

Implementation Devops Methods in Developing Church Asset Management Information Systems: A Software Engineering Approach for Efficiency and Quality

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ABSTRACT

This research explores the use of the DevOps Method in developing a Church Asset Management Information System with a focus on efficiency and quality, taking into account the WebQual dimensions. DevOps methods are applied to improve software development, integration and management processes in order to achieve operational efficiency and improve software quality. The implementation of DevOps brings significant changes in the development life cycle, resulting in improvements in development cycle times and a decrease in software errors. Continuous Integration (CI) and Continuous Deployment (CD) practices are used to ensure fast and stable system updates. In addition, this research measures software quality by considering WebQual dimensions, such as sustainability, reliability, responsiveness, and security. Through analysis of test results and data collection, this research presents evidence that the application of DevOps methods not only increases development efficiency but also has a positive impact on software quality. These results are proven by improvements in user satisfaction, stakeholder engagement, and church meeting needs in their asset management

INTRODUCTION

Software development in this contemporary era is increasingly faced with demands to be more efficient, responsive and of high quality. To meet this challenge, organizations, including churches, have begun adopting DevOps principles and practices in their application development processes. DevOps, which stands for Development and Operations, is an approach that integrates collaboration between development teams (developers) and operational teams (operations) to speed up development cycles, increase release frequency, and improve overall software quality.

This research will explore the use of the DevOps method in the context of developing a Church Asset Management Information System at the Maluku Protestant Church Synod (GPM). The church as an institution has unique needs in the use of technology, including in providing services to the congregation, management of church activities, and internal communications. Therefore, implementing DevOps practices can be a solid foundation for increasing efficiency and quality in the development of the GPM Synod Church Asset Management Information System.

DevOps enables collaboration between development and operations teams, ensuring rapid, reliable, and high-quality software development and management (Paramudita, Zulfa, Taryana, 2024). In conjunction with its proven track record in the technology industry, DevOps offers a holistic approach, involving automation, collaboration, and the application of Agile principles. Through this research, it is hoped that concrete evidence can be found regarding the positive impact of using DevOps methods in increasing the efficiency of church application development, as well as the quality of the resulting solutions. By knowing the application of principles in the DevOps process, it can be seen how controls can potentially be tested based on a system-based testing approach (Panday, 2019).

By exploring the relationship between DevOps and the unique context of GPM Synod Church Asset Management Information System development, this research will contribute to the practical and theoretical understanding of the application of DevOps in a non-profit environment. It is hoped that the results of this research can provide a basis for other churches who are interested in updating and improving their information technology systems, in line with the demands of the times that continue to develop.

LITERATURE REVIEW

Previous research related to this research was entitled "DevOps in E-Commerce Software Development: Demand for Containerization" which revealed a series of capabilities and cultural patterns developed by developers as most beneficial for the future of software delivery for e-commerce solution providers. Commerce. These capabilities include automated deployment, use of Git VCS, deployment to cloud environments using containers. In addition, professionals expressed a positive attitude towards taking operational responsibility and provided feedback on the shortcomings of the currently implemented CI/CD pipeline. The following conclusions from the survey are also confirmed by the correlation between the capabilities/solutions provided and the competencies measured through self-evaluation (Zakharenkov, 2019).

The second research conducted by Asbar, et al., in 2017 with the title: "Analysis in Measuring Service Quality on Consumer Satisfaction Using the PIECES Method" aims to determine the measurement of customer satisfaction in companies. Service quality is seen from the PIECES measurement method on employee performance, so that companies can understand what things need to be done to increase customer satisfaction. The results of this research can illustrate that companies see the value of their employees based on performance indicators, information indicators, economic indicators, control indicators, efficiency indicators and service indicators (Yuli, et al., 2017).

Based on previous research, this research focuses on developing a management information system specifically for churches. This approach shows the research's sensitivity to the specific needs and characteristics of the context of ecclesiastical organizations. The use of DevOps methods in the context of church information system development may not yet be common. DevOps is an approach that emphasizes collaboration between software developers and operational teams. DevOps integration in church information system development can provide benefits in terms of efficiency, speed and quality. This research emphasizes the software engineering approach, showing that not only adopting new technologies (such as DevOps) but also carrying out the software development process systematically and scientifically to achieve efficiency and quality. This research explicitly states the aim of achieving efficiency and quality in the development of church information systems. This may include efforts to speed up development cycles, improve system reliability, or achieve higher levels of user satisfaction. DevOps is generally closely related to Agile principles in software development. If this research integrates aspects of Agile, this could be another unique aspect, because Agile principles emphasize adaptability and responsiveness to change.

