



Research Article

Open Access

Healthdisisyon: Development and Assessment of Barangay Health Unit Decision Support System

Engel Kenneth P. Cultivo , Aira Marie C. Aquino and Catleen Glo M. Feliciano

College of Computing Studies Information and Communication Technology, Isabela State University, Hague, Isabela, 3309, Philippines
catleenglo.r.madayag@isu.edu.ph

ABSTRACT

Barangay officials are responsible for the barangay-related decision-making process. The secretary handles the data to be used by the officials. The Secretary is the person who assists the civil registrar in recording in his jurisdiction the births, deaths, diseases, and marriages that occur. For this purpose, in terms of births, deaths, and illnesses, the barangay secretary in the Philippines is an individual assigned to compile and manage the barangay records. It is laborious to consolidate, manage, evaluate, and retrieve information, especially in producing efficient information and decision processing, using the current method of encoding data to excel. For this purpose, the researchers design and develop a Networked Decision Support System Application to help barangay monitor the Natality, Mortality, and Morbidity rates in the Barangay for efficient information and decision processing and to define the system's acceptability to the end-user in terms of functionality, usability, and performance. The data will be automatically analyzed via tabular, graphical, and geographical formats using the device. Natality, mortality, and morbidity rates are easily consolidated by the system and computed. The information is now organized and the records of the different rates are stored in the system's database. The developed DSS for the Barangay Health Unit correctly fulfills functional requirements for features such as the management of the Barangay residents' profile, the mapping of geographical information, the statistical report using tabular and graphical data, and report presentation. The system was evaluated jointly with the residents by the barangay officials/staff like the secretary. The overall result of the system evaluation using ISO 25010 Software Quality Standard the criteria Functionality, Usability, and Performance statistically implies that the system was completely functional, efficient and usable, and fulfilled the requirements of the users.

Keywords Decision Support System, Barangay, Health, natality, mortality, mobility

Introduction

The provision of appropriate, timely, and accessible data by a county is important as data serves as inputs to set goals, make informed decisions and enforce better development policies (Albert & Vizmanos,2019). That is one of the reasons why the Philippine government has inspired e-government to use the advantages of technology to provide people

with enhanced and quality service. (Lacasandile,2018).

The Republic Act 7160, also known as the Local Government Code of 1991 allows the barangay to serve three main functions: a) as a political entity, b) as a primary unit of planning and implementation, and c) as a forum. The secretary who holds barangays knowledge plays a crucial role in the decision making of the officials to be able to achieve the mandates. The

Secretary maintains an updated record of all Barangay residents, such as name, address, place, and date of birth, gender, civil status, citizenship, and occupation of information, (Tacuban,2016) Assist and assist the local civil registrar within the unit with birth, death, disease and marriage registers. (Tan,2018). Secretary also submits a monthly report on the barangay registered births, deaths, diseases, and marriages, as well as the annual number of residents with their respective local civil registrars. Such information is the data used by officials in decision-making (Sec. 394 (c) (5), The Local Government Code of 1991) (9: 3a).

The Barangay Secretary experience the following problems in the current system in monitoring birth, death, and especially diseases rates in the barangay: No computerized system used to monitor the birth, death, and diseases; the secretary use MS Excel in consolidating the rates of birth, death, and diseases in the barangay. The number of birth, death, and diseases are evaluated manually. The secretary used folders as a repository of reports; the secretary used pre-printed form in generating reports submitted to City Health Office, Comelec, and Civil Registrar's Office; there is no statistical analysis in determining the rates of birth, death, diseases, and marriage; there is no repository of records of the different cases; unorganized filing of records and reports are also experienced by the secretary of the Barangay; delay in submission of reports due to inaccurate tabulation; the Barangay consolidate only the data of birth, death, and diseases without analysis and interpretation of data especially today's pandemic due to covid-19 where fast and accurate reports are highly needed.

