

**SCM-NAV: AN INDOOR NAVIGATION MOBILE APP FOR SHOPPING  
MALL**



**AMIRAH MARDHIAH BINTI MUHAMMAD KAMAL**

اونيورسيتي تيكنيكل مليسيا ملاك

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

## BORANG PENGESAHAN STATUS LAPORAN

JUDUL: SCM-NAV: AN INDOOR NAVIGATION MOBILE APP FOR SHOPPING MALL

SESI PENGAJIAN: 2020 / 2021

Saya: AMIRAH MARDHIAH BINTI MUHAMMAD KAMAL

mengaku membenarkan tesis Projek Sarjana Muda ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka dengan syarat-syarat kegunaan seperti berikut:

1. Tesis dan projek adalah hakmilik Universiti Teknikal Malaysia Melaka.
2. Perpustakaan Fakulti Teknologi Maklumat dan Komunikasi dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan Fakulti Teknologi Maklumat dan Komunikasi dibenarkan membuat salinan tesis ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. \* Sila tandakan (✓)

SULIT

(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)

TERHAD

(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi / badan di mana penyelidikan dijalankan)

TIDAK TERHAD

*amirah*

(TANDATANGAN PELAJAR)

Alamat tetap: No.54 Jalan Mahang 4,  
Taman Meru Utama, 41050 Meru Klang  
Selangor Darul Ehsan

Tarikh: 12/9/2021

*Ts. H. J. Muhammad Suhaizan Sulong*

Ts. H. J. MUHAMMAD SUHAIZAN SULONG

Penyelia

(TANDATANGAN PENYELIA)

Ts. Muhammad Suhaizan Sulong  
Nama Penyelia

Tarikh: 12/09/2021

CATATAN: \* Jika tesis ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa.

SCM-NAV: AN INDOOR NAVIGATION MOBILE APP FOR SHOPPING MALL

AMIRAH MARDHIAH BINTI MUHAMMAD KAMAL



This report is submitted in partial fulfillment of the requirements for the Bachelor of Computer Science (Software Development) with Honours.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY  
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021

## DECLARATION

I hereby declare that this project report entitled  
**SCM-NAV: AN INDOOR NAVIGATION MOBILE APP FOR SHOPPING MALL**  
 is written by me and is my own effort and that no part has been plagiarized  
 without citations.

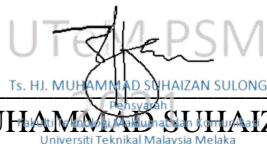
STUDENT : amirah Date : 12/9/2021

(AMIRAH MARDHIAH BINTI  
 MUHAMMAD KAMAL)



I hereby declare that I have read this project report and found  
 this project report is sufficient in term of the scope and quality for the award of  
 Bachelor of [Computer Science (Software Development)] with Honours.

SUPERVISOR : Ts. HJ. MUHAMMAD SUHAIZAN SULONG Date : 12/09/2021  
 (TS. MUHAMMAD SUHAIZAN SULONG)



## ACKNOWLEDGEMENTS

I would like to thank my supervisor Ts. Muhammad Suhaizan Sulong for giving me assistant and guide tremendously to complete this project successfully.

I would also like to thank my beloved parents who have been giving me a great moral support and motivation throughout this project.

I would like to thank my friends Nur Afiqah Farina and Ahmad Raidi for encourage me so well to finish this project.



## ABSTRACT

Shopping mall is a place for people to shop for their desired items. To save time, the shopping mall provides sign boards or information boards located at a particular spot in the mall for shoppers to plan their route inside the mall. However, not all floors in the mall have these sign or information boards which makes shoppers difficult to navigate to their desired or favorite shops and it is time consuming. Thus, to ease the shoppers, a mobile app is developed under the project: SCM-Nav: An Indoor Navigation Mobile App for Shopping Mall in which the Setia City Mall is taken as an industrial case. With this indoor navigation system, it can save shoppers time walking around to locate their desired shop or any services provided at the mall such as musollah, ATM machines, toilets, etc. One of the important features that this mobile app provides is able to show an exact route from the point of the shopper's current location to the desired shop or services. By using this app, shoppers are able to navigate inside the shopping mall with ease in short time.

