

**An Independent Project Report**

**submitted in partial fulfilment**

**of the regulations governing**

**the award of the**

**B.Sc. (Hons) in Computing, Year 3**

**Title: UCSI Mobile Library – Mobile Library Management System**

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#### Authorship Declaration

Except where reference is made in the references, this report contains no material published elsewhere or extracted in whole or in part from a dissertation or report presented by me for another degree or diploma.

No other person’s work has been used without due acknowledgement in the content of the report.

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**Title: UCSI Mobile Library - Mobile Library Management System**

# Abstract

As technology continues to evolve, people are increasingly looking for convenience, which makes their lives easier. Most of the traditional book management systems are based on computer applications. Although they can meet the functions of book management, they have an obvious disadvantage in that they are not portable. It cannot meet the needs of users to search book information in a portable manner. The mobile book management system based on the Android platform can solve this problem.

Therefore, this project will develop a mobile book management system that enables librarians, teachers, and students to operate directly from their mobile phones. On the mobile client, users can register, log in, inquire about books, inquire about borrowing, book reservations, and inquire about personal information. In addition, the system also introduces a shared note function, where teachers and students can share their understanding of books on the platform. The program takes place in the UCSI University Libraries.

# 1.0 Introduction

Mobile technology development originated in communications[1]. The development of technology has changed the way we live and work, such as the emergence of mobile phones. Mobile phones are becoming more and more important in all countries of the world[2]. Mobile phones are becoming more and more popular among young people and it is important to motivate students to learn and use them [3]. Mobile phones are easy to carry, which allows students to use them for efficient reference and research[4]. Almost every college student owns a cell phone connected to the Internet[5]. The number of people who own smartphones and use them to access the Internet has been increasing[6]. There are many applications for storing, receiving, and accessing files.

Mobile technology is the technology used for cellular communications. Generally speaking, mobile technology is any mobile technology, such as laptops, PERSONAL digital assistants, mobile phones, and other areas of technology. Mobile technology devices are a combination of operating systems, networks, hardware, and software[5].

# 2.0 Background

## 2.1 Literature Review

In the earliest days, library management methods relied on manual picking. The borrowing and returning of books are registered by pen and paper, which is very cumbersome and prone to data loss. As a result, the library's books are lost and management is chaotic[7].

From the end of the 19th century to the beginning of the 20th century, the form of libraries in the world changed from a closed to a modern library model[8]. With the rapid development of science and technology, only working on a computer can no longer meet people's needs. Coupled with the rapid development of Android, there are more and more mobile devices, and their frequency of use is also increasing. People can no longer resist the use of mobile devices. The main reason is that mobile devices are very convenient and fast[9]. It saves people time and can be used anytime, anywhere.

However, according to the survey, most traditional library management systems are still only available on computers[10]. This can't satisfy people's desire to use it anytime, anywhere, and it also makes many people who don't have time to go to the library or need to wait a lot of time in line to see their favorite books. Therefore, the library management system developed by Android is an important method to solve the problem.

At present, the 5G era has come into people's lives, and 4G is already ubiquitous in life.

With the rapid development of mobile Internet technology, smart devices are constantly being updated. Wireless Internet is also widely used, and more and more Android-based applications are available. According to data provided by Google, Android has 2.8 billion active users in more than 190 countries around the world, accounting for 75% of the global market share[11].

As early as the 20th century, the idea of an electronic library was put forward[12].  After that, some people also put forward digital libraries and network applications on the library. But over time, these concepts were refined and mobile libraries emerged.

According to the Library Journal, 44 percent of school libraries and 34 percent of public libraries around the world already offer some kind of mobile service to users, while 40 percent of both types of libraries plan to go mobile shortly [13].

To sum up, realizing the direct use of the booking system on the mobile phone is the development trend of library information management. This can not only improve the efficient and safe storage of library information but also allow users to see their reading information at any time, such as book information, reader information, and borrowing information. This can not only improve work efficiency but also reduce people's input and management, to greatly save the use of manpower. The mobile library can also make the operation of users more convenient, convenient, improve efficiency and save a lot of time, to a great extent to meet the needs of users.

