

## **Android-Based Online Public Access Catalog (OPAC)**

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### **Abstract**

*Technology in educational institutions has influenced a lot and even changed the educational process there. In the mobile age, every system is moving towards mobile-based service wherein everything has become available at the tip of the finger. In response to the call digitization, Online Public Access Catalog (OPAC) Android Application was developed to cater to the needs of the academe in knowledge management and to provide quality service to the students in terms of library services. The study was conducted in one of the schools in Iloilo City, Philippines, with the intention of evaluating its e-services quality level. The result revealed that the OPAC enables the students to search through not only book-related resources but every library resource such as ebooks, multimedia, storage devices, unpublished researches, and other learning material using their primary gadget such as smartphones. The study showed that the developed OPAC is high in terms of e-services quality level as perceived by the IT experts and students. The users have the ease of accessing the library resource information since smartphones have become the primary gadget nowadays. The student can easily search resources available in the library which are in line with the course syllabus. Every library user using a smartphone received a notification informing them of the availability of new library resources.*

**Keywords:** *Library resources, Library resource application, Mobile library resources, Library resource system quality assessment*

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## **I. Introduction**

### **Background of the Study**

In today's generation where people tend to find and acquire their needs and wants using the tip of their finger (Martin, 2013) has become the basis of improvement of application development in any type of organization. Stieglitz, et al (2015) cited that the diffusion of mobile applications had risen significantly and strongly emerged in any type of businesses, enhancing productivity and satisfaction. Educational institutions are not exempted to this and have to improve their technological infrastructure for the sake of their clientele, the students.

One of the technological infrastructures that should be improved is related to the library system since it is the center of information. The current Online Public Access Catalog in NISU - Lemery Campus is only accessible inside the library itself and not yet available online. Students are too lazy to check books in the library to get information they need in answering their classroom activities and just search the answer on the internet. Sometimes those information they have acquired from the internet are most likely not relevant, yield a different approach and probably not a timely information.

With the ideas stated above, the researcher decided to develop an Online Public Access Catalog(OPAC) Android Application for NISU - Lemery Campus. A recent article has encouraged libraries to start writing strong proposals for mobile options in this age of mobile ubiquity and information access has shifted increasingly away from the desktop and into mobile environments (Broussard, et al., 2010). The underlying problem was because technology influences the life of students and resorted to finger-tip searching. The school should also have to go with the current flow and show flexibility in a changing environment. Ally et al (2014) encourages students to use mobile applications that can aid their learning, the applications must be designed to provide an enjoyable experience for the student. Applications should be user-friendly, understandable, learnable and aesthetically pleasing to the user. The application should not just be a copy of the desktop alternative but is designed to be effective on a smaller screen with touch screen capability.

### **Objective of the Study**

The purpose of this study was to develop an Online Public Access Catalog(OPAC) Android Application for Northern Iloilo State University - Lemery Campus.

Specifically, the study aims to:

1. Design and develop an Online Public Access Catalog(OPAC) Android Application with following technical features:
  - a. android-ready application;
  - b. bibliographic control system that allows access by a number of access points to the bibliographic data stored in a machine readable form;
  - c. Resource searching includes books, thesis, and electronics books;
  - d. Understandable result format;
  - e. Downloadable library electronic resources; and
  - f. Newly added library resources notification.
2. Test the level of acceptability of the system in terms of the following parameters:
  - a. Functionality
  - b. Reliability
  - c. Usability
  - d. Efficiency
  - e. Maintainability
  - f. Portability
3. Develop a user's manual.

## **II. Materials and Methods**

This chapter discusses the methodology used in developing the Online Public Access Catalog(OPAC) Android Application. Detailed information on the requirement analysis which includes respondents, instruments used in the study and the data gathering procedures employed in the development of the project are presented.

### **Development of the System**

The first objective of the study was the development of the Online Public Access Catalog(OPAC) Android Application for the NISU - Lemery Campus Library. The method used in developing the software of the system was Iterative Development of the software development life cycle (SDLC) model.

