



# ANDROID-BASED BOOK INFORMATION SYSTEM WITH QUICK RESPONSE CODE

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**Abstract.** The purpose of this research is to give access to and manage your library's resources. A well-chosen system will boost the library's productivity, save time in administration, improve students' educational experiences, and foster independent learning. The framework enables the librarian to manage library resources in a more efficient manner, thus saving time. This system would reduce all manual work, allowing the whole process to be handled with only a few clicks and changes. Students can quickly access the information in the books with the aid of this device.

This research, which employed the agile approach, provided unrivaled versatility. The work was done in smaller bursts and was aided by continuous feedback. The technique was iterative, which ensures that each sprint is better than the previous one and that previous errors are not replicated. Agile methodologies promote an open culture of concept sharing and collaboration, allowing team members to learn from one another's mistakes and grow together. Agile teams have more control and power over their actions since they are self-organized and managed.

Furthermore, the system has been evaluated by three sets of respondents using an industry-accepted quality model –ISO25010. It has passed the software evaluation and is therefore ready for deployment.

**Key Words:** *Android-Based System, Android-Based Book Information System, Information System, Learning Resources Information System, Library System, Quick Response Code System*

## INTRODUCTION

Technology continues to evolve, and as it does it is becoming more and more integrated with society. Smart appliances and voice-controlled assistants are just two examples of how technology is evolving to make people's lives easier. As technology changes the way we manage our lives, it may also affect the way libraries are managed.

Adopting these new applications will allow institutions to "unite across international borders and work towards common goals". This means we could be seeing further collaboration across the globe, enabling libraries in providing improved access to scholarly material and resources. These innovations could also "help libraries to more effectively preserve and mine their collections online", thereby improving and redefining access for researchers.

This growing focus on the accessibility of digital resources will undoubtedly impact the role of library professionals. Librarians will be challenged to "learn new skills to be able to implement the new technologies for learning, research and information for their patrons". This could lead to an increased focus on learning and development within libraries, a shift in what is taught in Library & Information Science courses, or perhaps simply an expectation of librarians to extend their professional development.

Innovations will also lead to advancements in digital data management that will result in more accurate subject search results and citations while enabling libraries to curate and display relevant resources (Wenborn, 2018).

The purpose of the developed project Android-based Book Information System with the QR Code is to maximize the time and efficiency of students' and librarians' functions. Using this kind of application, the librarian will no longer hand it over and explain what the book is all about. Using the QR code, the students scan it using their mobile phones, and the information needed by the students will show on the display screen. The birth of technology surely did not limit people's initiative to go back to the basics and use books as references for different purposes. QR-code is one of the new trends that people can use, and some of the information will be revealed; some used it for payment.

The developed application uses a QR code to scan the book and display all information regarding the book from the author down to the summary. Through the developed application there will be a contactless transaction between the book and the reader who would eventually borrow it for purpose.

The Android-based Book Information System is the program that manages to provide information on - books in the library. It also enables seamless control of fine book information, such as the name of the author, version, and other significant details. Searching for books and selecting the best resources for students and the librarian is simpler. A library is a pool of information sources. These comparable tools made it easier for a well-defined audience, including readers, and students, to refer to or borrow the book. The scheme is used to conveniently locate books and read papers. It keeps the record and the regular quality consistent. The information industry has grown as people trust information more and more, and technology has changed the perceptions of library patrons. It offers libraries both a chance and a challenge.

The librarian's Android-based Book Information System helps librarians to manage library services in a more usable way that saves their time. It allows students the right to search for the books they need and the application will show the book's details by scanning the book through its QR code.

### **Specific Objectives**

Specifically, the study aimed to:

1. design and develop an Android-based Book Information System that contains:
  - 1.1 module for scanning the QR code attached in every book;
    - 1.1.1 using mobile phone camera develop under Android Studio
    - 1.1.2 enables reading the information connected to it.
  - 1.2 module for all the books information for scanning;
    - 1.2.1 database that will store all books information
    - 1.2.2 Generating book information from author to book's summary.
  - 1.3 module for Portal for updating new books; and
  - 1.4 report Module that will generate data reports.
2. evaluate/validate the developed system in terms of:
  - 2.1 functionality suitability;
  - 2.2 performance efficiency;
  - 2.3 compatibility;
  - 2.4 usability;
  - 2.5 reliability
  - 2.6 security
  - 2.7 maintainability; and
  - 2.8 portability

