Pocket Library: Mobile Application for Personal Book Loan Management

By

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Dissertation submitted in partial fulfillment of

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CERTIFICATION OF APPROVAL

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A project dissertation submitted to the

Information and Communication Technology Programme

Universiti Teknologi PETRONAS

In partial fulfilment of the requirement for the

BACHELOR OF TECHNOLOGY (Hons)

INFORMATION AND COMMUNICATION TECHNOLOGY

Approved by,

_____

(Dr. Rohiza Ahmad)

UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

SEPTEMBER 2013

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

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NUR FARAH HANI BINTI JAZNI

ABSTRACT

Library can be considered as the backbone of any educational institution. This is so since it is the place which provides pool of resources for supporting knowledge acquirement at such institutions. Nowadays, most libraries not only house printed books but also bank of computers to assist patrons getting hold of online materials. At the same time, libraries also provide a conducive place for people to meet, interact and discuss in the pursuit of knowledge. Among the services often provided by a library is book loan. Careful management of book loan is crucial in order to maintain the inventory of a library. Book loan management can be seen from the perspectives of two types of users: librarians and patrons. While book loan management's procedures and application systems for the librarians have been well documented and developed, the same cannot be said for the usage of the patrons.

The availability of such application systems can help the patrons to manage their loan in terms of constantly receiving reminders from the libraries of the due date of the books that they have borrowed, the amount of fines that they have to pay due to overdue loan, the information on new collections of interest, the information on availability of book previously reserved, as well as submitting request for extending a loan period. Due to potential benefit of the above system, this project intends to develop a mobile application system for personal book loan management namely "pocket library". The system is to be developed for the patrons of IRC in Universiti Teknologi Petronas (UTP). Mobile platform is chosen for the system due to its popularity and convenience to users. The scope of the project are limited to the student and staff of UTP who are largely make up as library patrons and having a difficulties managing their book loan properly. This report shares the background of the project including the problem statement, the objectives, the scope of study and the existing related works. Besides, the RAD methodology which has been chosen to drive the development and validation of "pocket library" is also elaborated and some of its initial designs are also shared. The report concludes with mentioning of the works which will be done in the second phase of the project.

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ABBREVIATION AND NOMENCLATURES

UTP	Universiti Teknologi PETRONAS
IRC	Information Resource Centre
OPAC	Online Public Access Catalogue
ILMU	Integrated Library Management Utility
LESTARI	Library Electronic System And Research Information
RAD	Rapid Application Development
SDK	Software Development Kit
API	Application Program Interface
iOS	iPhone Operating System
GPS	Global Positioning System

CHAPTER 1
INTRODUCTION

1.1 Background of Study

Universiti Teknologi PETRONAS (UTP) has its own library which is called Information Resource Centre (IRC). IRC offers services and information to all patrons including student and staff. One of the services offered is loan service (books, magazines, journals, audio/visual items). At IRC, whenever a patron borrows a material from the library, he/she will be provided with a printed receipt which summarizes the details regarding the material on loan. The receipt which states the returning date of the material is aimed to serve as reminder for borrower. However, at the moment, it seems that the receipt alone is not enough to ensure the return of borrowed material on time. Somehow, some people still forgot to return the borrowed items due to forgotten, misplaced or lost receipts.

To address or reduce the problem of unreturned library materials, in particular books, which have occurred frequently, this project intends to develop a mobile application system that can be used by library patrons in order to manage their book loan. While most libraries have computerized systems for librarian's book loan management such as the OPAC system at UTP (Malaysia centre of educational Excellence: Introduction to UTP, 2009), ILMU at UiTM (Library System UiTM, 2010) or LESTARI at UTM (Perpustakaan Sultanah Zanariah, 2011), the same cannot be said for the usage of the patrons. To date, the IRC at UTP is also found to be lacking of such system. At the moment, once a book has been borrowed by a patron at the IRC, no computerized support has been provided unless through email send by the library system, to the patron for managing the loan such as automated reminder of the due date, checking of overdue loan, checking of fines and extension of loan period.

Hence, this project presents the development of a mobile application system named "Pocket Library". The application once developed will come with some functionality such as pop-up notification of the due date for returning books, extension of loan period, and notification of new books available according to user's previous history, and last but not least storing information about charged fines. All in one mobile application where focus on personal book's loan management.

Thus, this project is aimed to develop a mobile-based book loan management for the library patrons at UTP. There are 4 sections within the period of the project development.

1) Analysis and data collection

2) Design and development of mobile apps

3) Evaluation of mobile apps

From the developed prototype, the user acceptance test will be conducted. The testing will be conducted primarily on library's patrons including all student and staffs. The result of the findings will be further elaborated in result and discussion part.

1.2 Problem Statement

"Academic libraries must not only collect and preserve materials, but must also be engines of innovation in this rapidly changing world" (Helen Shenton, 2011).

As time passed, the numbers of patrons are increasing and the common problem has identified. One of the services offered by IRC is borrowing books from a range of red spot or open collection area. Due to the current lack of computerized system for library patrons of UTP to manage their book loan, problems such as unreturned books, unpaid fines, are still occurring in abundance due to both intentional and unintentional action of the borrowers. The above has affected the library in terms of book inventory and patrons in terms of availability of books.

To date, there are no application is available to manage books loan in UTP for its IRC's patrons. Once the books being scanned in the machinery, there will be a printed receipt which summarizes the details regarding the material on loan including due date. The procedure is currently satisfactory yet at the point of returning books it is a bit difficult there. Patrons are better to be provided with automated reminder of the due date returning book via mobile application. Therefore, here is the proposed solution to address the difficulties. The project is mainly focusing on how to facilitate patrons to manage their communication and interconnection associating with libraries with the aids of mobile application where the scope narrowed to books loan. There are few more functionalities of mobile application such as storing information about fines, notification updates of new collection based on their history and last but not least is extension of borrowing loan.

With the mobile book loan management, it is hoped that the problems can be minimized and the patrons can have a better and simpler platform to manage their book loan. The research is an on-going process which always looking for a betterment to serve IRC's patrons the best.

1.3 Objective

The objectives of the project are as follows:

- To identify suitable mobile development model for developing mobile application for book loan management.
- To develop a mobile application for library book loan management.
- To conduct user acceptance test on the developed mobile application.

1.4 Scope of Study

This study focus primarily on patrons of IRC who are mainly students, lecturers and staffs of UTP who has problems in managing their book loan properly. Main purpose of this project is to minimize the common problem among IRC patrons which is unreturned books borrowed from library where the scope is narrowed down to book loans management.

Due to some limitation, this project will only cover the area of book loan management. Since it is known that IRC has variety of systems existing within its organization, hence the project promising to handle only the subjected area comprises book loan management for UTP IRC patrons. This part of the system has to be done accordingly and not go beyond that to avoid any misconception.

The study also conducted to analyse the suitable approach to be used throughout the development of the system. At the beginning phase, the system will run on android platform of mobile application only. Roose (2013) mention in her articles that the market of android are now expanding with the increment from 24 percent up to 92 percent by march 2013 and it is undeniably has become a leading mobile platform in recent times. However, further research will be conducted as to identify the best mobile application platform which suitable to the system.

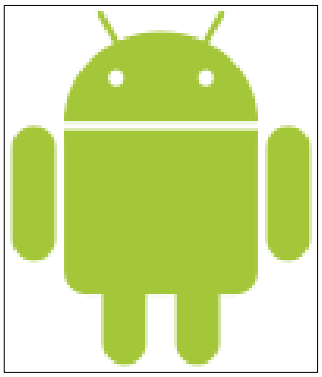


Figure 1: Android Mascot

Other than that, this project on mobile application also comprises few more functional areas such that notify the patrons with new arrival or collection of books according to their previous borrowing history and storing information about fines. Last but not least, patrons can use this application anywhere and anytime to extend their book's loan for such they can extend it for another one week up to 2 month period. Overall, this project scope is mainly to assist people to manage their book loan wisely.

CHAPTER 2

LITERATURE REVIEW

This chapter mainly reports some of the previous works done by researchers which are related to the project. As we all know that mobile function having some constraint such that limited memory size, slower processor and smaller size of font. All of these weaknesses must be considered throughout the period of developing mobile application for this project.

2.1 Catching up the technology

G. Basalla (2002) mention in her article that "traditional wisdom about the nature of technology has customarily emphasised the importance of necessity and utility. Many times, we have been told that technologies through the ages provides human with utilitarian object and structures necessary for survival".

Several technological advances have always tried the minds of men. Bear in mind that technology is always on our side that ease the task in our daily routine. As for example, simply think that how could we get a fresh food without having a fridge to maintain its freshness? In fact, technology has given us the power to support our rapidly growing needs in order to survive.

Figure 2: The mobile technology evolution

We need technology at every step, thus the use of technology has made our life comfortable. We get to keep a lot of information in a small device and use it whenever we like. Cars have also become better with the use of technology. Thus technology is critically an important and has become one of essential elements of our life.

2.2 Roles of IT in the betterment of our life

According to "Role of Technology in Developement", (2004) mentioned that the recent advancement of technology has giving a great impact in every single things in our life. In fact, the global revolution of technology may resulting in both threaten and protect the future of our planet. Following are some facts that should be considered:

- Between 1990 and 1996, international telephone traffic has increase its number unexpectedly more than doubled from 33 billion to 70 billion minutes per year.
- Number of computers worldwide tripled in the '90s (now over 400 million)
- Geographic Information Systems used by people has an increment by 20% each year
- Computing power of a single computer chip has increased by a factor of 64,000 since the last three decades.

