National Chiao Tung University

Department of Computer and Information Science

Thesis

EZBuy :個人化採購輔助系統

EZBuy: Personalized Shopping Assistance System

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June, 2011

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國 立 交 通 大 學

資 訊 科 學 系

碩 士 論 文

A Thesis

Submitted to Department of Computer and Information Science

College of Electrical Engineering and Computer Science

National Chiao Tung University

in partial Fulfillment of the Requirements

for the Degree of

Master

in

Computer Science and Engineering

June 2011

Hsinchu, Taiwan, Republic of China

中華民國一百年六月

結合手持行動裝置與網路服務平台之消費者需求輔助系統

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摘要

隨著時代的演進，手機逐漸成為人們外出時，不可缺少的東西，然而隨著手機的功能越來越強大，不僅僅只適用於通話之中，在日常生活中，常因為各種因素如：宗教信仰(素食、禁止吃牛肉、豬肉或飲酒等)、體質問題(過敏、疾病)以及減重需求需計算每日卡路里的攝取等因素，而這些因素將影響我們對於飲食的需求，因為宗教信仰而不能吃某些食物，因體質問題必須進行飲食控制等，現在我們可以利用手機來協助改善我們外出飲食購物的需求。為此在本論文當中，將提出一套系統-"EZBuy My Product Info"，使用者可以利用該系統，方便地購買符合使用者的喜好和需求的產

品，而這套系統將結合網路服務平台與手機軟體應用。透過網路服務平台，使用者需先行註冊個人資訊與特殊需求並進行編輯，例如：宗教信仰、慢性疾病或體質問題，造成在飲食中不能有哪些食物出現，以及查詢歷史購物清單，了解曾經買過哪些產品或是分享所買的東西，如：建議購買的產品、寫出他們對於購買該商品的評價，以及提供飲食控制與健身相關資訊等。而在手機軟體之中，藉由手機裝置上的攝影機，針對所想要購買的產品，掃描上面的條碼資訊，與所提供的網路服務平台進行連線，透過條碼資訊進行產品查詢，取得產品的各種資訊給予使用者參考，如：產品中包含的成分是不是有不符合特殊因素需求，例如包含：牛肉、豬肉或是素食等、有哪些疾病者可能需要注意這些產品可能對你會有所影響或是該產品中所包含的卡路里有多少等各種資訊。然而根據使用者使用本系統後進行調查每位使用者對於該系統的功能是否可協助他們的需求，，本系統對於使用者而言可以提供一個方便的查詢他們對於購物時的參考資訊來源。在另外一方面，也將針對實作系統所需之條碼讀取技術進行探討。

EZBuy: Personalized Shopping Assistance System

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ABSTRACT

With the steady growth and affordability of camera phones, available hardware and communication systems, and modern middleware technologies, more necessary mobile applications have become possible. These technologies integrated with barcode systems assist developing mobile-phone based barcode recognition applications. These applications can facilitate people shopping and improve life quality. Consumers can use the mobile built-in camera to scan a barcode that presents on virtually every product world-wide, then middleware and communication technologies are used to recognize the barcode and access product-related information.

Because the creation of such mobile phone based applications that provide services and information to real-world objects is currently very attractive, we propose an innovative software system called "EZBuy: My Product Info" that

makes use of modern middleware technologies and available hardware and communication systems. People can use the system to easily buy products that fit with their preferences and needs.

The system consists of mobile-phone J2ME based side to scan product barcodes, recognize it, submit user inquiries to a server, and display results. Results are related to whether users can eat or drink the product based on user preferences and needs such as religion (no meat, beef, pork, or wine), or health settings such as allergies, chronic diseases or calories. Also, the system includes web services "User web page" to facilitate user access to online profiles for editing accounts, and subscribing to other services. The results of testing our system show that the system can provide useful services for consumers and satisfies their needs.

Acknowledgement

Foremost, I would like to express my sincere gratitude to my advisor Prof. Yuan, Shan Ming for the continuous support of my master study and research, for his patience, motivation, enthusiasm, and immense knowledge. His guidance helped me in all the time of research and writing of this thesis. I could not have imagined having a better advisor and mentor for my master study.

Besides my advisor, I would like to thank the rest of my thesis committee: Dr. Sheau-Ling Hsieh and Dr. Hsien-Tang Lin, for their encouragement, insightful comments, and supports.

The most special thanks goes to my best partner and friend, my husband Yousef, he gave me his unconditional support and love through all this long process.

Last but not the least, I would like to thank my family: my parents : Yasser and Mariam Droubi, for giving birth to me at the first place and supporting me spiritually throughout my life.

Eman

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I. Introduction and overview of the system

1.1 Introduction

Nowadays, manufacturers and markets use barcode to track a product so that storing and selling become easier. A barcode is a small image of lines and spaces that represent numbers and other symbols. A barcode symbol typically consists of five parts: a quiet zone, a start character, data characters (including an optional check character), a stop character, and another quiet zone [1]. It represents data by combining these parts that containing products information. This information can be extracted using an optical scanner barcode reader.

Different standards have been used in the barcode systems. One of these standards is the EAN-13 "**European Article Number**" barcode which is a 13 digit (12 + check digit) ant it is a superset of the original 12-digit Universal Product Code (UPC) system developed in the United States. The EAN-13 barcodes are used worldwide for marking products often sold at retail point of sale. The numbers encoded in EAN-13 bar codes are product identification numbers. All the numbers encoded in UPC and EAN barcodes are known as Global (GTIN).

Today's consumer products packaging has introduced a noticeable amount of product-related information. This includes nutritional information, ingredients, contents which may cause allergy, and country of origin. There is also a plenty of additional product-related information that is not directly printed on the product packaging due to size constraints and possibly commercial considerations, e.g. reviews by consumer watch groups or price comparisons [2][3].

Due to the limited amount of space available on the product packaging and its static nature, the information cannot be customized for consumers who find it difficult sometimes to choose products that fit with their preferences and needs. In addition consumers might want seeing allergy-related

information in large print, non-natives might like to see the information in a different language, and females prefer seeing nutritional facts in more details to maintain their diets. Mobile phones have the possibility to solve many of these problems [4][5].

Mobile phone based applications are useful when being "on shopping", e.g., while shopping; a simple and fast user interaction is needed, requiring the automated recognition of objects. The barcode system can be integrated with mobile phones enabling more useful services. Mobile phones comprise display, long-range communication capabilities, processing, and user profile storage capabilities [6]. Employing mobile phones and image recognition technologies to identify a product barcode in shopping offers simple and faster interaction. Since new versions of mobile phones implement new kinds of applications such as taking photos, and movie shooting by using built in camera, Also, the growth in 3G mobile phone, combined with wide availability of barcode makes the development of consumer-related mobile application a promising future. In addition, the built in camera devices can be used as new input interfaces such as for symbol recognition. By adding an application that using the camera for supporting symbol recognition, such as of EAN-13 barcode, we can solve a lot of consumer's problems.

We address the problem of people shopping according to their preferences such as culture, allergy, health, calories based diet, preferences and dislikes. People who travel to new countries usually face difficulties to adapt themselves to the new life. One of the most important difficulties is food/drink shopping especially when the language written on products is not the same as their native language. People will find it difficult to find the desired product, to know the ingredients of a product, and read warnings and other important information. Furthermore, people may come from different cultures with religious restrictions on food and drinks as people might not be allowed to eat meat, beef, or pork or drink wine. In addition to shopping in a foreign country, people in their native countries may need to monitor what they buy. People with chronic diseases or who have allergy to a specific food or drink need to watch carefully what they eat and drink. Also, people who are on diets need to calculate the number of calories in their food.

Our proposed system consists of: A User Web Page that enable the consumer to input his needs, preferences and dislikes, and create his own health and preferences profile, a J2ME based mobile application for the EAN-13 barcode recognition on camera phones and a corresponding Java based server for linking the recognized product code to products database and the created user health and preferences profile. There are two versions of our system; the first one called EZBuy1, with this system, consumers can quickly find answer for their question "Is the product is fine with me?" The second version of our system "EZBuy2" was designed after considering consumers suggestions. By using EZBuy2 consumers can know not only if the product is suitable to their needs but also they can know why, also they can know how percentage the product is suitable to them. Our Thesis describes the modified version of our system "EZBuy2", the differences between the two versions will be described in more details in chapter5.

We hope that our system helps in bridging the gap between shopping problems and users' needs and allow the community to quickly develop and try out more realistic and widespread applications, and thus gain real-world experiences for better jump-starting the future internet of things, today.

1.2 Motivation

The idea of linking real-world products with users' requirements is very important. Consumers can buy products which are completely suitable to their preferences and needs. Nowadays there are many available open sources products databases like SINFOS1, Codecheck2, WikiFood3, or web services, such as those offered by Amazon. All provide the possibility to get information about a certain product; once it's worldwide unique EAN13 (European Article Number) number is known. The information accessible by these resources is often more extensive than the data printed on the product package itself, representing an added value to consumers.

For example, for food related products there is information available regarding contained allergens or genetically modified ingredients. Even though such data might be highly relevant for some user

groups, getting fast and easy access to this information is not readily granted, especially when it is needed most: when one is “on the go”, e.g., when one is standing in the supermarket and deciding what to buy. With the increasing mobility of powerful computing systems, e.g., mobile phones or handheld PDAs, the gap between the user and product related data as well as services can be bridged.

In order to develop useful and usable systems we have first to understand user needs, represent them in user requirements and maintain a focus on user requirements throughout the development [5]. In a way, the challenge is how to bridge the gap between the technical world of the designers and the professional world of the users, so the idea proposed in my system came from the use of mobile phones and communication technologies at shopping. The proposed system shall satisfy the requirements of the consumers and enable providers in the markets to satisfy consumer needs.

1.3 Problems

Imagine yourself in another country that means different language, different culture, and different life style. If you have special needs such as: Pork in your culture is forbidden to eat, Soy beans cause allergy to you or you don’t eat a specific kind of food. Maybe you will be in the case that no one can understand your language and you can’t read what is written on the product package, so what would you do in this situation.

Because shopping behavior is repetitive, consumers have multiple opportunities to make sure that the product is suitable to them or not, such as: asking the shop keeper, asking another consumer or just trying to understand some information from the photos on the product package, "EZBuy: My Product Info" system solves this problem by using a consumer mobile phone and products database.

Following some problems that may face consumers at shopping:

1. Consumers want to buy food products acceptable in their culture.

2. Consumers need to know if the product causes allergy or not.

3. Consumers with private health problems can't eat all kind of foods; they want to buy products suitable to their health situation.
4. Females care about beauty and fitness, so they want products that fit with their calorie based diet.
5. Consumers want a product compatible with their preferences and avoiding their dislikes.
6. Consumers want a system that can suggest some products fits with their needs and inform them about new items.
7. Consumers want read/write comments and feed backs about a product.
8. Consumers hope that they can suggest products to markets and tell the vendors about their needs.

1.4 Solution

In order to solve the previous problems we propose a complete system that consists of: User web page, J2ME based mobile application and java based server. The user web page allows consumers to create their own health and preferences profile which contains: User Culture, Allergy Type, Diseases and Health case, Calories Based Diet, User preferences and dislikes. The system can store users' health and preferences profile in a "User Preferences" database before going shopping.

J2ME based mobile application can be used while shopping to scan and recognize products EAN-13 barcodes, then send the barcode to java based server with the user ID. The java based server is responsible for comparing the product information with the user health and preferences profile after scanning the barcode, and returning the results. After these process consumers can find the answer if the product fits with their needs or not and know how percentage the product is suitable to them.

In addition, the user web page provides many services that can help consumers to know more about the products. It also presents information about the relation between the food and health, diseases, allergies, and cultures.

Below are the services that the user web page provides:

1. Allowing consumers to check the shopping history depending on the previous scanned barcodes which helps in remembering the amount of products bought this month and making decisions about next month shopping budgets.

2. Providing automatic functions such as Suggestion Products and New Items, which helps consumers by suggesting some items that fit with their health and preferences and inform them if there are new products in the market that are suitable to them.

3. By integrating "EZBuy: My Product Info" with a real markets and vendors the system allows consumers to suggest some new products, so vendors can know users needs and wishes from their shop.

4. Providing a service to enable consumers to write feed backs and read others comments.

5. Enabling consumers to contact by sharing their experience and bad; good stories about diet.

All of these services that the system provides will be explained in more details later.

The following graph shows the basic features of the system.

Figure 1: System outlines

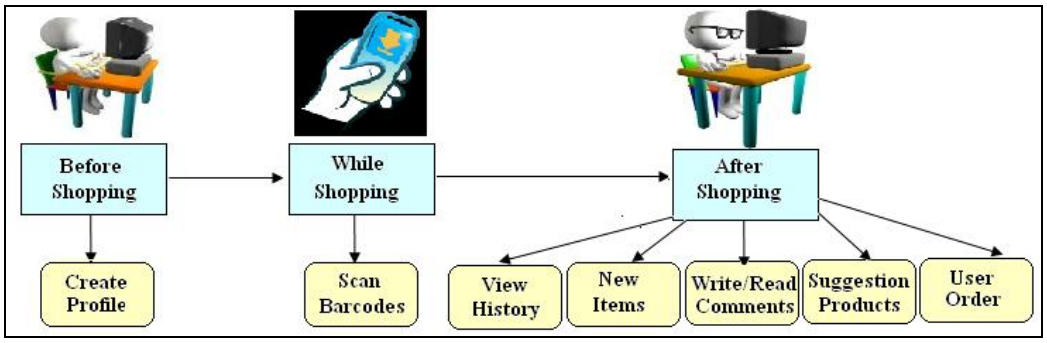


Figure 1 shows the key points of the suggested solution. And it contains the following:

1. **Before Shopping**: Create User Health and Preferences Profile.

2. **While Shopping**: Scan Products Barcodes and recognize it.

3. **After Shopping:** View History, Suggestion Products, New Items, Write/Read feedbacks, Sharing Diet Experience and User Order.

1.4.1 Why mobile phone and J2ME?

Over the past decade, mobile communications technology has made giant development, moving rapidly from the first generation (1G) of analog voice-only communications, to the second-generation (2G) of digital voice and data communications. Now, a revolutionary third-generation (3G) mobile communications platform has arrived. Third generation mobile network is a wireless communication system for a range of radio technologies that are designed to enhance the capabilities for radio-based networks. 3G is designed to offer high-speed e-mail and Internet access. Besides that, 3G also allow transmission of large-scale data. The rapid development of mobile communication technologies and the rapidly growing number of mobile devices result in the fast growth of Mobile E-Commerce, M-Commerce [7] [8].

Traditional E-Commerce applications are typically developed over the Web for human-computer interaction. These applications require that users must login the intended Web sites from their PCs through Internet. Also, users often need to visit lots of websites to conduct electronic transactions, which is a time-consuming process. Traditional E-Commerce restricts more normal behaviors of users. With the advancement in mobile technology, many business activities can be conducted through wireless networks, which extend the demands of client users for spatial location and realizes these enterprise demands. M-Commerce deals with selling goods, services, and contents that include related functions like advertising and payment transactions over wireless networks which are connected in real time and from any place. 3G is viewed as a necessary underlying infrastructure for the m-commerce.

