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Development and Evaluation of a Technology-based Barangay Management System

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Abstract: ***This study aims to develop a Barangay Management System (BMS) utilizing ISO 25010 standards, evaluating functional suitability, reliability, usability, security, and performance efficiency. A developmental research approach was applied, involving 30 respondents from barangay officials and staff. Data was collected through structured interviews and evaluated using weighted mean and Likert scale analysis. The findings indicate that the system is highly effective in improving barangay operations, streamlining administrative processes, and enhancing service delivery. Respondents strongly agreed on the system's usefulness in all measured attributes. These results suggest that the developed BMS can significantly contribute to more efficient local governance and service management.***

Keywords: Barangay Management System, e-Governance, local government technology, ISO 25010 evaluation, administrative automation

1. Introduction

The rapid evolution of technology has contributed a lot to the unceasing progress of all classes of industry. However, some sectors today seem to be left behind in familiarizing the use of different methods to allow progress on their part. Nowadays, business people delineate the applications and problems to be solved by the computer. However, this potential has not been fully documented in some businesses. It is because users may not fully comprehend the capabilities and limitations of modern computer technology (S. A. A. Bokhari and M. SeungHwan, 2022).

At present, our world has been transformed by technology in countless ways. Tasks have been made easier by different software, and newly developed technologies have been modernized even before it has been introduced to most of the world, and much more, faster than our imagination could catch. These advancements aim to better utilize the existing resources and maximize their uses to be able to bring out new or better products or results of modern computer technology. Management Information Systems have become more advanced and sophisticated today We have come to depend on computers for more and more aspects of our lives, and certainly for most business operations, it also improves employee's productivity since the employees are more prolific because they don't have to spend time gathering the data that the office wants (Mandičák, P. Mésároš, M. Spisakova and A. Kanalikova, 2022).

The primary objective of this research is to design and evaluate a Barangay Management System that enhances local governance efficiency through technology-based solutions, ensuring improved administrative performance and service delivery.

This study is significant as it introduces a structured approach to barangay management, integrating modern information systems to optimize local government operations. It contributes to the growing need for technology-driven public service solutions and serves as a model for other barangays seeking automation.

Objectives of the Study
The general objective of this study was to develop a Barangay Management System.

Specific Objectives:
Specifically, this study aimed to:
1) Integrate barangay profiling system;
2) Incorporate office management system; and
3) Test the quality of the characteristics of the developed system using ISO 25010 standards.

2. Methodology

Research Design
The researcher adopted the developmental type of research to achieve the purpose of the study.

Participants of the Study
This study was conducted at Malabor, Tibiao, Antique where barangay officials, SK Officials, Barangay Tanod, Barangay Health Workers, Barangay Nutrition Scholars, Purok Presidents were the participants of the study.

Data Gathering instruments and Techniques
The main technique used in gathering data was conducting an interview. This was done to gather information from the subjects of the study in order to achieve the desired purpose of the study.

Responses from interviews were categorized thematically and analyzed using qualitative content analysis to identify recurring insights and trends.

Preparation of Instruments
Conducting an interview is the most important part in conducting the study. The researcher prepared some questions in order to come up with the idea and data needed in the study.

Validation of Instruments
An instrument is valid if it measures what it is intended to measure and accurately achieves the purpose for which it was designed. Declaration of information on the research must be reliable and certain in order to meet this standard. The validation for questionnaire is not needed because the proponent used ISO 25010 evaluation form.

Data Gathering Procedure
In gathering the data, the researcher personally conducted interviews. First, the researcher prepared some questions, and all the questions were answered and through this procedure the researcher was able to get some important details and come up to the solution to the problem.

Statistical Tools
The evaluation forms were retrieved and a table was prepared in an accordance to the characteristics of the system based on ISO 25010 characteristics analyzed using weighted mean and sorted ranking.

Weighted Mean
The weighted mean for each item was obtained by multiplying the scale value of responses by the total number of responses indicating it to get the total weighted points and dividing them by the total number or responses. The mean is the measure of central tendency. It points to where the majority of the participants' answers to a question cluster.

$$\overline{X} = \frac{\sum fx}{n}$$

Where:
X= Weighted Mean
F=Frequency
X =Scores
n = Total number of participants
∑ = Summation symbol

Likert Scale
In the interpretation of the Weighted Mean (WM), Likert's Scale method has been used by the researcher using the following intervals and verbal interpretations. the 5-point scale was used in order to determine the rank or the adjectival description of the weighted mean of the responses for the proposed Prediction Model. The fields represent the rating, range, and the adjectival description for each rating.

Ranking
This will be used to get the rank average for each answer and determine which is the highest and lowest rank based on the results.