- Wireless technologies promise to serve the most remote locations e.g. use of cell phones by mountain farmers in yak caravans in Myanmar and Laos to find the best path to market especially during the rainy season.

According to the article "How does information help you in your daily life?" (2011) which clearly states that information is the crucial elements to assist people in decision making. Thus, information plays significant roles in our life. While speaking about information technology, "Information Technology will improve our life quality"(2011) state that for example the international wireless charging standard, eCoupled is the one which shows that the improvement of life quality within the area of technology. It improves our life by making an existing technology usable on world wide scale by implementing the standard only brings advantages hence improves life quality.

2.3 The evolution of mobile application technology

(Saracute,2013) declared in his writing that any universities and colleges which would take a road of having a mobile app for their community should take a consideration for young people especially in niche group of 18 until 29 years old who have smartphones. For having a two-third of the smartphone user then apps tend to become the necessary one. It is highly recommended for universities to go with apps if they want to include features like camera, location detector, virtual reality and many more as mobile application are worth for it.

According to (Gartner Inc.,2011) operating system preceding the worldwide market with the sales will reach 468 million units which the statistically indicates a 57.7% increase from year 2010. He forecast that android Operating system will conquering with an account 49% of smartphone market by year 2012 and become the most popular OS leading in smartphones world (Egham, 2011).

As reported by (Egham, 2011) , the sales of open OS device will make up 26 percent of all mobile handset device sales in 2011 and are expected to outperform it sales by 1 billion revenue by 2015 when they performed to account 47 percent of the total mobile device market.

OS	2010	2011	2012	2015
Symbian	111,577	89,930	32,666	661
Market Share (%)	37.6	19.2	5.2	0.1
Android	67,225	179,873	310,088	539,318
Market Share (%)	22.7	38.5	49.2	48.8
Research In Motion	47,452	62,600	79,335	122,864
Market Share (%)	16.0	13.4	12.6	11.1
iOS	46,598	90,560	118,848	189,924
Market Share (%)	15.7	19.4	18.9	17.2
Microsoft	12,378	26,346	68,156	215,998
Market Share (%)	4.2	5.6	10.8	19.5
Other Operating Systems	11,417.4	18,392.3	21,383.7	36,133.9
Market Share (%)	3.8	3.9	3.4	3.3
Total Market	**296,647**	**467,701**	**630,476**	**1,104,898**

Source: Gartner (April 2011)

Figure 3: Worldwide Mobile Communication Device Open OS Sales to End users by OS (thousands unit)

The table above shows the evolution of market trending of mobile application all over the world since year 2010 and forecast estimation of end user up until year 2015. The above table shows that Android has reaching it highest number of user among other mobile operating system platform. Over the years, the number of Android user becomes tremendously bigger as it approaching year 2015 with targeted market share of 48.8%. With the estimation in the above table, it convinces that Android is the best and most reliable operating system which chosen for this project.

2.4 Methodologies for Mobile Application Development

Mobile application has reaching high level of demand as the world turning mobile. It has been reported that more and more people shifting to smartphone and tablets. Since then, it opened up the avenues for mobile application development company to expand their market reach. According to Spencer (2012), there are three different approaches that can be used to make an impressive mobile app for their client:

(i) Web Apps and HTML

Nowadays, new generation of smartphones come out with the capabilities of HTML5,CSS3 and advance JavaScript. Mobile websites created and render web pages that are compatible to short screens.

(ii) Native Apps

This method also known as conventional mobile app. Generally, they are on handheld devices since the functionality and features use for smartphones.

(iii) Hybrid Apps

Hybrid app is most convenient apps when about to develop a very flexible mobile application combining web and native elements. In short, hybrid appsis a native apps with embedded HTML.It consist of all advantages of native apps and web technologies.

The study has conducted by (Mehta) conclude that all these three approaches differ significantly. Mobile web apps designed to run on mobile web browser. Since almost all high-end mobile devices support HTML5 to a large extend, it is aligned as technology for "Write Once, Run Anywhere". While native apps are built using native device operating system API and SDKs. They are coded using specific platform such that Objective C for iOS C for Windows phone and Java for Android. Last but not least, hybrid apps has become a trend and it is the combination of web apps and native apps. Since mobile web apps did not function when the device is offline, hybrid evolved to deliver an independent platform to make it accessible with offline operation.

2.5 The importance and roles of library

(Greer,2010) once said in his article which mentioned that the library is not necessarily focusing on its design and architecture of building but it is more about useful resources of a broader range of knowledge and services offered. And that does not even scratch the surface of the digital capabilities that many library systems possess.

As cited by (Edwards, Rauseo, & Unger, 2013) in their writing that library can be well defined as the centre for community's education, libraries are major players in creating liveable, environmentally friendly cities and towns. The Urban Libraries Council believed that a library can somehow turn to be a focal point to further and practice sustainability at the local level.

Over the year library has gone through some evolution process align with the betterment technology which diffuse in people's daily routine including in library process flow and operation process.

In order to reach a well-developed education in society, a great effort must be taken in action so that to discuss the institutional roles of library in advancing the frontiers of literacy. Hence, the paper would examine the importance and close bearing of the library upon the advancement of education and learning.
In short, we can classify the services commonly provided by libraries are as follows:

(i) A series of collection of literacy document or keeping the record for reference or borrowing.

(ii) A building where it contain books and other related materials for reading, research and learning

(iii) A collection of information not only in book on shelves but more to provide humans with advance programmes and subroutines which is stored and available for immediate use.

"Library can be defines as a learned institution equipped with treasures of knowledge maintained, organized, and managed by trained personnel to educate the children, men and women continuously and assist in their self-improvement through an effective and prompt dissemination of information embodied in the resources" as mention by Adio.

There a another definition of Library according to (Islam,2004) in the article by Adio is an instrument of self-education, a means of knowledge and factual information, a centre of intellectual recreation, and a beacon of enlightenment that provides accumulated preserved knowledge of civilization which consequently enriches one's mental vision, and dignifies his habit behaviour, character, taste, attitude, conduct, and outlook on life.

2.6 UTP Library

UTP library which refers to Information Resource Centre (IRC) has been established since year 1997.By year 1997, it was first located next to Multi-Purpose Hall and then relocate to next of Chancellor Hall by year 2004 .The official Launching of Chancellor Complex which houses UTP Chancellor Hall and the new Information Resource Centre by Prime Minister YAB Dato' Seri Abdullah Haji Ahmad Badawi on 22 August. IRC began its operation with approximately housing 212,000 volumes of books, research materials and other items. Recent updates have shown that it is now approximately reaching it best new collection of 250,000 items with 7,298 users (Information Resource Centre).

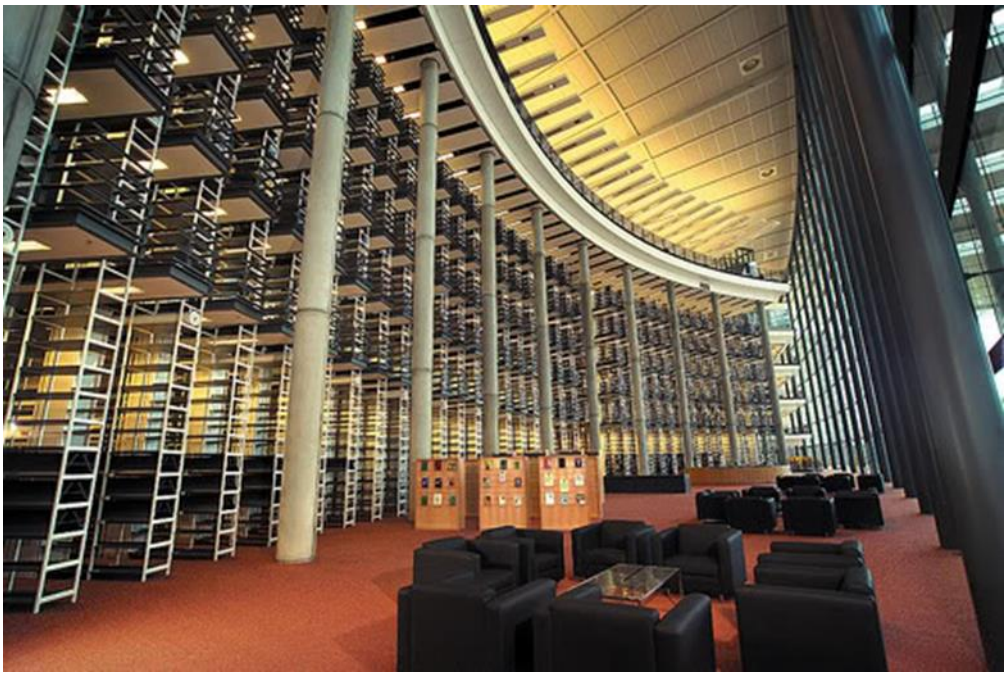


Figure 4: Information Resoure Centre (IRC) of UTP

With intent focus on the field of engineering and technology, one of the IRC's goals is to provide adequate and cutting-edge knowledge and resources to cater for the increasing demands of the patronage, which has different levels of information demands either for their research, multi-learning environment or self-teaching. In line with the rapid IT development, IRC is attached to incorporate high-technology and high-fashionable of IT infrastructure. Currently, IRC is equipped with integrated library system known as Millennium by Innovative Interfaces Inc. which promote efficient retrieval of information thus enables users to explore not only resources at IRC but also from all PETRONAS Group-wide Resource Centres.