The first phase in the iterative development is the planning and requirements phase which go through the specifications of the system. The specifications were realized through discussions with the campus library personnel about the current OPAC (Online Public Access Catalog) together with the available books and e-books. It found out that the OPAC which the campus was using is not really deployed online but rather a stand-alone application. These said specifications were also mapped out from the objectives of the study, the scope and limitations of the study and the conceptual framework of the study. It was later established that the proposed system would run on a mobile device with internet connection, in short the system is an android application.

In the analysis and design phase the researcher analyzed the specifications from the planning phase. The system and its process were mapped to the data that were coming in and out of them. The data flow diagram was the output of this phase. After the analysis phase the software development tools were determined. The researcher decides to develop the android application using the hybrid development. HTML and CSS were used to develop the design interface of the application. JQuery JavaScript framework were used for application animations, fluid design and JSON parsing. The database used in the application was the database used by the current OPAC which is MS Access. The web application later converted into a full-pledge android application using Website2Apk software.

In the implementation phase all the planning, specification, and design documents were used to code and implement the first iteration of the system. The core features of the Online Public Access Catalog(OPAC) Android Application was the output of the first iteration of this phase.

The testing phase was done after the current build iteration has been coded and implemented. To test the system black box testing was done to test the requirements and functionality. Android version compatibility test was also done to ensure that the software can run with the different android operating system versions. An acceptance test was also performed by the library personnel to know that the features and functionalities of the system work as expected.

After the four phases have been completed the evaluation phase takes place. Based on the results of the testing phase the system was evaluated if it needs to be incremented or deployed. The system is incremented or the next iteration of the development takes place if it doesn't meet the requirements, some features are changed or enhanced.

**Systems Operational Design**

The system's operational design discusses the different processes and subroutines employed by the software system through numerous components. Data flow diagrams were used to present the design of information flow through the system.

Figure 4 below summarizes the flow of all data through the Online Public Access Catalog(OPAC) Android Application according to different users. The system has two kinds of users, a student/faculty and a library personnel. The student and faculty have the same privileges that are able to search books using the installed OPAC android application in their phone.

The library personnel are the users who could manage the library book database using their computerized library system. When the new books are successfully inserted to the library database, the android push notification service will be activated to notify all the android device who installed the said application.

The student/faculty can type a keyword of either book title, capstone title, e-book title, author or subject in a search form as the basis of a book query in the library database. The book query will result in an understandable result format.

