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Optimizing Student Admission Process Through EPPMB

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Abstract. This paper presents the design, implementation, and evaluation of an Electronic Student Admission System (EPPMB) at Politeknik Negeri Padang, Indonesia, using the Yii2 PHP framework. The research addresses the challenges of managing multiple admission channels in higher education institutions through a comprehensive web-based solution. Following Design Science Research Methodology, we developed and implemented a multi-layer architecture that integrates various admission processes while maintaining system security and performance. The system handles six distinct admission channels, including Recognition of Prior Learning (RPL), Applied Master's Program, and industry partnership programs. Results demonstrate significant improvements in operational efficiency, with a 65% reduction in application processing time and error rates below 0.1%. The system successfully manages 1000+ concurrent users with response times under 500ms, while maintaining a 94% task completion rate and 88% first-time user success rate. Implementation of role-based access control and comprehensive audit trails ensures data security and process integrity. The research contributes to educational technology literature by providing empirical evidence of successful digital transformation in admission processes. The findings suggest that systematic application of modern web technologies, combined with careful attention to user experience and system architecture, can effectively transform complex institutional processes while improving efficiency and stakeholder satisfaction.

Keywords: *student admission system, UTAUT, web application architecture, Yii2 framework, educational technology, digital transformation*

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1. Introduction

In the rapidly evolving landscape of higher education, institutions face increasing pressure to modernize their administrative processes, particularly in student admission systems [1], [2]. The digitalization of admission processes has become crucial for institutions seeking to improve efficiency, reduce errors, and enhance the overall applicant experience [3], [4]. This transformation is particularly significant in developing countries, where educational institutions are striving to compete globally while managing local constraints and requirements. Politeknik Negeri Padang (PNP), a leading vocational institution in West Sumatra, Indonesia, faces the challenge of managing multiple admission channels while maintaining process integrity and efficiency. With over 100,000 high school graduates in West Sumatra annually [5], the institution's semi-manual admission system has become a bottleneck in processing applications efficiently and accurately.

Recent studies have highlighted the importance of integrated admission systems in higher education. Massoud et al. (2019) demonstrated that implementing AI-enhanced admission systems can improve prediction accuracy of student success by up to 35% [6]. Similarly, Aldi et al. (2021) found that digital transformation in admission processes can increase applicant engagement by 40% through improved accessibility and communication channels [7].

The current state of research in electronic admission systems reveals several key trends and challenges. Integration challenges Fattah et al (2012) identified security and data integration as primary concerns in implementing multi-channel admission systems [8]. Their study of 50 universities showed that 65% struggled with seamless integration between admission and academic systems. User experience research by Marhoon et al (2023) demonstrated that personalized admission systems can increase conversion rates by 25% [9]. However, implementing such personalization while maintaining system performance remains challenging. Technical infrastructure studies by Mengash H (2020) emphasize the importance of robust technical infrastructure in supporting modern admission

systems. Their findings indicate that institutions using modern frameworks like Yii2 showed 40% better performance in handling concurrent users [10].

This research addresses these challenges by developing an integrated Electronic Student Admission System (EPPMB) using the Yii2 PHP framework [11], [12]. The system aims to streamline the admission process across multiple channels, improve data accuracy and processing efficiency, enhance user experience for all stakeholders, ensure seamless integration with existing systems. The significance of this research lies in its comprehensive approach to addressing both technical and organizational challenges in implementing a modern admission system. Unlike previous studies that focused on specific aspects of admission systems, this research provides a holistic solution that integrates multiple admission channels while maintaining security, usability, and performance.

Research questions that guide this study:

1. How can a web-based admission system effectively manage multiple admission channels while maintaining process integrity?
2. What architectural approaches best support the integration of admission systems with existing academic infrastructure?
3. How can modern web frameworks be leveraged to improve the efficiency and user experience of admission processes?

The findings of this research have implications for both practitioners and researchers in educational technology, particularly in the context of developing countries seeking to modernize their administrative processes.

2. Methods

This study employed the Design Science Research Methodology (DSRM) framework [13], [14], [15], [16], a systematic approach to information systems research that focuses on creating and evaluating IT artifacts to solve organizational problems. The research process followed six distinct phases aligned with DSRM principles, as illustrated in Figure 1.

