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DESIGN AND IMPLEMENTATION OF A CERTIFICATION INFORMATION SYSTEM AT SANGGA BUANA UNIVERSITY USING OBJECT ORIENTED ANALYSIS AND DESIGN

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Abstract

This paper presents the design and implementation of a Certification Information System at Sangga Buana University utilizing an Object Oriented Analysis and Design. The primary objective of this system is to streamline and automate the certification process, enhancing accuracy, efficiency, and accessibility for both administrative staff and students. The Object Oriented approach facilitated modular and scalable system architecture, ensuring ease of maintenance and future enhancements. Through comprehensive analysis, design, and development phases, the system was tailored to meet the specific requirements of the university. The implementation results demonstrate significant improvements in processing time, error reduction, and user satisfaction. This study underscores the potential of Object Oriented Analysis and Design in developing robust educational information systems.
Keywords: Certification Information System, Sangga Buana University, Object Oriented Analysis and Design.Abstract

DESAIN DAN IMPLEMENTASI SISTEM INFORMASI SERTIFIKASI DI UNIVERSITAS SANGGA BUANA MENGGUNAKAN ANALISIS DAN DESAIN BERORIENTASI OBJEK

Abstract

Tulisan ini menyajikan desain dan implementasi Sistem Informasi Sertifikasi di Universitas Sangga Buana dengan memanfaatkan Analisis dan Desain Berorientasi Objek. Tujuan utama dari sistem ini adalah untuk merampingkan dan mengotomatiskan proses sertifikasi, meningkatkan akurasi, efisiensi, dan aksesibilitas bagi staf administrasi dan mahasiswa. Pendekatan Berorientasi Objek memfasilitasi arsitektur sistem modular dan terukur, memastikan kemudahan pemeliharaan dan peningkatan di masa mendatang. Melalui fase analisis, desain, dan pengembangan yang komprehensif, sistem ini disesuaikan untuk memenuhi persyaratan spesifik universitas. Hasil implementasi menunjukkan peningkatan yang signifikan dalam waktu pemrosesan, pengurangan kesalahan, dan kepuasan pengguna. Penelitian ini menggarisbawahi potensi Analisis dan Desain Berorientasi Objek dalam mengembangkan sistem informasi pendidikan yang kuat..
Kata kunci: Sistem Informasi Sertifikasi, Universitas Sangga Buana, Analisis dan Desain Berorientasi Objek.Abstrak

I. INTRODUCTION

In today's educational landscape, efficient management of administrative processes is crucial for the operational success of academic institutions. One of the critical areas is the certification process, which encompasses the issuance, verification, and management of student certificates. Traditional paper-based systems are often fraught with inefficiencies, including prolonged processing times, errors, and difficulties in maintaining records. As a result, there is a pressing need for automated systems that can handle these tasks more effectively.

Sangga Buana University has recognized these challenges and embarked on a project to develop a Certification Information System using Object Oriented Analysis and Design (OOM). The OOM approach is particularly suitable for this task due to its modularity, reusability, and scalability, which facilitate the development of robust and maintainable systems [1]. This methodology allows for a systematic approach to software development, where systems are built using interconnected objects that represent real-world entities [2].

Previous studies have highlighted the benefits of implementing information systems in educational institutions. For instance, a study by Regueras et al. demonstrated significant improvements in administrative efficiency and accuracy through the use of an automated certification system [3]. Similarly, the work of Camilo and Javier underscored the importance of adopting modern software engineering practices to enhance the reliability and functionality of academic management systems [4].

The primary objective of this research is to design and implement a Certification Information System tailored to the specific needs of Sangga Buana University. By leveraging the

principles of Object Oriented Analysis and Design, the system aims to provide a streamlined and user-friendly platform for managing certification processes. The anticipated outcomes include reduced processing times, minimized errors, and improved user satisfaction.