## 2.2 Discussion & Comparison

**Existing mobile library management system**

There are many mobile library management systems. This section will compare and discuss those existing mobile library management systems with the applications that will be implemented in this project.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S.NO | Title of the Paper ( System ) | PROS | CONS | Remakes |
| 1 | Developing a QR Code-based Library Management System with Case Study of Private School in Surakarta City Indonesia. | It reduces the lengthy borrowing process, membership, and collection checks[14]. | It needs good camera quality to protect from scratches. | Scanning each QR code is difficult when there are a large number of users present. |
| 2 | The university library management system is based on radio frequency identification. | Based on RFID technology, this system studies the label conversion subsystem and the self-service borrowing subsystem[15]. | Authentication and authorization required | It's more of a QR code system, but not for more users. |
| 3 | Design and realization of network-oriented library management system(LMS). | It is a network LMS that works on the company's private network[16]. | It can only be operated from a computer. | When the system is out of power, the library cannot be used. |
| 4 | Designing Android User Interface for University Mobile Library. | Users can perform actions anywhere[17]. | Only users can do it anywhere, while librarians need to do it on a computer. | Need to allow administrators to manage the application as well. |
| 5 | The Building of Library Management System Based on Hibernate Model. | Using Flex as the presentation layer, hibernate as the persistence layer, combined with Spring as the business layer, an efficient library management system is realized[18]. | Only suitable for web applications. | The cross-platform compatible framework is recommended |
| 6 | VESIT Library -An android based application. | Android app with SQL database server that helps students view all library collections[19]. | When the library is down, the application server is unavailable. | It needs to be implemented to run anytime and anywhere. |

Table 1: Comparison of existing mobile library systems

UCSI Mobile Library System is a System developed based on the Android platform. It not only allows users to operate at any time, anywhere but also allows administrators to operate at any time, anywhere. Login and registration are convenient, they can not only reduce people's dependence on computers but also save people time. Users don't have to go to the library to make inquiries and book reservations. The system also has a shared note-taking function, where users can share their ideas about books and exchange ideas with each other.

## 2.3 Problem Statement

**Problem 1:** **Few libraries use mobile management systems. It is the first choice for libraries in Malaysia to use a computer-based management system.**

Most Malaysian libraries do not use mobile management systems, they are more used to using computer-based management systems[20]. Because the computer-based management system has a long history, people are more familiar with its operation and skills. Faced with a new mobile library management system, they feel strange and dare not try it easily. The disadvantages of the computer-based library management system are also very obvious, it can only operate on the computer, and the operation is more complicated. This can be a huge waste of users' time and energy.

However, according to Gartner data, global smartphone sales are still on the rise, and Android market share has surpassed IOS to become the largest smartphone system in the world[21]. And Android is rapidly gaining market share. Android phones have become the trend for modern people to choose and use. People also began to think about how to realize mobile phone reading, so that people are no longer limited by the specified time and place, can enter the library management system through different mobile devices at any time, to realize the operation of reading books[22]. This way will be more convenient and fast, can save us a lot of energy.

**Problem 2:** **Few mobile library management systems provide users with book-related book review plans.**

One of the incentives to encourage users to return to the mobile library management system is to provide a book review program service. According to the library systems shown in Table 1, these systems do not provide book review services to users. Research shows that book reviews have a positive effect on sales and that the effect is significantly greater for positive reviews than for negative ones[23]. So we want to develop a book review planning service so that all users can participate and enjoy it. A good book review can be an eye-opener. Let the system and users form positive feedback.

## 2.4 Aim

The project will implement an Android-based application to allow users to borrow books directly.

This project aims to design and develop a mobile library management system based on Android, which can be used to view and borrow books in real-time and update all kinds of relevant data. In addition, the system through book review service to enhance the system and user intimacy, enhance user engagement.

## 2.5 Objectives

Objective 1: To study the existing library management system.

Objective 2: To identify the strengths and weaknesses of current mobile book management systems.

Objective 3: To design a mobile library management system to replace the computer-based library management system.

Objective 4: To develop a clear, easy-to-use system for users.

Objective 5: To evaluate the performance of book reviews within a mobile library management system.

## 2.6 Justification

The project aims to improve library management in Malaysia. Through the Android-based mobile devices to establish the connection between users and library management system, but also to establish the connection between users and users.

