

Barangay Management System

Claire Ong Carpio¹

¹Basilan State College

Email address: claireongcarpio @ gmail.com

Abstract— *Barangay is where the initial planning and implementation of projects and undertakings in the community take place but ironically it has the least amount of available information that serves as baseline for planning and policy implementation. The Barangay Management System or e - barangay is a web - based management system which shall reinvent barangay management from a traditional and centrally dependent unit towards a more inclusive and citizens-oriented scheme. It essentially aims to streamline existing administrative processes in terms of requesting documents, filing complaints and generating apt and accurate local statistics. The researcher has adopted the prototype methodology in the development of the system. It focuses on creating and testing system features, graphical user interface and scheduling iterations. This iteration lays down the foundation for development which includes functionality and usability testing to ensure the effectiveness, efficiency and reliability of the developed system. The researcher has likewise utilized the available data from the target local government unit to conceptualize the entirety of the system. And lastly, the researcher recommends for the integration of fiscal processes into the system as well as the transliteration of system contents to local dialects for extensive user conception.*

Keywords— *Barangay, web - based management system, effectiveness and efficiency.*

I. INTRODUCTION

As the global environment ages, the emerging trend for Information Technology has risen above the surface of development initiatives. As a process innovation, it lies at the center of streamlining processes both in the public and private sectors. It becomes less of a choice but more of a requirement for individuals, as computers play a crucial role in assisting people in organizing, storing and retrieving huge amount of information. It likewise serves as a tool which enables its users to do more tasks, hence making it a vital commodity especially in working environments. The application of information and communication technology for improving governance by enhancing government's role in service delivery, public administration, and the promotion of participatory democracy has been gaining momentum in many parts of the world. In Philippine local government, this has been witnessed lately in the significant rise in web presence of many cities, a development that was facilitated by the passage of the Electronic Commerce Act in 2000 and the implementation of subsequent programs to support the law's adoption by government.

For years, the government has been under pressure to meet the demands and cope up with the increasing complexities and changes in the world environment. It needs to tackle a number of complex social and economic issues like poverty, unemployment, spread of diseases (HIV/AIDS), poor education systems and environmental degradation. They need

to consider the readjustment and reinvention of local processes to effectively integrate into the world economy. Managing the public sector in today's environment of constant change has become a demanding challenge for policy makers, service delivery managers and civil servants – a challenge that is especially daunting for those in developing countries and countries with economies in transition.

The move to reinvent government has spread incessantly over the last two decades in many parts of the world. Governments in developed and developing countries alike have faced increasing pressures to improve their role in service delivery and public administration. The reforms sought have not only called for better public service through improved efficiency and effectiveness, promotion of transparency, and increased responsiveness. They have also highlighted the necessity to transform governance—to move away from the traditional, top-down approaches towards more decentralized and participatory systems. Common in the new public sector reforms is the use of Information and Communication Technology (ICT) in improving government procedures and processes and the linkage between government, citizens, and other groups in governance to promote a more active and participatory political deliberation and decision making—a strategy known as e-governance. Growing evidence over the past decades demonstrates the emergence of a global field of inquiry at the intersection of government, society, and information and communication technologies. This field is characterized by terms such as “Digital Government”, “e-government,” “e-governance,” or “information society.” At the initial stage, the term was a little more than a general recognition of the confluence of information technology developments and the application and use of these technologies by government entities. Subsequently, it has been used as a symbol of institutional reform leading to a new social paradigm. Countries all over the world are now paying serious attention to e-government, despite their differences in political systems, cultures, economies, and developmental stages. In lieu of this trend, e-government can therefore best be defined as the use of information technology to manage public affairs more effectively, deliver public service more efficiently, and achieve democratic governance more equitably.

The Philippines is generally composed of more than forty two thousand barangays nationwide. Barangay as the smallest political unit serves as the primary implementer of developmental programs, projects and policies. The nation's public service delivery system will falter at the grass roots without the inspired and dedicated work of the barangays. Barangays at the bottom level of the bureaucracy has more

people engagement compared to other government units. Thus, the empowerment of individual barangay could eventually lead to a stronger, more resilient and more prosperous society.

