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Research article

An Academic Extension-Driven Solution for Enhancing Local Governance

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Abstract: Despite the rise of the e-governance agenda in supporting local government operations, the involvement of higher education in promoting a collaborative extension initiative supporting such an agenda remains scarce in the literature, especially in rural communities with low digital literacy. Thus, this work details the development and implementation of the Cangbagsa Digital Barangay Information System (CDBIS), an academically driven extension solution that addresses inefficiencies in barangay (i.e., the Philippines' smallest administrative unit) operations. Prior challenges included processing documents within 2–3 days, data inaccuracies, and limited service accessibility. This study aims to digitize local governance, improve efficiency, ensure data integrity, and create a scalable model for community innovation. The system was developed using a web-based, multi-tier architecture that integrates a user-friendly interface, role-based business logic, a centralized database, and secure server infrastructure to support efficient barangay data management and decision-making. The post-implementation evaluation uses the Updated DeLone and McLean Information System Success Model and a 22-item survey for system users, using a 7-point Likert scale. Data from the survey were analyzed through descriptive statistics and stepwise regression to identify predictors of user satisfaction. Respondents rated all constructs highly. Regression analysis shows System Quality as the strongest predictor of satisfaction (β=0.361), followed by Service (β=0.295) and Information Quality (β=0.287), explaining 65% of the variance. CDBIS significantly improved governance, reducing processing time by 75% and improving data accuracy by 88%. Sustaining success requires ongoing optimization, training, and user engagement. The system offers a replicable model for digital transformation in other rural communities.

Keywords: Barangay information system; e-governance; digital transformation; system development; local governance

1. Introduction

Barangays, the Philippines' smallest administrative units, are the frontline of local government, as they directly interact with citizens and provide basic services. However, a significant number of these units, including Barangay Cangbagsa, a residential coastal community with 1,042 residents in 2024 and about 198 households, continue to use outdated manual systems, which undermine their capacity to manage records and provide prompt, efficient services. This dependence on paper-based procedures results in operational

bottlenecks, data inconsistencies, and restricted accessibility, ultimately affecting the quality of services they deliver to their residents. The issues at Cangbagsa, including the 2- to 3-day processing time for simple document requests, frequent data errors, and susceptibility to data loss, are symptomatic of a broader need for digital transformation in local governance.

Siquijor State College, a higher educational institution within the reach of Cangbagsa, in pursuit of its mandate for instruction, research, extension, and production, sees the urgent need for digitization in local government units. As a faculty member in Information Technology and a resident of the locality, the researcher heeded the Barangay Chief's request to address operational inefficiencies, data inconsistencies, and restricted service accessibility in Cangbagsa through a focused extension project: the design and implementation of a Digital Barangay Information System (DBIS). This project aims to transition the barangay's processes from manual to digital, streamlining administrative procedures, maintaining data integrity, and enhancing service availability, thereby demonstrating the practical application of technology to facilitate responsive and efficient local governance and to provide a replicable model for broader community innovation. Also, this project demonstrates the system's effectiveness through documentation of the processes in system design and its corresponding deliverables, offering a worthwhile model for other local government and barangay units interested in streamlining their operations and enhancing service delivery by embracing an information system solution.

In the literature, numerous studies highlight the continued reliance of local government on manual and paper-based procedures; inefficiencies, data fragmentation, and limited transparency arise from these practices [1-5]. These issues are associated with several persistent challenges at the local government level, including limited ICT infrastructure, budgetary constraints, digital skills gaps, and concerns about data privacy and security. These are supported by prior works of Islam *et al.* [6], Heidlund and Sundberg [7], and Nafi'ah [8]. Such problems highlight the desirability of systematically applying established information systems to support local e-governance initiatives. In the Philippines, for instance, Garcia *et al.* [9] highlight the challenges that persist at the grassroots level, noting that only 15% of barangays have fully adopted digital systems. This disparity underscores a critical gap that necessitates further investigation and action to bridge the technological divide in local governance.

Nevertheless, the concept of e-governance in the Philippines has gained significant traction in recent years, as government efforts aim to digitize public services for enhanced efficiency. Notably, Alampay [10] conducted a comprehensive analysis discussing the current government initiative to harmonize e-government projects. They coined it as the Medium-term Information Technology Harmonization Initiative, which prioritizes system interoperability, development of critical registries, and alignment with priority development strategies. This indicates a successful move towards modernizing government services. On the other hand, a growing body of developmental studies focuses on the design and evaluation of barangay information systems or related systems, document and issuance systems, geographic information systems, and health information platforms [11-13]. Empirical evaluations consistently indicate a high level of usability, acceptance, and perceived effectiveness of these systems in reducing administrative workload, improving data accuracy, and enhancing service delivery [14-17]. These align with national digitization efforts and legislative directions, such as the e-Governance Act of 2022, which emphasizes interoperability, cybersecurity, and digital inclusion.

