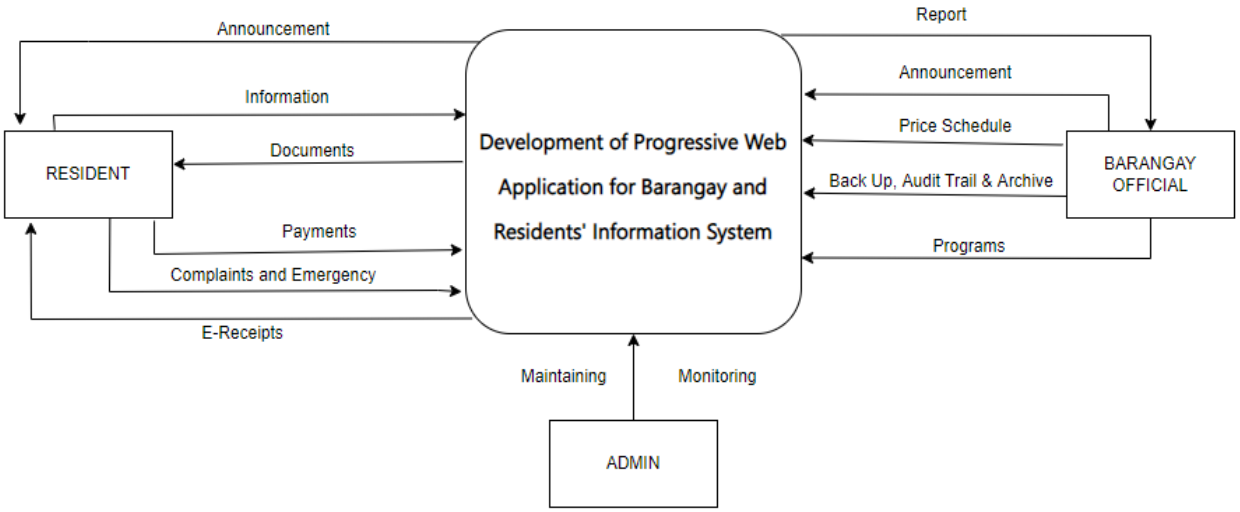
Chapter 3

METHODOLOGY

This chapter includes the project design, project development, operation and testing procedure, and evaluation procedure.

Project Design



The study will develop a web and mobile-based application, BaRIS, allowing residents, barangay, and higher government (admin) to get their needed documents, collection information, share resources, file and receive reports and other activities that can now be easily done online instead of normal procedure that will take time going to the barangay and maybe endangering the health of these people because of the pandemic. In addition, the study used several modeling tools to analyze the scope of the platform and formulate requirements for it.

Figure 6. Context diagram of the system

System Design

The scope of the system will be represented using Context Diagram as depicted in *Figure 6*. The diagram shows the external entities that interact with BaRIS and the network inputs and outputs flowing in and out of the system. The external entities expected to interact with the platform include residents, barangay, and higher government (admin).