The Local Government Code of 1991 envisions local government units to be self-reliant and effective partners in the attainment of national development. As such they should have programs, projects, activities and services for the benefit of their constituents. To do so, this requires information. Therefore, data is indispensable in sound decision-making. To perform effectively, each barangay should maintain a database holding different information about the barangay such as population, records on the disbursement of funds, grievance cases filed, houses constructed in the community and citizen's socio-economic profile. However, these tasks could not be carried out by the Barangay Chairman alone. Thus, with the power vested on him as the local chief executive, he appoints the Barangay Secretary and the Barangay Treasurer to serve as his hands in dealing with administrative and fiscal relations.

The Barangay Secretary performs most of the administrative operations of the barangay. Though, selected barangays already made use of computers and electronic devices to carry out official transactions, conversely, most are still caged with the manual-based operations. Clearances and certifications are prepared with less to no base-line data to assure reliability. This opens the risk for nonresidents to take due advantage of this process flaw. Most barangays depend on the master list of voters as issued by the Commission on Elections as basis for issuing certifications. However, at times, foreign residents are still able to seek these clearances though not officially registered on the barangay. And having no readily available accurate barangay statistics, programs and policies tend to discount inclusiveness. In addition, weak barangay data management and monitoring hinder the implementation of selected local programs as barangays lack reliable and accurate baseline data.

II. RESEARCH QUESTIONS

Barangay is where the initial planning and implementation of projects and undertakings in the community take place but ironically it has the least amount of available information that serves as baseline for planning and policy implementation. Barangay officials still rely on centrally produced data like the ones provided by the Philippine Statistics Authority for their local development planning.

In consideration with the foregoing challenges on the ground, the proponent of this study decided to come up with a relevant project that would not only streamline local processes through online services but shall also ensure data accuracy and reliability. A management system for barangays can potentially aid in achieving effective and efficient public service delivery.

III. OBJECTIVE OF THE STUDY

The system generally aims to develop a web-based Barangay Management System to support the functionality and operations of the barangay. It specifically aims to:

1. Create a registration module that will record barangay resident's demographic profile;
2. Create a documentary request module that will allow residents to request documents (barangay certificate and certificate of indigency) online and receive updates on the status of their request via SMS;
3. Create a complaint blotter module that will allow residents to file complaints and report incidents online, attached necessary evidence and receive alerts on the status of their complaints through SMS;
4. Create a report module that will generate significant statistics and reports such as total number of requests and complaints, population growth, master list of residents per purok, and others that can serve as baseline data for project and policy implementation; and
5. Create a module that will send predefined replies to complaints

IV. SCOPE

The Barangay Management System will automate the current manual process and transactions in the barangay. Apart from effective recording and monitoring of data, the e-barangay is also capable of processing online documentary request and online complaint blotter and supported by SMS technology. It is open to all registered residents of the target barangay.

V. LIMITATIONS

The e-barangay has three (3) system users namely the barangay chairman, secretary and the barangay residents. The system is limited to the following:

- a. Residents who are not duly registered in the system database can neither file complaints nor request documents;
- b. Residents with no available internet connection cannot access the online barangay services, hence all requests and complaints in that case must be filed personally at the barangay office;
- c. The system can only be accessed by system users as authorized by the system administrator.
- d. Documents that can be requested are limited to Barangay Certificates and Certificates of Indigency which will be cross checked from the system's database for authenticity.
- e. The residents can only attach photo as supporting evidence when reporting a complaint.
- f. As the system is still on its developing stage, highly technical statistics such as poverty lines may not be provided, this would be proposed in the recommendation for future studies.

