



Development and Evaluation of a Web-Based GIS-Enabled Demographic Profiling System for Data-Driven Local Government Policy Making

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Citation:

Paculaba, M.A. Development and evaluation of a web-based gis-enabled demographic profiling system for data-driven local government policy making *ASEAN J. Sci. Tech. Report.* **2026**, 29(7), e262067. <https://doi.org/10.55164/ajstr.v29i7.262067>

Article history:

Received: October 26, 2025

Revised: April 12, 2026

Accepted: May 13, 2026

Available online: June 14, 2026

Publisher's Note:

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Abstract: Timely and accurate demographic data have become an important factor for effective local governance. However, many municipalities in the 2nd District of Samar have yet to gather and collate household data automatically. Advanced methods often yield siloed datasets that clutter analysis and reduce the likelihood of spatial visualization. Consequently, the information generated is less useful in formulating effective sub-national policies. Furthermore, current demographic information systems are not integrated with GIS or web-based applications, creating a disconnect between data collection and information generation. This study aimed to fill the gap by developing a web-based GIS-enabled demographic profiling system to strengthen evidence-based policy-making among local government units (LGUs) in the 2nd District of Samar. The system integrates household-level demographic records and visualizes them through interactive GIS maps and dashboards for easier access, management, and spatial analysis. A descriptive research design was used to evaluate the system's functionality, reliability, usability, efficiency, maintainability, and portability, following the ISO 9126/25010 software quality framework. Further, the system's development follows the Waterfall System Development Life Cycle (SDLC) model. Results showed that the system met essential software quality standards and substantially improved how demographic data are accessed and analyzed. Thus, the system enhances Samar's LGUs' ability to design well-informed, inclusive, and community-oriented local policies.

Keywords: Information system development; waterfall model; ISO 9126/25010 quality model; web-based system; information system assessment

1. Introduction

Effective governance requires timely, relevant, and spatially referenced population information. Governments at the global, national, and local levels are recognizing that health services, infrastructure, disaster preparedness, and social protection plans require population and household statistics [1,2]. Over the past decade, the convergence of web technologies and Geographic Information Systems (GIS) has transformed how such data are collected, analyzed, and presented. Web-based information systems provide real-time data capture and integration, while GIS adds spatial intelligence, enabling decision-makers to visualize and query demographic indicators across

geographic scales [3-5]. Together, these technologies provide actionable insights for evidence-based policy formulation on raw demographic data.

Web-based GIS platforms can be applied in various governance and planning contexts, demonstrating potential to transform spatial decision-making. The effects of the systems impacted forest conservation, climate change, urban planning, and public health significantly[3]. These tools also enable data-driven decision-making by providing new, innovative capabilities to manage resources and respond to crises [6]. For example, a web-GIS platform design for sustainable waste governance in Istanbul that enabled stakeholder participation and real-time data sharing [7]. Also, the technology's utilization in urban governance has strengthened through visualization, enabling informed decision-making and enhancing citizen participation [9]. Thus, web-based GIS is vital for modern collaborative governance. Furthermore, many studies suggest that demographic profiling, along with spatial analysis, can significantly improve policy-making capabilities. The evidence indicates that a range of policies can create a certain impact. This shows how geodemography can help gain an understanding of our population and allow for more targeted interventions in urban planning, public health, and disaster management [9]. Also, spatial integration enables the identification of asynchronous data across different levels of government and provides useful geographic perspectives for demographic policy-making [10].

The Philippines faces significant challenges in leveraging Web-GIS platforms and spatial analytics for evidence-based policy-making, despite promising technological initiatives. The Community-Based Monitoring System (CBMS) pertains to a major national initiative that aims to enhance local-level data[11]. While the national Community-Based Monitoring System (CBMS) provides vital socioeconomic indicators, there is a recognized opportunity to enhance local agility by bridging the time between national data collection and real-time local application. Many local government units (LGUs) still use manual, paper-based workflows, which can result in fragmented data. [12]. Furthermore, existing systems primarily focus on single-sector issues, such as health surveillance or disaster mapping, rather than integrated household-level profiling. Studies reveal that Web-GIS technologies can support real-time integrated spatial analysis and decision-making systems [13]. Limited disaggregation, pooling of local government spending data, and sub-national survey capacity are the key challenges. It restricts the accurate measurement of many development indicators and the impacts of policies. Web-based GIS tools in the Philippines demonstrate significant potential for demographic analysis but remain fragmented across sector-specific applications. Research highlights diverse implementations, including health surveillance[14], election monitoring[15], and population data management[16]. Although these studies validate the feasibility of web-GIS applications in the Philippines, they mostly focus on a single sectoral problem, such as health surveillance, disaster mapping, or housing gaps. Furthermore, they rarely integrate household-level demographic profiling with dynamic, interactive spatial analysis to inform policy formulation.