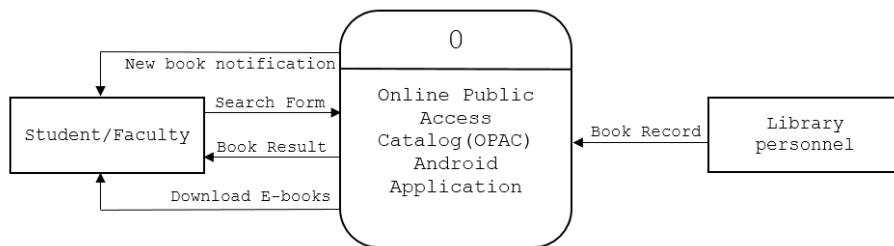


Figure 4. Context Data Flow Diagram

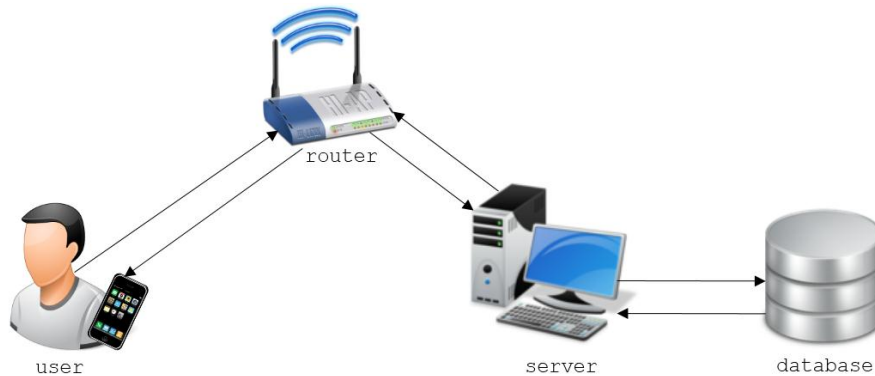


Figure 1. Operational Framework

Figure 1 shows the operational framework of Online Public Access Catalog(OPAC) Android Application. The user, who can be student/faculty, will input a keyword of either book title, capstone title, e-book title, author or subject in a search form. The keyword will be acquired by the server located in the library office to query related results from the library database through Local Area Network(LAN). If the keyword has been found in the database, the result will be returned to the mobile device application which sends the request to search. The result is formatted into a readable, understandable format. The result will list all the books, capstone title, e-book title and author. E-books in the search result will have a link to make the ebook file downloadable. Also if there are newly inserted books, e-books or capstone projects in the database, notification will be activated into the android mobile phone of every OPAC android application user.

**Construction Procedure**

The development of the system was broken-down into different subtasks and was completed in the allotted time frame.

Development Phases of Online Public Access Catalog(OPAC) Android Application		Month					
		1		2		3	
A. Module							
1.0	Information Gathering 1.1 Research of related studies 1.2 Gathering information about the current system	■					
2.0	Develop architectural design model, database design model and rough draft of proposed system.		■				
3.0	Develop the front-end (user side) design of the system.			■			
4.0	Develop the back-end (admin side) design of the system.				■	■	
5.0	Modification for enhancement of the system.					■	■
6.0	System testing and evaluation						■

Figure 2. Gantt Chart in developing Online Public Access Catalog(OPAC) Android Application

**Data Gathering Procedure**

In as much as the instrument was standardized, validity and reliability were established. The researcher proceeds in the distribution of the research instrument to the respondents. The respondents were asked to fill out the information needed. The survey instrument contained the questions that assess the acceptability level of the system. The software was evaluated based on its components and criteria in terms of functionality, reliability, usability, efficiency, maintainability, and portability.

**Research Design**

The study utilized the developmental and descriptive methods of research. The developmental method was used in the process of establishing the system for both the hardware and software parts. The descriptive method was used to determine the level of acceptability of the Online Public Access Catalog(OPAC) Android Application as to its functionality, reliability, usability, efficiency, maintainability and portability. The development of the system was based on Software Development Life Cycle (SDLC) particularly in the Iterative Model.