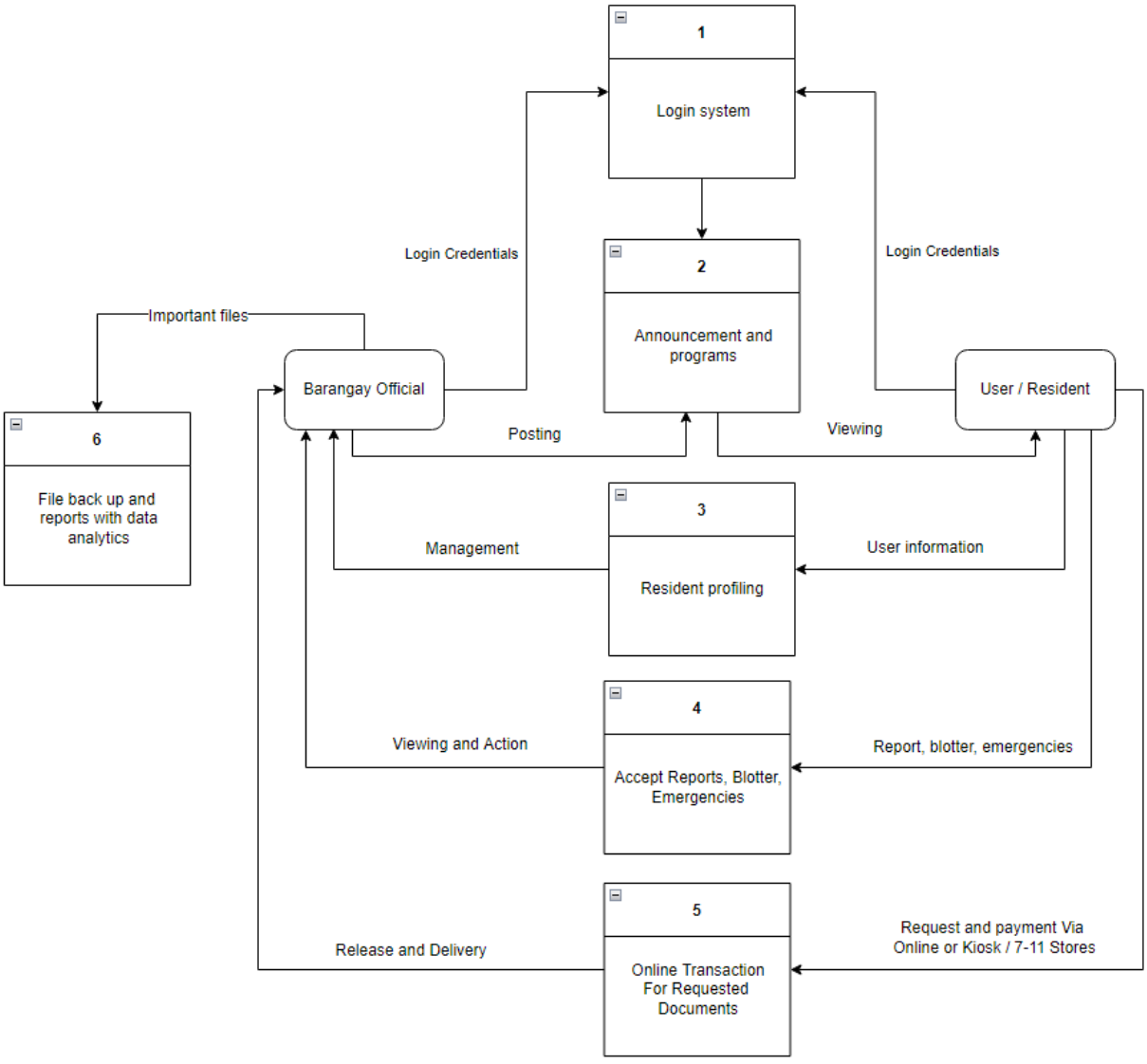


Figure 7. Data Flow Diagram

Based on system requirements in *Figure 7*, the following are the features of the platform designed for all **Users or Residents:**

- Viewing of announcements.

- Fill up their information.
- Report complaints and emergencies.
- Application for needed documents.
- Pay transaction online or via kiosk.
- Receive receipt for transactions.

For **barangay officials:**

- Receiver reports, blotter, and emergencies.
- Post announcements.
- Manage users or residents
- Set price for documents
- Back up, audit trail, and archive data.
- Create programs depending on the need.