The Eastern Visayas region in the Philippines, particularly Samar Province, urgently requires integrated demographic information systems due to its vulnerability to poverty and natural hazards[17]. Within this province, the 2nd District faces a persistent problem with household-level demographic data. Municipal Rural Health Units and Planning Offices rely heavily on manual processes to gather, tabulate, and extract information. The delay in updates, bad transcription, and limited mapping of household locations, sanitation conditions, and unmet need for family-planning services are due to these paper-based workflows. The Community-Based Monitoring System (CBMS) has provided numerous socioeconomic indicators. However, CBMS has yet to have an integrated LGU-managed web-based GIS platform capable of converting raw household data into decision-ready, spatially explicit information [11]. Consequently, it is difficult for local government units in the 2nd District of Samar to identify spatial patterns of vulnerability, create targeted interventions, and monitor development outcomes. Moreover, while there are studies on web-based GIS and demographic profiling, a distinct gap exists: there is no published research on the development and evaluation of a web-based, GIS-enabled demographic profiling system by the local government in the context of the Philippine LGU operationalized at the district scale. Existing Philippine systems do not usually have interactive spatial dashboards, nor are they designed for broad purposes. What is needed instead is an end-

to-end solution that integrates household data, visualizes indicators on sanitation and family planning, and allows for evidence-based policy formulation.

The present study aims to fill this gap by creating a web-based GIS-enabled demographic profiling system for the 2nd District of Samar. The system aims to strengthen local policy-making, service delivery, and data-driven governance in an environment where manual workflows hamper effective decision-making by converting household data generated manually into interactive, spatially explicit, and query-ready information. This system is designed to complement the national Community-Based Monitoring System (CBMS) by providing a localized, real-time interface tailored for immediate LGU operations. While the CBMS serves as a vital national initiative for comprehensive socioeconomic data, this platform offers the 2nd District of Samar the agility to process and visualize household-level data in real time, facilitating rapid, evidence-based local interventions.

2. Materials and Methods

2.1 Materials

2.1.1 Research Design

This study utilized developmental-descriptive research, a type of research common in information systems research, in which functional prototypes are designed, implemented, and evaluated as the subject of research [18-19]. The design's development stage was realized through the application of the Waterfall Software Development Life Cycle (SDLC) model, comprising requirements analysis, system design, implementation, testing, deployment, and maintenance [20]. On the other hand, the descriptive aspect of the study was incorporated during the assessment phase. Specifically, the system's effectiveness was evaluated using the ISO 9126 quality model. While ISO 25010 is the newer standard, ISO 9126 was chosen to focus strictly on the six core characteristics (Functionality, Reliability, Usability, Efficiency, Maintainability, and Portability) most critical for software deployment in resource-constrained local government environments. The evaluation used standardized tools, including validated questionnaires and usability testing, ensuring that findings were quantifiable and replicable.

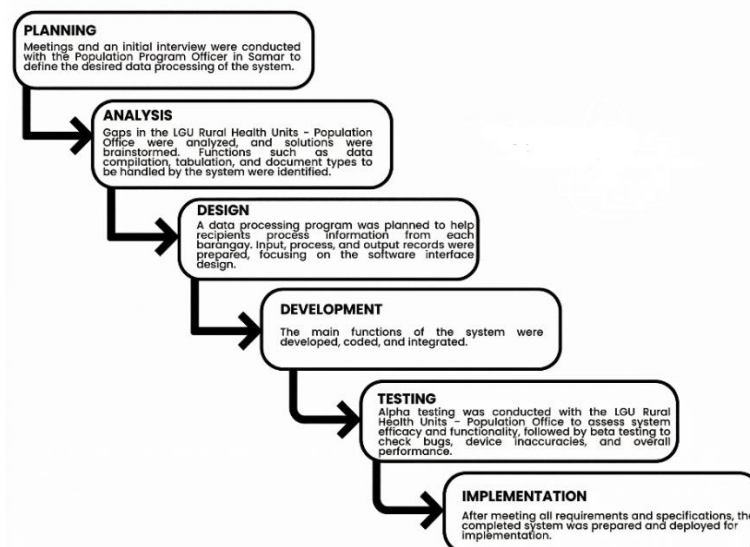


Figure 1. Waterfall Software Development Life Cycle

2.1.2 Data Sources

Two primary data sources were employed in this study. The first dataset consisted of household-level socio-demographic variables, including household composition, sanitation facilities, family planning utilization, and socio-economic characteristics. Initially, household-level demographic data were taken from the paper forms as administered by Local Government Unit (LGU) personnel and Rural Health Unit (RHU) staff in the 2nd District of Samar. The initial input used for the study comprised these records, which included socio-demographic and economic data. The information system developed will enable the encoding,

integration, and storage of collected data for analysis and incorporation into the digital environment. The second dataset comprises evaluation data from the end users. This was evaluative feedback from LGU personnel and RHU officers who were purposely selected as respondents. The officials selected were the primary users of the developed system for demographic profiling, program implementation, and policy formulation at the municipal level. The feedback was collected through standardized questionnaires based on the ISO 9126 framework that assesses the quality of software in terms of effectiveness, usability, reliability, and relevance to the functioning of local governance. To achieve an evaluation process, the participants were LGUs and RHUs, the primary users of the system at the municipal level and the ones directly implementing demographic profiling, programs, and policies.