**Table 3.6 - Project Development Time Frame**

ACTIVITIES	MONTH 1				MONTH 2				MONTH 3				MONTH 4				MONTH 5				MONTH 6			
	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4
<i>PROJECT INITIATION</i>																								
Meeting the Client																								
Conduct Interview																								
Identifying Problems																								
Documents																								
Interview Operations Personnel																								
Observe Manual System																								
<i>PLANNING</i>																								
Create Data Flow Diagram																								
Document Procedural Logic																								
<i>DEVELOPMENT</i>																								
Design User Interface																								
Design System Control																								
Design files and/or Database																								
Write Computer Program																								
<i>PRODUCTION</i>																								
Test & Debug Computer programs																								
Test the Computer System																								
Enhanced System																								
<i>RETIREMENT</i>																								
Install System																								
Plan Conversation																								
Train Users																								
Review and Evaluate System																								

Table 3.6 shows the project development time frame by the developer. The developed system was developed and implemented within six months. The first month of the project study was dedicated to conducting a feasibility study. When the project is worth continuing, the needed system requirements and functionalities were determined and tested to ensure the correctness of the determined system standards and requirements. Gathering operating documents and observations on the manual process in the institution's library will help to improving the developed system. The second month was devoted to planning about the system's program flow. The next month was for on designing the system, from the User interface to User experience, this observed the functionality of the system from the client perspective. The fourth and fifth months was devoted to developing the system, the testing and debugging helped the proponent ensure the functionality and achieve the user experience. The remaining months were for the installation of the system, conversation with the users, and training them on how to use the system, gives reviews, and evaluate the developed project.

## Planning

System planning was the first phase in system development. In order to develop strategies to ensure and achieve the goal of designing and developing software based on the quality model accepted by the IT industry, the researcher made a decision to meet the end-user of the developed system. The Veritas College of Irosin (VCI) was the beneficiary Institution to be the beneficiary. The institution desired an upgraded library that will offer efficient good and fast services.

The researcher conducted an interview with the school administrator and the librarian. They came up with a proposal to upgrade the library for the betterment of services rendered to the clients and stakeholders. The existing system served its purpose and now the institution is ready for a leap.

The system design activity started after the system requirements analysis has been completed. The following figures were the data flow diagrams of the android-based book information system with a quick response code.

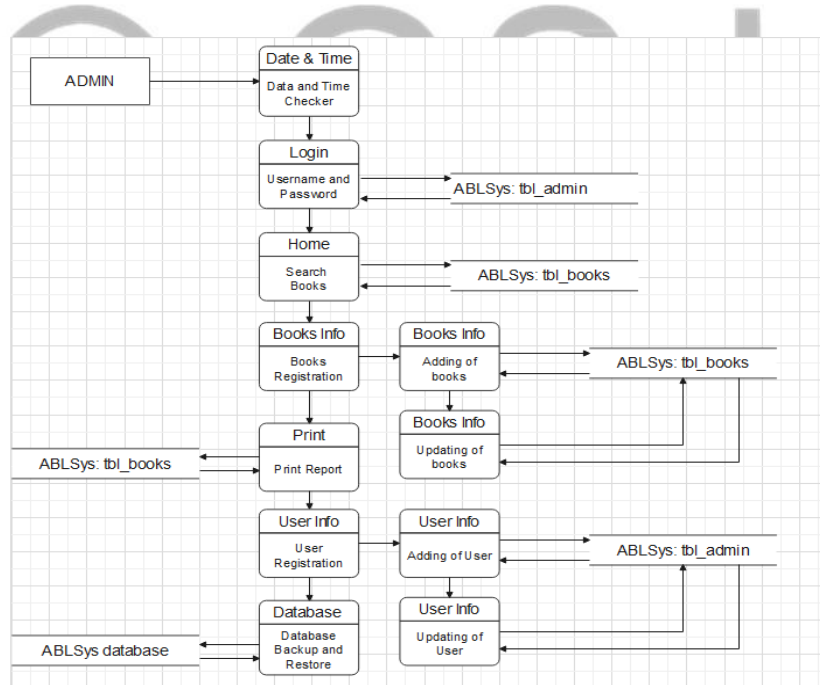
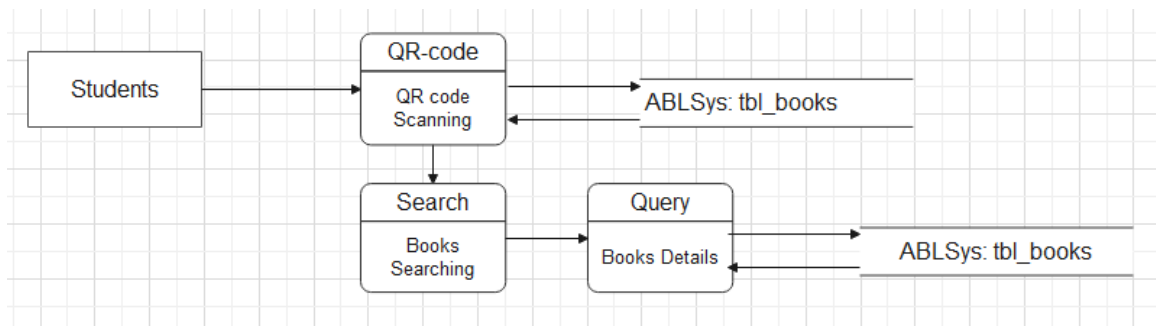