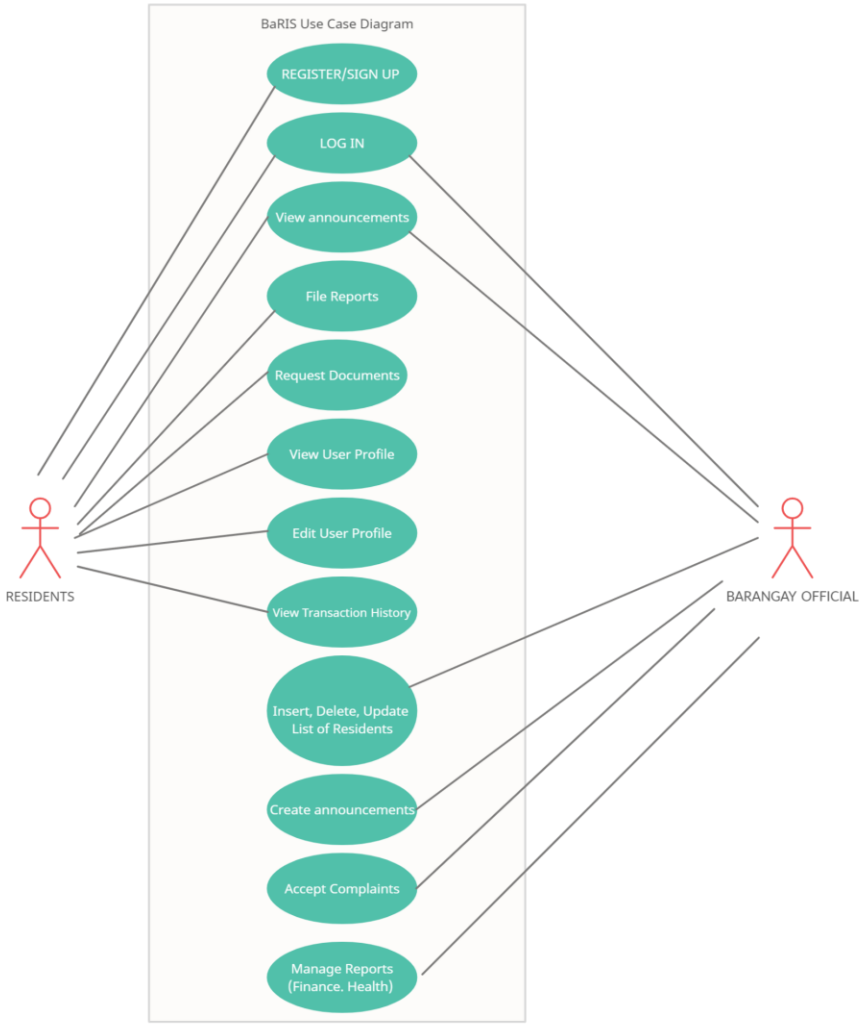


Figure 8. Use Case Diagram of the System

Figure 8 presents the use case diagram of the system showing the different actions in the system and its interaction with the users. The system has 2 external actors and 12 actions that can be performed in the system. The external actors, which are the residents and barangay officials, represent the different user access privilege of the system. Each action on the system can only be accessed with the corresponding privilege.