The citizen can gain more with the aid of the decision support system, as the decision support system is an information system that facilitates corporate or organizational decision-making activities. (Segal,2020). A DSS is used by planning divisions in an organization, such as the operations department, which gathers information and generates a report that can be used for decision-making. (Santoso,2017).

The proponent aims to design and create a Networked-based Decision Support System Application to monitor the rates of natality, mortality, and morbidity in the Barangay to solve the current problems of the Barangay, in which the system will generate an output that could be used by officials to make faster and more precise decisions.

This project focuses on the term Natality used in birth rate, another term Mortality used in death rate, and Morbidity is disease rate (Center for Disease Control and Prevention, 2020) to cater to some transactions of the Barangay Health Unit.

A Decision Support System that uses historical data and transforms it into descriptive statistics was adopted by the system. (Ouahilal et al,2016) and a combination of human-powered and computerization (2018). Using the system, the information would be automatically evaluated by the system in a tabular, graphical and geographical format that could be used by the barangay in decision making, apart from providing the secretary with a solution for managing barangay records. Report generation is performed automatically by the system. Natality, mortality, and morbidity rates are conveniently consolidated and calculated through the system. In specific, this study aims to first test the functionality of the system related to resident profile, geographical information-based mapping, statistical report using tabular and graphical data presentation, and reports. The second is to evaluate user acceptance using Software Product Quality (ISO 25010) as perceived by users' acceptability concerning Functionality, Usability, and Performance.

Methods

This research uses the research development type, which is the systematic analysis of the design, development, and evaluation of educational programs, processes, and products that must meet internal quality and efficiency criteria. In the field of instructional technology, developmental research is especially important. (Ritchie, 1994) with the application of descriptive statistical analysis on user's acceptance of technology evaluation.

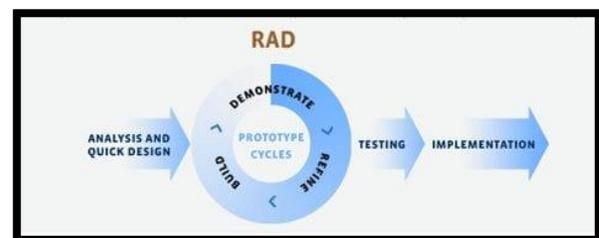


Figure 1. Rapid Application Development

The researchers used Rapid Application Development (RAD). A type of methodology for software development that utilizes minimal planning in favor of rapid prototyping. Software development preparation using RAD is correlated with writing the software itself (Rouse,2016).

Evaluation Method

Researchers perform system assessment using the Software Quality Standard(ISO 25010) to assess the end-acceptance user's of the system by the user. The Questionnaire to measure the level of user acceptance to the system based on the criteria Functionality, Usability, and Performance towards using the technology (Estdale & Georgiadou,2018)

The researchers used a Likert scale to determine, evaluate, and to give feedback to the system. (Likert,1932) This has been used to determine whether the respondents rated “Very Great Extent (VGA)”, “Great Extent (GE)”, “Moderate Extent (ME)”, “Little Extent (LE)”, and “Very Little Extent (VLE)”.

The locale of the study

The researchers will be conducted the study at Barangay Rizal Santiago City.

Sampling Method

The researchers used a purposive sampling approach to gather data and information from the respondents. This includes the detection and collection of people or groups of people who are knowledgeable and well-informed about a phenomenon of interest. (Etikan,2016).

The population of the study

The respondents of this study have consisted of the following: 1 Barangay Captain, 1 Barangay Secretary, 1 Barangay Deputized Collector, 2 Barangay Clerk, 3 Barangay BLO, 7 Purok Officials, 15 Residents knowledgeable in Information Technology of Barangay Rizal, Santiago City who will evaluate the system.

