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DEVELOPMENT OF REGISTRY OF INHABITANTS RECORD MANAGEMENT SYSTEM: A SUPPORT TOOL FOR LOCAL GOVERNANCE

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Abstract— The registry of inhabitants plays a crucial role in the development initiatives of a country. It is a foundation for better planning and effective service delivery, particularly in calamities, identifying vulnerable sectors, and maintaining peace and order. During the assessment, a digitalization system was suggested to enhance the local unit's record management. Thus, this study aimed to design and develop a record management system that addresses the challenges encountered by the local officials in the registry of inhabitants. The Systems Development Life Cycle (SDLC) framework and the Agile methodology have been employed in developing the system that

Development Life Cycle, Agile Methodology.

involve requirement analysis, system design, implementation, testing, deployment, and maintenance phase. User tests have been conducted to check if the system's functionalities have been guaranteed. The system was evaluated using the system usability scale (SUS), and another evaluation patterned after the ISO 9126-1 software quality model standard was administered to measure the system's functionality, usability, efficiency, reliability, and reliability maintainability. It revealed that the developed system meets the users' needs and requirements and the high acceptance rate from the local units indicates the system's success. Therefore, other local government units should consider adopting the system as a support tool for local governance.

I. Introduction

The barangay is the smallest administrative unit in the Philippines and the government's primary planning and implementation unit [1-2]. Therefore, a good barangay government is essential for the general development of the community. Managing the registry of barangay inhabitants (RBI), the official record of all barangay residents, is vital to local governance. The registry of inhabitants plays a crucial role in the development initiatives of a country. It is a foundation for better planning and effective service delivery, particularly in calamities, identifying vulnerable sectors, and maintaining peace and order. In addition, adopting digitalization through information and communication technology (ICT) in government sectors has proven helpful, enhancing governance, and easing government record-keeping operations [3-4].

It has been mandated by the Local Government Code (Sec. 394) that the barangay secretaries are responsible for maintaining and updating the records of their inhabitants [5]. The records should contain the following information: name, address, place, date of birth, sex, civil status, citizenship, occupation, and other relevant information prescribed by law or ordinances. This relevant information can be referred to as personal information, as stipulated in Republic Act 10172 and as directed by the authority. Therefore, the importance of keeping these records current must be considered, and a highly efficient system for record-keeping at the barangay level is imperative. This is in line with the recommendation from the Department of the Interior and Local Government (DILG) Memorandum Circulars to adopt computerized systems in barangay processes to enhance local governance. Hence, developing a highly efficient system for the registry of inhabitants in barangays is a crucial step toward promoting effective governance and better service delivery to citizens [6].

Several systems have been developed to enhance barangay governance. Bringula et al. [7] created an "E-Barangay Mobile Application" that facilitates local services through a mobile platform for residents to submit complaints, request documents, and provide suggestions. Lacasadile et al. [1] developed a system to automate barangay information and provide decision support for e-governance. The "Barangay Management System" of Carpio [2] is a web-based application that allows residents to register, file complaints, and request services online. The barangay secretary and the barangay chairman could receive and record residents' information and document requests and complaints, approve requests, view or respond to complaints, and generate reports even when they were on official travel or out of office, respectively. Goh et al. [8] developed an application with features like community registration,

fingerprint biometrics and camera integration, emergency evacuation, and weather forecasting. Additionally, it offers administrative modules for searches and rescues, donations, and private messaging. Other regions in the country have implemented the digitalization of the registry of barangay inhabitants. However, no documentation or publication has provided the developed system's features, strengths, and weaknesses. Moreover, despite the emergence of e-governance, there are still local government units that would take time to produce reports and provide a list of residents without glitches. For example, during the COVID-19 pandemic, the Department of Social Welfare and Development (DSWD) office needed the local listing of residents to distribute cash assistance to vulnerable sectors such as persons with disabilities, senior citizens, homeless persons, and workers in informal sectors [9]. However, the list had some hitches. For instance, some senior citizens and other families were not included in the list of some barangays.

In the province of Southern Leyte, particularly in the municipality of Hinunangan, composed of 40 barangays [10], no information system tracks down the registry of inhabitants' records. Traditionally, the RBI has been maintained manually using paper-based records, making it susceptible to errors, losses, and damages. Moreover, the manual approach can be time-consuming and ineffective, making it difficult for barangay officials to retrieve and update records as necessary. This might complicate the implementation of many local programs and services, such as identifying and providing interventions to vulnerable sectors in times of calamity. Besides, according to one of the two DILG unit heads of the province, one of the challenging parts at the municipal level is asking for reports from the barangays, such as this registry of inhabitants. As for them, no computerized system has yet been adopted for these concerns, particularly at the barangay level. It challenged

them to provide accurate reports when other government agencies, like DSWD and national agencies, require them.

