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Mobile Application Development For University Library Services (Case Study: Library Of Uin Sunan Ampel Surabaya)

Heri Cahyo bagus
UIN Sunan Ampel Surabaya, hericahyo.2019@gmail.com

Firza Hardy NUgraha
UIN Sunan Ampel Surabaya

Ilham m.said
UIN Sunan Ampel Surabaya

Yusuf Amrozy
UIN Sunan Ampel Surabaya

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Ilham[1], Yusuf Amrozi[2], Firza Hardy Nugraha[3], Heri Cahyo Bagus Setiawan[4]
[1,2,3]Information Systems Study Program, Department of Technology, Faculty of Science and Technology, Sunan Ampel Islamic University Of Surabaya, Indonesia
[1]ilham@uinsby.ac.id
[1,2,4]Department of Management, Faculty of Economics and Business, Airlangga University, Indonesia

ABSTRACT

This study was conducted to develop library services at UIN Sunan Ampel Surabaya by developing a system using the Rapid Application Development (RAD) method and the Mobile Library. This is done to complement the website services which can be accessed through catalog.uinsby.ac.id. Many users, especially students, experience restlessness in returning the book because there is no reminder feature for the deadline to return the book. As well as resulting in the number of fines that increase in number for each day. The purpose of this research is to make users more free to use the library services of UIN Sunan Ampel Surabaya which are packaged in a mobile library application using the Ionic framework. This study uses the RAD method to develop applications. One of the advantages and disadvantages of the RAD method is that RAD has a flexible nature in its development so it doesn't wait for one process to be done. The results of this study are the creation of a mobile library application that has an online extension feature, a reminder of the date of return of borrowed books, and the total amount of late book fines. So that it does not interfere with the circulation of the book if there is a bridge in returning the book and equalization is maintained in each user In addition, it also increases interest in student learning and services and improves effective and efficient library management.
Keyword : Mobile Library, System, Library, RAD, PDM, CDM and UIN Sunan Ampel Surabaya

INTRODUCTION

Information and communication technology or ICT (Information and Communication Technology) has become an inseparable part of any activity. Therefore, every agency has always been to integrate from manual needs to computing, to build and empower knowledge-based human resources so that they can compete in the world (Muasaroh, 2007). The science and information technology that have developed so far have provided daily benefits, which are felt in the library section. The existence of computers, the internet, to other communication tools such as smartphones that have made it easier to access data, process data, and communicate which are limited by distance and time. Almost all of the readers use the internet and use it to find information needs using their cellphone handheld. In order to implement the Tri Dharma PerguruaniTinggi, libraries in higher education have an important axis for the running of an education, research and community service. And it can be explained as "the heart of the university" as supporting information in higher education (NS, 2006). Because without a library, learning at the University will be less maximal. The Sunan Ampel UIN Library is a higher education library which has generally used information technology to support the progress of organizational issues. The use of information technology has been implemented in an integrated library system such as collection processing, circulation services, reference services, searching iOPAC (Online Public

Access Catalog), digitizing collections as well as the use of the internet as a medium for disseminating information in accessing information on an only basis and at any time. The increasing use of mobile devices or handheld phones for internet access needs has created opportunities and challenges in libraries to add and improve their services. Various libraries have tried to combine each service by following the development of mobile technology to create a concept called a mobile library. The activities carried out are storing, obtaining, and disseminating knowledge on mobile devices so that they can be accessed online. Android-based mobile library developer at Ahmad Dahlan University, helps users monitor the status of borrowed books and due dates to minimize delays when returning books (Hendriana, 2015).

Mobile library services are innovative, meaning that libraries make use of mobile devices where users can see, search for and get services from libraries without limiting time and place (Chang et al., 2016). The design and implementation of an Android-based mobile library application has also been carried out (Chiu et al., 2015) for the National Library ofiTainan, it is found that it is easy to see information about the collection of books, new books, and personal library records through the mobile devices they have. By implementing the Android-based m-library application into library services, it can allow closer interaction between users and the library system, especially access to personal library accounts, so that users can monitor the status of lending books that they have anytime and anywhere without the need to come and ask the librarian directly.