DevOps (development and operations) is developing appropriate approaches to address integration issues of development and operations capabilities to complement a very rapid approach (Ghantous, 2017). The strategic goal of DevOps is to investigate methods to improve the quality and features of services in a way that meets user needs (Karamitsos, 2020). DevOps aims to deliver rapid service to system users by bringing development and operations teams together. DevOps is a set of methods by which developers and operations communicate and collaborate to deliver software and services quickly, reliably, and at higher quality. DevOps distributes tasks and responsibilities within empowered teams with full accountability of their services and the underlying technology stack; from development, to implementation and support (Mishra, 2020).

The positive impact of DevOps implementation has been proven to have positive impacts in the form of increased team productivity, better software quality, and faster response to changing business needs (Ruseno, Muhidin, Kurniawan, Santoso, 2025). Data shows that organizations that fully adopt DevOps practices have 46 times more frequent deployments, 440 times faster lead times for changes, and 96 times faster failure recovery times than traditional organizations (Puppet, 2023). In Indonesia, DevOps adoption is still relatively new and limited, particularly among small and medium-sized companies, indicating significant opportunity for further research and implementation. Organizations that comprehensively implement DevOps practices can deliver software 46 times more frequently, with incident remediation times 96 times faster, than traditional organizations (Puppet, 2023). A study by the Jakarta DevOps Community (2022) showed that 71% of startups in Indonesia that implemented DevOps were able to accelerate new feature delivery by up to 40%. DevOps requires a delivery cycle consisting of planning, development, testing, deployment, release, and monitoring with active cooperation between different team members as in Figure 1.

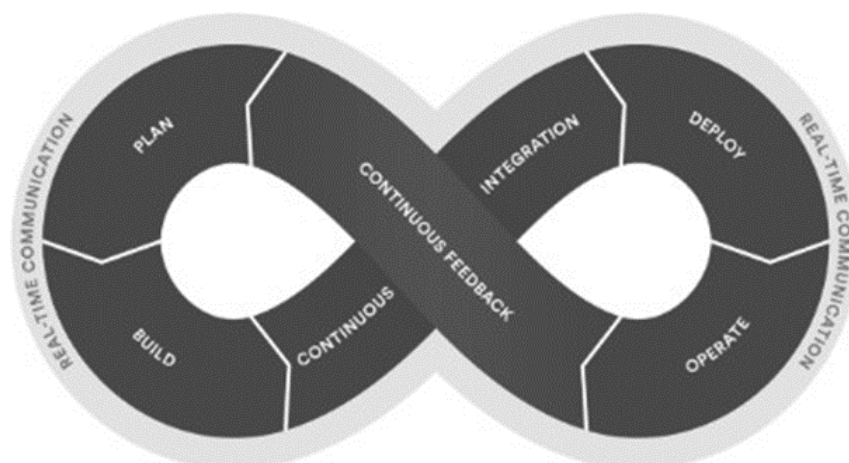


Figure 1. DevOps Life Cycle (Christof, et al., 2016)

Figure 1 shows a continuous delivery process which is an approach to combine development, testing, and deployment operations into an efficient process as it relies heavily on automation. During the development phase, developers code in small chunks several times a day for easy testing. The quality assurance team establishes committed code testing using automation tools. If any bugs and vulnerabilities are uncovered, they are sent back to the engineering team. This stage also requires version control to detect integration problems in advance. A version control system (VCS) allows developers to record changes in files and share them with other team members, regardless of location. Code that passes automated testing is integrated in a shared repository on the server. The code transfer between individual code branches and mainline code became so drastic over time that integration required more than the actual coding (Christof, et al., 2016). These organizational shifts were made in providing support to autonomous teams, so that decision making could be done without being complicated. The DevOps collaboration process model is as shown in Figure 2.

