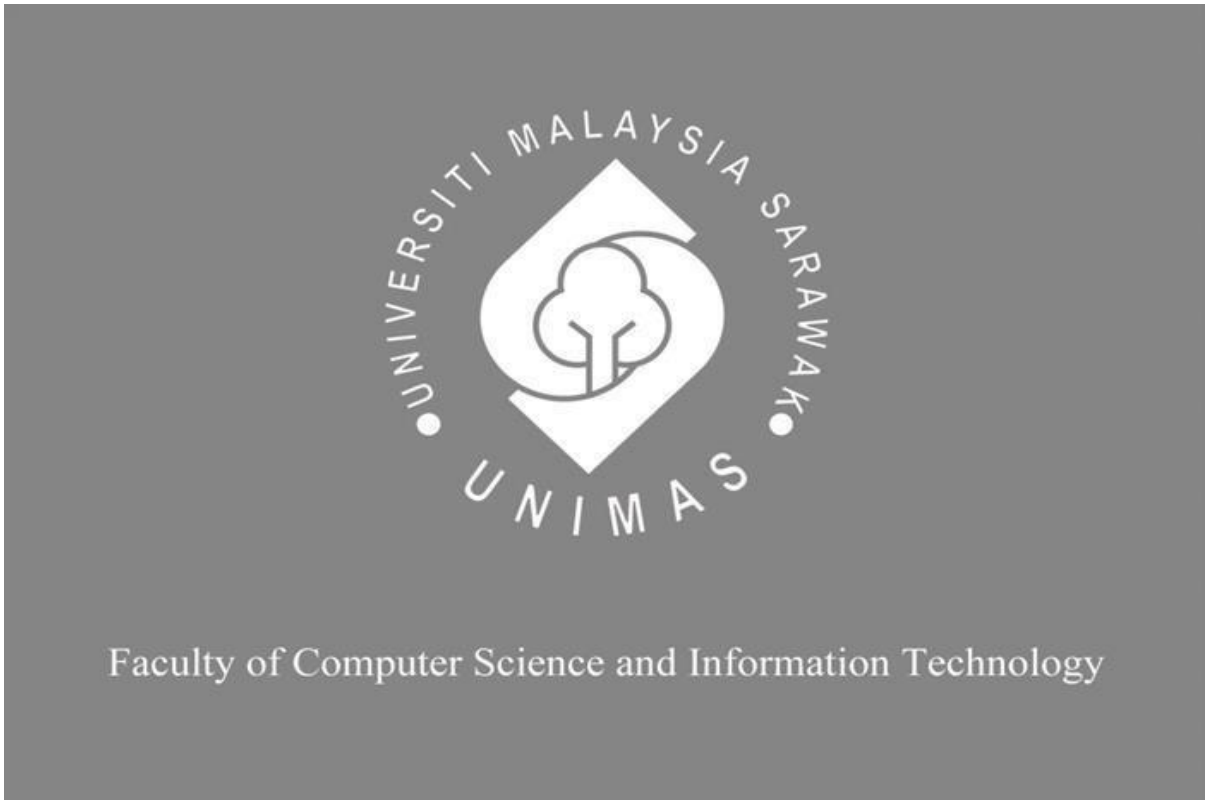


# *ANDROID-BASED MENU APPLICATION FOR CONSUMERS AND MICROENTERPRISES USING GOOGLE PLACES API AND CLICKSTREAM ANALYTICS*

Banabas Lau Sie Lung

Bachelor of Computer Science with Honors

(Computational Science)

2019/2020

**ANDROID-BASED MENU APPLICATION FOR CONSUMERS AND MICROENTERPRISES USING GOOGLE PLACES API AND CLICKSTREAM ANALYTICS**

BANABAS LAU SIE LUNG

This project is submitted in partial fulfillment of the requirements for
the degree of
Bachelor of Computer Science with Honors

Faculty of Computer Science and Information Technology
UNIVERSITI MALAYSIA SARAWAK
2019 / 2020

**UNIVERSITI MALAYSIA SARAWAK**

**THESIS STATUS ENDORSEMENT FORM**

**TITLE**

**Android-based Menu Application for Consumers and Microenterprises using Google Places API and Clickstream Analytics**

**ACADEMIC SESSION: 2019/2020**

**BANABAS LAU SIE LUNG**
(CAPITAL LETTERS)

hereby agree that this Thesis* shall be kept at the Centre for Academic Information Services, Universiti Malaysia Sarawak, subject to the following terms and conditions:

1. The Thesis is solely owned by Universiti Malaysia Sarawak
2. The Centre for Academic Information Services is given full rights to produce copies for educational purposes only
3. The Centre for Academic Information Services is given full rights to do digitization in order to develop local content database
4. The Centre for Academic Information Services is given full rights to produce copies of this Thesis as part of its exchange item program between Higher Learning Institutions [ or for the purpose of interlibrary loan between HLI ]
5. ** Please tick ( √ )

| | | |
|---|---|---|
| ☐ | CONFIDENTIAL | (Contains classified information bounded by the OFFICIAL SECRETS ACT 1972) |
| ☐ | RESTRICTED | (Contains restricted information as dictated by the body or organization where the research was conducted) |
| ☑ | UNRESTRICTED | |

Validated by

Suriati Khartini bt Jali

(AUTHOR'S SIGNATURE) (SUPERVISOR'S SIGNATURE)

Permanent Address
No. 76, Jalan Chong Kiun Kong, 93300 Kuching, Sarawak

Date: 3/8/20 Date: 3 August 2020

Note * Thesis refers to PhD, Master, and Bachelor Degree
** For Confidential or Restricted materials, please attach relevant documents from relevant organizations / authorities

# Declaration

I hereby declare that this project is my original work. I have not copied from others student's work or from any other sources except where due reference or acknowledgement is not made explicitly in the text, nor has any part had been written for me by another person.

.....

(BANABAS LAU SIE LUNG) 15th JULY 2020

# Acknowledgement

I would like to deliver my greatest gratitude to my supervisor, Dr. Suriati Khartini Binti Jali, who had provided continuous support, advice and guidance throughout my Final Year Project. Secondly, I wish to express my deepest gratitude to my examiner, Dr. Stephanie Chua Hui Li, who had provided constructive comments and feedbacks regarding my Final Year Project. I would also like to give my appreciation to Final Year Project coordinator, Professor Dr. Wang Yin Chai, who had provided useful guidelines throughout this Final Year Project.

Other than that, I would like to express my appreciation to my university, Universiti Malaysia Sarawak (UNIMAS) as well as my faculty, Faculty of Computer Science and Information Technology (FCSIT) for giving me this opportunity to do this Final Year Project. I am truly appreciated because throughout this project, I gain a lot of new knowledge which can help me to do better work in the future.

Last but not least, I also wish to thank my family and friends who had helped and supported me in completing this Final Year Project.

