



Palestine Polytechnic University
College of IT & Computer Engineering
Department of Information Technology

QR Reader with Shopping Cart

By

Arwa Fawwaz Ballal

Sahar Ameen Natsheh

Supervisor:

I. Suzan Sultan

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الإهداء ...

بدأنا بأكثر من يد، و قاسينا أكثر من هم، و عانينا الكثير من الصعوبات، و ها نحن اليوم و الحمد لله نطوي سهر الليالي و تعب الأيام و خلاصة مشوارنا بين دفتي هذا العمل المتواضع.

إلى منارة العلم و الإمام المصطفى إلى الأمي الذي علم المتعلمين، إلى سيد الخلق إلى رسولنا الكريم سيدنا محمد -صلى الله عليه و سلم-.

إلى الينبوع الذي لا يمل من العطاء، إلى من حاكت سعادتي بخيوط منسوجة من قلبها إلى والدتي العزيزة. إلى من سعى و شقي لأنعم بالراحة و الهناء، إلى من لم يبخل من أجل دفعي في طريق النجاح، إلى الذي علمني أن أرتقي سلّم الحياة بحكمة و صبر، إلى والدي العزيز. إلى من حبهم يجري في عروقي و يلهم بذكراهم فؤادي إلى إخوتي و أخواتي.

إلى من سرنا سوياً و نحن نشق الطريق معاً نحو النجاح و الابداع، إلى من تكافتنا و إياهم بدأ بيد و نحن نقطف زهرة تعلمنا إلى صديقاتي و زميلاتي.

إلى من علمونا حروفاً من ذهب و عبارات من درر، إلى من صاغوا لنا من علمهم و فكرهم منارة تنير لنا مسيرة النجاح و التقدم، إلى أساتذتنا الكرام.

Abstract

Customer acceptance for the product is related to his/her attitude towards that products' ingredient. Each individual has his own preferences some want to eat diet food, healthy... So, he/she is looking for a less effort way to seek for the products with specific ingredients

In our project we will develop a mobile application aims to facilitate the user purchasing, depends on his/her preferences (health or religion constraints) based on Quick Response (QR) Cod. QR is two-dimensional matrix used to store several types of data and can be read fast. In addition, placed on the product cover. Indeed, the user can check product cost....makes shopping cart of products with total price reached.

الملخص

يعتمد الزبون في شرائه للمنتجات الغذائية على الانطباع الذي يأخذه عند اطلاعه على محتويات المنتج. كما أن الاختلافات الفردية في القرارات الشرائية لدى الزبائن تعتمد على تفضيلاتهم. بالإضافة إلى أن البائعين يبحثون عن أفضل طريقة يرتبون فيها البضائع في مجموعات حسب محتوياتها و تفضيلات المشترين. لأن الزبون؛ في حال لم يجد ما يريده من البضائع بسرعة؛ قد يلجأ إلى البائعين المنافسين الذين يقومون بتصنيف بضائعهم ومع التقدم التكنولوجي و دخول الهواتف الذكية و تطبيقاتها في جميع نواحي الحياة. و ظهور تقنيات جديدة لتخزين البيانات كرمز الاستجابة السريعة (QR) واستخدامه في تخزين البيانات وطباعته على الكثير من أغلفة المنتجات.

في مشروعنا قررنا بناء تطبيق للهواتف الذكية بنظام اندرويد يقوم بقراءة الرمز وتحليله، ومن ثم اخراج البيانات المخزنة به ومراعاة تفضيلات المستخدم، مع السعر الذي سوف يتم جلبه من قاعدة البيانات للمحل. وامكانية عمل سلة من المشتريات مع السعر الكلي، وإرسالها كرسالة نصية إلى المهتمين بها.

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Chapter One

Introduction

Contents:

1.1 Introduction

1.2 Problem Statement

1.3 Objectives

1.4 System Scope

1.5 Methodology

1.6 Project Schedule

1.1 Introduction

In this chapter, several related subjects will be discussed, such as the problem statement to give brief information about the problems that face the usage of text to provide product information. The aims and objectives of our project and the way used to achieve them, the methodology followed by the phases of our project, and the expected time needed for the project tasks.

1.2 Problem Statement

Today, consumers are interested in reading information about the products and the price of it. In addition, they are looking for specific product information in the ingredients such as pig fat, groundnut, whether they want it or not. Besides sellers are willing to be competitors with other sellers and attract consumers.

Moreover, these days' smartphones spread and people like to use those smartphones applications to facilitate their lives. In addition, the manufacturers are trying to seize every possible opportunity to attract as many customers as possible.

Usually, when the customer goes to the market to buy food product he/she reads the product information. Customer checks whether it fits his/her health and willingness or not. But, during reading the customers suffer from several problems, such as:

- The product information written in small font ingredient, that some of them cannot be read.
- Sometimes the information written in foreign language that they don't know. As a result, they need a translator to understand it.

- The text written on the product might be distorted and become unreadable.
- The color of the product cover makes it hard to read (like black text on dark red background).
- The space available for presenting the product information, is small so can't provide enough information.

Also, customers are looking for products price that fit their budget. But the products price cannot be announced before getting to the cashier.

The sellers may use the product information. The sellers use it to categorize the products into groups to sell them on an easy way and attract the customers, like using the classification for the product based on health concerns such as diabetes. But they also face some problems, when they read the product text, as the consumers' problem.

The manufacturers aim to be on the top care about this information. They want to be trusted manufacturers to compete others, by manufacturing healthy certified products. This leads him/her to earn the customers satisfaction. To achieve that, they try to provide as much extra information as possible about their products.

1.4 Objectives of the project

This project aims to provide the wanted information of the product in a readable way, to facilitate the customers gaining, and the seller's competition. The following objectives are required:

1. Building an application to display the information in a way that the user defines, and display the total invoice of the procurement using a shopping cart.

2. Make this application available for customers and sellers, to enable them to classify the products.

1.5 Project Importance

When we discuss the project importance, we look at it from several points of view, such as the customers, the sellers, and the projects' team members' point of view.

For the customers, this project will help them display the products information in a customized manner. They choose what kind of information will be displayed in a way related to their preference. And if they want to, they can display the total invoice.

With regard to the sellers, they will be able to use that information to classify the products based on health concerns. For example, one shelf is for diabetes, the other one is for high blood pressure, and another one for the kids under 12 years old.

The project is one of graduation requirements for the team members, to finish the graduation project. Might, earn some money by selling the application to the public.

1.6 System Scope

This system is implemented for individuals, who will use this system to read the food products information. So the customers download this application in their Android Smart Phones. And for the big markets, which need it to achieve the customers' satisfaction.

As for the types of health concerns, the project will cover the pig fats and the allergy against peanuts, lactose, gluten and soyabean.

1.7Methodology

In this project, the project team will follow the customer opinion methodology in conjunction with system life cycle (SLC), qualitative methodology through making surveys for previous work in this area, and using understanding and interpretation of this work. The project team will continue with SLC in developing and designing mobile application.

1.8 Project Schedule

This section shows the expected time needed for every task in the Project. The Table Below represents the work schedule:

The table and chart below represent the expected time needed to accomplish tasks on first semester

Table 1Tasks schedule for the first semester

Task Number	Task Name	Expected Time Needed
T1	Planning and studying the idea	2
T2	Literature Review	4
T3	Functional Requirements Specifications	4
T4	Feasibility study	4
T5	Documentation	All over the Project Duration

Table 2Gant Chart for the first semester

Week Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14
T1														
T2														
T3														
T4														
T5														

The table and chart below represent the expected time needed to accomplish tasks on second semester

Table 3Tasks schedule for the second semester

Task Number	Task Name	Expected Time Needed
T1	System Design	4
T2	Development and Programming	11(overlapped)
T3	System Testing	2
T4	System Maintenance	2
T5	Documentation	All over the Project Duration

Table 4Gant Chart for the second semester

Week Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
T1																
T2																
T3																
T4																
T5																

Chapter Two

System requirements

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2.1 Introduction

2.2 Alternatives

2.3 Alternatives advantages and disadvantages

2.4 Optimal Solution

2.5 Feasibility study

2.6 Functional Requirements

2.7 Nonfunctional Requirements

2.8 Risks and risk analysis for the application

2.1 Introduction

In order to solve the problem statement that we talked about in the previous chapter. The problems that face the consumers and the sellers while using the textual representation for products information. And customers need to know the price and the information about it, that information used for medical concerns, religion ones or maybe just to get some knowledge. The sellers need this information to classify the products in different categories related to health concerns.

Several alternatives will be discussed in this chapter. Factually, we make our judgment against different alternatives to reach the optimal solution by studying every alternative's advantages and disadvantages and the cost related to each one of them. Then, we will discuss the requirements of the proposed application, these application requirements are divided into two portions: functional and nonfunctional requirements. And finally we will discuss the risks and the solution for each one of them.

2.2 Alternatives

Our project aims to build mobile application to provide information about the product and it's price. In order to facilitate the information providing process, there are three alternatives that depends on the usability of smart phones applications.

2.2.1 Text to text representation.

This application takes a photo of the ingredients block on the product, and then analyzes it. The text is analyzed using segmentation and edge detection in image processing. Then it detects the letters presented in the text, and represents the text as a text file that is more flexible and readable for the user. The user can control the size of the

text presented on the mobile screen and the text will be black on a white background.

2.2.2 Text to voice representation.

This application works in a similar way to the previous one, but instead of providing the information as a text file, the application will analyze the photo and read the text presented in a pleasing voice.

2.2.3 Quick Response Code (QR Code) reader application.

This application takes a photo of the QR code -which is an enhancement of the bar code- presented on the product and analyzes it, and represents it as a text file that contains the information that user is interested in only.

2.3 Alternatives advantages and disadvantages

For the purpose of defining the best alternative, we studied the advantages and disadvantages of each alternative as shown below.

2.3.1 Text to text representation

➤ Advantages

1. Easy to build and develop.
2. Can be used not only in food products, but also in any textual printed document, such as magazines, books, advertisements, etc.

➤ Disadvantages

1. The effect of the background color. For example the text presented is in the black color and the backgrounds' color is dark red. You can see that the difference in the luminance in the two colors is not that much and that

would cause a problem while taking a photo of the text. But, the problem can be solved by changing the settings of the mobile camera by increasing the luminance of the taken photo.

2. The application doesn't support different font types of the text.
3. The limited space used to display the product information.
4. It can help with the distortion problem by enhancing the image. But if the distortion is big, it cannot fix it, and that will affect the text displaying. The distortion can be some scratches caused by the translation of the product from a place to another.
5. No hints for the price of the product.

2.3.2 Text to voice representation

➤ Advantages

1. Can be used not only in the food products, but also in any textual printed document, such as magazines, books, advertisements, etc. In addition it is good for people how can't read.

➤ Disadvantages

It has the same disadvantages for the text to text representation.
In addition:

1. The quality of the voice and the sound level might not fit with the user's needs. For example a big amount of mobile phones has a low sound level used. There might be some

noise around the user that causes problems with hearing the voice that comes from the mobile. The user can use the headphones, but they aren't always available with him/her.

