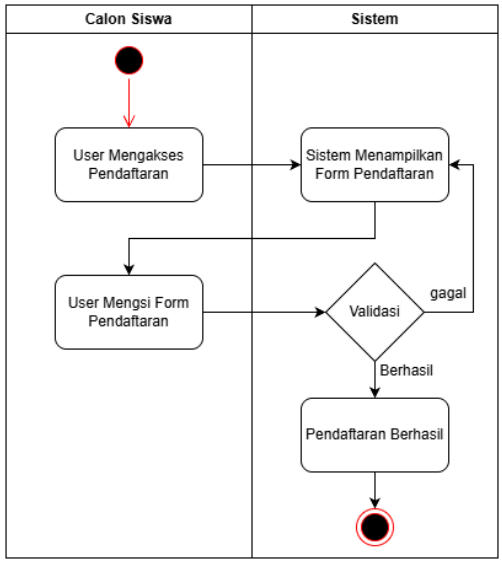

Figure 5. Activity Diagram Registration Process

Figure 5 illustrates the flow of the prospective student registration process in the PPDB system, which involves two swimlanes, namely Prospective Students and System. These swimlanes show the division of

responsibilities between users and the system during the registration process.

The process begins on the Prospective Student side with the initial node symbol, which marks the start of the activity. Prospective students begin the process by accessing the registration menu on the PPDB system. After that, the system responds by displaying a registration form that must be filled out by prospective students.

Next, prospective students fill out the registration form with the required data, such as personal identity and other supporting information. After the form is filled out and submitted, the system performs a data validation process to ensure that all data entered is complete and in accordance with applicable regulations.

During the validation stage, there are two possible outcomes. If the data entered is invalid or incomplete, the process is declared a failure and the system will display the registration form again so that prospective students can correct or complete the missing data. This process can be repeated until the data is declared valid.

If the validation is successful, the system will continue the process by displaying a successful registration status. Once the registration is declared successful, the process ends with a final node symbol, which indicates that the entire registration process has been completed.

2.3. Deployment Diagram

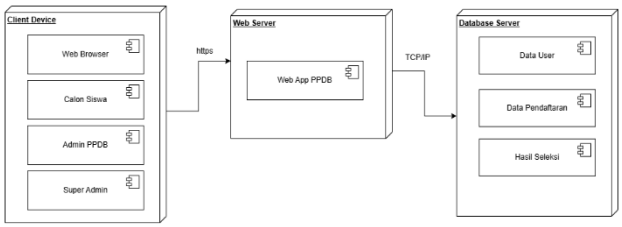

Figure 6. Deployment Diagram

The deployment diagram illustrates the physical architecture of the online PPDB system. This system is accessed by three actors: prospective students, PPDB administrators, and superadmins, through a web browser as a client device. All client requests are sent to the web server using the HTTPS protocol. The web server runs the PPDB application, which manages authentication, registration, selection, and account management. Application data is stored centrally on a database server, which stores user data, registration data, and selection results.

2.4. Design Of The Playfair Cipher Algorithm

The Advanced Encryption Standard (AES) is a symmetric cryptography algorithm used to secure data through encryption and decryption processes using the same key. AES works on 128-bit data blocks with key lengths varying between 128 bits, 192 bits, and 256 bits. This algorithm was established as a replacement for DES because DES was deemed insecure due to its short key length, making it vulnerable to brute force attacks. With its repeated transformation structure (rounds), AES is capable of providing a high level of data confidentiality in modern information systems, especially for sensitive data such as financial data and user data(Cristy & Riandari, 2021).

The AES encryption process consists of four main transformations, namely SubBytes, ShiftRows, MixColumns, and AddRoundKey. The MixColumns stage plays an important role in creating a diffusion effect, which spreads the influence of each plaintext bit throughout the ciphertext block so that the original data pattern becomes more difficult to recognize. At this stage, each column of the state matrix (4×4 bytes) is multiplied by a fixed matrix in the field (Galois Field GF(2^8))(Khoirunnisa, 2022) as follows.

$$\begin{bmatrix} 02 & 03 & 01 & 01 \\ 01 & 02 & 03 & 01 \\ 01 & 01 & 02 & 03 \\ 03 & 01 & 01 & 02 \end{bmatrix} \times \begin{bmatrix} S_0 \\ S_1 \\ S_2 \\ S_3 \end{bmatrix} = \begin{bmatrix} S'_0 \\ S'_1 \\ S'_2 \\ S'_3 \end{bmatrix}$$

Figure 7. Matrix State 4x4 byte

This transformation causes a change in one input byte to affect all bytes in the output column, thereby increasing cryptographic complexity. This layered mechanism makes AES highly resistant to pattern- and statistics-based cryptanalysis attacks(Cristy & Riandari, 2021).

