



## Enhancing church donation management using data-driven solutions



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### ABSTRACT

Efficient management of church donations is essential yet challenging for religious institutions due to inefficiencies and lack of transparency in traditional manual methods. This study developed a Church Donation Management System (CDMS) for a Cathedral in Cabanatuan City, utilizing the Agile Software Development Life Cycle (SDLC) to incorporate iterative improvements based on stakeholder feedback. The CDMS features an automated donor database, customizable reports, and real-time analytics to streamline donation tracking and enhance financial oversight. Evaluated using ISO/IEC 25010 Software Product Quality Standards, the system achieved high ratings from IT experts (mean score: 3.96) and end-users (mean score: 3.95) for usability, functionality, and efficiency. The results demonstrate that the CDMS significantly improves the accuracy, transparency, and operational efficiency of donation management processes while fostering better donor engagement and financial oversight.

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### 1. Introduction

Managing donations is a fundamental aspect of the financial operations of religious institutions, ensuring that they can sustain their activities and support their communities. However, traditional methods of donation management often involve manual processes that are time-consuming, error-prone, and lack transparency (Lin and Hsiung, 2024). These inefficiencies can lead to inaccuracies in record-keeping, delayed financial reporting, and reduced donor trust. The research locale, like many other religious institutions, has faced significant challenges in managing its donations using these conventional methods. The need for a more efficient, accurate, and transparent system became apparent. To address these challenges, this study proposes the development of a Church Donation Management System (CDMS) that integrates data-driven decision-making processes. The CDMS aims to automate and streamline the donation management process, enhancing the cathedral's ability to track donations accurately. Donation management systems to be effective must be able to generate timely financial

reports and maintain high levels of transparency and accountability (Liang and Liu, 2018). By leveraging modern technology and data analytics, the CDMS is expected to improve operational efficiency and foster better engagement with donors (Kumar and Reinartz, 2020). The development of the CDMS follows an Agile Software Development Life Cycle (SDLC), which allows for iterative progress and continuous improvement based on stakeholder feedback. This approach ensures that the system is tailored to meet the specific needs of the organization and its users (Kasauli, et al., 2021).

This paper outlines the development process of the CDMS, from initial requirements gathering through to system deployment and evaluation. The system's effectiveness is assessed using the ISO/IEC 25010 Software Product Quality Standards, which provide a comprehensive framework for evaluating software quality. It aims to demonstrate that the CDMS is a viable solution for enhancing the management of church donations, offering insights into the benefits of adopting data-driven technologies in traditional management practices (Opoku et al., 2024). In general, this research addresses the critical need for an automated, data-driven donation management system in religious institutions, highlighting the potential improvements in efficiency, accuracy, and transparency. The findings from this study are expected to contribute to the broader field of donation management systems and provide a foundation for future research in this area.

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## 2. Review of related literature

### 2.1. Introduction to data management systems

Data management systems (DMS) are crucial for the efficient organization, storage, and retrieval of data in various organizational contexts. According to [Thomas et al. \(2019\)](#), these systems streamline data processes, enhancing operational efficiency and decision-making. Types of DMS include Customer Relationship Management (CRM) systems, which focus on managing interactions with customers, and Enterprise Resource Planning (ERP) systems, which integrate core business processes ([Li and Xu, 2022](#)).

CDMS are specialized DMSs designed to address the unique needs of religious institutions. These systems support functions such as member management, financial tracking, and event organization. CDMS often includes modules for tracking donations and managing outreach programs, which are crucial for the operational effectiveness of churches. Existing CDMS solutions vary in their features and capabilities, with some offering advanced reporting and communication tools ([Mohamed et al., 2024](#)).