2.3.3 QR Code reader application

The QR Code will be discussed in the next chapter.

➤ Advantages

1. High data capacity, which means the large number of characters, which can be stored in the QR code.
2. The QR code uses black bars drawn on a white background, and that helps with analyzing the photo.
3. It's high speed reading process from any direction (360°) without any limitation for the angle of photo.
4. Its resistibility to distortion and the error correction functionality.
5. Reduce printing space.
6. It is possible to read QR code from the back side of the symbol.
7. There are free online applications to build QR code.
8. Linking Functionality of the Symbols.
9. The friendliest way of information representation.
10. Can be used to store key (link) to connect to the seller database.

➤ **Disadvantages**

1. Take time and effort to develop.
2. Not all products have QR Code.

2.4 Optimal Solution

The optimal solution is chosen based on the study of the benefits of each alternative (in other words the one with the most advantages).

After the study of all alternatives applications, it's clear that the third alternative is the most suitable one we found to meet the project objectives and the customer needs, so we chose the QR reader application.

As we discussed before, the QR Code solved all of the problems that faces the usage of text presentation for the products information. And in the future, it will be obtained to all kinds of product.

2.5 Feasibility study

In this section, we will discuss the cost of the optimal solution, which is QR code reader mobile application, as the following:

➤ **Costs**

- Development cost.
- Operational cost.

Each cost includes hardware cost, software cost, human resource cost, and other cost if needed.

➤ **Development cost:**

1. Hardware cost:

The table below shows the hardware resource cost for the application development:

Table 5Hardware cost for the application

Element	Number of items	Item cost	Total cost
Laptop computer	2	569.99 \$	569.99 \$
Smart phone(Samsung Galaxy S III/S3)	1	544.99\$	544.99 \$
Sub-total			1684.97 \$

*(www.amazon.com)

2. Software cost:

The table below shows the software resource cost for the application development:

Table 6Software cost for the application

Element	Number of licenses	License cost	Total cost
Microsoft windows 7 ultimate	1	196.48 \$	196.48 \$
Microsoft office professional 2010	1	363\$	363 \$
Eclipse indigo	1	30.95 \$	30.95 \$
Photoshop CS5	1	579.99 \$	579.99 \$
Sub-total			1170.42 \$

*Eclipse indigo is a software program that is used in Android mobile applications programming.

3. Human resource cost:

The table below shows the human resource cost for the application development:

This cost calculated using the following equation:

Total cost= Hours Per Week*cost Per Hour*Total Number Of Weeks.

The total number of weeks for the two semesters is 30 weeks.

Table 7Human resource cost for the application

Element	Hours/week	Cost/ hour	Total cost
Developer 1	30	20 \$	18000 \$
Developer 2	30	20\$	18000 \$
Sub-total			36000 \$

4. Other costs:

There are extra costs needed for the application development such as transportations, papers, printing, pens... etc. 300\$ needed to cover it.

➤ Operational cost:

1. Hardware cost:

The following table shows the costs for the hardware required to operate the application:

Table 8Hardware cost for the application

Element	Number of items	Item cost	Total cost
Smart phone(Samsung Galaxy S III/S3)	1	544.99\$	544.99 \$
Sub-total			544.99

2. Software cost:

The software needed is already downloaded on the hardware device, which is android operating system for mobile.

3. Human resource cost:

There is no cost needed for human resource to operate the application.

4. Other costs:

There are extra costs might be needed to download the application, it will be 2\$ as a fees included for the downloading process.

We summarize the cost as the following:

Table 9Total cost for the application

Resources	Development costs	Operating costs
Hardware resources development cost	1684.97 \$	544.99 \$\$
Software resources development cost	1170.42 \$	0\$
Human resources development cost	36000 \$	0 \$
Other resources cost	300\$	2\$
Total	39155.39 \$	546.99\$

2.6 Functional Requirements

The functional requirements for the proposed application(the QR Code reader application), is done by the application user.

Requirements abstraction

User

- **Display user information:**

Display the allergy information to make a review for them, and edit them later if needed.

- **Add user information:**

Enter the basic information about the person only once when they download the application, the information is:

- Allergies against peanuts, lactose, gluten and soya bean.
- Ingredients that the user don't want in the product like the pig fats.

The previous information will be stored within the mobile as preferences.

- **Update user information:**

Update the basic information about the person whenever they need, the information is:

- Allergy against peanuts, lactose, gluten and soya bean.

- Ingredients that the user don't want in the product like the pig fats.

The previous information will be stored within the mobile as preferences. When the user opens the updating form the stored preferences will be displayed in the form.

- **Display market information:**

Display the market database link to get the products' price if existed.

- **Edit market information:**

Edit the database link for the market when the user enters a new market.

- **Enable Wi-Fi connection:**

The user can be able to connect to the market Wi-Fi network in order to get the price from the market database.

- **Display products' information:**

Every time the application run, capture the QR Code by the phone camera. Then it will display:

- 1) The information:

Display the product information.

- 2) The price:

Display the product price.

- **Add to shopping cart:**

- Enter the number of items of this product.
- Calculate the price of these items.

- Add the price to the total invoice.
- **Display shopping cart:**
 - Display the shopping cart for the user in order to edit it and calculate the total invoice.
- **Remove from shopping cart:**
 - Display the bought items and their prices
 - Select the item to delete it from the cart.
 - Choose delete option for the item.
 - Update the shopping cart and the total invoice.
- **Sending shopping cart as SMS to the market:**
 - After finishing purchasing the products, the user can send the bell as SMS to whom he\she wants. As example send it to one ordered it from him\her, or to the market cashier, in this case user must have the market mobile number.

2.7 Nonfunctional Requirements

They are not directly concerned with the specific functions delivered by the system. They are related to the emergent system properties, such as:

- **Ease of usage**
 - Clear Interface (not cluttering).
 - Expressive icons.
 - Ease navigation screen and visualization technique. So in this way we will achieve ease of use.
- **Performance**

- Small response time. The QR Code can be analyzed fast, as mentioned before, and it won't take a while to filter the information and display them.

➤ **Availability**

- The application will be available to be downloaded on any smart android phone.

2.8 Risks, risk analysis and limitations for the application

2.8.1 Risks and risk analysis

There is no application built without problems. Even our application, so in this section we will talk about the risks that may face us as developers. Also we will talk about some expected solutions to solve these problems which are mentioned in the table below:

Table 10Risks and Solutions

Risks	Solutions
1. Disagreement between team members, or not finishing within the determined period.	<ul style="list-style-type: none"> • Distribute tasks between the team members. • Making a schedule for finishing tasks on the time. • The period between each meeting and the other not very long. • Work intensively.
2. Analyzing the application is not sufficient, because of	<ul style="list-style-type: none"> • Training continuously, and learning everything that the application needs

probing a new requirement.	as much as we can.
3. Losing or damaging the project code.	<ul style="list-style-type: none"> • Making more than one copy.

2.8.2 Limitations and constraints

The duration of the second semester is 16 weeks. The project team will be working on the design, implementation and testing. So the time specified for the implementation is limited, as a result, the project team will reduce the number of languages supported in the application and the supported allergy types for the food product ingredients.

Chapter Three

Quick Response Code

Contents:

3.1 Introduction

3.2 What is QR Code?

3.3 Versions and Sizes

3.4 Structure

3.5 Characteristics of QR Code

3.1 Introduction

In this chapter, a brief knowledge about Quick Response codes will be presented. We will discuss the term of QR Code, versions and sizes, structure of the symbols, masking the code, and the characteristics of the QR Code symbol.

3.2 What is QR Code (Quick Response Code)?^(1, 3)

It is two-dimensional matrix used to store several types of data and can be read fast, as shown in figure 1. Developed by Denso Wave Corporation in 1994, and printed out in 2000. And proposed as standard by ISO in the same year. This code is the latest version of bar code, which used for several years to store only the manufacturer information and key to reach the database for extra information about the product.



Figure 1: QR Code symbol, [ISO/IEC, 2000]

3.3 Versions and sizes^(2,12)

There are 40 sizes of QR Codes related to the version of the symbol. The difference between a version of the symbol and the next version defined by the number of modules it measures. For example, version1 measures 21X21 modules and version2 measures 25X25 modules, etc. Every version differs from the previous one by measuring four more modules. Figure 2 shows the version1 and version2 symbols.

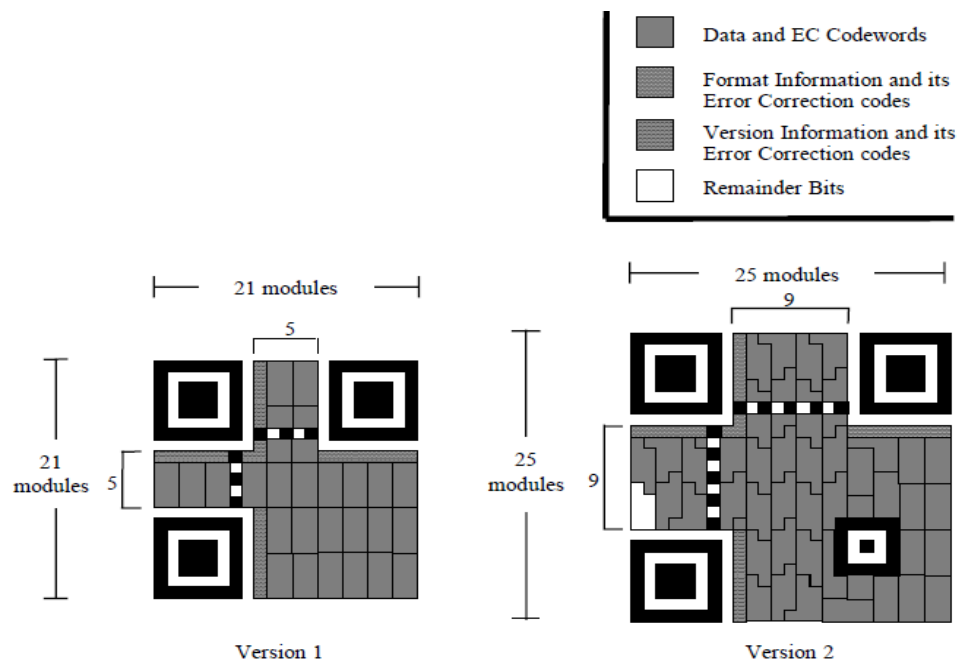


Figure 2 Version 1 and 2 symbols, [ISO/IEC, 2000]

3.4 Structure (3,7,10,12)

Figure 3 shows the structure of the QR Code symbol.