Database Design

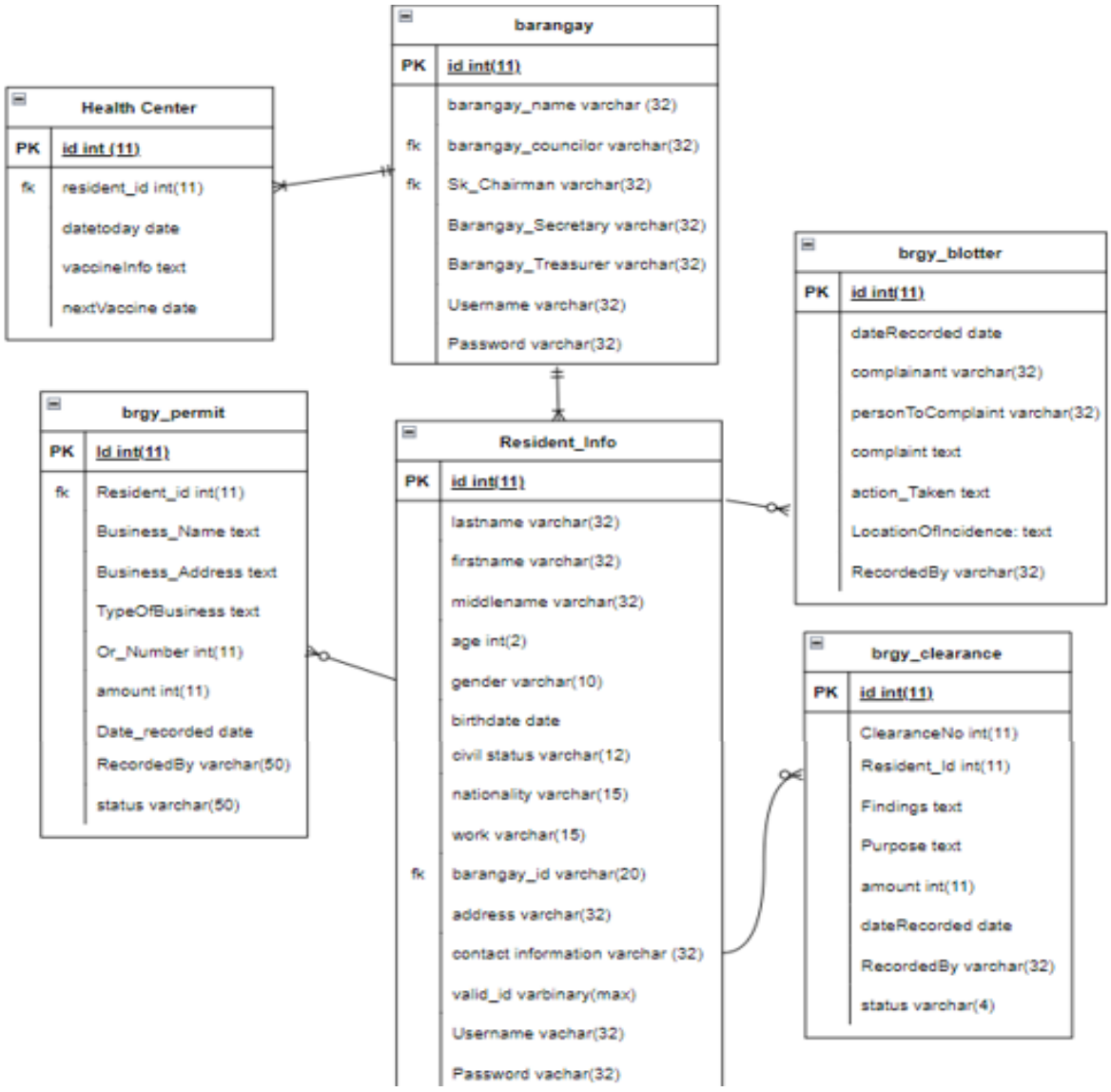


Figure 9. Database Design

Figure 9 presents the database design of the system. The BaRIS database will store the resident's information, barangay's information, councilor's name, SK councilor's name, barangay health center information, and other barangay-issued documents such as barangay clearance, business permit, blotter, and disease information.

Project Development

The Barangay System will be developed by following the iterative waterfall model approach as shown in *Figure 10*. The model consists of six phases of development, namely: Requirement Analysis, System Design, Implementation or Coding, Testing, Deployment and lastly, Maintenance. Moreover, it features a feedback path for changes or corrections all over the past phases for adjustments and some necessary modifications.