Compared to other cryptographic algorithms such as DES and 3DES, AES has significant advantages in terms of both security and efficiency. DES uses a 56-bit key length that can be practically cracked using modern brute force techniques, while 3DES, although more secure, has a much slower computation time because the encryption process is performed three times. AES offers a higher level of security with greater key complexity and faster performance, making it more suitable for use in web-based systems and applications that require fast response times(Khoirunnisa, 2022).

The selection of AES as a data security method is based on a combination of high security, computational efficiency, and flexibility of implementation on various information system platforms. AES has been proven to be capable of securing sensitive data through a strong encryption process that remains efficient in terms of processing time, thereby not burdening system performance. Furthermore, AES is an algorithm that has been widely used in previous research and is

recommended as a modern encryption standard, making the selection of AES relevant both academically and practically compared to other older cryptographic algorithms or those with lower performance.

The following is the encryption process using AES.

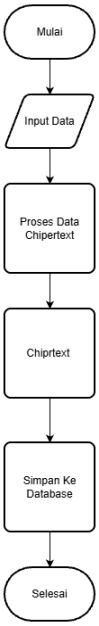

Figure 8. Process Enkripsi

Figure 8 shows the AES encryption algorithm process that will be applied, starting with the user, namely prospective new students who enter their registration data. The user then saves the registration data, and the system encrypts the data into encrypted text. Once in encrypted text form, the data is stored in a database.

Conclusion

Based on the results of the research that has been conducted, it can be concluded that the design of the website-based New Student Admission (PPDB) system at the Islamic Center School (ICT) Pakenjeng using the Rational Unified Process (RUP) method has been successfully implemented in accordance with the research objectives. The application of the RUP method, which was limited to the Inception and Elaboration stages, produced a clear analysis of system requirements and a structured and systematic system design as a basis for system development in the next stage.

At the Inception stage, the main findings of the research included: the identification of problems in the conventional PPDB process, such as low registration process efficiency, potential data recording errors, and the risk of data loss and misuse; (2) the determination of the scope of the website-based PPDB system; the identification of actors involved in the system, namely prospective students, PPDB administrators, and super administrators; and the formulation of functional and non-functional requirements for the system. The results of this stage directly address the research objectives in defining system requirements and problem constraints that form the basis for the design of a website-based PPDB system.

In the Elaboration stage, the main findings were: the development of a detailed system model using Unified Modeling Language (UML), including use case diagrams, activity diagrams, and the design of the PPDB process flow; the design of a system architecture that describes the main components of the system and the interactions between components; and the formulation of a data security concept through the application of cryptographic mechanisms to protect the personal data of prospective students. The results at this stage answer the research objectives in producing a well-documented system design that can be used as a reference in the implementation stage.

This study also designed a data security concept by integrating the AES cryptography algorithm as a mechanism for protecting the personal data of prospective students. The application of this security mechanism is expected to maintain data confidentiality and minimize the risk of data leakage and misuse.

Overall, the research results in the form of system design documents, UML models, and data security concepts are expected to serve as a reference and technical basis for the development of a website-based PPDB system at the implementation stage. With a structured, secure, and easy-to-use system, it is hoped that the PPDB process at ICT Pakenjeng can run more effectively, efficiently, transparently, and improve the quality of educational administration services.

References

Apriwulan, H. F., Siswanto, D. H., Susetyawati, M. E., & Hidayati, E. (2025). Systematic Management of Digital Education Services in Islamic Senior High Schools. *Jurnal Ilmiah Multidisiplin Ilmu*, *2*(5), 216-226

Azzahra, S. F., Kurniady, D. A., & Kurniatun, T. C. (2025). Implementation of Jakarta's Joint New Student Admission Policy: A Case Study in Private High Schools. *Edukasi: Jurnal Pendidikan dan Pengajaran*, *12*(2), 786-804.

Capterra. (2025). *draw.io Software Review 2026: Features, Integrations, Pros & Cons*. Capterra.

Cederbladh, J., Cicchetti, A., & Suryadevara, J. (2024). Early validation and verification of system behaviour in model-based systems engineering: A systematic literature review. *ACM Transactions on Software Engineering and Methodology*, *33*(3), 1-67.

Cristy, N., & Riandari, F. (2021). *Implementasi Metode Advanced Encryption Standard (AES 128 Bit) Untuk Mengamankan Data Keuangan*. *4*(2), 75–85.