Figure 4.1 – Data Flow Diagram of the Admin Side Module

Figure 4.1 displayed the data flow diagram of the developed system. It is very vital for the security of the system software to have a well-planned system for Admin for his/her monitoring and managing the detailed and general system functions.



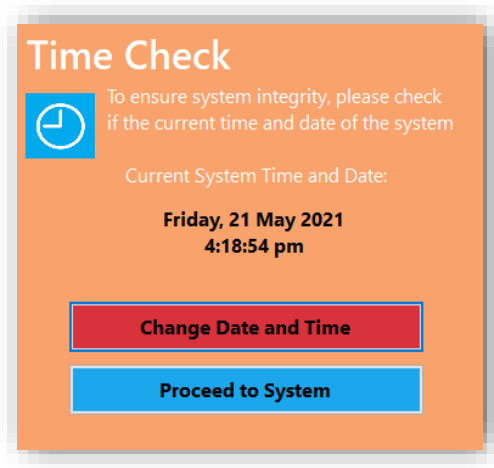
**Figure 4.2 – Data Flow Diagram of the Student Side Module**

Figure 4.2 showed the data flow diagram of the developed system with the three main modules: QR code scanning, and the Search and Query.

### Development

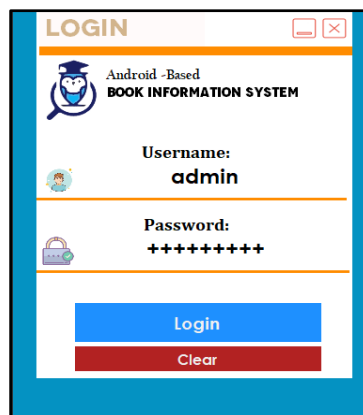
In this phase, the researcher followed the data flow diagrams which were planned ahead. All the suggested of the Admin especially the librarian were carefully followed. In order to make this proposed framework possible, the researcher used two separate applications in these measures. The first was Visual Studio, which is for the admin side of the software. Second was Android Studio, which is intended to create the scanning and searching processes.

The following screen shots were the outputs of the system analysis and design of the researcher:



**Figure 4.1 Time Checker**

Figure 4.1 showed the software's time checker, which indicated if the system time and date were right or had been tampered with by a system issue. If the administrator clicks the change date and time button, the program calls the device setup to correct the time and date. Any procedures that included the date and time would be affected by the time and date.



**Figure 4.2 Login Form**

Figure 4.2 displayed the login form of the developed system. It was designed for the security purposes of the system. It prevented unauthorized access to sensitive information.

The device will prompt the user for a username and password, which was compared to the details in the database. If the combination of the username and password is incorrect, the user will be unable to access the program.