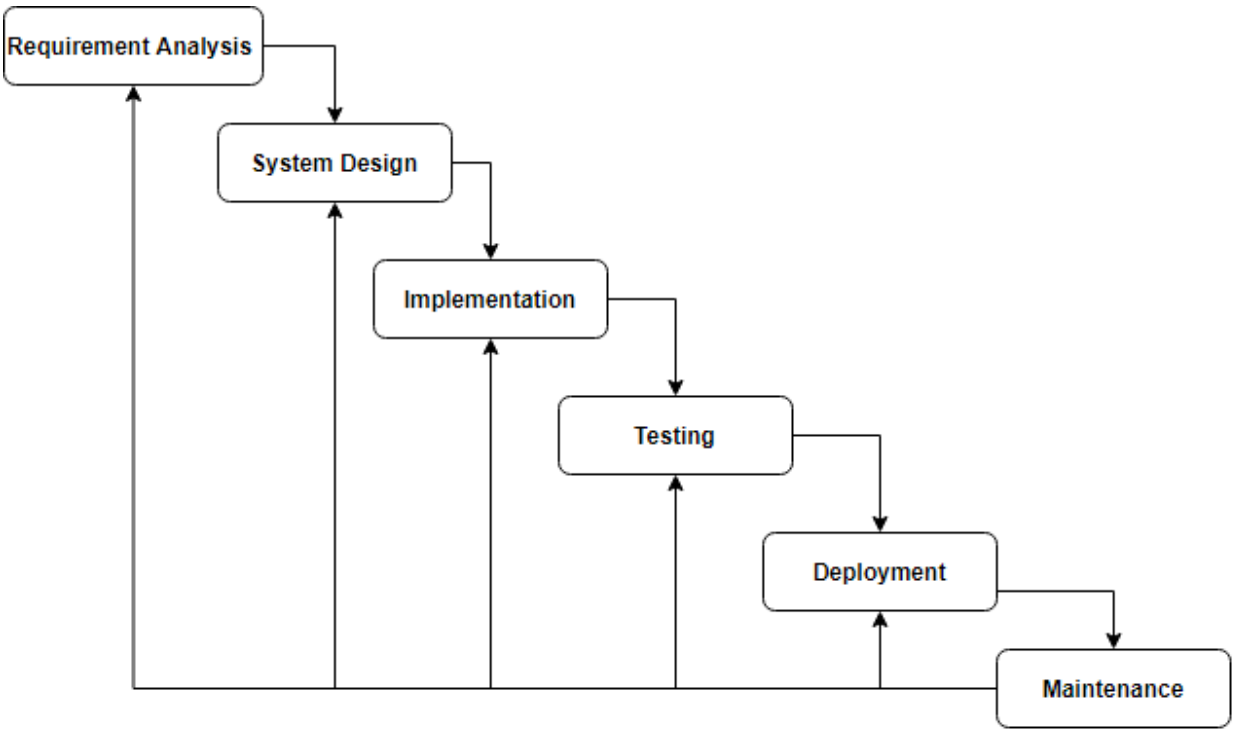


Figure 10. Iterative Waterfall Model

Requirement Analysis. In this phase, the researchers will think of all the possible specifications for the system and outline it properly where all future development can be based. The objectives, goals and what the proposed Barangay Information Management System can do are laid out. The researchers are also looking, analyzing and comparing existing studies, features and projects that can be useful for the proposed system.

System Design. This is the phase where the requirements on the first phase are being studied and prepared by the researchers. It will be focused on technological design requirements such as, programming language, equipment, and information sources that would be helpful for the

development of the system. It will include the overall look and functionality of the Barangay System. Feedback path will be accessible if there is more requirement needed.

Implementation. This phase will start by translating or converting all of the design that was specified in the last phase. The Implementation or Coding phase will serve as a vital role in successfully developing the system. The Barangay Information Management System will be developed using PHP for web, JavaScript for the creation of the mobile application, and MongoDB as its Database. An iteration can happen if there will be a problem in analyzing and designing phases.

Testing. The phase where each feature of the system is tested to ensure that everything is working as intended. The researchers will find and disclose problems that must be addressed immediately before going to the next phase. A possible iteration will be done wherever the problem is. It could be in the analysis, designing or implementation phase.

Deployment. This is the phase where the proposed Barangay Information Management system is complete and will be applied to the chosen barangay of the researchers. It would be uploaded on the web and the application can be installed through Google Play Store or on the website itself.

Maintenance. This last phase is where the system should be well maintained in order to keep and provide satisfaction of the users.

Operation and Testing Procedure

To ensure the quality of the Barangay Residents and Information System and mobile application, software testing shall be conducted in each software build. The system that will be developed will be tested in terms of functionality, reliability, and portability.

Functional Testing shall be performed to check the features or functionalities of BaRIS. This is to ensure that each software component performs the expected output. The following steps shall be taken for each iteration:

1. Distinguish the functions of each software build.
2. Create input data based on the specifications of the function.
3. Identify the output data based on the specifications of the function.
4. Execute the test cases.
5. Compare the actual result from the expected result.
6. Determine the result.
7. Evaluate if the test passes or fails.

Table 1.

Test Case Form.

Test Suite	File Reports
Test Case ID	3
Test Case Summary	Filing a Report
Related Requirement	Username: admin Password: admin
Prerequisite	Verified Account
Testing Procedure	1. Open the App 2. Login Using verified credentials 3. Click Services 4. Click File a Report 5. State your report 6. Click Send
Test Data	Reports
Expected Result	>=95% confidence
Status	Passed
Remarks	Passed
Created By	Marvin Jaudian
Date of Creation	December 20, 2021
Executed By	Marvin Jaudian
Date oof Execution	December 20, 2021
Test Environment	localhost

Reliability Testing shall be conducted to examine the performance of BaRIS under given environmental conditions. The following steps shall be taken for each iteration:

1. Run the BaRIS' web and mobile application repeatedly in Android environments to determine if the system shall provide the same output and results.
2. Count the total number of failing cases and the total number of cases under consideration.
3. Compute the probability of failure.

Portability Testing shall also be carried out to verify the adaptability, installability, replaceability, and co-existence of both website and mobile application. The following steps shall be taken for each iteration:

1. Run BaRIS on different mobile operating system versions of Android.
2. Run BaRIS on different smartphone devices that run on Android.

3. Run BaRIS on a different laptop or desktop.
4. Run BaRIS on different browsers.

A test case form shall be utilized to record each portability test performed. The results shall be analyzed to determine the effectiveness of BaRIS. *Table 1* shows the test case form.

Table 2.

Test Case Form.