This paper is structured as follows: Section II reviews related work and theoretical background. Section III outlines the methodology, including system design and development phases. Section IV presents the implementation results and discusses the system's performance. Finally, Section V concludes the paper with a summary of findings and suggestions for future research.

I. METHODS

The development of the Certification Information System at Sangga Buana University followed a systematic approach guided by Object Oriented Analysis and Design (OOM). This section provides an overview of the methodology adopted for the design and implementation of the system.

II. ANALYSIS AND DESIGN

This section details the analysis and design of the Certification Information System at Sangga Buana University. It includes system analysis, various UML diagrams, and design of input, output, and testing methods.

A. System Analysis

The system analysis phase involves understanding the functional requirements and identifying the key components and their interactions within the system. This phase focuses on: 1) Identifying user roles: Students and administrative staff. 2) Defining system functionalities: Registration, Fill the Certifications data, and reporting. 3) Establishing system constraints: Security, data integrity, and usability.

Implemented using Use Case Diagrams, highlights the interactions between students, administrators, and the system. It encompasses key functionalities such as complaint submission, status tracking, and complaint management. The Activity Diagram illustrates the workflow from start to finish, involving actors and system elements, and emphasizes key activities such as complaint submission, validation, and notification [1].

B. Use Case Diagrams

Use case diagrams illustrate the interactions between users (actors) and the system, highlighting the various functionalities provided by the system.

- Actors:
  a) Student: The primary user who interacts with the system to manage their certifications activities.
  b) Admin: The system administrator responsible for managing backend operations.

- Use Cases:
  a) Login: Both students and admins can log into the system using their credentials.
  b) Manage Master Data: Admin manages essential data like Certifications, TypeOfCertifictions, Department and user information.
  c) Register for Exam: Students can register for upcoming exams based on their eligibility.
  d) Manage Certifications: Admin manages and issues certifications for students after course completion.
  e) Generate Reports: Admin generates academic reports, performance summaries, and exam results.
  f) Manage Settings: Admin configures system settings, user roles, and access controls.
  g) Logout: Users can securely log out of the system after completing their tasks.

A. Requirement Analysis

The initial phase involved gathering and analyzing the requirements of the certification process at Sangga Buana University. This included identifying stakeholders, defining system objectives, and documenting functional and non-functional requirements [5]. Requirements were elicited through interviews, surveys, and consultation with university administrators and stakeholders.

B. System Design

Following the requirement analysis, the system design phase commenced, where the architecture and structure of the Certification Information System were delineated. Object Oriented Analysis and Design (OOAD) techniques, such as Unified Modeling Language (UML), were employed to create conceptual models, use case diagrams, class diagrams, and sequence diagrams [6]. The design aimed to ensure modularity, extensibility, and maintainability of the system.

C. Implementation

The implementation phase involved translating the design specifications into executable code. Object Oriented Programming (OOP) languageswere utilized to develop the system components based on the design artifacts [7]. Design patterns and best practices were adhered to during the coding process to promote code reusability and maintainability.

D. Testing and Validation

Once the implementation was complete, rigorous testing procedures were conducted to verify the functionality, reliability, and performance of the Certification Information System. Unit testing, integration testing, and system testing were carried out to identify and rectify any defects or discrepancies [8]. User acceptance testing (UAT) was also performed to ensure that the system met the expectations and requirements of end-users.

E. Deployment and Maintenance

Upon successful testing and validation, the Certification Information System was deployed for operational use at Sangga Buana University. Post-deployment support and maintenance activities were undertaken to address any issues, provide user training, and incorporate necessary updates or enhancements [9]. Continuous monitoring and feedback mechanisms were established to ensure the long-term sustainability and effectiveness of the system.

Figure 1. Use Case Diagram.