### 2.2. Adaptation for non-profits and NGOs

Adapting CDMS frameworks for non-profits and NGOs involves customizing features to meet the needs of these organizations. Non-profits often require robust systems for donation management, volunteer coordination, and impact assessment ([Alexander et al., 2023](#)). The adaptation process can involve integrating modules for tracking financial contributions and managing volunteer data, as well as ensuring scalability to accommodate organizational growth ([Yazdani and Haghani, 2024](#)). Case studies demonstrate that tailored CDMS frameworks can significantly enhance operational efficiency and transparency in non-profit organizations ([Cavicchi and Haghani, 2023](#)).

### 2.3. Technology trends and innovations

Recent technological advancements have influenced the development of CDMS, with trends such as cloud-based solutions, mobile accessibility, and advanced data analytics becoming increasingly prominent. According to [Noor et al. \(2018\)](#), cloud-based CDMS offer enhanced flexibility and scalability, while mobile solutions provide real-time data access. Innovations in data analytics facilitate more sophisticated reporting and insights, benefiting organizational decision-making ([Ghasemaghaei, 2019](#)).

### 2.4. Challenges and considerations

Implementing CDMS can present various challenges, including technical issues, financial constraints, and user adaptation problems. Studies

by [Patel et al. \(2024\)](#) highlight the importance of addressing these challenges through careful planning and robust support systems. Data security and privacy are also critical concerns, especially when handling sensitive information.

### 2.5. Best practices

Best practices for CDMS implementation include conducting a thorough needs assessment, engaging stakeholders, and providing comprehensive training. According to [Ain et al. \(2019\)](#), effective user training and support are essential for successful system adoption and utilization. Gathering and analyzing user feedback is also crucial for continuous improvement ([Kifetew et al., 2021](#)). Literature indicates that well-implemented CDMS can lead to significant gains in efficiency and transparency for churches and non-profits ([Kaunda, 2022](#)).

## 3. Methodology

The research design for this study follows a developmental approach, utilizing the Agile methodology. This approach is particularly suited for this project as it allows for iterative development and continuous feedback, ensuring that the system evolves to meet user needs effectively ([Buede and Miller, 2024](#)). The Agile SDLC includes phases such as requirements gathering, system design, development, testing, deployment, and review. Each phase is designed to be flexible and responsive to changes, facilitating the creation of a robust and user-centered CDMS ([Shore and Warden, 2021](#); [Martin, 2019](#)).

The study involved two main groups of respondents: IT experts and end-users (members of the church's administrative and financial teams). The IT experts were selected to provide technical evaluations of the system's functionality, security, and performance, while the end-users assessed the system's usability and practicality in real-world scenarios ([Phipps and Burbach, 2010](#)). The selection criteria for both IT experts and end-users were carefully defined to ensure that the respondents could provide meaningful and relevant feedback. The IT experts were required to have a minimum of five (5) years of experience in software development or IT systems evaluation. On the other hand, end-users were selected based on their involvement in the church donation management activities ([Wang et al., 2024a](#)).

The primary research instrument used in this study was a set of evaluation questionnaires tailored to the specific groups of respondents. The questionnaires were designed to capture detailed feedback on various aspects of the CDMS, including functionality, usability, performance, and security.

Additionally, the research included structured interviews and observation sessions to supplement the questionnaire data. These methods provided qualitative insights into the respondents' experiences and allowed for a deeper understanding

of the system's practical implications (Wang et al., 2024b). The combination of quantitative data from the questionnaires and qualitative data from interviews provided a comprehensive evaluation of the CDMS. This mixed-methods approach ensured that the system was thoroughly assessed from both technical and user perspectives, contributing to its overall effectiveness and usability (de Souza and Tartz, 2024).

#### 4. Results and discussion

##### 4.1. System development using agile methodology

The development of the CDMS followed the Agile SDLC. This development methodology enables iterative progress and continuous improvement based on stakeholders' feedback (Natarajan and Pichai, 2024). This methodology facilitated the

effective development and implementation of the system, addressing the specific needs of the church.