## ABSTRAK

Pusat membeli-belah adalah tempat orang membeli barang-barang yang diinginkan. Untuk menjimatkan masa, pusat membeli-belah menyediakan papan tanda atau papan maklumat yang terletak di tempat tertentu di pusat membeli-belah untuk pembeli merancang laluan mereka di dalam pusat membeli-belah. Walau bagaimanapun, tidak semua tingkat di pusat membeli-belah mempunyai papan tanda atau maklumat ini yang membuat pembeli sukar untuk menavigasi ke kedai yang mereka inginkan atau kegemaran dan memakan masa. Oleh itu, untuk memudahkan pembeli, aplikasi mudah alih dikembangkan di bawah projek: SCM-Nav: Aplikasi Mudah Alih Dalam Ruangan untuk Pusat Membeli-belah di mana Setia City Mall diambil sebagai kes industri. Dengan sistem navigasi dalaman ini, dapat menjimatkan masa pembeli berjalan-jalan untuk mencari kedai yang diinginkan atau perkhidmatan yang disediakan di pusat membeli-belah seperti musollah, mesin ATM, tandas, dan lain-lain. Salah satu ciri penting yang disediakan aplikasi mudah alih ini adalah dapat ditunjukkan laluan tepat dari titik lokasi semasa pembeli ke kedai atau perkhidmatan yang diinginkan. Dengan menggunakan aplikasi ini, pembeli dapat menavigasi di dalam pusat membeli-belah dengan mudah dalam masa yang singkat.

## TABLE OF CONTENTS

	<b>PAGE</b>
<b>DECLARATION.....</b>	<b>II</b>
<b>ACKNOWLEDGEMENTS.....</b>	<b>III</b>
<b>ABSTRACT .....</b>	<b>IV</b>
<b>ABSTRAK .....</b>	<b>V</b>
<b>TABLE OF CONTENTS.....</b>	<b>VI</b>
<b>LIST OF TABLES .....</b>	<b>XI</b>
<b>LIST OF FIGURES .....</b>	<b>XIII</b>
<b>CHAPTER 1: INTRODUCTION.....</b>	<b>1</b>
1.1 Introduction.....	1
1.2 Problem Statement.....	2
1.3 Objective.....	3
1.4 Scope.....	3
1.4.1 Module to be developed.....	3
1.4.2 Target User .....	4
1.5 Project Significance .....	5
1.6 Expected Output.....	5
1.7 Conclusion .....	5
<b>CHAPTER 2: LITERATURE REVIEW AND PROJECT METHODOLOGY . 6</b>	
2.1 Introduction.....	6



2.2	Facts and Findings .....	6
2.2.1	Domain .....	6
2.2.2	Existing System .....	7
2.2.2.1	YOHO Map .....	8
2.2.2.2	Sarath City Capital Mall App .....	9
2.2.2.3	InMapz .....	10
2.2.2.4	Comparison Between System .....	11
2.2.3	Technique .....	12
2.3	Project Methodology .....	12
2.4	Project Requirements .....	14
2.4.1	Software Requirement .....	14
2.4.2	Hardware Requirement .....	15
2.5	Project Schedule and Milestone .....	15
2.6	Conclusion .....	17
<b>CHAPTER 3: ANALYSIS</b> .....		<b>18</b>
3.1	Introduction .....	18
3.2	Problem Analysis .....	18
3.3	Requirement Analysis .....	19
3.3.1	Data Requirement .....	19
3.3.2	Functional Requirement .....	20
3.3.3	Non-functional Requirement .....	24
3.3.4	Others Requirement .....	25
3.4	Conclusion .....	26
<b>CHAPTER 4: DESIGN</b> .....		<b>27</b>