Software Model
This section gives a description of the methods used in developing the proposed system. **EBMT: Enhancing Barangay Management Through Technology** was developed using the Rapid Application Development (RAD) model.

The researcher used this model because the application's requirement is very well documented, fixed, and clear.

Rapid application development (RAD) is a team-based technique that speeds up information systems development and produces a functioning information system. Like JAD, RAD uses a group approach, but goes much further. While the end product of JAD is a requirements model, the end product of RAD is the new information system. RAD is a complete methodology, with a four-phase life cycle that parallels the traditional SDLC phases. Companies use RAD to reduce cost and development time and increase the probability of success.

Listed below are the four phases for RAD model:
Requirements Planning. The requirements planning phase combines elements of the systems planning and systems analysis phases of the SDLC. This phase requires intense involvement from Users, managers, and IT staff members to discuss and agree on business needs, project scope, constraints, and system requirements. The requirement planning phase focus always remains on reaching the goals and end when the team agrees on the key issues and obtains management authorization to continue.

User Design: During the user design phase, users interact with systems analysts and develop models and prototypes that represent all system processes, outputs, and inputs. The RAD group or subgroups typically use a combination of JAD techniques and CASE tools to translate user needs into working models. User design phase is a continuous, interactive process that allows users to understand, modify, and eventually approve a working model of the system that meets their needs.

Construction: The construction phase focuses on program and application development tasks similar to the SDLC. In RAD, however, users continue to participate and still can suggest changes or improvements as actual screens, or reports are developed.

Cutover: The cutover phase resembles the final tasks in the SDLC implementation phase, including data conversion, testing, changeover to the new system, and user training. Compared with traditional methods, the entire process is compressed. As a result, the new system is built in precise manner, delivered, and placed in operation much sooner.

3. Results and Discussion

This chapter presents the analysis, presentation, and interpretation of data based on the appropriate statistical tools.

Table 1: Mean Distribution of Functional Suitability of the system

Indicators	Frequency of Ranking					Mean	SD	Interpretation
	5	4	3	2	1			
Completeness	7	22	1	0	0	4.2	0.50	Strongly Agree
Correctness	10	20	0	0	0	4.33	0.47	Strongly Agree
Appropriateness	11	18	1	0	0	4.33	0.54	Strongly Agree

The Functional Suitability of the system's mean scores and standard deviation are displayed in table 2. Findings showed that Appropriateness and Correctness have the highest mean score of 4.33, while Completeness has the lowest scores 4.2.

This confirms that the system meets the required indicators, as reflected in the computed standard deviation.

Table 2: Mean distribution of Reliability of the system

Indicators	Frequency of Ranking					Mean	SD	Interpretation
	5	4	3	2	1			
Maturity	13	16	1	0	0	4.40	0.55	Strongly Agree
Availability	9	18	3	0	0	4.20	0.6	Strongly Agree
Fault tolerance	11	15	4	0	0	4.23	0.67	Strongly Agree
Recoverability	11	17	2	0	0	4.30	0.59	Strongly Agree

The reliability of the system's means scores and standard deviation are displayed in table 2. Findings showed that Fault Tolerance have the highest mean score, 4.23, and the Maturity has a mean scores of 4.4, Recoverability has mean scores of 4.3, while Availability has the lowest scores of 4.2.

This system has been found to be adequate for a variety of indicators supported by the calculated Standard Deviation. The findings of the study are consistent with the results of the study of Johnson A. (2020). Wherein majority of the respondents strongly agree with the system's reliability.

Table 3: Mean distribution of Portability of the system.

Indicators	Frequency of Ranking					Mean	SD	Interpretation
	5	4	3	2	1			
Adoptability	14	12	4	0	0	4.33	0.70	Strongly Agree
Durability	10	18	2	0	0	4.27	0.57	Strongly Agree
Installability	12	18	0	0	0	4.4	0.49	Strongly Agree
Replaceability	9	20	1	0	0	4.27	0.51	Strongly Agree
Affordability	9	17	4	0	0	4017	0.64	Agree

The portability of the system's means scores and standard deviation are displayed in table 3. Findings showed that Durability and Replaceability have the highest mean score 4.27, and the Adaptability has a mean score of 4.33, Affordability has a mean scores 4.17, While Installability has the lowest scores 4.4.

This basically means that the system was found to be portable in different indicators based on the computed standard deviation.