Moreover, based on the assessment that was conducted regarding the record management practices and challenges in the registry of barangay inhabitants in the municipality of Hinunangan, in which the barangay secretaries were participants, it revealed that barangay secretaries do not have enough time to organize files and records due to the many tasks assigned to them. In addition, generating reports consumes so much time, especially when they need summarization, categorization, and updates. Therefore, they all suggested a digitalization system to enhance their record management.

Thus, the researcher aimed to design and develop a registry of barangay inhabitants' record management system that addresses the challenges encountered by the barangay secretaries, such that it takes time to generate reports that need summarization, categorization, and updates. The system also incorporates relevant information that other systems have placed less emphasis on or included. In addition, the system serves as a repository of residents' and households' information, including other relevant information being asked for by the DSWD and other agencies on vulnerable sector-related data and vaccination-related information that LGUs are required to submit to the Department of Health (DOH) as indicated in Republic Act No. 115251, Sec. 4 [11]. The information can be used as the basis for better planning, monitoring, and decision-making at the barangay level, as barangay leaders will be able to forecast and assess the needs of their constituents based on the collated information.

II. Methodology

The registry of barangay inhabitants' records management system employed the Systems Development Life Cycle (SDLC) framework and the Agile methodology in

developing the system [12]. The SDLC framework was used to guide the entire development process. It is a structured, sequential process for the development of information systems. It defines a set of steps or phases, as shown in Figure 1, that must be followed to develop an information system effectively and efficiently [12]. At the same time, the Agile methodology (Figure 2) was used to manage and organize the development tasks flexibly and iteratively.

The development process is divided into short iterations called "sprints', with each sprint resulting in a potentially shippable product increment. This approach allows for quick feedback and adjustments based on changing requirements, and it places a strong emphasis on teamwork and collaboration. As a result, teams can respond quickly to changing requirements and deliver high-quality software quickly and efficiently. This makes it an ideal approach for projects where requirements are likely to change during development [13].

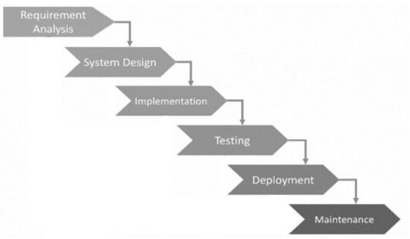

Figure 1: System Development Life Cycle Framework [12]

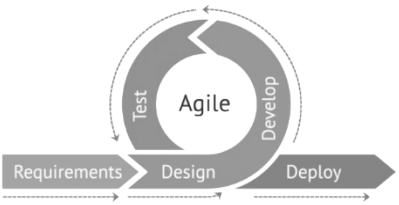

Figure 2: Agile Methodology [13]

III. Results and Discussion

A. System Design and Implementation

The system was developed using various programming tools, including Node.js and Express for the API, Dart Flutter for the UI, the.Net Framework in C# for the desktop service, and HeidiSQL for the database. Figures 3 and 4 show some screenshots of the system.