2.7 Rapid Growth of Mobile Application for Library system

(Barille, 2011) says about library mobile apps as depicted in her writing states that in recent days, the ideas of libraries should become an exploring mobile device as a way to connect with patrons is such most relevant one. Creating a library application ("app") or mobile Web site that allows patrons to access library in every hours, view their library account or even search databases is easier than most people think. The resources below should help libraries take a first step begin to plan and implement their own unique mobile application".

(Schroeder, 2010) mention in his article that in three years time, desktop would be irrelevant. Nowadays, Japan advanced in their research by using smartphone not PC. This statement clearly shows that the evolution of mobile application are tremendously hit the current market. It is not only for shopping, daily life routines or business but also give a great impact on educational platform specifically for library. Looking at different perspective, technology has contributed a huge transformation to library system including mobile application system as what have been done in some universities all over the world. They having a mobile application for library so make it easier for student to access into library catalogue, get updates for latest events, browsing books and many more rather than done it manually which normally considered as tedious process.

2.8 Mobile Application Development Model

As mentioned by (Wasserman) that generally developing mobile application is similarly to software engineering which involving embedded system. Common

issues arise including integration with device hardware, reliability, sustainability, performance, storage capacity and last but least traditional issues regarding security.

There are numerous of execution environment for mobile application platform. For example, Apple IOS development centre provide debugger integrated with XcodeIDE, Android can use Eclipse programming environment and Windows phone can use C or C++ programming language. There are few more typical mobile application platform such that Symbian, Blackberry and Ubuntu Touch.

All of these powerful development tools associating with mobile application development model to build an application accordingly. There are few of development model identified which assist the developer to create mobile application as desired one. Below are the mobile application development processes:

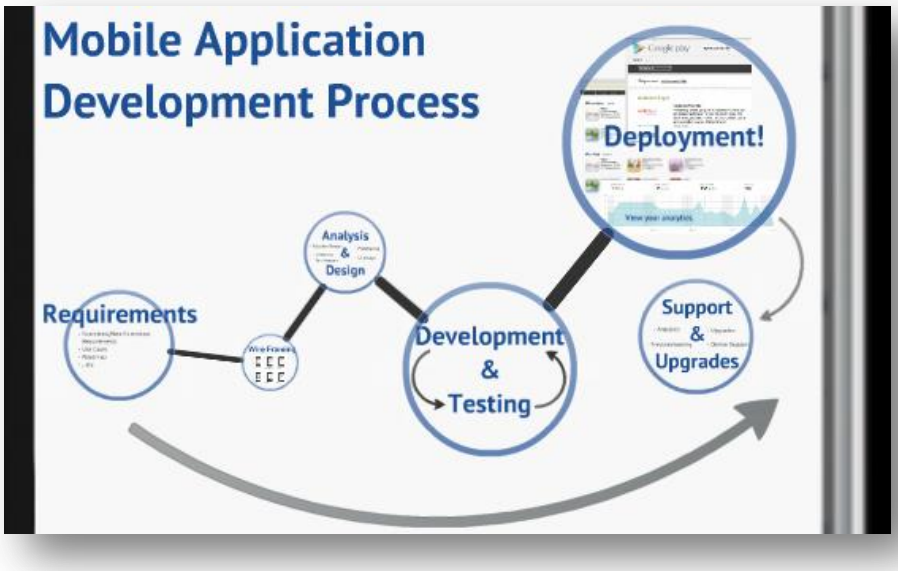


Figure 5: Mobile Application Development Process 1

Figure 6: Mobile Application Development 2

Table 1 below are the summarization top 5 multi-platform mobile app development especially for Android and iOS platform:

Developer Tools	Description
rhomobile smartphone apps made easy	• Create native apps, spanning over a stunning range of OS' and smartphones. • Can use for OS Android, Windows Mobile, Symbian, iPhone and RIM and almost all. • Framework of RhoMobile let you code only once.
PhoneGap	• Can uses for OS Android, Palm, Symbian , Blackberry, iPhone, iPad • Uses standard web development languages such as HTML and JavaScript. • Can work with hardware such as accelerometer, GPS/location, camera, sound

	• aids the development of native mobile apps via web programming languages such as HTML, PHP, JavaScript, Ruby and Python • Data can be stored in device or in cloud
	• Web programming based. • Support for JavaScript, PHP, Ruby, Python and such other languages • MoSync now includes Eclipse-based IDE for C/C++ programming.
	• uses standard web technologies, such as JavaScript, HTML5 and CSS3 • can create apps OS of iOS, Android OS and WebOS.
	• Integrated Developemt Environment (IDE) • Support programming languages such as Javascript, C, C++, COBOL,etc.

Table 1: Mobile Application Developer

2.9 Comparison Study of existing university mobile application

The research has shown that mobile application for library has offering enquiry support, online room booking, finding resources, circulation, and collecting statistic and so on. Among all the services offered had been implemented in some university all over the world including in Malaysia. Figures below show some of them which already move forwards with the advancement of practicing library mobile application.

NCSU mobile apps provide:

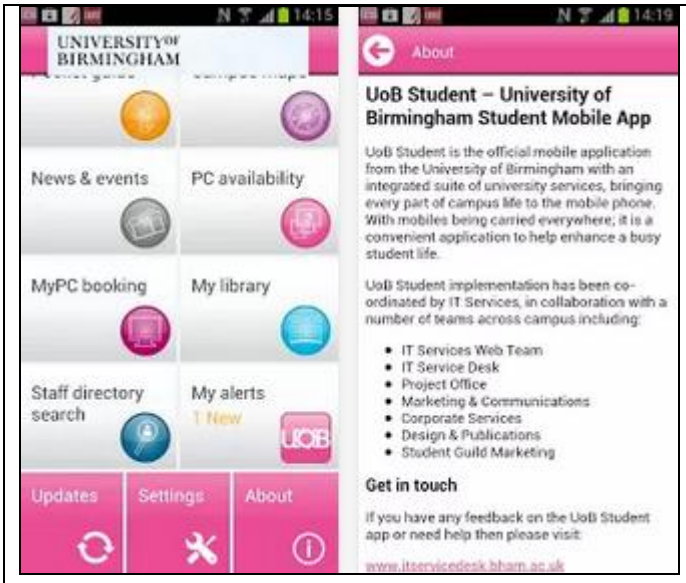
- Locations & Hours
- Computer Availability
- Catalog Search
- Reference Services
- News & Events
- Webcam Feeds
- Link to campus mobile site

Figure 7: Mobile apps for NC State University Library

The features including:

- Campus map
- Library reading list
- Find PC on campus
- Alerts and reminder
- View course timetable
- View course information
- Friend Locator
- View personal library record - see charges summary and which books are reserved, requested, booked and loaned.

Figure 5: Mobile Apps for University of Sheffield



	Provide access to university students such as: • Updated with new events • Browsing library catalogue • Find available PCs in library • Campus Map • Search for university staff email & contacts • Pocket guide to university services

Figure 9: Mobile Apps for University of Birmingham

In Malaysia, library mobile application has been used widely in some universities such as "BookMyne" for International Islamic University Malaysia (IIUM) and "m-libraries" for Open University Malaysia (OUM). The description of these two mobile applications as in figure 10 and 11 below:

Provide access to university students such as:

- Search library catalogue
- Log on into account and renew items
- Check account information
- Organize preferred book titles on a virtual bookshelves
- Barcode scanning capabilities
- Locate nearest library based on GPS.

Figure 10: Mobile Apps for IIUM library

	Provide access to university students such as: • Mobile online public access catalogue • A webcam; so user can check the congestion in library. • Can access to library database • Library short message Service (SMS) notification.

Figure 11: Mobile apps for Open University Malaysia library

All of the mobile application mentioned above provides a ubiquitous connectivity between libraries and patrons as they utilize the usage of mobile application technology. As mentioned by (Ibrahim & Mohamad Anuar), mobile technology become more powerful and GPS-enabled, less expensive where these two main aspects should be focused in next five to ten years.

In short, mobile application for library is no more at the stage of early experiment, yet it has become one of the necessary for every student especially in higher education levels. The technologies allow us to be better engaged and interact with the library in every single minute we move. To expand the library's reach and promotes the patrons to access with a mobile library application is exactly the best way to think about the solutions.

CHAPTER 3
METHODOLOGY/PROJECT WORK

3.1 Research Background

Basically, this project is purposely carried out to address the problems which frequently occur among the patrons of IRC in UTP. With the rapid growth of mobile technology makes software engineering field to catch up vastly to keep on it. The framework for this project research including few areas such that:

- Research Methodology
- Project activities
- Gantt-chart
- Key-milestone

3.1.1 Research Methodology

This project use RAD methodology throughout period of developing the application. It defined as an achievement of faster development lifecycle and better result compared with those lifecycle which designed in traditional ways. In short, it is designed to maximize advantages of powerful development of software that has evolved recently.