Our system proposes the architecture of M-Commerce systems applied to 3G networks based on J2ME technology. In chapter 2, we will give a brief description of the related background technology such as M-Commerce, 3G and J2ME platform. Thereafter, chapter3 describes the architecture for our system and introduces the design and implementation of the system applied to 3G network platform using J2ME. Finally, it draws conclusions on the benefits of such system.

Below some features that mobile phones supported:

1. Send and receive data, access WAP services, and provide full Internet access using technologies such as GPRS.
2. Sending and receiving pictures and videos through MMS, and for short distances with e.g. Bluetooth.
3. The ability to download new applications and services.
4. Large display screens.

1.4.2 Why barcode?

A barcode is an optical machine-readable representation of data, which shows data about the object to which it attaches. Originally, barcodes represented data by varying the widths and spacing of parallel lines, and may be referred to as linear or 1 dimensional (1D). Later they evolved into rectangles, dots, hexagons and other geometric patterns in 2 dimensions (2D). Although 2D systems use a variety of symbols, they are generally referred to as barcodes as well. Barcodes originally were scanned by special–optical scanners called barcode readers, scanners and interpretive software are available on devices including desktop printers and smart phones [9] [10].

In similar words barcode is a method of representing data by combining series of vertical lines that contain product information. This includes nutritional information, ingredients, contents which may

cause allergy, and country of origin. This information can be extracted using an optical scanner barcode reader. The European Article Numbering (EAN)-13 barcode is used internationally for tagging retail goods [1].

Our system focuses on extracted theses information about the product not by using an optical scanner but by using mobile phone camera.

Next section describes previous works related to our system that helps us in introducing a complete system for various people with different needs.

1.5 Related Research

In this section we review several systems developed based on barcode, mobile phones and image recognition technologies.

1.5.1 MyMobiHalal 2.0: Malaysian Mobile Halal Product Verification using Camera Phone Barcode Scanning and MMS.

Junaini and Abduallah developed a system to automatically scan barcode to recognize Halal food (food can be eaten by Muslims) using mobile phones [11]. This research describes a mobile-based support application that can be used only by Muslims to identify the Halal status (prepared in accordance to Islamic law) of the product using mobile device.

The application requires the user to have a mobile phone with minimum of one mega pixel camera resolution for capturing the barcode image. The application server is central in this project. The database of Halal products is stored in the application server. This server also provides a platform for barcode recognition process. The barcode images sent by the consumer will go through the application server and to be processed. Then, the recognized barcode number is being used to determine Halal products for Muslims. The main objective of this project is to enhance the user input from SMS to MMS.

1.5.2 A Barcode-Scanner Aid For Visually-Impaired People.

Visually-impaired people living independently face problems in determining the contents of packaged foods, both at home and when shopping in modern, 'self-service' stores. This work was aimed at assessing the feasibility of using product barcodes as an aid to the identification of package contents [12]. This work reported here was prompted by a member of the public, who contacted the University of Southampton with the suggestion that the barcode technology widely used in the food vending industry might also be used to help visually-impaired people identify the contents of food packages and developed such a device " A scanning device" which could read barcodes and output information about package contents in synthetic speech or tactile form was seen as potentially useful in both the home context and for food shopping.

1.5.3 Information Management System of Grocery Production Processing Based on a Bar Code Identification Technology.

This system brings forward with a method of adopting a bar code technology which is successfully applied to a production processing information management of a grocery enterprise [13].

Barcode technology has widely been applied in materiel management of production processing. As people are familiar with, car, television and mobile phone etc. are composed from much different hardware and each of hardware has an exclusive identification code followed, and that the number, the shape and the estate of the hardware do not happen to change during the whole production processing.

A terminal product is made up of much hardware by different craftwork flow [6]. It is easier to adopt barcode technology to practise the production processing management when the terminal product (such as television, mobile phone etc.) is made up of standard hardware. How to effectively manage the production processing and analyze the devotion and the output of materiel is a problem that a grocery enterprise all along wants to resolve when the product (such as biscuit etc.) crank out of non-standard materials.

1.5.4 Barcode Readers using the Camera Device in Mobile Phones.

This system shows new algorithms and the implementations of image reorganization for EAN/QR barcodes in mobile phones. The mobile phone system consists of a camera, mobile application processor, digital signal processor (DSP), and display device, and the source image is captured by the embedded camera device [14].

The camera device and application processor are necessary hardware components for this system. The application processor is needed to implement the camera interface, LCD controller, DSP for image processing, and application host CPU for real-time computations. The application processor works for displaying of the menu and preview in the display and computing of code recognition and decoding in real-time. With these systems, the user can control the position of the camera and decide the capture timing. The processing flow is as follows.

1. **Execute the barcode reader application:** The application processor is changed into barcode reader mode by user menu selection.
2. **Capture from embedded camera device:** The source images are captured by the embedded camera device via the camera interface, and these images are sent to two units, the DSP for image processing and the LCD controller for displaying the user preview.
3. **Process the image in DSP:** The code is detected and processed in the DSP from the captured source image, and the processed image in this phase is output as the normalized size and binarized image of the code area.
4. **Decode the code:** the processed code data in the previous phase is decoded in the host CPU, and the decoded code is derived to the application software.
5. **Display the results:** the host application displays the decoded results.

The introduced algorithm is based on the code area found by four corners detection for 2D barcode and spiral scanning for 1D barcode using the embedded DSP. This algorithm is robust for practical situations and the DSP has good enough performance for the real-time recognition of the codes.

1.5.5 Toolkit for Bar Code Recognition and Resolving on Camera Phones - Jump-Starting the Internet of Things.

Robert Adelmann , Marc Langheinrich and Christian Flörkemeier have developed a freely available EAN-13 bar code recognition and information system that is both lightweight and fast enough for the use on camera equipped mobile phones, thus significantly lowering the barrier for large-scale, realworld testing of novel information and interaction applications based on "connected" physical objects [3]. A toolkit consisting of: a J2ME client for the barcode recognition on the camera phones, and a server for linking the recognized product code to free databases on the internet.

1.5.6 Research and Application of the EAN-13 Barcode Recognition on Iphone.

College of Computer Science and Technology Sichuan University in Chengdu, Sichuan Province, P.R.CHINA presents an image processing algorithm which relies on knowledge about structure and appearance of ID barcodes. It is capable of interpreting a particular type of barcode, called EAN-13, take by the camera phone. Their contribution is an algorithm which is both fast and robust. In the future, we will focus on two things to make the barcode recognition more accurate and useful: one is improving the algorithm to shorten the decoding time; the other is establishing a shopping guide platform by using the barcode as a key to allow users to easily search and update the goods information [15].

1.6 Why EZBuy is different?

EZBuy “My Product Info” system is different from the previous systems in three aspects: The first aspect is using efficient barcode recognition that supports camera zoom-in and zoom-out functionality. This reduces the effect of the size and distance constraints. The second aspect is using middleware technologies that support web services to allow users to add any service they want and enable it on their mobile phones. Finally, we include different types of communication technologies such as 3G

and Wi-Fi. The 3G communication offers high data transfer speed and capacity. The Wi-Fi can be used if a mobile phone doesn't have 3G communication since Wi-Fi can provide useful information at real time [16].

My suggested system is a hybrid and integrated from the previous researches with new features as the following:

1. This system is not only intended for the Muslims but also to anyone coming from a religion and culture with special needs.
2. It provides "allergy assistant" service which can be used to warn the user just only by a single click.
3. It provides away to help consumers buy products suitable to their preferences.
4. It provides a good way to manage consumer's weight and take care about their health.
5. Not only the system based on the mobile application but also it provides a user web page which provides several services in addition to recognize the barcode.

II. System Analysis

This chapter discusses the requirements, use cases and the basic architecture of the system according to the problems and solutions shown in chapter 1.

The requirements described in section 2.1 of chapter 2. In section 2.2, use cases for consumer depending on user and system specifications are shown, and the system architecture with its main components and communication architecture are explained in section 2.3.

2.1 Requirements

This part shows the need of the system and what user expects from the system to do. Basically the requirements are divided to user and system requirements. Both were described after several meetings with the users who will use and test "EZBuy: My Product Info".

2.1.1 User requirements:

The users of the system are consumers from different cultures, different genders, various ages, each one has special needs. The user requirements were put as the following:

1. Users shall be able to create their own user name and password, log in to user page, create user profile depends on their culture, allergy type, health case, calorie based diet, preferences and dislikes.
2. Users shall be able to log in to "EZbuy: My Product Info" application using their mobile phones, scan products barcodes and see the results.
3. Users shall be able to view history based on the previous scanned barcodes.
4. Users shall be able to view suggestion products from the system depending on their preferences and needs and know if there are new items in the shop suitable to them.

5. Users shall be able to read users' comments and feedback, and write their comments on specific product.
6. Users shall be able to tell the vendors about their needs and suggest new items.
7. Users shall be able to use various services about diet, calories and fitness.

2.1.2 System Requirements:

This part describes the functional and non functional requirements of the system depending on the user specification for each function in the system.

The following table shows the functional requirements:

Table 1: Functinal Requirements

Function	Description
Log in	Provide access to the system according to user privileges
Create account	To create user name and password.
Create Profile	To select culture, allergy type, disease, diet type, preferences and dislikes.
Edit profile	Edit old profile.
Show history	To enable the user to check his previous history based on the scanned barcode.
New items	To inform the user if there is new products in the market suitable to user profile.
Suggestion products	To allow the system to suggest products to the user based on the scanned barcodes.

Write feedback	To allow the user to write his feedbacks about specific product.
Show feedbacks	To enable the user to see other users comments.
Tell us what do you need	To enable the user to suggest new products which help vendors to know market needs.
Body mass index calculator	Calculate user body mass index to know his perfect weight.
Calorie counter	Helping the user determine the calorie count for many calories in food, including fast food calories, calories in fruit and calories in restaurant food.
Calories required to lose weight	Helping the user to know the number of calories that you need depends on the size of your body and your level of activity
Pound to kilo converter and vice versa.	Convert the user weight from pounds to kilo or vice vera
Write your story	Enable the user to write his bad/good experience with diet.
Read story	Show other users stories about diet.
Log off	Leave the system

The second part of the system requirements is the **nonfunctional** requirements summarized as the following:

1. Fill out questionnaire: each user should answer some questions in a questionnaire which is a research instrument consisting of a series of questions and other prompts for the purpose of

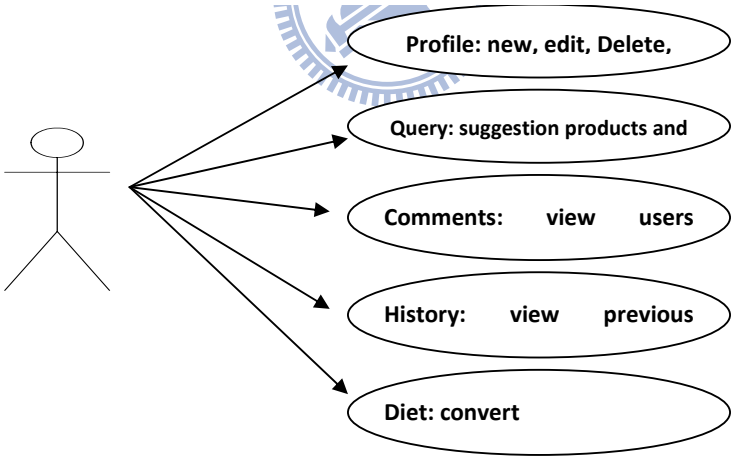
gathering information from respondents. It's designed for statistical analysis of the responses and help to improve the system.

2. Timer: the timing property is used to refresh the comments web page in order to check the database for new received comments.
3. User friendly: the system shall have a suitable user interface for users of different levels and ages. The system was implemented by .net framework which contains attractive objects and tools.
4. Reliability: several tests and intensive debugging shall be run to discover system errors and avoid future problems.

2.2 Use Cases

This part shows the use cases for the user depending on user and system specifications. The following figure describes consumer use cases.

Figure 2: Consumer Use Cases



2.3 System's Architecture

2.3.1 Main Components:

The architecture of the "EZbuy: My Product Info" system contains three parts: the barcode recognition component running entirely on J2ME enabled mobile phones that support the MMAPI9 (Mobile Media APIextension) extension, the user web page, and the Java based information server component, which is located on a separate server, to which the detected product code is transmitted via a GPRS "3G" or via Wi-Fi connection.

The J2ME mobile application provides functionality to recognize an EAN13 code, communicate with the server and display the results. The information server uses a plug-in architecture, allowing us to quickly add various services and compare users profile with the product information. The external server provides us with greater extendibility, higher flexibility and better performance.

The following figure shows the system functions and how these functions are integrated together.

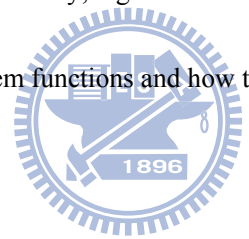
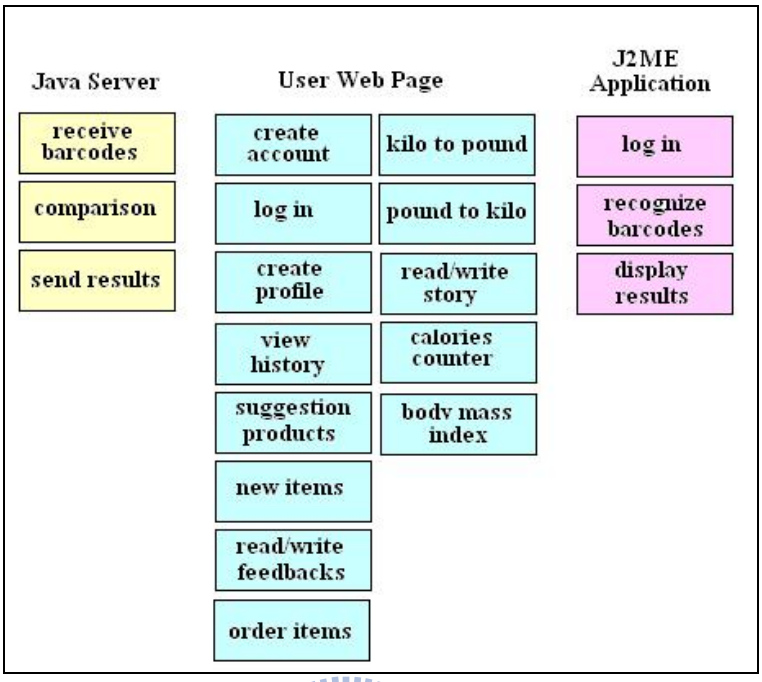


Figure 3: Components and Function Architecture



2.3.2 Communication Architecture:

The previous architecture involves three types of servers in which all components are communicating together. The first one is the database server which represents the core of the system where all data are stored. The second server is the web server which provides data exchange between the client and the database through internet protocol and http. The third server is java server which is responsible for sending products information and receiving EAN-13 barcode. These servers are shown in the following figure:

Figure 4: Communication Architecture

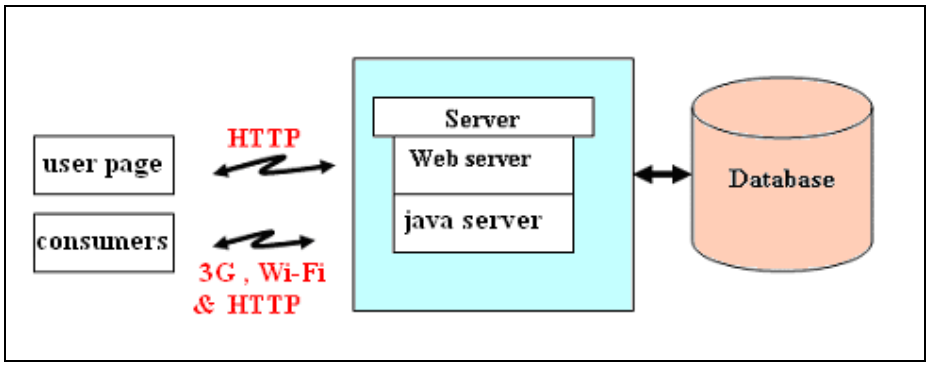


Figure 4 shows the consumer uses the system via the web. He enters the data and access the database through the web pages. On the other hand consumers also use the system via the 3g and Wi-Fi.