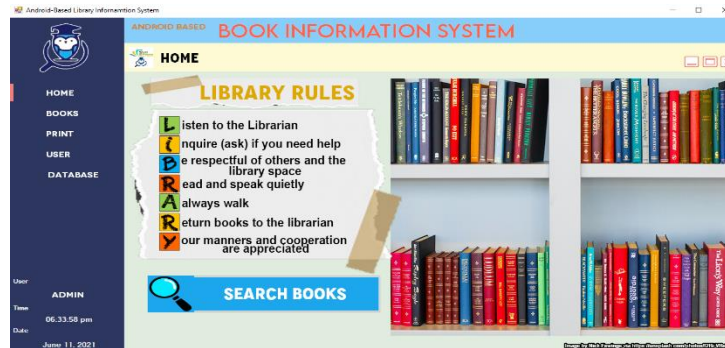


Figure 4.3 Main form

Figure 4.3 illustrated the program's home page, or the main form, which displayed the home form first. It allowed the school library's rules and regulations, as well as a search button for a fast search of books. The main form included buttons for books, printing, users, and databases. The form also showed the current user as well as the system's time and date.

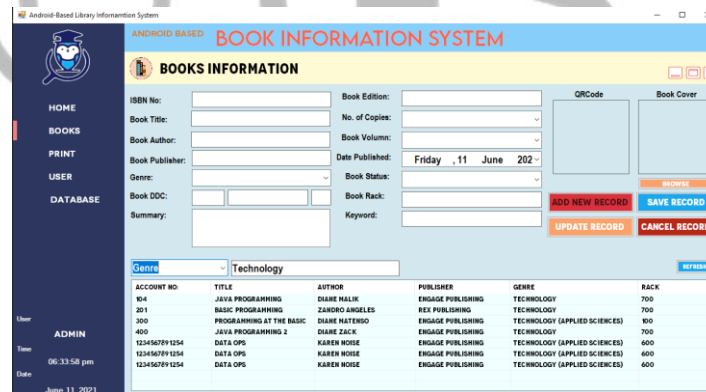


Figure 4.4 Book Information Module



Figure 4.4 illustrated the Book Information module. It allowed the administrator to add new books to the library's collection. Some fields may be required for the administrator to save the record. The software uploads images and creates Quick Response codes that is be saved to the database.

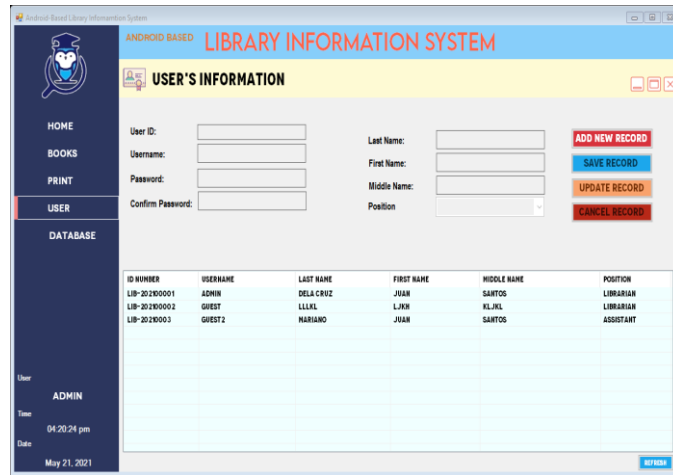


Figure 4.5 User's Information

The User Information shown in Figure 4.5 was for those who were actually active users of the system. The device did not keep track of the user's previous records. The system required the user's basic details, as well as his or her username and password, in order for him or her to gain access to the system.

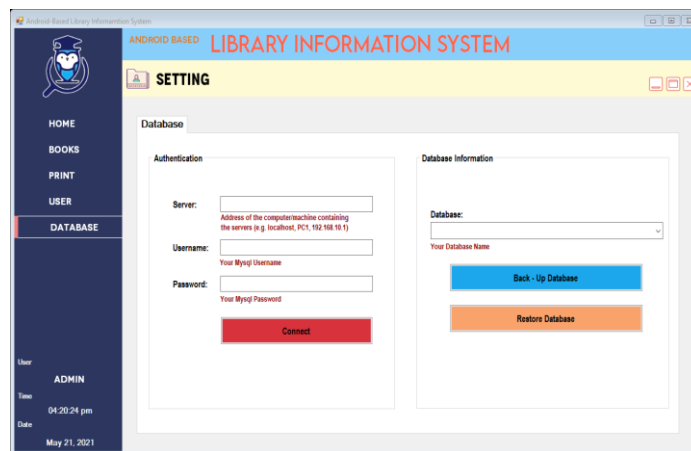
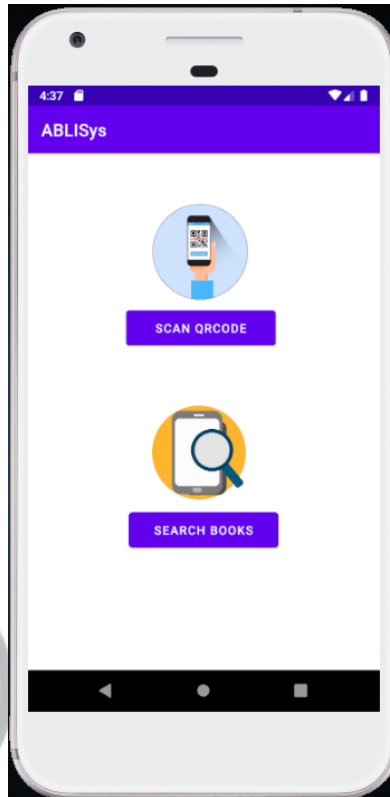