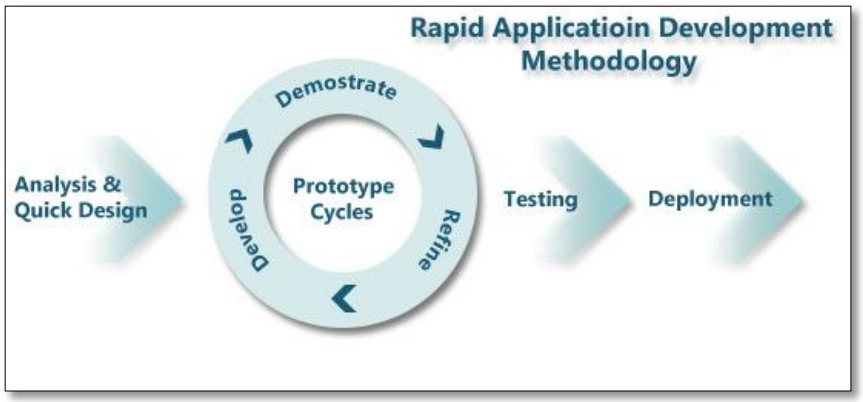


Figure 126: RAD Methodology

The result is likely receiving formative feedback when prototype is being created. This methodology use minimal planning due to the main purpose is to build a rapid

prototyping which then allow the software to be written in quick ways and can change the requirement anytime where it is necessary. RAD approach is not suitable f or mission to create a critical and consist of complexity type of project.

In the other hand, RAD approach is targeting to small, narrowed and well defined objectives of projects whilst the data set is already exist. In general, RAD methodology consists of four (4) main basic stages including:

- Analysis and Quick Design
- Prototyping cycle
  - ✓ Develop
  - ✓ Demonstrate
  - ✓ Refine
- Testing
- Deployment

However, for this project, the stages will be conducted up to testing stage only. This is due to limitation of time and resources to conduct through test and modification for real deployment.

(1) Analysis and Quick Design

In this initial phase, the author need to gather all information needed throughout the development period of the project. It identifies main objectives and the reasons why is should be implemented as well as to find out the requirements. During this phase the author defines clearly the background of study, identify the scope and gather all information related which to be used in the next phase. Quick designs of software happen at this stage where author seek for a suitable design to match its objective and final product review.

(2) Prototyping Cycle

Prototyping is crucial phase where the development of the software starts to take place. It can be described in three sub-division which are developing the software,

demonstrate and last but not least refine it.

All the data gained in analysis stages are used to develop the software. It is involving to determine which design and interface best to be formulated in the model. The content will be evaluated before the demonstration phase takes place.

Next is demonstrating the software where to see whether the software can be functional or not and purposely to see any bugs or problem within it. It is importance to make sure the model meet the requirements and standard and definitely meet our goals as defined at the beginning stage of project.

If the any requirement needed to be implemented in the software, this stage is substantial to make any changes on it. The author can make few refinements before go to the final result such that refine the design, interface and value of the software all should be done within this stage. All of these three processes should be takes place subsequently and in recurring cycle until the author reach to the final result.

(3) Testing

The system will be finalized after the testing part has done. This is primarily including user acceptance testing (UAT) to see the opinion from user's side. User acceptance testing is conducted to identify the acceptability and suitability of the software with the user at the same time fix any bugs that occur within the built of application. The criteria which involves in of user acceptance testing are as follow:

- Instruction understandability
- Behaviour of the user response to it
- Ease of use
- Effectiveness and time saving
- User friendly

3.2 Tools and Technology

It would be impossible to develop the system without the aid of technology and development tools. There are two machine needed in this development stage, firstly named development machine where consist of CPU to install and run Adobe Photoshop, MYSQL, Java Development Kit (JDK) and other tools for system development only. The other one is target machine which referring to Android smart phone connected to development machine to test the functionality of the system.

Below are the tools used throughout the development process:

Development Machine Specification (CPU unit)

- Processor – Intel® Core ™ i5-3317U CPU
- Platform – Microsoft Windows 7 Home Premium
- RAM – 4.00 GB
- System type – 64-bit Operating System
- Browser – Google Chrome version 30.0.1599.69 m

Target Machine Specification (Samsung Ace)

- CPU – 832 MHz
- GPU – VideoCore IV
- RAM – 1GB
- Platform – Android v2.3.6 (Gingerbread)
- Internet – 3G, GPRS, EDGE, Wi-Fi

Figure 13: Samsung Galaxy Ace

Below are the software used throughout the development process:

- Application/Android Development

JAVA ECLIPSE (Android Coding System)

Figure 14: Eclipse Logo

Eclipse is a multi-language software development environment comprising workspace and an extensible plug-in system. It is written mostly in Java. It can be used to develop applications in Java and, by means of various plug-ins, other programming languages including Ada, C, C++, Fortran, Haskell, Perl, PHP, Python, R, Ruby (including Ruby on Rails framework), Scala, Clojure, Groovy, and Scheme. (Wikipedia: Eclipse (software), 2013)

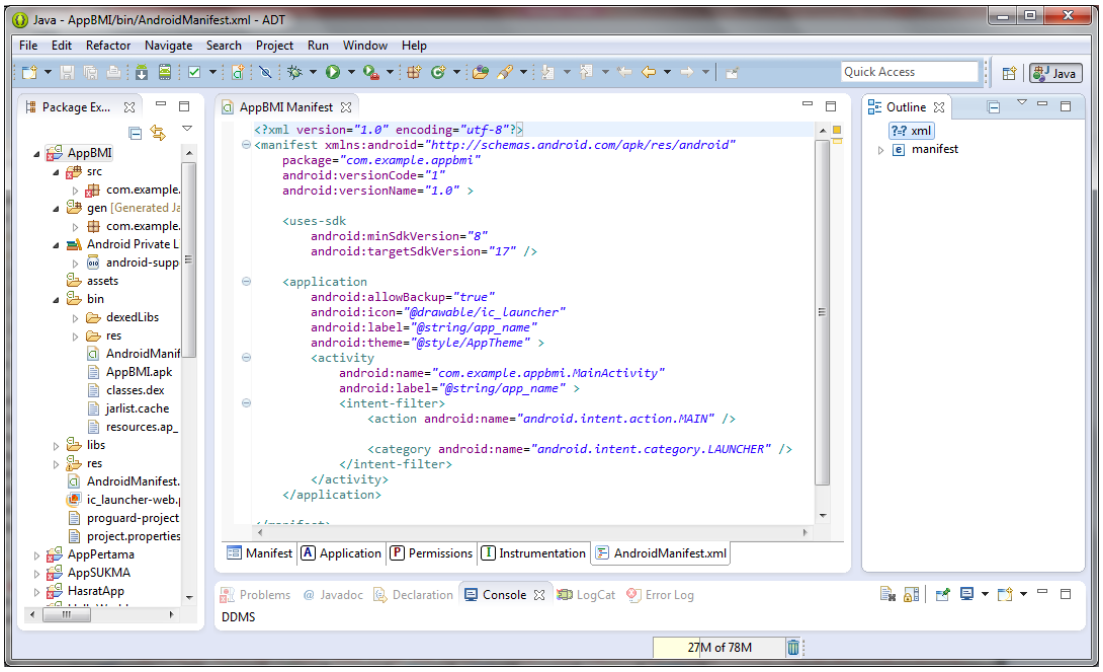


Figure 15: Coding in Eclipse

- Genymotion Virtual Device

Figure 16: Genymotion Software logo

The software basic on virtual device to help user test the apps directly form Eclipse. It increase the effectiveness to run the apps on big screen,TV or even bigger display. Genymotion is comparatively fast Android emulator which comes in pre-configured Android (x86 with OpenGL hardware acceleration) image testing, and application testing. Some of the Genymotion features such as:

- Easily download and run pre-configured virtual images: Android 4.3 API level 18 (with x86 support): Android 2.3.7 API 9; Nexus 7 Jelly Bean, Nexus S Jelly Bean, Nexus One Jelly Bean, 10.1", WXGA Tablet Jelly Bean, 7.0" and WSVGA Tablet Jelly Bean.
- GPS (with configurable coordinates) and battery (with configurable battery levels) emulation widgets.
- Eclipse and Android Studio plugins
- Supports Linux, Windows and Mac.