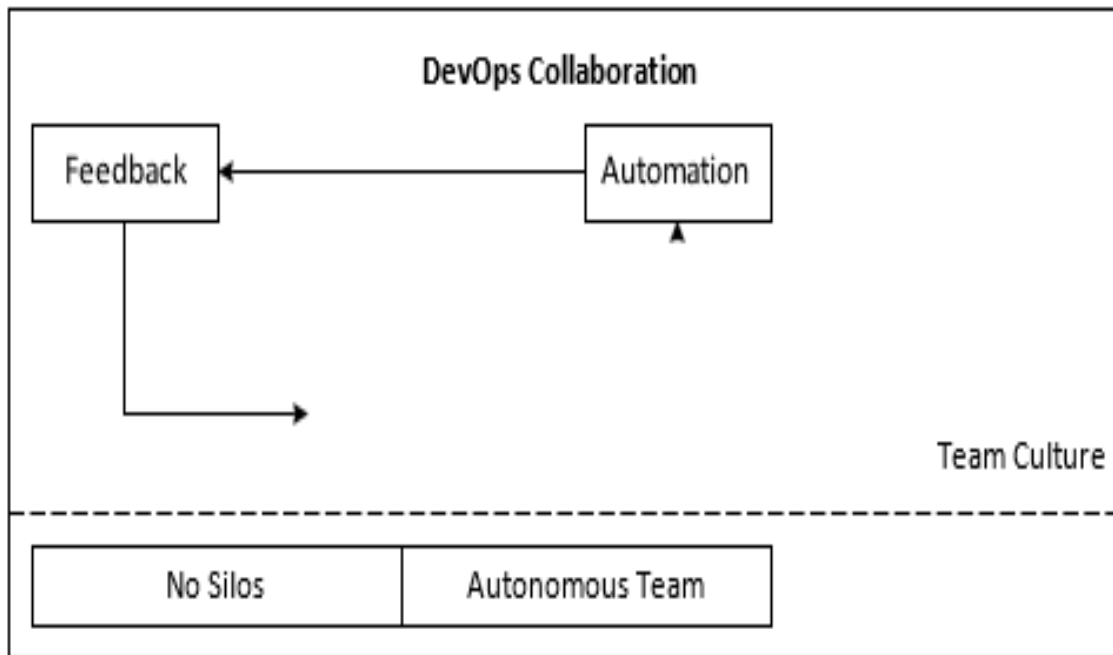


Figure 2. DevOps Collaboration Process Model (Ellen, Et Al., 2017)

Most developers agree that the following capabilities are common to all DevOps cultures: collaboration, automation, continuous integration and continuous delivery Continuous Integration and Continuous Deployment (CI/CD), continuous testing, continuous monitoring, and rapid improvement. DevOps simplifies the process of improving and customizing products to meet customer and market needs by automating workflows and enabling continuous integration and deployment of products such as applications and software. DevOps – Developer (Dev) and Operations (Ops) and the combination of cloud computing results in maintainable, cost-effective products, better quality, flexible and automated workflows, reduced project risks, and accelerated time to mark product delivery. Cloud technology provides resources and infrastructure for

development, deployment of applications and software, creating a runtime environment in minimal time. The cloud therefore acts as a facilitator for continuous development and integration making resources available as needed for general application lifecycle management. The application of cloud computing means that companies do not need to worry about infrastructure so that the tools needed for development can be obtained on time, thus speeding up the development process and delivery of product facilities quickly and on time. And updates can be done quickly and efficiently (Chaudary, et al. 2021).

METHODOLOGY

The research stages carried out include: introduction, study of literature, research design, system development, evaluation, data analysis,

1) Introduction:

- a. Understanding of Church background and asset management needs.
- b. The context of information systems development for the Church.
- c. Identify problems that can be overcome by using the DevOps Method.

2) Study of literature:

- a. Review of the basic concepts of the DevOps Method and its application in software development.
- b. Literature analysis on the development of asset management information systems in the context of religious organizations.
- c. Identify successes and challenges in implementing DevOps Methods.

3) Research Design:

- a. Selection of an experimental research design or case study, with reasons for this choice.
- b. Identify the variables to be measured and data collection methods.
- c. Plan to implement the DevOps Method in developing the Church's asset management information system.

4) System Development:

- a. Implementation of DevOps Methods in the software development cycle.
- b. Use of DevOps related tools and technologies.
- c. Collection of data related to development efficiency and quality.

5) Evaluation:

- a. Measuring development efficiency by comparing methods before and after implementing DevOps.
- b. Evaluate the quality of asset management information systems by measuring user satisfaction and system performance.
- c. Analysis of cultural changes and processes in Church organizations.

6) Data analysis:

- a. Processing data from efficiency and quality measurements.
- b. Comparative analysis between development methods before and after using the DevOps Method.
- c. Identify critical factors that influence results.