2.3.2-1 Why HTTP

HTTP web part represents the information exchange method. In our system consumers use the web site “user web page” for creating user name and password, creating profile, showing history, suggestion products, new items, user order, and read/write feedbacks. HTTP (Hypertext Transfer Protocol) is the foundation protocol of the World Wide Web. It sets the rules for exchanges between browser and server. It provides for the transfer of hypertext and hypermedia, for recognition of file types, and other functions.

HTTP concepts include (as the Hypertext part of the name implies) the idea that files can contain references to other files whose selection will elicit additional transfer requests. Any Web server machine contains, in addition to the Web page files it can serve, an HTTP daemon, a program that is designed to wait for HTTP requests and handle them when they arrive. Your Web browser is an HTTP client, sending requests to server machines. When the browser user enters file requests by either "opening" a Web file (typing in a Uniform Resource Locator or URL) or clicking on a hypertext link, the browser builds an HTTP request and sends it to the Internet Protocol address (IP address) indicated by the URL. The HTTP daemon in the destination server machine receives the request and sends back

the requested file or files associated with the request. (A Web page often consists of more than one file).

2.3.2-2 Why Wi-Fi and 3G

In this section, a brief overview of these technologies is discussed.

1. WI FI

WI FI stands for wireless fidelity and generally refer to any type of 802.11 networks, whether 802.1lb, 802.1la, 802.11g. WI-Fl is a wireless technology that uses radio frequency to transmit data through the air. W LAN access point or hub or transmitter sends out a wireless signal that allows Wireless devices to access within a circle of roughly 100 meters. Zone around the transmitter is known as hot spot. Computers connected to WI Fl receivers near a hot spot can connect to Internet at high speeds without cable. WI-Fl refers to three types of wireless protocols that can work with each other: IEEE 802.1 lb ("Wireless B"), IEEE 802.1 la ("Wireless A"), and the newer IEEE 802.1lg ("Wireless G"). They can connect computers very fastly: 11 Mbps for Wireless B, 54Mbps for Wireless A, and 54Mbps for Wireless G. [17] which are described in subsequent sections.

1. 802.llb
    1) It is the longest, well-supported, stable, and cost effective standard, runs in the 2.4 GHz range that makes it prone to interference from other devices (microwave ovens, cordless phones, etc) and also has security disadvantages
    2) Limits to the number of access points to three.
    3) It has 11 channels, with 3 non-overlapping, and supports rates from 1 to 11 Mbps.
    4) Uses direct-sequence spread-spectrum technology.
2. 802.1lg
    1) It is an extension of 802.1 lb, with the same disadvantages (Security and interference)
    2) It has a shorter range than 802.1 lb

3) It is backwards compatible with 802.1 lb so it allows a Smooth transition from 1 lb to 1 Ig
4) It is flexible because multiple channels can be combined for Faster throughput, but limited to one access point
5) It runs at 54 Mbps,
6) Uses frequency division multiplexing technology

3. 802.lla
   1) It is completely different from 1 lb and 11g.
   2) It is flexible because multiple channels can be combined for faster throughput and more access points can be collocated
   3) It has shorter range than 1 lb and 1 Ig
   4) It Runs in the 5 GHz range, so having less interference from other devices
   5) It has 12 channels, 8 non-overlapping, and supports rates from 6 to 54 Mbps
   6) It uses frequency division multiplexing technology.

WI-Fl is a trademark of the WI-FT Alliance (formerly the Wireless Ethernet Compatibility Alliance), the trade organization that tests and certifies equipment compliance with the 802.1 lx standards.

Advantages of Wi-Fi:

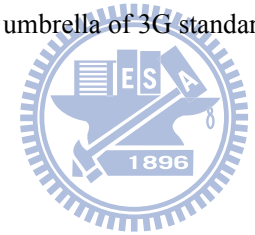
1) It Uses an unlicensed portion of the broadcast spectrum, and requires less regulatory controls in many countries.
2) It frees network devices from cables, allows for a more dynamic network to be grown.
3) Many reliable and bug-free WI-Fl products on the market.
4) Competition amongst vendors has lowered prices considerably since their inception.

2. 3G (3rd generation)

3G stand for 3rd generation mobile telephone systems. It is a technology for mobile service providers. 3G combines high-speed mobile access with Internet Protocol (IP) based services. 3G can use a variety of present and future wireless network technologies.

The first mobile services were analog. Mobile services began to emerge in the 1940s, the first mass market mobile services in the U.S. were based on the AMPS (Advanced Mobile Phone Service) technology. IT is referred to as first generation wireless. The FCC licensed two operators in each market to offer AMPS service in the 800-900MHz bands. In the 1990s, mobile services based on digital mobile technologies are known as second generation (2G) of wireless services. In the U.S., these were referred to as Personal Communication Systems (PCS) and used technologies such as TDMA (Time Division Multiple Access), CDMA (Code Division Multiple Access) and GSM (Global System for Mobile Communications). [17] From 1995 to 1997, the FCC auctioned off PCS spectrum licenses in the 1850 to 1990 MHz band. CDMA and TDMA were deployed in the various parts of the U.S., while GSM was deployed as the common

standard in Europe. The next or Third Generation (3G) mobile technologies hopes to support higher bandwidth digital communications and are expected to be based on one of the several standards included under the ITU's IMT-2000 umbrella of 3G standards [18].



III. System Design

This chapter discusses the details of each function and component in the system. The relations among these components are shown using the context design model. The design is divided into two types that are web based system, j2me based application and java based system.

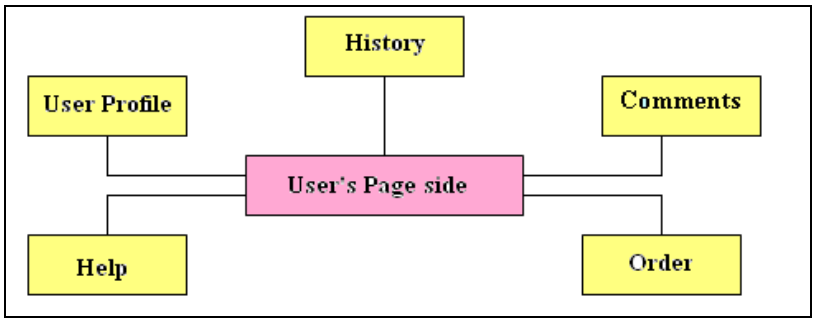
3.1 Web Based System

The web based system contains all functions performed using the web pages in the user page side. The web pages were designed by ASP.NET which provides many visual tools that enhance the user interface such as text box, list box and buttons. The web pages are saved in the ASPX format. IIS web server is used to connect the web site with the internet network.

3.1.1 User page side

Figure 5 shows the context model for the main parts in the user page side. After the consumer logs in to the system he will be able to perform the main tasks in the system.

Figure 5: user page side context model



1. User profile

This part contains the following functions:

1) **New:** this function allows the user to create new user profile. User profile must contain several items: culture type, allergy type, calories based diet, health and disease case, preferences and dislikes.
2) **Edit**: this function allows the user to edit previous profile.
3) **Delete**: this function allows the user to delete his profile.

The following sections describe the items included in the user profile and the design facts:

3.1.1-1 design facts

1) User culture and religion

Food is an important part of religious observance and spiritual ritual for many faiths including Christianity, Judaism, Islam, Hinduism and Buddhism. The role of food in cultural practices and religious beliefs is complex and varies among individuals and communities. Any introduction to such a diverse and complex topic will not be able to include everything. Instead, here is a sample of some ways in which various religious groups include food as a vital part of their faith [19][20]. Understanding the role of food in cultural and religious practice is an important part of showing respect and responding to the needs of people from a range of religious communities. However, it is important to avoid assumptions about a person's culture and beliefs. This item enable the user to choose his culture from Dropdown List, the system automatically will create user profile, which will used to a comparison with the product information after scanned the barcode. The user will be able to know if the product is acceptance for him or not based on his culture and religion as shown below.

a. **Christianity:**

The various faiths of Christianity include Roman Catholic, Orthodox and Protestant. The

regulations governing food and drink differ from one to the next, including some faiths that don't advocate any restrictions.

Selected facts include:

1) Some Catholic and Orthodox Christians observe several feast and fast days during the year. For example, they may fast or avoid meat on Fridays, during Lent or on Good Friday. Some eat fish instead.
2) Most Protestants observe only Easter and Christmas as feast days and don't follow ritualised fasting.
3) The ritual of communion is regularly celebrated by many Christians. This involves eating bread and drinking wine (or substitutes) to represent the body and blood of Jesus Christ.
4) Some Christians don't drink alcohol. These include many members of the Salvation Army and other Protestant churches.
5) Mormons and Seventh Day Adventists also avoid caffeinated and alcoholic beverages. Many Seventh Day Adventists don't eat meat or dairy products. Those that do eat meat don't eat pork.
6) Self-denial (of food), or fasting, is sometimes considered to be 'praying with the body'. It is believed to improve spiritual discipline by overcoming the sensations of the physical world and focusing on prayer and spiritual growth. It may also be used by some Christians as a way to respect those people around the world who regularly face starvation or malnutrition.

b. Judaism

Judaism can be Liberal or Orthodox, depending on how strictly people follow (adhere to) the Jewish laws. Kashrut refers to the laws pertaining to food in the Jewish religion. Kosher

means that a food is 'fit' or permitted. Foods such as pork and shellfish are strictly forbidden. The Jewish 'food laws' originated more than 3,000 years ago and contribute to a formal code of behavior that reinforces the identity of a Jewish community. Food forms an integral part of religion in life for a practicing Jew.

Other selected facts include [21]***:***

1) Foods must be prepared in the right way in order to be Kosher; for example, animals that provide meat must be slaughtered correctly.
2) The consumption of certain foods, including dairy products and fish, is subject to restrictions; for example, there are rules forbidding the mixing and consumption of dairy products with meats.
3) Ritualised fasting is also included in Judaism. For example, Yom Kippur – the Day of Atonement – is a Jewish fast that lasts from approximately dusk till dusk.
4) Jewish feast days include Rosh Hashanah and Passover.
5) The Passover commemorates the birth of the Jewish nation. The food eaten helps to tell the story of the Exodus; for example, bitter herbs recall the suffering of the Israelites under Egyptian rule.

c. Islam:

Moderation in all things (including eating and dietary habits) is central to the Muslim way of life. When done according to the way of Allah, daily acts like eating are considered a form of worship. In Islam, the concept of Halal – meaning 'lawful or permitted' – is applied to all areas of a person's life and includes regulations surrounding food. All foods are allowed (Halal) except for those that are considered harmful. Prohibited foods (and other aspects of life) are called Haram [22].

Other selected facts include:

1) The list of Haram foods includes pork, alcohol and any products that contain emulsifiers made from animal fats, particularly margarines.
2) Bread or bread products fermented by yeast may possibly contain traces of alcohol and so may be considered Haram.
3) Gelatine made from pork or from any other animal that is not Halal is forbidden. (Some gelatines may be Halal.)
4) Caffeinated drinks such as coffee may be considered Haram.
5) Muslim fasting periods vary. The month of Ramadan requires mandatory fasting from dawn until dusk as do other dates of religious significance, such as the ninth day of Zul Hijjah.

d. Hinduism

Hindus believe in the interdependence of life. People who practice the Hindu religion don't eat meat from animals or any food that has involved the taking of life. They also avoid foods that may have caused pain to animals during manufacture. 'Karma' is believed to be the spiritual load we accumulate or relieve ourselves of during our lifetime. If a Hindu consumes animal flesh, they accumulate the Karma of that act, which will then need to be balanced through good actions and learning in this life or the next [20][19].

Selected facts include:

1) Many Hindus are vegetarian but this is not compulsory.
2) Depending on the level of adherence to this belief, in many cases beef is forbidden while pork is sometimes restricted or avoided.
3) Prohibited animal products tend to vary from one country or region to the next. For example, duck and crab may be forbidden in one geographical location while fish may be part of the staple food for people living in other areas.
4) Most Hindus do not eat beef or beef products, because the cow is held to be sacred.
5) Dairy products including milk, butter and yoghurt may be eaten.

6) Foodstuffs such as alcohol, onions and garlic are thought to inhibit the Hindu's quest for spiritual enlightenment. They are therefore avoided or restricted.
7) Fasting depends on the person's caste (or social standing) and on the occasion; for example, rules regarding fasting depend on whether the day has religious or personal significance.

e. Buddhism

The dietary rules of Buddhism, which is more of a life philosophy than a religious doctrine, depend on which branch of Buddhism is practiced and in what country.

Selected facts include [21]**:**

1) In his multiple lives on Earth, Buddha cycled through various animal forms before attaining the form of a human being. Most Buddhists choose to become vegetarian to avoid killing animals.
2) Similarly to the Hindu concept of Karma, Buddhism proposes that violence or pain inflicted on others will rebound on you, hence the need for a vegetarian lifestyle. Some Buddhists believe that a contributing cause of human aggression is violence against animals.
3) Some Buddhists avoid meat and dairy products, while others only shun beef. This is affected by cultural, geographical and dietary influences.
4) Religious dates vary from one region to the next. Mahayana Buddhism, for example, celebrates three festivals for the birth, enlightenment and death of Buddha, while Theravada Buddhists observe all three events on a single day.
5) Buddhist monks tend to fast in the afternoon.
6) Buddhist monks and nuns are not allowed to cultivate, store or cook their own food; instead, they must rely on 'alms', which are donations from believers. This sometimes includes meats, as monks and nuns aren't allowed to ask for specific foods.