When examining barangay-specific digital solutions, current literature appears limited, particularly in addressing the needs of rural barangays. Most studies focus on urban settings, with Cruz and Reyes [18] documenting several successful implementations in Metro Manila, the Philippine capital. Yet Roberts and Hernandez [19] emphasize the unique challenges rural barangays face in adopting digital technologies. It emphasizes that most marginalised communities are often the least connected and participate least in digital citizenship programmes. The application of Agile methodology within government systems has been recognized as a means to enhance digital transformation projects. The literature reveals several advantages of employing Agile practices in this context, e.g., Kupi and McBride [20]. For instance, Agile enables the faster deployment of essential features within digital platforms, significantly improving service delivery [21]. Moreover, it fosters improved stakeholder engagement throughout the development process, ensuring that

users' needs and feedback are prioritized [22]. This adaptability to changing requirements keeps government projects relevant and responsive. Lastly, the iterative nature of Agile development reduces project risks, allowing for continuous evaluation and improvement [21]. Such methodologies could be instrumental in addressing the performance issues currently faced by various e-governance initiatives in the Philippines. Despite these efforts, the agenda of involving higher education institutions in assisting digitization initiatives in rural communities draws limited attention in the literature. The involvement brings a collaborative platform that enables the productive exchange of expertise to promote the e-governance agenda, which could leapfrog future initiatives in nearby communities. Demonstrating how such development and collaboration efforts work provides critical insights into promoting e-governance in rural communities, especially in developing countries where digitization is still emerging and leaves much to be desired.

Thus, this work intends to contribute to the domain literature in three ways. First, it designs an information system that accounts for the intricacies and idiosyncrasies of Barangay Cangbagsa, a rural community. Aside from the overarching components of the proposed information system, which include the resident database, project and program monitoring, barangay directory, and analytics reports, it embeds analytics capabilities to support more informed decision-making. Second, it demonstrates the deployment of the information system to Cangbagsa, given their existing IT infrastructure and the technical expertise of their human resources. Third, it evaluates the adoption of the information system in the community and identifies specific gaps that could serve as a salient feedback mechanism for future system development efforts in similar communities.

To assess the adoption of the proposed CDBIS, the updated DeLone & McLean Information Systems Success Model [23] is deployed. This multidimensional framework examines the interdependent success metrics across distinct performance categories. This study integrates such an established model to develop a comprehensive analytical structure for interpreting findings that inform the adoption of the proposed information system and, by extension, similar systems. The model encompasses six critical dimensions of information system effectiveness: system quality, information quality, service quality, usage quality, usage patterns, user satisfaction, and net benefits. As illustrated in Figure 1, these components are interconnected: Technical attributes (system, information, and service quality) directly influence both adoption behaviors (Usage/intent) and satisfaction levels. Subsequent system engagement generates tangible benefits that later create a feedback loop, affecting continued usage and stakeholder satisfaction.

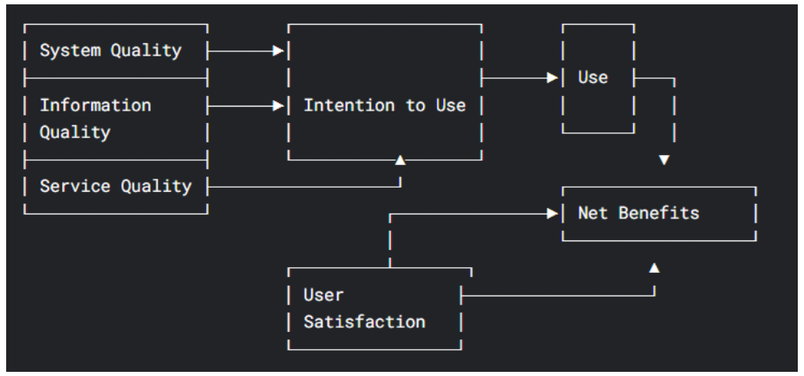

Figure 1. Updated Information Systems Success Model

In addition, the DeLone & McLean model [23] was applied in the study to support the specific objectives of assessing the CDBIS. Although the full model encompasses the elements of "Use" and "Net Benefits," these aspects were not given much emphasis, as the system's implementation is still new and its use is mandatory for all barangay officials and personnel. Therefore, assessing the "Use" of the system would not yield much variation, since all respondents (or project beneficiaries) are required to use it. Likewise, "Net

Benefits" was not considered since this study focused on the initial perceptions of the respondents regarding the quality of the system, information, and service, and not on the long-term effects of the system on the organization and community, which would require a longer period of observation and comparison of baseline data. Through the use of the contextualized model, the assessment of the system is made more practical and context-specific, focusing on the aspects that were most relevant to the initial assessment of the proposed system while recognizing that future studies could use the full DeLone & McLean model to assess the usage and socio-economic benefits of the system. Consequently, Pitt et al. [24] adapted Delone & McLean's Updated Information System Success Model for clientele retention contexts. Following Jeyaraj [25], they streamlined the framework to three core quality dimensions that collectively determine system effectiveness. This modified structure is visually presented in Figure 2. Driven by this modified structure, the study applies the adapted framework to assess the effectiveness of CDBIS as an e-governance solution. Correspondingly, the model incorporates three core dimensions: system quality (i.e., alignment with user specifications and satisfaction benchmarks), information quality (i.e., content value and utility), and service quality (i.e., technical performance against user expectations).