VI. CONCEPTUAL FRAMEWORK

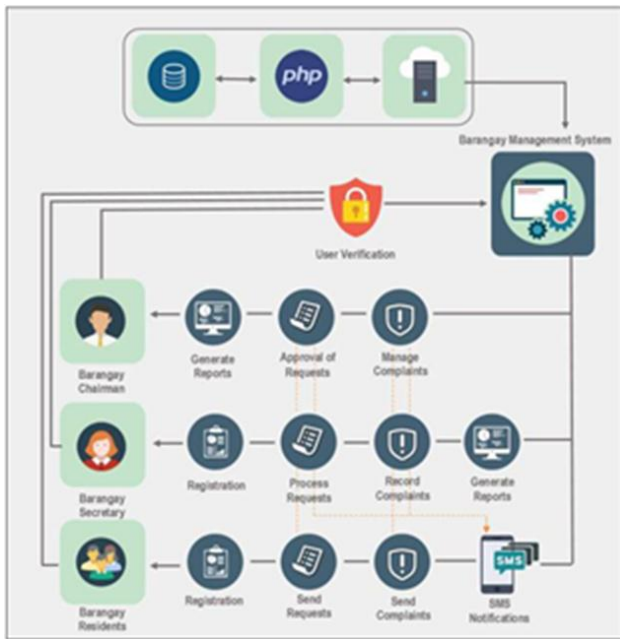


Figure 1. Architectural Design of the Barangay Management System (e - barangay)

The researcher has adapted the Prototyping Methodology as guide in the development of the Barangay Management System (e - barangay). A version of the system is developed in system prototyping to quickly check the customer’s requirements and the feasibility of some design decisions. This type of methodology supports change avoidance as it allows users to experiment with the system before delivery and so refine their requirements.

VII. RESEARCH DESIGN AND METHODOLOGY

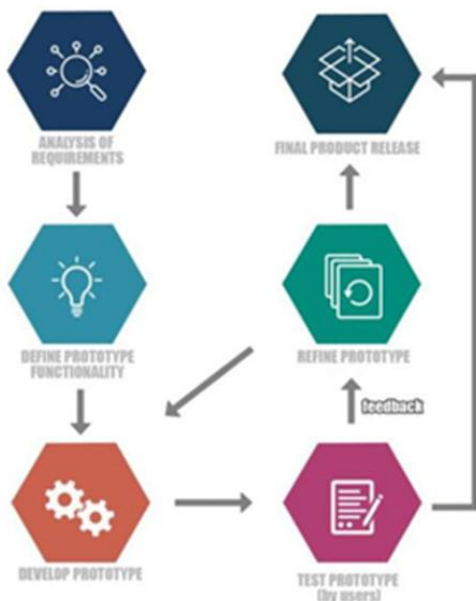


Figure 2. The Process of Prototype Development

For this project, the researcher applied the six-phased model of system prototyping shown in figure, where the system before final release shall undergo a series of testing and refinements.¹

Analysis of Requirements

In this phase, the researcher conducted an on-site visit to the target community to discuss the needed requirements for the project, a formal written consent was sent one (1) week before the scheduled visit. The Aguada Barangay in Isabela City has the largest population count among the 42 barangays in the City. This was the reason why the researcher chose this community as the target barangay for the system development. After having conducted a personal interview with the barangay officials, the researcher came up with the matrix of functions. This served as baseline data for designing the project’s modules.

Define Prototype Functionality

In this phase, the researcher identified the target users with corresponding modules to be developed. The e - barangay system will constitute the functions of the barangay chairman, the secretary and the residents. The system aims to create a digitally empowered and integrated local government unit that shall provide more responsive and transparent online citizens-oriented services.

- Identified System Users:
- Barangay Chairman
 - Barangay Secretary
 - Barangay Residents

Identified System Modules:

1. Registration – register residents profile living within the jurisdiction of the barangay for proper recording and monitoring. This record shall also be served as basis for releasing barangay certificates.
2. Online Complaint Blotter/Reporting – residents will be able to send their barangay level complaints and receive notification through SMS on the status of their complaint.
3. Document Request – residents can request barangay certificates and certificate of indigency and be notified through SMS on the status of their request.
4. Reports – barangay chairman and secretary can generates reports that shall serve as basis for planning and implementation of targeted programs.

Development of Prototype

The development of the system was done using the PHP programming language and MySQL as its database. Bootstrap as one of the most popular front-end frameworks for developing websites and web applications shall be used for designing the system’s user interface. It is composed of the integrated functions of the barangay chairman, the barangay secretary and the barangay residents. Further, the development of the system’s modules shall be made in accordance with the determined functions of each barangay official.

User Testing and Feedback

Each module has undergone a testing phase to consequently determine any operational or functionality bug, so as to address the same as earlier as possible. The testing

phase was conducted on December 2018, subject for the availability of target users. To further determine the level of user’s satisfaction, evaluation tools were administered to identify how satisfied the users were in terms of system usability and functionality.