2) Allergy type:

Food-allergic people need comprehensible, complete, reliable, and personalized information about food products. Today, such integrated information is not available mainly because of different interests of the stakeholders in the food value chain [19][23]. This item enable the user to choose his allergy type from Checkbox List, the system automatically will add user allergy type to user profile, which will used to compare with the product information after scanned the barcode. Within this system we introduce an approach that is able to warn the user of potential allergic reactions to an item with a single click.

Food allergy is when your immune system reacts to a particular food [23]. This causes inflammation of the body's tissues, which in some cases can be life-threatening. It should not be confused with food intolerance, which is completely different. In both cases you get symptoms when you eat even small quantities of certain foods.

But food intolerance is not caused by the immune system. This means symptoms are usually limited to the digestive system (vomiting, diarrhea) and are rarely life-threatening.

A lot of people avoid eating certain foods because they mistakenly believe they are allergic to them. Actual food allergy is rare and tends to run in families [24]. Only 5 to 8 in 100 infants and 1 to 2 in 100 adults have a food allergy. You are more at risk if you or any family members have other allergic diseases, such as eczema, asthma and hay fever. If you suspect that you are allergic to a type of food, you should get a diagnosis from your doctor or a qualified specialist in allergic diseases before making substantial changes to your diet.

An Overview of Common Food Allergies: More than 160 foods have been found to cause food allergies in sensitive individuals. However, eight major food allergens account for over 90 percent of all documented food allergies in the United States and represent the foods most likely to result in severe or life-threatening reactions.

These common food allergies include:

1. Milk
2. Eggs
3. Fish (e.g., bass, flounder, cod)
4. Crustacean shellfish (e.g., crab, lobster, shrimp)
5. Tree nuts (e.g., almonds, walnuts, pecans)
6. Peanuts
7. Wheat
8. Soybeans.

3) Calories Based Diet.

According to the National Institute of Diabetes & Digestive & Kidney Diseases (NIDDK), diet refers to what a person eats or drinks during the course of a day. There are many different types of diets, like the Atkins diet, the Zone diet, the South Beach diet and many more. It is important to remember that a diet that limits portions to a very small size or that excludes certain foods entirely to promote weight loss may not be effective over the long term. It is much easier to maintain a diet that takes into account the foods that you like and dislike and also include combinations of foods with enough calories and nutrients for good health [25] [26].

When planning your diet it is important that you consider what calorie level is appropriate for you. Is the diet that you and considering to take nutritionally balanced? Will this diet be practical and easy to follow? Will the diet be maintainable for the rest of your life? The below information will show you what to look out for in a diet.

This item enable the user to choose his calorie level diet from a pop up list, the system automatically will add user diet type to his own profile, which will used to compare with the product information after scanned the barcode. The system will be able to inform the user if the product is compatible with his diet type.

Over view of Calorie level [27]**:**

1. **Low-calorie Diets:** Most weight loss diets provide 1,000 to 1,500 calories per day. However, the number of calories that is right for you depends on your weight and activity level. At these calorie levels, diets are referred to as low-calorie diets. Self-help diet books and clinical and non-clinical weight loss programs often include low-calorie diet plans.

The calorie level of your diet should allow for a weight loss of no more than 1 pound per week (after the first week or two when weight loss may be more rapid because of initial water loss). If you can estimate how many calories you eat in a day, you can design a diet plan that will help you lose no more than 1 pound per week. You may need to work with a trained health professional, such as a registered dietitian. Or, you can use a standardized low-calorie diet plan with a fixed calorie level. The selected calorie level, however, may not produce the recommended rate of weight loss, and you may need to eat more or less.

2. **Good nutrition:** Make sure that your diet contains all the essential nutrients for good health. Using the Food Guide Pyramid and the Nutrition Facts Label that is found on most processed food products can help you choose a healthful diet. The Pyramid shows you the kinds and amounts of food that you need each day for good health. The Nutrition Facts Label will help you select foods that meet your daily nutritional needs. A healthful diet should include:

3. **Adequate vitamins and minerals**. Eating a wide variety of foods from all the food groups on the Food Guide Pyramid will help you get the vitamins and minerals you need. If you eat less than 1,200 calories per day, you may benefit from taking a daily vitamin and mineral supplement.
4. **Adequate protein**. The average woman 25 years of age and older should get 50 grams of protein each day, and the average man 25 years of age and older should get 63 grams of protein each day. Adequate protein is important because it prevents muscle tissue from breaking down and repairs all body tissues such as skin and teeth. To get adequate protein in your diet, make sure you eat 2-3 servings from the Meat, Poultry, Fish, Dry Beans, Eggs, and Nuts Group on the Food Guide Pyramid every day. These foods are all good sources of protein.
5. **Adequate carbohydrates.** At least 100 grams of carbohydrates per day are needed to prevent fatigue and dangerous fluid imbalances. To make sure you get enough carbohydrates, eat 6-11 servings from the Bread, Cereal, Rice, and Pasta Group on the Food Guide Pyramid every day.
6. **A daily fiber intake of 20 to 30 grams.** Adequate fiber helps with proper bowel function. If you were to eat 1 cup of bran cereal, 1/2 cup of carrots, 1/2 cup of kidney beans, a medium-sized pear, and a medium-sized apple together in 1 day, you would get about 30 grams of fiber.

5. **No more than 30 percent of calories, on average, from fat per day**, with less than 10 percent of calories from saturated fat (such as fat from meat, butter, and eggs). Limiting fat to these levels reduces your risk for heart disease and may help you lose weight. In addition, you should limit the amount of cholesterol in your diet. Cholesterol is a fat-like substance found in animal products such as meat and eggs. Your diet should include no more than 300 milligrams of cholesterol per day (one egg contains about 215 milligrams of cholesterol, and 3.5 ounces of cooked hamburger contain 100 milligrams of cholesterol).

6. At least 8 to 10 glasses, 8 ounces each, of water or water-based beverages, per day. You need more water if you exercise a lot.

The different types of diets [25]**:**

1) **high protein - low carbohydrate**
    a. minimum 10 grams of protein per serving
    b. maximum 10 grams of carbohydrate per serving
2) **low calorie**
    a. maximum 300 calories per serving
3) **low fat**
    a. maximum 10 grams of fat per serving

4) Disease and health case

Maintaining health:

The body requires carbohydrates, fats, proteins, vitamins, and minerals to maintain healthy organs, bones, muscles, nerves, and to produce hormones and chemicals that are necessary for the proper function of organs. Vitamins and minerals are naturally occurring substances that are essential for the growth and function of the body. Vitamins and minerals are both necessary (in small amounts) for normal chemical reactions (metabolism) in the body [26].

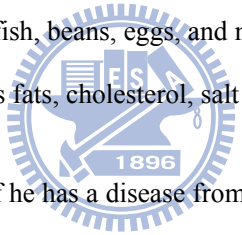
Preventing and controlling diseases:

Obesity and heart attacks are major public-health problems in the United States and other countries. Therefore, most dietary recommendations are aimed at preventing these two diseases. Obesity is caused by eating more calories than the body burns. Obesity, in turn, can be a cause of many diseases such as heart disease, diabetes, liver disease, arthritis, high blood pressure, gout, gallstones, and certain cancers [19].

To lose weight or maintain a healthy weight, one needs to eat more low-energy-dense foods. Low-energy-dense foods (such as vegetables and fruits) contain few calories per unit volume of food so that one can eat a large volume of it (for example, lettuce) without taking in many calories. One should also eat less of the high-energy-dense foods such as fats, egg yolks, fried foods, sweets, and high-fat salad dressings. Foods with a high energy density also often have high cholesterol and saturated fat content. One should also eat less of those foods that provide calories but little other nutrients, such as alcohol and many packaged snack foods [28] [25].

The Dietary Guidelines for Americans, published in 2005 by the United States Department of Agriculture (USDA), contains guidelines for healthy diets based upon review of scientific studies for people above 2 years of age. These guidelines recommend that a healthy diet should [27]:

1. Emphasize fruits, vegetables, whole grains, and fat-free or low-fat milk and milk products.
2. Include lean meats, poultry, fish, beans, eggs, and nuts.
3. Be low in saturated fats, trans fats, cholesterol, salt (sodium), and added sugars.



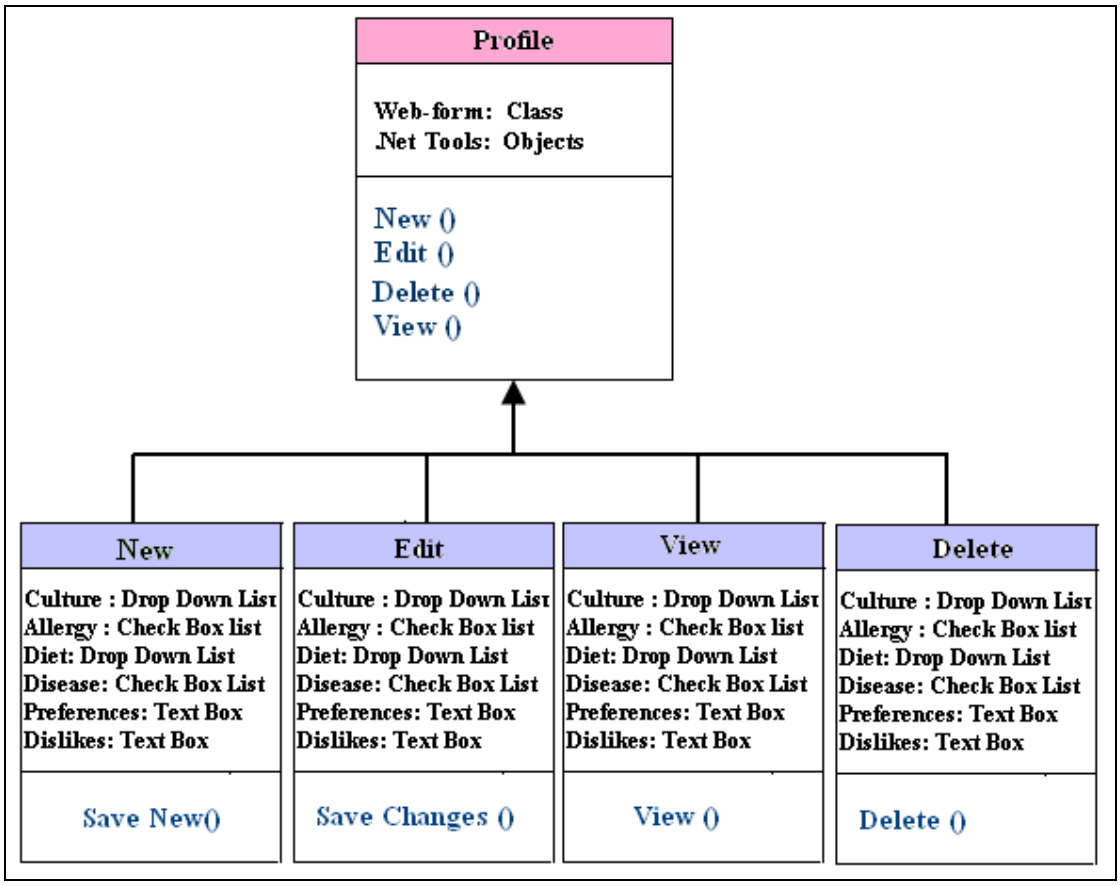
This item enable the user to choose if he has a disease from checkbox lists or defined the disease using a Textbox, the system automatically will add user disease type to user profile, which will used to compare with the product information after scanned the barcode. The system will be able to warn the user just by single click if the food is incompatible with him or not.

5) User Preferences & Dislikes

This item enable the user to write what he wants, input his preferences and dislikes, the system automatically will add this information to his own health and preferences profile, which will used to compare with the product information after scanned the barcode. The system will be able to tell the user is this product is one from your preferences or dislikes.

The following figure shows the object model of the profile part in the system which includes all items described before.

Figure 6: Profile object model



2. Help and Suggestions

These service help the user to know which products is suitable to his preferences and profile, the system will be able to suggest items for the user based on previous shopping history, for example if a user scanned the same product more than 5 times in a defined period of time that's mean the user interested in that product, so based on user profile, previous history this function can help the user by suggest different items in the market suitable to him.

In addition, by integrate this service with the meta data “new item” of the products, the system will inform the user if there are new items in the market that is suitable to him. In my opinion, we think this service is very important to both the consumer and the vendor.

The consumer will be more comfortable with shopping in this market, he can find what he wants and know any new products without any efforts. Also, vendors can make big advertisements to their shops and increase sales.

3. History

The user can view his previous shopping lists including : product barcode, ingredients , shopping date and a lot of information about the products, which help the user to manage his shopping behavior.

4. Order

In this part, the user is able to advice new products to vendors, so that vendors can know market needs and help import new items to the country. The user enters the product barcode, country of origin and little description about the product.

5. Comments

In this part, the user can view the comments and feedbacks received from other users. He can view all comments at the same time a pop up window is used to show a new received message. The web page checks the database periodically for new messages according to a timer value in the Meta tag, also the user can write his comments and feedbacks about specific product.

3.2 J2me Based Application

J2ME is the next evolution of Java introduced by Sun Microsystems as a new breed of portable communications devices opened the opportunities at the turn of the century [29]. J2ME is also known as a reduced version of the Java API and Java Virtual Machine (JVM) that is designed to operate

within the sparse resources available in the new breed of embedded computers and microcomputers [30].

Why consider J2ME in the first place? The foundation and ideology of Java and J2ME brings itself a reasonable set of potentials of being a part in EZBuy “My Product Info”.

According to the press and general signals from the market, J2ME has a massive focus and is considered as an attractive technology for building mobile applications. But there are several concrete arguments that indicate why J2ME should be considered as an interesting supplement for e-commerce - these are [29]:

1) Lower network usage and server load: J2ME based applications can operate when disconnected and only interacts with a server when necessary. J2ME has its own runtime environment and the possibility of storing data in the mobile device.
2) Enhanced user experience: The J2ME API provides enhanced possibilities for presenting GUI's like event handling and richer graphics.
3) Persistent storage: The official MIDP1.0 API provides facilities for persistent storage (record store) of data. The integrity of the record stores is kept throughout the normal use of the platform, including reboots, battery changes, etc. and is independent of any SIM/WIM.

J2me based application enabled barcode recognition offers functionalities to recognize an EAN-13 barcode [31] , communicate with servers and display results. It contains predefined J2ME components (libraries) for the major tasks: Object recognition, communication with a remote server as well as an presenting the final information to the user using the available graphical user interface. The algorithm which is responsible for barcode recognition is based on the Batoo-Toolkit [32]. It is designed for Nokia phones. Additional components (functional modules) can be easily added without any required knowledge about the image recognition task. For example, the communication between the mobile phone and servers are based mainly on the 3G and Wi-Fi other communication types such as SMS can be easily added [33].

3.3 Java based server

URLs and URL Connections provide a relatively high-level mechanism for accessing resources on the Internet. Sometimes your programs require lower-level network communication, for example, when you want to write a client-server application [34].

In our system "EZBuy: My Product Info", the server provides some service, such as processing database queries in order to get user profile information and product information based on the received user id and product barcode. Not only this service is provided by a server, but also: It's responsible for make a comparisons to find the answer is the scanned product is suitable to the user or not, analyzing user profile and shopping behavior to be able to suggest products to users and inform them about new items.