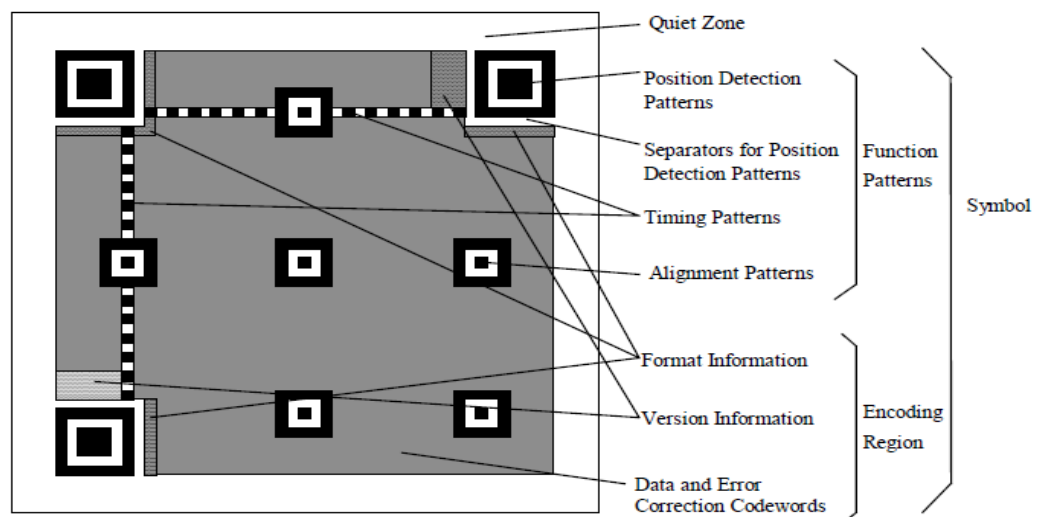


Figure 3 The structure of the QR Code, [ISO/IEC, 2000]

3.4.1 Quiet Zone

It is the white margin space located around the symbol, which is used to make it easier to detect the symbol. It requires four or more cells.

3.4.2 Patterns

3.4.2.1 Finder patterns (Position Detection Patterns)

This pattern is arranged in three corners of the QR Code (three patterns in one QR code symbol), it is used to detect the position, size, and the angle of the symbol. It gives the ability of detection from all directions (360°).

3.4.2.2 Timing pattern

They are two lines (horizontal and vertical). The horizontal timing pattern is located in the sixth row between the two separators for the upper finder patterns, and the vertical pattern runs down column 6 of the symbol between the separators for the left-hand finder patterns. It is used for correcting the central coordinate of the data cell when the symbol is distorted or when there is an error in the cell pitch. In addition, they are used to determine the density and the version of the symbol.

3.4.2.3 Alignment patterns

It is used to correct the distortion of the symbol, especially the nonlinear distortions. The number of Alignment Patterns depends on the symbol version.

3.4.3 Separators

A white region located between the finder patterns and the encoding area of the symbol.

3.4.4 Data Area

The data is stored in the data area. The data will be encoded into the binary numbers of '0' and '1' based on the encoding rule. The binary numbers of '0' and '1' will be converted into black and white cells and then will be arranged. It also contains error correction codewords, the Version Information and Format Information.

3.4.5 Indicators

- Character Count Indicator:

Bit sequence which defines the data string length in a mode.

- Mode(numeric, alphanumeric, kanji) Indicator:

Four-bit identifier indicating in which mode the next data sequence is encoded.

3.5 Characteristics of QR Codes ^(3,4,6,8,11)

3.5.1 High speed reading from all directions(360°)

As mentioned before the finder patterns can give the symbol the ability to be read from all directions. By using the software, the details will be analyzed, finder patterns identified, and the position/size/angle of the symbol detected, and the decoding process will be implemented. By arranging the finder patterns into the three corners of the symbol, the decoding speed of the QR Code can be made 20 times faster than that of other matrix symbols.

3.5.2 Resistant to Distorted Symbols

The alignment patterns are arranged with a regular interval within the range of the symbol. The variance between the center position of the alignment pattern estimated from the outer shape of the symbol and the actual center position of the alignment pattern will be calculated to have the mappings (for identifying the center position of each cell) corrected, Which leads to the linear and nonlinear distorted symbols readable.

3.5.3 Data Restoration Functionality

QR Code has four different error correction levels (7%, 15%, 25%, and 30% per symbol area). The error correction functionality is implemented according to each of the smudge/damage, and is utilizing Reed-Solomon code which is highly resistant to burst errors. Reed-Solomon codes are arranged in the QR Code data area. By this error correction functionality, the codes can be read correctly even when they are smudged or damaged up until the error correction level. The error correction level can be configured by the user when he/she creates the symbol.

3.5.4 Linking Functionality of the Symbols

QR Code has a linking functionality which will enable a single symbol to be represented in several symbols by dividing it. A single symbol can be divided into 16 symbols at maximum. Each symbol has an indicator showing how many symbols the original symbol had been divided into and in which order that specific symbol would be among all divided ones. By this linking functionality, the QR Code will be able to be printed even

if the printing space is not wide enough to have a single QR Code printed.

3.5.5 The Confidentiality of the Code

By making the relationship between the character type and the stored data unique for a special usage, QR Code can be easily encrypted. Unless the conversion table between the character type and the stored data is deciphered, no one will be able to read the QR Code.

3.5.6 Direct Marking.

QR Code exerts superior readability even for symbols which are directly marked using laser or dot pin markers. For directly marked symbols, the cell shape does not necessarily have to be square, it can also be circular shape. Even if the white part (with high reflectance) and the black part (with low reflectance) are inverted due to the angle of the illuminating ray, the code can still be read in an accurate manner. It is also possible to read from the back side of the symbol when it is marked upon a transparent material such as glass, etc.

Chapter Four

System Specifications

Contents:

4.1 Introduction

4.2 General idea of the system

4.3 Functional requirements

4.4 Use case Diagram

4.1 Introduction

Determining the system requirements is vital phase to get clear understand about the functionalities of the proposed application. In this chapter, we will discuss what the application will do, functional requirements in details. The ones have been mentioned in the previous chapter. To their importance for considered the building blocks for application to be implemented, and finally we will depict some diagrams, to illustrate the functionality of the application.

4.2 General idea of the application

The application will firstly ask the user for the user basic information, then every time the user runs the application he/she take a photo of the QR code, which it placed in the product cover, after that the application return some information to the user.

4.3 Functional requirements in details

The users' functional requirements for the proposed application are depicted using use cases templates are described by Coc01 standard [Cockburn, Alester: Writing Effective Use Cases. Addison Wesley Pub Co, 2001].

4.3.1 Display the user information

Primary Actor	Application user.
Goal in Context	Fill list with the allergies and unwanted ingredients.
Trigger	The user displays the allergy and unwanted ingredients from the stored preferences (if existed).
Scenario 1	1.The user: opens display

	information screen and check the information.
Priority	Not essential, when needed.
When available	After installing the application.
Frequency of use	Several times.
Secondary actor	Preferences.

4.3.2 Adding the user basic information

Table 11Adding the user basic information

Primary Actor	Application user.
Goal in Context	Fill the preferences with the needed information.
Trigger	The user enters the basic information, reenters them after they have been deleted, or updating an existed information.
Scenario 1	1. The user: Installs the application. 2.The user: enters the basic information. 3.The user: saves information into the mobile.
Scenario 2	When the information where deleted 1.The user: reenters the basic information. 2. The user: saves information into the mobile.
Priority	Essential, must be implemented.

When available	After installing the application or deleting the information
Frequency of use	Once
Secondary actor	Data storage .

4.3.3 Edit the user information

Table 12Update user information

Primary Actor	Application user.
Goal in Context	Update the data storage with the edited information.
Trigger	The user alters the basic information.
Scenario	<p>When the user intends to update the information</p> <ol style="list-style-type: none"> 1. The user: opens display information screen. 2. The user: chooses edit information option. 3. The user: updates the information. 4. The user: saves changes.
Priority	Not essential, when needed
When available	After entering the basic information.
Frequency of use	Several times
Secondary actor	Data storage

4.3.4 Display market information

Table 13 Display market information

Primary Actor	Application user.
Goal in Context	The application displays the market database link that is used to get the price.
Trigger	Display the market link in order to edit it later if needed.
Scenario	1. The user: runs the application. 2. The user: view market information. 3. Display the market name and database link.
Priority	Not essential, when needed
When available	Always.
Frequency of use	Several times.
Secondary actor	-

4.3.5 Edit market information

Table 14 Edit market information

Primary Actor	Application user.
Goal in Context	Edit the database link for the market.
Trigger	Edit the database link for the market when the user enters a new market.
Scenario	1. The user: runs the application. 2. The user: view market

	<p>information.</p> <p>3. The user: choose edit market information option.</p> <p>4. The user: enters the new link and choose save option.</p>
Priority	Not essential, when needed
When available	Always.
Frequency of use	Several times
Secondary actor	-

4.3.6 Enable Wi-Fi connection:

Table 15 Enable Wi-Fi connection

Primary Actor	Application user.
Goal in Context	The user connects to the market Wi-Fi to get the price.
Trigger	The user connects to the market Wi-Fi.
Scenario	<p>1. The user: chooses the Wi-Fi icon in the application.</p> <p>2. The user: connects to the market network.</p> <p>3. The user: presses the back button.</p> <p>4. The mobile: returns to the application.</p>
Priority	Not essential, when needed
When available	After launching the application.
Frequency of use	Several times.
Secondary actor	Networks manager.

4.3.7 Display products' information

Table 16 Display product information

Primary Actor	Application user.
Goal in Context	The application displays the processed QR code information after filtering them.
Trigger	Display a customize information on the mobile screen.
Scenario	5. The user: runs the application. 6. The user: chooses start scan. 7. Filter the information as required. 8. Display the customize information. 9. Display the price (if existed) from the market database.
Priority	Not essential, when needed
When available	After entering the basic information.
Frequency of use	Several times
Secondary actor	data storage , sqllite database, market database

4.3.8 Add to shopping cart

Table 17 Add to shopping cart

Primary Actor	Application user.
Goal in Context	The application displays the processed QR code information

	that contains a link to get the price.
Trigger	Display the products' price.
Scenario	<ol style="list-style-type: none"> 1. The user: runs the application. 2. The user: chooses capture image option to get the price. 3. The application will get the price from the market database. 4. Display the price. 5. Calculate the items' price, add to the shopping cart, and calculate total invoice.
Priority	Not essential, when needed
When available	Scanning the QR Code and getting the price from the database.
Frequency of use	Several times
Secondary actor	Sqllite database

4.3.9 Display shopping cart

Table 18 Display shopping cart

Primary Actor	Application user.
Goal in Context	The user can display the shopping cart.
Trigger	The user can display the shopping cart to review it in order to delete items from it or send it as SMS.
Scenario 1	<ol style="list-style-type: none"> 1. The user: chooses show shopping cart option. 2. The application will get the items, the prices, and the total

	invoice from a database and display them.
Priority	Not essential, when needed.
When available	After finishing purchasing.
Frequency of use	Several times.
Secondary actor	Sqllite database.

4.3.10 Remove from shopping cart

Table 19 Remove from shopping cart

Primary Actor	Application user.
Goal in Context	The user can remove an item from his/her shopping cart.
Trigger	Remove an item from shopping cart.
Scenario 1	<ol style="list-style-type: none"> 1. The user: chooses show shopping cart option. 2. The application will get the items, the prices, and the total invoice from a database. 3. The user: can choose any item and drop it from the list. The total invoice will be updated.
Priority	Not essential, when needed
When available	After finishing purchasing items and displaying the shopping cart.
Frequency of use	Several times
Secondary actor	Sqllite database

4.3.11 Sending bell as SMS

Table 20 sending bell as SMS

Primary Actor	Application user.
Goal in Context	The user can send the bell to the interested in.
Trigger	Sending the bell as SMS.
Scenario 1	<ol style="list-style-type: none">1. The user: displays the shopping cart.2. The user choose send bell as SMS option.3. The user enters the mobile number and sends it.
Priority	Not essential, when needed
When available	After finishing purchasing items and displaying the shopping cart.
Frequency of use	Several times
Secondary actor	Interested party's' mobile phone.

