# Science Computer and Information Technology Faculty, University of Malaya



## Web-Based Smart Diet System

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# Abstract

We all realize how important "diet" can be to the daily lifestyle. Many genetics, environmental, behavioral and cultural factor can affect health. Food choices are among the most pleasurable and effective decision to improve health prospects. Most people especially working adults are lack of concern and initiative to seek for healthy balance diet and lifestyle due to hectic schedule and bad eating habits. This can increase major risk factors for chronic diseases such as cancer, diabetes and heart attack.

What constitutes to a balance lifestyle is consuming healthful diet. Healthful diet Healthful diet contains the amount of essential nutrients and calories that is needed to prevent nutritional deficiencies. Healthful diet, which contain the right balance of carbohydrate, protein, fat, vitamins and minerals can help to reduce risk for chronic diseases and be a part of a full and productive lifestyle. Such diets are obtained from a variety of foods that are available, affordable and enjoyable. They are simple day-to-day decisions that may affect health and well-being.

Therefore, an interactive smart diet system proposed in this project will definitely help user to practice a healthful living by suggest the best menu and physical activities, which is the closest to user's taste and personal health condition to ensure a new and better way of living.

## Acknowledgement

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# Chapter 1: Introduction

## 1.1 Problem Domain

There are many genetics, environmental, behavioral and cultural factor that can affect health. The problem in persisting a healthy diet and lifestyle is listed below:

a) Most people do not care and concern about their diet.

b) Most people have imbalance lifestyle. They are lack of balance in what they eat (meal), do (physical activities), and think (work/study).

c) Most people are lack of knowledge about diet especially senior citizens. They do not care about their health but the food satisfaction they feel in return.

d) Costly medical intervention will give limitation for only those who are affordable to get assist and training from doctor and nutritionist.

e) Most people especially working adults are lack of exercise and physical activities due to their hectic schedule and busy lifestyle.

f) Water, air and sound pollution will greatly affect both physical and emotion in public. These will put an additional stress to people who seek a clean and healthy lifestyle.

g) Unhealthy eating habits from different ethnics in Malaysia.

h) Weather is also a contributing point towards the dietary system.

## 1.2 Research Objectives

1. Widen the knowledge on healthcare methods and people needs.
2. Cultivate and brush up public awareness on the importance of diet to maintain a healthy body and mind.
3. Alert on current health disease, which affect health in Malaysia.
4. Improve diet and healthcare information research from the internet by different kind of ethnics in Malaysia.
5. Provide a simple, fast and easy to use e-diet system, which will facilitate different kind of users from various ages to monitor their personal nutrition and preserve a balance and healthy diet.

## 1.3 Scope of Research

1. Provide food categories for users to select their own favourite food according to their taste and their total calories.
2. Calculate the amount of recommended calories according to users personal information.
3. Show the best level of nutrition based on users health information.
4. It is a user friendly and simple system.
5. Targeted for public users, health assistance, dietitians, doctors, hospitals and health organizations for research.
6. The system can be maintain and update from time to time by the administrator.
7. Allow user to know their body mass index.
8. It is a web-based system.
9. It is developed in English.

## 1.4 Project Milestone

**Table 1.4: Project Milestone**

**Report Type: Project milestone (Updated)** * Date - dd/mm/yy
**Date: 13 / 10 / 02**
**Produced by: Chan Hung Yee**

| No. | Task Description | Early Start | Late Start | Actual Start | Early Finish | Late Finish | Actual Finish |
|---|---|---|---|---|---|---|---|
| | **Phase 1 Initial Planning and Investigation** | | | | | | |
| 1.1 | Initiation | 13/06/2002 | 13/06/2002 | 13/06/2002 | 15/06/2002 | 15/06/2002 | 15/06/2002 |
| 1.2 | Analysis on Project Feasibility | 16/06/2002 | 16/06/2002 | 16/06/2002 | 19/06/2002 | 19/06/2002 | 19/06/2002 |
| 1.3 | Planning | 20/06/2002 | 20/06/2002 | 20/06/2002 | 22/06/2002 | 22/06/2002 | 22/06/2002 |
| 1.4 | Initial Design | 23/06/2002 | 23/06/2002 | 23/06/2002 | 27/06/2002 | 27/06/2002 | 27/06/2002 |
| | **Phase 2 Research and Analysis** | | | | | | |
| 2.1 | Study on Well Balance Diet | 28/06/2002 | 28/06/2002 | 28/06/2002 | 03/07/2002 | 03/07/2002 | 03/07/2002 |
| 2.2 | The Importance of Diet | 04/07/2002 | 04/07/2002 | 04/07/2002 | 09/07/2002 | 09/07/2002 | 09/07/2002 |
| 2.3 | User characteristic analyst | 10/07/2002 | 10/07/2002 | 10/07/2002 | 15/07/2002 | 15/07/2002 | 15/07/2002 |
| 2.4 | Comparison on existing e-diet system | 16/07/2002 | 16/07/2002 | 16/07/2002 | 21/07/2002 | 21/07/2002 | 21/07/2002 |
| 2.5 | Human Computer Interaction (HCI) | 22/07/2002 | 22/07/2002 | 22/07/2002 | 27/07/2002 | 27/07/2002 | 27/07/2002 |
| | Documentation | 28/07/2002 | 28/07/2002 | 28/07/2002 | 02/08/2002 | 02/08/2002 | 02/08/2002 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Phase 3 Methodology** | | | | | | | |
| 3.1 | Questionnaire | 24/07/2002 | 24/07/2002 | 24/07/2002 | 26/07/2002 | 26/07/2002 | 26/07/2002 |
| 3.2 | Interview | 27/07/2002 | 27/07/2002 | 27/07/2002 | 29/07/2002 | 29/07/2002 | 29/07/2002 |
| 3.3 | Electronic Survey | 30/07/2002 | 30/07/2002 | 30/07/2002 | 01/08/2002 | 01/08/2002 | 01/08/2002 |
| 3.4 | Documentation | 02/08/2002 | 02/08/2002 | 02/08/2002 | 06/08/2002 | 06/08/2002 | 06/08/2002 |
| **Phase 4 System Analysis** | | | | | | | |
| 4.1 | Functional Requirement | 07/08/2002 | 07/08/2002 | 07/08/2002 | 09/08/2002 | 09/08/2002 | 09/08/2002 |
| 4.2 | Non-Functional Requirement | 10/08/2002 | 10/08/2002 | 10/08/2002 | 12/08/2002 | 12/08/2002 | 12/08/2002 |
| 4.3 | Hardware Requirement | 13/08/2002 | 13/08/2002 | 13/08/2002 | 15/08/2002 | 15/08/2002 | 15/08/2002 |
| 4.4 | Software Requirement | 16/08/2002 | 16/08/2002 | 16/08/2002 | 18/08/2002 | 18/08/2002 | 18/08/2002 |
| 4.5 | Documantation | 19/08/2002 | 19/08/2002 | 19/08/2002 | 20/08/2002 | 20/08/2002 | 20/08/2002 |
| **Phase 5 Design** | | | | | | | |
| 5.1 | System Architecture Design | 21/08/2002 | 21/08/2002 | 21/08/2002 | 23/08/2002 | 23/08/2002 | 23/08/2002 |
| 5.2 | ER-Diagram | 24/08/2002 | 24/08/2002 | 24/08/2002 | 26/08/2002 | 26/08/2002 | 26/08/2002 |
| 5.3 | DFD Diagram | 27/08/2002 | 27/08/2002 | 27/08/2002 | 29/08/2002 | 29/08/2002 | 29/08/2002 |
| 5.4 | Graphical User Interface | 30/08/2002 | 30/08/2002 | 30/08/2002 | 01/09/2002 | 01/09/2002 | 01/09/2002 |
| 5.5 | Database Design | 13/10/2002 | 13/10/2002 | 13/10/2002 | 16/10/2002 | 16/10/2002 | 16/10/2002 |
| 5.5 | Documentation | 02/09/2002 | 02/09/2002 | 02/09/2002 | 16/10/2002 | 16/10/2002 | 16/10/2002 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
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| 6.1 | Administrator Log In Module | 20/10/2002 | 20/10/2002 | 20/10/2002 | 02/11/2002 | 02/11/2002 | 02/11/2002 |
| 6.2 | Health Diet Analysis Module | 03/11/2002 | 03/11/2002 | 03/11/2002 | 13/11/2002 | 13/11/2002 | 13/11/2002 |
| 6.3 | Food Categories Analysis | 14/11/2002 | 14/11/2002 | 14/11/2002 | 26/11/2002 | 26/11/2002 | 26/11/2002 |
| 6.4 | Disease Option Analysis | 27/11/2002 | 27/11/2002 | 27/11/2002 | 10/12/2002 | 10/12/2002 | 10/12/2002 |
| 6.5 | Feedback | 11/12/2002 | 11/12/2002 | 11/12/2002 | 12/12/2002 | 12/12/2002 | 12/12/2002 |
| 6.5 | Documentation | 13/12/2002 | 13/12/2002 | 13/12/2002 | 16/12/2002 | 16/12/2002 | 16/12/2002 |
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| 7.1 | Functional Requirement Testing | 17/12/2002 | 17/12/2002 | 17/12/2002 | 19/12/2002 | 19/12/2002 | 19/12/2002 |
| 7.2 | Non Functional Requirement Testing | 20/12/2002 | 20/12/2002 | 20/12/2002 | 22/12/2002 | 22/12/2002 | 22/12/2002 |
| 7.3 | Heuristic Evaluation | 23/12/2002 | 23/12/2002 | 23/12/2002 | 24/12/2002 | 24/12/2002 | 24/12/2002 |
| 7.4 | Cognitive Walkthrough | 26/12/2002 | 26/12/2002 | 26/12/2002 | 27/12/2002 | 27/12/2002 | 27/12/2002 |
| 7.5 | Usability Testing | 28/12/2002 | 28/12/2002 | 28/12/2002 | 29/12/2002 | 29/12/2002 | 29/12/2002 |
| 7.6 | Documentation | 30/12/2002 | 30/12/2002 | 30/12/2002 | 01/01/2003 | 01/01/2003 | 01/01/2003 |
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| 8.1 | Evaluation Results | 02/01/2003 | 02/01/2003 | 02/01/2003 | 04/01/2002 | 04/01/2002 | 04/01/2002 |
| 8.2 | Things learned throughout the project | 04/09/2002 | 04/09/2002 | 04/09/2002 | 06/01/2003 | 06/01/2003 | 06/01/2003 |
| 6.2 | Problem Encountered | 05/09/2002 | 05/09/2002 | 05/09/2002 | 07/01/2003 | 07/01/2003 | 07/01/2003 |
| 6.3 | Limitation and weaknesses | 06/09/2002 | 06/09/2002 | 06/09/2002 | 08/01/2003 | 08/01/2003 | 08/01/2003 |
| 6.4 | Further Improvement and study | 07/09/2002 | 07/09/2002 | 07/09/2002 | 09/01/2003 | 09/01/2003 | 09/01/2003 |
| 6.5 | Documentation | 08/09/2002 | 08/09/2002 | 08/09/2002 | 11/01/2003 | 11/01/2003 | 11/01/2003 |
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| 9.1 | Enhancement | 12/01/2003 | 12/01/2003 | 12/01/2003 | 20/01/2003 | 20/01/2003 | 20/01/2003 |

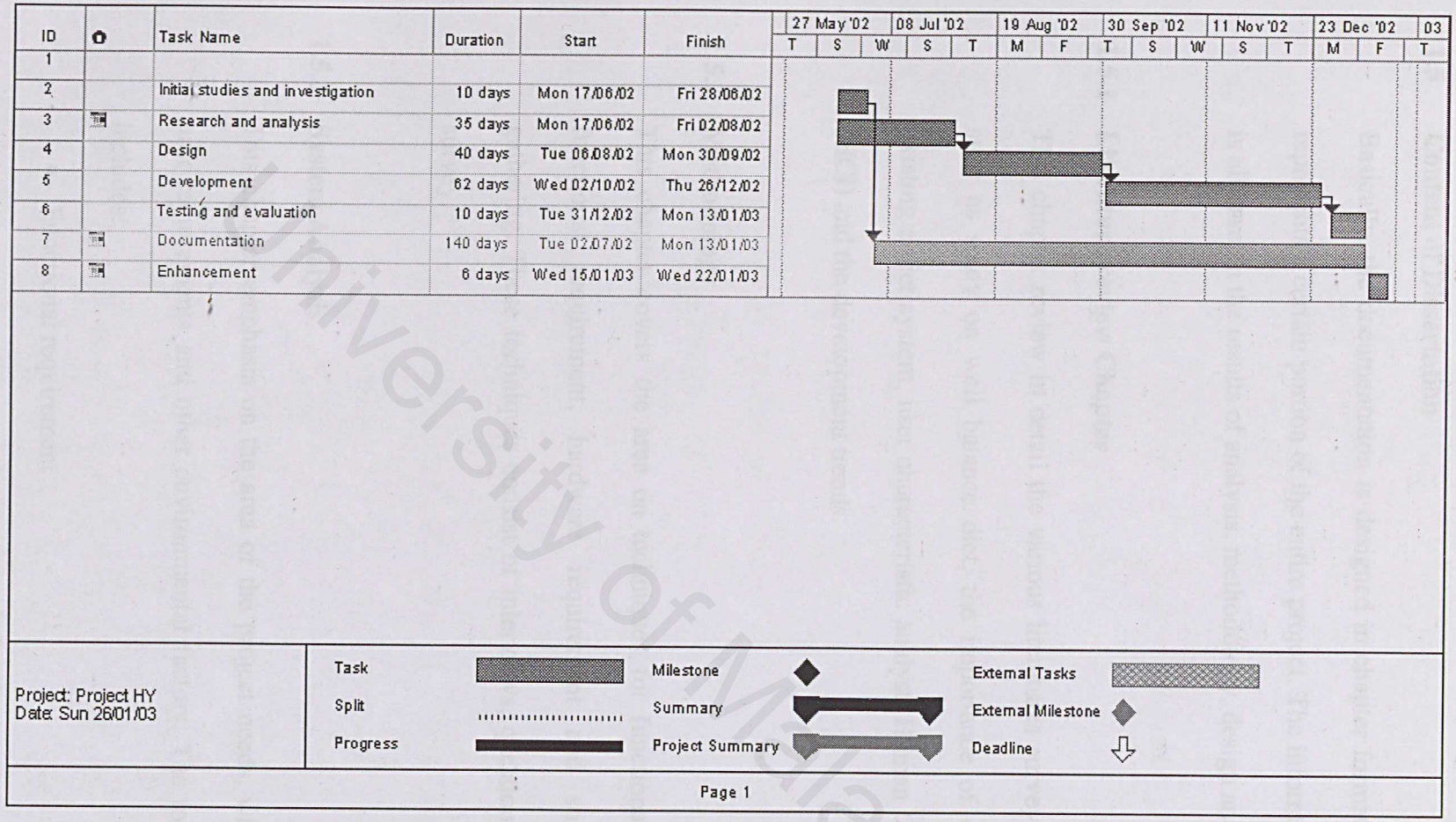



**Figure 1.4: Gantt Chart**

## 1.5 Content of Dissertation

Basically, the documentation is designed in chapter format where each chapter represents a certain portion of the entire project. The information in each chapter is all base on the results of analysis, methodology, design and evaluation.