Darwish, N. R. (2011). Improving the Quality of Applying eXtreme Programming (XP) Approach. *International Journal of Computer Science and Information Security*, *9*(11), 1-16.

Fakhroutdinov, K. (2015). *UML 2.5 Diagrams Overview*. Uml-Diagrams.Org.

Iskandar, A., & Retnawati, H. (2024). Design of a Web-Based Information System for New Student Registration in Vocational High Schools. *Ingenierie des Systemes d'Information*, *29*(4), 1469.

Khoirunnisa, O. G. (2022). *Implementasi Algoritma AES untuk Keamanan Data Rekam Medis*. *15*(1), 21–27.

Kruchten, P. (2004). *The Rational Unified Process An Introduction Third Edition*.

Maisyaroh, M., Septiana, L., Maulana, Y. I., & Malik, F. I. (2021). Rancang Bangun Sistem Informasi Penerimaan Peserta Didik Baru (PPDB) Siswa-Siswi SMK Merah Putih. *Bina Insani Ict Journal*, *8*(1), 43. https://doi.org/10.51211/biict.v8i1.1519

Melati, L. A., Sahiruddin, S., & Ramadhani, I. A. (2024). Rancang Bangun Sistem Informasi Penerimaan Peserta Didik Baru (Ppdb) Pada Smk Muhammadiyah Salawati Berbasis Website Menggunakan Metode Waterfall. *Jurnal Pendidikan Teknologi Informasi (JUKANTI)*, *7*(1), 45–51. https://doi.org/10.37792/jukanti.v7i1.1166

Muhammad, R. P., & Ibrahim, G. El. (2024). Rancang Bangun Sistem Ppdb Online Studi Kasus Smk Muhammadiyah Gamping Menggunakan Metode Extreme Programming. *Jurnal Informatika Dan Teknik Elektro Terapan*, *12*(2). https://doi.org/10.23960/jitet.v12i2.4001

Mohd, H., Baharom, F., Muhd Darus, N., Saip, M. A., Yasin, A., & Muhammad Robie, M. A. (2016). A secured e-tendering model based on rational unified process (RUP) approach: inception and elaboration phases. *International Journal of Supply Chain Management (IJSCM)*, *5*(4), 114-120.

Nistrina, K., & Sahidah, L. (2022). Unified Modelling Language (Uml) Untuk Perancangan Sistem Informasi Penerimaan Siswa Baru Di Smk Marga Insan Kamil. *Jurnal Sistem Informasi, J-SIKA*, *4*(1), 17.

Norhikmah, N., Musyarapah, M., & Yildiz, E. (2026). Digital Management of Online Student Admission (PPDB) in Islamic Early Childhood Education: A Case Study. *Indonesian Journal of Early Childhood Educational Research (IJECER)*, *5*(1), 15-25.

Pendidikan, M., Kebudayaan, D. A. N., & Indonesia, R. (2021). *Menteri pendidikan dan kebudayaan republik indonesia*.

Prasetyo, F., Hamdi, Z., Utami, A. S. F., & Tabrani, M. (2024). Rancang Bangun PPDB SMK Mandala Enterpreneur. *INFORMATION MANAGEMENT FOR EDUCATORS AND PROFESSIONALS : Journal of Information Management*, *9*(1), 11. https://doi.org/10.51211/imbi.v9i1.2865

Sari, I. R., Anggraini, A., Paramita, B., Pramuditho, A. A., & Aqil, I. (2025). Mentoring and Training for the PPDB Process to Improve School Administration Services at SMK Bina Jaya Palembang. *Mauve Journal De Leardu*, *2*(1), 25-36.

Satria, A., Ramadhani, F., & Sari, I. P. (2023). Rancang Bangun Sistem Informasi Penerimaan Peserta Didik Baru (PPDB) Sekolah Menengah Kejuruan Telkom 2 Medan Menggunakan Codeigniter. *Wahana Jurnal Pengabdian Kepada Masyarakat*, *2*(1), 23–31. https://doi.org/10.56211/wahana.v2i1.285

Yudahana, A., Riadi, I., & Elvina, A. (2023). Perancangan Sistem Informasi Pendaftaran Peserta Didik Baru (Ppdb) Berbasis Web Menggunakan Metode Rapid Apllication Development (Rad). *Rabit : Jurnal Teknologi Dan Sistem Informasi Univrab*, *8*(1), 47–58. https://doi.org/10.36341/rabit.v8i1.2977