The client uses the service provided by the server, for displaying query results to the user. The communication that occurs between the client and the server must be reliable. That is, no data can be dropped and it must arrive on the client side in the same order in which the server sent it.

TCP provides a reliable, point-to-point communication channel that client-server applications on the Internet use to communicate with each other. To communicate over TCP, a client program and a server program establish a connection to one another. Each program binds a socket to its end of the connection. To communicate, the client and the server each reads from and writes to the socket bound to the connection.

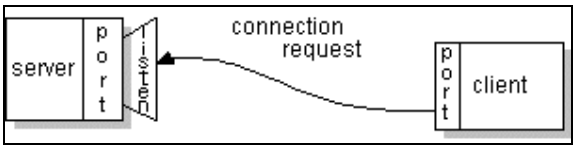
What Is a Socket [35]?

A socket is one end-point of a two-way communication link between two programs running on the network. Socket classes are used to represent the connection between a client program and a server program. The java.net package provides two classes--Socket and Server Socket--that implement the client side of the connection and the server side of the connection, respectively.

Normally, a server runs on a specific computer and has a socket that is bound to a specific port number. The server just waits, listening to the socket for a client to make a connection request.

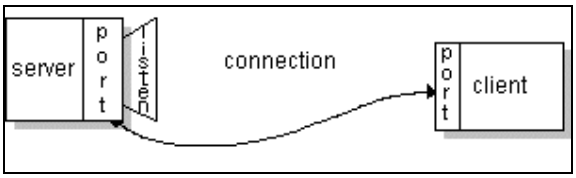
On the client-side: The client knows the hostname of the machine on which the server is running and the port number on which the server is listening. To make a connection request, the client tries to rendezvous with the server on the server's machine and port. The client also needs to identify itself to the server so it binds to a local port number that it will use during this connection. This is usually assigned by the system.

Figure 7: client-server request



If everything goes well, the server accepts the connection. Upon acceptance, the server gets a new socket bound to the same local port and also has its remote endpoint set to the address and port of the client. It needs a new socket so that it can continue to listen to the original socket for connection requests while tending to the needs of the connected client.

Figure 8: client server reply



On the client side, if the connection is accepted, a socket is successfully created and the client can use the socket to communicate with the server. The client and server can now communicate by writing to or reading from their sockets.

The java.net package in the Java platform provides a class, Socket, that implements one side of a two-way connection between your Java program and another program on the network. The Socket class sits on top of a platform-dependent implementation, hiding the details of any particular system from your Java program. By using the java.net.Socket class instead of relying on native code, your Java programs can communicate over the network in a platform-independent fashion [35][36].

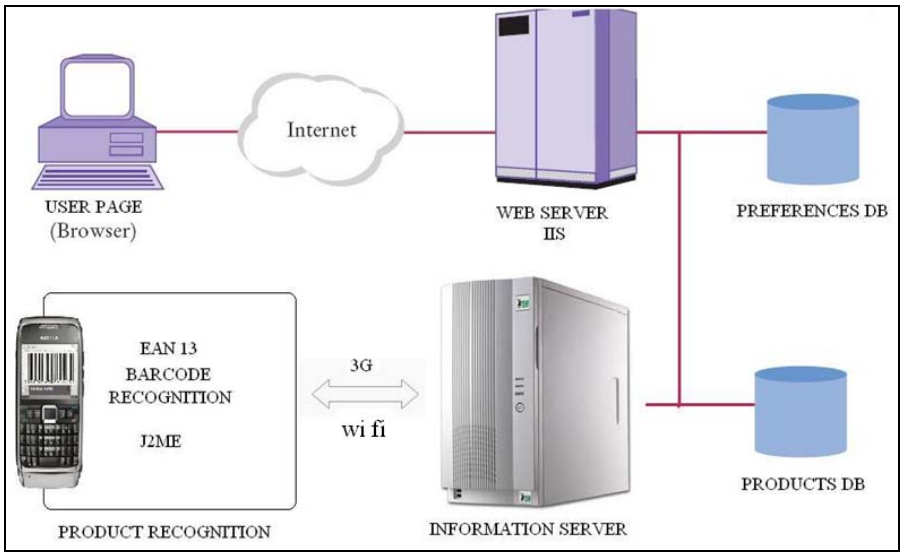
Additionally, java.net includes the ServerSocket class, which implements a socket that servers can use to listen for and accept connections to clients. This lesson shows you how to use the Socket and Server Socket classes.

At the end of this section we can say that, our java based server side is an information server which is responsible for communicating with mobile phones and product database. It receives requests from users and matches the request with user profile and product information. Then, it returns the result to the mobile phone using 3G and Wi-Fi.

3.4 Architecture Design

The general architecture of our system is shown in Figure 3.As mentioned before the system contains three parts: the user profile side, the mobile phone side - barcode recognition component running entirely on J2ME enabled-mobile phone that supports the MMAPI9 (Mobile Media APIextension) extension, and the server side including web server and information server component which is located on a separate server.

Figure 9: General System Architecture



IV. System Implementation

This chapter describes system implementation steps. The implementation starts after analyzing the requirements and the specifications, putting the design structure and the architecture layout. Testing processes were put in parallel with the design process to achieve the reliability. The layer architecture should be kept in the implementation phase to enable future changes and modifications.

4.1 Evolution Prototyping

The system is implemented using the evolution prototyping method to meet all requirements. Evolution prototyping involves the user in system development stages and focuses on user needs. It also guarantees a fast delivery of the system. The objective of Prototyping is to adapt the prototype to customer requirements as quickly and flexibly as possible [37].

The implementation started as step-by-step evolution progresses from one planned prototype to another. Each prototype was reviewed until the final system was achieved. Step-by-step prototyping generates a list of requested enhancements for each prototype.

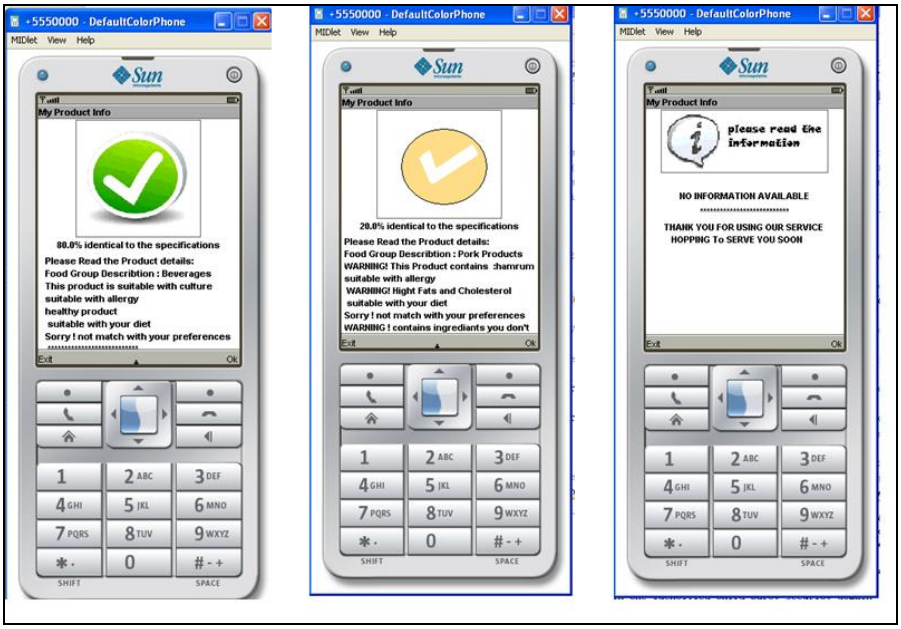
"EZBuy: My Product Info" system contains three parts:

4.1.1 The barcode recognition component:

It was implemented using J2ME "Java ME"enabled mobile phones that support the MMAPI9 (Mobile Media APIextension) extension. It provides functionality to recognize an EAN13 code, communicate with the server and display the results. Figures 10 and 11 show EZBuy J2ME based login screen and results.

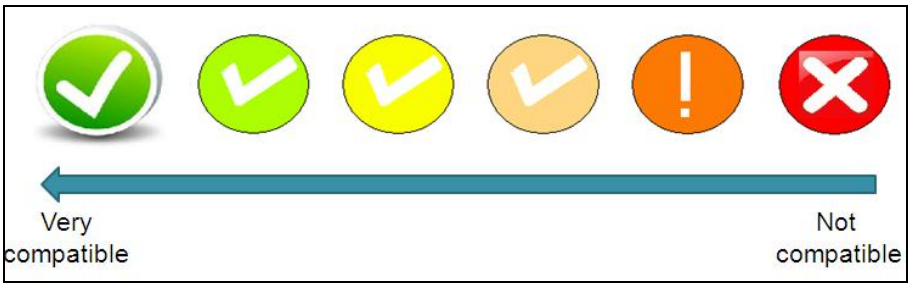
Figure 10: EZBuy J2ME based login screen

Figure 11: EZBuy J2ME results



In addition, EZBuy mobile application is responsible for calculating how much percentage the product is suitable to the user. For example If the product is very compatible with the user a picture with green color appears as shown in figure 12.

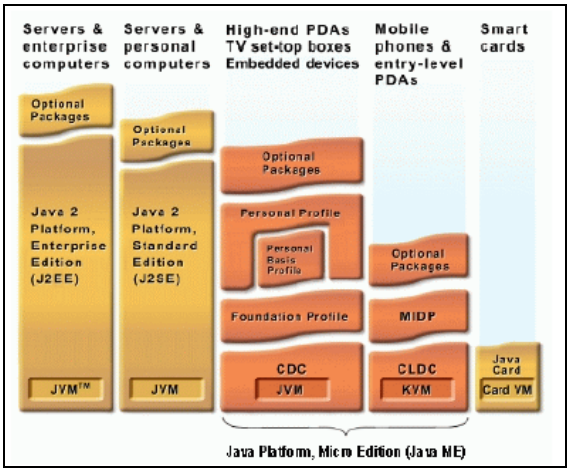
Figure 12: Compatible Degree



Java ME platform is a collection of technologies and specifications that can be combined to construct a complete Java runtime environment specifically to fit the requirements of a particular device or market. This offers a flexibility and co-existence for all the players in the eco-system to seamlessly cooperate to offer the most appealing experience for the end-user.

Java ME platform has been divided into two base configurations, one to fit small mobile devices and one to be targeted towards more capable mobile devices like smart-phones and set top boxes [38].

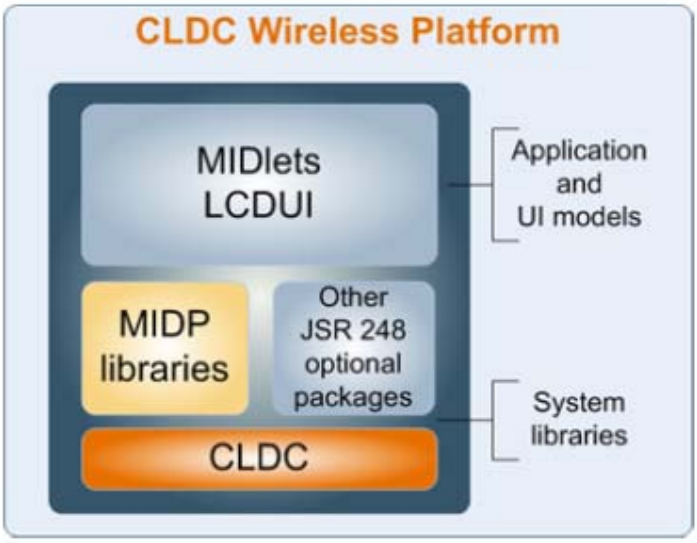
Figure 13: an overview of the components of Java ME technology [38]



The configuration targeting resource-constraint devices like mobile phones is called the Connected Limited Device Configuration (CLDC). It is specifically designed to meet the needs for a Java

platform to run on devices with limited memory, processing power and graphical capabilities. For a CLDC and MIDP environment, which is typically what most mobile devices today are implemented with, a MIDlet is then created. A MIDlet is the application created by a Java ME software developer, such as a game, a business application or other mobile features. These MIDlets can be written once and run on every available device conforming with the specifications for Java ME technology. (see Fig 14).

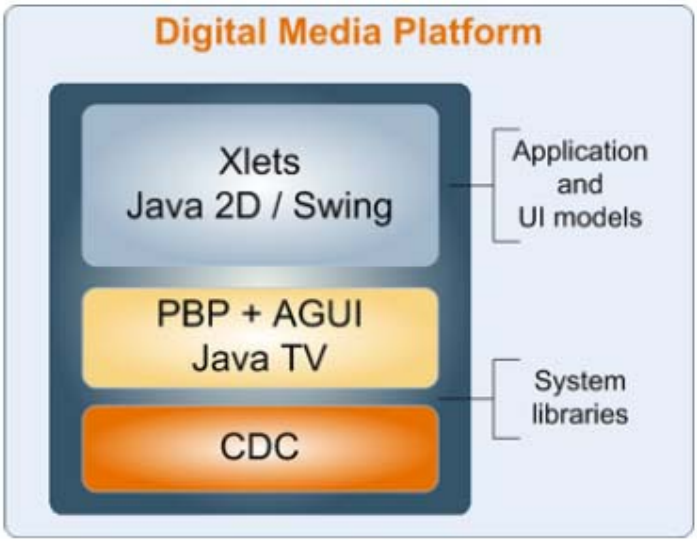
Figure 14: The Connected Limited Device Configuration (CLDC) [38]



The configuration targeted larger devices with more capacity and with a network-connection, like high-end personal digital assistants, and set-top boxes, is called the Connected Device Profile (CDC). Looking at the benefits the CDC configuration brings to the different groups in the value-chain the following can be said: (see Figure 15)

1) Enterprises benefit from using network-based applications that extend the reach of business logic to mobile customers, partners and workers.
2) Users will benefit from the compatibility and security of Java technology.
3) Developers benefit from the safety and productivity of the Java programming language and the rich APIs in the Java platform.

Figure 15: The Connected Device Configuration (CDC) [38]



4.1.2 Java Based Information Server Component:

It located on a separate server, to which the detected product code is transmitted via a GPRS or Wi-Fi connection. It is simple, centralized, connection-oriented Java server. The information server uses a plug-in architecture, allowing us to quickly add various services and online information sources (represented as so called "service connectors"). Although this process could also be located on the phone itself, performing them on an external server provides us with greater extendibility, higher flexibility and better performance.

4.1.3 User Web page.

It was implemented using .NET framework and visual basic under .NET environment, .NET supports good user interface and object oriented programming. The web pages were designed by ASP.NET which contains powerful tools that facilitates web browsing. ASP.NET has the following Advantages [36]:

1) **Powerful database-driven functionality**

Like ASP (Microsoft's language preceding ASP.Net), ASP.Net allows programmers to develop web applications that interface with a database. The advantage of ASP.Net is that it is object-oriented and has many programming tools that allow for faster development and more functionality.