In the mobile library management system based on the Android platform, the administrator can operate directly on the mobile device, so that the administrator can be faster, more convenient, and easier to maintain and manage operations on the mobile device. At the same time, users are not limited to going to the library to consult, reserve, query books, and other materials, so simple and more humanized interface design and the scalability of the mobile library management system will allow users to have a better experience.

In addition, there is a book review design, which will enhance the user's sense of experience, and the positive effect of a book review is stronger[23]. Solving the existing library queuing problem is the biggest reason that attracts me to this topic. By introducing this system, we believe it will bring convenience and a good experience for users and librarians.

## 2.7 Scope

**The Target Users**

* UCSI students and faculty: Faculty and students are the primary target audience. They will borrow books, search books, and so on.
* Librarians: Librarians are also targeted users. They need to manage and maintain the system.

**The Features and Functions**

* Login and registration: Before entering the system, you need to log in and connect to the network. You need to register the user information before using the account and password to log in to the system for the first time.

**Client:**

* Search for books: users can search for the information of books in the library and their lending information.
* Book reservation: you can reserve books that have been borrowed for the next borrowing.
* Report lost books: if the borrowed books are lost, you can report lost books and register them.

**Administrator :**

* User management: Administrators can add and modify user information.
* Query Books: Administrators can query the number of existing books and borrowed books.
* Book Management: Administrators can update information on books in the library.
* Book reservation management: The administrator can modify the book information reserved.
* Return and report lost books: The administrator can update and manage data on the return of books borrowed by users and the reported loss of books.

**Specific Technical Requirements**

This is a mobile library management system based on Android.

# 3.0 Approach and Deliverables

## 3.1 Data Collection

In order to collect data and obtain project requirements, quantitative method will be used in this study. Quantitative research is the process of collecting and analyzing numerical data. It can be used to find patterns and averages, make predictions, test causal relationships, and generalize results to wider populations[24]. Quantitative research is widely used in the natural and social sciences. The study will randomly select 120 respondents from UCSI University to obtain system requirements and customer preferences.

## 3.2 Software Development Life Cycle (SDLC) Methodology

This study will use the Software Development Life Cycle (SDLC) Methodology. Software Development Life Cycle (SDLC) is the process of producing the highest production quality software in the shortest possible time and at the lowest cost[25]. SDLC has a well-structured phase process that helps developers quickly produce high-quality software that is properly tested and ready for use. The process of building a system usually follows a standard process, and every project that follows a standard process will increase the likelihood of success. The study completes the project through the stages of analysis, planning, design, development, testing, and deployment. During the life cycle, the project first comes up with ideas, then generates a solution called the design phase, selects the best solution to build the project, and finally tests and deploys the project[26].

图示

描述已自动生成

Figure 1: SDLC model

Properly completed SDLC enables the highest level of administrative control and documentation. This is why SDLC was chosen. Agile Methodologies, another research method, requires several different roles to work in the project. For example, Agile Methodologies one of Scrum needs at least three leadership roles, which are Product Owner, Development Team, and Scrum Master[27]. Furthermore, traditional SDLCs are predictive SDLCs. Its requirements are well-defined and the technical risk is low. Based on the above advantages and features, it was decided to use SDLC in this development.

### 3.2.1 Requirement Analysis

This phase emphasizes what the system needs. The product of this phase is the SRS (Software Requirements Specification). This is a document that describes what the project does and how it is implemented[28]. The SRS must include the purpose of the system, a brief description and specific requirements identified.

### 3.2.2 Planning

During the life cycle, the idea and purpose of developing the system need to be determined. This phase is designed to determine the new scope of the system, develop a timeline (Gantt chart) and resource plan for the project.

### 3.2.3 Design

This phase aims to develop the project structure and plan based on the needs found in the previous phase. The product of this stage is the SDD (Software Design Document). SDD is different from SRS of previous state. SRS describes what the system function is to do, while SDD describes how the system function is implemented[29]. Additionally, the design phase includes identifying the languages and packages used to develop the system.

### 3.2.4 Development

The development phase is the coding phase which translates the design project plan into a real application and can be used at the production level.