**Respondents of the Study**

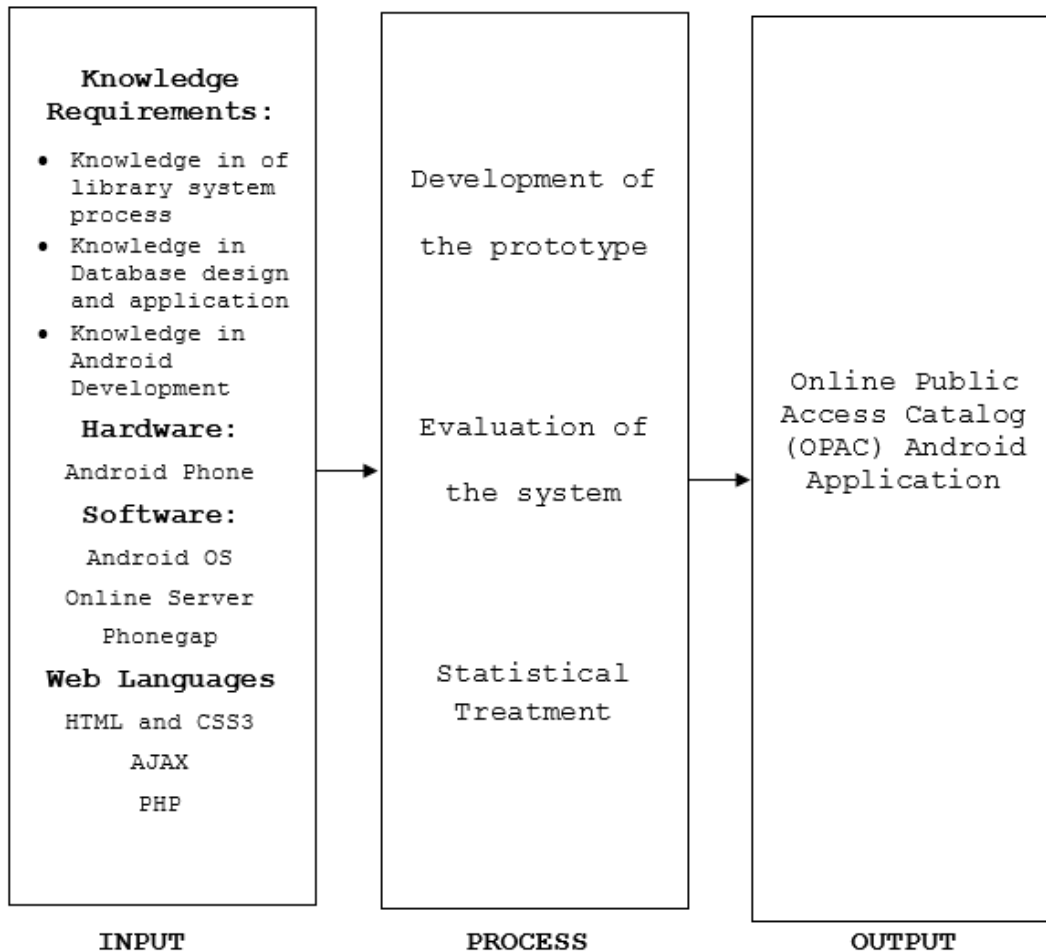
Twenty-five IT experts were chosen to evaluate the acceptability level of the system. Purposive sampling was used as a sampling technique to get the samples. Those IT experts were Project Manager, IT consultant, Full-stack Programmer, Web developer and Front-end Developer who were currently working in the field.

**Research Instrument**

The researcher conducted a survey using a questionnaire. The questionnaire for evaluating the system quality and performance was a standard survey questionnaire under the ISO/IEC 25022 Systems and Software. The questionnaire was utilized to determine the acceptability of Online Public Access Catalog(OPAC) Android Application in terms of functionality, reliability, usability, efficiency, maintainability, and portability. In as much as the instrument was standardized, validity and reliability was established. The Likert 5-point scale was used to interpret the responses of the respondents.

**Conceptual Framework**

The output of this study is the completion of Online Public Access Catalog (OPAC) Android Application.



### III. RESULTS AND DISCUSSIONS

This chapter deals with the presentation, analysis and interpretation of data that were gathered based on the objectives of the study.

#### Acceptability level of the Online Public Access Catalog(OPAC) Android Application

The second objective of the study was to determine the level of acceptability of the system among 25 IT experts in terms of: functionality, reliability, usability, efficiency, maintainability, and portability. The summary of mean scores is presented in Tables 1 – 7.

Table 1  
Mean scores on the level of acceptability of the OPAC Android Application in terms of Functionality

Items	Mean	SD	Verbal Interpretation
A. As a Whole	4.44	0.66	Very High
1. Suitability	4.64	0.57	Very High
2. Accurateness	4.56	0.51	Very High
3. Interoperability	3.68	0.63	High
4. Compliance	4.52	0.59	Very High
5. Security	4.80	0.41	Very High

Table 1 presents the mean scores on the level of acceptability of the Online Public Access Catalog(OPAC) Android Application in terms of functionality the obtained mean score as a whole (M = 4.44, SD = 0.66) was interpreted as very high. The table further reveals that the highest obtained mean score (M = 4.80, SD = 0.41) was interpreted as very high on the item of “Security”. On the other hand, the lowest mean score (M = 3.68, SD = 0.63) was interpreted as high on the item “Interoperability”. The finding implies that

some aspect of functionality of the application can't serve its purpose particularly interacting with another system. Specifically, the application can only be installed in android OS and some students cannot use the said app since they are using different OS.