Most of the collections in the UIN SunaniAmpel Surabaya library were borrowed by students. The borrowing process at the student library is asked to show a library card. Furthermore, students can use the book within a predetermined period of time. Providing a loan period so that the limited number of books can be used properly by other students. However, due to the density of activities that the students participated in, some of them forgot to return the books to the library on time, resulting in many books being stuck on the students. One of the causes of the above problems is the absence of a time limit reminder for returning books, which causes many books to be returned late, and there is no communication platform between students and librarian. So we need an application that is able to provide notification of returns, extend borrowing, is expected to optimize the use of books available in the library. Based on these conditions, the research took the form of developing a library system in UIN GreeceAmpeliSurabaya based on android in the form of a description entitled Implementation of Rapid Application Development on Library of UIN Sunan Ampel Surabaya using the Rapid Application Development (RAD) method because it can help develop applications that focus on project completion time. With the m-Library application, it is hoped that it can help student activities to borrow or search for books in the library of UIN Sunan Ampel Surabaya. Based on the background that has been discussed above, the problem formulations in this research are as follows: How to design an Android-based mobile library application that can be applied at the UIN Sunan Ampel Surabaya Library?, How to make an Android-based mobile library application that can be applied at the Sunan Ampel UIN Surabaya Library?

LITERATUR REVIEW

Library

The library or library is defined as the template for books which are arranged to be read and studied or used as reference material (TheiOxfordiEnglishiDictionary). The term library library is also defined as media media, learning centers, education sources, information centers, documentation centers and referral centers (Mahmudin, 2006). The library is a work unit in the

form of a place to collect, store, manage, and organize a collection of library materials systematically to be used by users as a source of information as well as a fun learning tool (Darmono, 2007). Library is a place where there are activities of gathering, managing, and disseminating (services) all kinds of information, both printed and recorded in various media such as books, magazines, newspapers, films, tapes, tape recorders, videos (Yusuf and Suhendar, 2005).

The change of IAIN Sunan Ampel to UIN has implications for changing the strategic plan for the next 5 years. The Strategic Plan of UIN Sunan Ampel Surabaya is the basis for the preparation of the Library Strategic Plan. As a State Islamic University located in the provincial capital of East Java, UIN Sunan Ampel Surabaya is a great hope for the Muslim community in East Java in meeting the needs of quality higher education. The new challenges after becoming a university are not only external in the form of competition with other state universities, but also internal challenges, especially in facing the dynamics of change in order to achieve quality according to national standards.

As a higher education that integrates multidisciplinary Islamic sciences and science and technology as well as functioning as a medium of interaction between the potential of the people and culture, UIN Sunan Ampel continues to strive to develop a set of basic Islamic sciences, humanities and technological sciences that are able to provide students with critical thinking patterns, intelligent and universal about Islamic values that rahmatan lil-alamin.

Libraries are not only oriented towards developing technology and management systems but also oriented towards developing other needs, such as collection development, security systems, adding and improving the quality of human resources, and so on. At the end of 1998 the library started to hold stock-taking (re-data collection), and the results showed negative because from the stock-taking results it was known that there were 20% of missmatches between the database and the real data collection. This makes library managers try to design a collection security system, and therefore, since then the library has established and has a collection security device, a security gate, to reduce and eliminate these problems.

Since 1999 the Library has opened internet services for users as a response to the demands of technological advances and developments, even now free access is being responded to by the availability of free wifi in all areas of the library.

The vision of the Library of UIN Sunan Ampel Surabaya is as follows: "To become a superior and competitive library in the Islamic field". Mission is the reason why an institution exists and carries out its activities. As a source of learning for the academic community, the Library of UIN Sunan Ampel Surabaya formulates the following missions:

1. Providing a source of education in multidisciplinary Islamic sciences as well as superior and competitive science and technology;
2. To disseminate the results of multidisciplinary Islamic research and science and technology relevant to the needs of society; and
3. Supporting research-based religious community empowerment.

The function of the library as a research center is in line with the role of the library in supporting the implementation of one of the elements of the Higher Education Tridharma, namely the field of research. In this role, the library tries to become a reference center for researchers, both lecturers, students and employees in finding reference sources to complete their research. In this context, the library has prepared competent human resources to provide assistance to researchers through various services which, among others, include; information literacy, user guidance, basic and complex reference services, and guidance for final project completion.

Apart from these academic functions, the library also functions as a recreation area for visitors by providing various collections of entertainment, such as films equipped with a DVD player and television, works of fiction, novels and so on. The collection is provided to provide refreshing facilities, so that the library can be an alternative as a place of recreation in the midst of the seriousness of the campus community.

Android

Android is an iPlatform or application that is free to develop. There are no license or royalty fees to develop on the Android platform. Android is a new generation of mobile platforms, a platform that provides developers to do as they expect. The operating system underlying Android is licensed under GNU, GeneraliPublici License Version 2 (GPLv2), which is often known as the term "copyleft" license, where any third-party repairs must be tolerated under the term. Android is also distributed under the release of Apache Software (ASL / Apache2), which allows it to be distributed both and onwards (Safaat, 2012a). Androidi is an operating system for mobile phones based on Linux. AndroidiSDK (SoftwareiDevelopmentiKit) provides the daniAPI (Application Programming Interface) tools needed for developers to create and develop applications that are used on mobile phones with the Android operating system using Java programming language (Safaat, 2012b).