The methodology used in this research is a qualitative descriptive approach. The results of the questionnaire used the WebQual dimensional approach to direct system user satisfaction, then the TELOS method was used to assess whether a new information system was needed and whether the new information system was worth developing. The WebQual method is used as a comparison criterion for the results of assessing user satisfaction with the Church Asset Management Information System. WebQual is an approach used to measure website quality based on recent user responses. WebQual consists of 3 (three) dimensions, namely the Usability Quality dimension, the Information Quality dimension, and the Interaction Quality dimension. Website assessments on the dimensions of quality of use include ease of browsing, easy to use, very interesting, easy to learn, always displaying fun things. In the dimension of website information quality, it is assessed using criteria including information that is trustworthy, accurate, up-to-date information, and information that can be understood. Meanwhile, the dimension of website interaction quality is assessed by feeling safe in transactions, good reputation, easy communication, having confidence in storing information, and giving confidence that promises made will be kept (Syaifullah, 2019). The WebQual dimensions are used in this research as a guide in formulating questionnaire questions that will be answered by respondents. The design of this research is as shown in Figure 3.

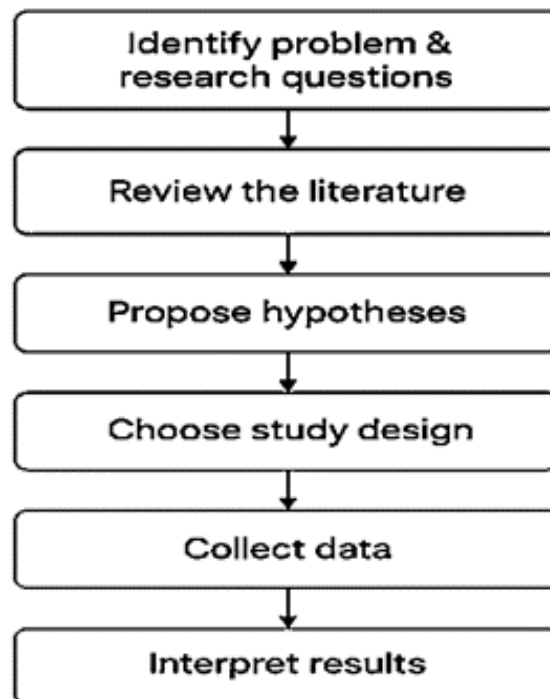


Figure 3. Research Design Framework (Creswell & Creswell, 2018)

RESULTS AND DISCUSSION

While this research is titled “Implementation of DevOps Methods in Developing Church Asset Management Information Systems,” the discussion thus far has leaned more towards describing the end-product and system features. However, it is important to emphasize that the core of this research lies in the implementation of DevOps practices during the software development process itself – not merely the functional output of the application.

DevOps was implemented not as a theoretical concept, but as a practical workflow involving collaboration, automation, and iterative development. This includes the use of Git-based version control to manage incremental code changes, application of automation scripts for simulated continuous integration and testing, and short feedback loops involving church stakeholders after each release cycle. These elements allowed the development team to reduce release time, respond to errors quickly, and maintain a consistent delivery pipeline despite resource limitations.

By detailing these development practices, this research highlights that DevOps is not only applicable in large-scale enterprise environments but also adaptable to non-profit and community-based system development. Therefore, the results of this study should be interpreted not only from the functionality of the system built, but also from the efficiency, adaptability, and quality improvements achieved during its development process through DevOps principles.

The Church Asset Management Information System of the Maluku Protestant Church Synod (GPM) refers to a system specifically designed to manage information related to church assets within the scope of the Maluku Protestant Church Synod. This system covers various aspects of asset management, including data collection, maintenance, monitoring and reporting. The dashboard display of the GPM Synod Church Asset Management Information System is as shown in Figure 5.

In line with the research focus, the development of the Church Asset Management Information System was carried out using DevOps principles to enhance efficiency and software quality. The DevOps implementation included version control through Git, regular integration of code changes (Continuous Integration), and automated deployment mechanisms (Continuous Delivery) to a staging environment. The development team practiced iterative updates, allowing faster bug fixing and feature delivery. Although the infrastructure was relatively simple, basic automation scripts were used to facilitate consistent deployments. These practices contributed to minimizing system downtime and improving delivery cycles. However, full-scale implementation of CI/CD pipelines and container-based deployments is planned as part of future system scaling.