**Requirements gathering and system design:** During the initial requirements gathering phase, detailed discussions with stakeholders, including church administrators and IT experts, identified critical needs such as an automated donor database, customizable reporting capabilities, and real-time analytics (Barrows, 2024). The system design phase translated these requirements into a structured architecture, as illustrated in the CDMS Architecture Diagram, Fig. 1 on the next page.

This architecture included components such as the user interface (UI), application logic, database, data analytics engine, integration layer, and security module. The modular design ensured scalability, maintainability, and integration with existing systems. Fig. 1 illustrates the structural design of the CDMS, showcasing the interaction between different system components and their functionalities.

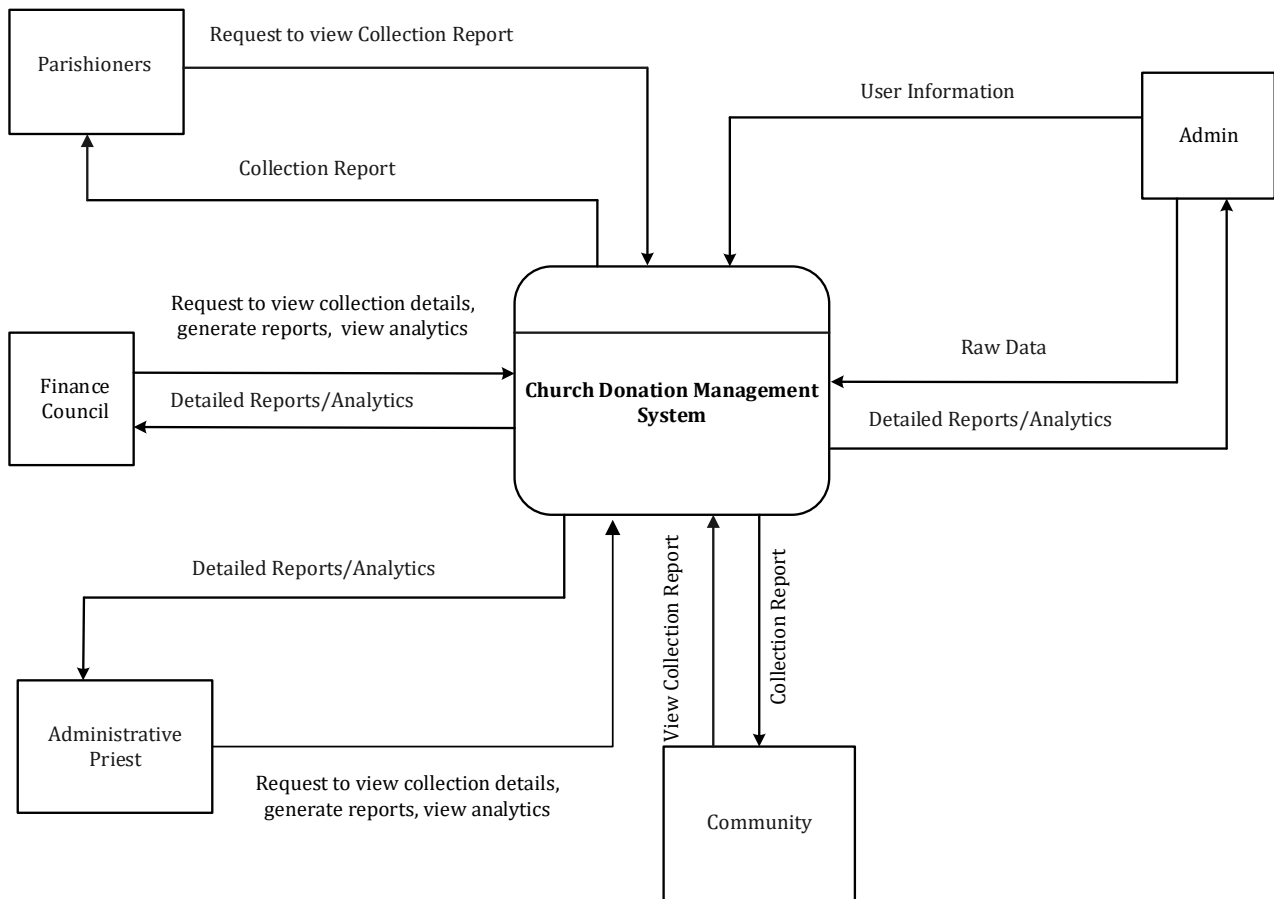


Fig. 1: Architecture diagram

The diagram also highlights the modular architecture of the CDMS, which includes the user interface (UI), application logic, database, data analytics engine, integration layer, and security module. This modular design ensures scalability, maintainability, and effective integration with existing systems.

**Development and testing:** The development of the CDMS followed an iterative approach, with each cycle of development including coding, unit testing, and the integration of new features. This iterative

method enabled early detection and correction of potential issues, ensuring that the system effectively met user requirements (Okesola et al., 2020). Comprehensive testing—encompassing functional, performance, and security aspects—was conducted throughout the development process. This not only helped improve system reliability but also ensured scalability, setting a foundation for long-term sustainability. Moreover, user acceptance testing (UAT) involving end-users allowed for validation in real-world scenarios, confirming the system's

practical usability (Lewis and Sauro, 2021). The continuous testing framework ensured that both immediate operational needs and future demands for scalability were considered.

**Automated donor database:** The successful automation of donor tracking significantly reduced manual errors and administrative workload (Ghasemaghahi and Calic, 2020). This improvement was crucial for enhancing accuracy and efficiency in the church's financial management. By automating these processes, the CDMS reduced the time spent on manual tasks, allowing staff to focus more on donor engagement and strategic decision-making. From a broader perspective, the automation also increased transparency in donation handling, which is vital for maintaining donor trust and improving financial accountability within the organization. IT experts lauded the system's functional suitability and robust security features, while end-users appreciated the intuitive and clear user interface. These findings imply that automation, combined with a user-friendly design, can enhance the overall integrity of financial systems in non-profit organizations.