2.1.3 Respondents

The evaluation of the system involved 30 respondents purposively selected from various municipalities within the 2nd District of Samar. The participant group comprised a representative mix of target end-users, specifically Local Government Unit (LGU) Planning and Development Officers, Population Program Officers, and Rural Health Unit (RHU) staff. The selection criteria required that respondents be directly involved in the manual preparation of demographic profiles, policy drafting, or health program implementation. Their domain expertise was leveraged to ensure a credible assessment of the system's functionality and its practical applicability within the local governance context. Information on their specific roles and expertise was used to validate the system's usability across different technical skill levels.

2.1.4 Instrument

A questionnaire was utilized, derived from the quality model (ISO 9126/25010), to evaluate the software. The tool was organized into six dimensions: functionality, usability, reliability, efficiency, maintainability, and portability. For each item, a five-point effectiveness scale was administered. The scales for the categories are as follows: not effective (NE) is between 1.00-1.50, slightly effective (SE) is between 1.51-2.50, moderately effective (ME) is between 2.51-3.50, highly effective (HE) is between 3.51-4.50, and extremely effective (EE) is between 4.51-5.00.

For data analysis, descriptive statistics were used. The average enabled the researcher to obtain a measure of the central tendency of responses for each software quality dimension. The standard deviation (SD) is a measure of the variability of user perceptions. If the SD is lower, that means the evaluators have the same answer. If the SD is higher, that means they have different answers. Using the SD along with the mean strengthened the analysis of the question, as both results indicate the effectiveness of the solution and the degree of agreement across respondents.

2.2 Methods

2.2.1 System Development Approach

The Waterfall Software Development Life Cycle (SDLC) model was used to develop this Web-Based GIS-Enabled Demographic Profiling System. This model comprises the following phases: analysis, system design, implementation, testing, deployment, and maintenance. The Waterfall model was chosen as the software development life cycle, as it has clearly defined study objectives and suitable documentation for long-term sustainability in the local government context. Each phase produced deliverables that informed subsequent phases, ensuring that design ambiguity was kept to a minimum while verification was carried out systematically.

2.2.2 Tools and Technologies

The system was designed and implemented using a set of open-source technologies. This was done to apply major cost savings while ensuring adaptability and sustainability in resource-poor environments. The selected technologies were chosen for their ability to ensure scalability and maintainability, as well as compatibility with government IT infrastructure standards. The tools cover server-side scripting, client-side interactivity, geospatial processing, and database management and deployment across different layers of system development.

Table 1. Tools and Technologies Used in System Development

Technology/Tool	Purpose/Function
PHP	A server-side scripting language used to implement system logic/functions.
Laravel Framework	It provides an automatic MVC (Model-View-Controller) architecture, which leads to easy scalability, maintainability, and secure development of web applications.
JavaScript	Enables dynamic client-side interaction and handles requests asynchronously for better responsiveness.
Leaflet.js	An open-source JavaScript library for visualization functions and mapping geospatial data.
QGIS	A desktop GIS application mainly used for pre-processing spatial data sets for validation and projection consistency.
PostgreSQL	Household-level demographic data were stored in a relational database system.
PostGIS Extension	Improves PostgreSQL to store spatial data and run geospatial queries.
HTML5, CSS3, Bootstrap	Front-end tools to create a responsive, user-friendly interface.
Apache Web Server	A web server is used to host the application.
Linux Environment	The deployment platform was chosen to be compatible with open-source standards and the existing LGU IT infrastructure.

Table 1 summarizes the various tools and technologies used, along with their major functions in the system. The combined use of these technologies yielded a system that will be technically robust and more practical for Local Government Units (LGUs) to adopt. Their combined application made the system more efficient, easier to use, and scalable, thereby supporting improved data-driven governance and policy formulation.