4.1	Introduction.....	27
4.2	High-Level Design.....	27
4.2.1	System Architecture.....	27
4.2.2	User Interface Design .....	28
4.2.2.1	Shopping Mall User Interface.....	28
4.2.2.2	Shop Owner User Interface .....	33
4.2.2.3	Administrator User Interface .....	35
4.2.3	Database Design .....	41
4.2.3.1	Conceptual and Logical Database Design.....	42
4.3	Detailed Design.....	44
4.3.1	Software Design.....	44
4.3.1.1	Activity Diagram.....	44
4.3.2	Physical Database Design.....	48
4.3.2.1	Physical Entity Relationship Diagram.....	48
4.3.2.2	Data Definition Language.....	49
4.4	Conclusion .....	50
<b>CHAPTER 5: IMPLEMENTATION.....</b>		<b>51</b>
5.1	Introduction.....	51
5.2	Software Development Environment Setup.....	51
5.3	Software Configuration Setup.....	51
5.3.1	Android Studio.....	51
5.3.2	Firebase Database .....	51
5.3.3	Version Control Procedure .....	51

5.4	Implementation Status .....	52
5.4.1	Authentication Module .....	52
5.4.2	Shopping Mall Directory Module.....	52
5.4.3	Promotion and Event Module.....	53
5.4.4	Indoor Navigation Module .....	54
5.4.5	Map Module.....	55
5.4.6	Feedback Module.....	57
5.5	Conclusion .....	57
<b>CHAPTER 6: TESTING .....</b>		<b>58</b>
6.1	Introduction.....	58
6.2	Test Plan.....	58
6.2.1	Test Organization.....	58
6.2.2	Test Environment.....	58
6.2.3	Test Schedule.....	59
6.3	Test Design.....	60
6.3.1	Test Description.....	60
6.3.2	Unit Testing and Testing Documentation.....	60
6.3.2.1	Pathway of Navigation .....	60
6.3.2.2	Store Directory List .....	62
6.3.2.3	Promotion and Event .....	63
6.3.2.4	Give Feedback .....	64
6.3.2.5	Shop Owner Login.....	65
6.3.2.6	Add Store Promotion .....	66
6.3.2.7	Administrator Login .....	67

6.3.2.8	Update Store Details .....	68
6.3.2.9	Add New Store .....	69
6.3.2.10	Approve Store Promotion .....	70
6.3.2.11	Decline Store Promotion and Event .....	71
6.3.2.12	Map .....	72
6.3.2.13	Delete Store .....	73
6.3.2.14	Dashboard Report .....	74
6.4	Test Data .....	75
6.4.1	Shop Owner Login .....	75
6.4.2	Administrator Login .....	75
6.5	Test Result and Analysis .....	76
6.6	Conclusion .....	80
<b>CHAPTER 7: PROJECT CONCLUSION .....</b>		<b>81</b>
7.1	Introduction .....	81
7.2	Observation on Weaknesses and Strengths .....	81
7.3	Project Contribution .....	81
7.4	Propositions for Improvement .....	81
7.5	Conclusion .....	82
<b>REFERENCES .....</b>		<b>83</b>

## LIST OF TABLES

	PAGE
<b>Table 1.1: Summary of Problem Statement .....</b>	<b>2</b>
<b>Table 1.2: Summary of Project Objectives .....</b>	<b>3</b>
<b>Table 2.1 Comparison between existing applications .....</b>	<b>11</b>
<b>Table 2.2 Software Requirement .....</b>	<b>14</b>
<b>Table 2.3 Hardware Requirement .....</b>	<b>15</b>
<b>Table 2.4 Gantt Chart.....</b>	<b>16</b>
<b>Table 3.1 Admin .....</b>	<b>19</b>
<b>Table 3.2 Store List .....</b>	<b>19</b>
<b>Table 3.3 Promotion and Event .....</b>	<b>20</b>
<b>Table 3.4 Category List .....</b>	<b>20</b>
<b>Table 3.5 Map .....</b>	<b>20</b>
<b>Table 3.6 Functional Requirement .....</b>	<b>21</b>
<b>Table 3.7 Non-Functional Requirement.....</b>	<b>24</b>
<b>Table 3.8 Software Requirement .....</b>	<b>25</b>
<b>Table 3.9 Hardware Requirement .....</b>	<b>26</b>
<b>Table 4.1 Admin Database .....</b>	<b>49</b>
<b>Table 4.2 Store List Database .....</b>	<b>49</b>
<b>Table 4.3 Promotion and Event .....</b>	<b>49</b>
<b>Table 4.4 Category List .....</b>	<b>50</b>
<b>Table 4.5 Map .....</b>	<b>50</b>
<b>Table 6.1 Test Schedule .....</b>	<b>59</b>
<b>Table 6.2 Pathway of Navigation .....</b>	<b>61</b>
<b>Table 6.3 Store Directory List.....</b>	<b>62</b>
<b>Table 6.4 Promotion and Event section .....</b>	<b>63</b>