C. Activity Diagrams

Activity diagrams provide a visual representation of the workflow within the system, detailing the sequence of activities and decision points.
Activity Diagram for "Register for Exam":

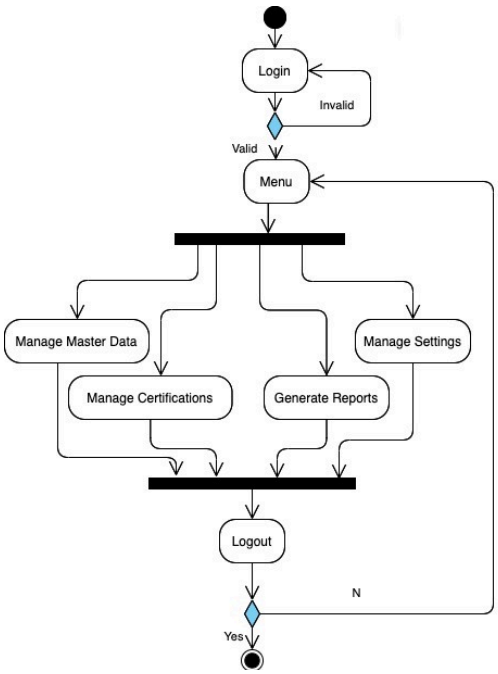

Figure 2. Adminstrator Activity Diagram.

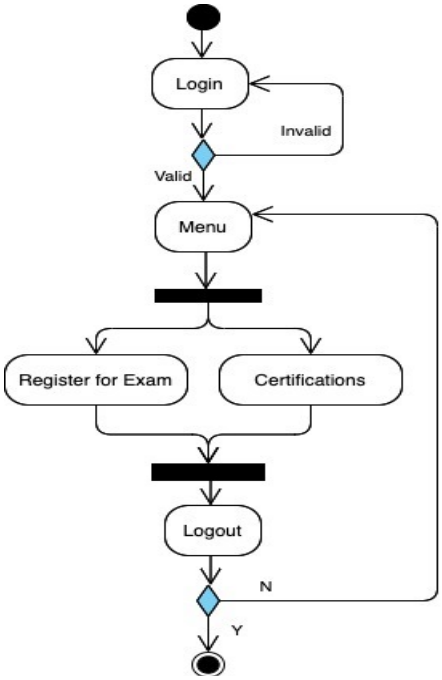

Figure 3. Student Activity Diagram.

D. Sequence Diagrams

Sequence diagrams depict the interaction between objects in a specific sequence of events for a particular use case.
Sequence Diagram for "Register for Exam":

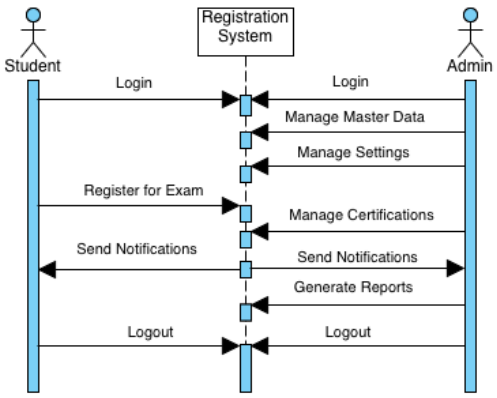

Figure 4. Sequence Diagram.

E. Class Diagrams

Class diagrams describe the structure of the system by showing the system's classes, their attributes, methods, and relationships between the classes.

Class Diagram:

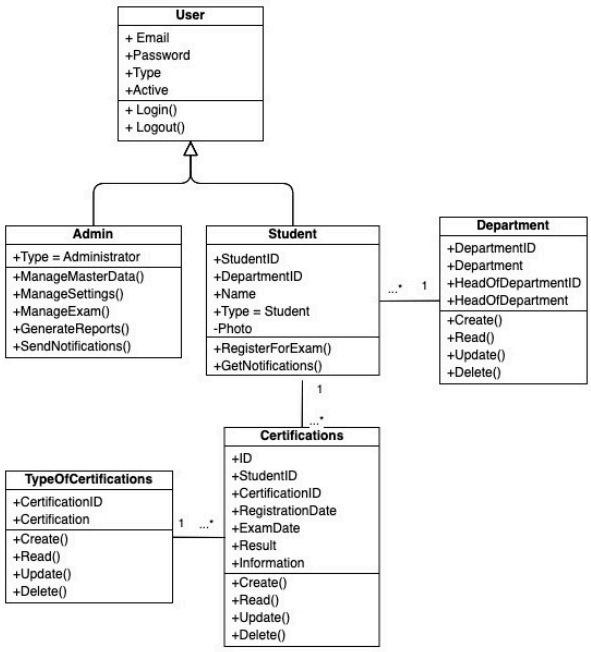

Figure 5. Class Diagram.

F. *Input Forms*

Input design focuses on creating user-friendly interfaces for data entry, ensuring accuracy and completeness of the data. Login Form, Student Registration Form, Master Data Forms, Master Settings Forms, Students Data Forms, Certifications Forms.

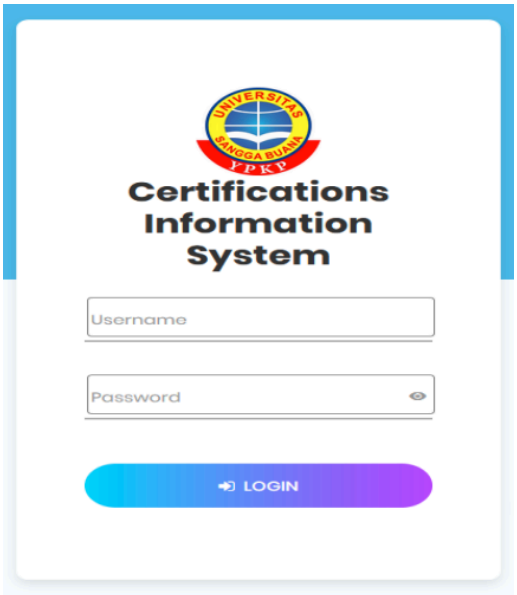

Figure 6. Login form.

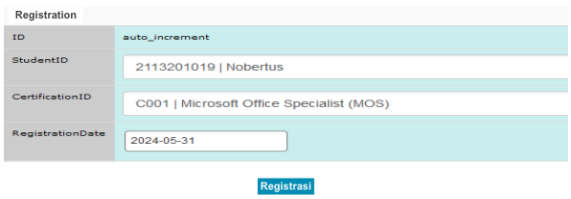

Figure 7. Student registration form.

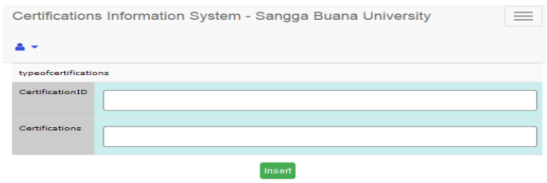

Figure 8. TypeOfCertification input form.

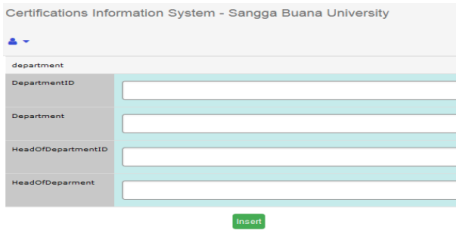

Figure 9. Department input form.

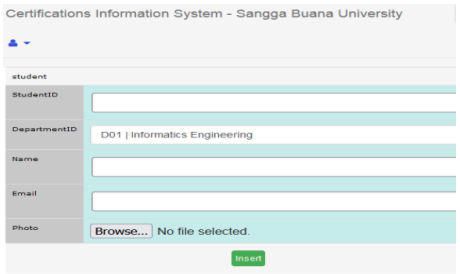

Figure 10. Student input form.