Table 2. System Features and Functions of the Web-Based GIS-Enabled Demographic Profiling System

Module	Description	Core Functions/Capabilities
Data Entry and Compilation Module	It allows Local Government Unit staff and Rural Health Unit officers to input and upload household demographic information.	Web-based applications for individual household entry Batch uploading of demographic records Data validation during entry to reduce errors
Data Management Module	This provides a secure mechanism for storage, retrieval, and updating household datasets.	Centralized database management CRUD operations (Create, Read, Update, Delete) Version control and audit logging
GIS Visualization and Analysis Module	Translates demographic data into geographical maps and supports geospatial analysis.	Interactive map visualization using GIS tools Detection of spatial clusters (e.g., poverty, sanitation) Query functions for targeted analysis
Reporting and Dashboard Module	Provides dynamic dashboards and custom reporting for evidence-based decision making.	Real-time statistical summaries Customizable charts and graphs Exportable reports (PDF, Excel) for official use
User Access and Security Module	Prevents unauthorized users from accessing and manipulating data to preserve the confidentiality of information.	Role-based access control Authentication and authorization mechanisms Secure data transmission and storage

2.2.3 System Features and Functions

The developed system comprised five core modules, each designed to address specific functional requirements and support evidence-based decision-making for LGUs.

This modular design enhanced the system's usability and aligned its functionality with the actual flow of operations in the planning and management of health services in LGUs.

2.2.4 Evaluation Procedure

The assessment of the developed system was carried out using the ISO 9126/25010 software quality model, which provides a dimensional framework for software quality evaluation. It involves functionality, reliability, usability, efficiency, maintainability, and portability. These dimensions were chosen as they are internationally recognized benchmarks of software quality.

The respondents were purposively selected as evaluators among the Local Government Unit (LGU) staff and Rural Health Unit (RHU) officers from the 2nd District of Samar, as they serve as the primary end-users of the system and are involved in demographic profiling and policy formulation. Before the assessment, the respondents were oriented on system features and guided to undertake hands-on exercises such as data entry, report generation, and GIS-based visualization.

Two primary instruments were used for the evaluation:

A questionnaire standardized based on ISO 9126/25010 – this tool was adapted to measure user perception of system effectiveness across the six quality dimensions. It used a five-point Likert scale with responses ranging from 1 (Not Effective) to 5 (Very Effective).

System's usability testing sessions – respondents were asked to perform the system's key functionality: entering demographic data, visualizing household distributions, and generating statistical reports. To capture ease of use, task completion time, and user errors, observational notes were used to identify items that could provide additional insights.

2.2.5 Data Analysis

The data collected from the respondents were evaluated using descriptive statistics, including the mean and standard deviation (SD). The mean was used to calculate the central tendency of responses from participants regarding functionality, reliability, usability, efficiency, maintainability, and portability. To assess the level of variation in responses, the standard deviation was computed, which helps in understanding users' perceptions. If SD values are low, it indicates that respondents agree. If they are high, it signifies that the respondents do not agree. The mean value was interpreted from an effectiveness scale 4.51 to 5.00 Extremely Effective (EE), 3.51 to 4.50 Highly Effective (HE), 2.51 to 3.50 Moderately Effective (ME), 1.51 to 2.50 Slightly Effective (SE), and 1.00 to 1.50 Not Effective (NE). Including the SD with the mean not only represented the effectiveness rating but also clearly showed the consistency of the analysis.

2.2.6 System architecture and Data Flow

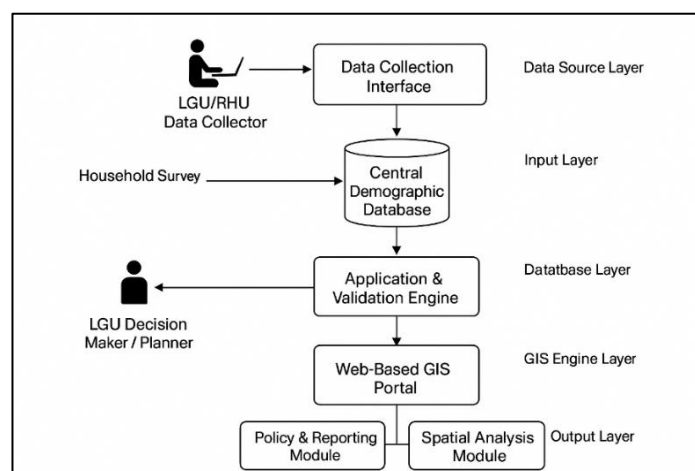


Figure 2. System architecture and Data Flow Diagram of the Web-Based GIS-Enabled Demographic Profiling System.

