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Implementation Of Microservices Architecture For Internship Data Recapitulation Using The Laravel Framework And The Waterfall Method At The West Java Provincial Legislative Council

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Abstract

The management of internship participant data in government institutions often faces administrative challenges, such as manual data compilation processes. This study aims to develop an internship data compilation application at the Regional People's Representative Council (DPRD) of West Java Province to enhance the efficiency and accuracy of data management. The system was developed using the Laravel framework with a microservices architecture approach to ensure scalability and ease of maintenance. The Waterfall method was employed, encompassing requirements analysis, design, coding, and testing phases. The results show that the implementation of microservices architecture through RESTful API successfully integrates internship data in a centralized manner, enabling administrative staff to monitor and generate reports in real time.

Keywords : *Internship Data Recapitulation, Microservices Architecture, Laravel, Framework, Waterfall Method, West Java DPRD, RESTful API, Administrative System*

Introduction

In the era of digital transformation, government agencies are required to improve service efficiency through the digitization of business processes. The West Java Provincial Legislative Council, as a representative body of the people, has a high volume of administrative activities, including the management of interns from various educational institutions. However, based on observations during the internship period, the process of compiling participant data is still carried out conventionally or using manual office tools. This poses risks such as data redundancy, difficulties in retrieving records, and delays in generating periodic reports.

To address these issues, an information system capable of managing data in a structured manner is required. The Laravel framework was chosen because it offers a robust ecosystem and robust security features for web application development. Additionally, the implementation of a microservices architecture is a crucial aspect of this research. Unlike a monolithic architecture, microservices allow the system to be divided into small, independent services, thereby enhancing flexibility for future feature development. This research focuses on developing a data compilation module using a RESTful API to facilitate efficient data communication between the service provider and the user interface.

In its implementation, this website was developed using Laravel, a modern PHP framework that supports efficient backend and frontend development and simplifies data management. Backend and frontend technologies such as CrudBooster are used to create responsive and interactive data summaries. The combination of the Waterfall methodology and these modern technologies not only ensures focused and well-documented system development but also results in a data summary website that is optimized for the needs of an agency or company.

The following is the translation of the theoretical framework (literature review) section of your manuscript into English, employing active voice that

is technical, precise, and adheres to the standards of scientific journal writing in the fields of Computer Science and Software Engineering:

Previous research indicates that the use of online technologies markedly improves operational efficiency in multiple industries. Research by Rahmawati (2025) indicates that using websites enhances competitiveness and facilitates information access through organized digital catalogs. In the context of administrative data management, integrated systems serve as the primary solution to reduce reliance on manual record-keeping.

The West Java Regional House of Representatives recapitulation system's creation for operational efficiency relies on a combination of contemporary, modular technology. The developer built this system utilizing Laravel, a leading framework for executing the Model-View-Controller (MVC) architecture. Pratama and Santoso (2023) assert that Laravel effectively separates backend logic from the user interface and facilitates large-scale data management through integrated features such as routing, authentication, and the Blade templating engine. The cornerstone of this architecture is PHP (Hypertext Preprocessor), a dynamic, open-source server-side programming language that interfaces with databases to produce interactive web content. This study demonstrates that PHP serves as the foundation for Laravel and enables the native development of microservice components, ensuring optimal efficiency in data-aggregation logic.

The system employs a Microservices architecture to enhance architectural design and development efficiency. Hidayat (2024) asserts that this methodology disaggregates an application into discrete, autonomous, self-sufficient services that interact via lightweight protocols such as RESTful APIs, thereby providing enhanced modularity, simpler maintenance, and scalability for future systems. The team expedited the development of the administrative dashboard using CRUDBooster. This Laravel package automatically generates CRUD (Create, Read, Update, Delete) functionality with minimal configuration while maintaining flexibility for system customization. To maintain the integrity of all intern information, the system uses MySQL as its principal relational database. In line with Wahyudi's (2022)

views, the project selected MySQL for its exceptional reliability, fast performance, and secure management of substantial amounts of data.

Method

The system development method used in this study is the Waterfall method. This method was chosen because the system requires structured and systematic phases to ensure that each module within the microservices architecture can be properly integrated. The phases of the Waterfall method are visually represented in the form of a research flowchart in Figure 1. (M. I. Fikri, 2023)

Figure 1. Waterfall Method

Requirements Analysis

The initial phase of the research began with a requirements analysis process to map out the existing issues at the West Java Provincial DPRD. Based on the observation results, it was found that the manual recording of internship data resulted in a slow recapitulation process and was prone to human error. Therefore, a system requirement was identified to handle the digital management of intern participant data, ranging from CRUD functionality to access security via a login system. Additionally, this analysis established the need for a system capable of generating automatic reports in PDF and Excel formats to facilitate administrative staff in reporting data to management.