# TABLE OF CONTENTS

**Declaration**……. I

**Acknowledgement** …… II

**List of Figures** …… VII

**List of Tables** …….. IX

**Abstract** …… X

**Abstrak** …… XI

**Chapter 1: Introduction** ……... 1

**1.1 Introduction** …… 1

**1.2 Problem Statement** …… 1

**1.3 Aim and Objectives** …… 2

**1.4 Methodology** ……... 2

**1.5 Scope** ……... 4

**1.6 Significance of Project** ……... 5

**1.7 Project Schedule** ……. 5

**1.8 Expected Outcome** ……. 5

**Chapter 2: Literature Review** ……. 6

**2.1 Introduction** …… 6

**2.2 Review on Existing Applications** …….. 6

**2.2.1 Google Maps** …… 6

**2.2.2 Menu** …… 8

**2.2.3 Grab-a-menu** ……. 10

**2.2.4 The-Menu** …….. 13

**2.3 Comparison on Existing Applications and the Proposed Application** …… 14

**2.4 Brief Overview of the Proposed Application** ……. 15

**2.5 Summary** ……... 16

**Chapter 3: Requirement Analysis and Design** ……. 17

**3.1 Introduction** …….. 17

**3.2 Mobile Application Development Life Cycle (MADLC)** …….. 17

**3.2.1 Phase 1: Requirement Analysis** ……... 17

**3.2.1.1 Survey** ……. 18

**3.2.1.2 Functional Requirement** ……... 20

**3.2.1.3 Non-Functional Requirement** ……... 20

**3.2.1.4 Software** …….. 21

**3.2.1.5 Hardware** …… 22

**3.2.2 Phase 2: System Design** …… 22

**3.2.2.1 Activity Diagram** …… 23

**3.2.2.2 Use Case Diagram** …….. 23

**3.2.2.3 Sequence Diagram** ……. 27

**3.2.2.4 Class Diagram** …… 28

**3.2.2.5 Interface Design** ……. 29

**3.2.3 Phase 3: Implementation** ……. 31

**3.2.4 Phase 4: Testing** …… 32

**3.2.5 Phase 5: Maintenance** …….. 33

**3.3 Summary** …….. 33

**Chapter 4: Implementation** ……... 34

**4.1 Introduction** …….. 34

**4.2 Installation and Configuration of the Software/Tools Used**……. 34

**4.2.1 Firebase** …….. 34

**4.2.2 IntelliJ IDEA** …….. 34

**4.3 Implementation of Modules** ……. 35

**4.3.1 Authentication Module** …….. 35

**4.3.2 Consumer Module** ……. 37

**4.3.3 Microenterprise Owner Module** …….. 38

**4.3.4 Menu Module** ……. 39

**4.3.5 Clickstream Analytics Module** ……. 39

**4.4 Summary** ……... 41

**Chapter 5: Testing** …….. 42

**5.1 Introduction** …….. 42

**5.2 Functional Testing**…… 42

**5.2.1 Test case**…….. 42

**5.3 Non-functional Testing** ……..... 46

**5.3.1 Usability Testing**…… 46

**5.3.1.1 User Interfaces**…… 47

**5.3.1.2 User Functionality** …….. 48

**5.3.1.3 Overall Evaluation of the Application**…….. 49

**5.4 Summary** …….. 50

**Chapter 6: Conclusion and Future Work**…… 51

**6.1 Introduction** ..... 51

**6.2 Project Achievement** ..... 51

**6.3 Limitations and Constraints** ..... 52

**6.4 Future Works** ..... 52

**6.5 Conclusion** ..... 53

**References** ..... 54

**Appendix A: Project Schedule** ..... 56

**Appendix B: Need Analysis Questionnaire** ..... 59

**Appendix C: Usability Testing Questionnaire** ..... 62

**Appendix D: Data Collection** ..... 65

# List of Figures

Figure 1.1: *MADLC phases*

Figure 2.1: *Home screen of Google Maps*

Figure 2.2: *List of coffee shops*

Figure 2.3: *Details and menu of coffee shop*

Figure 2.4: *Home screen of Menu*

Figure 2.5: *Food categories in Menu*

Figure 2.6: *Food item in Menu*

Figure 2.7: *Home screen of Grab-a-menu*

Figure 2.8: *List of available places in the search location with Google Maps*

Figure 2.9: *Menus of Grab-a-menu*

Figure 2.10: *Home screen of The-Menu*

Figure 2.11: *Categories of other products*

Figure 3.1: *Different categories of products*

Figure 3.2: *Consumer's feedback on the features*

Figure 3.3: *Activity diagram for proposed application*

Figure 3.4: *Use case diagram for all the actors*

Figure 3.5: *Sequence diagram for login*

Figure 3.6: *Sequence diagram for upload menu*

Figure 3.7: *Class diagram of proposed application*

Figure 3.8: *Sample Login Page*

Figure 3.9: *Sample Home Page for Owner*

Figure 3.10: *Sample Home Page for Consumer*

Figure 3.11: *Sample Add Item Page for Microenterprise Owner*

Figure 4.1: *Login page of Places Menu*

Figure 4.2: *Registration pages of Places Menu*

Figure 4.3: *Homepage for consumer*

Figure 4.4: *List of searched places*

Figure 4.5: *View place and menu item*

Figure 4.6: *Homepage for microenterprise owner*

Figure 4.7: *Add and edit menu item pages*

Figure 4.8: *Code snippet of logging "view place" event to Firebase Analytics*

Figure 4.9: *SQL query from BigQuery table in Data Studio to get total visits of a place*

Figure 4.10: *Analytics dashboard*

Figure 5.1: *Feedback from consumers on the user interface*

Figure 5.2: *Feedback from microenterprise owners on the user interface*

Figure 5.3: *Feedback from consumers on the functionality*

Figure 5.4: *Feedback from microenterprise owners on the functionality*

Figure 5.5: *Feedback from consumers on overall experience*

Figure 5.6: *Feedback from microenterprise owners on overall experience*

# List of Tables

Table 2.1: *Comparison on the existing applications*

Table 3.1: *Software used and its description*

Table 3.2: *Hardware used and its description*

Table 3.3: *Use Case Description for all the actors*

Table 5.1: *Test case of login functionality*

Table 5.2: *Test case of forgot password functionality*

Table 5.3: *Test case of Consumer homepage functionality*

Table 5.4: *Test case of Microenterprise Owner homepage functionality*

Table 5.5: *Test case of Microenterprise Owner add, edit, and delete item functionality*