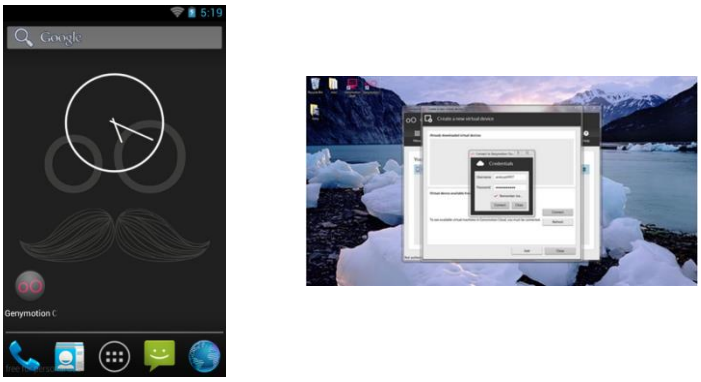


Figure 17: Genymotion Virtual Device on Desktop

- Graphic Development

Adobe Photoshop CS5

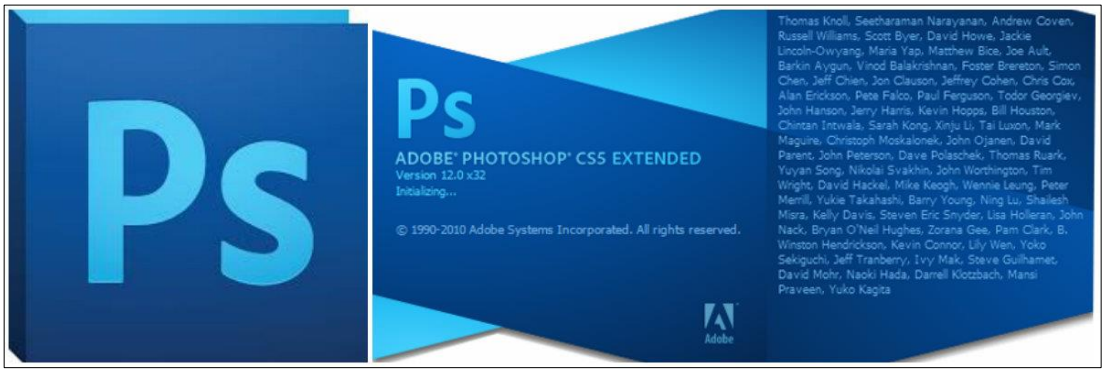


Figure 18: Adobe Photoshop CS5 logo

Adobe Photoshop is a popular designing application that is used to create graphic designs and photo manipulation. In this system, it was used to design the interface as well as components such as characters and buttons.

3.3 System architecture

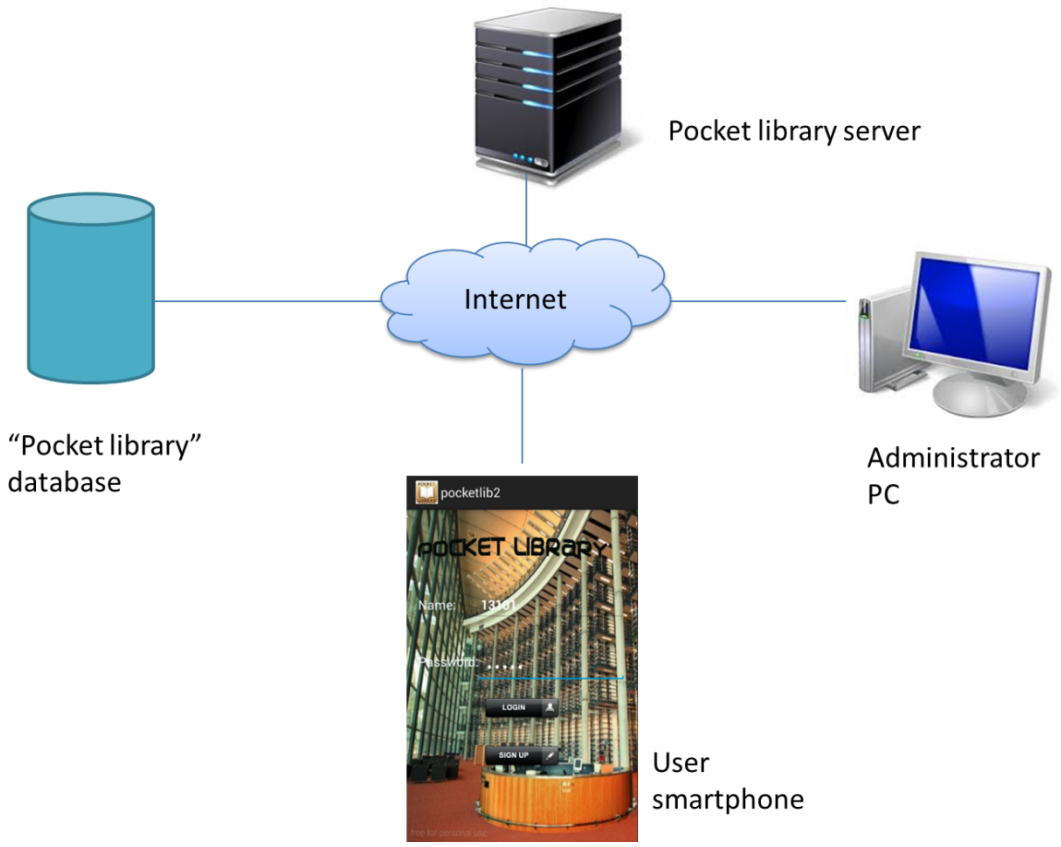


Figure 19: System architecture of "pocket library" system

The architecture shows that user can access the system, Pocket Library online with the connection of internet. There are few elements involved in the system identified as database, pocket library server, administrator PC and user's smartphone. To get accessed to the application, user need to login as their ID and all of the activity for such updating user will also have to connect to internet to receive data from system server, in this case the library server. The administrator which is librarian will update for update any new data for that particular activities each user login. They also responsible to maintain the system effectiveness, enhancing the system, helpdesk management and to ensure the systems functions well and cater the request from user.

IRC patrons are end user and they have to connect to the internet to request the information based on the selected features on mobile application. At the end, user will get the information from the pocket library server. For such, the function of availability of new book collection must be tailored with the database of IRC system. At this moment, four functionalities are proposed to be comprises in the system as depicted in the figure 19 above.

3.4 Project activities

(i) Self-research

Self-research help to understand the current situation deeper and better about how the growth of mobile technology does gives impact to the society. While focusing on the target area of UTPians, the scope of study also narrowed down so that later it will emerge as an application which serves all of them at the best way. The main purpose of this activity is finding out the best way to make life easier and save time consuming in order to manage everything related to book loans. Specifically it targets on people who merely rely on mobile apps in their daily routine. Nevertheless, the author well informed about the existing apps developed before this, but this project began to start with new ideas, new interface, improved with enhanced ways of developing it.

(ii) Quantitative questionnaire

Generally the most common way to gather data and produce a quantitative result is via questionnaires or survey. Well-designed questionnaires are able to gather information on both overall performance of the system together with the specific components of the system.

(iii) Qualitative interviews

To gather a qualitative analysis, one-to-one directed conversation must be done in order to obtain an opinion from the respondent and it allows the author to get quick response from them. This information obtained is much valuable where we can get most updated and true experience thus translate it in a word form. For this project, the target respondents are students and lecturers of UTP and IRC staffs.

3.5 Key Milestones

Key Milestones for Final Year Project II (FYP II)

Activities	Month
Submission of Progress report	**October 2013**
Pre- SEDEX	**November 2013**
Submission of Dissertation (1st draft)	**December 2013**
SEDEX	**December 2013**
Submission of Technical report and dissertation (online)	**December 2013**
VIVA presentation	**December 2013**
Submission of final dissertation hardbound	**December 2013**

Table 2: Key Milestone FYP II

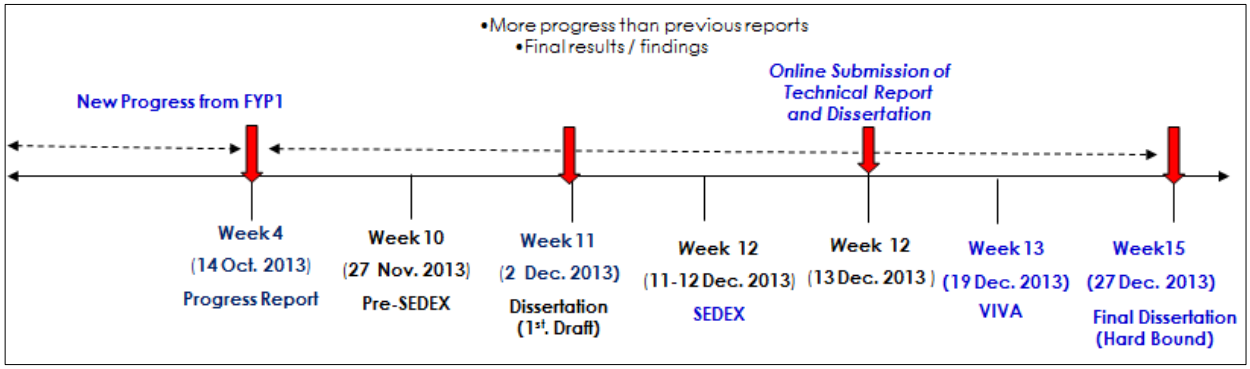


Figure 20: FYP II Timeline

CHAPTER 4
RESULTS AND DISCUSSIONS

This chapter discusses on all of the results collected from most of the phases in the system development process. The result helps to support the evidence towards achieving the objectives together with the discussion. This chapter will describe on several main aspects as mentioned below.

4.1 Data Gathering and Analysis

4.1.1 Result from literature study

The result of findings obtained from literature study, it was found that mobile application has undergone evolving phase where people always need it everywhere and anytime to assist their daily activities. Below are some results that achieved based on the literature study. The main focus here is concerning about mobile application used in several universities world widely. For such, University of Birmingham (UoB),NCSU library and University of Sheffield having mobile application to facilitate their student in daily activities including library system. It has been proven that mobile application gives positive impact towards university community to deliver their daily tasks. Therefore the same ways should be introduced to UTP community.