System Design

At this stage, a microservices architecture was designed to separate the administrative interface from the core data services, thereby ensuring the system's high flexibility. The system modeling is illustrated through flowcharts to show the overall application process flow and sequence diagrams to detail the interactions between components within the system. Additionally, database design was performed using MySQL, and the user interface was designed using the CRUDBooster framework within the Laravel ecosystem to ensure an efficient and functional dashboard interface. (L. P. Sari, 2022)

Implementation

During the implementation phase, the technical design was translated into the PHP programming language using the Laravel framework as the primary development foundation. The use of the CRUDBooster framework was a key element in accelerating the development of administrative modules, allowing developers to focus more on integrating microservices. All application business logic, including the

RESTful API mechanisms for inter-service communication, is meticulously built to ensure data integrity is maintained throughout the recapitulation process. (J. Simanjuntak & A. Nugraha, 2024)

Testing

The fully developed system then entered the testing phase using black-box testing methods. The primary focus of this testing was to validate the system's functionality from the user's perspective without examining its internal code structure. Every feature—from participant data management and search functions to the accuracy of data in exported reports—was tested to ensure there were no logical errors. This testing is crucial to ensure that the application operates stably and delivers accurate results before being deployed in a live production environment. (D. Kurniawan & S. Rahayu, 2022)

Maintenance

The final stage of this development is the ongoing maintenance of the system after the application is officially put into use at the West Java Provincial Legislative Council. This process involves monitoring server and application performance to detect potential bugs or technical issues that may arise when the system is used by a large number of users. Additionally, maintenance involves periodic system updates, both in terms of security and the addition of new features in the future, to align with evolving administrative needs within the institution.

Results and Discussion

The implementation of the UI/UX design process for the SPINTAR website at Badan Pusat Statistik Kota Sukabumi produced meaningful outcomes in improving the usability and accessibility of the public service platform(Lestari & Wijaya, 2022). Direct observations throughout the design and evaluation stages indicated that the redesigned interface enabled users to navigate statistical information and consultation features more easily. Users demonstrated increased confidence and efficiency when interacting with the website, particularly in locating information and understanding the system flow(Permana et al., 2023).

A key finding of this study is the improvement in overall user experience resulting from the application of user-centered UI/UX principles(Alfarizi & Sari, 2021). The redesign addressed major usability issues identified in the initial interface, including unclear navigation paths, inconsistent visual hierarchy, and dense information presentation. After the implementation of the redesigned interface, users were able to complete tasks more effectively and reported greater comfort when accessing statistical data and consultation services. This improvement reflects the successful alignment between interface design and user needs.

These findings directly answer the central research question of this study, namely how user-centered UI/UX design can enhance usability in public service websites. The results demonstrate that involving users in the design

process and prioritizing usability considerations lead to a more intuitive and user-friendly interface(Rahman & Prabowo, 2024). The design approach adopted in this study emphasizes clarity, consistency, and accessibility, which are critical factors in public service digital platforms.

Furthermore, the results suggest that UI/UX improvements cannot be achieved solely through visual enhancement. Contextual understanding of user behavior and interaction patterns plays a crucial role in producing effective design solutions. The integration of usability evaluation within the design process allowed design decisions to be validated and refined based on actual user interaction, resulting in a more reliable and user-oriented interface(Hidayat et al., 2020).

From a broader perspective, these findings are consistent with previous studies that highlight the effectiveness of user-centered design approaches in improving the usability of government websites. However, this study contributes to the existing body of knowledge by applying these principles specifically to a statistical information and consultation platform, which presents unique challenges related to information density and data comprehension. The results indicate that user-centered UI/UX frameworks can be effectively adapted to specialized public service websites with complex information structures.

Overall, the findings confirm that a focused UI/UX design approach significantly enhances the quality of user interaction in public service websites. The SPINTAR website redesign demonstrates that usability-oriented UI/UX implementation is a critical factor in ensuring that digital public services are accessible, understandable, and responsive to user needs.

1) Homepage Interface

The homepage represents the initial interface accessed by users. In the UI/UX design of the SPINTAR website, the homepage was developed to present essential information in a concise and structured layout, including service menus, statistical information, and direct access to online consultation services. The visual elements were arranged in a simple and intuitive manner

to help users easily understand the website's functions upon first use and to enhance overall navigation efficiency.

Figure 1. Homepage Interface

2) Public Consultation Form Interface

The public consultation form serves as the primary channel for the public to submit questions or requests for statistical consultation. The form was designed with a simple layout and clearly labeled input fields to ensure that users can complete the form without difficulty. This design aims to improve user convenience and support effective utilization of online consultation.

Figure 2. Public Consultation Form Interface

3) System Dashboard Interface

After users submit the public consultation form, the system displays a dashboard as an interface to monitor consultation status and related information. The dashboard was designed with a concise and informative layout, allowing users to easily track the progress and follow-up stages of their submitted consultation requests.