Results

A. Design and develop DSS for Barangay Health Unit.

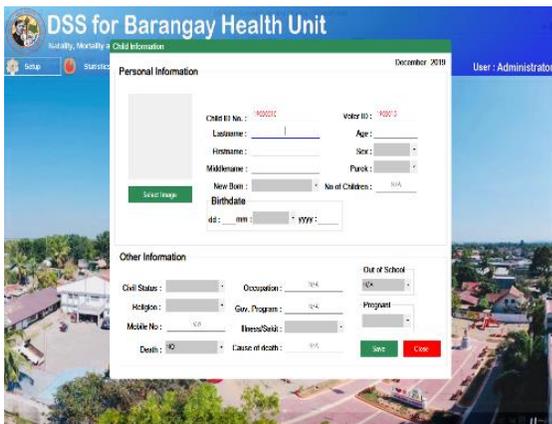


Figure 2. Child Profile Information Form User Interface



Figure 2. Child and Parent Profile Information Form User Interface

The System collects the resident’s information using the profile information form as shown in Figures 2. This form serves as a tool to collect data and store it in the database to generate useful information.



Figure 3. Mapping Form User Interface

This is one of the Decision support system features of the system. Upon collecting data the system has another functionality of using a map to identify the barangay purok. Natality, Mortality, and Mobility. The map used a tooltip for each purok that once the user hovers or taps the purok tooltip the summary status of the purok will be seen. Color of text change depends on the average rate or status in the purok. The status is divided into low, medium, high, and critical conditions which can be used by the officials in decision making (Fox et al, 2014) on what will be their action for the purok or the entire barangay.



Figure 4. Statistics Form User Interface

Another Decision support system features of the system being developed are the statistical analysis of the data which is using data and converted into descriptive statistics (Ouahilal et al,2016) in a form of a bar graph as shown in figure 4, which is showing the consolidated rate of natality, mortality, and mobility in a barangay. This feature provides a clear understanding of the barangay official and staff the current situation of rate which is a big help for faster and easier decision making.



Figure 5. Tabular and graphical reports generated by the system

Figure 5 shows the tabular and graphical reports using a bar graph of the system. Which is the consolidated data of the system and summarized into a table and be able to generate a graph for better

understanding and monitoring of the rate which is useful for decision making of the barangay.



Figure 6. Printed Reports generated by the system

Another add-on feature of the system is to generate printed summary reports of the system data.

B. Users Evaluation Results in Acceptability

Evaluation Result	Official/ Staff	Quantitative Rating	Residents	Quantitative Rating
Functionality	4.74	Very Great Extent	4.84	Very Great Extent
Usability	4.82	Very Great Extent	4.88	Very Great Extent
Performance	4.65	Very Great Extent	4.88	Very Great Extent
Total	4.74	Very Great Extent	4.86	Very Great Extent
Grand Mean			4.80	Very Great Extent

Figure 7. Users Evaluation Results in Acceptability

The criteria of official/staff and residents in Functionality, Usability, Performance with a mean value of 4.74, 4.82, 4.65 and the total mean of 4.74 is respectively with the quantitative equivalent to “Very Great Extent” while a resident is 4.84, 4.88, 4.88 with the total mean of 4.86 is respectively with the quantitative equivalent to “Very Great Extent”. The total grand mean of Functionality, Usability, and Performance is a value of 4.80 respectively with a quantitative rating of “Very Great Extent”. It statistically implies that the system functioned correctly and meets the requirements of the user.

Conclusion and Future Works

Based on the development, testing, and implementations conducted, the researchers concluded the following:

1. The developed DSS for Barangay Health Unit performs functional requirements properly of the features such as managing the profile of the residents of the barangay, mapping geographical information, statistical report using the tabular and graphical presentation of data, and generating printed reports. The features are a big help for the barangay to manage, consolidate, and easier retrieval data which can be used for faster and reliable decision making. The researchers also concluded that the feature of the system is another tool for today's pandemic COVID-19 as it would be another way for the barangay to provide updated information and supports decision on the health situation of per purok using the mapping, tabular and statistical features.