UTP have small scale of community and until today there is no mobile application system available for the whole campus activities. Hence, as for the starting point, the project is targeting to develop mobile application for library system where the scope narrowed down to personal book loan management only specialized for Android OS platform.

Apart from that, the results from literature review prove that there are varieties of mobile application developer available such as appsinventor, phonegap,gidgetpad.com and so on that can be used throughout the period in developing the system. The development of the system can be achieved by selecting any of suitable developer considering the resources availability and system requirement.

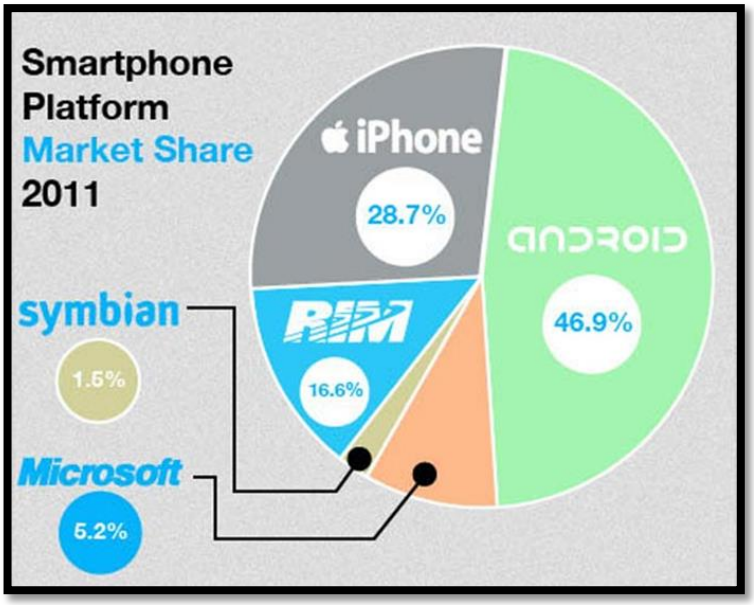


Figure 21: Infrographic of smartphone platform market share 2012 worldwide

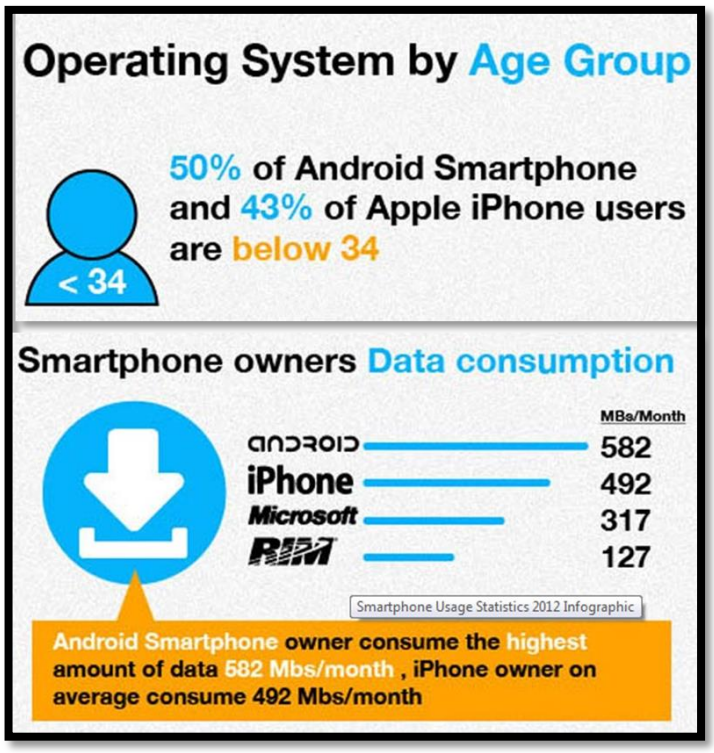


Figure 22: Infographic of smartphone OS by age group and data consumption worldwide

Above pictures depicts the actual scenario which happens in today's world. The number of smartphone user are getting bigger and expanding tremendously

especially for android Operating System. Based on the literature study and previous study of people, it can be concluded that Android operating system leading the market of smartphone due to its effectiveness and conveniences to user. Apparently, there are two most competitive OS that greatly competing in today's market which is iPhone Operating System (iOS) and Android. In this project, the scope is limited to Android platform user only.

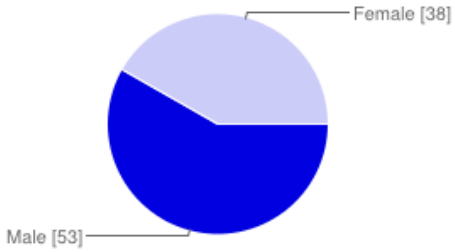
4.1.2 Result from surveys

An online survey has conducted with the main objective to know their demographic info and also to study their preferences towards the new mobile application system will be implemented more specifically to book loan management system. It is believed that this survey helped to understand better about user behaviour and their expectation to the system to be implemented.by identifying their level of exposure with the current system it gave a solid base to predict their readiness to the proposed system.

Part 1: Demographic

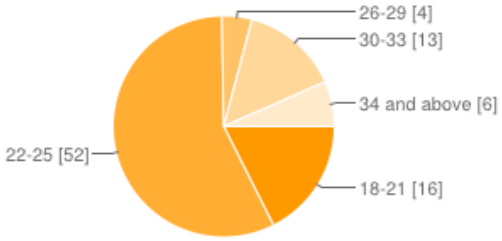
Under Demographic section, data collected about the respondents are the age, gender and type of occupation in UTP. All respondents mostly students and staff whose been always interacting and borrowing book from library (IRC). Full result together with the percentage can be analysed below:

Gender



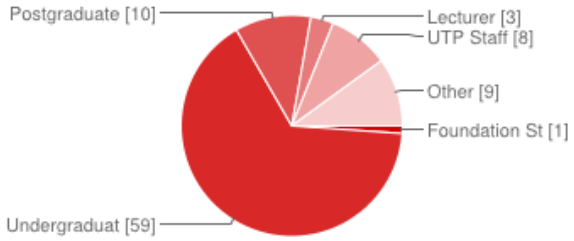
Male	53	58%
Female	38	42%

Age



18-21	16	18%
22-25	52	57%
26-29	4	4%
30-33	13	14%
34 and above	6	7%

Occupation

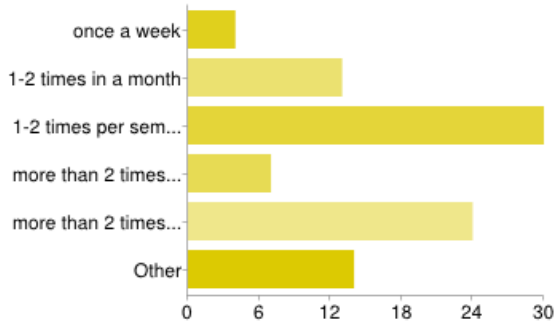


Foundation Student	1	1%
Undergraduate student	59	66%
Postgraduate student	10	11%
Lecturer	3	3%
UTP Staff	8	9%
Other	9	10%

Part 2: Activities and preferences with library system

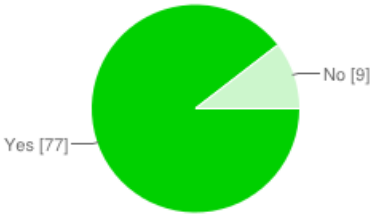
Under this section, author wants to gather the information of the behaviour of respondent including the frequency of their borrowing book in certain period of time and also to know their preferences functions in the mobile application to be implemented. Most of the respondents are smart phone user installed with Android operating system. In overall, 92 number of responded has a full result as follows:

How frequent do you borrow books from the library?



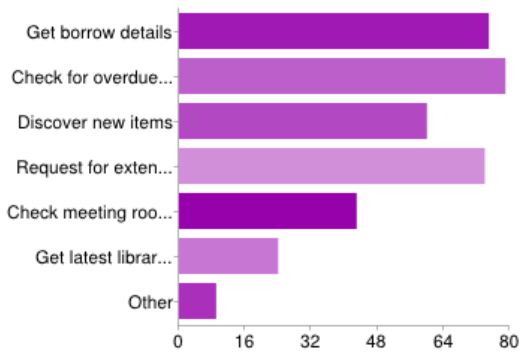
once a week	4	4%
1-2 times in a month	13	14%
1-2 times per semester	30	33%
more than 2 times in a month	7	8%
more than 2 times per semester	24	26%
Other	14	15%

Are you using smartphones?



Yes	77	90%
No	9	10%

What features do you think would be suitable for "pocket library" mobile apps?



Get borrow details	75	21%
Check for overdue charges	79	22%
Discover new items	60	16%
Request for extension of book loan period	74	20%
Check meeting room availability	43	12%
Get latest library news	24	7%
Other	9	2%

This survey helped identifying the behaviour and preferences also other important demographic info of the students for this type of system, which is positive. From their responses it can conclude that pocket library bring huge potential in making patrons and libraries interacting in better ways through mobile application.

4.2 Concept and design

4.2.1 Framework and Flowchart

Figure 23 below illustrates the flowchart of proposed mobile application. Generally, this system has 4 main functionalities which are; due date reminder, new book collection, viewing charged fines and last but not least extension of book loan period. From the main home screen, user can directly go to selected function. The user can

tap on the screen as required in the instruction and can go back to main menu by tap on back button on the phone.

