



Development of WebGIS-Based Monitoring System for Key Performance Indicators of Muhammadiyah Regional Board in Central Java

Jumadi¹, Bana Handaga², Munajat Tri Nugroho³, Muhammad Dai⁴, Gunawan Ariyanto², Nurgiyatna²

Faculty of Geography, Universitas Muhammadiyah Surakarta, Indonesia ¹

Faculty of Informatics and Communication, Universitas Muhammadiyah Surakarta, Indonesia ²

Faculty of Engineering, University of Muhammadiyah Surakarta, Indonesia ³

Faculty of Pharmacy, University of Muhammadiyah Surakarta, Indonesia ⁴

Corresponding Email*: jumadi@ums.ac.id

Article Info:

Submitted: 20 February 2024

Revised: 15 March 2024

Accepted: 20 April 2024

Publisher: 30 April 2024

Keywords: WebGIS, key performance indicators, Muhammadiyah, organizational performance, monitoring tool;

Abstract

This paper aims to describe the development of a WebGIS application for the Muhammadiyah Regional Board of Central Java as a monitoring tool for the organization's Key Performance Indicator. The initial phase of the project involved conducting Focus Group Discussions (FGDs) to collect data regarding the organization's needs and requirements. Furthermore, the design process involved creating a comprehensive inventory of application functions and user interfaces. The use of WebGIS technology enables monitoring of key performance indicators (KPIs) and integration of spatial data. This enables more comprehensive visualization of performance data through interactive dashboards and spatial visualization. Further enhancements to the application were designed based on a thorough stakeholder review, taking into account comments obtained through the stakeholder review process. Once the application reached a satisfactory level of performance, it was formally introduced to stakeholders through a socialization process. The application was started and its security was verified using the reliable hypertext transfer protocol (HTTPS) via the URL <https://kpi.pwmjateng.id>. The implementation of the KPI monitoring tool based on WebGIS technology has yielded good results, and it is showing its success within the Muhammadiyah Regional Board of Central Java. Now, they can effectively monitor and track their indicators.

1. Introduction

To achieve strategic goals and drive sustainable growth, organizations must efficiently monitor and manage performance. Key key performance indicators (KPIs) for organizations cover their needs for performance monitoring, identification of areas that require improvement, and appropriate decision making (Sreedharan, 2024). The process of improving the effectiveness of Key Performance Indicator (KPI) monitoring is very

important for organizations such as the Muhammadiyah Regional Board of Central Java, which carries out various activities. It is important to monitor the progress of performance achievement periodically so that the pace of the organization is more directed.

Traditional methods of monitoring Key Performance Indicators (KPIs) require the creation of customized reports and the use of Excel, which are cumbersome, error-prone, and lack interactive capabilities (Kalischko & Riedl, 2021). Conventional approaches may not always provide the critical understanding needed to convey complex information or even require extra effort for information visualization and distribution. Web technologies and Geographic Information Systems (GIS) play an important role in better visualization and distribution of information (Purwanto & Sejati, 2021). WebGIS is an online version of GIS that allows users to view and transform data in a spatial context, thus improving their understanding of performance metrics. So it has good potential to be used as a KPI dashboard for the Muhammadiyah Regional Board of Central Java. The main objective is to create an application that not only simplifies the process of monitoring key performance indicators (KPIs), but also utilizes WebGIS to offer comprehensive insights into regional performance variations achieved by the organization. By utilizing this technology, the organization will define its actions more cohesively, aligning them with the practicalities of the problem at hand. Therefore, stakeholders will carefully guide and concentrate their interventions on areas of need.

The definition of Key Performance Indicators (KPIs) in the context of an organization's advanced technology for performance management is limitless. This notion relates to the process of establishing a list of goals, determining their feasibility, and making appropriate modifications along the way to achieve them (Sari et al., 2023). In a world populated by similar entities, the application and integration of KPIs in organization-wide performance management methods is commonplace. Achieving KPIs thus requires the cooperation of all parts of the organization (Nwakamma, 2024). An effective monitoring system is essential to identify optimal work practices and detect errors that occur to achieve the set targets (Ali et al., 2021).