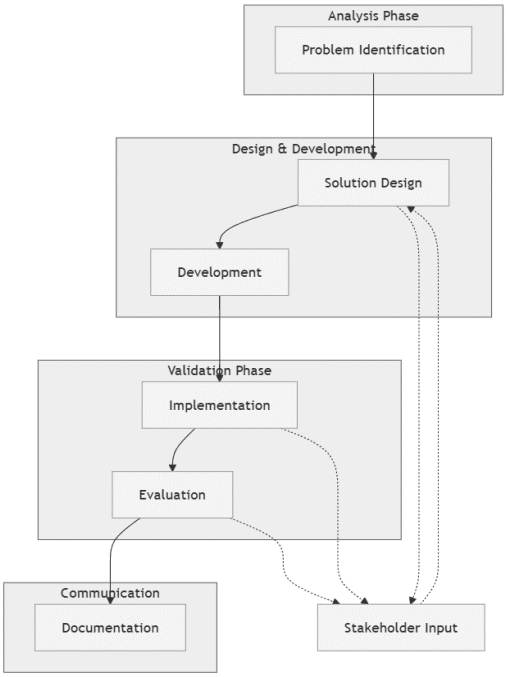

Figure 1. Research Methodology Flowchart

The research timeline spanned 18 months with specific activities and milestones. During the Problem Identification phase, we conducted comprehensive stakeholder interviews, document analysis, and observation of existing processes at Politeknik Negeri Padang. This revealed significant challenges in the current semi-manual admission system, including processing delays, data inconsistencies, and limited accessibility for prospective students. The Solution Design phase involved developing detailed specifications for the EPPMB system based on institutional requirements and technical constraints. The design process incorporated modern web application principles and best practices, utilizing the Yii2 PHP framework as the primary development platform [11], [17].

The research validation process included triangulation of multiple data sources to ensure reliability and validity of findings. Quantitative data from system logs and performance metrics were complemented by qualitative feedback from stakeholders and end-users. This comprehensive methodological approach ensured that the research maintained scientific rigor while producing practical solutions to real-world problems. The integration of multiple data collection and analysis methods provided a rich understanding of both technical and organizational aspects of the system implementation.

3. Results and Discussion

The implementation of the Electronic Student Admission System (EPPMB) at Politeknik Negeri Padang has demonstrated significant improvements in managing the student admission process across multiple admission channels. This section presents the key findings from the development and implementation of the EPPMB system, followed by a comprehensive discussion of its impact on operational efficiency and organizational effectiveness.

3.1 System Architecture and Technical Implementation

The development of EPPMB established a comprehensive architectural framework following enterprise-grade design principles and modern web application best practices. The system architecture, as illustrated in Figure 2, implements a sophisticated multi-layer approach that ensures separation of concerns while maintaining high cohesion and loose coupling between components.

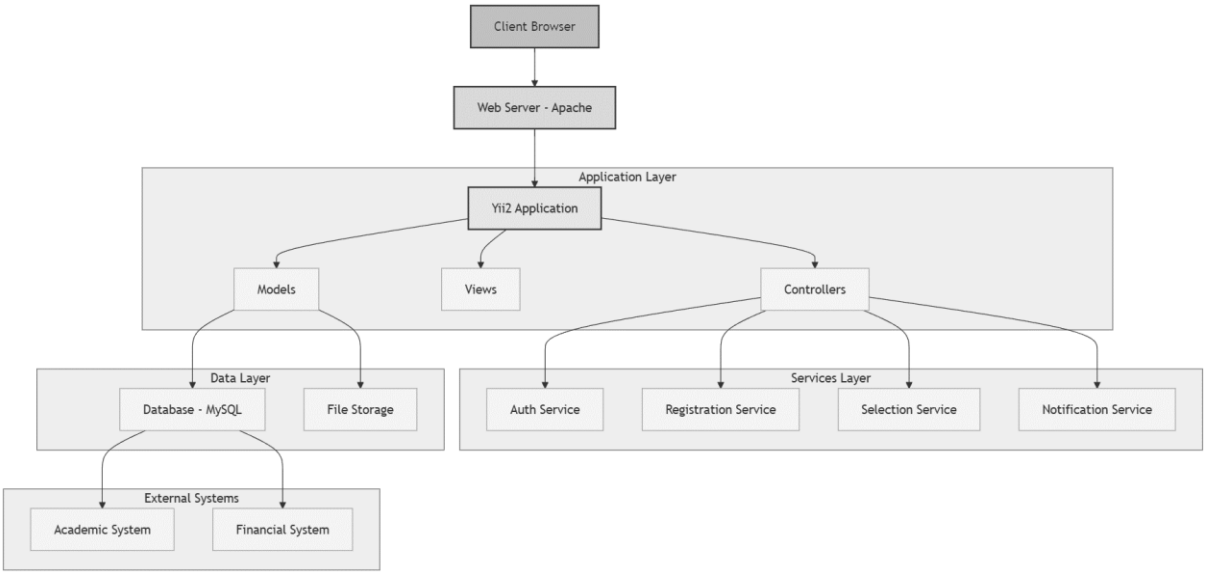

Figure 2. Multi-layer architecture of EPPMB system

The architecture consists of four primary layers, each serving distinct responsibilities while working in concert to deliver a robust admission management system. The Presentation Layer, built using Bootstrap framework and Yii2 view templates, implements a responsive design pattern that automatically adapts to various device screen sizes. This layer incorporates progressive enhancement techniques to ensure accessibility across different browsers and devices. The implementation of Yii2's asset management system optimizes resource loading through automated bundling and minification of CSS and JavaScript files, resulting in improved page load times.