Smartphone

This smartphone or better known as a smartphone is one of the realizations of Biquitous Computing (ubicomp) in which one technology enables computation processes so that it is integrated with various daily activities with a range that is not limited by time or in one particular area (Istiyanto, 2013). Smartphones also offer access to both published information and corporate network systems such as intranets. Global availability of telephony network networks and applications can change the delivery of information to the community of business, law and research communities (White, 2010).

Mobile Application

The Mobile application is an application that enables immobility by using equipment such as PDAs, cell phones or mobile phones. Utilization of the Mobile application for entertainment is most popular with up to 70% of cellphone users, because by utilizing the presence of game features, music players, to video video plays makes us easier to enjoy entertainment when only and everywhere (Putra, 2015). The explanation of the research references above has relevance and difference with the author's research. The research conducted by the authors is described as follows:

1. The information system development method uses the RAD (Rapid Application Development) method. By using RAD, the writer must understand the character of information system development methods compared to other information systems development methods.
2. Analysis using DFD (DataiFlowiDiagram) in the form of system analysis that is currently running, context diagrams, DFD level 0, DFD level 1, DFD level 2, 3. By using DFD analysis the researcher can understand the needs of users and business processes in the Sunan Ampel UIN Library, Surabaya.
3. Framework used for application development using the Ionic Framework. By using the Ionic Framework, the writer must understand the language structure and character of the Ionic

Several previous studies that have been done. Tri Rejeki Widada Ningsih Application of Mobile Library Application (M-Library Application) at Gadjah Madai University Library, Yogyakarta 2014 Accessing library integration logic in GadjahiMada University environment, obtaining the latest information on activities in the library, and academics can make book reservations, and control loans independently. Muhammad Yogi Musa Builds Online Library Application Based on Desktopy and MobileiAndroid Study Case at Universitasi Darma Persada 2015 Library Using SDLC (SystemiDevelopmentiLife Cycle) method. Using VisualiBasic .Net 2010. Database used MySQL. by using a barcode the librarian is easier to input. Resqa Dahmurah 2018 Mobile-Based Library Service Application Using a three-tier concept to develop applications. Framework used by ReactJS, and Laravel Framework for Admin. Database using MySQL. The application developed can send notification of book return schedule, extend the loan period online, can order (booking).

METHODOLOGY

The research framework carried out in this final project is as illustrated in Figure 1 as follows:

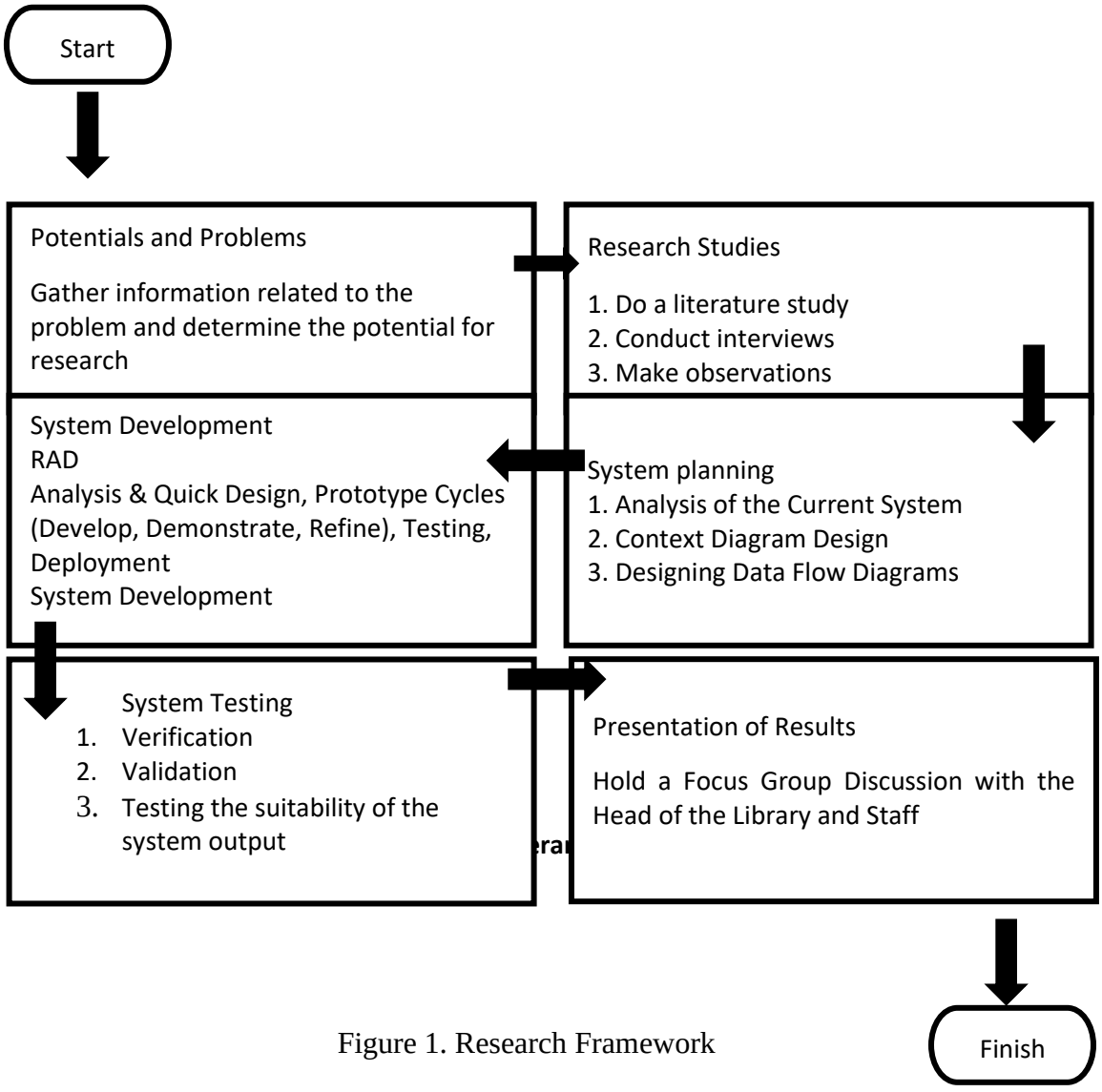

Figure 1. Research Framework

Potentials and Problems

With some problems that are still experienced at the Sunan Ampel UIN Library, Surabaya, as conveyed during an interview with Mrs. Umir as the secretary of the library section of the UIN Sunan Ampel Surabaya library that the return of books that have been borrowed is always late when returning them. From year to year, the decline is not significant, because the existing system is not running optimally. From the point of view of some students who have been interviewed experienced complaints when looking for books or scientific works through the Digilib UIN Sunan Ampel Surabaya (digilib.uinsby.ac.id) because the keywords entered are not always the same when the results are issued. So there is a need for a mobile library application that supports these complaints. At the research study stage, there are three ways, namely by conducting literature studies, interviews, and observations.

System Planning

This stage the authors conducted an activity analysis such as designing a Data Flow Diagram (DFD) of business processes in the Sunan Ampel UIN Library, Surabaya. Modeling Data Flow Diagrams (DFD) is a depiction of subsystems as networks between functions that relate to each other with data flow and storage. In this section, we will explain the Flowmap for the initial stage of the system analysis that is currently running at the Sunan Ampel UIN Library, Surabaya. there is a flowmap for registration of members of the library in UIN Sunan Ampel Surabaya. is the registration process to become a member of the UINSA library. The administration department only waits for data from the IT Library to be entered in the database and printed as library membership cards.

Students who will get a membership card are required to take part in the literacy training held from the UINSA Library and upload a photo for personal identity. The membership card given to students is temporary, if the KTM (Student Identity Card) has not been given to students. The Library Card is given together with the Student Identity Card. Following the mobile library context diagram, the context diagram serves to identify all inputs to the system or output from the system, and provides an overview of the entire system. The context diagram shows an overview of the mobile library application, because all subs in the system are represented by one process symbol. In the context diagram depicted, it can be identified the components that interact in the use of the external entity or user group.The mobile library application subsystem interacts with external entities or users, namely admins and students. Admin has the main data access authority, granting access to users, viewing reports. Students have access rights to personal data, view books, journals, or scientific papers, and their location codes, as well as view data on books that have been borrowed, and know the date of return of books via a reminder.

System Development

Rapid application development (RAD) is a model of the development process of a software device that is classified as an incremental (multilevel) technique. RAD emphasizes short, short, and fast development cycles. Time shortened is an important limitation for this model. Rapid application development uses the iterative method (iterative) in developing a system in which a working model (work model) of the system is constructed at the beginning of the development stage with the aim of determining the user's requirements and then getting rid of it. The working model is used occasionally as a design for the final system implementation (Nugroho, 2017). This research was conducted in several stages in order to achieve the planned goals. The stages with the RAD system development method are shown in Figure 2:

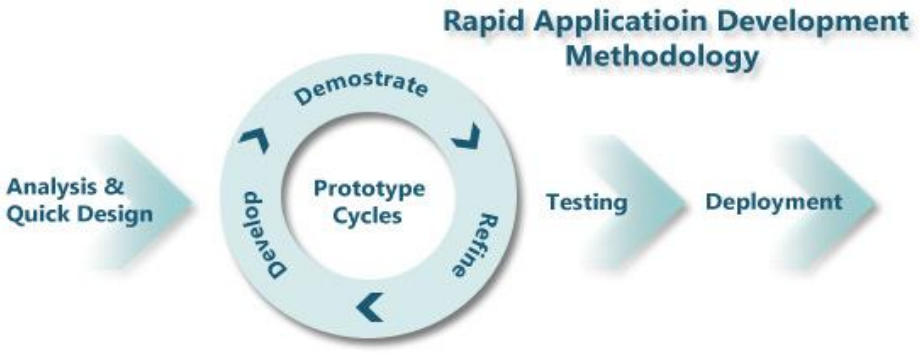

Figure 2. Method RAD (Rapid Development Application) (Nugroho, 2017)

The RAD model adopts the waterfall model by modifying the development of the information system in the shortest time achieved by applying: Component based construction (component-based programming not procedural), Emphasis on reuse of existing male device components, Generation of automatic or semi-automatic programming codes, Multiple teams (many teams), each team completes a task that is at the same level but not the same. The number of times depends on the area and the complexity of the system being built. The method of developing mobile applications that will be used is the Rapid Application Development (RAD) method. This method is one of the methods used to develop Android Mobile Development applications. According to James Martin, "Rapid Application Development (RAD) is the development of a designed cycle that can provide much faster development and higher quality results than those achieved with the traditional life cycle. The method of developing this application consists of four stages, namely RequirementsiPlanningiPhase, UseriDesigniPhase, ConstructioniPhaseidaniCotuveriPhase (G. B. Shelly, 2009). steps in system development are as follows :

a. Analysis and Quick Design
   Broadly speaking, in the Analysis and Quick Design phase. Namely the process to identify the objectives of the system and information needs to achieve the desired goals. By conducting interviews with the Head of the UINSA Library and the Secretary of the UINSA Library.
b. Prototype Cycles
   In the Prototype Cycles stage, there are three stages that will always run, including: Develop, Demostrate, Refine. This stage is used to create a mobile library application. Making this system with the javascript programming language using the Ionic framework and MySQL as the database.
c. Testing
   Perform the testing phase of the system that has been created and runs according to the author's wishes for the input entered and the output given. If an error occurs during this stage, a search and repair is carried out in the system. This stage will continue until the program is in accordance with what has been expected by the author.
d. Deployment,
   The system that has gone through the testing phase will proceed to the next stage for testing its use which is given to the Head of the Sunan Ampel UIN Library and Staff to try the mobile library application.

System Testing

At the system testing stage, verification and validation will be carried out to check the system is running well or not from the initial stage to the system development process so that it meets the desired output. System testing is carried out with supervisors as users and S1 students of the Information System Study Program class of 2015 as users to test the feasibility of the system being run. Verification is a process for evaluating the system to ensure whether the system from the system development stage meets the conditions from the initial stage. Validation is the stage for evaluating the system to ensure that the system from the system development stage meets the predetermined requirements. In the final stage, the author conducted a Focus Group Discussion with the Head of the Library of UIN Sunan Ampel Surabaya with the staff to find out the results of research and development of the mobile library application that has been completed and can be applied by the library to use the mobile library application. The research site was conducted at the Sunan Ampel UIN Library, Surabaya, which is located at the State Islamic University of Sunan Ampel Surabaya in the service activities of the university's academic community.

RESULT AND DISCUSSION

The Sunan Ampel UIN Library has been using the library information system since 2009 to help the management of the library and can be accessed by users through the website www.library.uinsby.ac.id. The UINSA Library information system has an interface, namely: OPAC (Online Public Access Catalog), used by users to search for book collections available in the catalog, library information, and member areas.

The development of the m-library application in this study is one of the services for users who have been able to access the features available on the OPAC interface as shown in Figure 3. Through the m-library application, users can access personal library accounts and make some interactions with the system. libraries independently regarding the total penalty for late returned books and notification notes for book returns, which are not available on the OPAC interface. Application development is limited to the functions and features that can be made possible with the existing UINSA Library application database schema.