## Abstract

*Nowadays, mobile applications are growing very rapidly. It is very convenient as most people own a smartphone and stay connected to the Internet all the time. Many mobile applications have been developed to solve daily problems. Therefore, the purpose of this proposed application is to offer a simple marketing tool for microenterprise owners in marketing their products and provide features which consumers can search and view menus at their place before going out. By having this app, it is hoped that it can fill in the gap of current existing solutions to help consumers and microenterprise owners to deal with their shopping and marketing.*

# Abstrak

Pada masa kini, aplikasi mudah alih berkembang dengan pesat. Ia sangat mudah kerana kebanyakan orang memiliki telefon pintar dan sentiasa berhubung dengan Internet sepanjang masa. Banyak aplikasi mudah alih telah dibangunkan untuk menyelesaikan masalah harian. Oleh itu, tujuan aplikasi yang dicadangkan ini adalah untuk menawarkan alat pemasaran mudah untuk pemilik mikroenterprise dalam pemasaran produk mereka dan menyediakan ciri-ciri yang pengguna boleh mencari dan melihat menu di tempat mereka sebelum keluar. Dengan mempunyai aplikasi ini, diharapkan ia dapat mengisi jurang penyelesaian sedia ada untuk membantu para pengguna dan pemilik microenterprise menangani belanja dan pemasaran mereka.

# Chapter 1: Introduction

## 1.1 Introduction

Mobile applications are very popular in these days, as life is so much easier with the capability to do a lot of things using only smartphones. Currently, Android hold about 76% in the mobile operating system market share worldwide, therefore Android-based application development is a good choice when consider developing application for mobile devices.

Nowadays, there are already many problems have been solved using mobile applications. However, there are also still a lot of improvements or innovations that can be done in the existing solutions. One of the areas which can be enhanced is menu application for consumers and microenterprises. Google offers a great set of Application Programming Interface (API) for developers to use for free in software development, one of them is Google Places API.

Google Places API enables developers to implement place requests such as place search, details, photos, and hence more features can be built into their applications. Clickstream analytics is also important to businesses as entrepreneurs can learn more about their customers by studying their in-app behavior, and come up with suitable marketing strategy to engage their customers.

## 1.2 Problem Statement

As consumers, buying things and going to cafe is part of our daily life. We need to buy items when the items at home are running out, or plan to go out to eat at cafe, but we do not always know which shop has the items we need, and what foods and drinks are available at a particular cafe. This situation often leads to waste of time, energy and petrol when we find out

the things we want are not available. If consumers can view menus at home, they can have some planning before going out, and an app to do it can be convenient.

On the other side, many microenterprise owners do not have the platform to promote their products, therefore it is less efficient for them to just wait for customers to visit. If there is a platform to upload, display and update menus, microenterprise owners can be more proactive to promote their products to potential customers, which can be helpful to increase their sales.

## 1.3 Aim and Objectives

This project aims to solve the two-sided problem faced by consumers and microenterprises as described in the problem statement. Based on the problem statement stated, the objectives of this project are:

- **1.3.1** To design an application that can save time, energy and petrol of consumers when they plan for shopping or go out to eat and drink.
- **1.3.2** To develop a platform for microenterprise owners to market their products through uploaded menu.
- **1.3.3** To evaluate or test the usability of the Android-based menu application for consumers and microenterprises using Google Places API and Clickstream Analytics.

## 1.4 Methodology

The Mobile Application Development Life Cycle (MADLC) methodology will be used in this project. This is because MADLC is a representation of the conventional Software Development Life Cycle (SDLC) from a mobile device's perspective, therefore MADLC would be more relevant in the context of mobile application development (Kaur & Kaur, 2015). The

phases involved are similar to those in SDLC, which are requirement analysis, system design, implementation, testing and maintenance, as shown in Figure 1.1.