Figure 2 shows the system architecture of the proposed Web-Based GIS-Enabled Demographic Profiling System, which enables seamless acquisition, processing, and spatial visualization of demographic and sanitation data to support evidence-based decision-making at the local government unit (LGU) level. The data source layer initiates data acquisition through LGU and Rural Health Unit (RHU) personnel who conduct structured household surveys and field interviews. Using the Data Collection Interface, field staff directly encode demographic and sanitation information, reducing transcription errors and eliminating inefficiencies common in paper-based workflows. On the other hand, at the input layer, household information flows into the Central Demographic Database, a secure, centralized repository designed for the immediate storage and retrieval of household composition, socio-economic attributes, and sanitation indicators. Systematic data handling at this stage enables accurate information for the downstream processing. Moreover, the Application and Validation Engine ensures data integrity and consistency in the database layer. The component automatically checks, collects records, and controls the use of the dataset for spatial and statistical analysis, enabling timely decisions based on reliable data. Furthermore, the GIS engine layer serves as the analytical and visualization core, linking verified demographic and sanitation data to geographic coordinates through the Web-Based GIS Portal. The resulting GIS-based maps provide an overview of household locations and sanitation status. This enables spatial pattern searches, service gaps, and areas of vulnerability. Finally, the output layer provides insights through the Policy and Reporting Module and the Spatial Analysis Module. The use of interactive dashboards, dynamic map displays, and real-time reports provides ample evidence for LGU decision-makers and planners to formulate policies, target interventions, and continuously monitor development indicators.

3. Results and Discussion

3.1 System's Interface

This section illustrates the main system interfaces of the developed web-based GIS-enabled demographic profiling system. The system supports various modules, such as user login, demographic data entry, GIS information visualization, and report generation. All forms are accompanied by a description of how the system enables the LGU to manage household demographic information at the household level. Through these interfaces, the study highlights the system's user-oriented design and its ability to encourage evidence-based decision-making at the local level.

3.1.1 Login Form

As shown in Figure 3, the login page can be accessed only by authorized personnel from the Local Government Unit (LGU) and Rural Health Unit (RHU). A standard username and password authentication mechanism was employed to protect confidential demographic information from unauthorized access. The design is minimalist for ease of use, allowing users to enter their credentials and access the main dashboard easily.

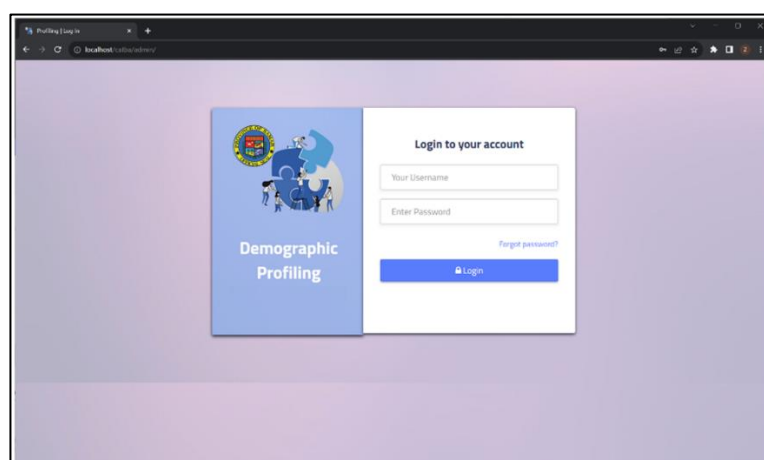


Figure 3. Log-In Form of the Web-Based GIS-Enabled Demographic Profiling System

3.1.2 Data Entry Form

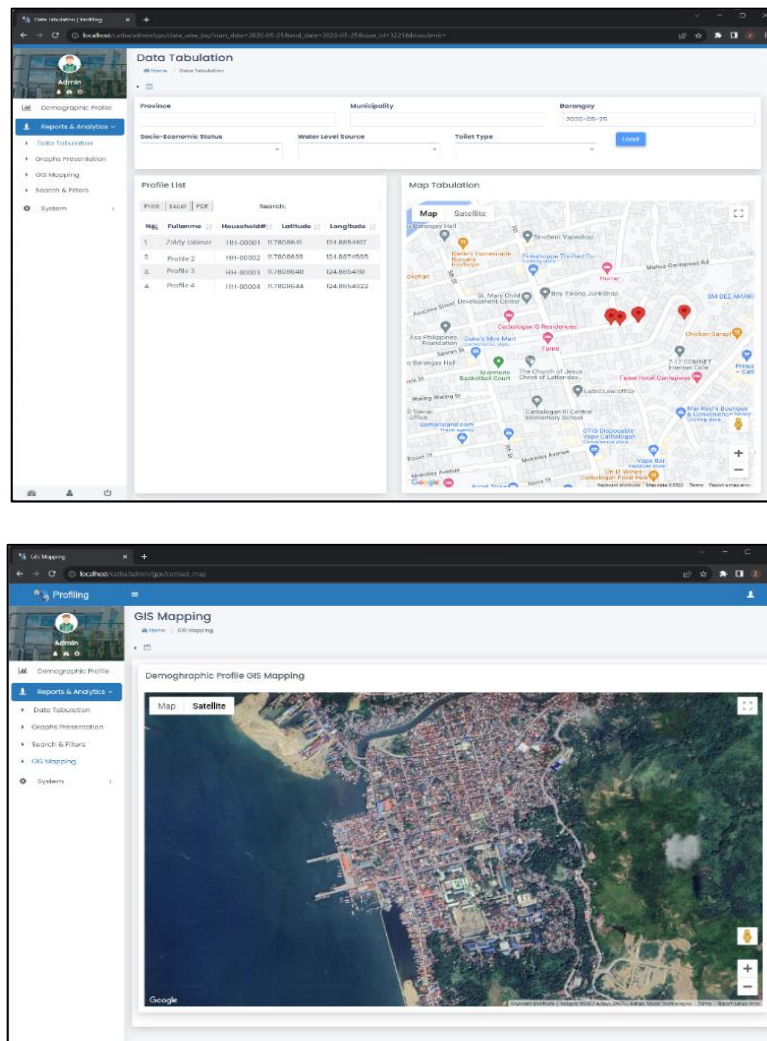
As shown in Figure 4, the data entry module allows authorized personnel to enter household-level demographic information, such as family composition, economic status, and health-related information. The design consists of intuitive fields and dropdown menus, along with validations for incorrect input, to facilitate error-free data entry. This feature enables the digital encoding of bulk household data, eliminating the need for paper records.