Figure 4.6 Database

As shown in Figure 4.6, the database can be accessed by the user, who can then back up the record that is being saved to the database. In addition, the system can retrieve the record from the system's backup archive. The backup file was stored in a system-defined folder.



**Figure 4.7 Android-Based Application for User**

As shown in Figure 4.7, the user can access the scanning for the Quick Response code that is attached to the books where the students can see the details of the books using the scan QR code. If you know the name of the book, you can browse the books by searching the available books in the library where the search books button is.

**Table 4.11. Overall Evaluation of the Developed System**

Quality Characteristics		IT Experts (10)	Students (10)	Librarian	Mean	Interpretation
1.0	Functional suitability	3.7	3.5	3.6	3.6	More than what is expected
2.0	Performance Efficiency	3.7	3.5	3.3	3.5	More than what is expected
3.0	Compatibility	4	3.8	4	3.9	More than what is expected
4.0	Usability	3.8	3.7	4	3.8	More than what is expected
5.0	Reliability	3.8	3.5	4.3	3.8	More than what is expected
6.0	Security	3.6	3.5	4	3.7	More than what is expected
7.0	Maintainability	3.6	3.5	4	3.7	More than what is expected
8.0	Portability	3.8	3.7	4	3.83	More than what is expected
		<b>3.75</b>	<b>3.58</b>	<b>3.9</b>	<b>3.816</b>	
	<b>Overall Mean</b>	<b>3.86</b>				<b>Very Applicable</b>

Table 4.11 reflects the overall evaluation results of the Android-Based Book Interpretation System with Quick Response Code. With an overall mean of 3.86, the system is deemed “more than what is expected”, thus, “Very Applicable” in providing better services in the Veritas College of Irosin (VCI).

The Android- Based Book Information System with Quick Response Code has passed the assessment of the system evaluators. Thus, the developed system is now ready for installation and deployment. With the Approval of the administration where the system will be installed, the researcher has the responsibility to train the official operators and system administrator.

## Summary and Findings

The following findings were obtained from the study:

1. In offering academic programs, it is necessary that the HEIs must be responsible in preparing all the facilities, especially the library where the students get information for their lessons and research. Thus, the use of the developed system is a big development and will offer better services to the clients and stakeholders.
2. Based on the result of the quick review, testing, and evaluation, the developed system passed ISO 25010. The areas where Android-Based Book Information System with Quick Response Code got the highest ratings in the following characteristics: Compatibility, Security, Maintainability, and Portability.

## Conclusions

Based on the findings of this study the following conclusions are formulated:

1. Based on the quality of the developed system that was checked and evaluated, the customized software is now ready for deployment. The end-users will benefit from the assistance which will be certainly provided. It will be used for upgrading the service being rendered in the library.
2. The developed system is considered to be "Very Applicable" as perceived by the different respondents. The developed system received an overall mean rating of 3.816, thus it is serviceable to the expected clients and stakeholders.

## Recommendations

Based on the conclusions the following recommendations are hereby offered:

1. The current manual system in Veritas College of Irosin. May be improved through the implementation of the developed Android-Based Book Information System with Quick Response Code.
2. In the developed system in the perspective of the respondents turned out to be "More than what is expected" based on the overall mean of 3.816. Thus, the system is considered to be "Very Applicable" in terms of Functional Suitability, Performance Efficiency, Compatibility, Usability, Reliability, Security, Maintainability, and Portability. Therefore, the newly developed software may be deployed and used to improve the services.