Refine Prototype

Each module has undergone a prototype refinement to further calibrate the system functions with user requirements. This was made by running subsequent testing until targets have been met. Final Product Release

Upon final testing and/or refinement, the system will be deployed to the target community for actual administration. However, before the final release, important notice of instructions to users shall be provided in a form of user’s manual aside from the conduct of formal orientation.

Functional Requirements

This section describes the functional requirement of the Barangay Management System.

Software Functionality

The e - barangay is a web – based barangay management system that allows that barangay officials and residents to properly manage and handle their daily operations and transactions. It has the following major functions:

Registration Module - residents can register and/or update their profile online

Online Complaint Blotter/Reporting - submit complaint form, upload image or video and receive status update through SMS

Online Document Request - submit request form and receive status update through SMS

View Complaint Module - view list of new complaint, pending complaints, resolved complaints and discarded complaints, search complaints, view details of complaints, send status of complaints

View Document Request Module - view list of new requests, pending request and processed requests

View Report Module - barangay chairman and secretary will be able to view different reports generated by the system through list, graphs and statistical form

Process Request Module - barangay secretary will receive and record document request, check barangay record for the authenticity of the request, forward request to barangay chairman for approval, print approved barangay certificate, notify barangay residents for release

Approval of Request and Registration Module - barangay chairman will receive and view list of request, approves request, forward to secretary for printing, notified when there is an incoming transaction to be approved

Manage Users Module – the barangay chairman and secretary can add new users, view active users, deactivate users and view unused accounts

Users and Characteristics

There are three (3) types of users that can use the system. The barangay chairman who is in – charge of the approval of all new registrations and requests. He will also receive incoming complaints from the residents for proper action. The

barangay secretary in – charge of processing all approved requests as well as the proper recording and monitoring of complaints. The barangay residents who can send their requests and complaints online. Figure 3 below shows the system users with their corresponding modules.



Figure 3. System Users with Respective Modules

Nonfunctional Requirements

This section describes the nonfunctional requirement of the Barangay Management System.

Technical Requirements

Hardware Requirements:

- Server Side:
 - Processor: Intel Core i3 or higher
 - RAM: 4 GB or higher
 - Hard Disk Drive: 500 GB or greater
 - Network: Static IP
- Client Side:
 - Processor: Intel Core i3 or higher
 - RAM: 2 GB or higher
 - Hard Disk Drive: 500 GB or greater
 - Network: Static IP

Software Requirements:

- Server Side:
 - Operating System (Window 8 or 10)
 - PHP
 - XAMPP
 - MySQL
 - SMS API
 - HTML, CSS, Bootstrap
- Client Side:
 - Operating System (Window 8 or 10)
 - Web Browser

Performance Requirements

The system should work reliably, with automatic backup and recovery features. The system will always be available, except for periodic maintenance or unavailable internet connection.

The system at any time can only be accessed by authenticated users. Only registered voter of the barangay can create an account and access the system

The systems interface is easy to learn and can be used by users of any technical background. User’s manual is provided to guide users.

Assumptions and Dependencies

The system is dependent to internet so the absence of it may cause failure in updating the database. It also expected that barangay residents will only file valid complaints. The barangay management system seeks to address the existing information gaps in data collection and monitoring between national, provincial and municipal and barangay level that is vital in determining the causes of problems in community, formulating appropriate policies and program, hence, the developer of the system is expecting that the higher government unit will support in the implementation of the proposed barangay system and aid in solving existing constraints (e.g. internet access, availability of supplies and personnel).

Security Requirements

The system was protected from unauthorized users. This can be done by allowing each system user to set user name and password which will be approved by the administrator. This will be used in gaining access to the system. In line with this, every user will have different level of access to the system which is dependent on the tasks assigned to the user.

In terms of the confidentiality of the data only the barangay chairman and secretary can view data and information from the database. Barangay residents are only limited to sending complaints, receive reply of their complaints and can have the option to request barangay certificate online.

Analysis

This section describes how the researcher analyzes the requirements gathered to come up with the envisioned project.