**Customizable reporting:** The CDMS's ability to generate detailed, customizable reports received positive feedback from both IT experts and end-users (Wymer and Regan, 2011). This feature played a significant role in improving financial oversight and transparency (Kitsios and Kamariotou, 2019). The system enabled administrators to tailor reports based on specific financial metrics, thereby enhancing decision-making processes and optimizing donor management. The broader implication here is that customizable reporting not only facilitates operational efficiency but also helps institutions align their financial reporting with organizational goals. This can be especially valuable for improving transparency during audits or donor reviews, ultimately fostering better donor relations and institutional credibility.

**Real-time analytics:** The real-time reporting and analytics capabilities of the CDMS were highly praised, with users noting substantial improvements in their ability to make data-driven decisions (Wolniak, 2023). Real-time analytics allowed for dynamic updates on donation activities, improving operational efficiency by enabling immediate responses to financial changes (Dehdashti, 2022). An example of this is the fluctuations in donation trends could be identified and addressed promptly, leading to more informed financial planning. The broader significance of this feature is its potential to help organizations adapt quickly to changing conditions, not just in financial management but in overall resource allocation. Real-time analytics, by fostering an agile decision-making process, are critical for organizations that rely on timely financial insights to meet their operational goals.

**Deployment and feedback:** Following thorough testing, the CDMS was successfully deployed at the Cathedral's Pastoral Office. Training sessions were conducted to familiarize end-users with the system's features and functionalities, ensuring smooth

adoption (Doherty and Sorenson, 2015; Hussinki, 2022). The post-deployment feedback was collected to identify areas for improvement, and this feedback was instrumental in making necessary adjustments and enhancements (Chatterjee and Mittal, 2024). The continuous improvement loop, driven by user feedback, reflects a broader strategy of aligning system functionality with evolving user needs, ensuring the system remains relevant and effective over time. This approach highlights the importance of flexibility and adaptability in software systems, particularly in environments where operational needs can change frequently.