### 1.5.1 Literature review Chapter

This chapter review in detail the various literatures survey being done on area such as study on well balance diet, the importance of diet, comparison on existing e-diet system, user characteristic analyst, Human Computer Interaction (HCI) and the development trends.

### 1.5.2 Methodology

This chapter covers the area on techniques for functional requirement, non-functional requirement, hardware requirement and software requirement gathering. These techniques consist of interviews, questionnaire and electronic survey.

### 1.5.3 System Analysis

This chapter emphasis on the area of the project needs, which aligns with the user requirements and other environmental factors. The topics in this chapter includes:

- Functional requirement
- Non-Functional Requirement

- Hardware Requirement
- Software Requirement

### 1.5.4 Design

This chapter covers the area on the design being used throughout the project duration. It also covers the implementation of the methods in the project. The design technique include:

- System Architecture Design
- ER-Diagram (Entity Relational Diagram)
- Data Flow Diagram
- Graphical User Interface Design
- Database Design

### 1.5.5 System Development

This chapter covers the area of system development throughout the project duration. It shows programmed coding based on the design module and how it works.

### 1.5.6 System Testing

This chapter includes the evaluation whether the system operates based on the system requirement and specification. It also covers the materials on types of evaluation methodology researched and being used for evaluating the program.

### 1.5.7 Discussion

This chapter focuses on certain issues that have been learned, research contribution, problem encountered and their solutions, limitation and weaknesses, further improvement and suggestion for project enhancement.

### 1.5.8 Appendix

It includes the log sheets and questionnaire and survey form.

### 1.5.9 References

It contains the references used throughout the project duration.

## 1.6 Conclusion

The project aim to produce a smart diet system, which allows the user to choose and analyst the food selection. It also provides a recommended meal plan according to their personal information and diet prevention based on their health condition. The success criterion for this project is to perform all the above activities.

The quality of the project is very much relying on the ability of the program to meet the objectives and scope along with the right alignment with users needs.

# Chapter 2: Literature Review

## 2.1 Study on Balance Diet

Wise food choices provide the necessary foundation for optimal nutrition. Selection of a variety of foods using tools such as the USDA/HHS Dietary Guidelines and USDA Food Guide Pyramid is the best way to provide desirable balance, without excessive intake of macronutrients, micronutrients and other beneficial components of foods. Nevertheless, for certain nutrients and some individuals, fortification, supplementation or both may also desirable. The best nutritional strategy for promoting optimal health and reducing the risk of chronic disease is to wisely choose the vide variety of foods. Additional vitamins and minerals from fortified foods and supplements can help some people meet their nutritional needs as specified by Dietary Reference Intakes (DRI) (Dist Assoc, 1998).

### 2.1.1 Balance Food as the Basis for Good Nutrition

Research on the relationship between diet and disease has indicated that both macronutrients and micronutrients are important and has documented the need to avoid dietary excesses and imbalances as well as insufficient nutrients intakes. Nutrient-nutrient, drug nutrient, and other interactions are also important and may affect health; high doses of one nutrient or food constituent may affect the absorption of metabolism of others. These concerns underscore the conclusion that nutrition cannot be optimized simply through fortification or

supplementation of food supply. Wise food choices are also essential and provide the necessary foundation and optimal diet.

Research has identified numerous compounds other than essential nutrients in plant and animal foods (phytochemicals and zoo chemicals), with chemical properties or biological effects that suggest health benefits (Decker, 1995). It is difficult to specifically identify those responsible for positive health effects observed in clinical studies because there are so many constituents in foods.

There is no scientific basis for the common assumptions that if a small amount of a food component is beneficial, then more must be better, or that concentrated amounts of a limited number of components will provide greater benefits than the combination of the many different constituents provided by food. For example, a variety of natural pesticides produced by plants to ward off predators have anti-carcinogenic properties which preconditioning the body's detoxification systems. However, they may not be safe or effective when concentrated and taken in larger doses as supplements (Medical Assoc, 1993). Other synthetic forms may also be more bioavailable than the forms in food and many provide greater risk of toxicity or imbalance.

While researchers have repeatedly observed health benefits associated with high fruit and vegetable consumption, it has not been possible to identify a combination of balance healthy diet (Willett, 1998). Eating a wide variety of foods is the best way to obtain adequate amounts of beneficial food constituents, while avoiding chemical excess or imbalances.

The Food and Nutrition Board of the National Research Council, National Academy of Sciences, has set dietary standards called Recommended Dietary

Allowances (RDA). These describe the daily amounts of energy, protein, minerals, and fat-soluble and water-soluble vitamins needed by normal healthy males and females from infancy to old age. A male, for example, 23 to 50 years old and weighing 70 kg (154 lb) has an RDA of 56 g of protein, 45 mg of ascorbic acid, and 10 mg of iron. A female 23 to 50 years old and weighing 58 kg (128 lb) has an RDA of 46 g of protein, 45 mg of ascorbic acid, and 18 mg of iron (Encarta, 1998a).

### 2.1.2 Essential Nutrient

Nutrients are classified as essential or nonessential. Nonessential nutrients are manufactured in the body and do not need to be obtained from food. Examples include cholesterol, a fatlike substance present in all animal cells. Essential nutrients must be obtained from food sources, because the body either does not produce them or produces them in amounts too small to maintain growth and health. Essential nutrients include water, carbohydrates, proteins, fats, vitamins, and minerals.

#### 2.1.2.1 Water

Water circulates through our blood and lymphatic system, transporting oxygen and nutrients to cells and removing wastes through urine and sweat. Water also maintains the natural balance between dissolved salts and water inside and outside of cells. Our joints and soft tissues depend on the cushioning that water provides for them. While water has no caloric value and therefore is not an

energy source, without it in our diets we could not digest or absorb the foods we eat or eliminate the body's digestive waste (Encarta, 1998c).

### 2.1.2.2 Carbohydrate

Carbohydrates are the human body's key source of energy, providing 4 calories of energy per gram. When the body breaks down carbohydrates, the sugar glucose is produced; glucose is critical to help maintain tissue protein, metabolize fat, and fuel the central nervous system.

Glucose is absorbed into the bloodstream through the intestinal wall. Some of this glucose goes straight to work in our brain cells and red blood cells, while the rest makes its way to the liver and muscles, where it is stored as glycogen (animal starch), and to fat cells, where it is stored as fat.

Starches and sugars are the major carbohydrates. Common starch foods include whole-grain breads and cereals, pasta, corn, beans, peas, and potatoes. Naturally occurring sugars are found in fruits and many vegetables; milk products; and honey, maple sugar, and sugar cane. Foods that contain starches and naturally occurring sugars are referred to as complex carbohydrates, because their molecular complexity requires our bodies to break them down into a simpler form to obtain the much-needed fuel, glucose. Our bodies digest and absorb complex carbohydrates at a rate that helps maintain the healthful levels of glucose already in the blood. Nutritionist caution that most people should take complex carbohydrate (Encarta, 1998d).

### 2.1.2.3 Proteins

Dietary proteins are powerful compounds that build and repair body tissues, from hair and fingernails to muscles. In addition to maintaining the body's structure, proteins speed up chemical reactions in the body, serve as chemical messengers, fight infection, and transport oxygen from the lungs to the body's tissues. Although protein provides 4 calories of energy per gram, the body uses protein for energy only if carbohydrate and fat intake is insufficient. When tapped as an energy source, protein is diverted from the many critical functions it performs for our bodies.

Proteins are made of smaller units called amino acids. Of the more than 20 amino acids our bodies require, eight (nine in some older adults and young children) cannot be made by the body in sufficient quantities to maintain health. These amino acids are considered essential and must be obtained from food. When we eat food high in proteins, the digestive tract breaks this dietary protein into amino acids. Absorbed into the bloodstream and sent to the cells that need them, amino acids then recombine into the functional proteins our bodies need (Encarta, 1998e).

### 2.1.2.4 Fats

Fats provide 9 calories of energy per gram, are the most concentrated of the energy-producing nutrients. Fats play an important role in building the membranes that surround our cells and in helping blood to clot. Once digested and absorbed, fats help the body absorb certain vitamins. Fat stored in the body cushions vital organs and protects us from extreme cold and heat.

Cholesterol is a lipid, which is an organic compound that is not soluble in water. In order to travel through blood, cholesterol therefore must be transported through the body in special carriers, called lipoproteins. High-density lipoproteins (HDLs) remove cholesterol from the walls of arteries, return it to the liver, and help the liver excrete it as bile, a liquid acid essential to fat digestion. High-fat diets also contribute to obesity, which is linked to high blood pressure (hypertension) and diabetes mellitus. A diet high in both saturated and unsaturated fats has also been associated with greater risk of developing cancers of the colon, prostate, breast, and uterus (Encarta, 1998f).

**2.1.2.5 Vitamin and Minerals**

Vitamins enhance the body's use of carbohydrates, proteins, and fats. They are critical in the formation of blood cells, hormones, nervous system chemicals known as neurotransmitters, and the genetic material deoxyribonucleic acid (DNA). Vitamins are classified into two groups:

a) Fat soluble

b) Water-soluble.

Fat-soluble vitamins, which include vitamins A, D, E, and K, are usually absorbed with the help of foods that contain fat. Fat containing these vitamins is broken down by bile, a liquid released by the liver, and the body then absorbs the breakdown products and vitamins. Excess amounts of fat-soluble vitamins are stored in the body's fat, liver, and kidneys. Because these vitamins can be stored in the body, they do not need to be consumed every day to meet the body's needs.

Water-soluble vitamins, which include vitamins C (also known as ascorbic acid), B1 (thiamine), B2 (riboflavin), B3 (niacin), B6, B12, and folic acid, cannot be stored and rapidly leave the body in urine if taken in greater quantities than the body can use. Foods that contain water-soluble vitamins need to be eaten daily to replenish the body's needs.

In addition to the roles noted in the vitamin and mineral chart accompanying this article, vitamins A (in the form of beta-carotene), C, and E function as antioxidants, which are vital in countering the potential harm of chemicals known as free radicals. If these chemicals remain unchecked they can make cells more vulnerable to cancer-causing substances. Free radicals can also transform chemicals in the body into cancer-causing agents. Environmental pollutants, such as cigarette smoke, are sources of free radicals (Patterson et al, 1998).

Minerals are minute amounts of metallic elements that are vital for the healthy growth of teeth and bones. They also help in such cellular activity as enzyme action, muscle contraction, nerve reaction, and blood clotting. Mineral nutrients are classified as major elements (calcium, chlorine, magnesium, phosphorus, potassium, sodium, and sulfur) and trace elements (chromium, copper, fluoride, iodine, iron, selenium, and zinc).

Vitamins and minerals not only help the body perform its various functions, but also prevent the onset of many disorders. For example, vitamin C is important in maintaining our bones and teeth; scurvy, a disorder that attacks the gums, skin, and muscles, occurs in its absence. Diets lacking vitamin B1, which supports neuromuscular function, can result in beriberi, a disease characterized by mental

confusion, muscle weakness, and inflammation of the heart. Adequate intake of folic acid by pregnant women is critical to avoid nervous system defects in the developing fetus. The mineral calcium plays a critical role in building and maintaining strong bones; without it, children develop weak bones and adults experience the progressive loss of bone mass known as osteoporosis, which increases their risk of bone fractures (Encarta, 1998g).

### 2.1.3 Recommended Food and Nutrient Intakes

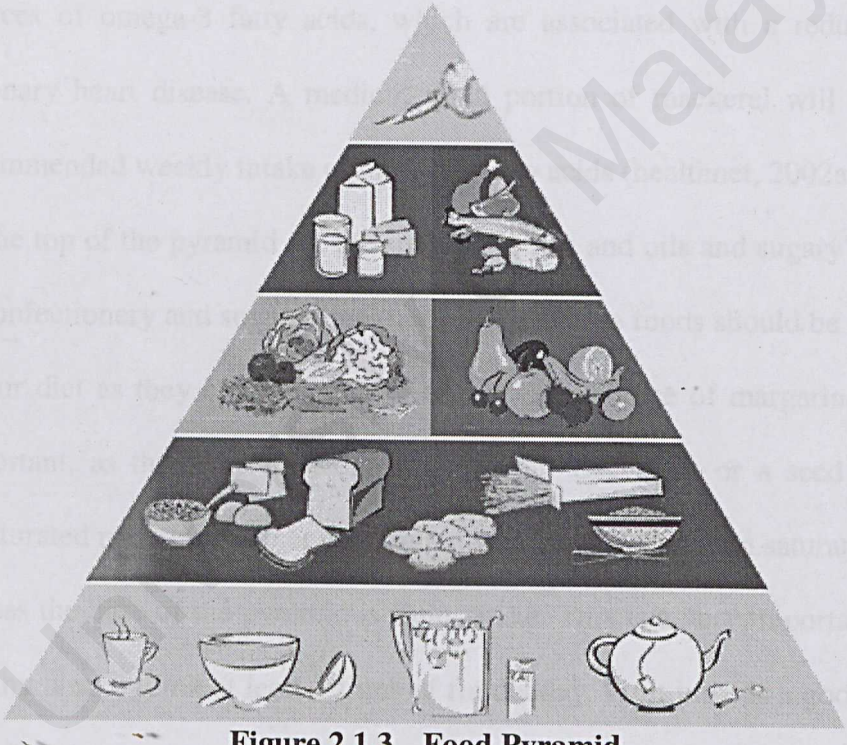


**Figure 2.1.3 Food Pyramid**

From the pyramid it is clear that most of our diet should consist of cereal products, potatoes and fruits and vegetables. These two groups alone will provide

energy, fiber, most vitamins and minerals and some protein. All forms of fruit and vegetables are beneficial (dried, juice, frozen and fresh).

Added to this strong base are smaller amounts of meat, fish and vegetarian alternatives, and the dairy products. Together these two groups complement the protein provided by the cereals and provides more vitamins in a good bioavailable form. Dairy products are an excellent source of calcium and their contribution to the diet is very important. Full fats products must not be taken too much as they are rich in saturated fat (healthnet, 2002a). Increase the consumption of oily fish (mackerel, herring, sardines etc.), as these are rich sources of omega-3 fatty acids, which are associated with a reduced risk of coronary heart disease. A medium sized portion of mackerel will provide the recommended weekly intake of omega-3 fatty acids (healthnet, 2002a).

At the top of the pyramid are the spreadable fats and oils and sugary foods, such as confectionery and sugary breakfast cereals. These foods should be a small part of our diet as they are very rich in energy. The choice of margarine and oil is important, as there are different types of fat. Use olive or a seed oil and an unsaturated margarine rather than butter or lard to cut down on saturated fat.

Across the base of the pyramid is fluid intake. This is a very important part of a healthy diet to drink at least 2 litres of fluid a day. Fruit juice is a good source of vitamin C but coffee is a diuretic and can actually dehydrate the body system. Always follow the recommended safe intakes of alcohol (21 units per week for women and 28 for men) to gain a healthy and balance life.

**Table 2.1.3 Recommended servings of food**

| Type of food | Recommended servings |
|---|---|
| Meat, poultry, fish (cooked weight) | 0–4 oz |
| Fruit | 4+ servings |
| Vegetables | 4+ servings |
| Milk, yogurt, cheese | 4+ servings |
| Breads, cereals, grains | 6+ servings |
| Foods with mostly sugar and/or fat (soft drinks, pastries, cookies, desserts, candy) | 0–1 time |
| Legumes (cooked dry beans and peas) | 4+ times |
| Fast foods | 0–2 times |

### 2.1.3.1 Eight Guidelines for Healthy Diet

1. **Guide food choices using food pyramid**

   Serving sizes.