Table 2  
*Mean scores on the level of acceptability of the OPAC Android Application in terms of Reliability*

<b>Items</b>	<b>Mean</b>	<b>SD</b>	<b>Verbal Interpretation</b>
A. As a Whole	4.19	0.65	High
1. Maturity	4.48	0.59	Very High
2. Fault Tolerance	4.44	0.51	Very High
3. Recoverability	3.64	0.49	High

Table 2 presents the mean score on the level of acceptability of the Online Public Access Catalog(OPAC) Android Application in terms of reliability the obtained mean score as a whole (M = 4.19, SD = 0.65) was interpreted as high. The maturity item that got the highest mean score (M = 4.48, SD = 0.59) was interpreted as very high. The recoverability item got the lowest mean score (M = 3.64, SD = 0.49) was interpreted as high. The finding indicates that the reliability of the system has some weakness because of its reliance on internet connectivity and doesn't have the caching system to cache the resources when some interruption happens caused by internet problems. However, both fault tolerance and maturity implies that the system is not prone to hacking and any unwanted infringement and failure only centers only on internet connection and none else.

Table 3  
*Mean scores on the level of acceptability of the OPAC Android Application in terms of Usability*

<b>Items</b>	<b>Mean</b>	<b>SD</b>	<b>Verbal Interpretation</b>
A. As a Whole	4.84	0.37	Very High
1. Understandability	4.92	0.28	Very High
2. Learnability	4.80	0.41	Very High
3. Operability	4.80	0.41	Very High

Table 3 presents the mean score on the level of acceptability of the Online Public Access Catalog(OPAC) Android Application in terms of usability the obtained mean score as a whole (M = 4.84, SD = 0.37) was interpreted as very high. The understandability item got the highest mean score (M = 4.92, SD = 0.28) and was interpreted as very high. The learnability and operability items got the lowest mean score (M = 4.80 SD = 0.41) and (M = 4.80, SD = 0.41) respectively were interpreted as very high. The finding implies that the system requires little effort from its user in recognizing the logical concept and applicability of the system. It also implies that the system is easy to operate and understand because it has user-friendly features such as buttons, menu, search box, etc.

Table 4  
*Mean scores on the level of acceptability of the OPAC Android Application in terms of Efficiency*

<b>Items</b>	<b>Mean</b>	<b>SD</b>	<b>Verbal Interpretation</b>
A. As a Whole	4.54	0.54	Very High
1. Time Behavior	4.48	0.59	Very High
2. Resource Behavior	4.60	0.50	Very High

Table 4 presents the mean score on the level of acceptability of the Online Public Access Catalog(OPAC) Android Application in terms of efficiency the obtained mean score as a whole (M = 4.54, SD = 0.54) was interpreted as very high. The resource behavior item that got the highest mean score (M = 4.60, SD = 0.50) was interpreted as very high. The time behavior item got the lowest mean score (M = 4.48, SD = 0.59) was interpreted as very high. The finding implies that the system performs fast enough to process a specific amount of data from the server since it uses JSON object data structure. Thus, resources consume very less and are lightweight during processing of data.

Table 5

Mean scores on the level of acceptability of the OPAC Android Application in terms of Maintainability

Items	Mean	SD	Verbal Interpretation
A. As a Whole	4.10	0.80	High
1. Analyzability	3.56	0.71	High
2. Changeability	4.56	0.58	Very High
3. Stability	3.72	0.74	High
4. Testability	4.56	0.58	Very High

Table 5 presents the mean score on the level of acceptability of the Online Public Access Catalog(OPAC) Android Application in terms of maintainability the obtained mean score as a whole (M = 4.10, SD = 0.80) was interpreted as high. The changeability and testability items got the same highest mean score (M = 4.56, SD = 0.58) respectively and were interpreted as very high. The analyzability item got the lowest mean score (M = 3.56, SD = 0.71) was interpreted as high. The finding implies that the system requires little effort needed to make specific modifications for improvement. The changeability and testability got the highest ratings because the application was easy to modify and validate since it is a hybrid android application (Khandeparkar et al., 2015). The analyzability got the lowest rating because the has no error logs feature to record every error during the operation of the program.