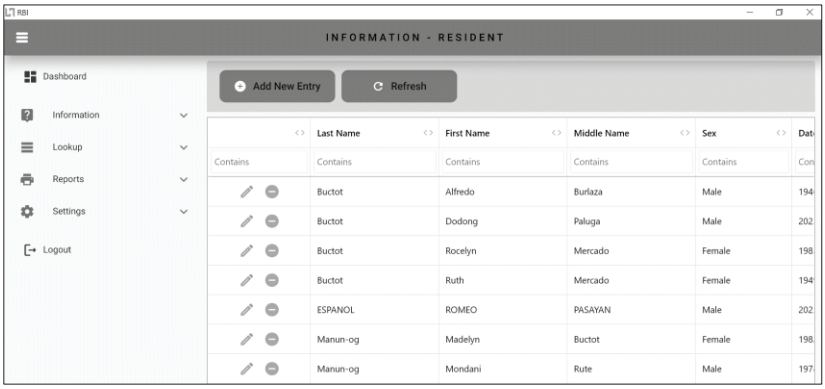

Figure 3: The Registry of Barangay Inhabitants System Main Screen

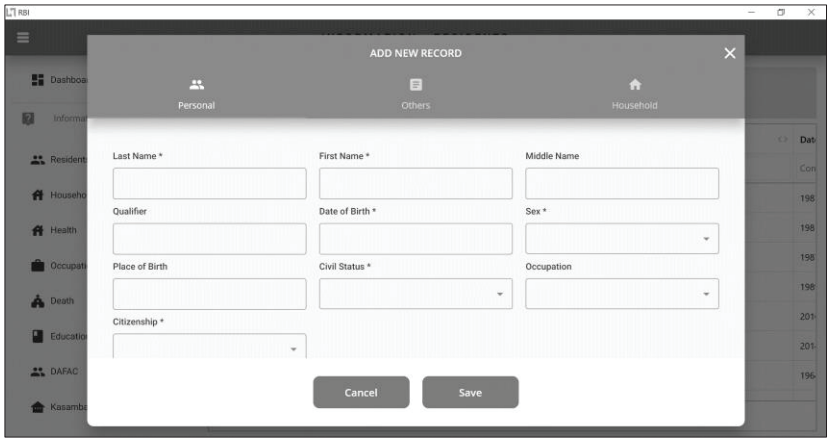

Figure 4. The Add New Record Interface of Residents Information

B. System Testing

A series of testing activities were undertaken to ensure the system's smooth operation and optimal functionality. The testing process involved the active participation of seven barangay secretaries who were purposefully chosen, each with diverse experiences. Participants involved in the testing have their ages ranged from 24 to 58, and they had experience ranging from one year to twenty-three years in the job to assure of their capability and the knowledge of the job. Any identified modifications and errors were promptly addressed and rectified during

this phase. This iterative process continued until the user's expressed satisfaction, and all functions and features passed and met the defined requirements. The head of the agency has issued user acceptance certificate as proof that it has gone through the process. In addition, the developed system was evaluated using the system usability scale (SUS) created by John Brooke consisting of a 10-item questionnaire [14]. It has five response options for participants, from strongly disagree (1) to strongly approve (5). The odd-numbered questions were positively framed, while the even-numbered questions were negatively framed. Prior to arriving at the SUS score, get the sum for all odd-numbered questions (X) and even-numbered questions (Y). It will then be calculated then to be X0 = X-5 and Y0 = 25-Y. To calculate the SUS score, add X0 and Y0 and multiply by 2.5 (SUS Score = (X0 + Y0) *2.5). The SUS Score indicates usability performance in effectiveness, efficiency, and overall ease of use. For example, if the average SUS score is 68, a score of 68 will placed at the 50th percentile. Another round of system evaluation was conducted utilizing the adapted survey questionnaire of Manun-og et al. [15] patterned from ISO 9126-1 (Software Quality Model Standard) to assess system functionality, usability, efficiency, reliability, and maintainability. The survey consists of a 20-item questionnaire with five response options for participants, ranging from highly disapproved to highly approved. It was evaluated by the same person and another three experts in the field: one is a senior programmer in a prestigious software company with 15 years of experience in the industry, 12 years as a system administrator, and another is an IT faculty member at a university for 20 years. The system evaluations can be observed in Tables 1 and 2 for further insight.

Table 1: System Usability Scale (SUS) result

X (sum of odd numbers)	Y (sum of even numbers)	X0 (X-5)	Y0 (25-Y)	SUS Average Score (X+Y)*2.5	Grade	Adjectival Rating
24.2	9.3	19.2	15.7	83.75	A	Excellent

Table 2: Systems evaluation result

Criteria	Weighted Mean
Systems functionality	4.90
Systems usability	4.90
Systems efficiency	4.90
Systems reliability and maintainability	4.78

Note: 1:0-1.8 (Highly Disapprove), 1.9-2.6 (Disapprove), 2.7-3.4 (Neutral), 3.5-4.2 (Approve), 4.3-5.0 (Highly Approve)

C. Deployment and Maintenance

The developed system has been accepted and deployed in the municipality of Hinunangan. The memorandum of agreement had already executed to ensure that both parties responsibilities were clearly understood. Finally, the system will be monitored and maintained to ensure its continued operation. If necessary, it may involve fixing bugs, updating the system, and providing ongoing support [16, 17].

The developed system incorporates the necessary information identified during the assessment, as demonstrated in Figures 3 and 4. The data gathered from the registry of barangay inhabitants and other relevant information were aligned with the requirements set by the national agency and the municipality. User testing activities confirmed that all features, components, and operations were passed and accepted by the end users. The System Usability Scale (SUS) evaluated the system's usability. Tables 1 and 2 showed an impressive average score of 83.75, placing the system in the top-rated category. This indicates that the system's

effectiveness, efficiency, and overall ease of use were excellent. Further evaluation results, as shown in Table 2, demonstrate high approval of the system's functionality, usability, efficiency, reliability, and maintainability. The system's performance has been evaluated against the ISO 9126-1 software quality model standard and has been found to meet the standard.

Hence, the system that was created is intended to be operational, functional, of quality, and meets the requirements and needs of its users. Research conducted by Santa et al. [3] supports the notion that user satisfaction primarily depends on the system's operational efficiency and the quality of information it provides. A system that effectively fulfils user needs is considered more practical and of superior quality [18, 19]. Therefore, when developing a system, it is crucial to consider user satisfaction as a measure of success. Additionally, user satisfaction directly influences whether the end user accepts the system [20, 21]. Failure to meet user needs would result in their rejection and non-utilization of the system [22, 23].