The utilization of WebGIS technology for Key Performance Indicator (KPI) monitoring, in accordance with Knowledge Management principles, is rooted in the idea of visualizing data spatially (Budiprayitno, 2020). This will allow them to have a thorough understanding of performance indicators and make decisions based on actual data (Purwanto & Sejati, 2021). In addition, the use of WebGIS in the management of organizational calculations has several benefits. These include the ability to conduct performance evaluations and compare indicators with the current situation (Zanon et al., 2020).

The project is an adaptation of WebGIS as a dashboard design in KPI visualization within the Muhammadiyah Regional Leadership of Central Java. Through the utilization of spatial analysis, companies can gain valuable insights into performance differences in the various regions under them. This knowledge can then be used to strategically optimize operations for the benefit of the entire organization. In addition, it provides a means to prioritize and concentrate on specific areas of operation, ensuring clear communication and effective execution of actions resulting in the achievement of targeted results. The development of this KPI system serves as a positive change that allows leaders to better understand the comparative situation of their region, thus influencing their decision-making process. The purpose of applying WebGIS technology in KPI monitoring is to offer a new approach for

organizations such as the Muhammadiyah Regional Board of Central Java, to improve their operations through the use of technology. This technology allows them to achieve transparency, accountability, and efficiency in their decision-making process.

2. Implementation Method

The process of designing a WebGIS-based Key Performance Indicator (KPI) monitoring application is carried out through several important stages, including:

1. Focus Group Discussion (FGD) was conducted to find out and understand the diverse needs of the organization.
2. Design Stage: Develop a strategic blueprint for the functionality and aesthetic appearance of the application.
3. Development Phase: WebGIS technology will be used in conjunction with the application construction process to build the application from scratch.
4. Test and Evaluation: This involves assessing the functionality, usability, and reliability of the application through different testing stages.
5. Improvement: the app needs to keep progressing every day. So it is necessary to improve the application by considering feedback and making observations.
6. Socialization refers to the act of gathering the key individuals involved and offering them instructions on how to use the application.
7. Implementation: The application will be deployed and accessible on the server located at <https://kpi.pwmjateng.id>.

2.1 Conducting Focus Group Discussions

The development process began with the organization of a Focus Group Discussion (FGD) with key stakeholders of the Muhammadiyah Regional Board of Central Java (Figure 1). This discussion is very important in determining the unique needs of the business and the specific time to meet those needs. The development process began with a Focus Group Discussion (FGD) involving stakeholders of the Organization and Performance Development Bureau of the Muhammadiyah Central Java Regional Executive Board. These discussions were important to unearth intricate details about the uniqueness and specific needs of the organization. Each participant provided suggestions and input regarding their respective Key Performance Indicator (KPI) technology for the task, the desired frequency of data updates, and their preferred data presentation style. The program was developed with a focus on prioritizing user objectives and ensuring it could be tailored to fit the company's specific operational environment efficiently.