Table 6

Mean scores on the level of acceptability of the OPAC Android Application in terms of Portability

Items	Mean	SD	Verbal Interpretation
A. As a Whole	4.43	0.71	Very High
1. Adaptability	3.84	0.85	Very High
2. Installability	4.64	0.57	Very High
3. Conformance	4.60	0.58	Very High
4. Replaceability	4.64	0.49	Very High

Table 6 presents the mean score on the level of acceptability of the Online Public Access Catalog(OPAC) Android Application in terms of portability the obtained mean score as a whole (M = 4.43, SD = 0.71) was interpreted as very high. The installability (M = 4.64, SD = 0.57) and replaceability (M = 4.64, SD = 0.49) items got the highest score were interpreted respectively as very high. The adaptability item got the lowest score (M = 3.84, SD = 0.85) and was interpreted as very high. The finding implies that the system is easy to install since it just needs an apk file and adding of another software feature is easy since fundamentally developed from a hybrid android app. Also, if the system is developed in another platform, the data will just fetch from the server using JSON parsing. On the other hand, adaptability is the lowest rating because it is currently only available in android applications.

Table 7

Mean scores on the level of acceptability of the OPAC Android Application as a Whole

Items	Mean	SD	Verbal Interpretation
A. As a Whole	4.40	0.69	Very High
1. Functionality	4.44	0.66	Very High
2. Reliability	4.19	0.65	High
3. Usability	4.84	0.37	Very High
4. Efficiency	4.54	0.54	Very High
5. Maintainability	4.10	0.80	High
6. Portability	4.43	0.71	Very High

The overall rating of the Online Public Access Catalog(OPAC) Android Application among Information Technology Experts (M = 4.40, SD = 0.69) was interpreted as very high. The usability item that got the highest mean score (M = 4.84, SD = 0.37) was interpreted as very high. The maintainability item got the

lowest mean score ( $M = 4.10$ ,  $SD = 0.80$ ) was interpreted as high. These findings show that the IT experts perceived that the application must provide a caching system to improve performance and can make the data viewable even when the internet runs out. But in general, the very high result is indicative that the application is easy to operate and caters the need of both faculty and student in finding library resources at their convenience.

### ***Development of User Manual***

The third objective of the study was the development of the Online Public Access Catalog(OPAC) Android Application User Manual. The manual was formulated to assist the end-user on how to use the system without actual demonstration. It follows an organized structure arranged in chronological outline to present a concise and logical operation of the system. See (Appendix B) for complete details of the user manual.

## **IV. CONCLUSIONS AND RECOMMENDATIONS**

This chapter presents the summary of findings, conclusions, and recommendations formulated on the basis of the research findings.

### ***Conclusions***

Based on the findings of the study, the following conclusions were formulated:

1. The development of an OPAC with features that include android-ready application; bibliographic control system; resource searching includes books, thesis, and electronics books; understandable result format; downloadable library electronic resources; and newly added library resources notification are necessary parts of the system. Each feature enhances the capability of the current web-based OPAC. The student and faculty have the ease of accessing the application since android phone has become the primary gadget nowadays. The teacher can easily search for electronic resources available in the library which can be the basis for lectures. Notification sends to every android phone of student and teacher to inform of availability of new books.
2. The OPAC android application is acceptable in terms of functionality, reliability, usability, efficiency, maintainability and portability. Hence, it can now be utilized.
3. The user manual for OPAC android application can provide proper guidance in using the system effectively and efficiently.

### ***Recommendations***

Based on the summary of findings and conclusions, the following recommendations were formulated:

1. The OPAC android application is recommended to be used by the library personnel, faculty and students to access everywhere the application and keep in touch with the updates of the resources in the library.
2. It is recommended that Northern Iloilo State University - Lemery should endeavor to integrate it on their system to promote the library resources to students and faculty and to make the searching of library resources easier and more convenient.
3. For future researchers, this study will serve as a basis in conducting further study on developing other related software systems.
4. Further study on automating other processes related to the OPAC android application is also recommended to enhance the process effectively and efficiently.

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