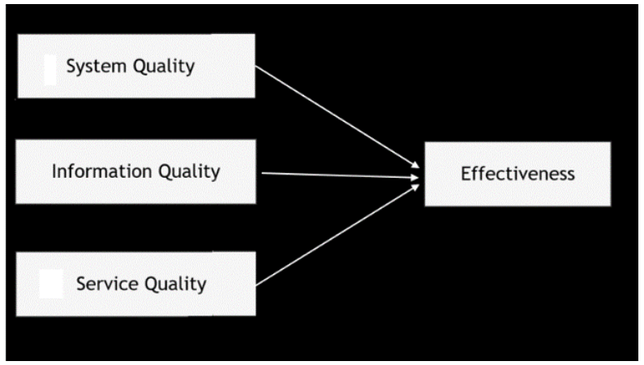

Figure 2. The Factors on the Quality of CBIS Systems' Effectiveness

2. Materials and Methods

2.1 Research Design

This study employed a developmental and descriptive approach. Specifically, it focused on the design, development, deployment, and assessment of the CDBIS as a technology-based extension initiative. The approach is appropriate for information systems research that aims to produce an operational system and empirically evaluate its effectiveness upon its implementation.

2.2 Development Paradigm

The system development follows the Agile software development methodology, which emphasizes flexibility, iterative development, and continuous stakeholder involvement. The Agile approach was selected due to the evolving requirements of barangay operations and the need for frequent feedback from barangay end users. The development process is divided into iterative cycles consisting of five phases: (1) pre-development, (2) development, (3) iteration, (4) feedback, lessons, and refining, and (5) deployment. These phases are represented in Figure 3.

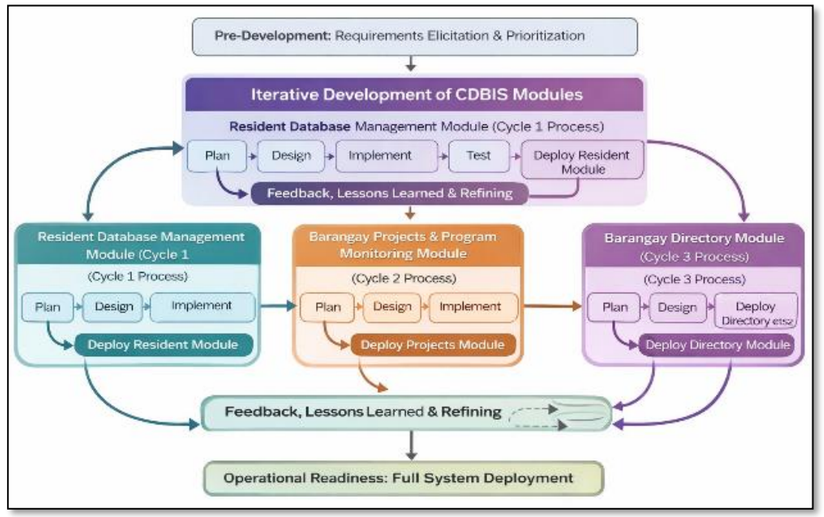

Figure 3. Iterative Development Life Cycle of the CBDIS

The CDBIS development process follows a systematic, iterative approach based on the Agile Software Development paradigm. The first stage is pre-development, where the main stakeholders or end users, including the barangay secretary, barangay captain (or Chief), selected residents, and the developer, are involved in requirements gathering and prioritization. The stage ensures that the system aligns with the community's genuine needs and that specific goals are set for the system's capabilities. Next, the project moves through three iterative development stages (sprints), each focusing on a different module. The first sprint focused on the Resident Database Management Module, which underwent planning, design, implementation, testing, and deployment. The second sprint highlights the Barangay Projects and Program Monitoring Module, which also went through the iterative development process, while the third sprint focuses on the Barangay Directory Module. The iterative processes in each of the three sprints lasted two weeks, allowing sufficient time for development, testing, and stakeholder feedback. Throughout the three sprints, continuous feedback from barangay officials and some residents was incorporated to improve the system's functionality and usability, with a user-centered approach. The development team includes the developer, the extension director, the barangay secretary, the barangay chief, IT experts, and selected residents who were actively involved in decision-making, testing, and reviewing. The system was developed using web technologies such as HTML, CSS, and JavaScript for front-end development, a relational database management system (RDBMS) for data storage, and PHP for server-side scripting. The system is hosted on a secure server environment with regular backups to ensure availability and functionality at all times. After the refinement and successful deployment of all modules, the system entered the operational readiness stage, indicating full deployment and community use.

2.3 System Architecture and Technology Stack

The CDBIS was developed as a web-based, multi-tier information system architecture to ensure accessibility, scalability, and maintainability. Its system infrastructure is illustrated in Figure 4.

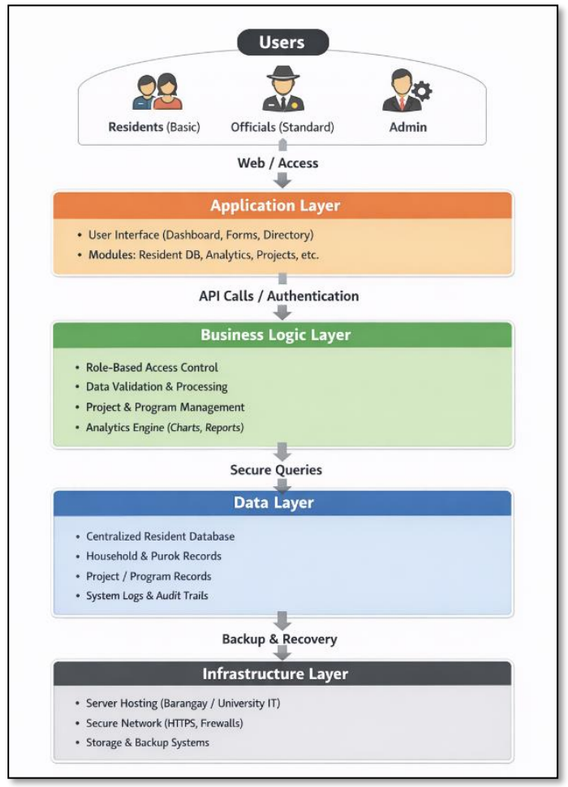

Figure 4. Cangbagsa Barangay Digital Information System Architecture

Details of the system infrastructure are provided as follows:

2.3.1 Presentation Layer

The presentation layer is the system user interface. It was built using standard web technologies like HTML, CSS, and JavaScript to ensure compatibility with most web browsers. This layer provides community and barangay officials with accessible tools, including dashboards, digital forms, and directories. Focusing on usability and responsiveness, it allows users to seamlessly engage with the system by inputting resident information, checking project updates, or searching directories.

2.3.2 Application and Business Logic Layer

This layer is the central engine of the CDBIS. It handles critical operations such as user authentication and role-based access control, ensuring that only authorized users can access confidential information. It also handles resident record management, project monitoring, and analytics processing, allowing barangay officials to make informed decisions based on real-time data. Server-side processing in this layer handles user requests and securely communicates with the database via application programming interfaces (APIs), ensuring system efficiency and security.

2.3.3 Data Layer

The data layer stores and manages structured data. Using an RDBMS, it stores data for resident profiles, household information, barangay projects, user accounts, and system logs. This structured data enables fast, precise information retrieval, supporting accurate reporting and monitoring. By centralizing community data, the system provides a solid platform for evidence-based planning and governance.

2.3.4 Infrastructure Layer

The infrastructure layer is the technical backbone of the CDBIS. It runs the system in a secure server environment and is aided by network services that provide connectivity. The system has routine backup processes integrated to eliminate data loss and ensure availability, reliability, and recoverability in the event of disruptions. This layer also provides system resilience and reliability, which allows barangay officials and residents to depend on the system for their day-to-day activities.

2.4 Security and Data Privacy Measures

To ensure the protection of personal and sensitive data, the CDBIS was developed in compliance with the Philippine Data Privacy Act of 2012 (Republic Act No. 10173). In addition, various security features were also integrated to ensure the confidentiality, integrity, and availability of data. First, Role-Based Access Control (RBAC) was implemented to ensure that users can access only data relevant to their roles, thereby minimizing the risk of unauthorized disclosure. Second, secure data transfer is also ensured through HTTPS encryption, which protects data as it is transmitted between users and the system. Third, the data integrity is also safeguarded through input validation and system checks, which prevent the entry of invalid and inconsistent data. Fourth, audit trails and logging systems are also integrated to monitor activities within the system, thus promoting accountability and transparency in system operations. And lastly, to further enhance the system's resilience, data backups and a secure server setup are also employed to ensure the system can recover in the event of failure or data loss.

2.5 Limitations

Aside from the success of the design, deployment, and evaluation of CDBIS, a few challenges hindered its deployment and evaluation. First, a good number of barangay officials and household residents have limited digital literacy skills, so additional orientation and hands-on training are deemed necessary to enable them to use the system fully. Additionally, there are some IT infrastructure limitations, such as internet connectivity and the availability of compatible devices, that occasionally affect the system's performance and usability. However, most of these challenges have been resolved and mitigated through additional user training and constant troubleshooting aided by the extension project initiated by Siquijor State College.

2.6 Sustainability

The sustainability of the CDBIS depends on clear provisions for maintenance, costs, and technical support. The system's maintenance will be addressed through regular updates and database backups to ensure reliability and security within the framework. In addition, the cost structure is mainly composed of regular software updates, network and connectivity, electricity, and minimal user training costs, which can be addressed through funding from the local government. Technical support will be provided by the faculty of the College of Technology at Siquijor State College, in coordination with the barangay through a Memorandum of Understanding, and as part of the Technology Transfer Agreement between the college and the community, ensuring that troubleshooting, updates, and user support are always available. This sustainability plan outlines the directions for the project's long-term sustainability.

2.7 System Pages

The CDBIS is a robust, web-based system designed to make barangay operations easier and more efficient. When users log in, they are presented with a clean and simple homepage that showcases the system's key features. Designed with accessibility in mind, the system's homepage provides easy access to key areas, including resident analysis, household information, project and program tracking, and the barangay directory. This one-stop access makes it convenient for barangay officials, employees, and residents to access information, manage records, and track barangay initiatives. Moreover, the homepage is not only clean and organized; it is also role-aware, dynamically changing what users see depending on their access level to ensure the security of the system's data and the smooth flow of operations. In addition to the homepage shown in Figure 5, four other modules work seamlessly together to support a particular aspect of barangay management.

Figure 5. Cangbagsa Digital Barangay Information System Homepage

These modules are presented in the following:

2.7.1 Resident Database Management Module

Figure 6 shows the Resident Database Management Page, Barangay Cangbagsa's central demographic repository. This module enables authorized personnel to easily insert, modify, search for, and view all resident and household information. Designed for processing data in real time, this module ensures that all data is up to date and accurate, helping make well-informed decisions and improve service delivery. It also enables the direct generation of official documents such as the barangay census report, making administrative processes easier and more transparent. The module is user-friendly and accounts for user roles, enabling system administrators to navigate resident, household, and voter information seamlessly.