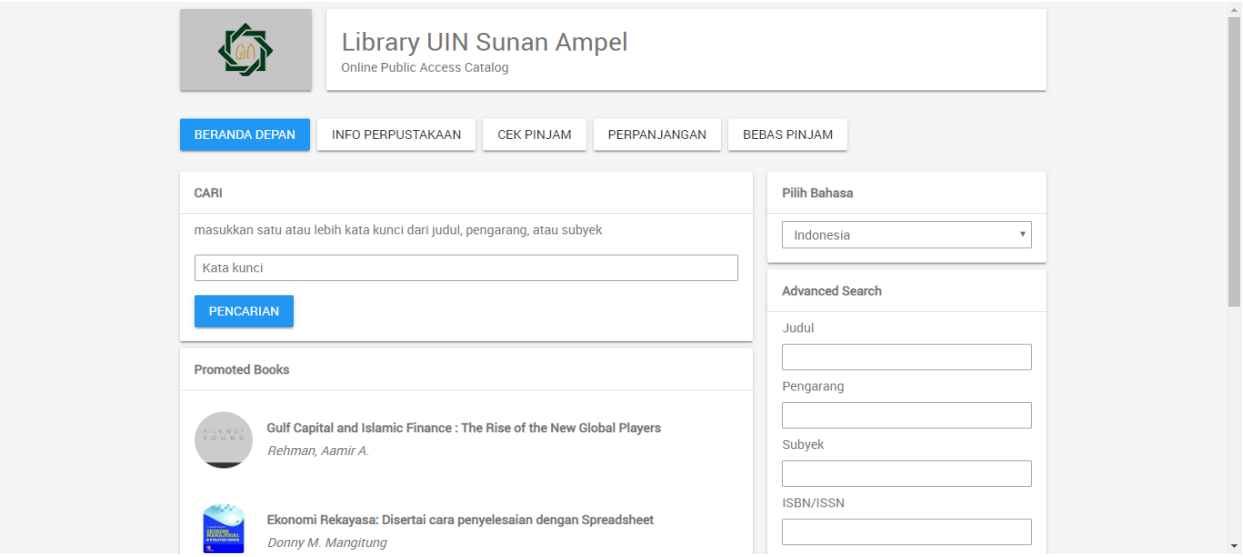

Figure 3. UINSA Catalog

Development of the m-library application prototype in the UINSA library using the Android platform. The selection of Android was made based on the consideration of an interview with the Head of the UINSA Library Section. The advantage of Android is that it is open source licensed so that anyone with Android programming skills can create or develop applications that can run on Android-based gadgets (Safaat 2012).

This research begins by analyzing the needs of stakeholders. Stakeholders are all people who benefit either directly or indirectly from the system being developed (Sommerville and Sawyer in Pressman 2010). Stakeholders in this study are internal libraries (head of libraries, library secretaries and IT department staff) and library members (lecturers and students). In conducting the needs analysis, the primary data used are the results of interviews with 15 stakeholders selected as research respondents, consisting of several groups which can be seen in Table 1.While the secondary data is a list of m-library features from interviews with respondents who refer to the head UINSA library.

Table 1. Research Respondent

Responden	Jumlah	Keterangan
Head Of Devision UINSA Library	1	Responsible for the library
Secretary Library Of UINSA	1	Librarian
IT Staff Library UINSA	1	Operational executor
Student	10	Library users
Lecturer	2	Library users
Total	15	

The purpose of developing an Android-based m-library application in the UINSA Library is to provide users with ease and speed of accessing library information and services via mobile devices, which is more efficient than the web-based UINSA Library application. The results of the interview showed that 75% of respondents stated that they had difficulty accessing the UINSA Library web via mobile devices, due to the website interface design factors that had to zoom-in and zoom-out the screen and the unavailability of a mobile web version.

From the results of interviews with respondents, the information needed by users regarding the mobile library is information about the status of the book loan, the date of returning the book that is being borrowed, late fees, and reminders. As many as 100% of respondents (12 people) mentioned that the books that were borrowed and the due date were important information needed by mobile library users to minimize the occurrence of delays.

The basic needs of the m-library application in this study were carried out by interviewing respondents. The results of the interview which are seen in Table 2, show that there are 10 needs that are expected to be covered in the m-library application. Needs that will be prioritized in the application are needs based on the results of the respondents' interviews. However, out of 10 needs, not all features will be included in the application. Because consideration for the determination of needs is based on: (1) the application developed in this research is focused on the functions related to the main needs of the mobile library, and (2) the availability of data that has been stored in the UINSA Library database to enable these needs to be implemented in the m-library application.

In Table 2, there are 8 basic requirements that are determined to be implemented in the m-library application with the database structure currently used by the UINSA Library. The five main basic requirements (R1, R5, R6, R9, and R10) are requirements that can be implemented in the

application, because there is data storage space in the UINSA Library database. For the two additional basic needs (R3 and R7) the data is not and is not yet in the database, but these needs are not the main thing if they are fixed or not included in the application. Two additional basic needs displayed in the application aim to introduce and inform libraries, which are in line with one of the objectives of the library that provides mobile services, suggested by Lippincottin Becker (2015). There are needs that do not become primary and additional needs, according to the IT Staff of the UINSA Library, there are two features (R2 and R8) which are not the main needs and are additional because they are less effective when included in the application.