Process Model

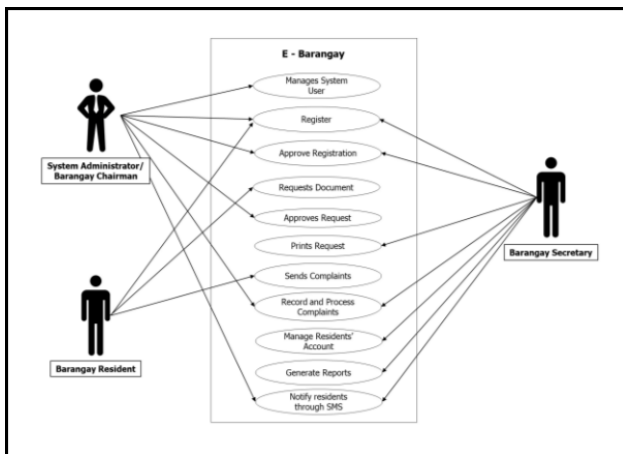


Figure 4. Use - Case Diagram of the Barangay Management System

The use – case diagram shows how the three (3) actors to include the Barangay Chairman, Barangay Secretary, and Barangay Resident interact with the e-Barangay System. The barangay chairman at the same time system administrator manages the system users. He will approve resident’s registration. An notification will be send to the barangay chairman account when there are pending transactions to be

processed. He can also view and generate reports through the system.

The barangay secretary will be in – charge of the receiving, process and properly recording of incoming requests and complaints. She must also notify residents on the status of request and complaints.

Barangay residents can file complaints and requests online and register their own profile for proper recording. They will also be notified on the status of their transactions through SMS.

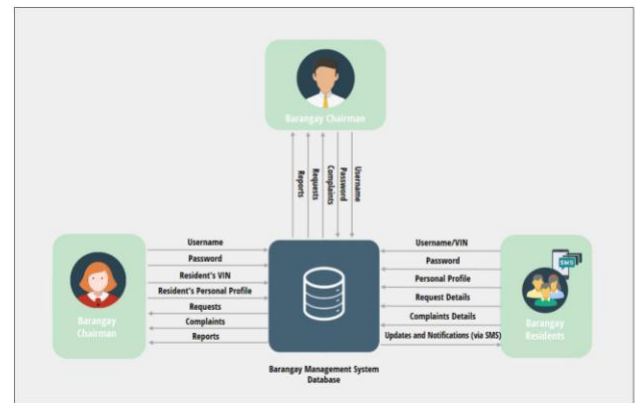


Figure 5. Context Data Flow Diagram

Figure 5 shows the Context Data Flow Diagram of the e - barangay. It shows the data input and output from the three (3) users: Barangay Chairman, Barangay Secretary and Barangay Residents.

VIII. RESULTS AND DISCUSSIONS

This chapter presents the tabulation, analysis and interpretation of the data gathered through the designed questionnaire on the evaluation of the respondents towards the functionality and usability of the barangay management system. The responses were tallied and statistically treated to facilitate the interpretation of results.

TABLE 1. Barangay Chairman’s Evaluation on the Functionality of the e – barangay during First Testing

Statement	Mean	Verbal Interpretation
The system is easy to log – in	5.00	Very Satisfactory
The system can register, view and update residents profile/account	4.00	Satisfactory
The system is capable of receiving document requests for approval	4.00	Satisfactory
The system is capable of receiving and recording complaints	2.00	Poor
The system can generate the correct and complete reports	2.00	Poor
The system is capable of sending announcements/updates through Short Message Service (SMS)	4.00	Satisfactory
The system is able to complete the tasks without delay	4.00	Satisfactory
Overall Weighted Mean	3.57	Satisfactory

The Barangay Chairman rated all functionality items as satisfactory to very satisfactory except for items 4 and 5. The respondent experiences difficulty in recording complaints as well as in generating reports. In general, the respondent finds the system’s functionality as Satisfactory (3.57).

TABLE 2. Barangay Chairman’s Evaluation on the Usability of the e – barangay during First Testing

Statement	Mean	Verbal Interpretation
Ease of use	4.00	Satisfactory
Orderliness of system contents	4.00	Satisfactory
System interface design	4.00	Satisfactory
Clear links and buttons	4.00	Satisfactory
Readability of major heading and body text	2.00	Poor
A person with no computer skill can be able to use the system	4.00	Satisfactory
Overall Weighted Mean	3.67	Satisfactory

Table 2 shows that the Barangay Chairman rated all usability items as satisfactory except for item 5. The respondent found the headings and text contexts barely readable. This concern was included as one of the recommendations of the respondent for further refinement. Overall, the respondent finds the system’s usability as Satisfactory (3.67).