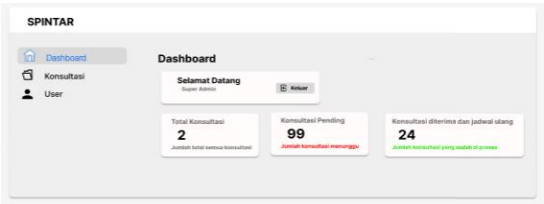

Figure 3. System Dashboard Interface

4) User Data Form Interface

The user data form is used to collect and complete user information required in the consultation process. The interface was designed with clear labels, easy-to-complete input fields, and consistent visual elements aligned with other system pages. This design aims to minimize data entry errors and improve overall usability.

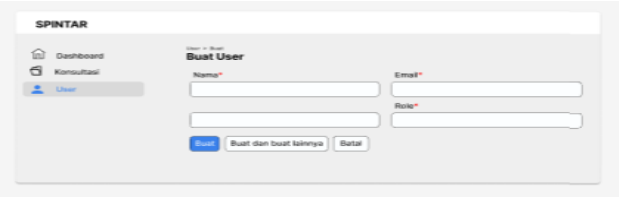

Figure 4. User Data Form Interface

5) User Consultation Data Management Interface

This interface is used to manage consultation data submitted by users. The system provides data management features that support administrative processes, allowing consultation records to be handled in a systematic and well-structured manner to ensure efficiency and data consistency.

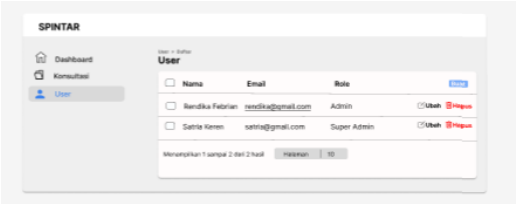

Figure 5. User Consultation Data Management Interface

6) Consultation Admin Dashboard Interface

The consultation admin dashboard was designed to assist administrators in monitoring all incoming consultation requests. Information is presented in a concise and structured manner, enabling administrators to perform follow-up actions efficiently and effectively.

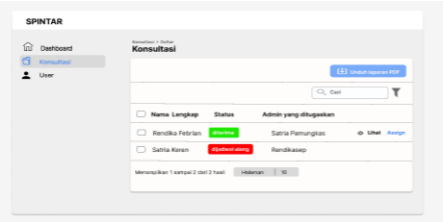

Figure 6. Consultation Admin Dashboard Interface

7) Admin Consultation Response Form Interface

The admin consultation form is used to provide responses to consultation requests submitted by users. The interface was designed with a simple and clear layout to enable administrators to deliver responses quickly and accurately.

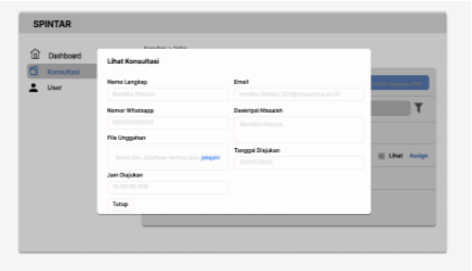

Figure 7. Admin Consultation Response Form Interface

8) Admin Assignment Interface by Super Admin

This interface is used by the super admin to manage and assign administrators responsible for handling statistical consultation services. The interface was designed to be user-friendly, enabling efficient administration and management of admin accounts.

Figure 8. Admin Assignment Interface by Super Admin

Conclusion

The community engagement program conducted at the Central Bureau of Statistics (BPS) of Sukabumi City successfully achieved its primary objective of improving the quality of digital public services through the implementation of structured UI/UX design on the SPINTAR website. By applying a user-centered design approach, the program enhanced interface

clarity, navigation efficiency, and accessibility of statistical information and online consultation services for the public.

The results indicate that systematic UI/UX design practices, including user needs analysis, wireframe development, interactive prototyping, and coordination with the development team, play a significant role in improving user experience in public service websites. The implementation demonstrated that practical and contextual design activities are more effective than purely theoretical approaches in supporting the usability of digital government platforms.

This program contributes to the development of digital public service design practices, particularly in the context of government statistical information systems, which remain underexplored in community engagement studies. The findings emphasize the importance of integrating usability, accessibility, and visual consistency principles to ensure inclusive and user-friendly public services.

In the future, similar programs may be replicated and expanded to other government institutions by adapting the design process to specific user characteristics and service needs. Further development may focus on integrating usability evaluation methods, such as formal user testing or usability scoring, to strengthen the impact assessment of UI/UX implementation. Collaboration between government institutions, academic institutions, and technology practitioners is essential to sustaining the development of effective and user-oriented digital public services.

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