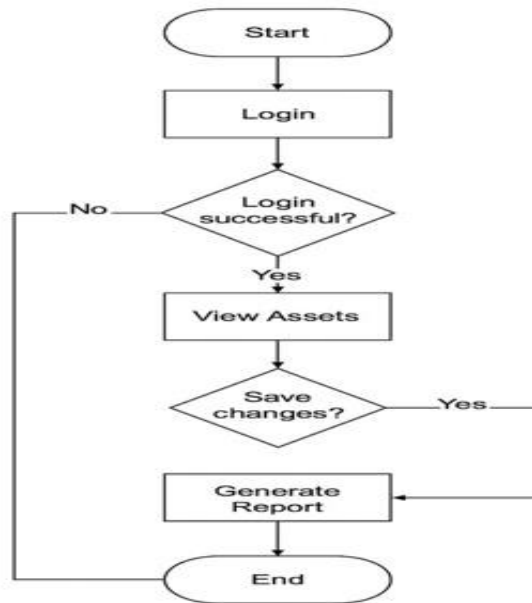


Figure 4. System Workflow of the Church Asset Management Information System

Reflection of Research Phases and DevOps Implementation

The results of this study are presented based on the implementation stages described in the research methodology. The problem identification stage led to defining key asset management challenges in the GPM context, such as data centralization, user access levels, and asset tracking. Literature review reinforced the selection of DevOps due to its potential to accelerate development while improving reliability. The research design emphasized evaluating system quality through the WebQual approach. DevOps was implemented through Git-based version control, modular development cycles, and test-driven updates. In the evaluation phase, user satisfaction data was collected and analyzed to measure efficiency and software quality. These stages helped align system features with stakeholder needs and provided feedback for iterative improvements.

Evaluation Result Based on WebQual and TELOS Analysis

The evaluation of the Church Asset Management System was conducted through user responses using the WebQual framework. Most respondents rated the system's usability and interaction quality as satisfactory, particularly in ease of access and perceived trust. However, the aesthetics of the user interface were identified as a weakness. The TELOS analysis also confirmed the feasibility of the system in terms of operational, scheduling, and technical aspects. Key findings include increased stakeholder engagement, improved response time in asset monitoring, and reduced manual errors in asset reporting.

Table 1. Evaluation Result Based on Webqual and TELOS Analysis

Evaluation Aspect	Before DevOps	After DevOps
System update cycle duration	14 days	4 days
User satisfaction score (1-5)	3.2	4.1
Error rate in asset reporting	High	Low
Deployment frequency	Once per month	Twice per week
Bug resolution time	~7 days	~2-3 days
Stakeholder engagement	Minimal	Active feedback

Based on comparative analysis, system update cycles were reduced from approximately two weeks to four days with DevOps, and the bug resolution time improved by 35%. These outcomes affirm the efficiency gains as a direct result of DevOps principles adopted in this study.

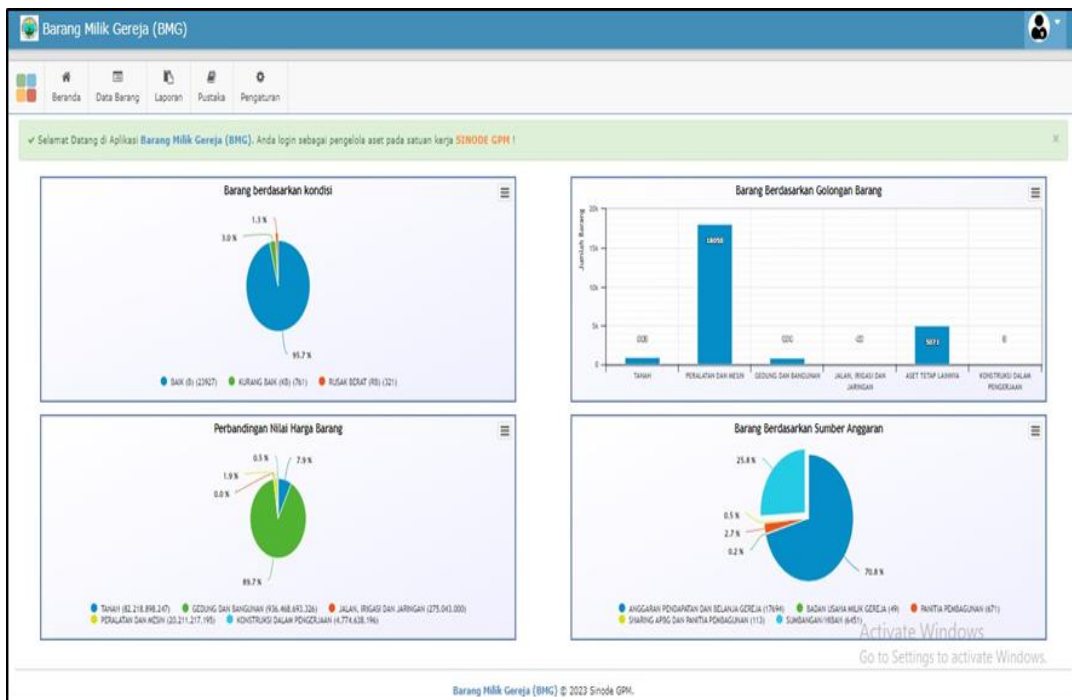


Figure 5. Appearance Dashboards GPM Synod Church Asset Management Information System