<b>Table 6.5 Give Feedback .....</b>	<b>64</b>
<b>Table 6.6 Shop Owner Login .....</b>	<b>65</b>
<b>Table 6.7 Add Store Promotion .....</b>	<b>66</b>
<b>Table 6.8 Administrator Login .....</b>	<b>67</b>
<b>Table 6.9 Edit Store Details.....</b>	<b>68</b>
<b>Table 6.10 Add New Store .....</b>	<b>69</b>
<b>Table 6.11 Approve Store Promotion.....</b>	<b>70</b>
<b>Table 6.12 Decline Store Promotion and Event.....</b>	<b>71</b>
<b>Table 6.13 Map.....</b>	<b>72</b>
<b>Table 6.14 Delete Store .....</b>	<b>73</b>
<b>Table 6.15 Dashboard Report .....</b>	<b>74</b>



## LIST OF FIGURES

	<b>PAGE</b>
<b>Figure 2.1 YOHO Map .....</b>	<b>8</b>
<b>Figure 2.2 Sarath City Capital Mall App .....</b>	<b>9</b>
<b>Figure 2.3 InMapz.....</b>	<b>10</b>
<b>Figure 2.4 Agile.....</b>	<b>12</b>
<b>Figure 4.1 System Architecture .....</b>	<b>27</b>
<b>Figure 4.2 Homepage View.....</b>	<b>28</b>
<b>Figure 4.3 Navigation Features for Shopper .....</b>	<b>29</b>
<b>Figure 4.4 Store Directory Interface .....</b>	<b>30</b>
<b>Figure 4.5 Map Interface.....</b>	<b>31</b>
<b>Figure 4.6 Interface of Promotion and Event.....</b>	<b>32</b>
<b>Figure 4.7: Login Interface for Shop Owner .....</b>	<b>33</b>
<b>Figure 4.8: Interface of Submit Promotion and Event .....</b>	<b>34</b>
<b>Figure 4.9 Login Interface for Administrator .....</b>	<b>35</b>
<b>Figure 4.10 Interface of Update Store Details .....</b>	<b>36</b>
<b>Figure 4.11 Verify List Interface .....</b>	<b>37</b>
<b>Figure 4.12 Add New Store Interface.....</b>	<b>38</b>
<b>Figure 4.13 Delete Store Interface .....</b>	<b>39</b>
<b>Figure 4.14 Dashboard Report Interface.....</b>	<b>40</b>
<b>Figure 4.15 Firebase Main Page Database Design .....</b>	<b>41</b>
<b>Figure 4.16 Firebase Picture Storage .....</b>	<b>42</b>
<b>Figure 4.17 Conceptual ERD .....</b>	<b>42</b>
<b>Figure 4.18 Logical ERD .....</b>	<b>43</b>
<b>Figure 4.19 Activity Diagram for Shopper .....</b>	<b>45</b>
<b>Figure 4.20 Activity Diagram for Shop Owner .....</b>	<b>46</b>
<b>Figure 4.21 Activity Diagram for Administrator .....</b>	<b>47</b>
<b>Figure 4.22 Physical Entity Relationship Diagram.....</b>	<b>48</b>

<b>Figure 5.1 Authentication Module.....</b>	<b>52</b>
<b>Figure 5.2 Shopping Mall Directory Module.....</b>	<b>53</b>
<b>Figure 5.3 Promotion and Event Module.....</b>	<b>54</b>
<b>Figure 5.4 Indoor Navigation Module.....</b>	<b>54</b>
<b>Figure 5.5 Map Module .....</b>	<b>56</b>
<b>Figure 5.6 Feedback Module.....</b>	<b>57</b>