The screenshots showcase the user-friendly interface, including the dashboard, donation entry form, reporting tool, real-time analytics, and user management features. These visuals highlight the system's intuitive design and its ability to meet user needs effectively.

## 4.2. Technical challenges and solutions

The development of the CDMS followed the Agile SDLC, which allowed for iterative progress and continuous stakeholder feedback. Throughout the development process, several technical and user-related challenges were encountered, but these were effectively addressed, resulting in a robust system tailored to the needs of the research locale.

One of the major technical challenges involved optimizing the system's performance efficiency, particularly in handling large amounts of donation data. Initially, the system faced issues with slow database queries and data processing delays. To overcome this, database indexing techniques and optimized queries were employed, hence, significantly improving the system's response time and ensuring faster data retrieval. Another challenge involved ensuring the long-term maintainability of the system. The development team implemented a modular code structure that allowed for easier future updates and feature expansions. In addition, comprehensive documentation and regular code reviews were carried out to ensure the system could be maintained and upgraded efficiently over time.

Stakeholder feedback played a crucial role in refining the system, particularly in addressing usability concerns. Early user acceptance testing revealed difficulties with the user interface, as some users found the design elements unfamiliar and difficult to navigate. In response, the UI was redesigned to include more familiar controls and simplified navigation. In addition, security concerns were also raised, particularly regarding the protection of sensitive donation data. To enhance security, encryption methods were applied, and multi-level user access controls were introduced to prevent unauthorized access to donation records.

Adoption of the system by end-users, particularly the church's administrative team, presented additional challenges. Many users were accustomed to manual donation management processes, and the transition to the new system required significant

adjustment. To facilitate smoother adoption, additional training sessions should be conducted aside from the detailed user manuals provided. Furthermore, the system’s customizable reporting feature, which allowed users to generate detailed financial reports, was highly valued by the administrative team. Initially, some difficulties were encountered in ensuring that the reports met the specific financial oversight needs of the church.

The CDMS framework, originally developed for religious institutions, can also be adapted for non-profit organizations and NGOs to improve decision-making and resource management. This structured system can be modified to meet the specific needs of these organizations. Important adjustments include involving the community in decision-making to ensure that the needs of stakeholders are considered and encouraging collaboration among staff, beneficiaries, and funders.

Additionally, the framework can help organizations manage limited resources more effectively by improving financial planning and oversight, leading to greater transparency and accountability. It can also be adapted to ensure that all activities align with the organization’s mission and contribute to measurable outcomes.

Incorporating long-term planning and risk management strategies enables organizations to navigate challenges and operate more efficiently. By integrating core values and ethical principles, the framework promotes a culture of integrity and responsibility. Overall, these adaptations can strengthen decision-making, resource management,

and strategic planning, helping non-profits and NGOs achieve their goals more effectively.

### 4.3. Evaluation results and discussion based on ISO/IEC 25010

The CDMS was evaluated based on feedback from IT experts and end-users, focusing on various quality characteristics defined in the ISO/IEC 25010 standards.

#### 4.3.1. IT experts' evaluation

The CDMS underwent evaluation based on feedback from IT experts and end-users, focusing on various quality characteristics outlined in the ISO/IEC 25010 standards. IT experts assessed the system across dimensions such as functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability. The evaluation results, summarized in Table 1, highlighted notable strengths in functional suitability (3.97), security (3.73), and usability (3.98), indicating strong adherence to key quality standards.

However, areas such as performance efficiency (4.00) and maintainability (3.92) were identified as potential areas for improvement. These findings suggest a comprehensive assessment of the system's capabilities across critical operational aspects. This ensures alignment with user expectations and industry standards.