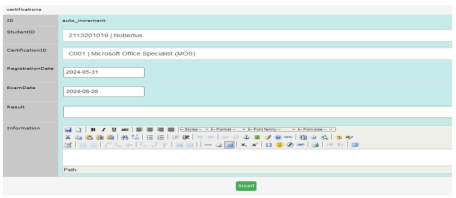

Figure 11. Certification Exam Date, Result, and Information input form.

G. *Output Reports*

Output design ensures the system provides useful and accessible information to users.

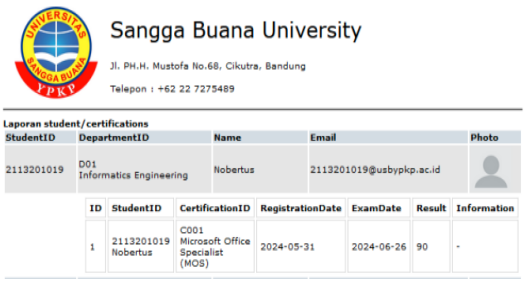

Figure 12. Student result.

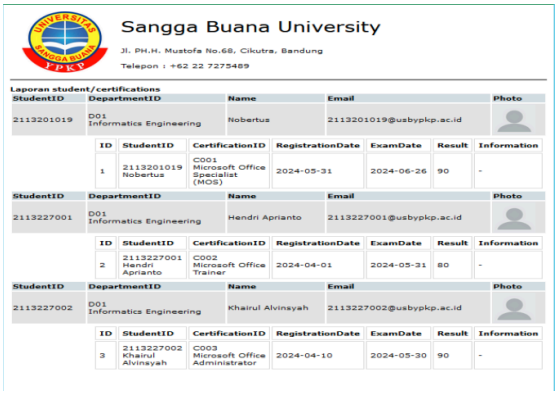

Figure 13. Admin Report.

H. Testing

Black Box Testing will be conducted in a manner that contrasts with existing requirements to ensure the system can handle all improper inputs. This ensures that users can only input correct data into the system. The test aims to identify errors such as missing or incorrect functions within the software, interface errors, issues in data structures or external database access, performance problems, and errors in software initialization and termination.

Table 1. Black box testing.

Process	**Testing Case**	**Expected Outcome**	**Testing Result**
Registration process	Student login and fill registration Form	Data registration added successfully	Valid
Certifications	Student access the certifications data	Certification data can be accessed successfully	Valid
Manage Master Data	Admin manages master data	Master data successfully managed	Valid
Manage Settings	Admin manages settings	Settings data successfully managed	Valid
Manage Certifications data	Admin manages certifications	Certifications data successfully managed	Valid
Generate Reports	Admin generate reports	Successfully generated reports	Valid

III. CONCLUSION

In conclusion, the utilization of Object Oriented Analysis and Design (OOM) in the development of the Certification Information System at Sangga Buana University has yielded several significant insights and benefits.

1. The adoption of Object Oriented Analysis and Design has proven to be highly advantageous in the development of the Certification Information System. By adhering to Object Oriented Analysis and Design principles such as encapsulation, inheritance, and polymorphism, the system architecture was designed to be modular, flexible, and scalable. This facilitated a more organized and efficient development process, enabling the integration of complex functionalities while maintaining code readability and maintainability. Additionally, Object Oriented Analysis and Design emphasis on modeling real-world entities as objects allowed for a more intuitive representation of system components, enhancing communication and collaboration among development team members. Overall, the systematic application of Object Oriented Analysis and Design has contributed to the creation of a robust and adaptable Certification Information System tailored to the specific needs of Sangga Buana University.
2. The ease of use and user-friendliness of the Certification Information System have been paramount in its successful implementation and adoption. Through careful consideration of user requirements and iterative feedback loops, the system was designed with a user-centric approach, prioritizing intuitive navigation, clear interfaces, and contextual guidance. User training sessions and documentation further facilitated the transition to the new system, ensuring that both students and administrative staff could effectively utilize its functionalities. As a result, the Certification Information System has been met with positive feedback from users, who appreciate its simplicity, efficiency, and reliability in managing certification processes.

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