2. **Aim for a healthy weight**

   Being at a healthy weight reduces the risk of developing high blood pressure, heart disease, stroke, certain cancers, and diabetes. Getting regular physical exercise and eating a balanced diet are the best ways to maintain a balance weight.

3. **Choose a variety of grains daily, especially whole grain.**

   Grains include wheat, rice, oats, and barley, and foods made from grains, such as bread and pasta. These foods provide vitamins, minerals, and fiber as well as carbohydrates for energy. Whole-grain foods use grains that have been through less processing, retaining more of the nutrient value of the food.

With plenty of whole grains, such as whole-wheat bread and oatmeal, the risk of heart disease, bowel diseases, and certain types of cancer will be reduced.

4. **Choose a variety of fruits and vegetables daily**

   These foods provide vitamins, minerals, and fiber as well as other non-nutrients (called phytochemicals) that protect against cancer, heart disease, and high blood pressure. They also promote healthy bowel function.

5. **Choose a diet low in saturated fat and cholesterol**

   A diet low in saturated fat and cholesterol and moderate in total fat (no more than 30% of total calories) reduces your risk of developing heart disease, cancer, and high blood pressure. "Trans fats" such as partially hydrogenated vegetable oil (found in many hard margarines and shortenings and processed foods, such as chips and cookies) tend to raise cholesterol and should also be limited (healthnet, 2002b).

6. **Choose beverages and foods that limit your sugar intake**

   Added sugars contain few other useful nutrients and; but when consumed in excess, they will crowd healthier foods out of diet. Snack foods (such as cookies, cakes, and candy) and beverages (such as soft drinks and juices) are often major sources of excess added sugar (healthnet, 2002b).

7. **Choose and prepare foods with less salt and sodium**

   Eating less salt and sodium helps reduce your risk for high blood pressure. Aim for a moderate salt and sodium intake (healthnet, 2002b).

8. **Take alcohol beverages in moderation**

   Alcohol supplies calories but few nutrients. Alcohol is also the cause of many health problems and accidents and can lead to addiction (dietitian, 2002).

### 2.1.4 Conclusion

Based on this topic, it is important to take balance diet, which consists of water, carbohydrate, protein, fats, vitamins and minerals. A balance diet is the core requirement for healthy living.

## 2.2 The Importance of Diet

Diet is a very important feature in health. Studies indicate that most of the Malaysian gain weight in adulthood, increasing their risk for high blood pressure, heart disease, stroke, diabetes, certain types of cancer, arthritis, breathing problems, and other illnesses because they do not plan for a proper balance diet in their eating habits. Obesity wills occurs when food is overtaken and nutrient insufficiency wills hunter those who have improper eating habits.

### 2.2.1 Nutritional Status in Malaysia

Both under-nutrition and over-nutrition occur in Malaysia. Differences exist between population groups and between peninsular and eastern Malaysia. While the overall nutrition situation has improved tremendously over the years (the average daily per capita energy supply is 2549 kilocalories with 45.3% of the protein consumed being derived from animal sources), pockets of under-nutrition exist in various parts of the country and are being specifically targeted by government policy (Health, 2002).

The major nutrient deficiencies in the country are protein-energy malnutrition among children, and deficiencies in the micronutrients iron, vitamin A and iodine. Moderate under-nutrition is widespread, especially among rural under-served communities, and affects mainly young children and pregnant women. Underweight and chronic under-nutrition occur among pre-school children and schoolchildren (24.1% of children under five years old have a weight for age

below international standards). Similarly, iron deficiency anemia affects young children as well as pregnant women. Vitamin A deficiency does not appear to be a major problem (Health, 2002). About 7% of the population is estimated to be at risk of iodine deficiency disorders (Health, 2002). Goiter prevalence differs between regions:

a) 10% to 58% is found in endemic areas in Peninsular Malaysia

b) 38% to 76% in Sabah

c) 0.7% to 99.5% in Sarawak

Recently an increasing prevalence of diet-related non-communicable diseases, related to the excessive consumption of various nutrients (example: fat) and low level of intake of other nutrients (example: complex carbohydrates). The rapid socioeconomic development in the country has brought about increasing prevalence of diseases such as obesity, diabetes mellitus, cardiovascular diseases and cancers. It is estimated that 11.5% of the population is overweight and cardiovascular diseases and malignant neo-plasma have become the leading causes of death in Malaysia after heart disease (Health,2002).

**Table 2.2.1(a) 10 Principles Causes of Death in Malaysia's Hospital, 1999**

| | | |
|---|---|---|
| 1. | Heart Diseases & Diseases of Pulmonary Circulation | 15.02 % |
| 2. | Septicemia | 12.74 % |
| 3. | Cerebrovascular Diseases | 9.59 % |
| 5. | Malignant Neoplasm | 9.08 % |
| 6. | Accident | 7.56 % |
| 6. | Certain Conditions Originating In The Prenatal Period | 6.33 % |
| 7. | Pneumonia | 4.83 % |

| | | |
|---|---|---|
| 8. | Diseases of the Digestive System | 4.75 % |
| 9. | Chronic Lower Respiratory Diseases | 3.87 % |
| 10. | Nephritis, Nephrotic, Syndrome and Nephrosis | 3.79 % |

From Table 2.2.1(a), it shows that more than 65% of the total death in Malaysia is cause by diseases and sickness, which is the result from unhealthy living with imbalance food intake. Heart Disease and Pulmonary Circulation disease is the greatest killer among Malaysian. This followed by Septicemia, Cerebrovascular Diseases and Malignant Neo-Plasma.

Disorders of the blood arise from abnormal changes in the blood composition. An abnormal reduction in the hemoglobin content or in the number of red blood cells is known as anemia. Anemia also results from decreased production of red cells, attributable to a loss of iron and deficiency of vitamin $B_{12}$. On the other hand, interaction of thrombocytes with the fatty deposits is thought to contribute to heart attacks (Encarta,1998b).

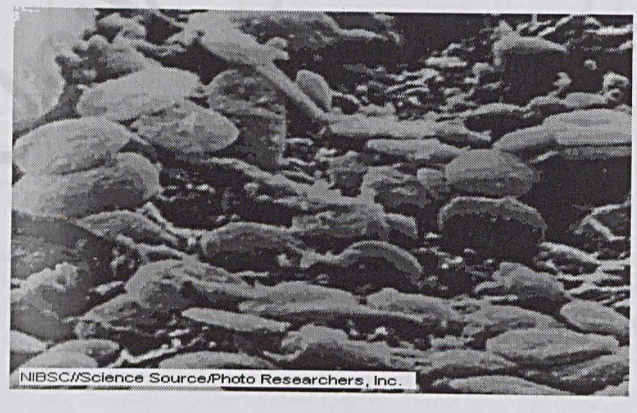
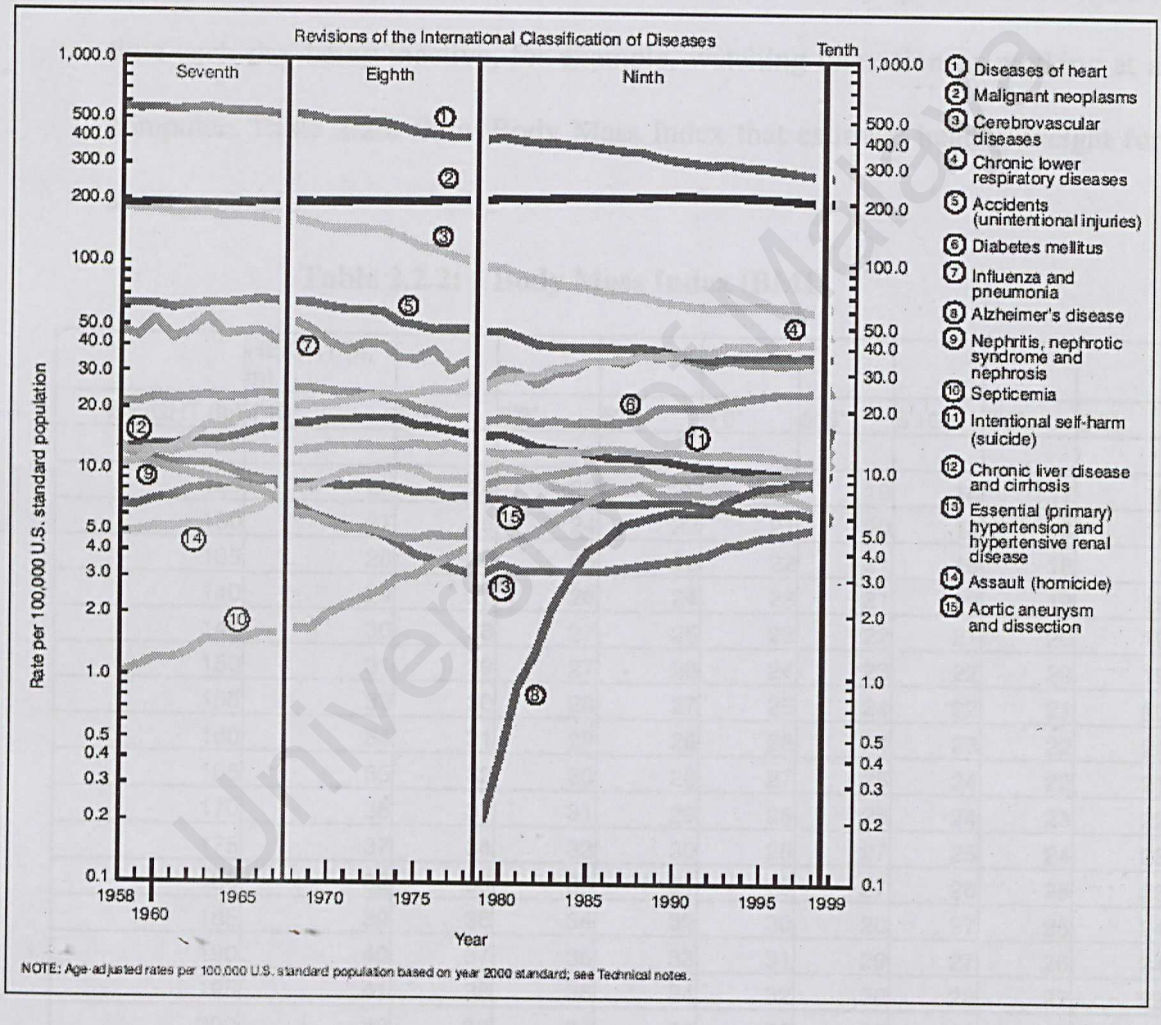



**Figure 2.2.1 Thrombocytes and clotting**

Table 2.2.1(b) shows 15 leading cause of death in United States from 1958-1999. Heart disease is the number one killer in the country. This follow by Malignant Neoplasm and Cerebrovascular disease (Hoyert et al, 2001). This shows that most of the leading cause of death around the globe is cause by insufficient of certain nutrition in their diet.

**Table 2.2.1(b): Age adjusted death rates for the 15 leading causes of death, 1958-99**



### 2.2.2 Maintain a Healthy Diet and Lifestyle

The key for obtaining a balance healthy lifestyle and free from diseases is from diet. In order to stay healthy, people must balance the amount of calories in the foods and drinks they consume with the amount of calories the body uses (refer to food pyramid in Figure 2.1.3). Physical activity is an important way to use food energy. Most of the working adults spend much of their working day in activities that require little energy. In addition to that, they spend a lot of leisure time each day being inactive, for example, watching television or working at a computer. Table 2.2.2 show Body Mass Index that estimate healthy weight for average people.

**Table 2.2.2: Body Mass Index (BMI)**

| | HEIGHT (ft, in) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| WEIGHT (lb) | 4'10" | 5'0" | 5'2" | 5'4" | 5'6" | 5' 8" | 5'10" | 6'0" | 6'2" |
| 125 | 26 | 24 | 23 | 22 | 20 | 19 | 18 | 17 | 16 |
| 130 | 27 | 25 | 24 | 22 | 21 | 20 | 19 | 18 | 17 |
| 135 | 28 | 26 | 25 | 23 | 22 | 21 | 19 | 18 | 17 |
| 140 | 29 | 27 | 26 | 24 | 23 | 21 | 20 | 19 | 18 |
| 145 | 30 | 28 | 27 | 25 | 23 | 22 | 21 | 20 | 19 |
| 150 | 31 | 29 | 27 | 26 | 24 | 23 | 22 | 20 | 19 |
| 155 | 32 | 30 | 28 | 27 | 25 | 24 | 22 | 21 | 20 |
| 160 | 34 | 31 | 29 | 28 | 26 | 24 | 23 | 22 | 21 |
| 165 | 35 | 32 | 30 | 28 | 27 | 25 | 24 | 22 | 21 |
| 170 | 36 | 33 | 31 | 29 | 28 | 26 | 24 | 23 | 22 |
| 175 | 37 | 34 | 32 | 30 | 28 | 27 | 25 | 24 | 23 |
| 180 | 38 | 35 | 33 | 31 | 29 | 27 | 26 | 25 | 23 |
| 185 | 39 | 36 | 34 | 32 | 30 | 28 | 27 | 25 | 24 |
| 190 | 40 | 37 | 35 | 33 | 31 | 29 | 27 | 26 | 24 |
| 195 | 41 | 38 | 36 | 34 | 32 | 30 | 28 | 27 | 25 |
| 200 | 42 | 39 | 37 | 34 | 32 | 30 | 29 | 27 | 26 |
| 205 | 43 | 40 | 38 | 35 | 33 | 31 | 29 | 28 | 26 |
| 210 | 44 | 41 | 38 | 36 | 34 | 32 | 30 | 29 | 27 |
| 215 | 45 | 42 | 39 | 37 | 35 | 33 | 31 | 29 | 28 |
| 220 | 46 | 43 | 40 | 38 | 36 | 34 | 32 | 30 | 28 |
| 225 | 47 | 44 | 41 | 39 | 36 | 34 | 32 | 31 | 29 |
| 230 | 48 | 45 | 42 | 40 | 37 | 35 | 33 | 31 | 30 |

A BMI of 20 to 26 is desirable for most adults. A BMI of 27 to 29 indicates obesity and is associated with some risk for heart disease, diabetes, and other diseases. A BMI of 30 or more poses the greatest risk for life-threatening diseases (Foster, 1998).

#### 2.2.2.1 Diets

The most common and conservative way to remain a healthy and balance lifestyle is through nutritional balance, low calorie diet. Most health care professionals, recommend diets consisting of 1200 to 1500 calories per day. High fat foods contain more calories per serving than other foods and may increase the likelihood of weight gain. By eating a variety of foods, emphasizing rice, bread and other whole grain foods as well as fruits and vegetables. These foods are filling but lower in calories than foods rich in fats or oils.

Maintaining weight is equally important for older people who begin to lose weight as they age. Some of the weight is from the lost of muscle. Maintaining muscle through regular activity helps to keep older people feeling well and helps to reduce the risk of falls and fractures.