Table 4: Mean distribution of Usability of the system

Indicators	Frequency of Ranking					Mean	SD	Interpretation
	5	4	3	2	1			
Appropriateness Recognizability	18	12	0	0	0	4.6	0.49	Strongly Agree
Learnability	15	15	0	0	0	4.5	0.50	Strongly Agree
Operability	13	17	0	0	0	4.43	0.50	Strongly Agree
User Error protection	14	14	2	0	0	4.4	0.61	Strongly Agree
User Interaction Aesthetic	12	16	2	0	0	4.33	0.60	Strongly Agree
Accessibility	13	17	0	0	0	4.43	0.50	Strongly Agree

Table 4 shows the mean scores and standard deviation of the system's usability. It was found that Operability and Accessibility has the highest score of 4.43, User Interaction aesthetic has a mean score of 4.33, Appropriateness Recognizability has a mean score of 4.6, Learnability has a mean score of 4.5, while User error Protection has the lowest mean score of 4.4.

Table 4 states that the system was found to be usable with regards to the different indicators as supposed by the computed Standard Deviation

Table 5: Mean distribution of Performance Efficiency of the system

Indicators	Frequency of Ranking					Mean	SD	Interpretation
	5	4	3	2	1			
Confidentiality	8	21	1	0	0	4.23	0.52	Strongly Agree
Integrity	11	19	0	0	0	4.37	0.49	Strongly Agree
Non-repudiation	6	24	0	0	0	4.2	0.4	Strongly Agree
Accountability	14	16	0	0	0	4.47	0.50	Strongly Agree

Table 5 shows the mean scores and standard deviation of Performance of the system. Results showed that the Accountability has the highest mean score of 4.47, Integrity has mean score of 4.37, Confidentiality has mean score of 4.23 while non-repudiation has the lowest mean score of 4.2

It was found that the system is efficient with regards to the different indicators as supposed by the computed Standard Deviation.

Table 6: Security of the System

Indicators	Frequency of Ranking					Mean	SD	Interpretation
	5	4	3	2	1			
Confidentiality	13	15	2	0	0	4.23	0.49	Strongly Agree
Integrity	12	17	1	0	0	4.57	0.58	Strongly Agree
Non-repudiation	11	12	7	0	0	4.33	0.54	Strongly Agree
Accountability	14	16	0	0	0	4.43	0.49	Strongly Agree

Table 6 shows the mean scores and standard deviation of the security of the system. The results showed that Accountability has the highest mean score of 4.47, Confidentiality and Integrity has a mean score of 4.37, While the Non-repudiation has a lowest mean score of 4.13.

It simply states that the mean secured of the system relative to the various indicators is consistent confirmed by the calculated Standard Deviation.

Table 7: Mean distribution of Compatibility of the system

Indicators	Frequency of Ranking					Mean	SD	Interpretation
	5	4	3	2	1			
Co-existence	13	15	2	0	0	4.37	0.60	Strongly Agree
Interoperability	11	17	2	0	0	4.3	0.59	Strongly Agree

Table 7 shows the mean scores and standard deviation of the Compatibility of the system. The result showed that the Co-existence has the highest mean score of 4.37, while the Interoperability has the lowest mean score of 4.3.

This simply means that the system was compatible with regards to the different indicators as proven by the computed Standard Deviation.

Table 8: Mean distribution of Maintainability of the system

Indicators	Frequency of Ranking					Mean	SD	Interpretation
	5	4	3	2	1			
Modularity	8	21	1	0	0	4.23	0.49	Strongly Agree
Reusability	14	16	1	0	0	4.57	0.58	Strongly Agree
Analyzability	11	18	1	0	0	4.33	0.54	Strongly Agree
Modifiability	13	17	0	0	0	4.43	0.49	Strongly Agree
Testability	13	15	2	0	0	4.37	0.61	Strongly Agree

Table 8 shows that Reusability has the highest mean score of 4.57, Modifiability has a mean score of 4.43, Testability has a mean score of 4.37, Modularity and Analyzability has the lowest mean score of a mean score of 4.23. The system was found to be maintainable in relation to the different indicators, which is supported by the calculated Standard Deviation.

4. Findings

The study found that the Development and Evaluation of A Technology-Based Barangay Management System platform effectively enhances the operations of the barangay. It is a system that benefits the constituents and local government of the barangay. Furthermore, the system really helped improve the services offered by the barangay.

5. Conclusion

Alter the thorough analysis and evaluation of the data gathered from the participants, the initial testing and their evaluation, the researcher has led to the following conclusions:

Development and Evaluation of a Technology-Based Barangay Management System significantly enhances the operations of the barangay, providing efficient services, and reducing time consumption.

The system produces quality outputs, minimizing errors thus, contributing to the overall efficacy of office operations.

The respondents strongly agreed in all aspects of the developed system- based on ISO 25010 characteristics which are functional suitability, reliability, portability, usability, performance efficiency, security, and compatibility maintainability.

6. Recommendation

To give light to the findings, the following are recommended: The barangay should adopt the said system to help achieve the efficiency of office operations.

The staff who is going to use the system must undergo training so as not to find difficulties.

Future researchers are encouraged to help improve the system so as to cope with the hands of time.

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