4.4 Use Case Diagram

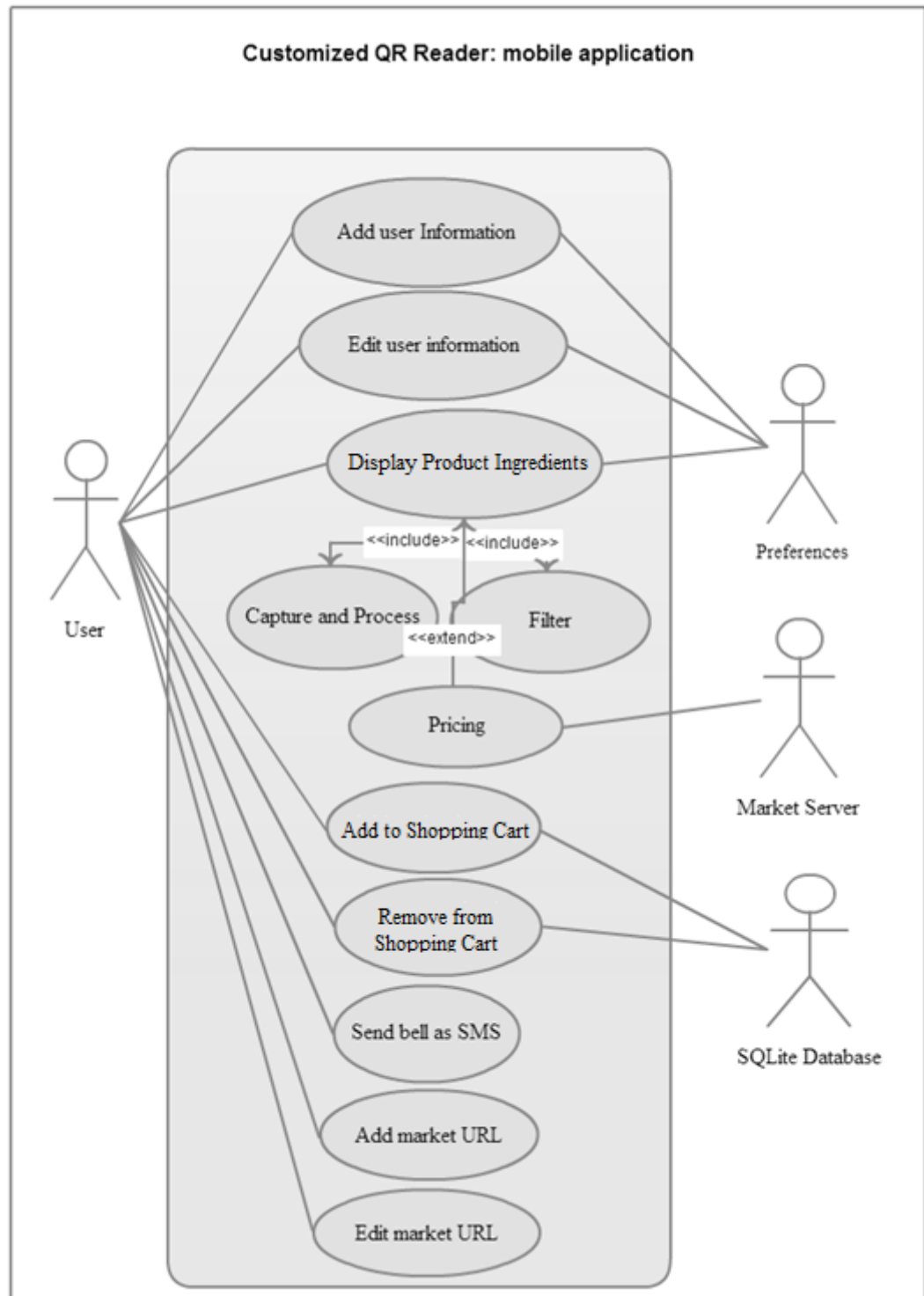


Figure 4 Use case diagram

Chapter Five

System design

Contents:

5.1 Introduction

5.2 User interface design

5.3 Data storage

5.4 Programming constraints

5.5 Resources

5.1 Introduction

This chapter describes the project system design. It includes user interface design, data storage , and database design.

5.2 User interface design

In this section all user interface screens will be discussed, and also the types of data that should be entered or will be displayed in each screen. There are several processes the user can achieve by interacting with the system, such as:

- Display and edit user information.
- Display and edit market information.
- Scan a QR Code.
- View products ingredients in a customized way, and view the products' price.
- Add products to shopping cart.
- View shopping cart.
- Delete products from shopping cart.
- Sending the bell as SMS.

The user can do all of the previous processes via interacting with the following screens:

- Main screen.
- Start scan screen.
- View products' information screen.
- View shopping cart screen.
- User information.
- Market URL screen.

5.2.1 Main screen



This screen will be launched when the application starts. It contains three buttons that lead to other screens. This screen contains a button to make the user able to access the wireless and networks settings to connect to the market server.




Figure 5 Main Screen

The following table describes every button destination screen in our application in details:

Table 21 Main Screen Buttons Description

Button Name	Button Description
 Settings	This button redirects the user to edit market URL and edit user information screens using a menu.
Button Name	Button Description
 Wi-Fi	As for this button, it redirects the user to Wi-Fi settings in his/her mobile.

 Scan	It redirect the user to scanning screen to start scan the QR Code.
--	--

The following snapshot shows the menu that will be displayed when the user chooses settings button:

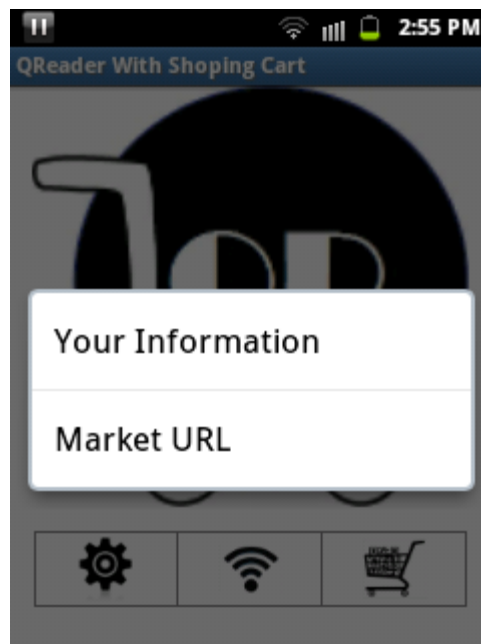


Figure 6 Setting screen

This screen contains two options; those options will be discussed in the following table:

Table 22 Settings

Option title	Option description
Your information	This option redirects the user to user information screen.
Market URL	This option redirects the user to market URL screen.

5.2.2 Your information screen

The user can select his/her unwanted ingredients. If the user did not enter his/her information yet, the application will restore the default data storage; which is only free pig fat.

The user can determine his/her preferences in food ingredients. He/she can select the unwanted ingredients. The user can save the changes made on his/her preferences in food ingredients using a simple data storage. User can update the data storage anytime.

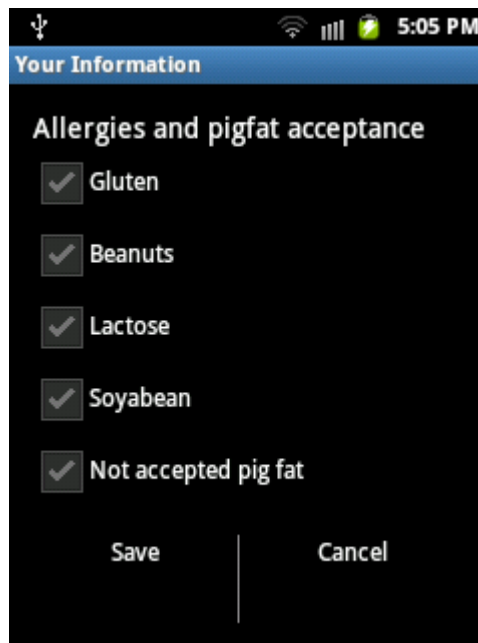


Figure 7 Your information

The following table describes each component of this screen in details.

Table 23 User information

Component name	Component type	Description
Gluten	Checkbox	If checked that mean that the user

		has allergy against gluten.
Peanuts	Checkbox	If checked that mean that the user has allergy against peanuts.
Lactose	Checkbox	If checked that mean that the user has allergy against lactose.
Soya bean	Checkbox	If checked that mean that the user has allergy against gluten.
Not accepted pig fat	Checkbox	If checked that mean that the user not accept the pig fat in the product.
Save	Button	It saves the information and redirects the user to the main screen.
Cancel	Button	Redirects the user to the main screen.

Essential points should be considered:

- When the user saves information, the value of each checkbox will be stored as a binary value in data storage store technique.
- For every ingredient in the above table, different names should be taken in consideration when filtering product ingredients.

The ingredients names above are displayed in expressions that the user understands. However, there are a dozens of other expressions used to name each one of these ingredients, they will be discussed in "Resources" section in this chapter. These expressions must be taken in mind when filtering the product ingredients.

5.2.3 Market URL screen

The user can edit the market URL by entering the market link. Every time the user enters a new market, he/she must update the

market link. The last visited market url is stored and the user edit it if needs.



Figure 8 Edit market URL

Table 24 Market URL screen

Name	Type	Description
Market link	Text input box.	<ul style="list-style-type: none">• The maximum length of the text must be 50 characters.• The user can get it from the market.
Save	Button	It saves the market URL and redirects the user to the main screen.
Cancel	Button	Redirects the user to the main screen.

5.2.4 Start scan

This screen is Barcode Scanner main screen; the user should place the QR Code inside the gray rectangle. When the user places the code inside the rectangle, yellow spots will mark the main patterns in the QR Code. After that, the code will be decoded and the user will be automatically redirected to view product information screen. After capturing the QR Code, the user will be automatically redirected to product information screen.

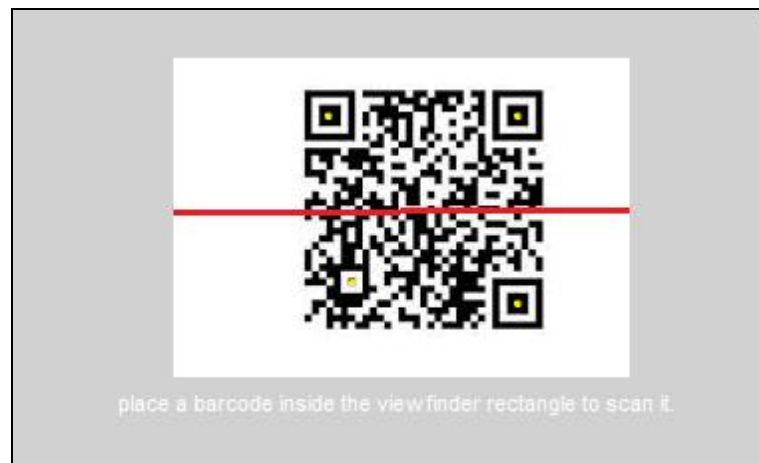


Figure 9 Scanning screen

In case, the user did not download the Barcode Scanner application. This screen will not be shown and he/she will be notified and asked to download this application to their device in order to start decoding QR Code. The following screenshot presents the dialogue box that will be displayed in that case.