TYPE OF BROWSER	STEPS	EXPECTED OUTPUT
Google Chrome	1. Download Google Chorme browser 2. Open Google Chrome after downloading it 3. Access http://BaRIS.com 4. Test every feature if BaRIS 5. Test the responsiveness of BaRIS	Upon testing every feature of BaRIS, Google Chrome browser should be responsive
Microsoft Edge	1. Download Microsoft Edge browser 2. Open Microsoft Edge after downloading it 3. Access http://BaRIS.com 4. Test every feature if BaRIS 5. Test the responsiveness of BaRIS	Upon testing every feature of BaRIS, Microsoft Edge browser should be responsive
Firefox	1. Download Firefox browser 2. Open Firefox after downloading it 3. Access http://BaRIS.com 4. Test every feature if BaRIS 5. Test the responsiveness of BaRIS	Upon testing every feature of BaRIS, Mozilla Firefox browser should be responsive

Evaluation Procedure

The evaluation instrument that will be used to determine the acceptability of BaRIS will be adopted from the ISO 25010 software quality metrics.

The following procedure will be followed to evaluate the acceptability of the developed BaRIS:

1. The researchers will invite one barangay official for each of the two selected barangays, and two residents for each barangay as well to be the respondents to serve as evaluator of the BaRIS.
2. The objectives of the research shall be discussed and a demonstration shall be conducted to explain the functionalities of the system.
3. Evaluators will be asked to create an account for their respective roles or profile, log it in then browse through all the features of the system.
4. After the project demonstration, the evaluator will be given a questionnaire, rating the system by the standard evaluation criteria of ISO 25010 using a Likert scale rating system as shown in Table 2 where 4 is the highest and 1 is the lowest.

Table 2.

Likert's Scale

Scale	Descriptive Rating
4	Highly Acceptable
3	Very Acceptable
2	Fairly Acceptable
1	Not Acceptable

5. The overall mean ratings shall be computed for each criterion based on the collected evaluation.
6. The evaluation results shall be translated into qualitative interpretation using the scale shown in Table 3.

Table 3.

Scale Range and the Equivalent Descriptive Rating

Scale	Adjectival Rating	Range
4	Highly Acceptable	3.26 - 4.0
3	Very Acceptable	2.51 - 3.25
2	Acceptable	1.76 - 2.5
1	Not Acceptable	1.0 - 1.75

References:

Aiim. (2021). *What is information management?* What is Information Management? Retrieved November 19, 2021, from https://www.aiim.org/what-is-information-management.

Alonzo, C. P., Alvarez, A. D., Dian, A. J. M., Soriano, R. S., Tabunar, L. G., & Javier, M. B. S. (2019). ELECTRONIC PROFILING OF ZINARAG, APARRI, CAGAYAN. *of INNOVATIONS in INFORMATION and*, *3*(2), 66.

Amatya S., Kurti A. (2014) Cross-Platform Mobile Development: Challenges and Opportunities. Advances in Intelligent Systems and Computing, vol 231. Springer, Heidelberg. Retrieved November 3, 2021 from https://doi.org/10.1007/978-3-319-01466-1_21

Aparici, M. M. A., & Ruelan, J. R. J. (2018, May) INFORMATION SYSTEM FOR MALITA, DAVAO OCCIDENTAL". Retrieved November 21, 2021.

APM (2021). What is Information Management? Retrieved November 7, 2021 from https://www.apm.org.uk/resources/what-is-project-management/what-is-information-management/

Arun G. (2017, July 4). *5 advantages of Cross Platform Mobile App Development*. Digital Doughnut. Retrieved November 7, 2021, from https://www.digitaldoughnut.com/articles/2017/april/5-advantages-of-cross-platform-mob-app-development

Beal, V., Ledbetter, L., Phipp. J, & Ingalls, S. (2021, July 29). *What is an API (application program interface)?* Webopedia. Retrieved November 4, 2021, from https://www.webopedia.com/definitions/api/.

BioMelbourne Network. (2020, January 27). Importance of acceptable use policy – IT Systems & Services. Retrieved November 6, 2021, from https://biomelbourne.org/importance-of-acceptable-use-policy-it-systems-services/

Business World. (2018, August 17). *The Barangay System*. Grant Thornton Philippines. Retrieved November 7, 2021, from https://www.grantthornton.com.ph/insights/articles-and-updates1/opinion/opinion/.