TABLE 3. Barangay Chairman’s Evaluation on the Functionality of the e – barangay during Second Testing

Statement	Mean	Verbal Interpretation
The system is easy to log in	4.00	Satisfactory
The system can register, view and update residents profile/account	5.00	Very Satisfactory
The system is capable of receiving document requests for approval	5.00	Very Satisfactory
The system is capable of receiving and recording complaints	5.00	Very Satisfactory
The system can generate the correct and complete reports	5.00	Very Satisfactory
The system is capable of sending announcements/updates through Short Message Service (SMS)	4.00	Satisfactory
The system is able to complete the tasks without delay	5.00	Very Satisfactory
Overall Weighted Mean	4.71	Very Satisfactory

The concerns during system test 1 were analyzed and integrated for refinement. After which, the system was tested again and the results above show that there were no longer errors encountered while using the system. The system was already able to receive and record complaints and reports were generated accurately. Overall, the respondent finds the system’s functionality as Very Satisfactory (4.71).

TABLE 4. Barangay Chairman’s Evaluation on the Usability of the e – barangay during Second Testing

Statement	Mean	Verbal Interpretation
Ease of use	4.00	Satisfactory
Orderliness of system contents	5.00	Very Satisfactory
System interface design	5.00	Very Satisfactory
Clear links and buttons	5.00	Very Satisfactory
Readability of major heading and body text	5.00	Very Satisfactory
A person with no computer skill can be able to use the system	4.00	Satisfactory
Overall Weighted Mean	4.67	Very Satisfactory

The concern of the respondent with regards to the readability of headings and text were integrated to the refined version of the system. Font sizes and styles were adjusted in such a way that the contents will be clear and readable to the user. Overall, the respondent finds the system’s usability as Very Satisfactory (4.67).

TABLE 5. Barangay Secretary’s Evaluation on the Functionality of the e – barangay during First Testing

Statement	Mean	Verbal Interpretation
The system is easy to log – in	5.00	Very Satisfactory
The system can register, view and update residents profile/account	4.00	Satisfactory
The system is capable of receiving, recording and printing document requests (e.g. Barangay Certificate)	2.00	Poor
The system is capable of receiving and recording complaints	4.00	Satisfactory
The system can generate the correct and complete reports	2.00	Poor
The system is capable of sending announcements/updates through Short Message Service (SMS)	4.00	Satisfactory
The system is able to complete the tasks without delay	4.00	Satisfactory
Overall Weighted Mean	3.57	Average

The Barangay Secretary rated almost all functionality items as satisfactory to very satisfactory except for items 3 and 5. The respondent found a hard time printing documents and reports generated do not match the data inputted. In general, the respondent finds the system’s functionality as Average (3.57).

TABLE 6. Barangay Secretary’s Evaluation on the Usability of the e – barangay during First Testing

Statement	Mean	Verbal Interpretation
Ease of use	4.00	Satisfactory
Orderliness of system contents	4.00	Satisfactory
System interface design	4.00	Satisfactory
Clear links and buttons	4.00	Satisfactory
Readability of major heading and body text	5.00	Very Satisfactory
A person with no computer skill can be able to use the system	4.00	Satisfactory
Overall Weighted Mean	4.17	Satisfactory

The Barangay Secretary did not encounter any difficulty on the usability of the system. As a matter of fact, the respondent rated all items as satisfactory to very satisfactory. This implies that the usability of the system with regards to the secretary’s account was operative. Overall, the respondent finds the system’s usability as Satisfactory (4.17).