## References

- 1) Wenborn, Chloe ; How Technology Is Changing the Future of Libraries; Social Media and Content, Wiley; date published: April 11, 2018;
- 2) HarperCollins Publishers; QR Code; date published: (n.d); date accessed: July 30, 2020; accessed from: <https://www.collinsdictionary.com/dictionary/english/qr-code>
- 3) Gunnels, Alison; What is Computer Security? - Definition & Basics; date published: (n.d.); date accessed: November 24, 2020; accessed from: <https://study.com/academy/lesson/what-is-computer-security-definition-basics.html>
- 4) International Design Foundation; Usability; date published: June, 2018; date accessed: July 07, 2020; accessed from: <https://www.interaction-design.org/literature/topics/usability>
- 5) Codacy; ISO/IEC 25010 Software Quality Model; date published: February 17, 2017; date accessed: November 20, 2020; accessed from: <https://blog.codacy.com/iso-25010-software-quality-model/>

- 6) Chu, Haidee; In the internet era, public libraries are more vital than ever; date published: January 25, 2020; date accessed: August 05, 2020; accessed from: <https://mashable.com/article/public-library-big-data-surveillance-decade-2020/>
- 7) Kahle, Brewster; Transforming Our Libraries from Analog to Digital: A 2020 Vision; date published: Monday, March 13, 2017; date accessed: August 08, 2020; accessed from: <https://er.educause.edu/articles/2017/3/transforming-our-libraries-from-analog-to-digital-a-2020-vision>
- 8) Maven Infosoft; Library Management System; date published: January 13, 2020; date accessed: August 21, 2020; accessed from: <https://www.maven-infosoft.com/librarymanagement-system>
- 9) Hossain, Kaviul; Library Management System using RFID; date published: October, 2019; date accessed: August 21, 2020; accessed from: [https://www.researchgate.net/publication/336279056\\_Library\\_Management\\_System\\_using\\_RFID](https://www.researchgate.net/publication/336279056_Library_Management_System_using_RFID)
- 10) School Library Association; Library Management System; date published: No Date; date accessed: August 21, 2020; accessed from: <http://primaryschoolibraryguidelines.org.uk/it#:~:text=The%20system%20helps%20children%20to,a%20great%20sense%20of%20ownership>.
- 11) Graham; Top 5 technologies to Give Librarian an Impetus to Innovate; date published: August 24, 2015; date accessed: August 21, 2020; accessed from: <https://www.soutron.com/top-5-technologies-give-librarians-impetus-innovate/>
- 12) Wenborn, Chloe; How Technology Is Changing the Future of Libraries; date published: April 11, 2018; date accessed: August 21, 2020; accessed from: <https://www.wiley.com/network/librarians/library-impact/how-technology-is-changing-the-future-of-libraries>
- 13) Child, Jackie; Ideas for using Technology in the Library; date published: March 2, 2019; date accessed: August 21, 2020; accessed from: <http://tinkeringchild.com/ideas-for-using-technology-in-the-library/>
- 14) Lynch, Jim; Library Tech Trends for 2019; date published: January 14, 2019; date accessed: August 21, 2020; accessed from: <https://blog.techsoup.org/posts/library-tech-trends-for-2019>
- 15) Esguerra, Ray Karlo L.; Library Management: User Monitoring and Report System of Colegio de San Juan de Letran Calamba; date published: No Date; date accessed: August 30, 2020; accessed from: <https://ejournals.ph/article.php?id=154>
- 16) CMAbrigo; All systems go for iLib in UP Diliman; date published: February 7, 2008; date accessed: August 30, 2020; accessed from: <https://uplibrarybulletin.wordpress.com/category/automation-of-libraries/>
- 17) Manila Standard; QR enables payment convenience; date published: March 08, 2020; date accessed: August 30, 2020; accessed from: <https://www.manilastandard.net/mobile/article/319204>
- 18) Uy, Jasmin R.; For lack of libraries: DepEd pushes for library hubs; date published: October 6, 2006; date accessed: August 30, 2020; accessed from: <https://www.philstar.com/cebunews/2006/10/30/366212/lack-libraries-deped-pushes-library-hubs>
- 19) A Librarian's Colorful Journey; A Look at the De La Salle University Library's Learning Commons; date published: October 3, 2013; date accessed: August 30, 2020; accessed from: <https://maryruthocaguin.wordpress.com/2013/10/03/a-look-at-the-de-la-salle-university-librarys-learning-commons/>
- 20) Dharmaraj, Samaya; PH government department uses QR code scan for COVID-19 health check; date published: July 22, 2020; date accessed: August 30, 2020; accessed