Figure 4. Data Entry Form of the Web-Based GIS-Enabled Demographic Profiling System

3.1.3 Reports/GIS Visualization

The reporting module provides a summary of household demographic data in table and graphical forms, as well as GIS visualization, as shown in Figure 5. Along with numerical indicators, such as household size composition, socio-economic classification, and population counts, the module also presents GIS-based maps showing the distribution of households and sanitation status. Using GIS-enabled reporting, a user can find the exact locations of households and their sanitation status within a community. It will also help identify clusters of households without facilities. This feature strengthens the decision-making process by providing a dual perspective—statistical and spatial—thereby allowing Local Government Units (LGUs) to prioritize interventions, allocate resources efficiently, and design policies grounded in both quantitative data and geographic evidence.

During the system's pilot implementation in the 2nd District of Samar, a Municipal Planning Officer used the GIS Visualization module to assess the local sanitation program. By filtering the dataset for 'No Sanitary Toilet Facility,' the system immediately identified a dense geographic cluster in an isolated purok that had been overlooked in previous aggregated, paper-based reports. This spatial evidence empowered the Municipal LGU to pivot its policy, shifting from a general, town-wide subsidy to a targeted sanitation infrastructure project specifically for the georeferenced households in that cluster. This transition from broad-based to evidence-based intervention ensured that limited municipal resources were allocated with maximum impact, directly addressing a critical public health gap identified through the system.



Figures 5. Reports/GIS Visualization Forms of the Web-Based GIS-Enabled Demographic Profiling System

3.2 System's Evaluation Results

Table 3. Level of Effectiveness of the System along Functionality as Assessed by the Respondents (n = 30)

Indicators	Mean (M)	Standard Deviation (SD)	Interpretation
The system performs the required task	4.30	0.55	Highly Effective
The system displays an accurate result	4.70	0.46	Extremely Effective
The system can interact with another system	4.30	0.52	Highly Effective
The system prevents unauthorized access	4.60	0.48	Extremely Effective
Grand Mean	4.48	0.50	Highly Effective

³ Legend: 4.51–5.00 = Extremely Effective (EE); 3.51–4.50 = Highly Effective (HE); 2.51–3.50 = Moderately Effective (ME); 1.51–2.50 = Slightly Effective (SE); 1.00–1.50 = Not Effective (NE)

The functionality of the Web-Based GIS-Enabled Demographic Profiling System was assessed and evaluated by 30 respondents across four indicators, as shown in Table 3. The grand mean was 4.48 (SD = 0.50), indicating a Highly Effective (HE) level. The result suggests that the system effectively executes its main functions, produces accurate results, supports interoperability, and provides secure access. In terms of the

system's effectiveness, the display of accurate results ranked highest ($M = 4.70$, $SD = 0.46$). This means that respondents have confidence in the outputs' reliability for decision-making or for drawing demographic profiles. The indicator on preventing unauthorized access received an average score of 4.60 with a standard deviation of 0.48, indicating it was Extremely Effective. This reflects that the system prevents unauthorized access to sensitive household-level data.

On the other hand, performing required tasks and interaction with other platforms obtained a mean score of 4.30 (Highly Effective) with slightly higher SD (0.52–0.55). This implies that respondents largely agreed that the system is effective, but not all shared the same opinions as the previous indicators. This means that further improvement, particularly concerning interoperability, can enhance the system's long-term viability for LGUs.

The low SD values across all indicators indicate consistent evaluations, strengthening the overall credibility of the findings. The obtained results confirm that the system responds to functional requirements from the ISO 9126/25010 quality model, which aligns with previous studies that found that functional requirements are the backbone of government information systems [21-22].