Table 2. Interview Result And Services

Kode	*Requirement*	Head of Library	IT Staff Librarian	Student	Lecturer
R1*	Catalog online	√	√	√	√
R2	Reference Help	√			
R3**	Library Service Information	√	√		
R4**	*Feedback*	√	√	√	√
R5*	Borrowing	√	√	√	√
R6*	Book loan extension	√	√	√	√
R7**	Reservation	√		√	
R8	Book Taking		√	√	
R9*	Reminder	√	√	√	√
R10*	Total Of Fine Book	√	√	√	√

*Primary Needs
**Extra Primary Needs

Building Systems

The login page functions to input NIM or NIP and password so that users can enter the m-library application. On this logon page, if the user enters personal data incorrectly, this will display an notification that the inputted data is wrong and cannot be entered in the m-library application. After designing and making the m-library application at UIN Sunan Ampel Surabaya, the next step was testing the application carried out by experts in their fields. Validation of the program design is obtained from the results of the assessment of experts who are competent in their fields. Designing an application is the initial step in making an application. To make an application one must know and understand the outline of what kind of application will be made. The results of application validation are obtained from experts. There are 3 points for the object test instruments, namely the aspects of testing, evaluation, and recommendations. Evaluation and recommendations were obtained from expert validation so that they became materials for revision.

Validate the Application Work Process

Validation of the performance of the system can be evaluated by experts. This testing instrument has 3 points as well as test items, status, and information. Status is obtained from expert

validation so that it becomes a benchmark for making improvements. The results of the validation in Table 3 are as follows:

Table 3. Work Validation Instrument

No.	*Test Item* / Activity	Status	Explanation
1	Borrowed book data	(√) Duration ( ) Not Duration	Outcomes: Can display borrowed book data
	Simulation: Users see data on books that have been borrowed		
2	Extend the loan Book	(√) Duration ( ) Not Duration	Outcomes: Can carry out the online loan process
	Simulation: User clicks the button to extend online book		
3	Look at the book fine	(√) Duration ( ) Not Duration	Results: Can see the total book fine
	Simulation: Users can see the total fines if they are late to return the book		

User Interface Design Validation

The validation of the design between users is carried out by a competent expert. Display also affects the comfort of the user, because it is more comfortable to use and makes it easier to understand the flow of the application. The results of user interface design validation are obtained from experts. This testing instrument found 3 points between other heuristic evaluations, reviews, and recommendations. Reviews and recommendations are obtained from expert validation so that they become a benchmark for making improvements.

Context diagrams are developed into Data Flow Diagrams to show details of the system. The following is the DFD level for the mobile library application.

1. Data Flow Diagram (DFD) level 1
   DFD level 1 is a derivative of the context diagram. The level 1 diagram explains some of the processes that occur in the mobile library application. At DFD Level 1 consists of the main processes in the subsystem. The first process is data processing carried out by the admin. The second process is the tracing process. In this process, users can search for books, journals and scientific papers.
2. Data Flow Diagram (DFD) level 2 from process 1 Data Processing
   DFD level 2 from process 1 is a decrease from DFD level 1 that occurs in the data management process. Explains the data processing required at DFD level 1 Data processing for books, journals, and scientific papers to manage data on books, journals, and scientific papers in table books, journals and scientific papers, lecturer data processing to manage lecturer data in lecturer tables, postgraduate data processing to manage postgraduate data in postgraduate tables and student data processing to manage student data in student tables.
3. Data Flow Diagram (DFD) level 2 from Process 2 Tracing
   DFD level 2 from process 2 is a decrease from DFD level 1 that occurs in the search process.
4. Data Flow Diagram (DFD) Level 3 of Process 1.1 Lecturer Data Processing

DFD Level 3 from Process 1.1 Lecturer Data Processing is a decrease from DFD level 2 that occurs in the lecturer data processing process. Admin can add, edit and delete lecturer data. Lecturers can only edit lecturer data.