## CHAPTER 1: INTRODUCTION

### 1.1 Introduction

Shopping mall is a place for people to shop for their desired items. To save time, the shopping mall provides sign boards or information boards located at a particular spot in the mall for shoppers to plan their route inside the mall. However, not all floors in the mall have these sign or information boards which makes shoppers difficult to navigate to their desired or favorite shops and it is time consuming. Thus, to ease the shoppers, a mobile app is developed under the project: SCM-Nav: An Indoor Navigation Mobile App for Shopping Mall in which the Setia City Mall is taken as an industrial case. With this indoor navigation system, it can save shoppers time walking around to locate their desired shop or any services provided at the mall such as musollah, ATM machines, toilets, etc. One of the important features that this mobile app provides is able to show an exact route from the point of the shopper's current location to the desired shop or services. By using this app, shoppers are able to navigate inside the shopping mall with ease in short time.

Previously, shoppers relied on sign boards or information boards located in certain places in the mall. Because the information board is not placed at every floor in the mall. So, it will be difficult for shoppers to find the information board just because to go to the store they want. At the same time, it will be time consuming for the shopper. With this indoor navigation system, it can make it easier and save shoppers time to find the store they want to go.

This system will provide indoor navigation features for shoppers to find the store or destination they want to go. Among them, this system will show a more precise direction for shoppers to go to the destination they want to go and will not make shoppers go wrong away. The system is reliant on its center parts to accomplish greatest effectiveness and ideal execution of the application. This technology can increase the effectiveness and improve the efficiency for shoppers to navigate in the shopping mall.

## 1.2 Problem Statement

There are few problems that have been found in this existing indoor navigation system. Thus, the Problem Statement (PS) is condensed into Table 1.1.

**Table 1.1: Summary of Problem Statement**

PS	Problem Statement
PS1	Shoppers have to rely on the information board to acquire information about store directory
PS2	Time consuming in finding a shop on the information board that contains a directory of shops
PS3	Shoppers end up having no interest due to being exhausted not finding a desired shop at the end

**PS1: Shoppers have to rely on the information board to acquire information about store directory.**

The current indoor navigation system still uses information boards to display all the information about the location of the store. In addition, this information board is also only in certain places. It is a waste of time for shoppers to look for the information board.

**PS2: Time consuming in finding a shop on the information board that contains a directory of shops.**

Information boards are only available in certain places. It will double the waste of time when the shopper has arrived at the information board and need to find one by one the destination they want to go. Because the mall does not have only 1 or 2 stores but has more than 100 stores. Even worse, if the destination they want to go is far from where the information board they were sitting at that time.

**PS3: Shoppers end up having no interest due to being exhausted not finding a desired shop at the end.**

Why are shoppers no longer interested in continuing their intention to go to the destination because shoppers are not sure where the store is exactly. Because it will waste time to look at the store number one by one and the shopper will be dizzy to find the store because the mall is big.

### 1.3 Objective

Project Objectives (PO) has been issued as follows and summarized into table 1.2.

**Table 1.2: Summary of Project Objectives**

<b>PO</b>	<b>Problem Objectives</b>
<b>PO1</b>	To study currently available application in aiding shoppers for directions and navigation inside the shopping mall
<b>PO2</b>	To develop a mobile application of an indoor map navigation application which could assist shoppers to navigate in the shopping mall by using their mobile phones
<b>PO3</b>	To evaluate the functionality of the developed mobile indoor navigation on the application

### 1.4 Scope

#### 1.4.1 Module to be developed

##### 1. Authentication Module

An authentication module is a plug-in that collects user information such as a user ID and password and compares the information against entries in a database. Users need to login using a valid ID and password to log into the system.

##### 2. Shopping Mall Directory Module

Shopping mall directory module are list of shops and amenities with details that is in the shopping mall. With this module, users can find the store they

want. This module also displays details such as store name, lot no and category.

### 3. Promotion and Event Module

Promotion and event module are list of promotions and events, manage promotions and events for shop include verification and manage promotions and events for mall. This module also will display all the promotions and events that exist along with the details.