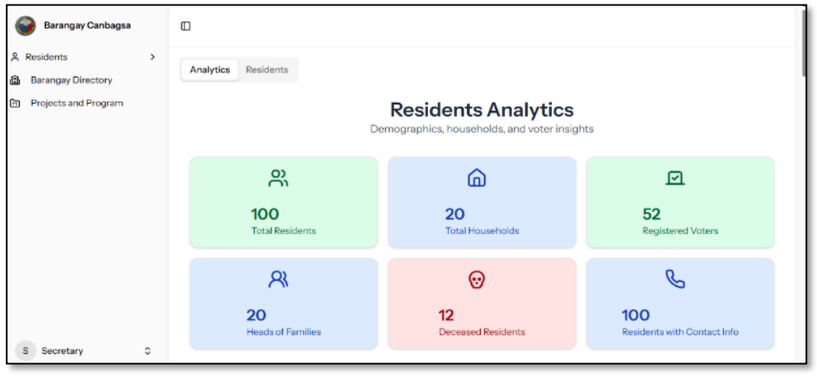

Figure 6. Resident Database Management Page

2.7.2 Barangay Projects and Program Monitoring Module

The Barangay Projects and Program Monitoring Page, as shown in Figure 7, is a dynamic, transparent platform for barangay development monitoring. It is a real-time dashboard that provides vital project information: status, timeline, and budget allocation. With this system, barangay officials and personnel can monitor project developments in real time, making informed decisions. The module can generate comprehensive reports that provide stakeholders with a complete understanding of project outcomes and ensure responsible resource management. Through its clean and interactive design, the monitoring page enhances transparency and facilitates data-driven decision-making.

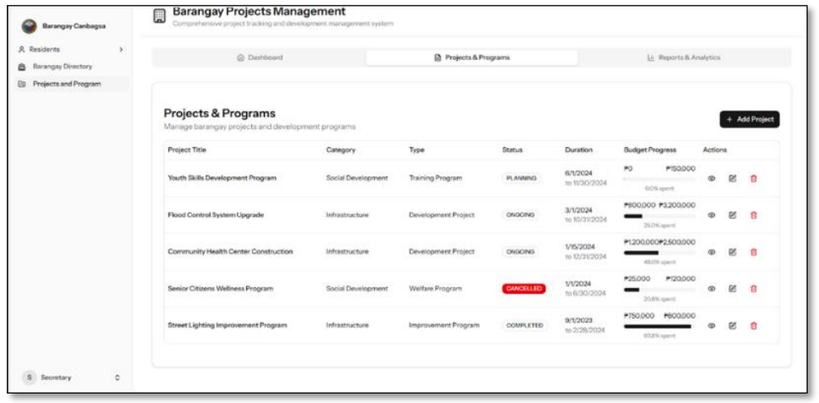

Figure 7. Barangay Projects and Program Monitoring Page

2.7.3 Barangay Directory Module

Figure 8 presents the Barangay Directory Page, a dedicated section of the information system designed to enhance transparency and foster public accessibility. This module serves as a centralized digital repository of elected barangay officials and appointed personnel, providing essential contact details, office roles, and service information in compliance with the Philippine Data Privacy Act of 2012. By making this data readily available, the directory promotes open governance and strengthens community engagement. The page also highlights key service features, including organized recordkeeping, secure system access, efficient community management, and streamlined digital services. These elements ensure that residents can easily connect with barangay offices for inquiries, transactions, and support. With clearly displayed office hours, hotline numbers, and email contacts, the directory empowers citizens to access public services with ease and confidence.

Figure 8. Barangay Directory Page

2.7.3 Analytics and Reporting Module

The Analytics and Reporting Page is the central location for data visualization and reporting within the system, designed to support evidence-based barangay governance. The page enables users to extract real-time summaries, identify trends, and generate operational reports that accurately reflect the performance of various community projects and programs. Using simple graphs and essential data points such as the number of projects, completion rates, and budget utilization, the page provides a comprehensive view of development achievements and resource allocation. Category- and status-based graphs enable barangay leaders to identify areas where progress is being made, where projects are stalled or canceled, and to adjust strategies accordingly.

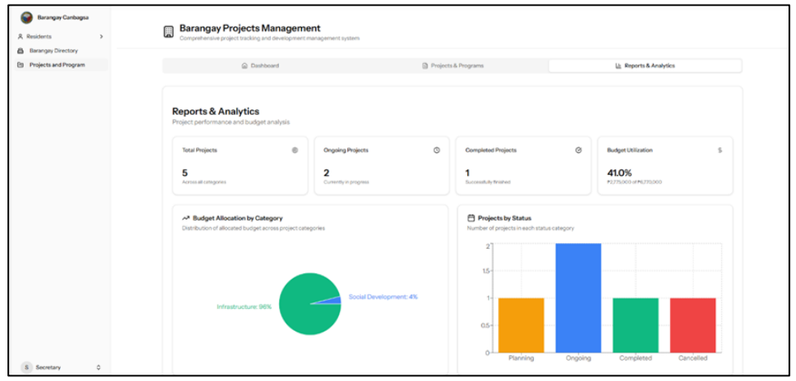

Figure 9. Analytics and Reporting Page

2.8 System Evaluation

After system implementation, a quantitative adoption evaluation was conducted to assess user satisfaction and system effectiveness. The evaluation was guided by the updated DeLone and McLean Information Systems Success Model.