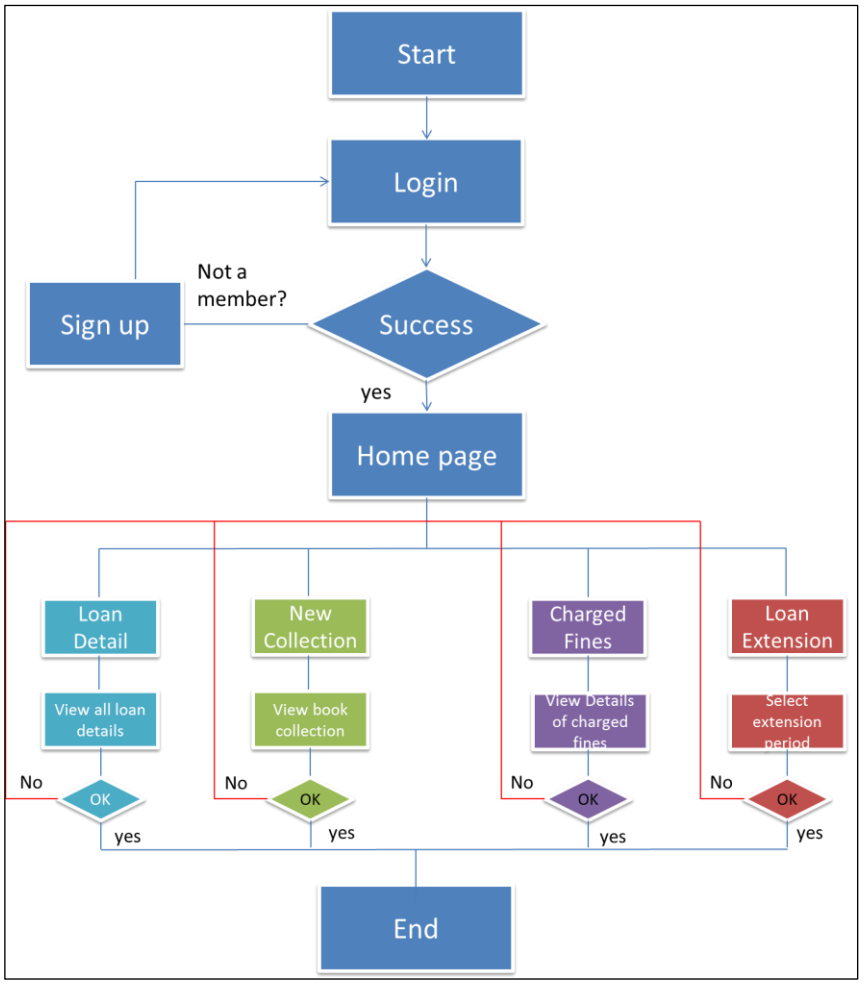
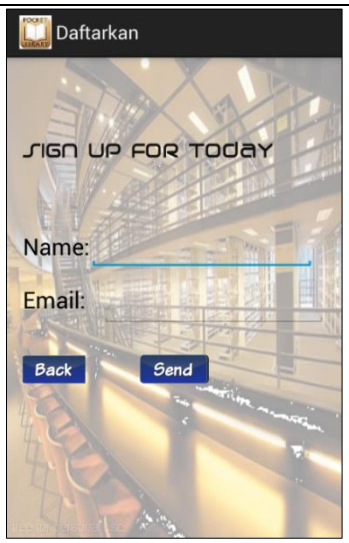
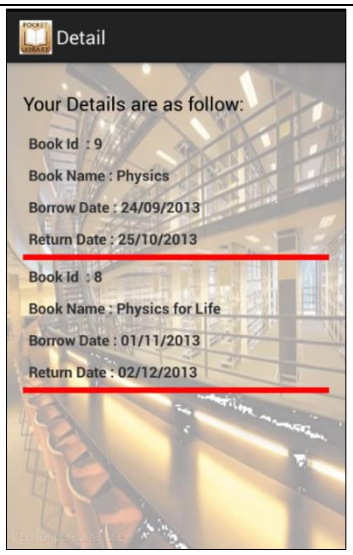
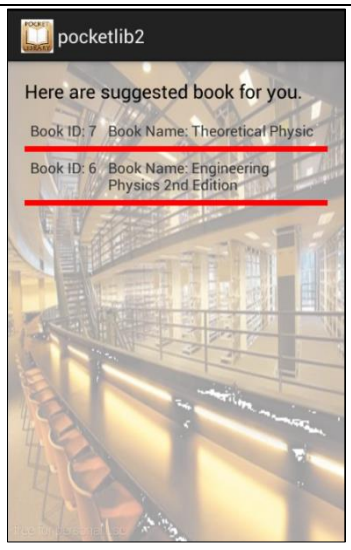


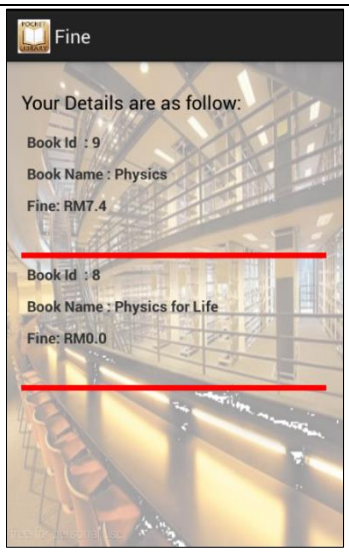
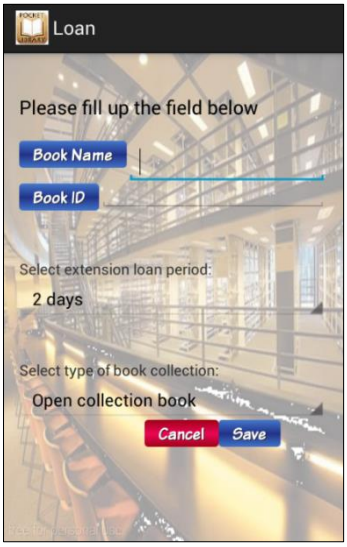
Figure 23: System flowchart

4.3 System Prototype

According to (Prototype, 2013) a prototype can be best describe as an early sample, model or release of a product built to test a concept or process or to act as a thing to be replicated or learned from. It is a term used in a variety of contexts. This first build product is including semantics, design, electronics, and software programming. The prototype model has demonstrated on the poster presentation and evaluated by qualified internal examiner. The following figures in Table 3 illustrate the prototype of the system and the work that has been completed.

Interface	Description
	• Main splash screen • User will get first to this screen for login procedure. • user need to input their ID number and password in specified field • Only student, staff and lecturer of the UTP can access to this section as they are registered user.
	• If the user do not have any account, they can sign up by click on “sign up” button from main screen as above. • They need to input name and email in the specified field as displayed in the figure • To finish the procedure, user need to click on “save” button and the data will send directly to library server • They will notified in the email as for registration • Otherwise, click on “Back” button to cancel the procedure.

	• Once user successfully logged on the application they will directed to homepage • there are 4 option the user can choose ➢ New collection ➢ Loan Details ➢ Charged Fines ➢ Loan Extension
	• Assume that user go to “Loan Details” function • the server will return data as the details of book loan. • the screen will display the name, id, date of borrowing and return date of borrowed book as retrieved from library database.
	• Assume user choose “New Collection” function • the screen will display data available according to user’s previous borrowing/search history as retrieved from library database.

	• Assume user choose "Charged Fines" function • the screen will display data (overdue charges) as retrieved from library database.
	• Assume that user go to Extension book loan functions • user can choose the extension date of returning books ranging from two days, 3 days, 5 days, 1 weeks, 2 weeks, 3 weeks or a month. • to finish the procedure, user need to click "save" and wait for an email confirmation from the administration • otherwise, user can go back to main menu by click on "cancel" button on the phone.

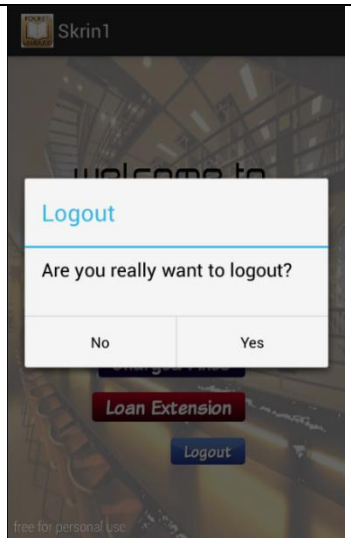
	• Assume user wants to logout from the application. • they can simply click on "logout" button, then the application will prompt the dialogbox ask logout confirmation • user can either click on "yes" and out from application otherwise click "No" to cancel the logout procedure and stay on the application.

Table 3: Snapshot for "pocket library"

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Relevance to the Objective

"Pocket library" mobile application has many benefits to help IRC patrons in UTP for managing and overcome their difficulties regarding their book loan management. There is no doubt that library mobile application is almost needed by every single patron of IRC as it comes in simplest way to use and keep people updated with their book loan information anytime and anywhere.