### 3.2.5 Testing

Every completed program code requires the testing method to avoid any bugs in the application. The test that is used is called UAT (User Acceptance Testing). This test is performed by the client to identify the goals of the project, whether it is matched with the requirement[30].

### 3.2.6 Deployment

At this stage, the goal is to deploy the software to production so users can start using the product. However, many organizations choose to move products through different deployment environments, such as test or staging environments. This allows any stakeholder to use the product safely before placing it on the market. Additionally, this allows any eventual bugs to be caught before the product is released.

## 3.3 UML Diagram

UML stands for Unified Modeling Language. It is a rich language for modeling software solutions, application structures, system behavior, and business processes. It has two main categories; Structure Diagrams and Behavioral Diagrams. The detailed categories are as follows.

图示

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Figure 2: Classification of UML diagrams

### 3.3.1 Use Case Diagram

A use case diagram is the primary form of system/software requirements for an undeveloped new software program. A use case specifies the expected behavior (what). Once a use case is specified, it can be represented with a textual and visual representation (i.e. a use case diagram). A key concept of use case modeling is that it helps us design systems from the end user's perspective. It is an efficient technique for communicating system behavior in the user's way by specifying all externally visible system behaviors.

图示

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Figure 3: Use Case Diagram

This use case diagram relates to three actors (teacher, student, and administrator). Students and teachers can visit the library page to book books, borrow books, check books and report lost books. From the administrator's point of view, the administrator can add or delete book information, manage reservation information, and manage user information.

In addition, they can leave a book review on the book and share their feelings after reading.

### 3.3.2 Activity Diagram

An activity diagram is a behavioral diagram, i.e. it describes the behavior of the system. An activity diagram depicts the flow of control from a starting point to an ending point, showing the various decision paths that exist in the execution of an activity. Activity diagram is the key and foundation of UML software development flowchart. Project planners use this activity to describe system operating procedures one by one to make the implementation design phase clearer and easier.

The following diagram illustrates an activity diagram in a project.

图示

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Figure 4: User Activity Diagram (Borrow Book)

图示

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Figure 5: Administrator Activity Diagram

### 3.3.3 Sequence Diagram

A sequence diagram shows the interaction of objects in chronological order in the field of software engineering. It describes the objects involved in the scene and the sequence of messages exchanged between the objects needed to perform the function of the scene.

The following figure illustrates the sequence diagram in the project.

箱线图

中度可信度描述已自动生成

Figure 6: Borrow Book

图示

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Figure 7: Admin Panel

## 3.4 Work Breakdown Structure (WBS)

图示

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Figure 8: Work Breakdown Structure Diagram

1. WBS for Project Implementation
   1. Requirement Specification
      1. Determine business Needs
      2. Define Title, scope, Objectives
   2. Product Design
      1. Construct Use Case, Activity Diagram
      2. Construct Gantt Chart, WBS diagram
      3. Define Project Constraint, Major Risk and Assumptions
   3. Product Implementation
      1. Identify the User Interface
      2. Define System Flow
   4. Testing
      1. Test the System Flow
      2. Bugs Finding

## 3.5 Gantt Chart == Major MileStone

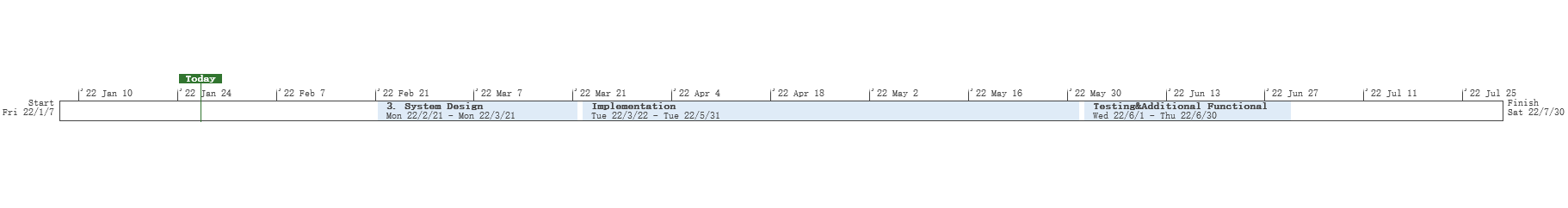
****

Figure 9: Project TimeLine.