2.8.1 Respondents and Data Collection

A total of 50 respondents took part in the assessment of the CDBIS. The sample includes six of eight barangay officials and personnel actively utilizing the system, accounting for 75% of the total population, and 44 household heads out of 198, representing 22% of the sample. The barangay officials offered administrative insights, while the household heads provided community-level insights. The choice of these respondent profiles ensures that the assessment was conducted properly, reflecting the experiences of both those who implement the system and those who benefit from its services. The CDBIS was assessed six months after its launch in April 2025. This allows sufficient hands-on experience for the users of the system, namely the barangay officials and the household heads, so that their feedback would be based on experience with the functional system. Before administering the survey, all respondents were reoriented to the system's characteristics and the constructs of the Updated Delone & McLean Information System Success Model to ensure they provided accurate, informed answers. Additionally, the research bias toward the local and the researcher has been eliminated, as the respondents were well-informed about the system and received hands-on experience. Pilot testing of the model's measures (or items) was deliberately skipped, as a standardized evaluation tool was adopted and the instrument had been tested for reliability in similar settings in the literature. The tool was reviewed for contextualization by three information technology experts and two barangay officials who were not part of the main survey. They maintained that the instrument was appropriate for deployment in the study environment but suggested translating it into the local dialect to facilitate better understanding by the respondents. The translation was conducted by the researcher in collaboration with the Siquijor State College Research Office to ensure it was culturally and linguistically appropriate. Informed consent was obtained from all participants before data collection to ensure they understood the purpose of the study, that their participation was voluntary, and that the information gathered would be kept confidential.

2.8.2 Instrument and Data Analysis

Based on the constructs of the Updated Delone & McLean Information System Success Model, the evaluation includes a 22-item survey questionnaire structured around four (4) constructs. System quality is evaluated through seven (7) measures: design, navigation response, response time, system security, system availability, functionality, and error-free transactions. Information quality assessment focuses on seven (7) measures: content variety, completeness, detail, accuracy, timeliness, reliability, and appropriateness. Service quality incorporates six (6) measures: responsiveness, reliability, confidence, empathy, follow-up service, and competence. Meanwhile, the user satisfaction construct involves two (2) measures: perceived user acceptance and perceived user satisfaction.

This methodological approach provides valid measurement parameters for evaluating the CDBIS. Survey responses were analyzed using a 7-point Likert Scale (i.e., strongly disagree, disagree, somewhat disagree, neutral, somewhat agree, agree, and strongly agree) to assess user agreement with each model construct. For quantification, the weighted mean was computed for each indicator, each construct, and the overall system evaluation. The mean scores were analyzed using the following descriptive scale: 6.50-7.00: Strongly Agree (Very High); 5.50-6.49: Agree (High); 4.50-5.49: Somewhat Agree (Moderately High); 3.50-4.49: Neutral (Moderate); 2.50-3.49: Somewhat Disagree (Low); 1.50-2.49: Disagree (Very Low); and 1.00-1.49: Strongly Disagree (Extremely Low). This quantitative method enables the generation of measurable, comparable parameters for evaluating the effectiveness, usability, and acceptability of the CDBIS.

3. Results and Discussion

In this section, the evaluation results of the CDBIS using the Updated Delone & McLean Information System Success Model are discussed in sufficient detail. The evaluation spans four constructs: system quality, information quality, service quality, and user satisfaction. Table 1 presents the results for the system quality construct, including the mean evaluation score for each measure, its corresponding Standard Error of the Mean (SEM), and the corresponding interpretation of the score, as defined in Section 2.8.2. It suggests that all mean scores are above 5.86 ("Strongly Agree" is at 6.24), with Error-Free Transactions scoring highest (6.24 ± 0.150) and System Availability lowest (5.86 ± 0.151). All items are interpreted as "Agree" except the highest, which is "Strongly Agree". The composite mean is 6.02±0.124.

Table 1. System Quality

Measures	Mean ± SEM	Interpretation
Design	6.08 ± 0.137	Agree
Navigation Response	5.92 ± 0.134	Agree
Response Time	6.12 ± 0.147	Agree
System Security	6.04 ± 0.137	Agree
System Availability	5.86 ± 0.151	Agree
Functionality	5.88 ± 0.133	Agree
Error Free Transaction	6.24 ± 0.150	Strongly Agree
Composite	**6.02 ± 0.124**	**Agree**

These results show that the CDBIS achieves high ratings across all system quality measures. Error-Free Transactions receives the highest score (6.24), followed by Response Time (6.12), indicating that users strongly value reliable, smooth, and efficient performance. The composite mean of 6.02 confirms that respondents agree the system consistently meets their expectations for technical quality. These findings align with the DeLone and McLean Information System Success Model [23] and studies by Gable *et al.* [26], which highlight that system reliability and fast response times are key drivers of user satisfaction. However, other research, such as Livari [27] and Shareef et al. [28], suggests that technical quality alone does not entirely predict satisfaction, as users also expect relevant information and responsive support. This implies that while CDBIS has established a strong technical foundation, continuous effort is needed to maintain system stability and performance. At the same time, complementing technical improvements with adequate user support and content relevance would help sustain high levels of trust and satisfaction among barangay users.