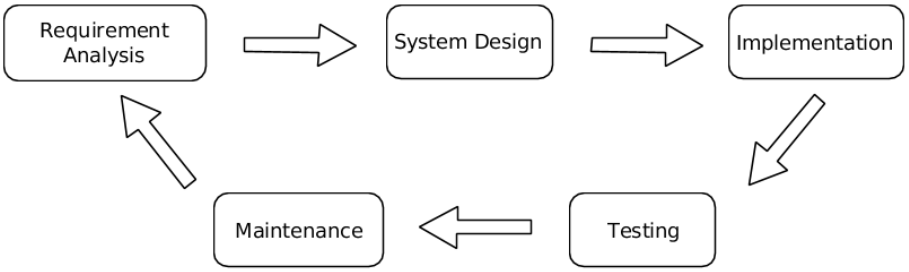


Figure 1.1: *MADLC phases*

- ### 1.4.1 Requirement Analysis

  Before developing a mobile application, ideas need to be collected and refined. The information about the target users is gathered in the phase of requirement analysis, which can be conducted using various tools such as questionnaire and interview. Besides that, a review of existing solutions is needed to be done to decide the necessary features to be implemented in the mobile application.

- ### 1.4.2 System Design

  After the required information is obtained from phase 1, the mobile application development can proceed to the design phase. The design phase includes constructing the Unified Modeling Language (UML) diagrams to help in visualizing the interaction of the entities of the mobile application, the design of user interface, as well as deciding the technology stack to be used for the implementation, such as

Integrated Development Environment (IDE), database, programming languages, libraries, API and etc.

- **1.4.3 Implementation**

  When the design is decided, the development of the mobile application can enter the implementation phase. This phase involves coding the source codes and debugging to build the actual mobile application.

- **1.4.4 Testing**

  The testing phase is for testing the functionalities and usability of the prototype of the mobile application. Debugging is important in this phase to find errors and fix them to ensure the mobile application is robust.

- **1.4.5 Maintenance**

  Once the mobile application is well tested, the development will reached the final phase, which is maintenance. This phase involves getting user feedback, fixing bugs and doing improvement to the application (Kaur & Kaur, 2015).

## 1.5 Scope

The target users of the final product are consumers and independent owners of microenterprises. According to Malaysian government definition on Small and Medium Enterprise (SME), a microenterprise has sales turnover which is less than RM 300,000 or has less than 5 employees, for example grocery, cafe, bakery, electrical appliances, stationery and etc (SME, 2016). Consumers and microenterprise owners can come from diverse ages, as long as they know how to use the final product in their Android smartphones.

The scope of this project will also be constrained in the area of Kota Samarahan, but it is supposed to be a sufficient demonstration for other areas as well. The targeted

microenterprises will be those stand-alone businesses which are outside of shopping malls, as Google Places API for indoors is not yet available. This application is supported on the Android platform.

## 1.6 Significance of Project

This project aims to bring a better shopping experience for consumers and provide a marketing tool for microenterprise owners. By saving time, energy and petrol, it can help to increase user's productivity in daily life, as well as a cleaner traffic and environment.

## 1.7 Project Schedule

The project schedule description and the gantt chart of the project has been attached to Appendix A for reference.

## 1.8 Expected Outcome

This menu application is developed to enhance consumers' and microenterprise owners' shopping and marketing experience. It is expected to be easy to use and included with necessary functionalities such as search for cafe, view and update menus, statistics on user in-app behavior and etc, along with comfortable user interface (UI) and user experience (UX).

# Chapter 2: Literature Review

## 2.1 Introduction

According to Machi and McEvoy (2016), a literature review is defined as a written document that builds a logically argued case from a broad understanding of the current state of knowledge about a topic of study. This case set up a persuasive thesis to answer the question of the study. Therefore, by the definition of literature review, the purpose of reviewing existing applications for this project is to get a clear understanding of the topic relevant to the proposed application.

Based on the objectives of this project stated above, a review on existing Android applications is carried out to decide the features to be included in the implementation of the proposed application. The existing applications listed below are selected for review, because they have similar functionalities as described in the objectives.

## 2.2 Review on Existing Applications

This section will review on four existing Android applications to determine the similarities, advantages and disadvantages of the applications. The features of the existing and proposed application will also be discussed.

### • 2.2.1 Google Maps

Google Maps is a popular mobile navigation application developed by the technology giant Google. With Google Maps, users can get real-time Global Positioning System (GPS) navigation, information about traffic, as well as explore nearby places to eat and drink or buy groceries (Google, 2019). As the proposed application of this final year project is focusing on menus and places, this part of review will also focuses on the similar feature of Google Maps.