**Table 1:** IT experts' evaluation results

Software product quality categories	Weighted mean	Verbal description
Functional suitability	3.97	Very functional
Performance efficiency	4.00	Very efficient
Compatibility	3.95	Very compatible
Usability	3.98	Very usable
Reliability	3.95	Very reliable
Security	3.73	Very secured
Maintainability	3.92	Very maintainable
Portability	3.97	Very portable
Overall score	3.96	Very functional, very efficient, very compatible, very usable, very reliable, very secure, very maintainable, and very portable

Based on the evaluation results, it is evident that the CDMS exhibits significant strengths in areas critical to its functionality and security. However, the identified areas for improvement, specifically in performance efficiency and maintainability, provide a clear direction for future enhancements. By addressing these aspects, the system can better align with user expectations and industry standards, ensuring it remains a robust and reliable tool for end-users. Continuous feedback and iterative improvements will be key in maintaining the system's high quality and effectiveness, ultimately

contributing to its long-term success and user satisfaction.

#### 4.3.2. End-user evaluation

End-users provided feedback on the usability, ease of use, and overall effectiveness of the CDMS, as detailed in Table 2. The evaluations highlighted strong scores for ease of use (4.00), system responsiveness (4.10), and user interface clarity (3.90), underscoring the system's user-centered design and effectiveness in practical usage scenarios (Doherty and Sorenson, 2015).

**Table 2:** End-users' evaluation result

Software product quality categories	Weighted mean	Verbal description
Functional suitability	3.87	Very functional
Performance efficiency	4.00	Very efficient
Usability	3.97	Very usable
Overall score	3.95	Very functional, very efficient, and very usable

High usability scores from both IT experts and end-users indicated that the CDMS effectively met user needs. The Agile methodology facilitated ongoing adjustments based on user feedback, ensuring a responsive and user-centered design approach (Shania et al., 2023). Performance efficiency and maintainability were identified as areas needing enhancement (Pushpakumar et al., 2023). IT experts suggested further optimization to ensure the system's long-term sustainability and efficiency. Addressing these areas will be crucial for maintaining the system's effectiveness in managing donation activities and enhancing operational efficiency.

The positive feedback from end-users regarding usability and effectiveness aligns with the system's high scores in ease of use and responsiveness. These

attributes are pivotal in ensuring smooth operation and user satisfaction in donation management systems. Moving forward, improvements in performance efficiency and maintainability will be essential to sustain and enhance the system's performance over time (Pawar and Palivela, 2022).

#### 4.4. System's effectiveness in managing church donation

The CDMS was evaluated by end-users, revealing several key areas where the system excelled. The results indicated strong agreement on the system's overall effectiveness, particularly highlighting its user-centered design, functionality, and usability (Table 3).

**Table 3:** System's effectiveness as perceived by the end-users

Software product quality categories	Weighted mean	Verbal description
The system includes status that is visible and keeps the user informed about its availability in a clear and timely manner	3.44	Strongly agree
The system uses simple words that can be easily understood	3.59	Strongly agree
The system allows to undo an action using the clear, cancel and delete buttons	4.00	Strongly agree
The system uses standard design and controls like the other applications the user is using which makes it less confusing	3.98	Strongly agree
The system provides validation of the user's entries in important fields thus enabling me to minimize the occurrence of errors	3.85	Strongly agree
The system elements such as buttons, interface, and functions are easy to recognize and navigate	3.56	Strongly agree
The system allows to use the usual shortcuts such as ctrl+c (copy), ctrl + s (save), ctrl + p (print)	3.98	Strongly agree
The system design includes only necessary elements and words important and related to the donations record process	3.73	Strongly agree
The system design includes easy-to-understand and helpful error messages that make it easier to correct entries	3.44	Strongly agree
The system design includes a help section and/or clear instructions on what to do so it can be understood how to use it	3.85	Strongly agree
Grand weighted mean	3.74	Strongly agree

One of the most significant findings was the high score for the system's undo functionality, which received a mean score of 4.00. This feature allows users to easily correct mistakes using clear, cancel, and delete buttons, enhancing control and reducing errors. The importance of this functionality is underscored by its top rating, demonstrating that users greatly value the ability to undo actions swiftly and confidently.