2) **Faster web applications:**

Two aspects of ASP.Net make it fast -- compiled code and caching. In the past, the code was interpreted into "machine language" *when* your website visitor viewed your page. Now, with ASP.Net the code is compiled into "machine language" *before* your visitor ever comes to your site. Caching is the storage of information that will be reused in a memory location for faster access in the future. ASP.Net allows programmers to set up pages or areas of pages that are commonly reused to be cached for a set period of time to improve the performance of web applications. In addition, ASP.Net allows the caching of data from a database so your website isn't slowed down by frequent visits to a database when the data doesn't change very often.

3) **Memory leak and crash protection:**

ASP.Net automatically recovers from memory leaks and errors to make sure that your website is always available to your visitors.

4) **Multiple language support:**

Programmers can actually write their code in more than 25 .Net languages (including VB.Net, C#, and JScript.Net). This allows programmers to develop your site in the language they know best and it means that you can more easily find programmers to support the work on your site.

4.2 System Components and libraries

The system contains different libraries and components, which is the internal components who are the tools and classes inside the .NET framework such as text boxes, buttons, list boxes and Labels.

4.2.1 Internal Components

In this part some implemented functions will be shown together with the internal components or tools of the system. These tools can be dragged into the design page easily. Tools settings and properties also can be changed easily from the property window or by coding according to users specifications and needs. Figure 16 shows new user page and log in page. ASP.net frameworks have well organized and developed tools that can facilitate web browsing via personal computers or mobile devices [39].

Figure 16: create user account and log in screens.

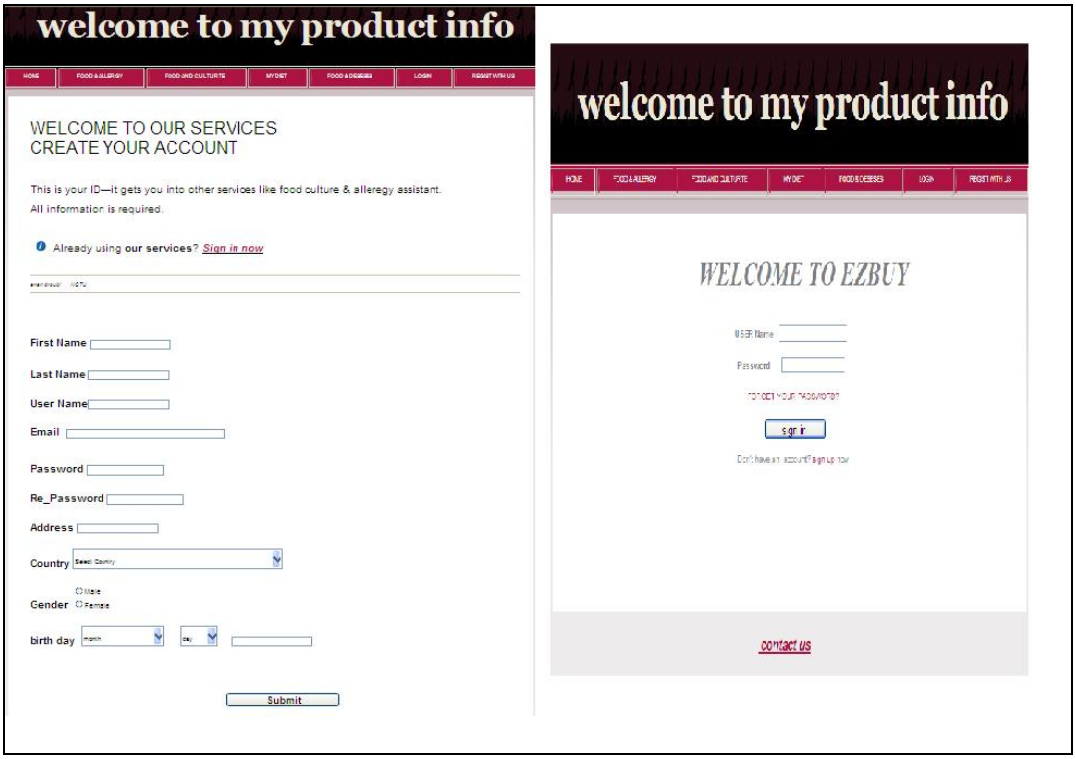


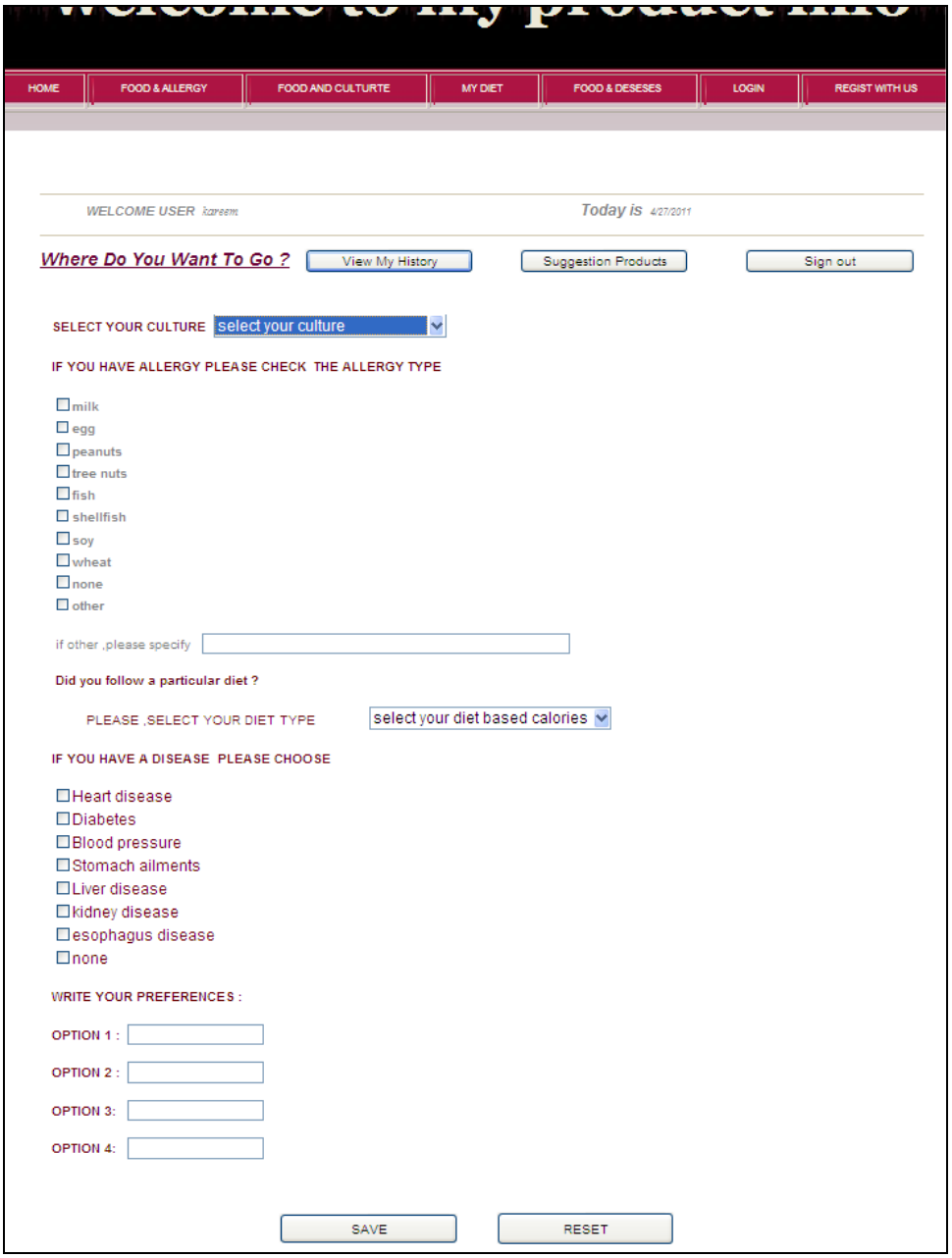
Figure 16 shows how to create new profile, it describes the main visual items used in the system. It shows also the Dropdown List which is used for selection culture and calorie based diet type. Checkbox list is used to select: allergy type, disease and health case. Textbox tool is used to enter user preferences and dislikes.

Figure 17: EZBuy Web Based Provided Services Screen

Figure17 shows the welcome page that can be used by a user to choose the service preferred, services include: Edit Profile, View My History, Suggestion Products, New Items, Write Feedbacks, Show Feedbacks, Tell us what do you need. The welcome page also enables the user to fill out the questionnaire that helps developers to improve the system and add new services in the future.

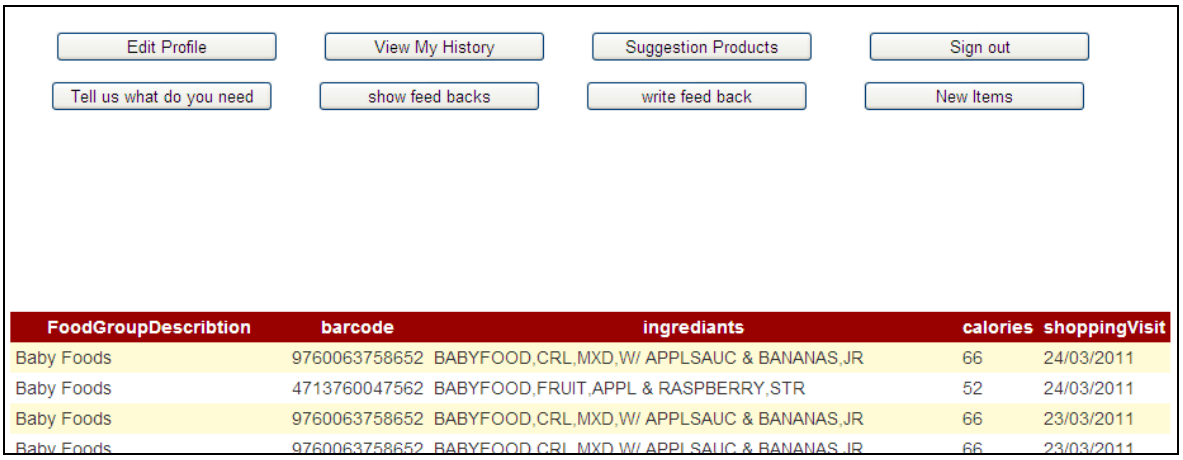
Figure 18 shows the Edit Profile Page that enables the user to create his own profile including: Culture Type, Allergy Type, Disease and Health Case, Calories Based Diet, Preferences and Dislikes.

Figure 18: Edit Profile screen



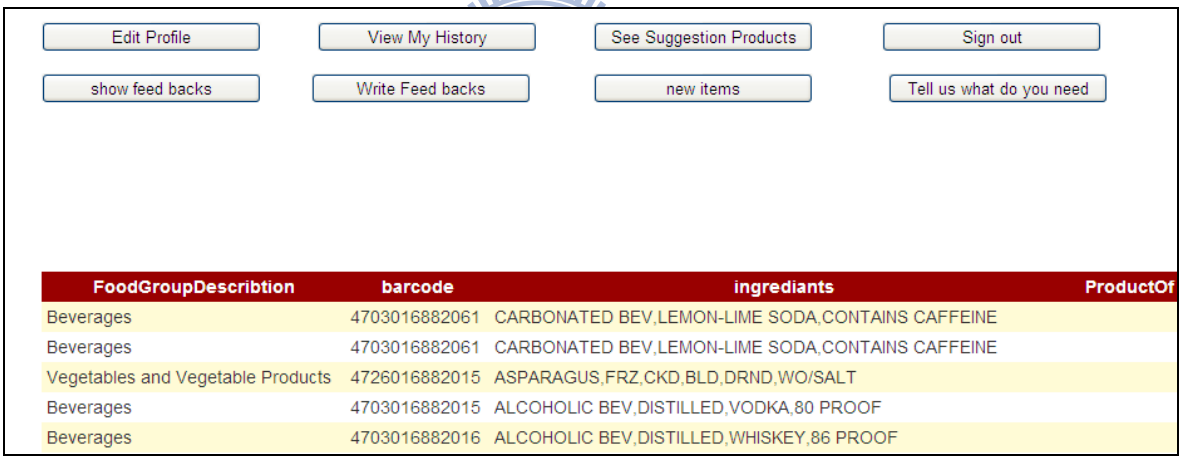
Another important tool is the data grid view which displays a list of data items by binding data fields to columns and by displaying a column header to identify the field. In our system we use the Grid View tool to 3 services: Suggestion Products, New Items and View History as shown in Figures 19, 20.

Figure 19: View History



FoodGroupDescribtion	barcode	ingrediants	calories	shoppingVisit
Baby Foods	9760063758652	BABYFOOD,CRL,MXD,W/ APPLSAUC & BANANAS,JR	66	24/03/2011
Baby Foods	4713760047562	BABYFOOD,FRUIT,APPL & RASPBERRY,STR	52	24/03/2011
Baby Foods	9760063758652	BABYFOOD,CRL,MXD,W/ APPLSAUC & BANANAS,JR	66	23/03/2011
Baby Foods	9760063758652	BABYFOOD,CRL,MXD,W/ APPLSAUC & BANANAS,JR	66	23/03/2011

Figure 20:Suggestion Products



FoodGroupDescribtion	barcode	ingrediants	ProductOf
Beverages	4703016882061	CARBONATED BEV,LEMON-LIME SODA,CONTAINS CAFFEINE	
Beverages	4703016882061	CARBONATED BEV,LEMON-LIME SODA,CONTAINS CAFFEINE	
Vegetables and Vegetable Products	4726016882015	ASPARAGUS,FRZ,CKD,BLD,DRND,WO/SALT	
Beverages	4703016882015	ALCOHOLIC BEV,DISTILLED,VODKA,80 PROOF	
Beverages	4703016882016	ALCOHOLIC BEV,DISTILLED,WHISKEY,86 PROOF	

Figure 21 shows another function of the system which is Share your diet Experience. Stories can be about a good experience or bad. Tell us everything, How did you know about the diet? How were you using it? Why did you choose to try it? Was it worth? Do you think that all people knew what there were doing?