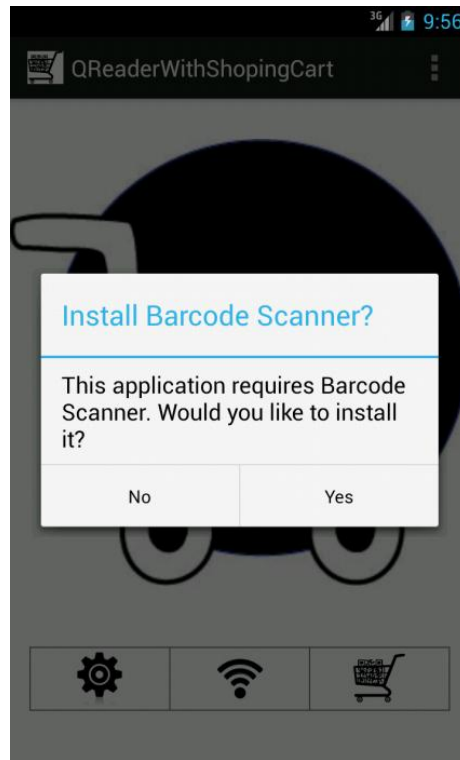


Figure 10 Download Barcode Scanner dialoge

The Barcode scanner is an application that developed by zxing team. This application can be easily downloaded from google play free. The following picture shows the applications logo.



Figure11 :Barcode Scanner logo

5.2.5 View product information

In view product information screen, the user can display the products' name and ingredients in a customized way. All of the products ingredients will be displayed, and the unwanted ingredients will be marked with another color.

The code will contain an ID for the product, by connecting to the market server and sending the ID to its database. The user will be able to display the products price (if existed), and also to add that product to the shopping cart and calculate the total invoice.

In case the user didn't connect to the market server. This screen also contains a button to make the user able to access the wireless and networks settings to connect to the market server. In addition, if there was no pricing database in the market, no price will be retrieved and the user will be notified.

Every android device has an option menu. By clicking the options menu, the user will be able to add the product to the shopping cart, and determine the number of items wanted from that product.



Figure 12 Product Information Screen

Table 25View product information

Name	Type	Source	Note
Ingredients	Read only	Decoded QR Code	Must be multiline

	text		
Price	Read only double value	Market database	-

The following picture represents the options menu for the product. By selecting add to the shopping cart option, the product will be added to the shopping cart. Also, the user can choose finished purchasing option; by selecting it, the user will be redirected to view the shopping cart and edit it.

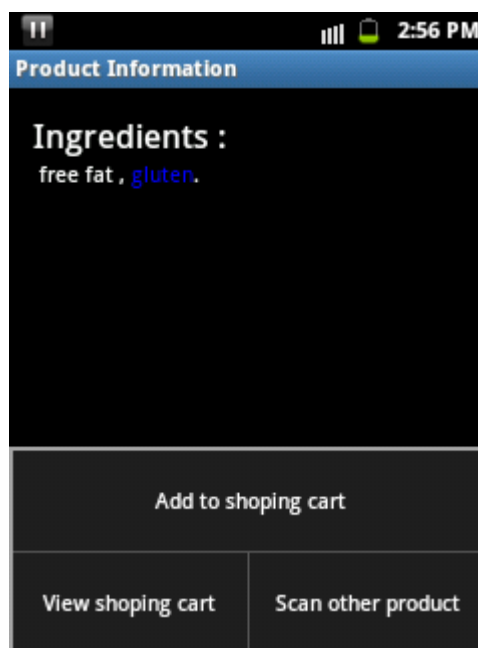


Figure 13 add to shopping cart

5.2.6 Shopping cart

The shopping cart screen contains a list shows all of the purchased items for the user. And it also contains a label shows the total invoice for the user.

By selecting any item, the user will be informed in how much the total invoice will be after deleting the selected item. Also the user can remove any item from the list via click and hold, then choose delete from list option. The total invoice field will be updated after every deleting process.

The following figure and table shows the shopping cart screen and its contents in details.



Figure 14 shopping cart screen

Table 26View shopping cart

Name	Type	Source
Items	Clickable list of string values	Simple database in the mobile
Total	Double	Sum of prices in the list

As we previously mentioned, the user can delete any product from the shopping cart using click and hold. The following picture shows the context menu for the cart list.

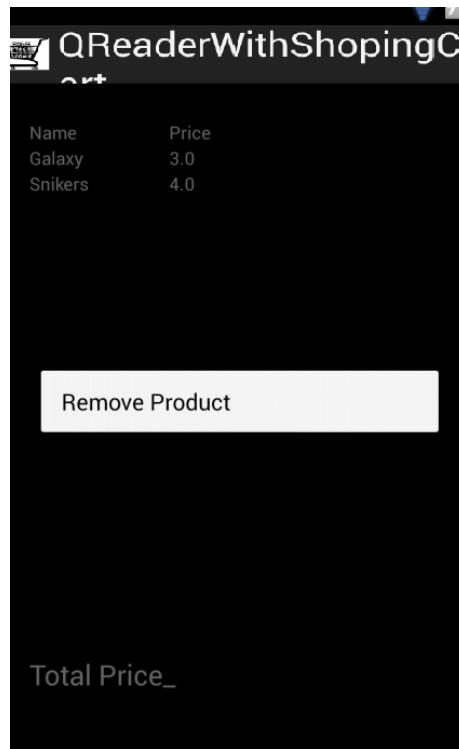


Figure 15 Delete item from shopping cart

By interacting with the options menu, the user can send the bell as SMS to any mobile number he/she wants. This is shown below.



Figure 16 sending bell as SMS

The following screen and table shows the dialog box that will be used to enter the destination mobile number in details.

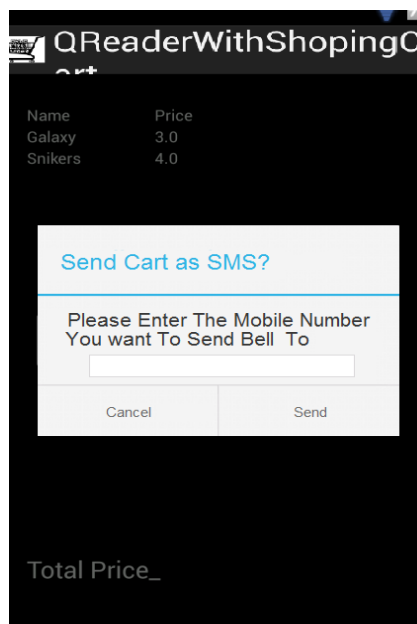


Figure 17 Send bell as SMS

Table 27 send SMS screen

Component name	Component type	Description
Mobile number	Numeric input box	The maximum size is 12 characters.
Send	Button	Sends the bell to the destination number.
Cancel	Button	Cancels sending and redirecting to shopping cart screen.

If the user chosen finished purchasing, he will be informed that all of the data in the shopping cart will be deleted as the following figure and table shows.

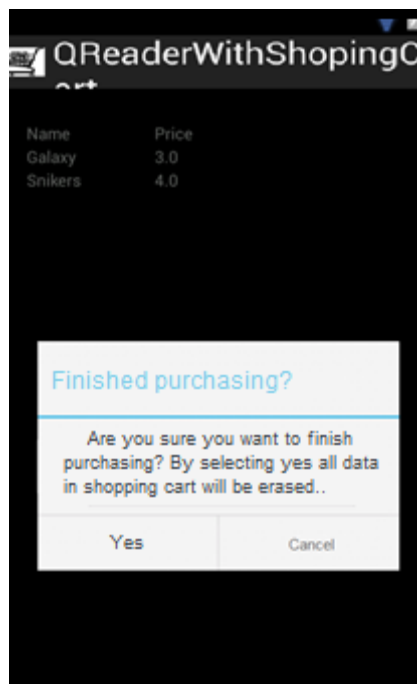


Figure 18 Finish purchasing

Table 28 Finish purchasing

Component name	Description
Yes	This button redirects the user to the applications main screen and erases all data in shopping cart.
Cancel	This button redirects the user to the shopping cart screen.

5.3 data storage

5.3.1 Preferences(data storage)

The preferences will be used to store the simple values that are needed in this application. Those values are the market link and the user preferences (unwanted ingredients).the unwanted ingredients will be stored in the preference as a binary value (0 or 1), 0 value will be stored when the ingredient is not checked and 1 value will be stored when the ingredient is checked.

Those preferences will be used during the products ingredients filtration. The ingredients that are checked will be marked in a text color that is different from the other ingredients text color.

5.3.2 SqlLite database

A simple database contains a single table will be used to store the shopping cart. In this section, we will describe the purchased products sqllite database in details.

5.3.2.1 Object class diagram

Table 29 object class diagram

Purchased products	
PK	Id
	Name Price

5.3.2.2 Data dictionary

This table contains all the information needed for the shopping cart. The attributes and data types are discussed in the table below:

Table 30 Data dictionary

Attribute	Type	Size	Key	Null?	Constraint
Id	Integer	3	PK	No	Auto increment
Name	Varchar	15		No	
Price	Float	4		No	

5.3.3 XML arrays

The xml array files will be used to store the different names for each ingredient. Those arrays will be saved in the android device and separated from the other parts of the application. In every filtration process, the arrays will be referenced in every filtration process.

5.4 Programming constrains

Several types of permissions will be needed to run this application on android device. Those permissions are:

- Hardware controls to use the camera for capturing the QR Code picture from the products cover.
- Using internal storage of the mobile phone to save the shopping cart and modify its contents.

- Connect and disconnect from Wi-Fi using system tools of the device, and searching for the available networks.

5.5 Resources

Every food ingredient may have more than one name for one thing, Those names should be adapted while searching for a specific ingredient. Those ingredients are listed as the following:

- **Peanuts**
 - Arachidic acid
 - Nu-Nuts
 - Arachide
 - Monkey nuts
 - Beer nuts
 - Mandelona nuts
 - Goober nuts
- **Soyabean**
 - Bean curd
 - Bean sprouts
 - Edamame
 - Kinako
 - Miso
 - Natto
 - Nimame
 - Okara
 - Hydrolyzed soy protein (HSP)
 - Mono- and di-glycerides
 - MSG (monosodium glutamate)
 - Soy
 - Soy lecithin

- Soy protein
- Soybean oil
- Soya
- Shoyu
- Soy sauce
- Soybean
- Tamari
- Tempeh
- Teriyaki sauce
- Textured vegetable protein (TVP)
- Tofu (dofu, kori-dofu)
- Yuba

Chapter Six

System Implementation, Testing, and Recommendation

Contents:

- 6.1. Introduction
- 6.2. Development Software tools
- 6.3. System implementation
- 6.4. Faced problems
- 6.5. Important code
- 6.6. Some concerns about application installing
- 6.7. Testing
- 6.8. Recommendation and future work

6.1 Introduction

In this phase, we code the designed application in the previous chapter. Indeed we test our application to build free errors as possible as we can. During that we faced a lot of problems, because of used of a new software tools inn building the application. Therefor we talked about major problems faced us in implementation.