- from: <https://opengovasia.com/ph-government-department-uses-qr-code-scan-for-covid-19-health-check/>
- 21) Public Company Information; Globe, VEND Pilot 1st QR Code-Operated Vending Machines in PH to Promote Cashless Transactions; date published: January 22, 2020; date accessed: August 30, 2020; accessed from: <https://www.globe.com.ph/about-us/newsroom/consumer/globe-vend-pilot-ph-qr-code-vending-machines.html#gref>
  - 22) Asian Banking and Finance; Philippines pushes for national QR code standard; date published: October 29, 2019; date accessed: August 30, 2020; accessed from: <https://asianbankingandfinance.net/cards-payments/news/philippines-pushes-national-qr-code-standard>
  - 23) Jeff; QR code check-in and sign-out; date published: 2020; date accessed: September 27, 2020; accessed from: <https://www.proxyclick.com/features/qr-code-check-in-check-out>
  - 24) Prathipa, R.; Development of Secure Electronic Voting System with Touch Screen and Finger Print Authentication; date published: January 1, 2017; date accessed: September 27, 2020; accessed from: <http://www.ijareeie.com/>
  - 25) Sinha, Rahul; Integrate QR Code Authentication to Documents; date published: 2018; date accessed: September 27, 2020; accessed from: <https://www.qryptal.com/technology/integration/>
  - 26) Lee, Yen Nee; Forget the QR code. Facial recognition could be the next big thing for payments in China; date published: November 19, 2019; date accessed: September 27, 2020; accessed from: <https://www.cnn.com/2019/11/19/tencents-wechat-china-may-soon-use-facial-recognition-for-payments.html>
  - 27) Sohn, Ji-young; Forget the QR code. Facial recognition could be the next big thing for payments in China; date published: January 27, 2019; date accessed: September 27, 2020; accessed from: <http://www.theinvestor.co.kr/view.php?ud=20190127000189>
  - 28) Paypers; PayMaya launches QR and online payments app for SMEs; date published: May 22, 2020; date accessed: September 27, 2020; accessed from: <https://thepayers.com/mobile-payments/paymaya-launches-qr-and-online-payments-app-for-smes--1242543>
  - 29) Kabagani, Lade Jean; Valenzuela creates contact tracing app via QR code system; date published: September 12, 2020; date accessed: September 27, 2020; accessed from: <https://www.pna.gov.ph/articles/1115247>
  - 30) Agcaoili, Lawrence; BSP to launch QR code, expands e-payments for government transactions; date published: November 19, 2019; date accessed: September 27, 2020; accessed from: <https://www.philstar.com/business/2019/11/19/1969854/bsp-launch-qr-code-expands-e-payments-government-transactions>
  - 31) Almonte, Liza; RapidPass ID offers easy checkpoint access for ECQ frontliners; date published: April 6, 2020; date accessed: September 27, 2020; accessed from: <https://www.portcalls.com/rapidpass-id-offers-easy-checkpoint-access-for-ecq-frontliners/>
  - 32) Balinbin, Arjay L.; AF Payments, GCash launch QR code transport ticketing system; date published: October 15, 2019; date accessed: September 27, 2020; accessed from: <https://www.bworldonline.com/af-payments-gcash-launch-qr-code-transport-ticketing-system/>
  - 33) Wrike; What is Agile Methodology in Project Management? ; date published: 2017; date accessed: September 27, 2020; accessed from: <https://www.wrike.com/project-management-guide/faq/what-is-agile-methodology-in-project-management/>
  - 34) tutorialspoint; SDLC - Agile Model; date published: 2017; date accessed: September 27, 2020; accessed from: [https://www.tutorialspoint.com/sdlc/sdlc\\_agile\\_model.htm](https://www.tutorialspoint.com/sdlc/sdlc_agile_model.htm)

- 35) Windsor, Grace; 5 Stages of the Agile System Development Life Cycle; date published: February 28, 2020; date accessed: September 27, 2020; accessed from: <https://medium.com/brightwork-collaborative-project-management-blog/5-stages-of-the-agile-system-development-life-cycle-brightwork-com-a207bdf61696>

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