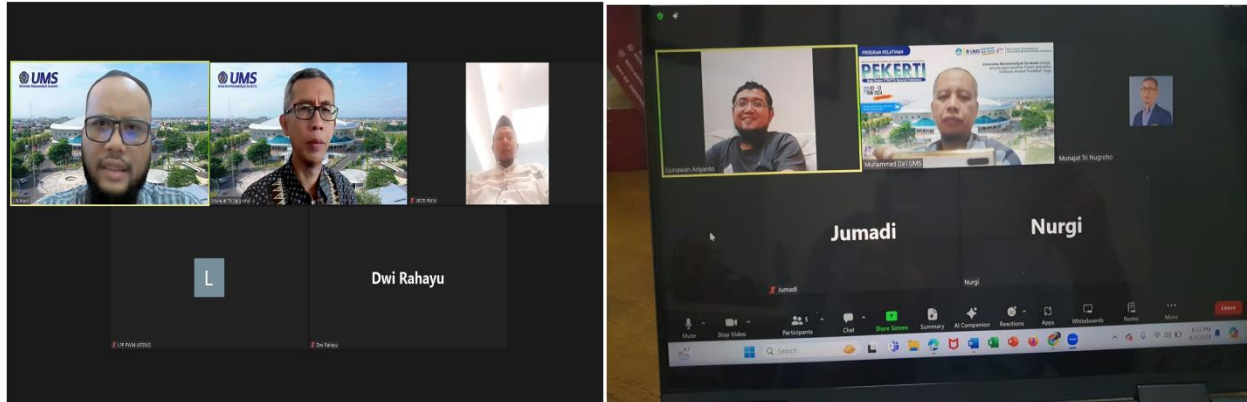


Figure 1. FGD with Muhammadiyah Regional Board of Central Java Stakeholder

2.2 Design phase

After analyzing the FGD results, a methodological approach was used to determine the specific elements that should be incorporated into the application interface. The design aims to be user-friendly, requiring a high level of technological competence to comfortably utilize the app. First and foremost, it is important to highlight the significance of critical components such as real-time updates, custom-built dashboards, and interactive maps. The design is made to accommodate the growth of Key Performance Indicators (KPIs) of each sector as well as the regions underneath.

2.3 Development phase

The development phase includes the implementation of WebGIS technology in the developed application. This step was important to include relevant features. The developers focused their efforts on integrating GIS tools and capabilities to visualize data based on its geographic location. System maintenance mostly involved managing data storage, processing and retrieval. To ensure the confidentiality of all data and prevent unauthorized access, access authorization and security protocols were implemented.

2.4 Evaluation

After the creation of the initial version, the software application undergoes testing to assess its functionality, usability, and reliability. The program's ability to meet the company's data management and operational requirements was tested through experiments conducted in a real environment. Feedback from users during testing has identified problems or further requirements. Review procedures were meticulously conducted, with important criteria such as response speed, user interface and overall user experience thoroughly assessed.

2.5 Improvements

Each iteration of the program is subject to improvement, as each test run results in improvements based on the feedback obtained from the evaluation. Engineers addressed all reported software issues and implemented appropriate optimizations based on user feedback. Analysis of the product prototype in parts improved several areas of the application, such as data accuracy, speed of displaying data, and overall user satisfaction.

2.6 Socialization

Socialization refers to the process by which individuals learn the developed application and implement within the organization. This phase involves deploying the application to relevant stakeholders and subsequently organizing training sessions to educate them on its features and functions. The aim is to ensure that all users have the necessary skills to utilize the Key Performance Indicator (KPI) panel monitoring program. Users are incentivized to participate in the new system through the provision of instructional materials, such as user guides and tutorials.



Figure 2. Socialisation with Muhammadiyah Regional Board of Central Java

2.7 Deployment

The installation stage involves deploying the application and making it accessible via secure HTTPS protocol at the URL <https://kpi.pwmjateng.id>. This deployment is the final stage of the development process, so that the Muhammadiyah Central Java Regional Board can access and utilize the WebGIS-based KPI monitoring tool. The program has become an integral component of the organization's performance management system, offering immediate insight into key performance indicators (KPIs) and facilitating data-driven decision-making.

3. Results and Discussion

The implementation of a WebGIS-based Key Performance Indicators (KPI) monitoring program for the Muhammadiyah Regional Leadership (PP) of Central Java has yielded noteworthy results. The program, available at <https://kpi.pwmjateng.id>, has improved the organization's capacity to efficiently monitor and control its performance metrics (Figure 3-5). Specific results of this implementation are outlined below.

First, it allows organizations to monitor the growth and spatial distribution of their members. Through the utilization of WebGIS technology, individuals can visually represent the distribution and concentration of members in different geographical areas. This spatial visualization tool allows organizations to gain a comprehensive picture of membership

trends and growth patterns. This helps identify places with significant concentrations of membership and areas that may require more targeted recruitment efforts.