### 2.2.2.2 Exercise


**Figure 2.2.2.2: Aquatic exercises**

The benefits of exercise are far-reaching. Clinical studies have demonstrated that regular aerobic exercise reduces the risk of death due to heart disease and stroke, aids in reducing weight, helps prevent diabetes mellitus, strengthens bones, and enhances immune function. The psychological benefits are also broad, and most studies suggest a positive relationship between physical fitness and mental achievement.

Many people exercise to lose weight. A calorie is a unit that measures the energy content of foods and the energy expenditure by the body. When the daily calorie intake from food is the same as calories expended from exercise, weight remains the same. The number of calories burned during exercise varies greatly with the type of physical activity, but the key to successful weight reduction is to exercise regularly, without increasing food intake proportionally. For example, walking one hour per day may utilize only 300 calories of energy per day, a small fraction of an individual's daily caloric intake. But over a period of time, if food consumption is simultaneously

reduced or remains the same, significant weight loss will result. One sound approach to reducing calories is to eat healthier foods that contain more fiber and less fat, and therefore fewer calories. This type of diet has also been proven healthier for the heart and blood vessels (Myers, 1998).

**Table 2.2.2.2: Calories Use**

| ACTIVITY | 35kg (75 lb) | 45 kg (100 lb) | 70 kg (150 lb) | 90 kg (200 lb) |
|---|---|---|---|---|
| Bicycling, 10 km/h (6 mph) | 135 | 160 | 240 | 320 |
| Bicycling, 20 km/h (12 mph) | 225 | 270 | 410 | 540 |
| Running, 9 km/h (5.5 mph) | 365 | 440 | 660 | 880 |
| Running, 11.5 km/h (7 mph) | 510 | 610 | 920 | 1220 |
| Running, 16 km/h (10 mph) | 710 | 850 | 1280 | 1700 |
| Jumping Rope | 415 | 500 | 750 | 1000 |
| Swimming, 23 m/min (25 yd/min) | 155 | 185 | 275 | 370 |
| Swimming, 46 m/min (50 yd/min) | 270 | 325 | 500 | 650 |
| Tennis, singles | 220 | 265 | 400 | 530 |
| Walking, 3 km/h (2 mph) | 125 | 160 | 240 | 320 |
| Walking, 5 km/h (3 mph) | 175 | 210 | 320 | 420 |
| Walking, 7 km/h (4.5 mph) | 245 | 295 | 440 | 590 |

### 2.2.2.3 Behaviour Modification

Many eating and exercise habits combine to promote weight gain and sickness. Certain times, places, activities, and emotions may be linked to periods of overeating or inactivity. It is recommended to keep a food diary to record all food or drinks consumes and the mood or precipitating events that trigger eating to control the eating behaviour.

### 2.2.3 Conclusion

In general, this chapter explain the health problem, which occurs due to imbalance diet when under-nutrient or over-nutrient of food take place. People could not control what they normally eat. What they eat normally is based on their culture and ethnic groups with imbalance diet.

Integrating will definitely offer a better and healthier lifestyle, which allow the people to use an application to consult their daily diet.

## 2.3 User Characteristic Analyst

This topic explains the analysis of user characteristic level, which is conducted by questionnaire. Refer to appendix for the set of questionnaire. A range of students and working adults has answered more than 35 set of questionnaire and the result is rewarding. There are four main topics, which are focus on. They are:

- Computer User Level
- Diet Analysis
- Diet System Analysis
- Diet System Request

### 2.3.1 Diet Analysis Result

**Table 2.3.1(a): Illustration on Diet Analysis Result**

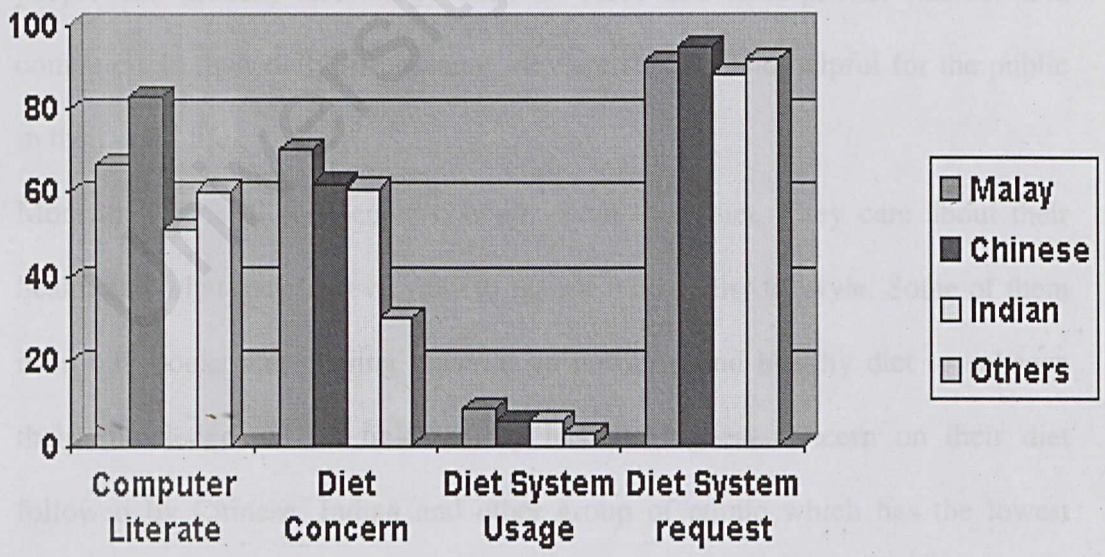


**Table 2.3.1(b): Result of Diet Analysis**

| | | A | B | C | D |
|---|---|---|---|---|---|
| | | Computer Literate | Diet Concern | Diet System Usage | Diet System request |
| 1 | Malay | 66.8 | 70.1 | 850% | 91.4 |
| 2 | Chinese | 83.2 | 62.3 | 5.7 | 95.2 |
| 3 | Indian | 51.2 | 61.1 | 5.7 | 88.5 |
| 4 | Others | 60.5 | 30 | 2.8 | 92.1 |
| 5 | | | | | |

The result from this survey is shown in the graph above. Please refer to Table 2.3.1(a). Table 2.3.1(a) shows the illustration on Diet Analysis result. The collected information is group based on the ethnic group in Malaysia, which consist of Malay, Chinese, Indian and others group of ethnic. From the survey, most of the people is computer literate. Chinese has the highest level of computer literate (83%), followed by Malay (67%), other groups of ethnic (62%) and Indian (51%). An average of 66% of them are computer literate. More and more people use modern technology such as PDA and hand-phone, internet and computers in their daily life because they are flexible and helpful for the public in their daily life.

More than 55% of the people concern about their diet. They care about their health and what they eat everyday to maintain a healthy lifestyle. Some of them even buy books and reading material on nutrition and healthy diet to enhance their knowledge in this field. Malay has the highest concern on their diet followed by Chinese, Indian and other group of ethnic which has the lowest concern on their diet. This may cause by lower standard of living and lack of diet knowledge.

In Diet System usage analysis, there is less than 10% who are using diet system in their daily lifestyle currently. This may cause by the difficulties in finding the appropriate system for their usage. Apart from that, they are lack of self-initiative to find the relevant system to calculate daily diet and healthy meal.

Based on the research on Diet System Request, the requirement for a fast and easy diet is somehow rewarding. This is mainly due to the peoples' eagerness to try on such system and their level of concern in diet. Apart from that, most of them consuming outside food regularly and they seldom exercise due to busy lifestyle. In a nutshell, people will be motivated to try on a web-based smart diet system because it is fast, easy and reliable.

### 2.3.2 Conclusion

The analysis stage of the development has been successfully due to the ample effort allocated in it. The most important and interesting part of the analysis is involving the study of current diet and health conscious in life. The study aims at finding out how these concepts and methodologies work and where improvement should be made.

The manner in which fact-finding is conducted will determine whether the right information is gathered before the start of design and development. In other words, to produce good programs, there is a vital need to understand the requirements and trends of development.

## 2.4 Comparison on existing E-diet System

There is a number of existing e-diet system in the market which help users to calculate the best diet according to the user needs. Each system has their own features and advantages.

### 2.4.1 Personal Nutrition System

**Step1**

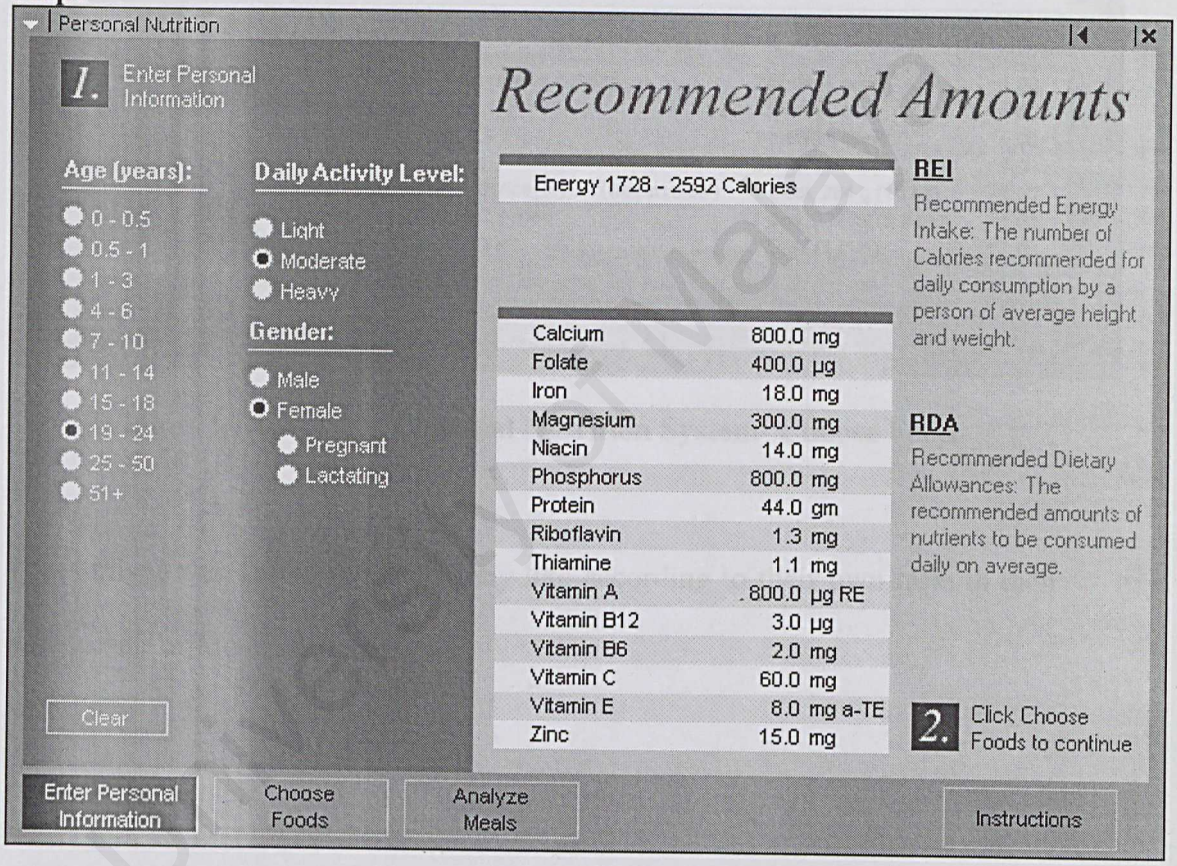



**Figure 2.4.1(a): Personal Nutrition System- Enter personal information**

After entering the personal information, Personal Nutrition System (Encarta, 2002) will shows the amount of recommended Energy intake and RDA on different kind of nutrient.

**Step2**

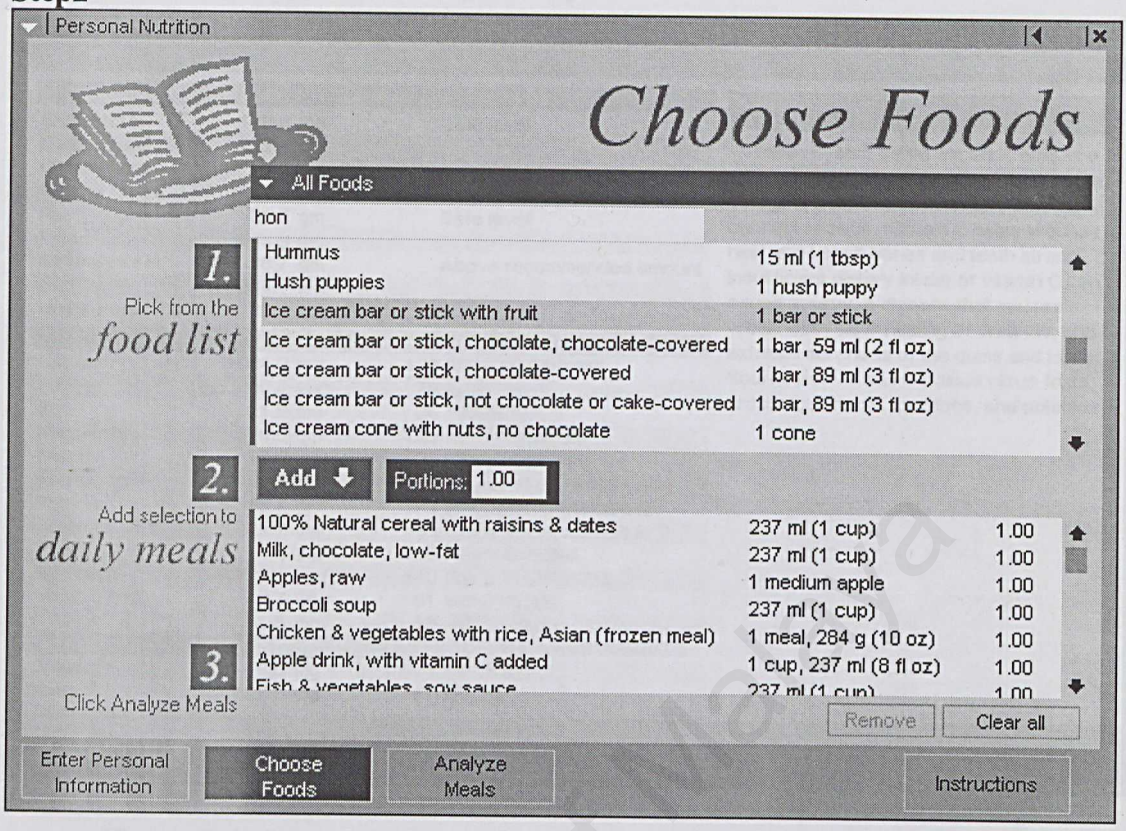



**Figure 2.4.1(b): Personal Nutrition System- Choose Food**

Users might choose the food that they like according to their own taste in their daily meal for food analyzing.