Table 4. Level of Effectiveness of the System along Reliability as Assessed by the Respondents ($n = 30$)

Indicators	Mean (M)	Standard Deviation (SD)	Interpretation
The system is error-free	4.60	0.48	Extremely Effective
The system is capable of handling errors	4.40	0.52	Highly Effective
The system can resume and restore lost data after failure	4.40	0.50	Highly Effective
The system presents integrated reports	4.40	0.51	Highly Effective
Grand Mean	4.45	0.50	Highly Effective

⁴ Legend: 4.51–5.00 = Extremely Effective (EE); 3.51–4.50 = Highly Effective (HE); 2.51–3.50 = Moderately Effective (ME); 1.51–2.50 = Slightly Effective (SE); 1.00–1.50 = Not Effective (NE)

Table 4 shows that the system's reliability was rated by respondents at a grand mean of 4.45 ($SD = 0.50$), indicating Highly Effective (HE). As indicated, users found that the system was stable, reliable, and performed its task appropriately without major problems. The indicator rated Extremely Effective (EE) was "The system is error-free" ($M = 4.60$, $SD = 0.48$), which had the highest mean score in the evaluation. This means users strongly believe the system can operate robustly and without critical failures. In the meantime, the error handling, data recovery after failure, and integrated report generation indicators obtained a mean score of 4.40, indicating Highly Effective (HE). Based on these findings, while the system has good handling and recovery measures, users still see opportunities to improve its long-term resilience and fault tolerance. The low standard deviation values of 0.48–0.52 indicate greater consensus among the respondents, suggesting confidence in the system's reliability. These findings support the ISO 9126/25010 quality model, which says reliability is an essential factor in user trust and continued use of a system. This result aligns with other studies that state that a reliable system improves the continuity of digital service delivery in governance and public administration [23-24].

As shown in Table 5, the system's overall usability achieved a grand mean of 4.58 ($SD = 0.50$), indicating Extremely Effective (EE). The rating shows that respondents agree that the system's operation requires minimal effort. Moreover, the system is intuitive and easy to learn. The findings imply that the user interface design and overall user experience were tailored to the needs of Local Government Unit (LGU) staff and Rural Health Unit (RHU) officers. The consistently high mean scores across indicators demonstrate that the system successfully balanced technical complexity with user accessibility. The simplicity and learnability of the system were appreciated by the respondents, as they play an important role in its adoption. The mean rating of 4.45 for interface aesthetics, while somewhat lower, is still within the Highly Effective range. This means that while users found the interface's graphics acceptable, further enhancements to design and layout can increase engagement. The standard deviation scores of 0.31 to 0.52 across all indicators reveal a consensus

among respondents with low variations. Thus, regardless of their technical skill levels, they found the system usable. This finding agrees with previous studies, which state that usability is an important factor for user acceptance and continued use of digital governance platforms [25-26].

Table 5. Level of Effectiveness of the System along Usability as Assessed by the Respondents (n = 30)

Indicators	Mean (M)	Standard Deviation (SD)	Interpretation
The system is easy to use	4.67	0.47	Extremely Effective
The user can learn to use the system easily	4.62	0.49	Extremely Effective
The user can use the system without much effort	4.57	0.50	Extremely Effective
The interface of the system looks good	4.45	0.52	Highly Effective
Grand Mean	4.58	0.50	Extremely Effective

⁵ Legend: 4.51–5.00 = Extremely Effective (EE); 3.51–4.50 = Highly Effective (HE); 2.51–3.50 = Moderately Effective (ME); 1.51–2.50 = Slightly Effective (SE); 1.00–1.50 = Not Effective (NE)

Table 6. Level of Effectiveness of the System along Efficiency as Assessed by the Respondents (n = 30)

Indicators	Mean (M)	Standard Deviation (SD)	Interpretation
The system responds quickly	4.60	0.47	Extremely Effective
The system can handle predicted volumes of data in a timely and efficient manner	4.70	0.46	Extremely Effective
The system uses an internal search facility to let users find what they want quickly and efficiently	4.50	0.50	Highly Effective
This system has all the functions and capabilities that the user expects it to have	4.40	0.52	Highly Effective
Grand Mean	4.60	0.49	Extremely Effective

⁶ Legend: 4.51–5.00 = Extremely Effective (EE); 3.51–4.50 = Highly Effective (HE); 2.51–3.50 = Moderately Effective (ME); 1.51–2.50 = Slightly Effective (SE); 1.00–1.50 = Not Effective (NE)

The Web-Based GIS-Enabled Demographic Profiling System's efficiency was rated by the respondents as Extremely Effective (EE), as indicated by a grand mean of 4.60 (SD = 0.49) in Table 6. The result shows that the system can respond to user commands quickly, manage large volumes of demographic data, and provide access to important information on time for decision-making. The system is rated highest in being able to handle expected volumes of data (M = 4.70, SD = 0.46), which shows the respondents trust the system would be able to manage and process large quantities of data. In local government settings, information that requires regular updates and multi-stakeholder access must be demographic in nature. The system's ability to respond quickly to commands was also highly rated, further demonstrating on-time results.