Another salient finding was the system's use of standard design and controls, scoring a mean of 3.98. By incorporating familiar design elements like other applications, the CDMS reduced the learning curve and made the system more intuitive for users. This familiarity helped users navigate the system with ease, contributing to higher overall satisfaction (Abdul-Gafaru et al., 2024).

The system's validation of user entries also received strong agreement with a mean score of 3.85. This feature ensures data accuracy by minimizing errors during input, which is crucial for maintaining reliable donation records. The ability to validate entries in real time provided users with confidence in the accuracy of their work, highlighting the system's effectiveness in supporting precise data management (Chatterjee and Mittal, 2024).

Furthermore, the inclusion of common keyboard shortcuts (e.g., Ctrl + C for copy, Ctrl + S for save, and Ctrl + P for print) was highly rated, with a mean

score of 3.98. These shortcuts significantly improved user efficiency, allowing them to perform frequent actions quickly and seamlessly. This feature reflects the system's thoughtful design aimed at streamlining user workflows (Hussinki, 2022).

The grand weighted mean of 3.74 indicates strong overall agreement on the system's effectiveness among end-users. These findings emphasize the CDMS's success in automating and improving donation management processes through intuitive design, robust functionality, and user-friendly features. The positive feedback underscores the value of incorporating user-centered design principles and continuous feedback in system development to meet user needs effectively.

## 5. Conclusions

The CDMS has made a notable impact on donation management by streamlining processes, improving accuracy, and providing real-time analytics in the research locale. The use of an agile development methodology allowed for continuous user feedback and iterative enhancements, resulting in a system that is both highly functional and user-friendly, while also maintaining strong security features. Key conclusions from the findings include the system's ability to reduce administrative workload and minimize errors, leading to more

accurate financial records. The system received high usability scores and positive feedback, emphasizing its intuitive design and ease of use. Additionally, its robust security features protected sensitive donation data, adhering to industry standards. However, performance efficiency and long-term maintainability still require further optimization to ensure sustainability.

Based on these findings, several recommendations are proposed. First, system efficiency could be improved by refining algorithms and optimizing database queries. Implementing modular code structures, providing comprehensive documentation, and conducting regular code reviews would also contribute to the system's maintainability. Additionally, integrating the CDMS with more financial and communication systems would broaden its functionality. Regular security audits are necessary to maintain data protection and compliance with relevant standards. To enhance the user experience, it is recommended to offer training sessions, provide user manuals, and offer ongoing support. Customizing the system for implementation in other organizations and continuously gathering user feedback will help drive future improvements. These recommendations aim to further refine the CDMS, ensuring its continued effectiveness and scalability in managing donations across a wider range of contexts.

While the CDMS demonstrated significant improvements in operational efficiency and transparency, several limitations were identified. First, the study was limited to a single church setting, which may not fully reflect the diverse needs of other religious institutions. Additionally, the system's performance efficiency and maintainability require further optimization to ensure long-term sustainability. The relatively small sample size of end-users and IT experts may have limited the generalizability of the findings. Lastly, while the system was well-received in terms of usability and security, some features, such as integration with other financial systems, were not fully explored.

On the other hand, future research could expand on this work by applying the CDMS to a broader range of religious institutions and exploring how the system can be customized to meet varying needs. Further studies should also focus on improving performance efficiency and maintainability, addressing the feedback from IT experts. Moreover, investigating the integration of the CDMS with other financial and communication systems could provide greater functionality. Finally, future studies could involve a larger and more diverse group of participants to validate the system's effectiveness across different contexts.

## Compliance with ethical standards

### Ethical considerations

This study adhered to ethical standards, with informed consent obtained from all participants.

Data privacy and security were ensured, and no personal financial data was used beyond system testing.

### Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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