Step 3

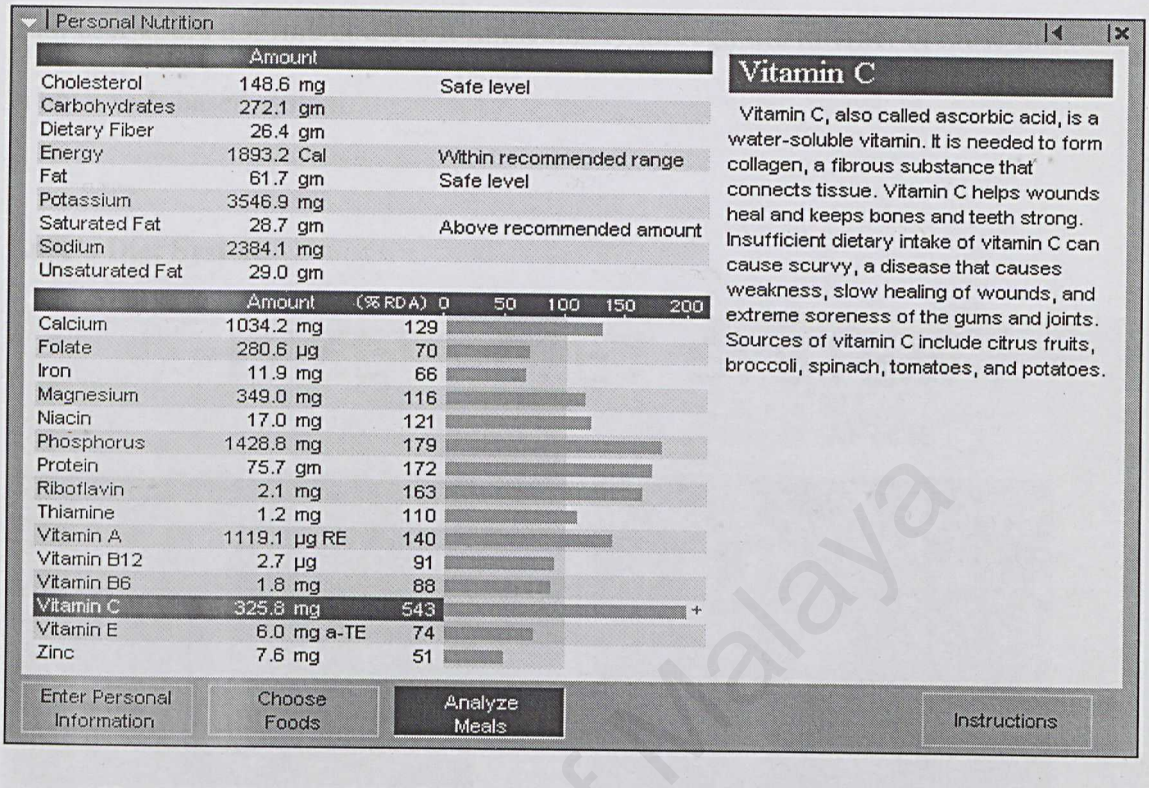



**Figure 2.4.1(c): Personal Nutrition System- Analyze Meals**

In this step, the system will do analyzation to the food, which have been chosen earlier. It will tell the user whether their cholesterol and fat level is safe. Apart from that, the system will provide the RDA for each nutrient by the food chosen. User might know what food to eat and choose the best food for their meal everyday to stay in a healthy lifestyle.

The disadvantages from this system is user could not identify which food give the unnecessary nutrient and do not suggest the nearest diet meal plan for the user in order to maintain their balance diet. Other than that, this system is more suitable in west countries because the food alternatives are based on western group. The ideal system should let user from different ethnic (Example: Malays,

Chinese and Asian) to be able to choose the food according to their taste. Besides that, user could not find and use it immediately through the internet because this is not a web-based system.

### 2.4.2 Laze's Diet System

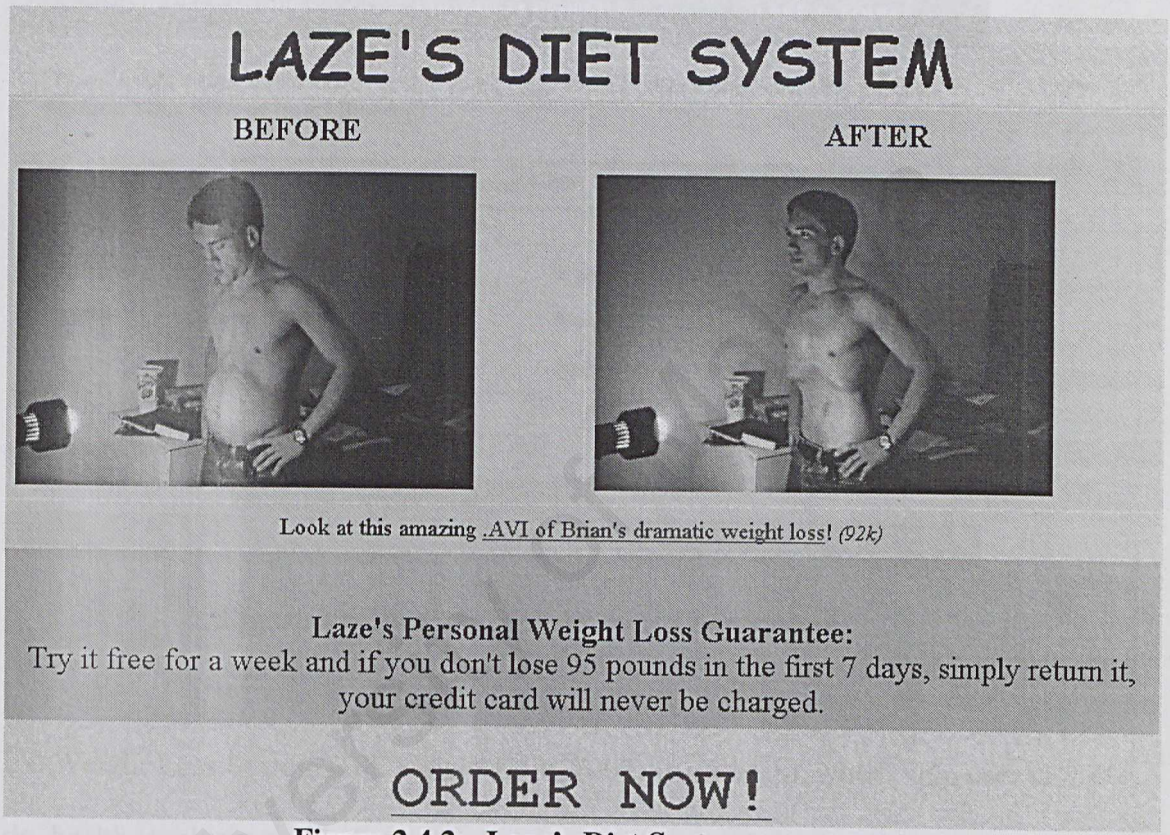



**Figure 2.4.2: Laze's Diet System**

Laze's Diet System (Laze, 2002) is a system, which will help user to lose weight in shortest time. The advantage in this system is users who are experiencing obesity may reduce their weight into a healthy balance weight.

However, there are disadvantages in this diet system. Users need to pay before they can look or try in that system. The system does not let users for trial before they purchase it. Users do not know how the system works to help users.

Sometimes user might not believe in the declaration by experience users, which promote how good is the system.

### 2.4.3 EZ-Weight Loss System

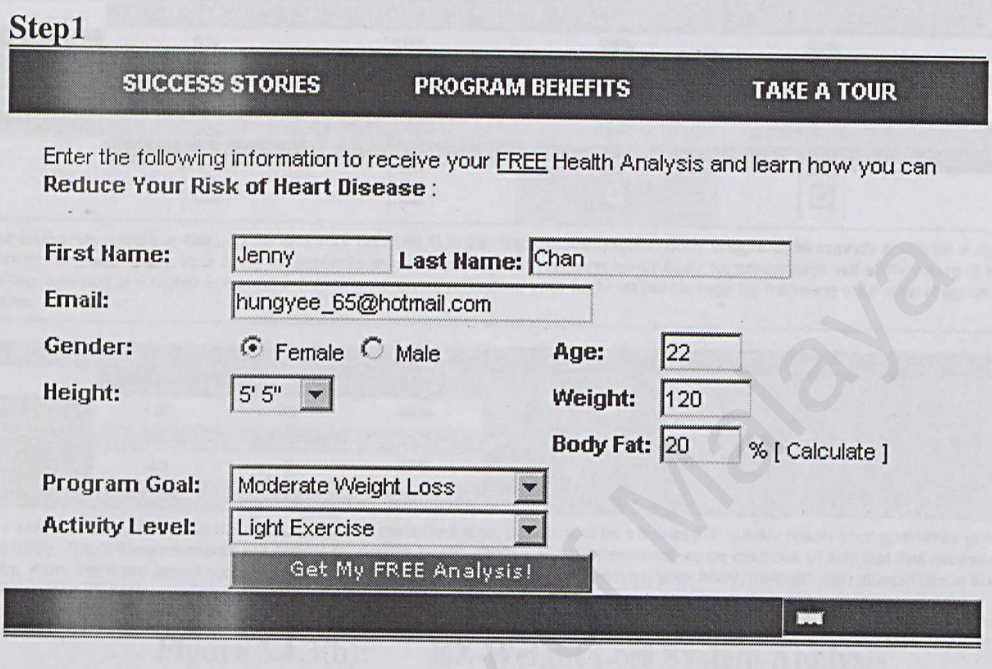



**Figure 2.4.3(a): EZ-Weight Loss System**

EZ-Weight Loss System (EZ-Weight Loss, 2002) is a system, which help user to do health analysis on their nutrition level (Example: fat) according to users height, weight, body fat and activity level.

**Step2**

Based on the information you submitted, we have created the following **Weight and Nutrition Analysis**:

The **Weight Analysis** displays the difference between Lean and Fat Weight. It also shows how much you would weigh if you were at a different Body Fat Percentage. It is important to always maintain or try to increase your Lean Body Weight as this will increase your metabolism, improve your strength and decrease your chances for osteoporosis.

Your **Nutrition Analysis** reveals how many carbohydrates, protein and fat you need each day to properly fuel your body while quickly reaching your goal. Your Nutrition Formula will continue to change as you lose fat, increase activity, age and set new goals. Our Recipe Builder instantly creates over 250 recipes that match your exact nutrition needs.

**Weight Analysis**

| | Too Low! | Very Fit | Healthy | High | Dangerous! |
|---|---|---|---|---|---|
| | 6% | 16% | **20%** | 30% | 40% |
| | 102 | 114 | **120** | 137 | 160 |
| | 96 | 96 | **96** | 96 | 96 |
| | 6 | 18 | 24 | 41 | 64 |
| | 0%-12% | 13%-19% | 20%-25% | 26%-34% | 34%+ |
| | ☒ | ☒ | ☒ | ☒ | ☒ |

Your total body wieght is **120** pounds and your body fat % is **20**. This results in a lean body weight of **96** pounds and a fat weight of **24** pounds. Congratulations! Your body fat percentage is within a healthy range. A lower body fat percentage will allow you to fit better in your clothing, function at a higher level and increase your energy. Reduce your body fat percentage by following your meal program and exercise routine.

**Nutritional Analysis**

| | | | |
|---|---|---|---|
| | 160 | 32 | 48% |
| | 86 | 17 | 26% |
| | 40 | 8 | 27% |
| | **1344** | **269** | **100%** |

Your nutrition formula reveals the exact amount of carbohydrates, protein and fat you need to quickly reach your goal while properly fueling your body. These macronutrients are critical for optimal health, fitness and performance, so be cautious of any diet that eliminates or restricts intake. Also, there are select carbohydrates, protein and fat that will help you nourish your body, maintain lean muscle tissue and quickly burn unnecessary body fat.

**Figure 2.4.3(b): EZ-Weight Loss System Analysis**

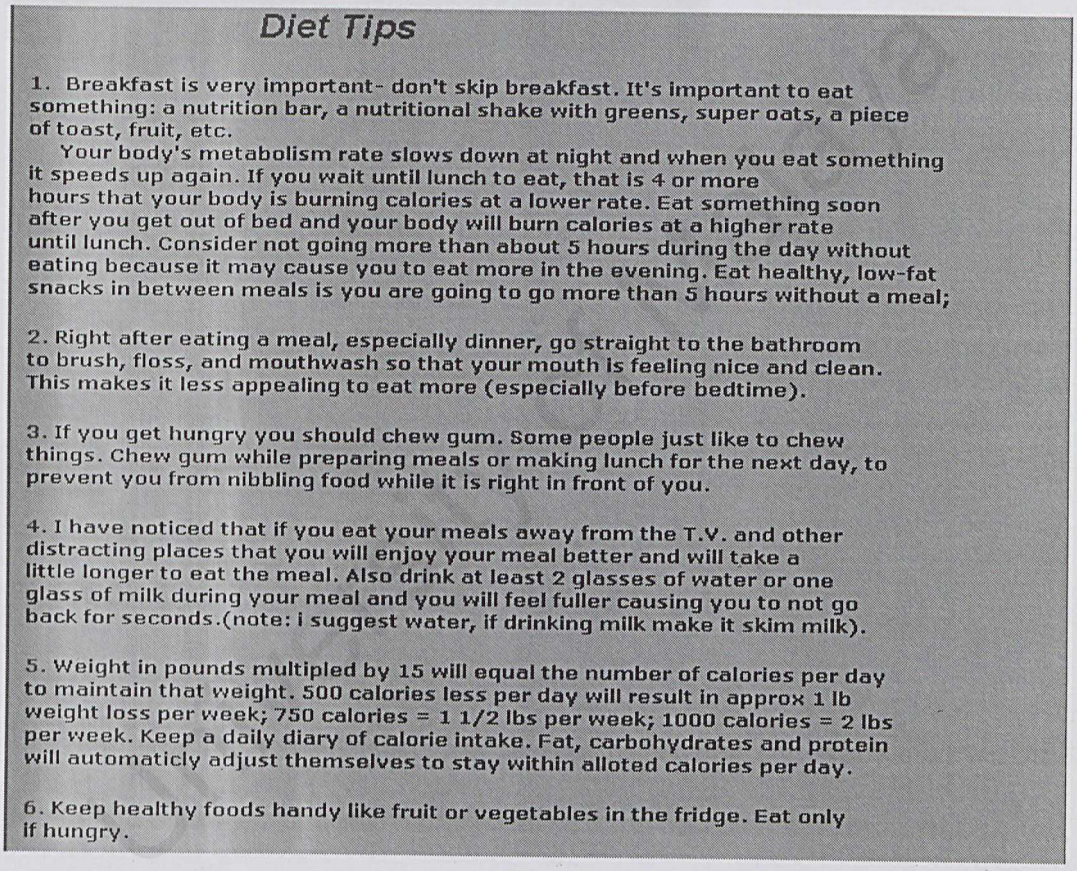
The Weight Analysis displays the difference between Lean and Fat Weight. It also shows how much user would weigh according to different Body Fat Percentage. It is important to always maintain or try to increase the Lean Body Weight as this will increase metabolism, improve strength and decrease chances for osteoporosis.

Nutrition Analysis reveals how many carbohydrates, protein and fat needed each day to properly fuel the body while quickly reaching for the goal.

The disadvantages from this system is that this system is only suitable for normal simple user because the system will analyze the health condition based on their

weight, height, body fat and activity level. This system does not provide any meal plan for user to follow or else they need to pay for the further analyzation. EZ-Weight Loss System pays attention only on certain nutrient, which consist of carbohydrate, protein and fat. It doesn't include other important nutrient such as vitamin and minerals.