6.2 Development software tools

In this section we will depict the most important software are used in development the application, which are:

- Android Development Tools Bundle.
- <http://sql5.000webhost.com>.
- Microsoft Office 2010.
- <http://www.createely.com>.

6.2.1 Android Development Tools Bundle

Android Development Tools (ADT) plug-in for Eclipse is an addition to the Eclipse IDE that supports the creation and debugging of android applications. which includes:

- Eclipse
- Android SDK Tools
- Android Platform Tools
- Latest Android Platform
- Latest Android System Image for Emulator

Advantages of using Eclipse:

- Reduce time and cost of the application creation and maintenance.
- Open source.
- Can be merged with different environments like PHP, ASP.net....etc.
- The ability of incorporate animation and media.
- Can separate the design from the code using extensible markup language (XML).

6.2.2 <http://sql5.000webhost.com>

00webhost is a website for free hosting for the web applications. It provides top class free web hosting services without advertising. There are no hidden costs, no adverts, and no restrictive terms. It also provides lightning fast speeds, maximum reliability and user support. Every account receives 1500MB space and a whopping 100GB bandwidth. It supports the latest version of PHP and MySQL. The following PHP features are fully supported:

- PHP mail() function and Send mail.
- Curl, GD2 library, XML, Zend, .htaccess support.
- fopen() and PHP sockets.
- safe_mode is OFF, file uploads are ON.
- Zend Optimizer support, Ioncube loader.
- It works well with several platforms such as android.

6.2.3 Microsoft Office 2010

It is a Microsoft product. It includes word processor (Microsoft Word). The "Microsoft Word" word processor is used to complete the projects' documentation.

6.2.4 <http://www.creately.com>

It is a free website used to draw and create the software engineering charts. Creately helps team members to work effectively wherever they are using the cloud-based collaboration software. It also provides an easy to use and high value diagramming tool that saves time and money, whether it is used for a business consultant, a web designer, a software developer or even a student.

6.3 system implementation

Steps for starting new application in ADT:

1. Write the application name (should start with upper case), the full package name, minimum SDK, targetSDK(maximum SDK), Compilation SDK, and the theme. In our project the minimum SDK is API 8 and maximum SDK is API 17.

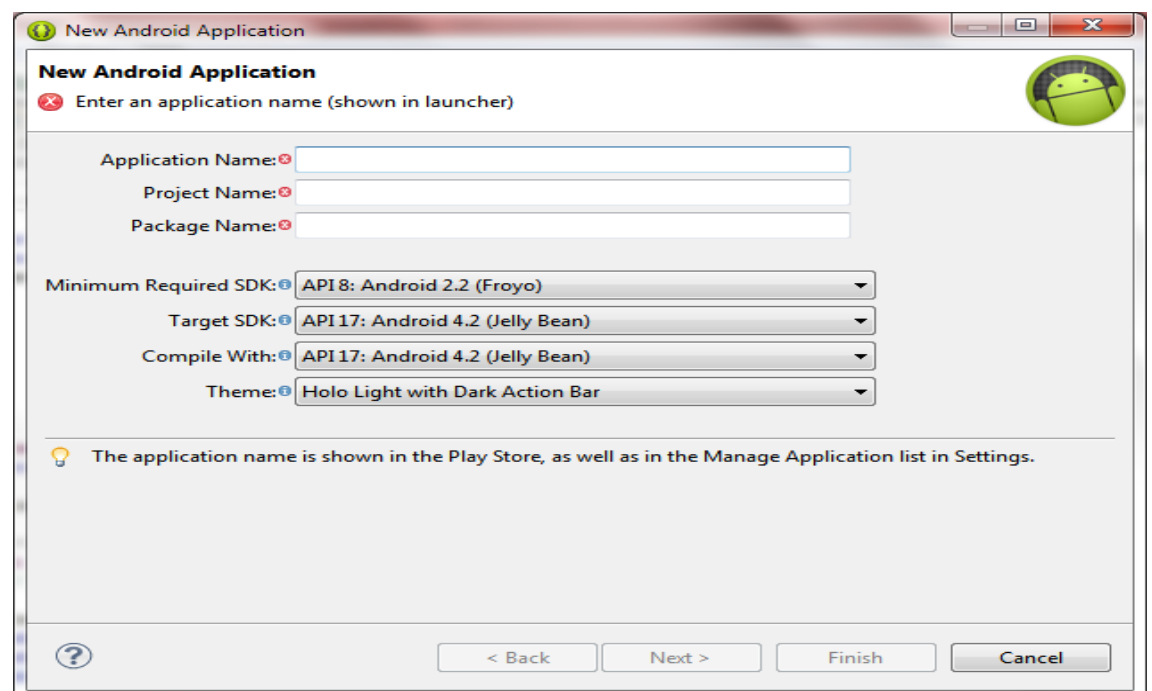


Figure 19 Create new android application

2. Write the application configuration

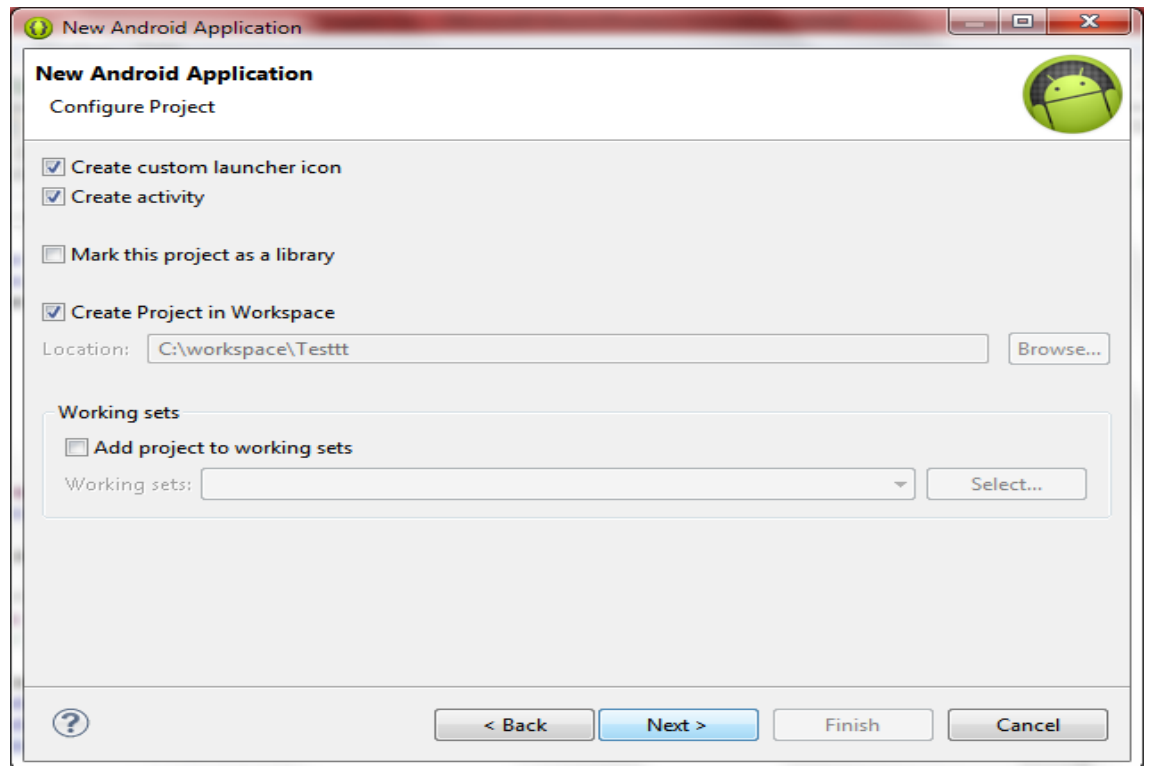


Figure 20 Application configuration

3. Configure the application icon. In our project, the team made their own logo and inserted it via "image" button and defined its attributes such as shape and background color.