**图形用户界面

中度可信度描述已自动生成**

Figure 10: Project Gantt Chart

## 3.6 Constraints and Assumptions

The project will not be developed on any high spec physical servers. This project will only use a normal PC as the base server for the application. The project requires each user to have a smartphone for things like borrowing books. The user account password of this project is not encrypted using any complicated algorithm. In addition, the project requires no additional implementation costs.

Assumption of this project:

* It is assumed that all users have smartphones to access the network.
* All users are assumed to have basic knowledge of using a smartphone.

# 4.0 Resources

## 4.1 Hardware

**Computer:** This project requires a fully functional computer as it requires prototyping and documentation of the proposed mobile application.

* **Model: MSI GP76（17.3-inch，2021）**
* **Processor: 2.3GHz 8-core Intel Core i7 processor**
* **OS: Windows10**
* **Memory: 16 GB 3200 MHz DDR4**
* **Graphics: NVIDIA GeForce RTX 3070**

## 4.2 Software

* **Microsoft Word**
  + Microsoft Word is used to write the project report and research findings.
* **Microsoft Project**
  + Microsoft Project is used to generate the Gantt chart diagram and project plan
* **Google Browser**
  + Browser is used to search for relevant journal research
* **Visual Paradigm Online**
  + A tool to construct UML diagram, ERD diagram, etc.
* **MySQL**
  + MySQL is a database used to store user and administrator details.
* **Visual Studio Code**
  + Visual Studio Code is used for implementing the system

# 5.0 External Bodies Involved

When the performance development of the mobile Library project is relatively complete, it will work with UCSI University Libraries.

# 6.0 Project Plan

|  |  |  |  |
| --- | --- | --- | --- |
| Task Name | Duration | Start | Finish |
| **UCSI Mobile Library - Mobile Library Management System** | **147 Days** | **Fri 22/1/7** | **Sat 22/7/30** |
| **Design & Analysis** | **25 Days** | **Fri 22/1/7** | **Thu 22/2/10** |
| 1. Project Planning | 2 Days | Fri 22/1/7 | Sun 22/1/9 |
| 1.1 Finding Reference | 9 Days | Sun 22/1/9 | Wed 22/1/19 |
| 1.2 Project Title | 2 Days | Mon 22/1/10 | Tue 22/1/11 |
| 1.3 Scope | 4 Days | Tue 22/1/18 | Fri 22/1/21 |
| 1.4 Problem Statement, Objective, Aims | 5 Days | Sat 22/1/22 | Thu 22/1/27 |
| 1.5 Justification | 3 Days | Thu 22/1/27 | Sat 22/1/29 |
| **2. Method** | **10 Days** | **Sat 22/1/15** | **Thu 22/1/27** |
| 2.1 Use Case Diagram | 2 Days | Mon 22/1/17 | Tue 22/1/18 |
| 2.2 Construct Work Breakdown Structure | 2 Days | Thu 22/1/27 | Fri 22/1/28 |
| 2.3 Create Gantt Chart and Project Plan, Resources | 2 Days | Sun 22/1/30 | Mon 22/1/31 |
| 2.4 Define Constraints, Assumptions, Major Risk | 4 Days | Tue 22/2/1 | Fri 22/2/4 |
| **3. System Design** | **21 Days** | **Mon 22/2/21** | **Mon 22/3/21** |
| 3.1 Design Requirement gathering | 10 Days | Tue 22/2/22 | Sat 22/3/5 |
| 3.2 Define Clear System Flow | 9 Days | Sat 22/3/5 | Wed 22/3/16 |
| 3.3 Interface Design | 4 Days | Wed 22/3/16 | Sat 22/3/19 |
| **Implementation** | **51 Days** | **Tue 22/3/22** | **Tue 22/5/31** |
| **Testing & Additional Functional Features** | **22 Days** | **Wed 22/6/1** | **Thu 22/6/30** |
| **Deployment and Bugs Finding** | **21 Days** | **Fri 22/7/1** | **Fri 22/7/29** |

Figure11 : Project Plan

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