While both are still in the Highly Effective range, the internal search facility and system capabilities scored slightly lower than user expectations (M = 4.50 and 4.40, respectively). The research indicates that this system meets the key efficiency requirements. However, enhancements to many advanced searches, as well as the system's general features, will yield better user satisfaction. The low value of SD, that is, (0.46 - 0.52) across the indicators, indicates agreement among respondents and thus reflects consensus on efficiency. The results are consistent with the ISO 9126/25010 quality model, which identifies efficiency as a key factor for software performance. In addition, the result aligns with previous studies that efficient systems enable real-time data management and policy decision-making in governance contexts [27-28].

Table 7. Level of Effectiveness of the System along Portability as Assessed by the Respondents (n = 30)

Indicators	Mean (M)	Standard Deviation (SD)	Interpretation
The system can be moved to other environments	4.40	0.50	Highly Effective
The system is easy to install	4.30	0.55	Highly Effective
The system complies with the portability standard	4.60	0.48	Extremely Effective
The system can easily integrate with other software	4.50	0.51	Highly Effective
Grand Mean	4.45	0.51	Highly Effective

⁷ Legend: 4.51–5.00 = Extremely Effective (EE); 3.51–4.50 = Highly Effective (HE); 2.51–3.50 = Moderately Effective (ME); 1.51–2.50 = Slightly Effective (SE); 1.00–1.50 = Not Effective (NE)

Table 7 shows that the portability of the Web-Based GIS-Enabled Demographic Profiling System was evaluated as Highly Effective (HE), with a grand mean of 4.45 (SD = 0.51). This illustrates that the said system is adaptable across various locations, easy to operate and set up, and highly portable and interoperable with standard software applications used by local governments and government environments. The system's adherence to portability standards received the highest rating (M = 4.60, SD = 0.48). This means that respondents consider the system meets recognized standards, which ensure it is sustainable and can be applied widely. In government settings, the ability to scale and transfer in multiple jurisdictions is especially advantageous. Likewise, the integration indicator (M = 4.50, SD = 0.51) was rated Highly Effective, suggesting system flexibility in communicating with other platforms to support collaborative governance and data sharing.

System transferability to other environments (M = 4.40; SD = 0.50) and ease of installation (M = 4.30; SD = 0.55) also impact the overall impression, yet received lower ratings, although still Highly Effective. These findings imply that the system can largely be moved and installed without too much trouble. Improving procedures and automating installation tools could, however, further improve portability and reduce the burden on users. The SD values (0.48–0.55) for the indicators indicate that respondents have similar perceptions and agree on system portability. According to the ISO 9126/25010 quality model, portability is an important factor that determines sustainability. The ISO 9126/25010 quality model recognizes portability as an essential factor in software sustainability, and the psychometric results confirm this. These findings support previous research, which affirms that portable, interoperable systems are most likely to be used in local government. Further, portability and integration features strengthen cross-sectoral collaboration [29–31].

4. Conclusions

The development and evaluation of the Web-Based GIS-Enabled Demographic Profiling System provide a transformative framework for data-driven local government policymaking. By digitalizing manual, paper-based registries through a robust geospatial architecture, the system empowers local government units (LGUs) with the spatial intelligence required to identify geographic clusters of community needs and implement targeted interventions with unprecedented agility. Evaluated as highly effective across all ISO 9126 software quality dimensions, the study demonstrates that integrating international technical benchmarks is a vital prerequisite for modernizing local governance tools. In practice, this platform serves as a high-impact, localized companion to national programs like the CBMS, offering real-time reporting and administrative flexibility to bridge the gap between data collection and immediate policy application. While the implementation highlights the need to address technical dependencies, such as connectivity and data integrity, it establishes a scalable digital foundation for more resilient and inclusive governance. Future advancements in predictive analytics will further enable local authorities to anticipate demographic shifts and vulnerabilities before they manifest, ensuring that local policies remain proactive, evidence-based, and community-oriented.

5. Acknowledgments

The author acknowledged the Samar Island Center for Good and Local Governance (SICGLG) of Samar State University for its support in making this study possible.

Author Contributions: Conceptualization, methodology, validation, formal analysis, resources, data curation, writing—original draft preparation, writing—review and editing, funding acquisition, project administration, and supervision are contributed by A.M.P.

Funding: Samar Island Center for Good and Local Governance (SICGLG) of Samar State University.

Conflicts of Interest: The author declares no conflict of interest.

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