Chartered Institute of Library and Information Professionals. (2020). Benefits of Information Management. Retrieved November 2021, from https://www.cilip.org.uk/page/BenefitsfromIM

Chuprina, R. (2021, November 5). E-Commerce Payment Systems for Business in 2021. Technology Partner for Innovative Companies. Retrieved November 5, 2021, from https://spd.group/ecommerce-solutions/e-payment-systems/

Devanesan, J. (2020, July 24). The Philippines is going cashless – finally. Tech Wire Asia. Retrieved November 6, 2021, from https://techwireasia.com/2020/07/digital-payments-are-finally-soaring-in-the-philippines/

Estinar, A. O., Grefiel, L. S., Libre, L. H., Lu, L. K., & Tangkeko, M. S. (2018). Pampanga's Barangay Health Information System (PBHIS): A Decision Support & Health Information System for Rural Health Unit. In *DLSU Research Congress* (pp. 1-6).

Farahat I.S., Tolba A.S., Elhoseny M., Eladrosy W. (2019) Data Security and Challenges in Smart Cities. In: Hassanien A., Elhoseny M., Ahmed S., Singh A. (Eds) Security in Smart Cities: Models, Applications, and Challenges. Lecture Notes in Intelligent Transportation and Infrastructure. Springer, Cham. Retrieved November 6, 2021, from https://doi.org/10.1007/978-3-030-01560-2_6

Faris, S. (2019, March 14). *Common problems in management information systems*. Small Business - Chron.com. Retrieved November 19, 2021, from https://smallbusiness.chron.com/common-problems-management-information-systems-63376.html.

Ghani, N. A., Hamid, S., Hashem, I. A. T., & Ahmed, E. (2018, August 22). Social Media Big Data Analytics: A survey. Computers in Human Behavior. Retrieved November 7, 2021, from https://www.sciencedirect.com/science/article/pii/S074756321830414X.

How to get a barangay certificate of indigency or low income in the Philippines. Archipelago Files. (n.d.). Retrieved November 19, 2021, from http://www.archipelagofiles.com/2017/03/how-to-get-barangay-certificate-of.html.

Interactive Pro. (2021) How Important is Information Management. Retrieved November 15, 2021, from https://www.edology.com/blog/computing-it/how-important-is-information-management/

ISchool (2021, November 15). *What is information management?*. Retrieved November 19, 2021, from https://ischool.uw.edu/programs/msim/what-is-information-management.

ISO 25000 Portal. iso25000.com. (n.d.). Retrieved November 30, 2021, from https://iso25000.com/index.php/en/iso-25000-standards/iso-25010.

Januzaj, Y., Ajdari, J., & Selimi, B. (2015, July 26). DBMS as a cloud service: Advantages and disadvantages. Retrieved November 7, 2021, from https://www.sciencedirect.com/science/article/pii/S1877042815038914

Lorenzo, et al., (2019). Most Encountered Problems in the Barangay. Retrieved from https://www.academia.edu/31877668/Most_Encountered_Problems_in_the_Barangay

Lotha, G., Zelazko, A., Abhinav, V., & Chopra, S. (2019, March 28). *Information system*. Encyclopedia Britannica. Retrieved November 19, 2021, from https://www.britannica.com/topic/information-system.

Lyra. (2021, August 3). What is an e-payment system? & How e-payment system works? Lyra India. Retrieved November 6, 2021, from https://www.lyra.com/in/e-payments/

M. C. Lucas-Estañ, T. P. Raptis, M. Sepulcre, A. Passarella, C. Regueiro and O. Lazaro, "A software defined hierarchical communication and data management architecture for industry 4.0," 2018 14th Annual Conference on Wireless On-demand Network Systems and Services (WONS), 2018, pp. 37-44, Retrieved November 5, 2021, from doi: 10.23919/WONS.2018.8311660.

Mercado, I. T., Munaiah, N., & Meneely, A. (2016). The impact of cross-platform development approaches for mobile applications from the user's perspective. Proceedings of the International Workshop on App Market Analytics - WAMA 2016. Retrieved November 7, 2021, from doi:10.1145/2993259.2993268

Montealegre, B., Francis, Bolilia, M. D. (2021, April 22). *How to get Barangay Clearance*. Philippine Clearances. Retrieved November 19, 2021, from https://philippineclearances.com/barangay-clearance/.

Padillio, A. M. (2019, July 22). Is the Philippines ready to go cashless? iMoney.ph. Retrieved October 1, 2021, from https://www.imoney.ph/articles/cashless-paymentphilippines/.