5. Data Flow Diagram (DFD) Level 3 of Process 1.2 Postgraduate Data Processing
   DFD Level 3 from Process 1.2 Postgraduate Data Processing is a decrease from DFD level 2 that occurs in postgraduate data processing. Admin can add, edit and delete postgraduate data. Meanwhile, postgraduate students can only edit postgraduate data.
6. Data Flow Diagram (DFD) Level 3 of Process 1.3 Student Data Processing
   DFD Level 3 of Process 1.2 Student Data Processing is a decrease from DFD level 2 that occurs in the student data processing.Admins can add, edit and delete student data. Meanwhile, students can only edit student data.
7. Data Flow Diagrams (DFD) Level 3 of the 1.4 Process Data Processing Books, Journals, and Scientific Papers
   DFD Level 3 of the 1.4 Process Data Processing Books, Journals, and Scientific Papers is a decrease from DFD level 2 that occurs in the data processing of Data Books, Journals, and Scientific Papers. DFD describes in detail the data processing of books, journals, and scientific papers carried out by the admin. The admin has the right to add, edit, and delete data on books, journals, and scientific papers.
8. Data Flow Diagrams (DFD) Level 3 of the 2.1 Process Searching for Books, Journals, and Scientific Papers
   DFD Level 3 of the 2.1 Process of Searching for Books, Journals, and Scientific Papers is a decrease from DFD level 2 that occurs in the search process. Searching for books, journals, and scientific papers can be done based on keywords or titles you want to search.

Analysis and Design Physical Data Model Result

From the Concept Data Model (CDM) in section 5.2.2. can know the application concept. Next, make PDM for database storage needs. Through this PDM, the relations contained in the CDM will be seen more clearly in terms of its function. Below is Figure 4. PDM which is related to each other:

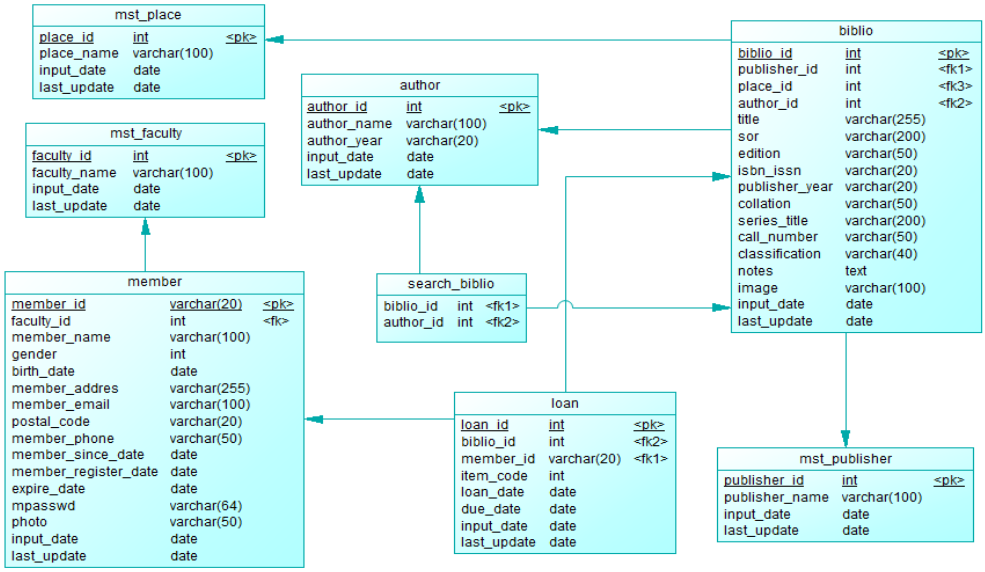

Figure 4. PDM Diagram

There are data types and foreign keys that have sprung up after being formed when designing a CDM. And there are additional columns to meet needs. The following is an explanation of the PDM: The book table named "biblio" is a data book that has a primaryike "biblio_id" which will be theoreign key on the "loan" and "search_biblio" tables. The table from which the book is named "mst_place" is the data where the book which has the primary key "place_id" will become the storeign key in the table "bibilio". Author table which is named "author" is the book author's data which has a primary key "author_id" which will become a foreign key in the "bibilio" and "search_biblio" tables. The table of book publishers named "mst_publisher" is data of book publishers who have a primary key of "publisher_id" which will be assigned key to the table "bibilio". The table of students and lecturers who are given the name "member" is the data of students who have a primary key "member_id" which will become the foreign key in the "loan" table. The faculty table which is named "faculty" is the data of students who have primary key "faculty_id" which will become the foreign key in the "member" table.

CONCLUSION

Based on the development and application testing results that have been found through the entire research process, the following conclusions can be drawn: The system built can extend the online loan period so that it does not require students to come directly to the library, The system built can count down the deadline for borrowing books, The system built can record books that are being borrowed, The system built can search for books available in the library catalog of UIN Sunan Ampel Surabaya. The test results have several additional suggestions so that the research can be better and then it is used to improve the deficiencies in this system, namely: Changes and improvements to the UI and UX of the mobile application so that it is more user friendly, Adding the Advance Search menu so you can maximize your book search, Added loan-free features to support the needs of the UINSunan Ampel Surabaya Library.

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