Meanwhile, Table 2 shows that users rated the quality of information provided by the CDBIS at 5.67. The highest score, 5.92, is for Accurate Information, indicating that most people consider the data generated by the CDBIS reliable and correct. Following close behind, Detailed Information receives a 5.88, suggesting that the system provides enough useful details to meet users' requirements. Also, mean evaluation scores across categories such as Content Variety, Complete Information, Timely Information, and Appropriate Information all fall between 5.62 and 5.64, indicating that users believe the system is relevant, thorough, and up-to-date. Moreover, Reliable Information receives the lowest score, 5.36, yet it still fits within the Agree range. This indicates minor concerns about consistency, but overall, users still demonstrate confidence in the system's generated information. These findings align with Lee *et al.* [29], who emphasized that accuracy and

detail are critical components of perceived information quality. At the same time, studies such as those by Wang and Strong [30] found that reliability and timeliness are equally important in building user confidence, and lower reliability scores can affect overall trust. Furthermore, these imply that while the system delivers useful and accurate information, improvements are needed to ensure that the data is consistently reliable. Strengthening data entry quality control, training staff in information management, and adopting automated validation tools will help address these concerns and further enhance user trust.

Table 2. Information Quality

Measures	Mean ± SEM	Interpretation
Content Variety	5.62 ± 0.151	Agree
Complete Information	5.62 ± 0.148	Agree
Detailed Information	5.88 ± 0.139	Agree
Accurate Information	5.92 ± 0.142	Agree
Timely Information	5.64 ± 0.151	Agree
Reliable Information	5.36 ± 0.189	Agree
Appropriate Information	5.62 ± 0.156	Agree
Composite	**5.67 ± 0.144**	**Agree**

As shown in Table 3, respondents have a high regard for the service quality of the CDBIS. In aggregate, the mean of the composite is 6.18, which is a "Strongly Agree", and is indicative of a decisively satisfied perspective. The highest mean scores correspond to Empathy (6.34), Follow-Up Service (6.32), and Competence (6.32), indicating that users believe in a clear understanding of the system staff, appropriate attention, and highly effective staff. Confidence (6.16) and Reliability (6.12) also obtain higher mean scores, indicating that users trust the services and rely on them. Responsiveness is marginally lower at 5.82, but not yet at the level of "Undecided," indicating that the system is responsive with efficient support. Altogether, these findings validate that CDBIS is indeed viewed as a reliable, competent, and user-focused service platform. These insights show that users feel well-supported and understood when interacting with the system's personnel. As confidence and reliability are highly rated, this further confirms trust in the service provided. These findings are consistent with the SERVQUAL model as cited by Davis [31], which emphasizes that empathy, responsiveness, and assurance are critical drivers of user satisfaction. Prior research by Zeithaml *et al.* [32] similarly found that consistent, professional support strongly influences perceptions of service quality in public sector systems. The implication is that strong service interactions are a key factor in sustaining satisfaction with the CDBIS. Barangay management should continue prioritizing staff training focused on empathy, communication skills, and problem resolution to maintain the high standards users expect and value. This is supported by the comment of the Barangay Secretary, one of the system administrators, who noted that, "The system helps me in processing reports faster and more organized compared to the manual system." In addition, an IT graduate and one of the household heads and respondents also highlighted that, "Before we had to go back to the barangay several times for our Brgy. Certificate to be released. Today, we received it in just a few minutes of processing."

Table 3. Service Quality

Measures	Mean ± SEM	Interpretation
Responsiveness	5.82 ± 0.161	Agree
Reliability	6.12 ± 0.145	Agree
Confidence	6.16 ± 0.141	Agree
Empathy	6.34 ± 0.147	Strongly Agree
Follow-Up Service	6.32 ± 0.147	Strongly Agree
Competence	6.32 ± 0.150	Strongly Agree
Composite	**6.18 ± 0.139**	**Strongly Agree**

Table 4 shows that users generally have a positive perception of their satisfaction with the CDBIS. The composite mean score of 5.99 indicates that respondents are satisfied with the system's overall performance. Perceived user acceptance receives a mean of 6.08, suggesting that most users have willingly accepted and adopted the system in their daily transactions. Perceived user satisfaction scored 5.90, showing that users are pleased with their experience using CDBIS. These results demonstrate that the system meets user expectations and effectively supports their needs, contributing to high levels of acceptance and satisfaction among barangay constituents and indicating that most users have integrated the system into their regular activities and view it positively. These findings align with the Technology Acceptance Model [31], which highlights that perceived usefulness and ease of use are strong predictors of user satisfaction and continued adoption. Similar studies in e-governance by Shareef *et al. [28] have shown that when digital systems are relevant and easy to use, users are more likely to embrace them in the* long term. Thus, CDBIS has successfully gained community trust, and its integration is pivotal in barangay operations. Management can build on this momentum by introducing additional features, offering refresher orientations, and promoting active user feedback to further strengthen satisfaction and long-term engagement. In summary, the results demonstrate consistently high mean scores across all measured constructs, supporting the working hypothesis that the CDBIS would be positively received and that higher perceptions of quality would correspond to higher user satisfaction.