Palmieri, M., Singh, I., Cicchetti, A. (2012). Comparison of cross-platform mobile development tools. Retrieved November 7, 2021 from https://ieeexplore.ieee.org/abstract/document/6376023

Pedamkar, P. (2021). *What is visual studio code?: Features and advantages: Scope & Career*. Retrieved November 4, 2021, from https://www.educba.com/what-is-visual-studio-code/

Perforce (2021). What is ISO 25010: Retrieve November 30, 2021 from

https://www.perforce.com/blog/qac/what-is-iso-25010

Putatan procedure - city government of Muntinlupa. (n.d.). Retrieved November 19, 2021, from https://muntinlupacity.gov.ph/wp-content/uploads/2017/04/putatan-procedure.pdf.

Regional Safe Space Network. (2019).what-is-information-management Retrieved November 21,2021, from https://rssn-americas.org/what-is-information-management

Rubrik. (n.d.). The Importance of Data Backup and Recovery. Retrieved October 1, 2021, from https://www.rubrik.com/insights/the-importance-of-data-backup-andrecovery

Runkler, T. A. (2012). *Data Analytics | SpringerLink*. Data Analytics | SpringerLInk. Retrieved November 21, 2021, from https://link.springer.com/book/10.1007%2F978-3-8348-2589-6.

Samonte, M. J. C., Arganza, J. M. Q., Aurelio, C. M. E., & Gonzales, P. D. A. (2019, March). E-Complaint: An Analytical Crowdsourcing Mobile Application for Community Peace and Order System. In Proceedings of the 2019 2nd International Conference on Information Science and Systems (pp. 105-109).

Savillo, D., & Ruaya, R. (2021, September 7). Here's why you should have a digital wallet today. INQUIRER.Net. Retrieved November 6, 2021, from https://cebudailynews.inquirer.net/398573/heres-why-you-should-have-a-digital-wallet-today

Simplilearn. (2021, November 15). *What is data analysis? types, methods and techniques: Simplilearn*. Simplilearn.com. Retrieved November 21, 2021, from https://www.simplilearn.com/data-analysis-methods-process-types-article.

Stiltner, M. (2021, March 17). The Philippines Top Four Payment Methods. Rapyd. Retrieved November 3, 2021, from https://www.rapyd.net/blog/philippines-payment-methods/

Suria International Services (2020, October 26) Key business benefits of cross-platform apps you need to know. Retrieved November 6, 2021, from https://www.suriainternational.com/benefits-of-cross-platform-app-development/

Techopedia. (2017, January 24). *What is Information Management (IM)? - definition from Techopedia*. Techopedia.com. Retrieved November 19, 2021, from https://www.techopedia.com/definition/20012/information-management-im.

Teclogiq. (2019, May 11). How to build cross platform mobile apps? Medium. Retrieved November 21, 2021, from How to Build Cross Platform Mobile Apps? | by Teclogiq | Medium

The Local Government Code of the Philippines. (n.d.). Retrieved November 7, 2021, from https://dilg.gov.ph/PDF_File/reports_resources/dilg-reports-resources-2016120_5e0bb28e41.pdf

Urban barangay | Philippine Statistics Authority - psa.gov.ph. (n.d.). Retrieved November 7, 2021, from https://psa.gov.ph/content/urban-barangay-1.

Wales, M. (2020, December 27). Front-end vs back-end vs full stack web developers. Retrieved November 3, 2021, from https://www.udacity.com/blog/2020/12/front-end-vs-back-end-vs-full-stack-web-developers.html#:~:text=The%20front%20end%20of%20a,SKILLS%20AND%20TOOLS

What is data analytics? - 4 ways to use data analytics. Lotame. (2021, May 7). Retrieved October 1, 2021, from https://www.lotame.com/what-is-data-analytics/.

Wróbel-Konior, S. (2020, February 5). What Is an E-payment System? SecurionPay - Payment Platform With Advanced Technology. Retrieved November 6, 2021, from https://securionpay.com/blog/e-payment-system/

Zbick, J. Nake, I., Jansen, M., Milrad, M.(2014, November 01). Mlearn4Web: A web-based framework to design and deploy cross-platform mobile applications. Retrieved November 7, 2021, from https://dl.acm.org/doi/abs/10.1145/2677972.2678007

Zwass, V. (2020).*Journal of Management Information Systems. Retrieved November 15, 2021, from https://www.britannica.com/contributor/Vladimir-Zwass/4614*