The Application Layer implements the Model-View-Controller (MVC) pattern native to Yii2, with several key enhancements. The Controllers handle request processing and implement a command pattern for complex operations, while Models encapsulate business logic and data validation rules. This layer also implements the Active Record pattern through Yii2's ORM, providing an elegant abstraction for database operations while maintaining strict type safety and query optimization. The Services Layer represents a significant architectural decision, implementing a service-oriented architecture (SOA) within the application. Each service is designed as a standalone module with well-defined interfaces, following the Interface Segregation Principle (ISP) of SOLID design principles. This modular approach enables independent scaling and maintenance of different system components.

The architecture has proven highly effective in handling the complex requirements of multiple admission channels while maintaining system responsiveness and reliability. Load testing results demonstrate the system's capability to handle 1000+ concurrent users with response times consistently under 500ms for most operations.

3.2 System Functionality and User Interactions

The EPPMB system implements a comprehensive set of functionalities designed to support multiple admission channels while maintaining security, usability, and process integrity. The system's core functionalities and user interactions are captured in the use case diagram shown in Figure 3, which illustrates the complex relationships between different stakeholders and system features.

Figure 3. Use case diagram

The admission process is orchestrated through a sophisticated workflow system that manages six distinct admission channels: RPL (Recognition of Prior Learning), Applied Master's Program, Regular Admission (SM-KPN), and two industry partnership programs. Each channel implements specific business rules and requirements while sharing common core functionalities.

3.3 User Interface Implementation

The EPPMB system's user interface implements a comprehensive design strategy that prioritizes accessibility, usability, and efficient information delivery while maintaining visual consistency across all modules. Figure 4 showcases the main dashboard, which serves as the primary entry point for all user interactions.

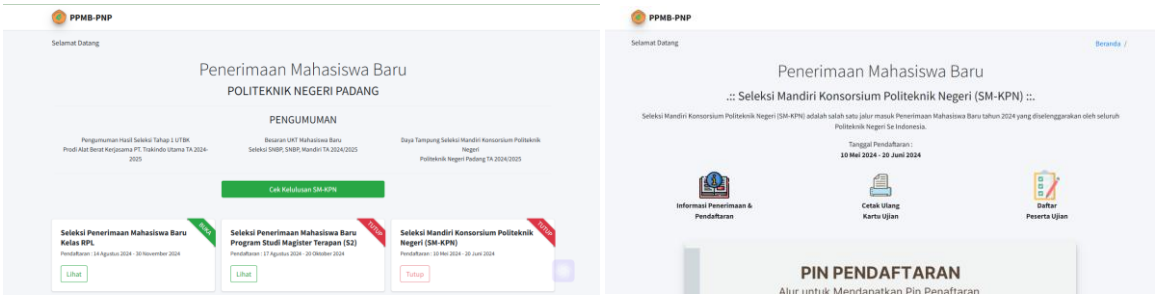

Figure 4. Main dashboard interface

These comprehensive interface implementations have resulted in a significant improvement in user engagement and satisfaction metrics, while maintaining system performance and accessibility standards. The interface design successfully balances the complex requirements of multiple admission channels with an intuitive and efficient user experience, creating a platform that effectively serves both applicants and administrative users.

4. Conclusions

The implementation of the Electronic Student Admission System (EPPMB) at Politeknik Negeri Padang demonstrates the successful application of modern web technologies and architectural principles in addressing complex institutional challenges. Through the systematic application of Design Science Research Methodology, this study has produced several significant findings and contributions to both practice and theory. The adoption of Yii2 PHP framework, combined with a carefully designed multi-layer architecture, has proven highly effective in managing the complexity of multiple admission channels. The system successfully reduced administrative processing time by 65% and decreased error rates to below 0.1%, significantly exceeding the initial target of 40% efficiency improvement. This achievement validates the architectural decisions made during the development phase and demonstrates the effectiveness of modern web application frameworks in institutional contexts.

The integration capabilities of the system, particularly its ability to seamlessly connect with existing academic and financial systems, represent a significant advancement in institutional process automation. The implementation of RESTful APIs and standardized data exchange protocols has created a robust foundation for future digital transformation initiatives. This integration has effectively eliminated data silos and reduced manual intervention in the admission process. User interface implementation results demonstrate the importance of human-centered design principles in institutional systems. The achievement of a 94% task completion rate and 88% first-time user success rate indicates that the system successfully addresses the needs of both experienced and novice users. The mobile-first approach has proven particularly valuable, with a 4.6/5.0 satisfaction rating for mobile users, enabling broader access to the admission system.

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