Table 4. User Satisfaction

Measures	Mean ± SEM	Interpretation
Perceived user acceptance	6.08 ± 0.145	Agree
Perceived user satisfaction	5.90 ± 0.141	Agree
Composite	**5.99 ± 0.135**	**Agree**

The collinearity diagnostics in Table 5 indicate no serious multicollinearity among the predictors. Tolerance values for system quality (0.512), service quality (0.593), and information quality (0.558) are well above the minimum acceptable level of 0.10, indicating each variable contributes unique variance to the model. Variance inflation factors (VIF) ranging from 1.688 to 1.925 remain substantially below the critical threshold of 10, confirming that multicollinearity is minimal and does not compromise the stability or interpretability of the regression coefficients. The regression results in Table 5 reveal that System Quality ($\beta = 0.361$) has the strongest influence on User Satisfaction, followed by Service Quality ($\beta = 0.295$) and Information Quality ($\beta = 0.287$). The model explains 65% of the variance in satisfaction ($R^2 = 0.650$), indicating a substantial predictive power. All predictors were statistically significant, confirming their relevance to user experience. These findings align with the DeLone and McLean Information System Success Model [23], which identifies system, service, and information quality as key contributors to system success. Supporting studies also emphasize that improvements in these areas directly influence user satisfaction and overall system effectiveness. The implication is that system performance should remain a top priority to achieve the most significant impact on satisfaction. However, a balanced approach that also enhances service interactions and information consistency will ensure more comprehensive and sustainable improvements in user experience. The absence of multicollinearity confirms the stability of these findings.

Table 5. Stepwise regression estimates of constructs with influence on user satisfaction of the CDBIS

Construct	β	SE	t-value	95% CI		Collinearity	
				Lower	Upper	Tol	VIF
System Quality	0.361**	0.132	2.96	0.125	0.658	0.512	1.925
Service Quality	0.295*	0.110	2.60	0.065	0.509	0.593	1.688
Information Quality	0.287*	0.109	2.46	0.049	0.489	0.558	1.793

[a] Probability of F to enter ≤0.05 and probability of F to remove ≥0.01.
[b] Influential factor/construct: constant + system quality + service quality + information quality. F change = 6.046, Sig F change = 0.018. Regression and Residual ANOVA: F =28.481, p = 0.000. $R^2 = 0.650$.
* significant at p≤0.05, **significant at p < 0.001

Finally, based on barangay secretary data logs, the CDBIS significantly improved the system's efficiency. The average processing time per document, which took 2-3 days (i.e., 2.5 days on average), was reduced by 75%, to ~0.625 days (~5 hours). This enabled the system to process 20 clients per day, up from 5 previously. Moreover, the system's accuracy improved from 90% to 98-99%, which is an 88% error reduction in processing. Together, the results suggest that the CDBIS is a successful example of a digital governance platform. However, sustained efforts in system reliability, service responsiveness, and information consistency are critical to maintaining user trust and satisfaction as the system upgrades.

4. Conclusions

Dependence on paper-based procedures in local government units has been found to have adverse impacts on operational efficiency, data quality, information accessibility, and service quality. The rise of e-governance platforms helped bridge these gaps, demonstrating effectiveness in minimizing administrative workload, enhancing data quality, and improving service delivery, all deemed critical to governance. Although significant attention has been paid in the literature to the design and implementation of these e-governance systems, the involvement of higher education in carrying out extension projects to promote a collaborative platform for the e-governance agenda remains a gap in practice, particularly in developing countries with rural communities where digital literacy is relatively low. Thus, this work demonstrates the design and deployment of CDBIS, an information system that transitions processes from manual to digital, streamlines administrative procedures, maintains data integrity, and enhances service availability. Furthermore, aside from the design and implementation of the CDBIS in a case barangay, this study reports an evaluation of the adoption efficacy of the CDBIS from the lens of the Updated DeLone & McLean Information Systems Success Model. Results of the adoption evaluation found strong positive perceptions across system quality, information quality, service quality, and user satisfaction constructs of the model. System Quality scores highest overall, highlighting the importance of reliable, efficient performance. While Information Quality is rated positively for accuracy and detail, some concerns about reliability suggest the need for improved data consistency. Measures such as maintaining data entry quality control, training staff on information management, and adopting automated validation tools would address these concerns. Service Quality achieves excellent ratings, especially for empathy and competence, confirming that responsive support significantly enhances satisfaction. Findings also revealed that the system met user expectations and effectively supported their needs, contributing to high levels of user satisfaction among stakeholders and end users. Regression results showed that System Quality had the most significant impact on User Satisfaction, followed by Service and Information Quality, consistent with established information systems success models. Collinearity diagnostics confirm the stability of these findings. Overall, CDBIS has been effectively integrated into barangay operations and demonstrates strong potential as a model for e-governance. Sustaining this success requires continuous system improvements, staff training, and active user engagement to build long-term trust and satisfaction. Finally, this work offers a practical application of technology to facilitate effective local governance, which can be adopted for broader innovation in rural communities. Future research could explore long-term usage patterns and the impact of additional features on community engagement. Also, as the adoption evaluation survey covers only a limited number of respondents, the generalizability of the results to other barangays or communities may need further examination in future work.

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