2. The overall result of the system evaluation using ISO 25010 Software Quality Standard the criteria Functionality, Usability and Performance as perceived by the users obtained a total mean value of 4.80 which is equivalent to "Very Great Extent". This statistics implies that the system was fully functional, perform efficiently and usable and meets the users' requirement. Thus the system is highly recommended to be implemented also to other barangays in the Philippines.

References

Albert, J. R. G., & Vizmanos, J. F. V. (2019). Philippine Statistical System in the Wake of the Emerging Data Revolution and Digitization.

Beynon-Davies P., Carne C., Mackay H., Tudhope D.(1999) Rapid application development (RAD): an empirical review. European Journal of Information Systems. Volume 8, No. 211-223. <https://doi.org/10.1177/030631200030005004>

Center for Disease Control and Prevention, 2020.An Introduction to Applied Epidemiology and Biostatistics, Principles of Epidemiology in Public Health Practice, Third Edition. Retrieve from: <https://www.cdc.gov/csels/dsepd/ss1978/lesson3/section3.html>

Convention of the Association for Educational Communications and Technology. Retrieve from: <https://eric.ed.gov/?id=ED373753>

Estdale, J., & Georgiadou, E. (2018). Applying the ISO/IEC 25010 Quality Models to Software Product. Systems, Software, and Services Process Improvement, 492–503. doi:10.1007/978-3-319-97925-0_42

Etikan, I. (2016). Comparison of Convenience Sampling and Purposive Sampling. *American Journal of Theoretical and Applied Statistics*, 5(1), 1. <https://doi.org/10.11648/j.ajtas.20160501.11>

Fox, T.J., Nelson, J.C., and Rohweder, J.J., 2014, Decision support system development at the Upper Midwest

Environmental Sciences Center: U.S. Geological Survey Fact Sheet 2014–3120, 2 p., <https://dx.doi.org/10.3133/fs20143021>. ISSN 2327–6932

Govindan, K., Mina, H., & Alavi, B. (2020). A decision support system for demand management in healthcare supply chains considering the epidemic outbreaks: A case study of coronavirus disease 2019 (COVID-19). *Transportation Research Part E: Logistics and Transportation Review*, 138, 101967. doi:10.1016/j.tre.2020.101967

Muñoz, E., Capón-García E., Puigjaner L.(2018) Decision support platform based on intelligent mathematical modeling agents. Elsevier. Volume 43,Pages 1-1717 <https://doi.org/10.1016/B978-0-444-64235-6.50213-8>

Ouahilal, M., Mohajir, M. E., Chahhou, M., & Mohajir, B. E. E. (2016). A comparative study of predictive algorithms for business analytics and decision support systems: Finance as a case study. 2016 International Conference on Information Technology for Organizations Development (IT4OD). doi:10.1109/it4od.2016.7479258

Pimentel, Aquilino. (1994). The Barangay and the Local Government Code. Manila: Rex Book Store.

Richey R. (1994). Developmental Research: The Definition and Scope. National

Rouse, M. (2016). Rapid Application Development (RAD). Retrieved from: <http://searchsoftwarequality.techtarget.com>

Santoso, L. W., & Yulia. (2017). Data Warehouse with Big Data Technology for Higher Education. *Procedia Computer Science*, 124, 93–99. doi:10.1016/j.procs.2017.12.134

Lacasandile, A., & Niguidula, J. D. (2018). e-government concept from cabal to the community. Proceedings of the 2018 International Conference on Data Science and Information Technology - DSIT '18. doi:10.1145/3239283.3239301

SEGAL, T. (2020). Decision Support System—DSS. Retrieve from : <https://www.investopedia.com/terms/d/decision-support-system.asp>

Tacuban T. 2016. Barangay Decision Support and Mapping System. *Asia Pacific Journal of Multidisciplinary Research*, Vol. 4, No. 2. P-ISSN 2350-7756, E-ISSN 2350-8442

Tan,Sue Teresa (2018).Barangay Secretary Duties. <https://careertrend.com/list-6849283-barangay-secretary-duties.html>