In addition, the program enables performance tracking of key performance indicators (KPIs) at both the Program Implementation Unit (UPP) and city/region council level on a quarterly basis. Regular tracking allows for quick evaluation of performance against predetermined benchmarks. Real-time data updates and configurable dashboards ensure that users can immediately detect and correct any deviations from targets. This quarterly monitoring helps to enforce a regular cycle of performance evaluation, facilitating proactive management and continuous improvement.

Finally, the program enhances the ability to monitor the distribution of Muhammadiyah-owned enterprises (AUMs). Users can view the location and operating status of these businesses on a map that allows for interaction. This allows users to gain a better understanding of the location of these businesses and to identify any areas that may lack service coverage. The tool facilitates strategic planning and resource allocation by identifying places where new businesses can be established to meet community needs more effectively.



Figure 3. Landing Page of the KPI Application

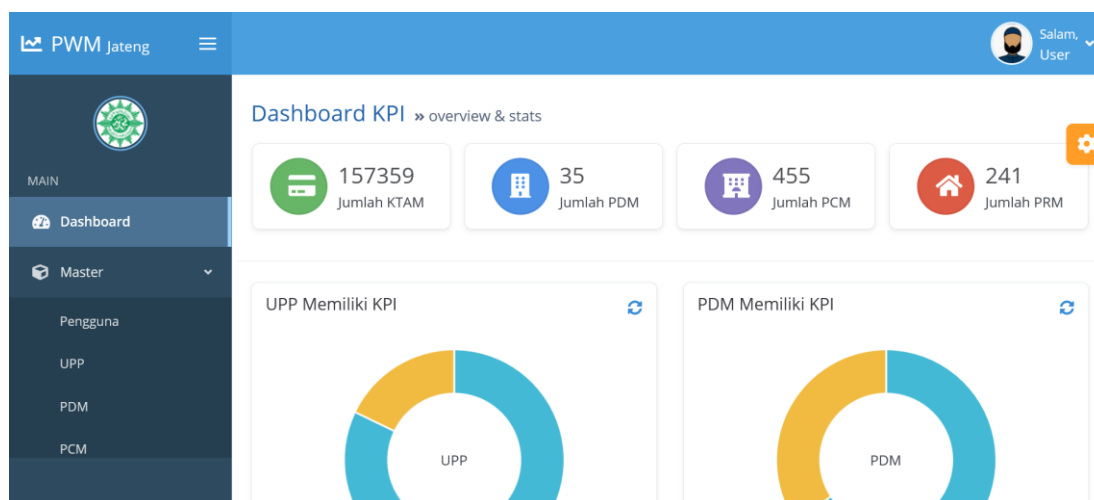


Figure 4. Graphical Dashboard of the KPI Application

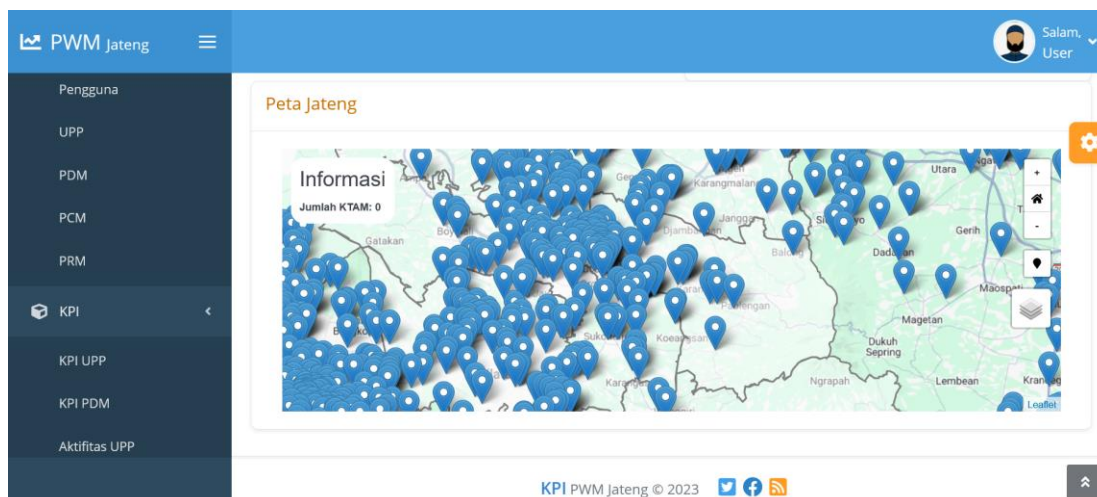


Figure 5. Map Dashboard of the KPI Application

The WebGIS-based KPI monitoring program has become a very important tool for the Muhammadiyah Regional Board (PP) of Central Java. It provides valuable information regarding member distribution, performance at different levels in the organization, and the expansion of the Muhammadiyah Company. This helps improve decision-making and strategic alignment across the organization.

4. Conclusion

The development and use of a WebGIS-based KPI monitoring tool is a major improvement in the performance management capacity of the Central Java Muhammadiyah Regional Board. By leveraging the spatial analytics features of WebGIS, the organization can visually represent data in a geographic context, providing deeper insight into regional performance differences. This new methodology increases clarity, accountability, and strategic decision-making, and fosters a culture of continuous improvement. The successful implementation of this application, which can be accessed at <https://kpi.pwmjateng.id>, highlights the possibilities of incorporating WebGIS technology into organizational performance monitoring. This opens up opportunities for more efficient and impactful management techniques.