Consequently, the system would become unusable. To ensure success, systems should also be customized to align with local work practices, addressing local demands and conditions [24]. In this regard, the developed system successfully tackles the agency's challenges. Furthermore, by employing the SDLC framework and Agile methodology, the study effectively tailored the system to meet the specific requirements of the local unit, enhancing the efficiency and effectiveness of their record management system for the registry of barangay inhabitants.

IV. Conclusion

The developed system has proven to be a valuable tool for the barangay unit in its record management system for the registry of inhabitants. One of the system's advantages is that, in times of disaster or when practical intervention is needed, they can assess the number of

individuals needing specific help from the government because they have the information ready. The positive feedback from user testing and evaluations, the functionalities that met the users' expectations, and the high acceptance rate from the agency are all indicative of the system's success. In addition, the retrieval of comprehensive data will be quicker, more timely, and more accurate. It has made the summarization, categorization, and reporting of updates effortless. Given its effectiveness, it is highly recommended that local government units adopt the system to improve the efficiency and accuracy of their record management processes.

V. Acknowledgement

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APPENDIX A

SYSTEM USABILITY SCALE IN THE DEVELOPMENT OF BARANGAY REGISTRY OF INHABITANTS

Dear Respondents:

This questionnaire gives you an opportunity to tell your reactions to the Development of Barangay Registry of Inhabitants that you used in your office. Your responses will help me understand of how the system meets the usability measures.

Please read each statement and indicate your response by putting check mark in the opposite column of how strongly disagree through strongly agree with the statement. If a statement does not apply to you, put NA. Rest assured that your responses will be kept confidential. Thank you.

☐ I have read and understand the purpose, and I agree to participate in this survey. I am aware that my participation is a great help for the study and that all data gathered will be treated with confidentiality.

Name: _____Age:_____
Sex:_____Position: _____ Years in Service:_____

PARTICULARS	SD 1	D 2	N 3	A 4	SA 5
1. I think that I would like to use this system frequently.					
2. I found the system unnecessarily complex.					
3. I thought the system was easy to use.					
4. I think that I would need assistance to be able to use this system.					
5. I found the various functions in the system were well integrated.					
6. I thought there was too much inconsistency in this system.					
7. I would imagine that user would learn to use this system very quickly.					
8. I found the system very awkward to use.					
9. I felt very confident using the system.					
10. I needed to learn a lot of things before I could get going with this system.					

* SD-Strongly Disagree, D-Disagree, N-Neutral, A-Agree, SA-Strongly Agree

Source: Taken from the standard SUS questionnaire of John Brooke, 1986

APPENDIX B
SYSTEM EVALUATION IN THE DEVELOPMENT OF BARANGAY REGISTRY OF INHABITANTS

Dear Respondents:

This questionnaire gives you an opportunity to tell your reactions to the Development of Barangay Registry of Inhabitants that you used in your office. Your responses will help me understand what aspects of the system you are particularly concerned about and the aspects that satisfy you.

Please read each statement and indicate your response by putting check mark in the opposite column of how highly disapprove through highly approve with the statement. If a statement does not apply to you, put NA. Rest assured that your responses will be kept confidential. Thank you.

☐ I have read and understand the purpose and I agree to participate in this survey. I am aware that my participation is a great help for the study and that all data gathered will be treated with confidentiality.

Name: _____Age: _____Position: _____
Years in Service: _____ Field of Specialization:_____

Systems evaluation

PARTICULARS	**HD 1**	**D 2**	**N 3**	**A 4**	**HA 5**
SYSTEM FUNCTIONALITY					
1. System features performed accurately.					
2. The interface of this system is pleasant.					
3. Report generated is consistent on the recorded entries					
4. Easily locate and search recorded entries.					
5. Transactions can be done immediately.					
SYSTEM USABILITY					
6. User-friendly environment is evident.					
7. The system quickly complete my work.					
8. The system help me become productive.					
9. The information provided with the system is effective in helping me complete my work.					
10. This system has all the functions and capabilities I expect it to have.					

SYSTEM EFFICIENCY					
11. Retrieval of records can be done immediately.					
12. Update and correction of entries can be updated and altered.					
13. Generation of the report done promptly.					
14. Report can be easily interpreted.					
15. Reports can be provided anytime as needed.					
SYSTEM RELIABILITY AND MAINTAINABILITY					
16. Records are safely secured and can be retrieved by an authorized person					
17. System is strongly secure with password					
18. Modification of system settings can be done by an authorized person					
19. Alteration of records can be traced and recognized.					
20. Errors of the system can be immediately corrected.					

* HD-Highly Disapprove, D-Disapprove, Neutral A-Approve, A-Highly Approve

Adapted from the study of Manun-og, et al., 2022