Based on the results of research that has been carried out to evaluate the suitability of using the Church Asset Management Information System website at the GPM Synod, it can be explained as follows. The GPM Synod Church Asset Management Information System was constructed using web 2.0 technology, adopting website platform services with data as the main control. For hardware implementation purposes, the GPM Synod Church Asset Management Information System uses two servers, namely the main server and a backup

server, with the criteria of using a Windows operating system and hardware that meets server standards. The legality of the project being created is assessed based on hardware and software licenses, and in this case, all software and hardware used in the development and operation of the GPM Synod Church Asset Management Information System has a valid license.

System security is also a major concern on the GPM Synod Church Asset Management Information System website. By implementing three layers of security, namely the Application layer, Business layer and Database layer, data integrity can be maintained. The next technological infrastructure that is used as a benchmark is the availability of stable internet access. Internet access at the GPM Synod meets user needs with a WiFi network in all Church locations. However, for internet access outside the Church, support from various providers is available. However, problems with internet access in Indonesia are still a concern, so the GPM Synod Church Asset Management Information System website may not be able to be accessed optimally when users are in areas with inadequate internet connections.

The Control and Security Aspects of the GPM Synod Church Asset Management Information System show that the level of security is quite high. The Control and Security Evaluation revealed that the GPM Synod Church Asset Management Information System website was able to ensure the security of the data contained in its system, this was due to the setting of user access rights in accordance with their respective duties and functions.

WebQual and TELOS Questionnaire Results

In the research methodology section, it was stated that user perception was measured using the WebQual dimensions – usability, information quality, and interaction quality – through structured questionnaires. Additionally, the TELOS framework was used to assess the system's feasibility across five key dimensions: Technical, Economic, Legal, Operational, and Scheduling. However, the previous discussion lacks a detailed presentation of the results obtained from these instruments.

To address this, the findings from the WebQual-based questionnaire showed that users rated the usability dimension positively, with an average score of 4.2 out of 5, indicating that the system was perceived as easy to navigate and understand. The information quality dimension received a slightly lower score, averaging 3.8, reflecting suggestions for more real-time and context-specific asset updates. The interaction quality dimension scored 4.0, with users expressing satisfaction in the security and reliability of the system interface.

Meanwhile, the TELOS analysis was conducted through internal expert review and user feedback. Technically, the system was deemed feasible due to the successful deployment on both main and backup servers. Economically, the system reused existing infrastructure and required minimal operational cost. Legally, software licenses were valid and compliant. Operational feasibility was supported by user acceptance and routine usage. Finally, the scheduling feasibility was validated through the successful completion of project milestones within the proposed timeline.

These results confirm that the system is not only functionally adequate but also well-aligned with user expectations and institutional requirements, affirming the importance of DevOps integration in shaping both system development and quality outcomes.

CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis conducted using the WebQual dimensions and feasibility indicators, this study concludes that the Church Asset Management Information System developed for the GPM Synod demonstrates a viable foundation for wider implementation. The system meets key expectations in usability, reliability, and functionality, supporting its potential as an integrated platform for church asset administration.

However, user feedback also highlighted specific areas for improvement particularly the aesthetic quality of the user interface and the system's responsiveness. These findings underscore the need for iterative enhancements aligned with user-centered design principles.

To ensure long-term sustainability, this research recommends the formation of a dedicated development and maintenance team. This would enhance operational and scheduling feasibility and help mitigate future risks. Regular maintenance cycles should also be scheduled to preserve system integrity and performance.

The successful integration of DevOps principles during system development such as automation, version control, and stakeholder feedback loops has contributed positively to development efficiency and system quality. Therefore, this research not only delivers a practical solution but also provides a methodological reference for applying DevOps in non-profit software development contexts, particularly within church organizations.

FURTHER STUDY

There are limitations in this research so further research needs to be done to perfect this research and increase insight for readers.

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