Figure 21: Diet Experience Services

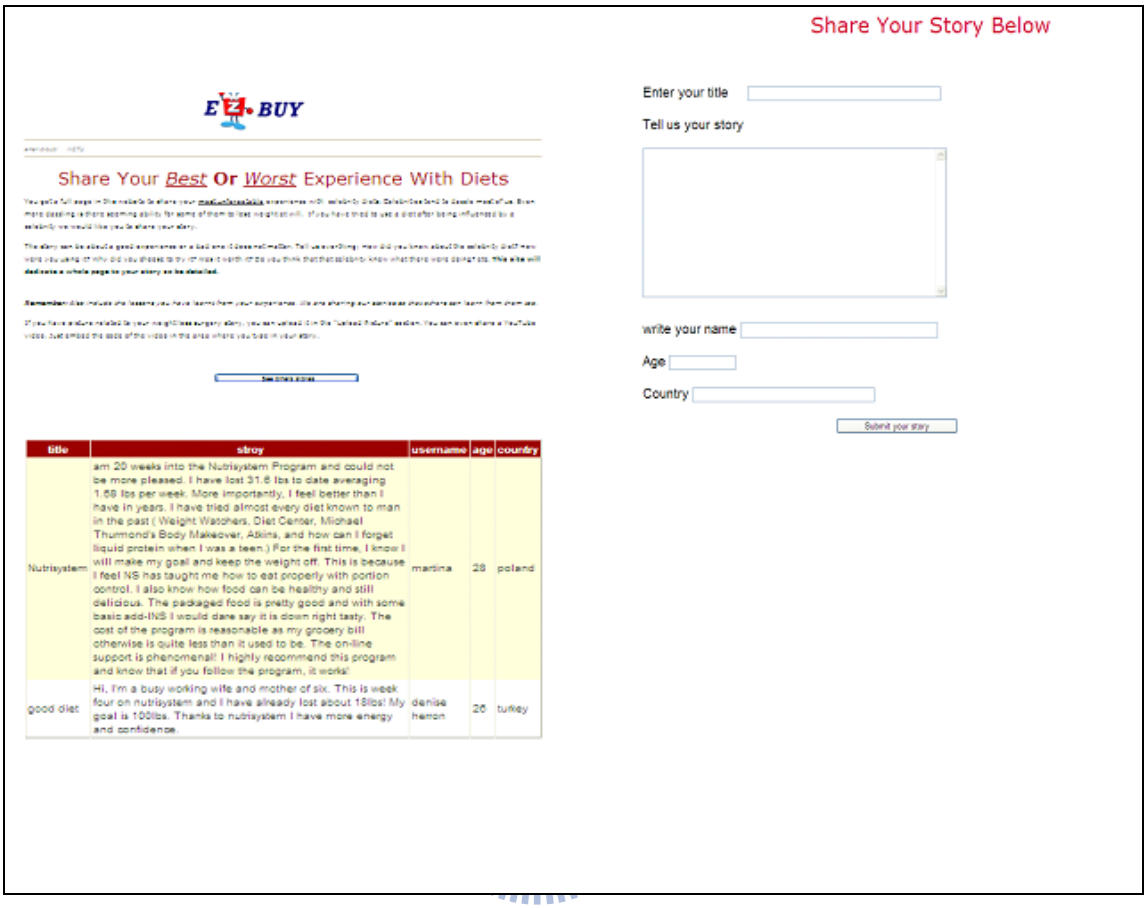


Figure22 shows the Tell us What do you need service which enable the user to advice new products to vendors, so that vendors can know market needs and import new items to the country. The user enters the product barcode, country of origin and few description about the product.

Figure 22: Tell us what do you need Service

As mentioned in previous chapters the user can view the comments and feedbacks received from other users. He can simultaneously view all as a pop up window used to show a new received message as shown in figure 23,24

Figure 23: Write Feedbacks

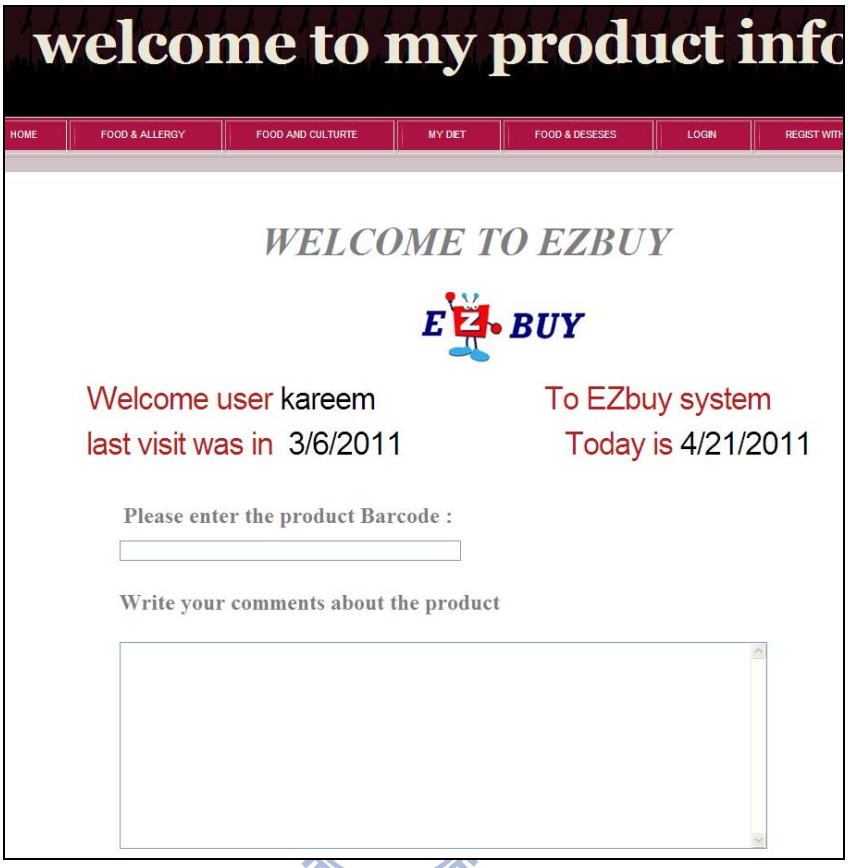
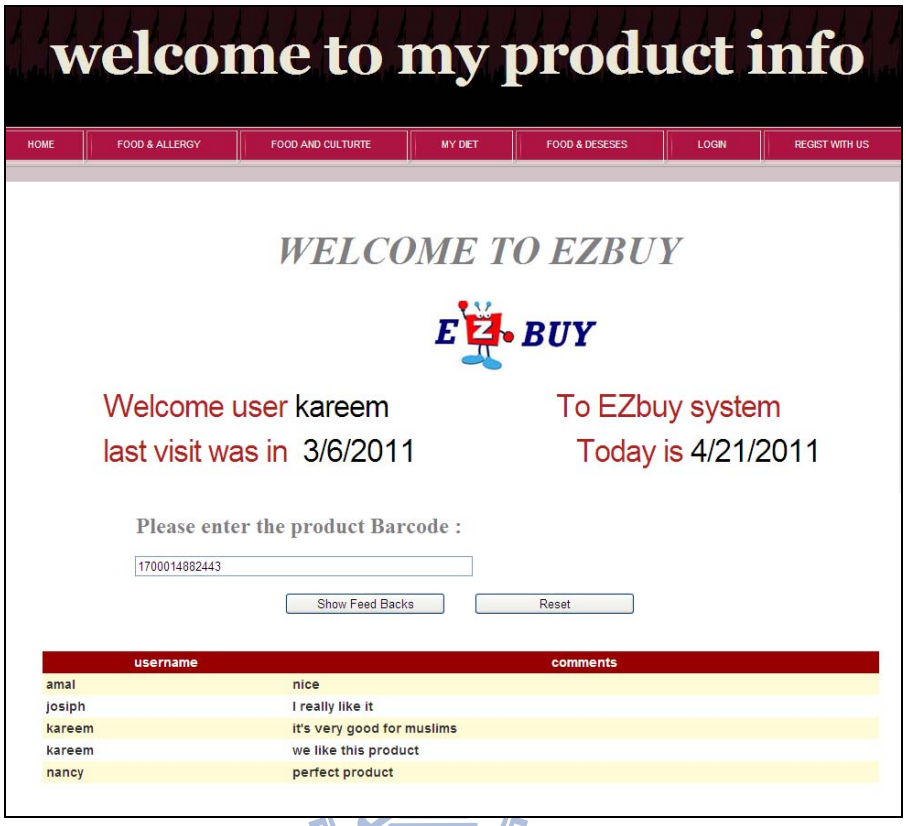


Figure 24: Show users comments



4.3 System Testing

Software Testing is the process used to help identify the correctness, completeness, security, and quality of developed computer software. Testing is a process of technical investigation, performed on behalf of stakeholders, that is intended to reveal quality-related information about the product with respect to the context in which it is intended to operate [37].

Software testing is just one kind of verification. Verification is the checking of or testing of items, including software, for conformance and consistency with an associated specification. At the same time the system must be validated to check what has been specified is what the user actually wanted.

The following 3 levels were performed in the testing phase:

1. Unit Testing: in which each unit (basic component) of the software is tested to verify that the detailed design for the unit has been correctly implemented
2. Integration testing: in which progressively larger groups of tested software components corresponding to elements of the architectural design are integrated and tested until the software works as a whole.
3. System testing: in which the software is integrated to the overall product and tested to show that all requirements are met.

V.Experiments and Results

This chapter discusses the experiment methods and the final results. An experiment of many steps was performed to test the usability and the importance of the system. Also this chapter describes in details how we test the EZBuy1, how we improve it to EZBuy2 and the difference between the both versions. During the testing some problems and suggestions occurred. Immediate solutions were put for these problems which made the system reliable and available for users.

5.1 Methodology

5.1.1 Participants:

There are 96 users participated in the experiments. The number of the users was calculated using the Sample Size Calculator [40]. Here are the formulas used in the Sample Size Calculator:

Sample Size

$$ss = \frac{Z^2 * (p) * (1-p)}{c^2}$$

Where:

Z = Z value (e.g. 1.96 for 95% confidence level), p = percentage picking a choice, expressed as decimal, c = confidence interval, expressed as decimal. *By using:* Z= 1.96, p = .5, c = .01, the Sample Size = 96.

The following is a brief description about the terms used in the Sample Size Calculator [36]:

1. **The confidence interval** (also called margin of error): is the plus-or-minus figure usually reported in newspaper or television opinion poll results. For example, if you use a confidence

interval of 4 and 47% percent of your sample picks an answer you can be "sure" that if you had asked the question of the entire relevant population between 43% (47-4) and 51% (47+4) would have picked that answer.

2. **The confidence level**: tells you how sure you can be. It is expressed as a percentage and represents how often the true percentage of the population who would pick an answer lies within the confidence interval. The 95% confidence level means you can be 95% certain; the 99% confidence level means you can be 99% certain. Most researchers use the 95% confidence level.

   When you put the confidence level and the confidence interval together, you can say that you are 95% sure that the true percentage of the population is between 43% and 51%. The wider the confidence interval you are willing to accept, the more certain you can be that the whole population answers would be within that range.

   For example, if you asked a sample of 1000 people in a city which brand of cola they preferred, and 60% said Brand A, you can be very certain that between 40 and 80% of all the people in the city actually do prefer that brand, but you cannot be so sure that between 59 and 61% of the people in the city prefer the brand.

3. **Percentage:** Your accuracy also depends on the percentage of your sample that picks a particular answer. If 99% of your sample said "Yes" and 1% said "No," the chances of error are remote, irrespective of sample size. However, if the percentages are 51% and 49% the chances of error are much greater. It is easier to be sure of extreme answers than of middle-of-the-road ones.

   When determining the sample size needed for a given level of accuracy you must use the worst case percentage (50%). You should also use this percentage if you want to determine a general level of accuracy for a sample you already have. To determine the confidence interval

for a specific answer your sample has given, you can use the percentage picking that answer and get a smaller interval.

Participants are group of under graduate and postgraduate students in NCTU and NTHU called "MSC" who were using mobile phones. These groups of consumers tend to have a good mobile application for serving their needs. Therefore, a total of 96 usable questionnaires were analyzed, the sample consisted of 47 (48.9%) female and 49 (51.1%) male respondents.

5.1.2 Design and Procedures

The experiments were performed during two months. The first part of the experiment was carried out in the first month. In this part the first version of "EZBuy1: My Product Info" was tested. Nokia N97 mobile phone was used to scan the product barcodes. To get the product information we used an open source database called "USDA National Nutrient Database for Standard Reference Release 18" [41]. The data base was designed by: The National Food and Nutrient Analysis Program (NFNAP) which is a research program that is achieving long-sought improvements in the nutrient values in the National Nutrient Databank System (NDBS). The project, directed by the Nutrient Data Laboratory (NDL), Agricultural Research Service, USDA, It was initiated in 1997 and recently renewed in collaboration with the NIH National Cancer Institute and the Office of Dietary Supplements, and other supporting NIH Offices, Institutes and FDA. The primary outcome of the program will be a body of nutrient data with unprecedented analytical quality. Approximately 5,400 items, representing nearly 60,000 nutrient values, in the USDA National Nutrient Database for Standard Reference (SR) have been either added or updated, using NFNAP generated data. NDL was able to add data on individual carotenoids, vitamin K, α-tocopherol and individual fatty acids, including trans and omega-3 fatty acids to SR.

Following is the procedure of testing our system "EZBuy: My Product Info":

1. Every user created user name and password using the user web page, logged in to the system, created user profile and specified his needs including: culture, allergy type, disease and health case, calories based diet, preferences and dislikes.
2. By using Nokia N97 every user tested J2ME based mobile application side and saw results depends on his needs : First a generated EAN-13 barcodes on the computer was used, then every user got a page contained printed barcodes and finally real products were tested.
3. Every user used the user web page to view history and using other services the system provides as described in previous chapters.

Primary data for this research was collected using a questionnaire designed to serve the purpose of the research objectives. The questionnaire was divided into two sections - the first explores the consumer's needs and wants from mobile applications and services, their mobile usage preference, and the importance of mobile service applications. The second observes people using the product to discover errors and areas of improvement (usability testing).

Five services that the "EZBuy1: My Product Info" J2ME mobile application provides were measured: Culture and Food (e.g. Muslims can't eat pork , vegetarian can't eat any kind of meat), Allergy assistant (e.g. soy , nuts , milk,…), Food and Diseases , Calories Based Diet , Preferences and Dislikes monitor.

Respondents were required to rate the services from 'Not important at all' to 'Very important' based on a five-point rating, and write their suggestions.

The second part of the experiments was carried in the second month. In this part the modified version of "EZBuy2: My Product Info" was tested. Participants used new services and rate them.

5.2 Results

Questionnaires and Statistical analyses are the instruments for getting users response about the system. Questionnaires targeted to test system's usability and benefits.

5.2.1 Importance of Applications

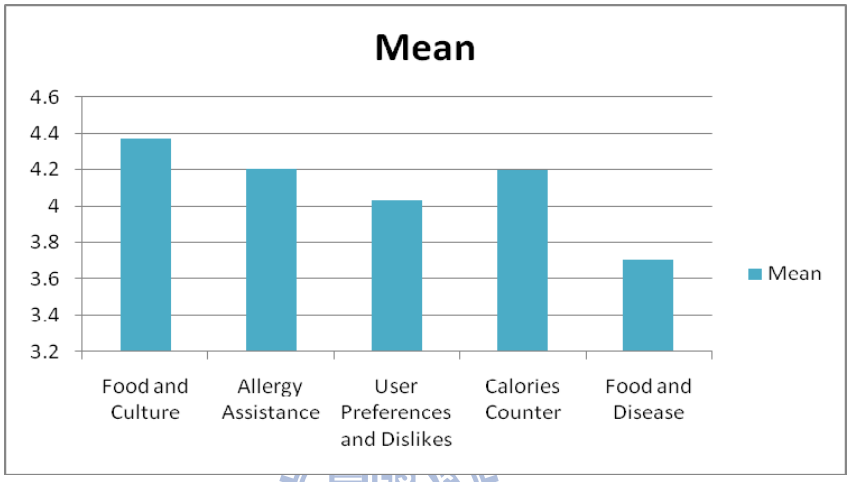
Table 2 and lists the mean importance of each service that EZBuy provides, and shows that culture and food service and allergy assistance, are of higher importance to student consumers. As most of the students are from various cultures which have special needs, it is not surprising that culture and food service has the highest mean.