TABLE 7. Barangay Secretary’s Evaluation on the Functionality of the e – barangay during Second Testing

Statement	Mean	Verbal Interpretation
The system is easy to log – in	5.0	Very Satisfactory
The system can register, view and update residents profile/account	4.0	Satisfactory
The system is capable of receiving, recording and printing document requests (c.g. Barangay Certificate)	4.0	Satisfactory
The system is capable of receiving and recording complaints	5.0	Very Satisfactory
The system can generate the correct and complete reports	5.0	Very Satisfactory
The system is capable of sending announcements/updates through Short Message Service (SMS)	5.0	Very Satisfactory
The system is able to complete the tasks without delay	4.0	Satisfactory
Overall Weighted Mean	4.57	Satisfactory

The errors encountered during system test 1 were analyzed and integrated for further refinement. Results of Test 2 above

show that there were no longer bugs seen. The system was able to print documents and the reports generated were accurate. In general, the respondent finds the system functionality as Satisfactory (4.57).

TABLE 8. Barangay Secretary’s Evaluation on the Usability of the e – barangay during Second Testing

Statement	Mean	Verbal Interpretation
Ease of use	4.0	Satisfactory
Orderliness of system contents	5.0	Very Satisfactory
System interface design	5.0	Very Satisfactory
Clear links and buttons	4.0	Satisfactory
Readability of major heading and body text	5.0	Very Satisfactory
A person with no computer skill can be able to use the system	4.0	Satisfactory
Overall Weighted Mean	4.5	Satisfactory

There were no errors encountered with regards to the system usability. The respondent rated all usability items as Very Satisfactory. Overall, the respondent finds the system’s usability as Satisfactory (4.5).

TABLE 9. Summary of Weighted Mean on the Three (3) Groups of Respondents

	Overall Weighted Mean		
	Chairman	Secretary	Residents
Functionality Test 1	3.57	3.57	3.10
Functionality Test 2	4.57	4.71	4.70
Usability Test 1	4.17	3.67	3.92
Usability Test 1	4.5	4.67	4.80

IX. CONCLUSION AND RECOMMENDATIONS

Conclusion

An on-site interview with concerned barangay officials was conducted to determine the range and nature of duties. This matrix served as guide in developing the system modules and interface design. Further, process diagram showing the communication flow from one official to the other was likewise used in the development of the system.

The E-Barangay is a web-based management system where residents can register, file complaints and send requests online. The system allows the barangay secretary to receive and record residents’ registry, document requests and complaints. While the barangay chairman as the approving authority can approve requests, view/respond to complaints and generate reports even when he is on official travel or out of office. In addition, the system is also capable of sending notifications to residents via SMS either on the status of their requests/complaints or for local announcements on advisories and barangay ordinances.

Based from the series of tests conducted on the functionality and usability of the system, the performance of the E-Barangay as shown on its overall weighted mean was found to be fully functional and usable. Though, there were marginal errors encountered, nevertheless, through prototype refinement, the same was addressed and fixed as reflected on the results of the second system test.

Recommendations

For further studies on barangay management systems, the researcher recommends the integration of the following:

1. In consideration with the statistical correlation found between the educational attainment and the functionality and usability satisfaction among respondents, the researcher highly recommends the transliteration of system contents particularly for communities with low English literacy rate; a version of the system in native language such as Filipino, Chavacano, Yakan should be made.
2. Integrate the financial functions of the barangay such as fund disbursements and obligations, as this significantly composes the barangay development agenda; and
3. Consider inter-barangay connection to promote a digitally empowered and integrated local government.

REFERENCES

- [1] Pulumbarit, J., G. Suarez, J. , “Barangay Office Management System. International Journal of Mathematics & Computing” (March 31, 2017), 1.
- [2] Siar, Sheila V., E-governance at the Local Government Level in the Philippines: An Assessment of City Government Websites Volume XXXII (2005).
- [3] G. Zhiyong Lan, The Role of E-Government in Fostering Public Trust and Innovation in Public Service Delivery Rosemarie M. Bautista, “Promoting Digital Empowerment through Implementation of Barangay Management System” (April 2015), 563.
- [4] Cecilia M. Reyes, et al., Community-based Monitoring System: A Tool to Fight Poverty, 2. Economists Intelligence Unit, E-government in Central Europe Rethinking Public Administration
- [5] Monga, A. (2008). E-government in India: Opportunities and challenges, JOAAG, Vol. 3. No. 2 Tracy N. Tacuban, MSCS, 2016 Web Pages.
- [6] www.region6.dilg.gov.ph, accessed November 13, 2018