Figure 2.1: *Home screen of Google Maps*

Figure 2.1 shows the home screen of Google Maps application. Below the search bar is a horizontal scrollable list of buttons, such as Restaurants, Coffee, Groceries, and so on.

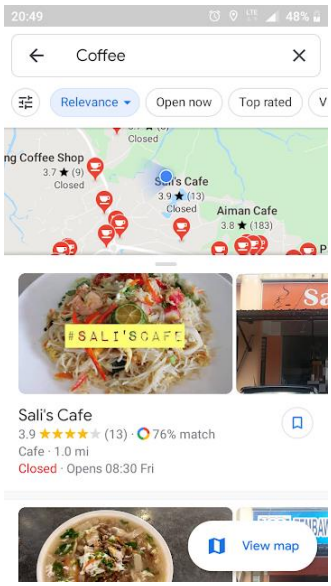


Figure 2.2: *List of coffee shops*

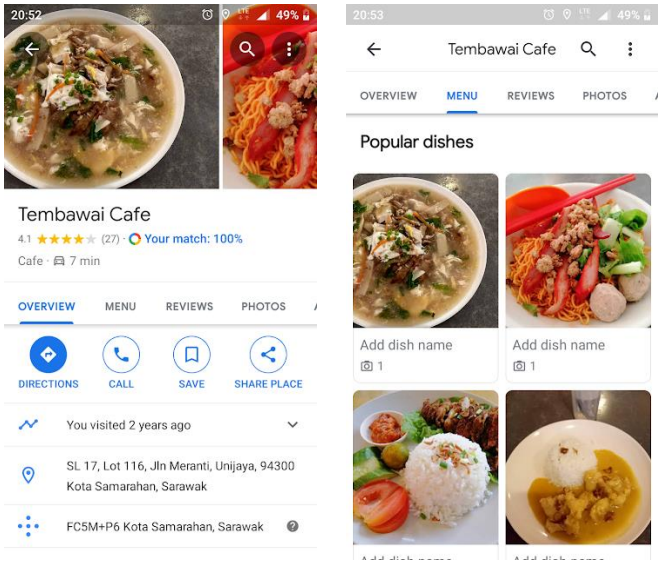


Figure 2.3: *Details and menu of coffee shop*

Figure 2.2 displays a list of coffee shops when the user clicks the “Coffee” button and Figure 2.3 shows the details and menu of the coffee shop. If the shop owner has uploaded menu photos through the Google My Business page, then when the user clicks the menu tab, a list of photos of the shop menu will be shown.

Google Maps provides navigation within the app for the users to follow direction to the searched places. It also enables users to view menu photos uploaded by shop owners, but the text of the menu tends to be very small in the photos and not easy to provide photo for every food and drink or other service items.

- ### 2.2.2 Menu

Menu is a menu application for restaurants and cafes which is developed by an Android developer Ivelin Pavlov. Restaurant and cafe owners can register an account for Menu and add their own menus in the application. Customers can then view the menus from nearby restaurants and cafes (Pavlov, 2015).

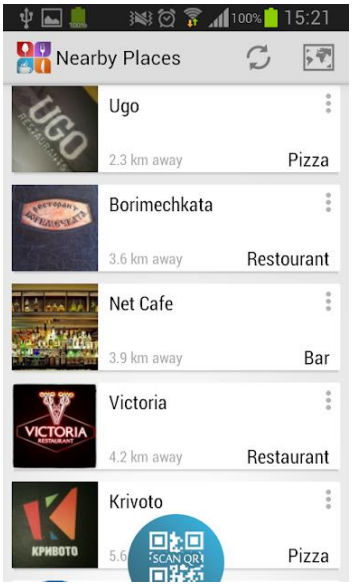


Figure 2.4: *Home screen of Menu*

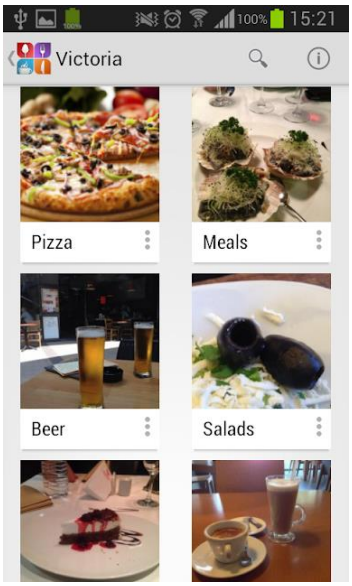


Figure 2.5: *Food categories in Menu*