### 4. Indoor Navigation Module

Indoor navigation module is to display the shopping mall indoor map include current user location, search a shops or amenities, and navigate to the shop. This module can also find the desired store on each floor.

### 5. Map Module

Map module can integrate with google maps location of the shopping mall. Google maps will show the way to Setia City Mall from the current user location.

### 6. Feedback Module

Feedback module is for shoppers to give star rating feedback to the system. Users can assign a star rating from 1 to 5 based on the use of the system.

### 7. Dashboard Report Module

Dashboard report module is for admin to view the number of ratings feedbacks. User will give the ratings feedbacks based on the convenience of the system on the user.

#### 1.4.2 Target User

1. Admin (Mall Admin) – Login functionality, edit store details, show user feedback, verify promotion and event, view dashboard report
2. User (Shop Owner) – Login functionality and add/update promotion and event

3. User (Shopper) – Navigation features, store directory list, view of promotion and event, feedback section and google map

### **1.5 Project Significance**

1. To save time and make it easier for shopper to navigate in the shopping mall
2. People do not necessarily rely on the sign, user can just search for direction by using this application
3. Provide a straightforward process for people to navigate their direction thus changing way of travel one location to another

### **1.6 Expected Output**

This project will produce an android mobile application that allows users to navigate in the shopping mall by using their mobile phones only. This will make it easier and save shopper time to find the shops in the shopping mall. Although some applications like this already exist, these applications will produce features that do not exist in existing applications and will improve existing features.

### **1.7 Conclusion**

In this chapter, problem statement, project objective, project scope, project significance and expected output of the project are clearly identified. The next chapter will discuss the related work of this project which are literature review and project methodology.

## **CHAPTER 2: LITERATURE REVIEW AND PROJECT METHODOLOGY**

### **2.1 Introduction**

The literature review was conducted to discuss issues from the existing system. From the current technology, researchers shall find out how it is developed and how to find a proper and effective solutions. The methodology will be discussed in this chapter. It acts as guide to ensure the progress working smoothly in correct steps. The methodology that will be use will help to continue for the next phase in relevant way. It also guided by milestone that mapping the progress implementation for the project. The further detail of the phase will describe in the following section.

The progress of this literature review is beginning with problem identification. The existing problems and inconvenience were used to find solutions for a better new system development. Other than that, the existing technologies also had been studied to find great enhancements and the technology implementation for the new system development.

### **2.2 Facts and Findings**

#### **2.2.1 Domain**

Setia City Mall is a joint venture between S P Setia, a Malaysian property developer, and the Asian Retail Investment Fund, a wholesale fund managed by Lend Lease, a multinational property and infrastructure firm.

The mall is the area's preferred shopping, eating, entertainment, and parklife destination, with over 740,000 square feet of Net Lettable Area, over 2,500 parking spaces, and over 240 stores distributed across five levels. Parkson, Golden Screen Cinemas, Fitness First, Zara, Uniqlo, Urbanfresh, Daiso, Harvey Norman, Kaison, and MPH Bookstore are among the major stores.

The mall has an outdoor eating district, a 10.5-acre park, a waterjet plaza, and outstanding children's play facilities in addition to prominent local and international

stores. The mall was also awarded the Green Mark Gold Award by Singapore's Building and Construction Authority (BCA), making it the first mall in Malaysia to do so.

### 2.2.2 Existing System

Studies from the similar systems or the existing systems are important to develop a new system. The existing systems can be used as reference and guidance to develop new systems. In addition, similar studies also can provide system builders with pertinent information which it is useful when developing systems in order to prevent errors on applying.



### 2.2.2.1 YOHO Map

Figure below shows the interface of YOHO Mall application. YOHO Map are mall indoor navigation application which are for YOHO Mall shopping Centre located in Hong Kong. The function is almost the same as other indoor navigation which provides mall map directory and enables user to navigate their path. The limitation of YOHO Map are the content of information about store promotion and upcoming event are not provided. Even though the application is not having many features but still, it is a simple and easy-to-use application.



Figure 2.1 YOHO Map