Food and disease service was found to be less important among students, which is probably due to the fact that this group of consumers' ages between 18 – 33 which means most of them do not have any disease.

Table 2: The mean importance of EZBuy services

EZBuy Services	Mean
Food and Culture	4.3750
Allergy Assistance	4.2083
User Preferences and Dislikes	4.0313
Calories Counter	4.1979
Food and Disease	3.7083

Figure 25: Importance Of EZBuy Services



5.2.2 Gender and Importance of EZBuy Services

To explore the relationship between the importances of various J2ME based mobile phone application services and gender, a series of independent sample t-tests were conducted. Table 3 and figure 26 show that there was no difference between males and females for all applications except calories counter, and this suggests that female respondents are more likely to be involved in Beauty and Fitness such as calories counter. Male respondents appear to be more cautious of religious and allergy in EZBuy services.

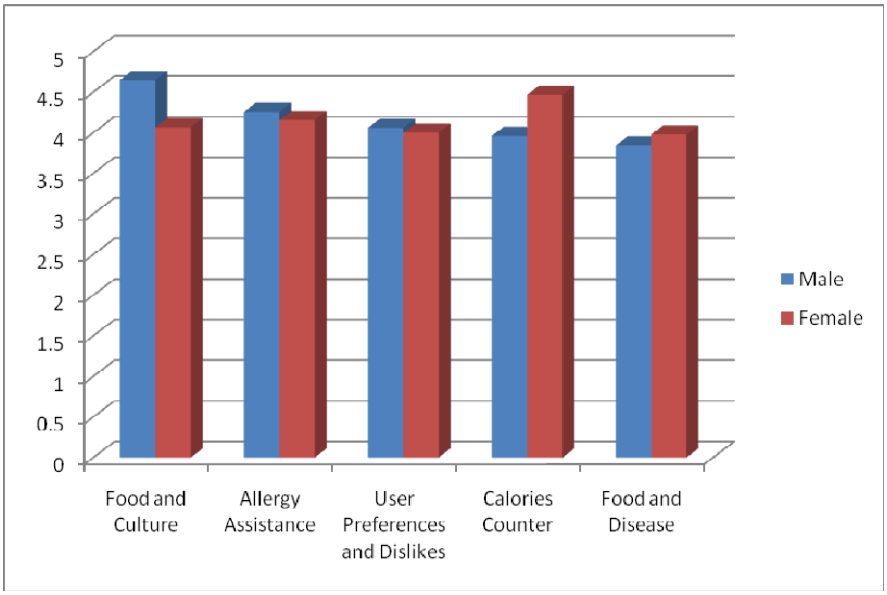
Table 3: Importance of Applications - Gender Comparisons

EZBuy Services	Male	Female	t-value	Sig(2-tailed)
Food and Culture	4.6471	4.0667	3.920	.000 **
Allergy Assistance	4.2549	4.1556	.610	.543
User Preferences and Dislikes	4.0588	4.00	.360	.720
Calories Counter	3.9608	4.4667	-3.272	.002**
Food and Disease	3.8431	3.9778	-.906	.367

** Significant at 0.01 level (2-tailed)

* Significant as 0.05 level (2-tailed)

Figure 26: Importance of Applications - Gender Comparisons



5.2.3 Culture

Food is an important part of religious observance for many different faiths, including Christianity, Judaism, Islam, Hinduism and Buddhism. Most religions include food observances as a vital part of their faith. If you are providing hospitality to people from different backgrounds, always serve a selection of vegetarian and meat foods on separate trays. A variety of non-alcoholic drinks should also be available.

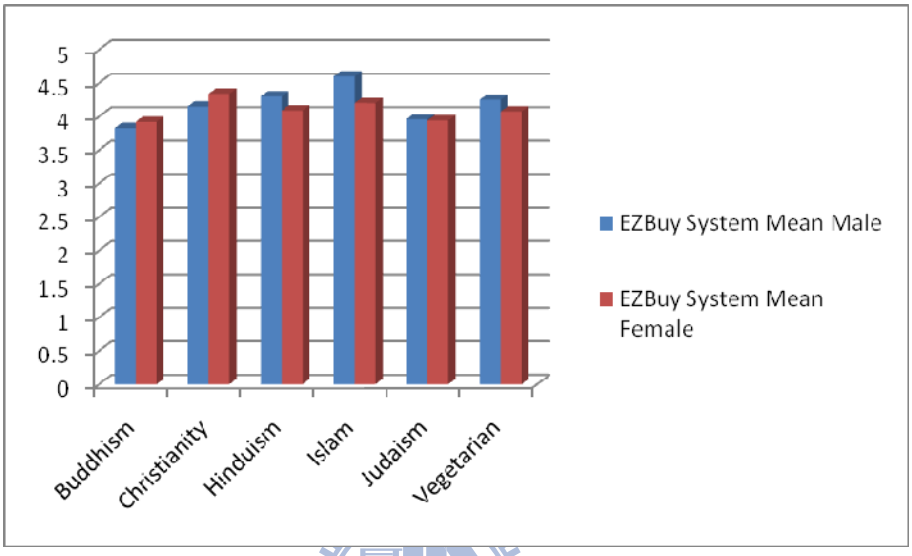
The sample consisted of 39 (40.6%) Islam, 16 (16.6%) budissim , 11 (11.4%) Christianity, 13 (13.5%) Hundose 12 (12.5%) vegeterian and 5 (5.2%) Judusim respondents. A series of independent sample t-tests were again used to look at the relationship between the culture groups and the importance of EZBuy1. Results are presented in Table 3 and figure 27, which show that there are no differences between culture groups for EZBuy1 system. Also the results show that there are no differences between males and females in the same group culture for EZBuy1 which means that EZBuy is very useful and important for all religions and cultures.

Table 4: Importance of EZBuy1 - Culture Groups Comparisons

EZBuy groups	EZBuy System Mean Male	EZBuy System Mean Female	T-value	Sig. (2-tailed)
Buddhism	3.83	3.92	-3.627	.009
Christianity	4.15	4.34	3.027	.061
Hinduism	4.3	4.089	1.183	.305
Islam	4.6	4.2	.041	.968
Judaism	3.96	3.94	-.430	.674

Vegetarian	4.25	4.076	-1.879	.095

Figure 27: Importance of EZBuy1 - Culture Groups Comparisons



5.2.4 Users' Suggestions

This analysis is used to explore how usable the application is.

1. 73.97% Satisfied with the services provided.
2. 5.20% have no idea.
3. 20.83% said that they have new ideas for improvements: 55% of them are females, 45% males.

The following is a description of users suggestions:

1) Enable the user to write his feed backs and read other users comments.
2) Improve the calories page so the user can know more information about the calories he has to eat and burn.
3) Allow the users to share their Best or Worst Experience with Diets.

4) Allow the user to suggest some products that are not available in the market, so the providers can know Market needs.

5) Show new items available that is suitable to the user.

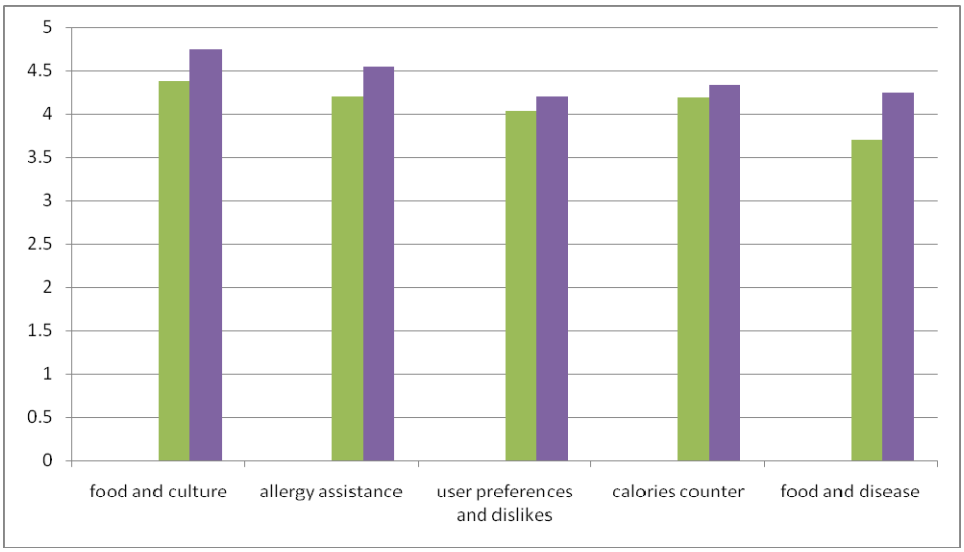
5.2.5 Differences Between the two versions of "EZBuy: My Product Info"

Based on users' suggestions we built the second version of our system "EZbuy2". After using both versions of the system, users answered a satisfaction questions to indicate which one they prefer, so a series of dependent sample t-tests were conducted to answer the question: Is there a significance difference in the importance before and after modifying? Table 5 shows the results.

Table 5: Differences between EZBuy1 and EZBuy2

Services	Mean Differences	Std. Deviation	Std error mean	t	df	Sig(2-tailed)
Food & Culture	-.2703	.623736	.06366	-4.254	95	.000
Allergy assistance	-.43750	.76520	.07810	-5.602	95	.000
Preferences &dislikes	-.61458	.83817	.08554	-7.184	95	.000
Calories diet	-.44792	1.11327	.11362	-3.942	95	.000
Disease & health	-.73958	1.07845	.11007	-6.719	95	.000

Figure 28: Differences between EZBuy1 & EZBuy2



The results show that users accept the full and modified version of our system "EZBuy2" more than the first version of EZBuy. Users are more satisfied of the new system. We think this is because:

1- EZbuy1 only tells consumers if they can eat this product or not, but EZBuy2 also provides why they can't for example, not suitable for your health condition because high cholesterol and you have high blood pressure.

2- EZBuy2 calculates how percentage the product is suitable to users.

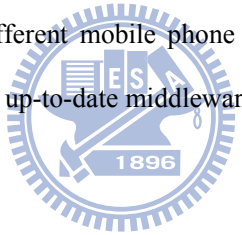
3- EZbuy2 includes consumers' suggestions and an improved user web page that enable consumers to find a lot of medical and health information.

4- By using EZBuy2 consumers can interact with each other and also interact with vendors.

VI. Conclusion and Future Work

6.1 Conclusion

In this thesis, we presented a system that eases consumer shopping and maintains consumer preferences. Because people recently have been willing to see more services that solve their daily problems on their mobile phones, we proposed and implemented "Preferences Monitoring" system. The system enables foreign and local people in a country to maintain their preferences, cultures, religions and health routines while shopping. After testing the system, we concluded that integrating the used barcode system in markets with modern mobile phones and middleware technologies has the potential for improving people life. However, there are still issues in this field requiring more consideration such as supporting different mobile phone platforms, implementing efficient barcode recognition algorithm, and deploying up-to-date middleware technologies.



6.2 Future Work

Our future work will contain testing more services of the system in real databases and integrating the system with multiple mobile phone platforms such as Android and Windows. Although the experiments have show a great acceptance from users, further experiments shall be performed to see if vendors will accept our system. The system can also be modified to use SMS communication in addition with 3G and Wi-Fi. Also, it can be modified to enable the user to choose the language used to display products information.

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APPENDIX A

QUESTIONNAIRE 1

1- Do you have a mobile phone with a camera?
a- YES b- NO
2- Do you have certain considerations when you buy food products?
a- YES b- NO
3- If yes, please check your considerations:
a- Special Culture
b- Food Allergy
c- Diet
d- Disease
e- Preferences (things that you like to buy/eat/drink) Dislikes (things you do not like to buy buy/eat/drink)
f- None
4- Please rate the following options from 1 to 5, where 1 is the best
4.1 - EZBuy in General is :
a- useful 1 2 3 4 5
b- helpful 1 2 3 4 5
c- easy to use 1 2 3 4 5
d- providing good information 1 2 3 4 5
4.2 - EZBuy as a mobile application is:
a- Scanning the barcode is easy to use 1 2 3 4 5
b- Displayed message is sufficient and appropriate 1 2 3 4 5
c- Displayed message is easy to read 1 2 3 4 5
d- Displayed message takes time to appear on screen 1 2 3 4 5
e- Scanning the barcode takes time 1 2 3 4 5
4.3 - EZBuy user web page :
a- Easy to log in 1 2 3 4 5
b- Easy to edit profile 1 2 3 4 5

c- Profile contains all information I need 1 2 3 4 5
d- Profile contains all services I need 1 2 3 4 5
4.4 - Please rate EZbuy Services: *where 1 is Very important and 5 is Not important at all*
a- Culture and Food 1 2 3 4 5
b- allergy assistance 1 2 3 4 5
c- calories counter 1 2 3 4 5
d- disease and food 1 2 3 4 5
e- preferences and dislikes 1 2 3 4 5
5- Where do you get information about a product if the information on the product is not enough?
a- You ask another costumers
b- You ask the shop keeper
c- Buy without caring you
d- don't buy
6- How would you like to rate EZBuy?
a- Excellent b- Good c- Average d- Bad e- Terrible
7- Do you agree that EZBuy has solved your problems?
a- Yes to a great extent b- No, not at all c- To some extent
8- Would you like to use EZBuy regularly?
a- YES b- Maybe c- NO
9- Would you recommend EZBuy to your family and friends?
a- YES b- Maybe c- NO
10- Are you satisfied with the information that EZBuy present?
a- Very satisfied b- Satisfied c- Somewhat satisfied d- Not satisfied
11- What do you feel is the best feature of EZBuy?
12- Would you like to suggest any improvements?

Table 6: Questionnaire1

QUESTIONNAIRE 2

1- After using the new version of EZBuy Please rate the following options from 1 to 5, where 1 is the best
1.1 – EZBuy2 in General is :
a- More useful 1 2 3 4 5
b- More helpful 1 2 3 4 5
c- More easy to use 1 2 3 4 5
d- More providing good information 1 2 3 4 5
e- No differences
1.2 – EZBuy2 as a mobile application is:
a- Scanning the barcode is easier to use 1 2 3 4 5
b- Displayed message is more sufficient and appropriate 1 2 3 4 5
c- Displayed message is easier to read 1 2 3 4 5
1.3 – EZBuy2 user web page :
a- Easier to use 1 2 3 4 5
b- Provide more information 1 2 3 4 5
1.4 - Please rate EZbuy Services: *where 1 is Very important and 5 is Not important at all*
a- Culture and Food 1 2 3 4 5
b- allergy assistance 1 2 3 4 5
c- calories counter 1 2 3 4 5
d- disease and food 1 2 3 4 5
e- preferences and dislikes 1 2 3 4 5

Table 7: Questionnaire 2