### 2.4.4 Cambridge Diet



*Diet Tips*

1. Breakfast is very important- don't skip breakfast. It's important to eat something: a nutrition bar, a nutritional shake with greens, super oats, a piece of toast, fruit, etc.
   Your body's metabolism rate slows down at night and when you eat something it speeds up again. If you wait until lunch to eat, that is 4 or more hours that your body is burning calories at a lower rate. Eat something soon after you get out of bed and your body will burn calories at a higher rate until lunch. Consider not going more than about 5 hours during the day without eating because it may cause you to eat more in the evening. Eat healthy, low-fat snacks in between meals is you are going to go more than 5 hours without a meal;

2. Right after eating a meal, especially dinner, go straight to the bathroom to brush, floss, and mouthwash so that your mouth is feeling nice and clean. This makes it less appealing to eat more (especially before bedtime).

3. If you get hungry you should chew gum. Some people just like to chew things. Chew gum while preparing meals or making lunch for the next day, to prevent you from nibbling food while it is right in front of you.

4. I have noticed that if you eat your meals away from the T.V. and other distracting places that you will enjoy your meal better and will take a little longer to eat the meal. Also drink at least 2 glasses of water or one glass of milk during your meal and you will feel fuller causing you to not go back for seconds.(note: i suggest water, if drinking milk make it skim milk).

5. Weight in pounds multipled by 15 will equal the number of calories per day to maintain that weight. 500 calories less per day will result in approx 1 lb weight loss per week; 750 calories = 1 1/2 lbs per week; 1000 calories = 2 lbs per week. Keep a daily diary of calorie intake. Fat, carbohydrates and protein will automaticly adjust themselves to stay within alloted calories per day.

6. Keep healthy foods handy like fruit or vegetables in the fridge. Eat only if hungry.

**Figure 2.4.4: Cambridge Diet**

Cambridge Diet (Cambridge, 2002) is a web site, which provides diet tips for users to maintain a healthy diet and balance lifestyle. However, this site do not

provide a better understanding and interaction program for the user to analyze their health condition and the way on how to do it by meal plan.

### 2.4.5 eDiets

**Step1**

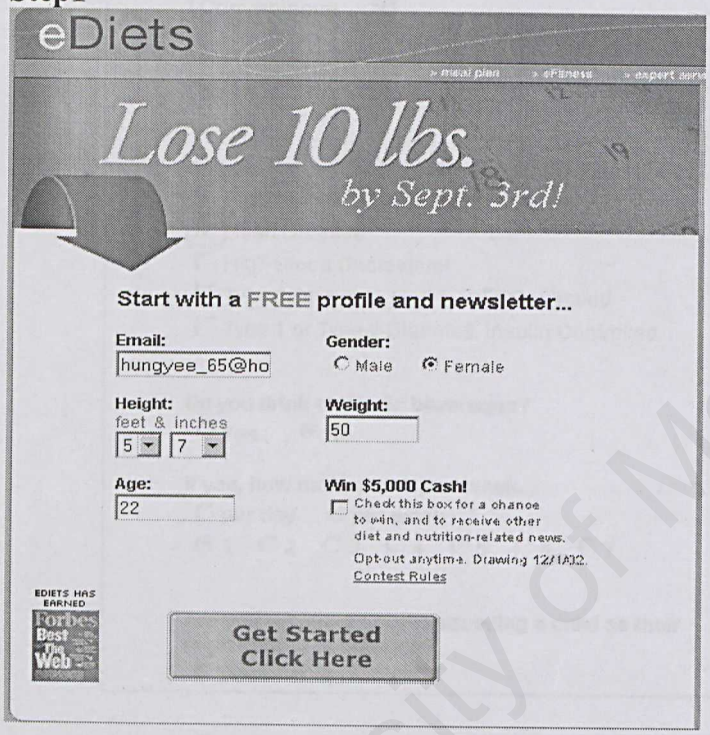



**Figure 2.4.5(a): eDiets – Enter Personal Details**

The first step in eDiets (eDiets, 2002) is to enter personal information on weight, height and their age. The analysis process will run based on this information.

**Step2**

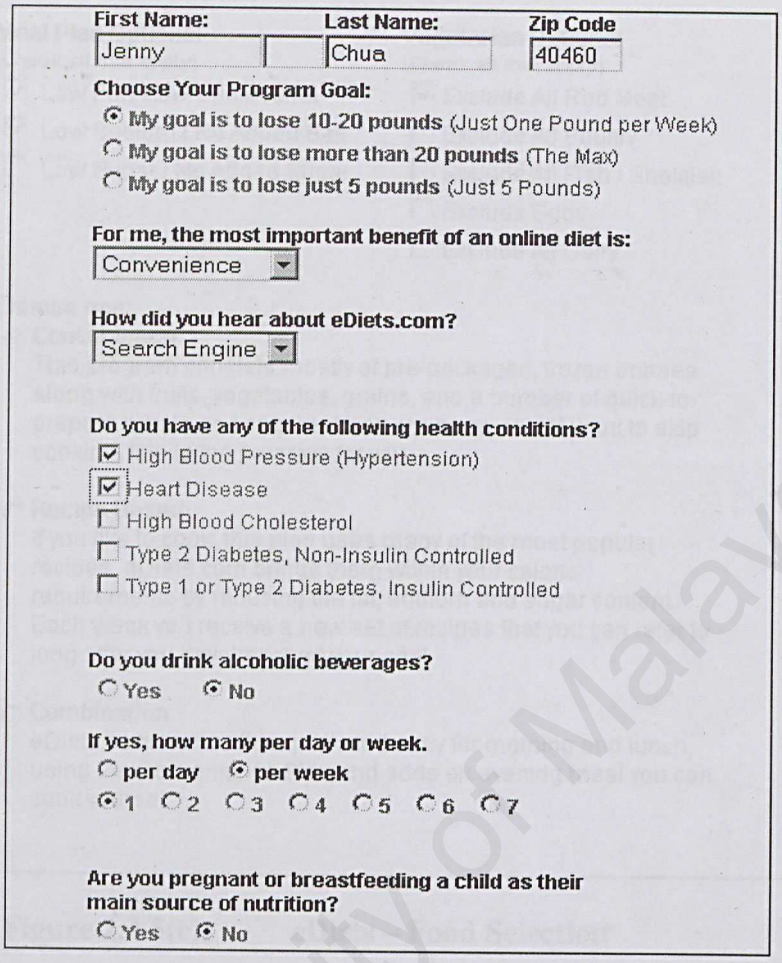



**Figure 2.4.5(b): eDiets – eating habits**

Step 2 in this system shows the user eating habits and their health condition. They need to specify what is the disease that they have to match their diet.

**Step 3**

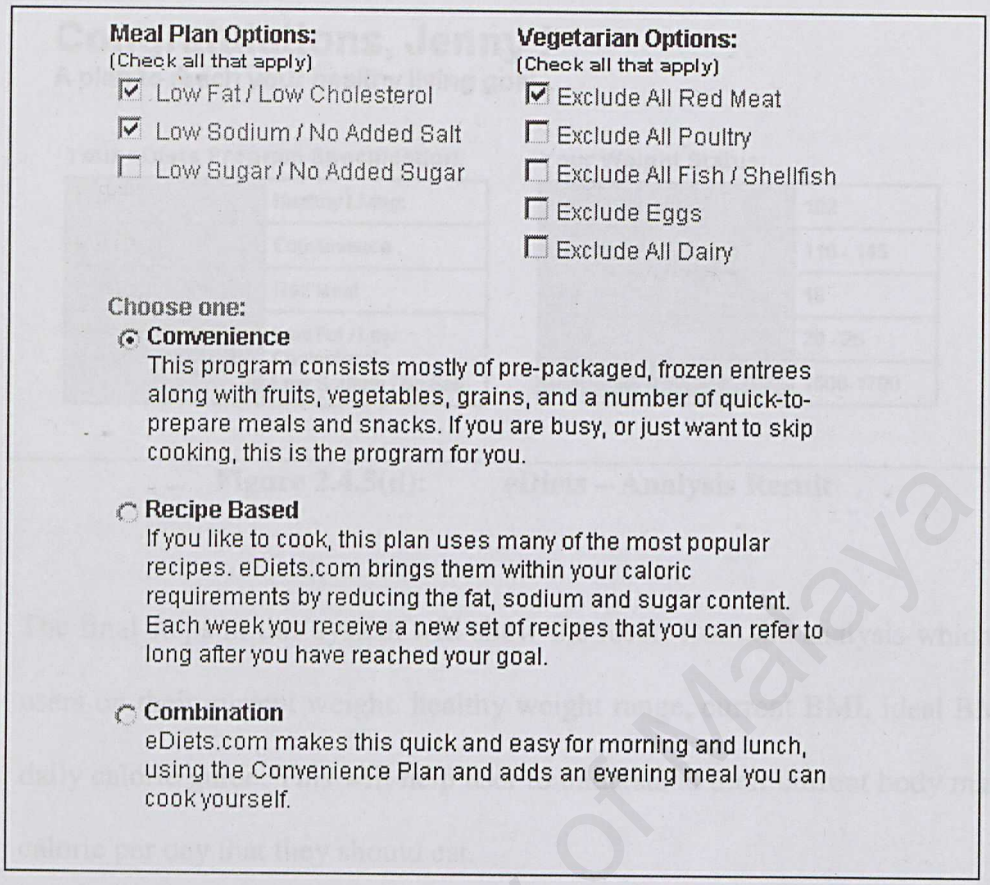
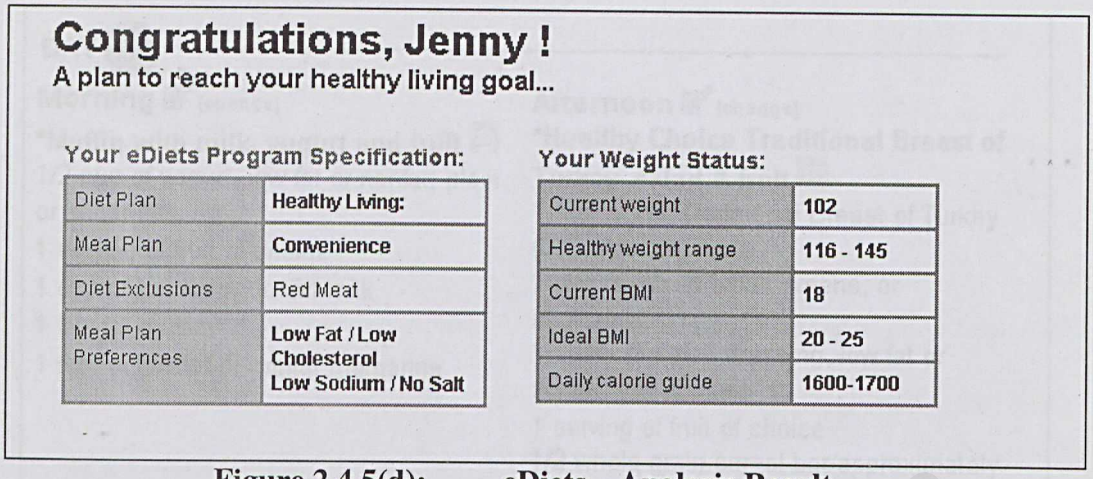



**Figure 2.4.5(c): eDiets – Food Selection**

Step 3 will let user to do the food selection according to the groups given to make the analyzation process runs easier.

Step 4



**Congratulations, Jenny !**

A plan to reach your healthy living goal...

Your eDiets Program Specification:

| | |
|---|---|
| Diet Plan | Healthy Living: |
| Meal Plan | Convenience |
| Diet Exclusions | Red Meat |
| Meal Plan Preferences | Low Fat / Low Cholesterol<br>Low Sodium / No Salt |

Your Weight Status:

| | |
|---|---|
| Current weight | 102 |
| Healthy weight range | 116 - 145 |
| Current BMI | 18 |
| Ideal BMI | 20 - 25 |
| Daily calorie guide | 1600-1700 |

**Figure 2.4.5(d): eDiets – Analysis Result**

The final steps in this system will show the result from the analysis which show users on their current weight, healthy weight range, current BMI, ideal BMI and daily calorie guide. This will help user to understand their current body mass and calorie per day that they should eat.

The disadvantages from this system is it shows insufficient information and details for user reference because user might not know what type of food is suitable for them in their diet. User might not know the calorie of their chosen food. Apart from that, the system do not show what is the insufficient nutrient in their diet and what else should they take to maintain a healthy lifestyle.

### 2.4.6 Meal Plans

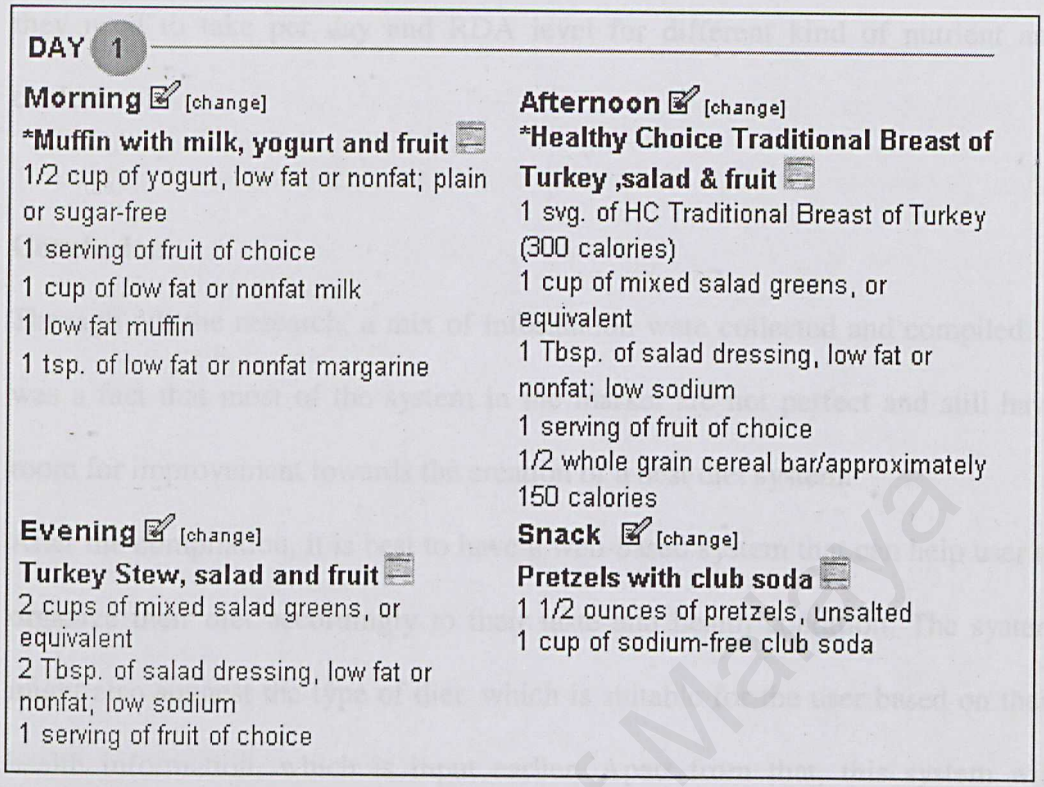



**Figure 2.4.6: Meal Planning**

Meal Planning is a system, which offer weekly menus customized to user's tastes and food preferences. It provide many different meal plans and menu for every lifestyle:

a) Convenience Plan

b) Combination Plan for Busy Cooks

c) Recipe Plan for home cooker.

Users can change the food suggested accordingly by clicking the change icon. The list of most nearest food for replacement will be listed out for selection.

The disadvantages from this system is user do not know the amount of calories they need to take per day and RDA level for different kind of nutrient and cholesterol.