5. Acknowledgments

LPPMP Universitas Muhammadiyah Surakarta funded this project through P2DAI scheme, grant number 104.11/A.3-III/LPPMP/VI/2024.

6. Reference

- Ali, A., Iqbal, S., Haider, S., Tehseen, S., Anwar, B., Sohail, M., & Rehman, K. (2021). Does information technology governance influence organizational performance in Pakistani public sector organizations? mediating effect of innovation. *Sage Open*, 11(2), 215824402110165. <https://doi.org/10.1177/21582440211016557>
- Budiprayitno, S. (2020). The influence of knowledge management on innovation and organizational performance in the field of game application and development. *Mec -J (Journal of Management and Economics)*, 4(2), 185-200. <https://doi.org/10.18860/mec-j.v4i2.8448>

- Kalischko, T. and Riedl, R. (2021). Electronic performance monitoring in the digital workplace: conceptualization, review of effects and moderators, and future research opportunities. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.633031>
- Nwakamma, M. (2024). Examining the integration of GPS-based staff performance monitoring and assessment system in an academic setting. *World Journal of Advanced Research and Reviews*, 21(3), 1081-1088. <https://doi.org/10.30574/wjarr.2024.21.3.0645>
- Purwanto, B. and Sejati, A. (2021). Voluntary geographic information (vgi) application to monitor land use violations Case study: ciganjur flood. *Journal of Informatics Research*, 3(3), 283-290. <https://doi.org/10.34288/jri.v3i3.244>
- Sari, V., Hady, H., & Elfiswandi, E. (2023). Employee commitment model: analysis of work environment and digital literacy on organizational performance to introduce the potential of West Sumatra tourist attractions (case study on West Sumatra tourism employees). *International Journal of Professional Business Review*, 8(7), e01676. <https://doi.org/10.26668/businessreview/2023.v8i7.1676>
- Sreedharan, J. (2024). Key performance indicators: a framework for health-related educational institutions. *Clinicoeconomics and Outcomes Research*, Volume 16, 173-185. <https://doi.org/10.2147/ceor.s446614>
- Zanon, L., Lisboa, V., & Carpinetti, L. (2020). The relationship between organizational culture and technology startup performance: a fuzzy cognitive map-based analysis. *Revista Gerakan Ya Production Operations. E Sistemas*, 15(3), 36. <https://doi.org/10.15675/gepros.v15i3.2722>