Furthermore, booming technology nowadays brings a new dimension to the society. With the rise of smart phones and Google's operating system Android, hence technology is influencing more people's life today more than ever before. Taking it for granted, it is a good ways in order to solve the problem for both administration and the patrons of IRC. The mobile apps that channelled via mobile Android application certainly assist people managing book loan as many of us have always forgotten due date of returning book. These are everyday use case scenarios that could be handled now by a mobile application.

In short, there is certainly much enthusiasm and interest in the library community about mobilizing library resources. While the application is in developing state, further research and studies also need to be done to add more attractive elements according the suitability and compatibility.

5.2 Recommendations

Improvements of the system are on-going process where the research study will be continued. As mentioned earlier in this document, the scope of the study defined for this project is relatively small in order to fulfil the time constraints. Nevertheless, some improvement on this project that is seems positively relevant such as:

- Enable user to reserve the books. In case of the book they wanted at that time is in the hand of another user, user should be enabled to reserve books and they would receive a mobile notification (through SMS) or simply can view the book availability in "New collection" area in mobile application once the book has been returned to library.

- In future, the system is potentially to develop with more advanced scanning system with QR code. Therefore the data of borrowed book can directly store in library database once the book scanned with their phones. This is clearly a brilliant idea as it will be eco-friendly system which less paper receipt will be printed.

- Enable user to create virtual self-book shelve. In this part is similar to physical book shelving they are having at home or office but in this system it is converted in virtual presence. User can review the past borrowed book and organize their preffered book title.

- This system would be appropriate associated with SMS notification to alert user on any activities which required a reminder from library. The automatic SMS notification which similar used in bank banks and other systems that require SMS notification.

All in all, From the points presented above, it can be concluded that the implementation of pocket library still have a vast room for improvement, not only on regards to the points that have been mentioned in this document, but also with the advance technology that is daily being implemented, greater things can still be done, to use technology on education systems' improvement.

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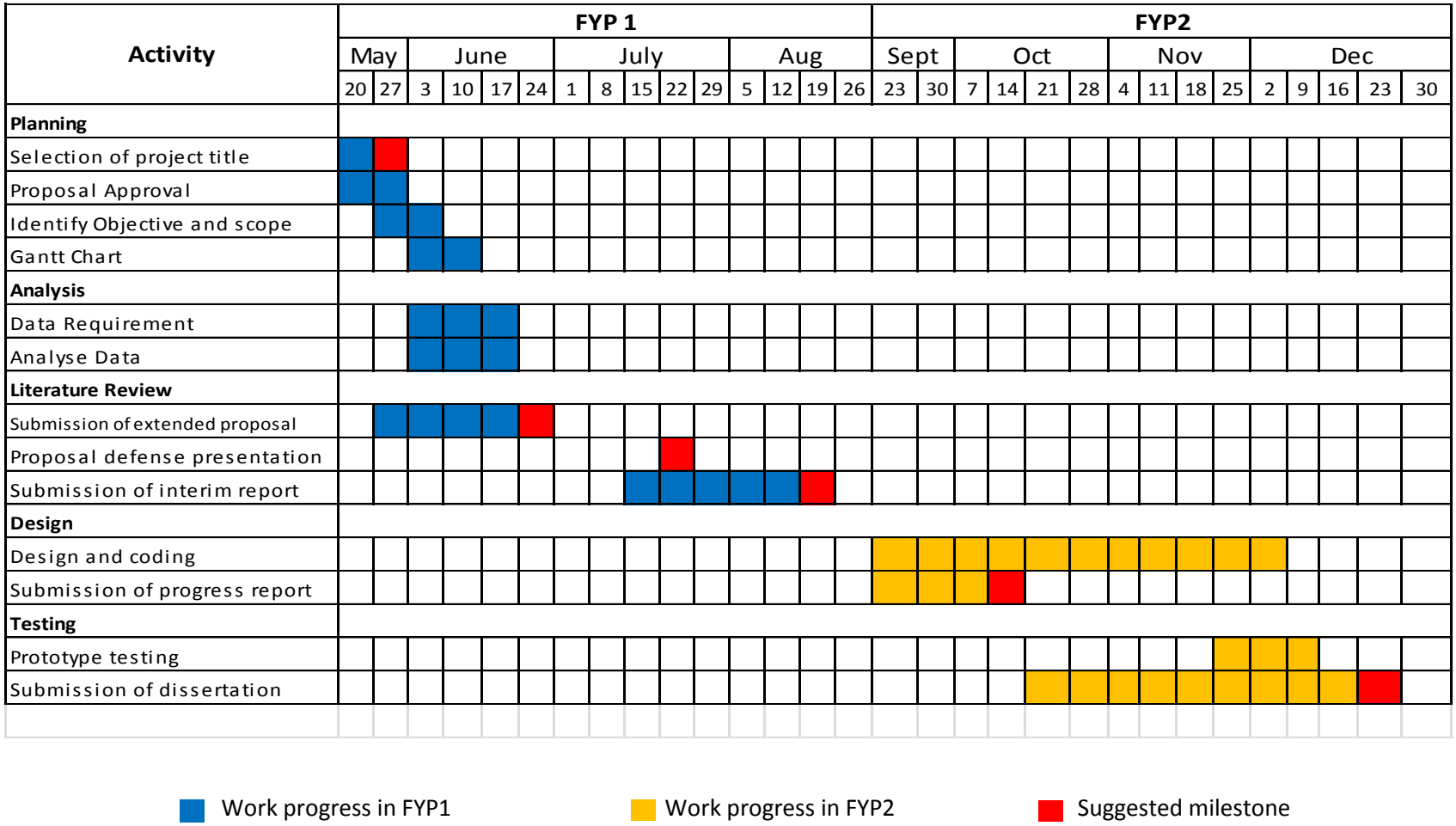
APPENDIX

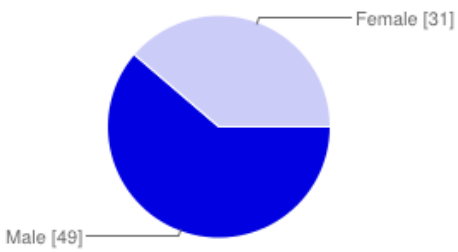
FYP 1 &FYP 2 Gantt chart



Online survey Questions and Results

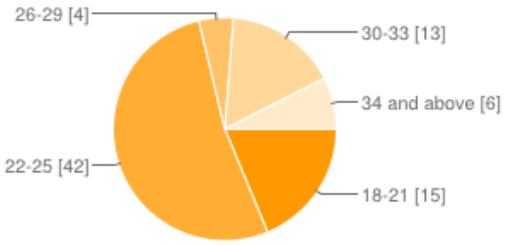
No of respondent: 80

Gender



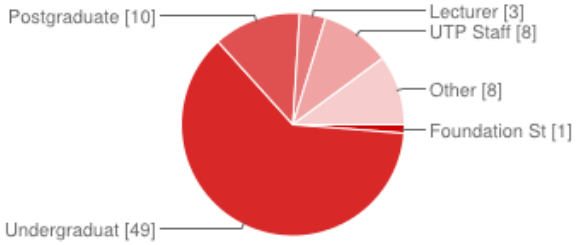
Male	**49**	61%
Female	**31**	39%

Age



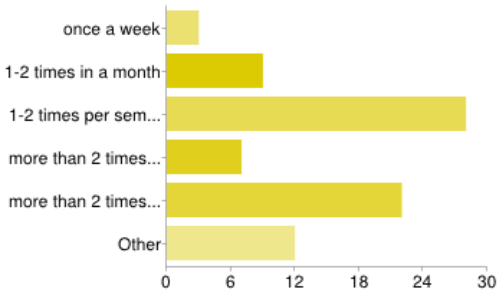
18-21	**15**	19%
22-25	**42**	53%
26-29	**4**	5%
30-33	**13**	16%
34 and above	**6**	8%

Occupation



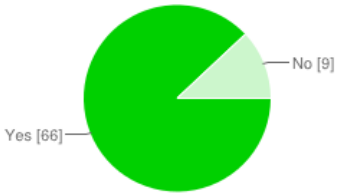
Foundation Student	**1**	1%
Undergraduate student	**49**	62%
Postgraduate student	**10**	13%
Lecturer	**3**	4%
UTP Staff	**8**	10%
Other	**8**	10%

How frequent do you borrow books from the library?



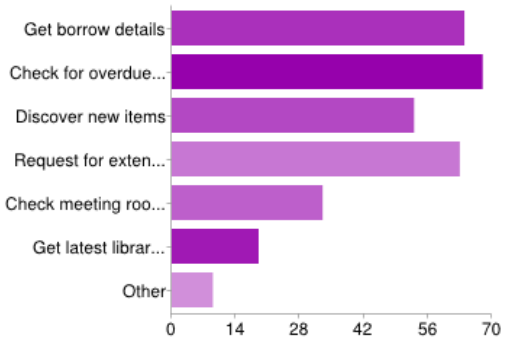
once a week	3	4%
1-2 times in a month	9	11%
1-2 times per semester	28	35%
more than 2 times in a month	7	9%
more than 2 times per semester	22	27%
Other	12	15%

Are you using smartphones?



Yes	66	88%
No	9	12%

What features do you think would be suitable for "pocket library" mobile apps?



Get borrow details	64	21%
Check for overdue charges	68	22%
Discover new items	53	17%
Request for extension of book loan period	63	20%
Check meeting room availability	33	11%
Get latest library news	19	6%
Other	9	3%