### 2.4.7 Conclusion

Through out the research, a mix of information were collected and compiled. It was a fact that most of the system in the market are not perfect and still have room for improvement towards the creation of a best diet system.

After the compilation, it is best to have a web-based system that can help user to organize their diet accordingly to their taste and health condition. The system might also suggest the type of diet, which is suitable for the user based on their health information, which is input earlier. Apart from that, this system will suggest the type of physical activity needed on the user input to maintain a healthy diet and lifestyle.

## 2.5 Human Computer Interaction (HCI)

### 2.5.1 What is HCI?

Human Computer Interaction (HCI) is concerning with the designing of computer systems, which helps to support people with their work as to ensure that they are able to carry out the activities productively and safely. Another definition for HCI is the study on how people interact with computers and to what extent computers are or are not developed for successful interaction with human beings. It includes a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them (HCI, 2002a).

The key concept in HCI is usability. Usability means creating systems that are easy to learn and ease to use. Much software lacks of these key concept and thus fails to deliver the intended messages to the users. Once very significant factor is that each user forms different perception and conceptions about their interactions and has different ways of learning and communicating. This skill varies from one user to the other.

Apart from that, the cultural differences also play a large part in forming this intellectual perception. Rapid research and development has been emphasized in the field of HCI as users needs are changing gradually from time to time. Cognitive psychology is to understand the psychological processes involved in the acquisition and use of knowledge by people. This includes domains such as perception, attention, memory, learning, thinking, and the importance of social and environmental influences on those domains. Cognitive psychology is a major contributor to HCI research by providing and applying psychological principles

to understand and help develop models that explain and predict human performance (HCI, 2002b).

### 2.5.2 Design Theories

Design theories help guide the design of interfaces and the selection of components contained within interfaces. Provided is a list of the areas within the interface design.

#### 2.5.2.1 GOMS (goals, operators, methods, selection rules) Model

GOMS model deconstructs the activities of a user task into components of activity and the respective information processes. Users formulate goals (and sub-goals), achieve those goals by using methods and procedures, via operators (e.g. move mouse), and use selection rules to choose appropriate methods and operators. The keystroke-level predictive model predicts performance time of tasks by calculating the sum of the lesser parts, which included time for keystrokes, pointing, thinking and waiting (GOMS, 2002).

#### 2.5.2.2 Menu Design

Menu structures are an important component of interfaces, and the appropriate menus can greatly enhance or detract from the user's experience and efficiency. The combination of the variety of menus between scrolling, two-dimensional, alpha-sliders, pop-up menus, menu phrasing and presentation sequence offer many trade-offs between speed, efficiency, and time (postech, 2002).

#### 2.5.2.3 User Control/Direct Manipulation

The ability to enable a user with control over the tool or interface is an essential component of the HCI interaction. Users should have the feelings of control and mastery over an interface. Listed below is the central idea of user control:

- Visibility of objects and action
- Rapid, reversible and incremental action
- Replacement of complex command-language syntax with direct, visual manipulation of the object of interest

#### 2.5.2.4 Anthropomorphic design

Anthropomorphic design is a designing technology, which act and behave like humans. The principles of designing proper interfaces and tools involve understanding user behavior to make it more "users-friendly".

### 2.5.3 Interface Design

#### 2.5.3.1 What is an interface?

At a glance, an interface is a structure that links component parts together as to provide an understanding to users of the application being used. It is a way to organize information and activate it when necessary.

In a detailed manner, interface means the selection screens. The selection screen is where choices are given to the users, the style which the selection are devoted, the transitions from one part to another, how options are linked or cross-

referenced and the method of input for any data the user need to give or get (Polson et al, 1992).

The practical evaluation that is counted in developing an interface design is:

a) A general description of who the users will be and what relevant knowledge they possess

b) A specific description of one or more representative tasks to be performed with the system

c) A list of the correct actions required to complete each of these tasks with the interface being evaluated (acm, 2002).

### 2.5.3.2 The Eight Golden rules of Interface Design

1. **Strive for consistency**

   There are many forms of consistency. Consistent sequences of actions should be required in similar situations. For example, identical terminology should be used in prompts, menus and help screens. There is also a great emphasis in colour, layout and fonts consistency (postech, 2002).

2. **Enable frequent users to use shortcuts**

   For frequent users, it is advisable to have the program to employ shortcuts. By incorporating shortcuts, the user can reduce the number of interactions with the program to go to a specific module. Short response times and quick display rates are attractions for frequent users (postech, 2002).

3. **Offer informative feedback**

This rule shows that for every user action, there should be some form of a system feedback. Visual presentation of the objects of interest provides a convenient environment for showing changes explicitly (postech, 2002).

4. **Design dialogs to yield closure**

Series of actions should be organized into groups with start, intermediary and end. The informative feedback at the end of a group of actions gives users the satisfaction of completion, a sense of relief and an implication that the way is clear to prepare for the next set of actions (Postech, 2002).

5. **Offer error prevention and simple error handling**

When designing the system, it is always desirable to have the least error as possible. An ideal should be error free but there is no perfection in this world. The same goes for users. Therefore, the system should be designed in a way will decrease the level of errors make by users throughout the execution of the system. There should also be some form of help provided to users when errors are detected (Postech, 2002).

6. **Permit easy reversal of actions**

The system should have the flexibility to perform some reversible actions when errors were detected. This will allow users to have a strong sense of navigation within the system (Postech, 2002).

7. **Support internal locus of control**

Experienced users strongly desire the sense of control over the system and that the system react to his or her actions. Inadequacy or difficulty in obtaining the intended information and inability to produce the right set

of action desired will build much anxiety and discontentment (Postech, 2002).

8. **Reduce short-term memory load**

Human have the weakness of forgetting things easily. Therefore, the design of the interface ought to be simple, multiple page displays be consolidated, provide sufficient training for usage and online help be there to guide users throughout the process of learning (Postech, 2002).

### 2.5.4 Consideration for designing icons

It is obvious that some concept will be hard to encapsulate into an icon. Even something as simple as an exit button is not that simple to design. There may be several forms of concepts lie beneath the button. For example, users may need to leave a section but stay in the application. There may be instances where the users may want to leave a screen, check something and return to the same screen. Therefore, the functions have similarities and so any icons used to represent these functions may need to have similarities. However there will be a need to use the icons for different functionality. Therefore, some differences will be needed to indicate the different consequences of use.

If there are many icons, users will take longer time to learn their respective meanings. In some cases for multimedia, especially when users are expected to spend very little time on the system, it is much feasible to have fewer icons in the menu.

Overall, icons do provide better access to the desired functionality despite their drawbacks. Instead of needing to remember symbols and codes, icons do provide the necessary mark to help activate the functions hidden in applications.

### 2.5.5 The use of Colour

The use of colour at interface has been a prominent way of representing different logical organization information. Colour coding provides various opportunities for coding information at the interface as well as making it enjoyable to look at. Various colours are soothing to the eye for example light yellow and light pale blue. Other than that colour can improve an uninteresting display, which is normal to users. Certain colour can also draw attention to warming such as red to symbolise stop or danger. However, excessive use of colour can result in colour contamination. Take for example a poster with the title "Blood Donation" painted with dark blue and bright red can result in interfaces that are difficult to interpret (apple, 2002).

#### 2.5.5.1 Guidelines for using colours in interface design

1. **Limit the number and amount of colours.**

   By limiting the number and amount of colours, the interface design will look much neater and users will find it easier to navigate.

2. **Recognise the power to speed or slow tasks.**

   Colours can help to increase the response time for interaction between the system and the user grouping colours in some form of patterns.

3. **Ensure that colour coding should support the task.**

   Applying colour coding should therefore help users to perform task easily and not the other way round.

4. **Make colour coding appear with minimal user effort.**

   By incorporating colours, user should feel comfortable and easier to perform the task in the system.

5. **Be consistent in colour coding.**

   When employing colours into the interface, there should be a standard format for each and every page as to ensure the consistency of the system.

6. **Use colour in graphic displays for greater information density.**

   Density can help depict information clearly when graphics are use in interface design.

### 2.5.6 Interaction Styles

**A. What are interaction styles?**

Interaction styles are the way user interacts with the system in the computer. There are many types of interaction styles available in the market. To understand the various interaction styles, it is important to have a historical point of view of the early types of interactions. The early types of interactions were common-driven applications tended to be used by expert users who are knowledgeable people that were not afraid of computers (Helander, 1990).

As for the form-filled style of interaction, it was focus to provide users with a different set of functionality. The intended users were clerical workers who had

no or little experience with computers. This type of interface mimicked the paper forms where clerks perform data entry on them.

New interaction styles were created as both this interaction styles provoke frustration for the general users who want flexibility and ease of use in the system that they use. The new interaction styles are menu driven style, natural language interaction style and Direct Manipulation Interaction style.

Menu driven style has a menu with a set of options being displayed on the screen where the selection and execution of one of these options would result in a change in the state of the interface. In other words, the menu driven interaction style provides users the accessibility to reach other modules dependable on the user needs. There is many ways of displaying menus for purpose of a complete understanding during the use of the system. One very significant way is to consider the ordering of the menu items. There are four alternatives for ordering menu items. There are frequency of use, alphabetical ordering, categorical ordering and conventional ordering (Helander, 1990).

Frequency ordering means arranging the menu in a way that the most frequently access option is place at the most convenient place of selection. For alphabetical order, it simply means arranging the menu in ascending (a-z) or descending (z-a) order. Categorical ordering is arranging the menu by category, for example Malay food in Malaysia and all types of food in the world. As for conventional ordering, the arrangement is base on conventional methods such as order of the days of weeks, week of months or months of years (Helander, 1990).

The use of natural language as a mean of interacting with the computer has been conceived highly desirable due to its naturalness. This interaction styles involves

the entering of natural language. Natural language is the normal daily English, Malay or other languages human speak among community. The system needs to be able to cops with the problem of ambiguity and ungrammatical constructions. Direct manipulation systems have icons representing objects and a mouse controlling every step it takes. Most direct manipulation systems have features stated below:

1. Clarity of the object of interest.
2. Swift, reversible, consecutive actions.
3. Replacements of complex command language syntax by direct manipulation of the object of interest.

Well designed direct manipulation systems may produce a sense of eagerness to use where by new users to the system can learn the basic functions quickly and providing the advance users the ability to carry out a wider range of task rapidly. It is important to gain confidence and master the usage of the system, as this will ensure a smoother task orientation. Even with such great feature, direct manipulation has its weakness. It suffers the inability to describe tasks that belongs to a concrete object and apart from that, not all actions can be accomplished correctly.

### 2.5.7 Conclusion

To produce usable and functional systems, the most important point is to pay great importance into the efficiency and usability of the system. The effectiveness of the system relies very much on the way the interface is organized and structured. As to meet the goal of efficiency, the interface has to be clear, concise and meet the users' requirements. Usability is a key concept in HCI where it focuses on making systems easy to learn and ease of use.

Applying the HCI factor to the project will ensure emphasis will be highly located for good user-friendly interface. To undergo this trend, there is a great need to understand how users think and react to computers and the applications that runs on top of it. The study of ergonomics and cognitive sciences of human behaviors will be the core for determining good design of interface.

# Chapter 3: Methodology

## 3.1 Requirement Gathering Approach Technique

During fact-finding phase within the system investigation stage, a lot of emphasis has been allocated on the acquiring of the basic requirements for the project. Activities such as understanding the market trends in developing a smart diet system, identifying the targeted audiences and the intended projects content is very important. It is significant to go through a series of assessment when selecting the right choice of approach technique for functional requirement, non-functional requirement, hardware requirement and software requirement.

## 3.2 Functional Requirement

Requirements describe a system's behavior. A functional requirement describes an interaction between the system and the environment (Pfleeger, 2001). To find the functional requirement for Web-Based Smart Diet System, interview will be conducted.

Interview is better than questionnaire and electronic method for functional requirement because it is a more personal form of survey. Brainstorm and interview with current and potential users such as nutritionist and dietitian to understand the context; problem and relationship of the requirement (Pfleeger, 2001). Interview will provide more reliable, effective and professional opinion from the respondents. Oral survey is basically used to get thorough opinions and impressions from the respondents (Babbie, 1973).

Interview can be administered in several different ways. Each respondent is not given an individual questionnaire in an interviewed group. Instead, the respondents answer the questions in a group and only one person takes notes for the whole group. Another more familiar form of interview is the phone survey. Phone surveys can be used to get short one word answers for example yes or no, as well as longer answers. This is an easy and fast method to get the answer. (Frey et al, 1995)

**Table 3.2: Research Method Based on Requirement**

| Requirement | Research Method |
|---|---|
| Functional Requirement | Interview |
| Non-Functional Requirement | Questionnaire (mail survey) |
| Hardware Requirement | Written survey (Drop-off and Group Administered survey) |
| Software Requirement | Electrical survey |

### 3.2.1 Strength and Weaknesses of Interview

#### 3.2.1.1 Strength of Interview

**(i) Personal Contact**

Interviews conducted either on the telephone with different groups of participants according to their age group or in person with professionals in nutrition such as dietitian and nutritionist. This method gives the ability to answer questions from the participant when they does not understand a question or needs further explanation on a particular subject (Frey et al, 1995) Interviewing offers the flexibility to react to the respondent's situation, ask for

more detail, seek for more effective replies and give the opportunity to ask questions which are complex or personal intrusive for the functional requirement (Jones, 1985).

**(ii) Response Rate**

There are more control over the response rate by using interview research compare to other type of survey although it is quite difficult to obtain a certain number of respondents who are willing to be interviewed. Compare with other types of survey, there are unknown how many respondents who will actually send back the survey. However, with oral survey the respondent will be interviewed until the required sample has been achieved (Frey et al, 1995). This is very important to gain a complete and accurate diet and nutrition result for functional requirement.

### 3.2.1.2 Weaknesses of Interview

(i) **Cost**

The most disadvantage of face-to-face and telephone survey is based on the cost. It takes time to collect sufficient data for a complete survey, and number of time to translates into payroll costs and sometimes payment for the participants to get involved. The cost of telephone bill is very high especially when using hand-phone (Senn, 1989).

**(ii) Bias**

There will be some form of bias when using face-to-face survey method. This may cause incorrect information and answer. This may definitely waste the cost to conduct the interview (Frey et al, 1995).

**(iii) Type of Possible Question**

There are types of questions, which are not convenient for this kind of survey, especially through phone surveys where the respondent does not have a chance to look at the questionnaire (Frey et al, 1995). For example, it will be very difficult for respondent to remember all the choices as well as the question if the question consists of 5 different answers without a visual reminder. This problem requires special care in constructing questions to be read aloud.

**(iv) Attitude**

Some of the respondents may have negative feelings or feeling bad when they do not feel like wanting to be interviewed. Anyone who has been interrupted during dinner or meeting by the phone is aware of negative feelings when they are requested to answer a phone survey. Upon receiving these calls, many potential respondents will hang up or do not want to be interviewed (Jones, 1985).

## 3.3 Non-Functional Requirement

Non-Functional requirement describes a restriction on the system that limits our choices for constructing a solution to a problem (Pfleeger, 2001). For example the system should be user-friendly and secure. To find the non-functional requirement for Web Based Smart Diet System, written survey is the best method to observe the structure and patterns of the system and review the current situation of the existing e-diet systems (Pfleeger, 2001).