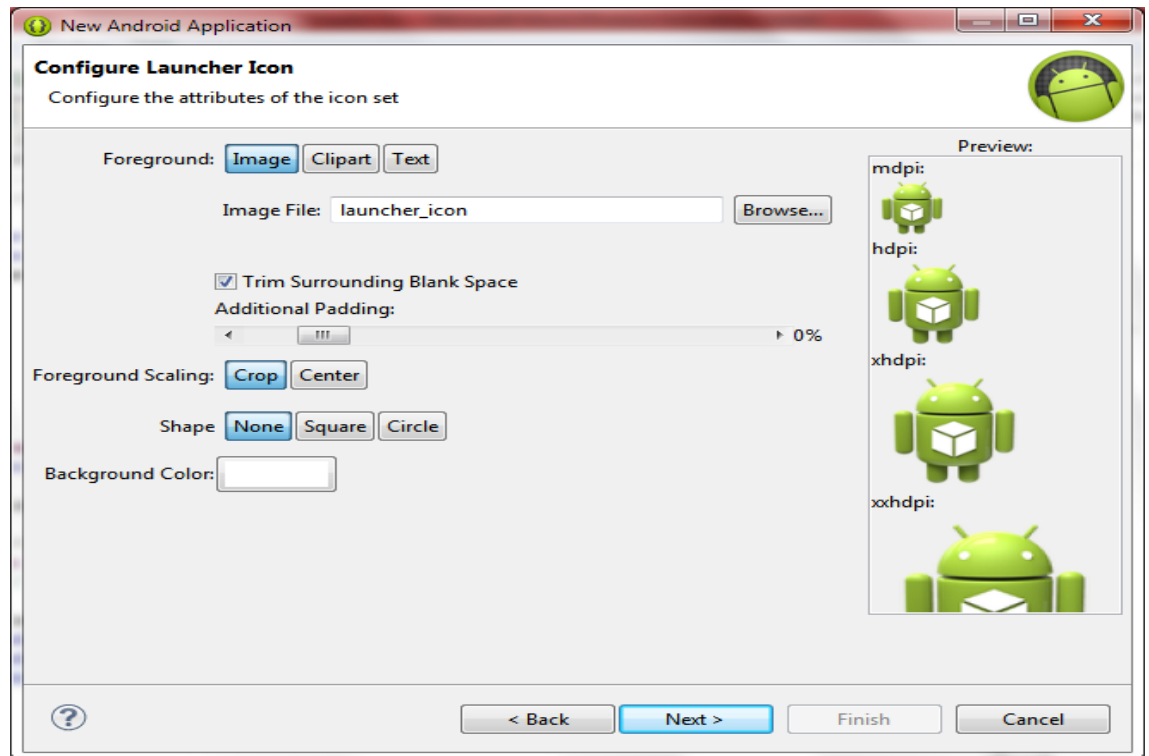


Figure 21Icon configuration

4. Create an activity and select the kind. The project team chosen a Blank activity.

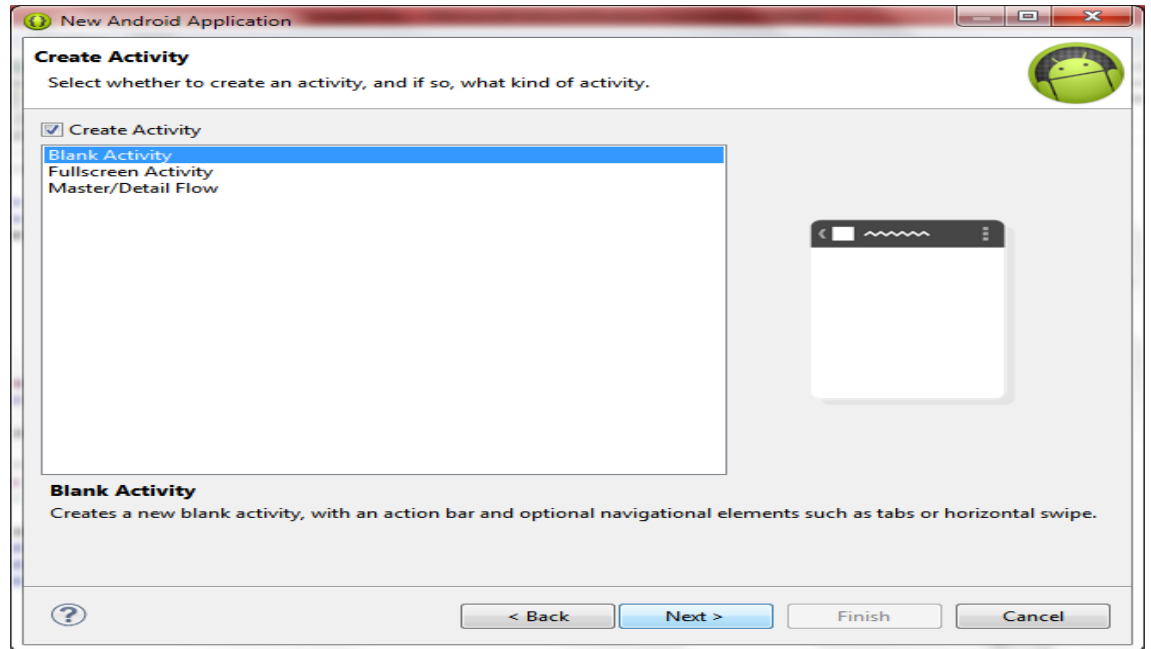


Figure 22Create Activity

5. Write the activity name, layout name, and the navigation type. And finish creating the application.

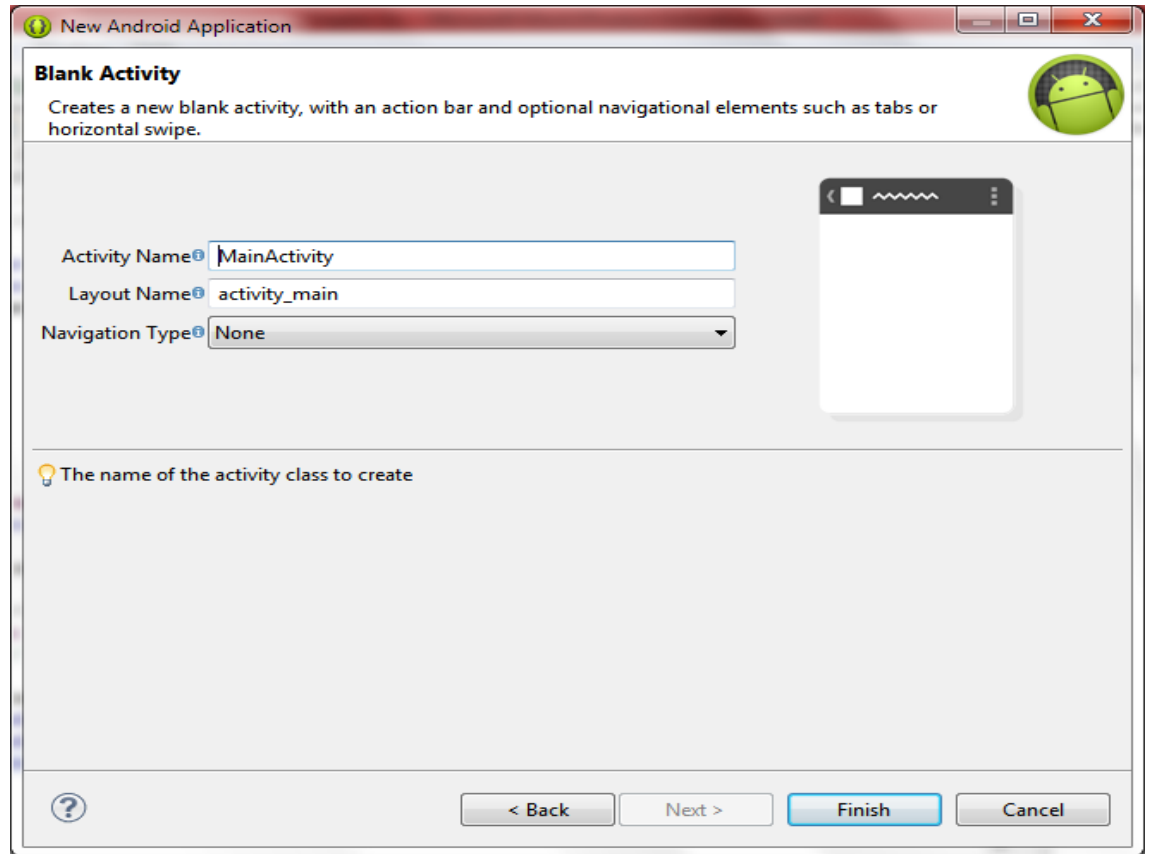


Figure 23 Activity and layout names

6. Start designing the user interface

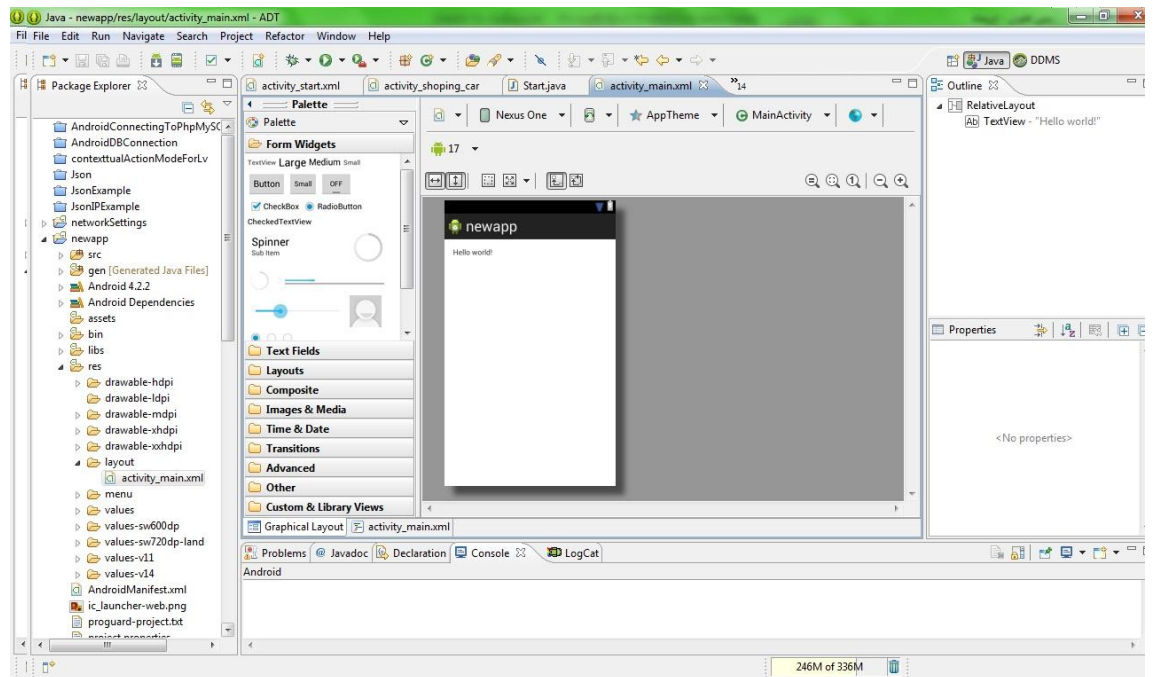


Figure 24 Starting interface designing

7. Insert the needed code for user interaction

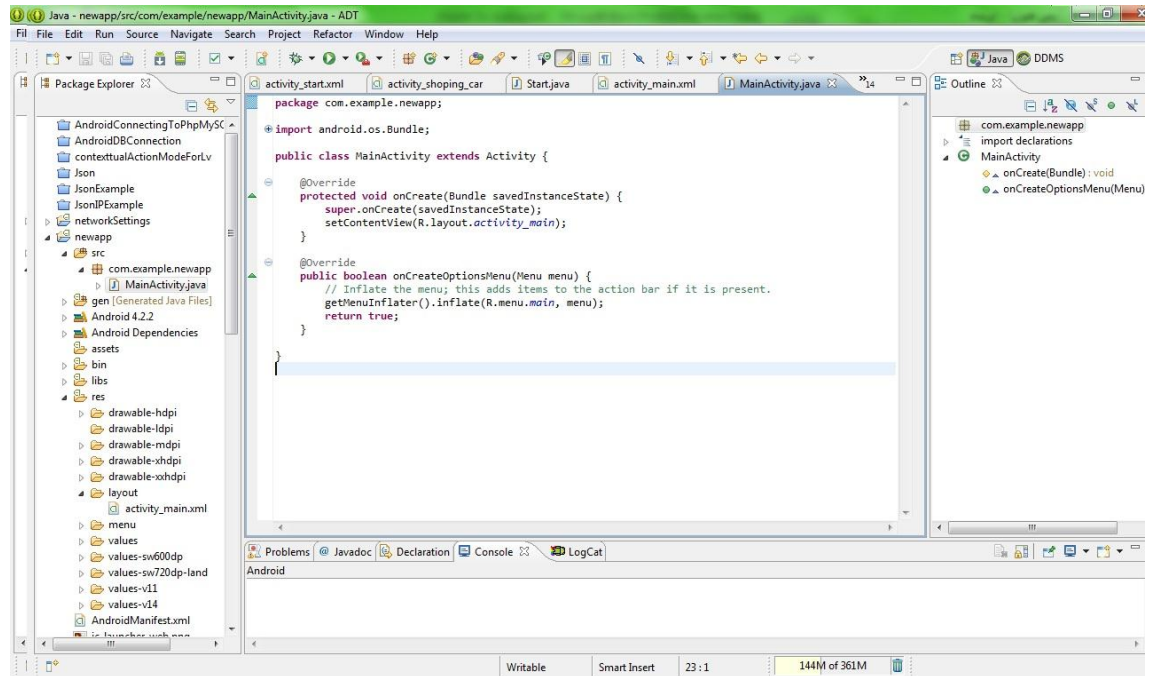


Figure 25 Inserting the needed code

6.4 Faced problems

During the system implementation phase, the project team faced several problems, such as:

1. The system developed using android development tools. Moreover, programming the project has been done in parallel with the teams' learning about android development tools.
2. The team faced a problem in finding a free hosting website for testing.

The project team solved the previous problems by doing the following processes:

1. The project team had to learn android development subjects and functionalities before their being presented into the classes.
2. The project team tried to deal with several free web hosting web applications, and 000webhost.com was the best.

6.5 Important code

In this section, we will provide a glance about some important code in our project. Here are some important parts of the code:

1. The filtration code:

```
publicSpannablearraysValues(){

    SpannablemodStr=newSpannableString(qrStr);
    SharedPreferencespref=
    this.getSharedPreferences("userPref",
    Context.MODE_APPEND);

    beanut=pref.getInt("beanut", 0);
    gluten=pref.getInt("gluten", 0);
    lactose=pref.getInt("lactose", 0);
    soyabean=pref.getInt("soyabean", 0);
    fat=pref.getInt("fat", 0);

    if(beanut==1){

        arr=getResources().getStringArray(R.array.
        BeanutArray);
        modStr=filter(arr,modStr);
```

```

    }

    if(lactose==1){

        arr=getResources().getStringArray(R.array.
LactoseArray);
        modStr=filter(arr,modStr);
    }

    if(gluten==1){

        arr=getResources().getStringArray(R.array.
GlutenArray);
        modStr=filter(arr,modStr);
    }

    if(soyabean==1){

        arr=getResources().getStringArray(R.array.
SoyabeanArray);
        modStr=filter(arr,modStr);
    }

    if(fat==1){

        arr=getResources().getStringArray(R.array.
FatArray);
        modStr=filter(arr,modStr);
    }

    return modStr;

}

```

2. Getting the product id from the encoded data:

```
Public float pricing(String str){
    float p;
    String newStr = null;
    Pattern pattern =
        Pattern.compile("#(.*?)#");
    Matcher matcher = pattern.matcher(str);
    if (matcher.find()) {
        newStr=matcher.group(1);
    }
    p=Float.parseFloat(newStr);
    indx=newStr.length();
    return p;
}
```

3. Filling the shopping cart with items and prices:

```
Private void populateList() {

    Product product;
    list = newArrayList<HashMap<String,
        String>>();
    HashMap<String, String>temp ;
        List<Product> p=
            pd.getAllProducts();
    for(int i=0;i<p.size();++i){
        product=p.get(i);
            temp = newHashMap<String,
                String>();
        temp.put(FIRST_COLUMN,
            product.getName());
        temp.put(SECOND_COLUMN, "\t");
        temp.put(THIRD_COLUMN,
            product.getPrice()+"");
    }
```

```
list.add(temp);  
}
```

4. Filling the form with the users' preferences in food products:

```
pref= this.getSharedPreferences("userPref",  
Context.MODE_APPEND);  
  
if(pref!=null){  
    beanut=pref.getInt("beanut", 0);  
    gluten=pref.getInt("gluten", 0);  
    lactose=pref.getInt("lactose", 0);  
    soyabean=pref.getInt("soyabean", 0);  
    fat=pref.getInt("fat", 0);  
}  
if(beanut==1){  
    chkBeanut.setChecked(true);  
}  
else{  
    chkBeanut.setChecked(false);  
}  
if(gluten==1){  
    chkGluten.setChecked(true);  
}  
else{  
    chkGluten.setChecked(false);  
}  
if(lactose==1){  
    chkLactose.setChecked(true);  
}  
else{  
    chkLactose.setChecked(false);  
}  
if(soyabean==1){  
    chkSoya.setChecked(true);
```



```

        }
    else{
        chkSoya.setChecked(false);
    }
    if(fat==1){
        radioNotAccepted.setChecked(true);
    }
    else{
        radioAccepted.setChecked(true);
    }
}

```

5. getting all products from the SQLite database:

```

public List<Product>getAllProducts(){
    List<Product> products = new
        ArrayList<Product>();
    Cursor cursor=database.query(
        MySQLiteHelper.TABLE_Products,
        allColumns, null, null, null, null,
        null);
    cursor.moveToFirst();
    while(!cursor.isAfterLast()){
        Product product =
            cursorToProduct(cursor);
        products.add(product);
        cursor.moveToNext();
    }
    cursor.close();
    return products;
}

private Product cursorToProduct(Cursor
    cursor) {
    Product product= newProduct();
    product.setId(cursor.getLong(0));
}

```

```

        product.setName(cursor.getString(1));
        product.setPrice(cursor.getFloat(1));
        return product;
    }

```

6. calculating total price for the purchased items:

```

public float getTotalPrice(){
    float p;
    Cursor c = null;
    c.moveToFirst();
    do{
        c=database.rawQuery("select sum("
            +MySQLiteHelper.COLUMN_PRICE+"
            from" +
            MySQLiteHelper.TABLE_Products,
            null);
    }while(c.moveToNext());
    p=c.getFloat(0);
    return p;
}

```

6.7 Testing

Testing is the most important step before delivering the system, it's done to make sure that the system works as expected and satisfy the system functional and non-functional requirements. The system need to be tested to check the efficiency and the effectiveness of the system. The system will be tested according to the following levels:

- Unit testing.
- Sub-system testing.
- Integration testing.

- System testing.

6.6.1 Unit testing

In unit testing we divided the system into several separate components, and then we tested each component separately to make sure it achieves the requirements. Our system contains number of unit testing cases. Such as decoding the QR Code, storing the preferences for the unwanted food ingredients, adding data to the SQLitedatabase and retrieving it, connecting to PHP server and get the product price from it, and filtering the products ingredients to highlight the unwanted ingredients if found.

In this section we will discuss the connecting to PHP server unit case

Table 31 Unit testing

Case number	Case title	Expected result	Actual result
1	Losing internet connection or wrong market URL.	Connection establishing error and check the market URL notification.	Error message.
2	All information retrieved correctly.	Display the product price.	Display the product price.

Case 1: In this case no internet connection and wrong URL are merged together in one test case. The result is provided as the following:



Figure 26 Losing internet connection or wrong market URL

Case 2: The product price is displayed on the screen. The result is provided as the following:



Figure 27 All information retrieved correctly

6.6.2 Sub-system testing

Subsystem testing helps with checking the compatibility of the different system parts that interact with each other's. And examine whether they interact correctly or not. Mainly, these test cases check the data transferring between different activities. This test includes data decoding and sending it to the filtration activity, then displaying the product ingredients with some highlighting.

Table 32 Sub-system testing

Case number	Case title	Expected result	Actual result
1	No preferences	No highlighting	No highlighting.

	stored or no matching found.	for product ingredients.	
2	Existed preferences and matches found.	Highlighting the matched product ingredients.	Some highlighting found.

Case 1: No preferences stored or no matching found. The result is provided as the following:

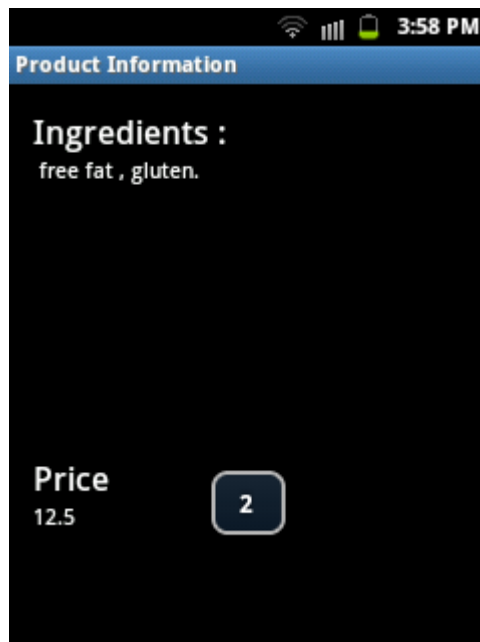


Figure 28 no preferences or no matching found

Case 2: existed preferences and matches found. The result is provided as the following:

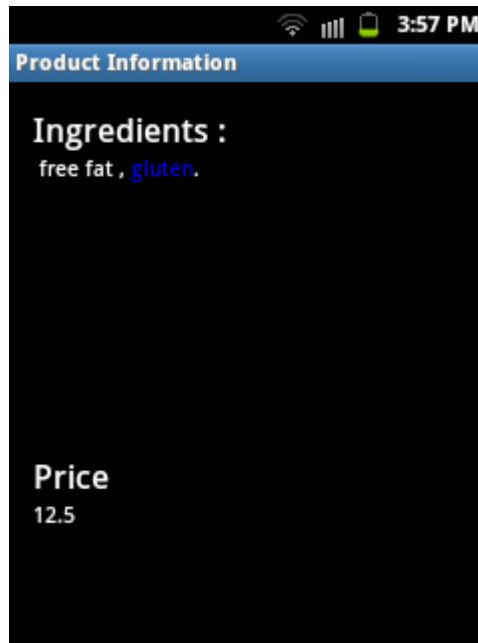


Figure 29 fixed preferences and matches found

6.6.3 Integration testing

In this phase the integral functions and sub-systems will be tested as one unit. This is done to insure that the individual modules are combined and tested as a compatible group. The case that will be discussed is retrieving the product price and name and adding it to the shopping cart.

Table 33 Integration testing

Case number	Case title	Expected result	Actual result
1	There is no connection to the market database or the market doesn't	No price or name found.	No price found. Add the product to the cart with unknown name

	have a database.		and zero price.
2	The price and name was retrieved successfully.	No price or name found.	The product is successfully added to the cart.

Case 1: There is no connection to the market database or the market doesn't have a database. The test result can be shown as the following:



Figure 30 There is no connection to the market database or the market doesn't have a database

Case 2: The price and name was retrieved successfully. The test result can be shown as the following:



Figure 31 The price and name was retrieved successfully

6.6.4 System testing

The aim of this phase is to validate system accuracy, performance and efficiency. It also simulates a real data under environment requirements. The team members test the system; they were trying to simulate the real environment to make sure that the system functioning just like it intended to be in the real world.

6.7 Conclusion and future work

The aim of this project is to provide a new system that deals with encoded food ingredients from health point of view. It also added the pricing technique to it. By adapting this system many problems will be solved for the customers and markets.

The project team achievements can be identified as the following:

1. Building a mobile application that can be able to decode the product ingredients and retrieve the data from it.
2. The application filters the ingredients and highlights the unwanted ones.
3. The application gets the price from the market database and displays it in the application.
4. The user can add the product to the shopping cart and calculate the total invoice.
5. The user can send the bell to the interested ones before going to the cashier.

For the future work, the following cases are recommended to work on:

1. The user's ability to add allergies and get synonyms for each one manually.
2. Providing QR Code to voice representation and notifying the user about the unwanted ingredients verbally.
3. Make market URL as QR Code.

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