There are several types of written surveys, which include:

- Mail Survey
- Drop-Off Survey
- Group Administered Questionnaire

However, only mail survey will be conducted to find the non-functional requirement.

### 3.3.1 Mail Survey

A wide range of results from different group of age and nutritionist is needed to explore the non-functional requirement for the system because the system should be developed according to a broad perspective from different kind of user. Since it is impossible to interview a large group of people, a mail survey is the method to choose a sample of user at low cost (Bourque et al, 1995).

### 3.3.1.1 Strength of Mail Survey

**(i) Cost**

Cost of mail survey is low compare with other type of surveying method. Mail survey also substantially less expensive than drop-off and group administered surveys. This type of survey can cost up to 50% less than self-administered survey, and almost 75% less than face-to-face survey (Bourque et al, 1995).

**(ii) Convenience**

Since many of these types of surveys are conducted through a mail process, the participants can work on the survey at home during their free time. The hardcopy of the survey will be posted to the participant and hence, they can bring along the questionnaire everywhere easily to be completed (Bourque et al, 1995).

**(iii) Bias**

There is a chance for personal bias because the mail survey does not allow personal contact between the researcher and respondent, which based on the first impression to alter the responses to the survey. This is an advantage because if the interviewer is not likeable, the survey result will barely affected (Bourque et al, 1995).

**(iv) Wide range of Sampling**

A greater population and a larger universe (sample of respondents) could be reach with this kind of survey because it does not require personal contact between the researcher and respondents (Bourque et al, 1995).

### 3.3.1.2 Weaknesses of Mail Survey

**(i) Low Response Rate**

One of the biggest problems with mail survey is the low response rate because the respondent need to takes a long time to answer and response back. Compare to telephone survey or face-to face survey, the mail survey has only a response rate of over 20% (Bourque et al, 1995).

**(ii) Ability of respondent**

Another problem with self-administered surveys is the respondent ability. Researcher needs to do a lot of assumption about the physical ability, respondent literacy level and their language ability. It is impossible to control for such variables because most surveys select the participants from a random sampling. Some of them are belongs to different group of ethnics and have different primarily spoken language for the survey. Some of them may also be literate or have a low reading level and therefore might not be able to accurately answer the requested questions. For those who have trouble in reading, visual impairment may not have the capabilities to complete the survey (Senn, 1989).

## 3.4 Hardware Requirement

Hardware requirement describe the minimum requirement for the system to run and their environment. For example the system require 128MB SDRAM and Intel Pentium 3 Processor. Written survey will be conducted to find the relevant hardware requirement for Web-Based Smart Diet system. Apart from mail survey, which has been discussed earlier, drop off survey and group administered questionnaire can be used.

### 3.4.1 Drop-Off Survey

To ensure a higher response rate compare to mail survey, a best time and place is needed to make sure the majority of respondent is available and ready to answer the survey question to determine the hardware requirement (Senn, 1989).

#### 3.4.1.1 Advantages of Drop-Off survey

**(i) Convenience**

Drop-Off survey allows the respondents to answer the survey at their own convenience. They can answer the question based on their free time.

**(ii) Response Rate**

The response rates for the drop-off survey are better compare to the mail survey because it allows personal contact with the respondent, which helps to explain the importance of the diet analysis and conducting the survey, and to answer any questions or concerns the respondent might have (Rea et al, 1992).

### 3.4.1.2 Weaknesses of Drop-Off Survey

#### (i) Sampling

The universe of this kind of survey will be considerably smaller than the mail survey because of the time it takes to make personal contact with the respondent is higher (Rea et al, 1992).

#### (ii) Time

This method takes considerably more time compare to mail survey because this method requires personal contact (Hoffer et al, 1996).

#### (iii) Response

The response rate for this type of survey is higher and better than mail survey but still lower than the response rate by using oral survey (Rea et al, 1992).

### 3.4.2 Group Administered Questionnaire

Group administered questionnaire will provide the survey results in one space of time and would ensure a higher response rate from a specific group of population. This type of survey is the most efficient for specific purposes because they have specified the group of respondent earlier and would give better result.

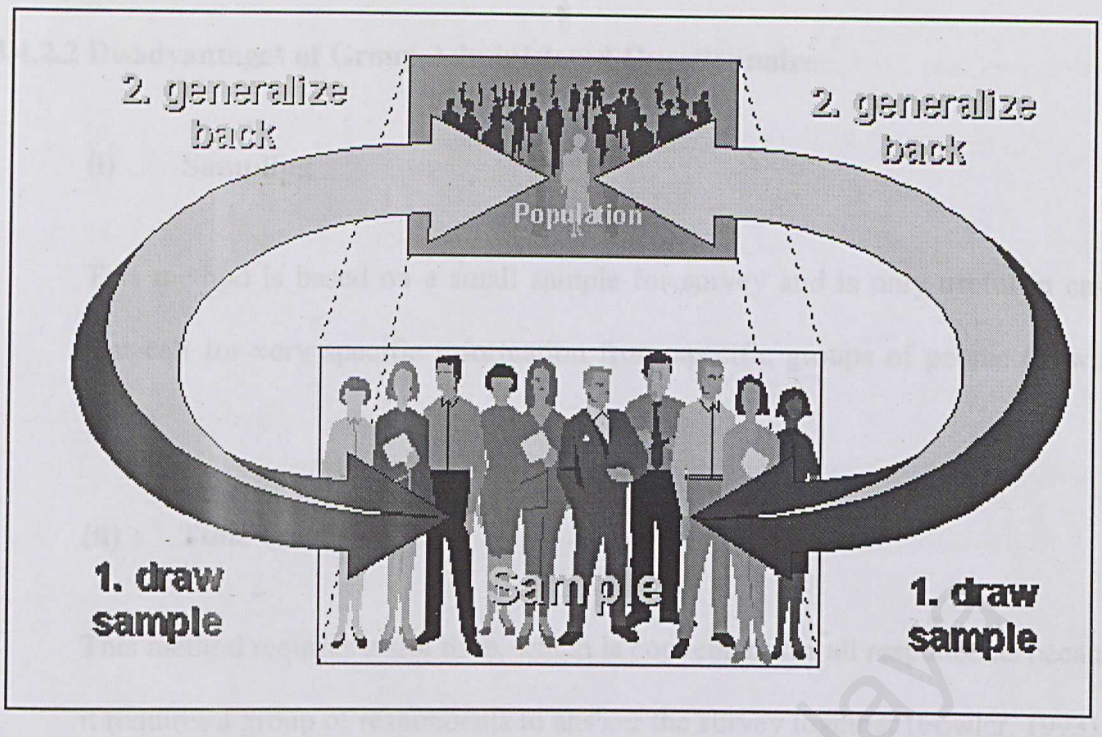



**Figure 3.4.2: Sample of Population**

### 3.4.2.1 Advantages of Group Administered Questionnaire

**(i) Rate of Response**

Group Administered questionnaire is generally administered to a sample of respondents in a group setting and ensure a higher response rate, as they are more efficient than mail survey and require less time compare to drop-off survey (Fowler, 1993).

**(ii) Specificity**

This kind of survey is very versatile, allowing a spectrum of open and closed ended types of questions, which serve a variety of purposes, particularly in a specific group (Fowler, 1993).

### 3.4.2.2 Disadvantages of Group Administered Questionnaire

**(i) Sampling**

This method is based on a small sample for survey and is only useful in cases that call for very specific information from specific groups of people (Fowler, 1993).

**(ii) Time Constrain**

This method requires a slot time, which is convenient for all respondents because it requires a group of respondents to answer the survey together (Fowler, 1993).

## 3.5 Software Requirement

Software Requirement defines the requirement and type of software, which will be used for the system development. Since there are many different kinds of software available in the market, a survey is needed to analyze the most appropriate and suitable software for system development. Electronic survey will be conducted to review on the software requirement.

With the growth of the Internet and World Wide Web with the expanded use of electronic mail for business communication, the electronic survey is becoming a more widely used survey method. Electronic surveys can take unlimited forms. They can be distributed as electronic mail messages sent to potential respondents, posted as World Wide Web forms on the Internet or even can be distributed via publicly available computers in high-traffic areas such as libraries

and shopping malls. Electronic surveys are placed on laptops and respondents need to fill out a survey on a laptop computer rather than on paper.

### 3.5.1 Strength of Electronic Survey

**(i) Cost Savings**

Sending the questionnaires online would be less expensive compare to other kind of survey, as it does not require paying for postage and stamps.

**(ii) Faster Transmission Time**

Questionnaires can be delivered to recipients in seconds, rather than in days as with traditional mail. More survey can be done at the same time.

**(iii) Ease of Editing or Analysis**

Less work is needed to edit and analyze the data, as it is easier to make changes towards the questionnaire, easier to copy and evaluating of the data.

**(iv) Higher Response Rate**

The response rates on private networks are higher with electronic surveys compare to paper surveys or interviews (Rea et al, 1992).

**(v) More Truthful Responses**

Respondents will tend to answer more honestly with electronic surveys compare to paper surveys or interviews because they can answer it alone without having physical contact with interviewer (Rea et al, 1992).

**(vi) Quicker Response Time with Wider Magnitude of Coverage**

Participants can answer in minutes or hours due to the speed of network and the network coverage of the survey is global and wide. They may get a lots of view and opinions.

### 3.5.2 Weaknesses of Electronic survey

**(i) Sample Demographic Limitations**

Scope of population and sample is limited to those only with access to computer and online network. Those places, which do not have network coverage or bad network connection or computer facilities will not be covered.

**(ii) Lower level of confidentiality**

It is difficult to ensure that all the secrecy and important details of survey is confidential because of the open nature of most online networks. This may limit the respondent to answer some of the sensitive issues.

### (iii) Additional Orientation or Instruction

More instruction and guidelines are needed from the computer online systems to help respondents to complete the questionnaire. This is because respondents may lack of computer skills and knowledge.

### (iv) Technical Problem with Hardware and Software

Computer has greater possibilities of problem in hardware and software, for example virus attack and hard disk corrupted compare to oral or written forms of questionnaire communication.

### (v) Response Rate

Even though research shows that e-mail response rates are higher (Rea et al, 1992), but the response will not always consistent. The response rates higher only during the first few days and deteriorate thereafter.

## 3.6 Survey method

There are four main steps to complete a survey. The steps are:

- **Designing Surveys**

  Initial planning for the survey design and survey questions is needed before conducting the survey on functional requirement, non-functional requirement, hardware requirement and software requirement. Planning is very important because it is difficult to adjust the basic research questions

since the instrument must remain stable in order to standardize the data set. During this process, the types of questions as well as the content, wording, order and format of the questionnaire.

- **Conducting Survey**

  After designing the questionnaire, the following process is to plan the outlines on how and to whom it will be administered to. The relevant sample group of survey population needs to be clarified.

- **Analyzing Survey Result**

  After conducting the survey, the results from the survey need to be processed and analyze by using statistics and computer software packages.

- **Reporting Survey Results**

  The final stage is to conduct the report of the results. A formal report contains contextual information, a presentation of the research question under investigation, a presentation of the quantified results and a discussion of the results. The result will be interpreted graphically for easier interpretation.

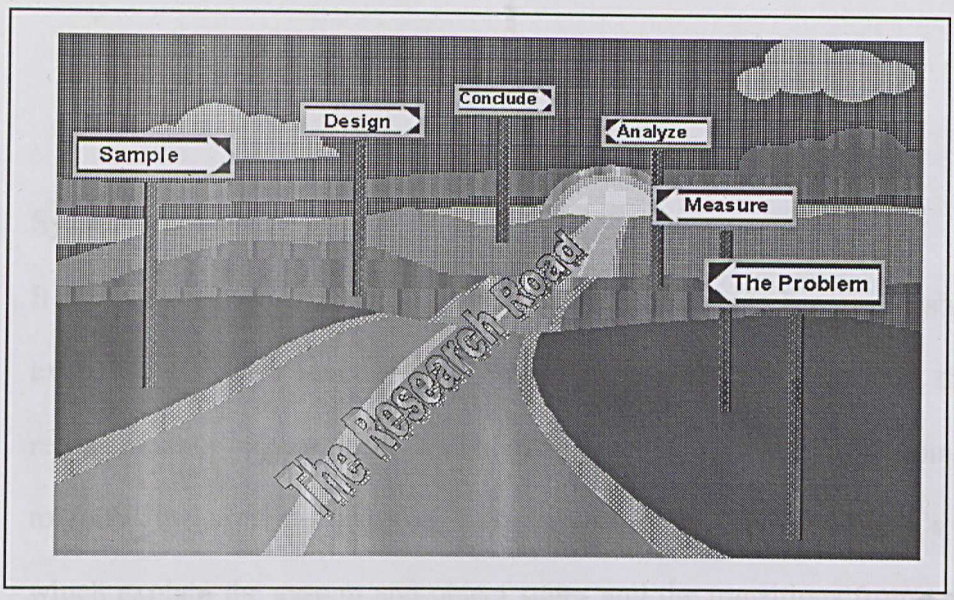



**Figure 3.6: The Research Road**

## 3.7 Conclusion

Considering which survey method that is suitable for different research elements for gathering the information on system requirement is fairly important. Its importance cannot be measured directly but what constitute a good development is when the content, presentation and output are able to be highly integrated and well balance of its usage.

# Chapter 4: System Analysis

## 4.1 System Analysis Process

It is very important to identify the system requirements because it shows what exactly the system functionality. System analysis discussed about the system requirement or a description of something the system is capable of doing in order to fulfill the system's purpose. Requirement expresses the system's behavior, which explain the system and object states and the transitions from one state to another (Pfleeger, 2001). After going through all the information gathered and analyzing it, the requirement for this project is outlined. Basically it is divided into:

- Functional Requirement
- Non-Functional Requirement
- Hardware Requirement
- Software Requirement

## 4.2 Functional Requirement

A functional requirement describes an interaction between the system and the environment. It explains how the system will function when given a certain stimuli (Pfleeger, 2001). The functional requirement for "Web-Based Smart Diet System" is describe in the following module.

### 4.2.1 Module One: Authentication Section

Only the administrator will be allowed to access this section by providing the password for authentication and encryption security. Administrator needs to sign in by using username and password. New administrators need to register themselves through the sign in form provided before they can access and message other administrator. After register, they can become a "standard user" of the administrator. That is the basic level of an administrator where they don't have the rights to update and manage the system database. They can only message other administrator and have some discussion in common. There is only one "site administrator" that has the rights to update and maintain the web site according to their need. The database can be update, add or delete based on the system's need. The "site administrator" can upgrade the level of other administrator by changing the access level through the database. This is an integrated engine for admin management, content management, message boards, database manager and internal messaging between administrators.

### 4.2.2 Module Two: Health Diet Analysis

Smart Diet System is a simple and free system that does not require username and password from the user. Users do not need to login themselves before using the system. User can use the system according to their requirement and needs. The following are the personal information which were requested from the system:

a) Name

b) Age Group

c) Gender

d) Height

e) Weight

f) Daily Physical Activities

g) E-mail

After the users have completed entering their personal information, the system will analyze the information and compare it with the database (system.mdb). The database contains a set of recommended nutrient based on users' gender, age and personal details. After comparison, the system will show a set of nutrient and daily calories intake, which is suitable and recommended for users in order to maintain a healthy diet. The information will be shown by using graph and table to help reading easier, faster and more user friendly. Description for every nutrient will be included in the table to help users to increase their understanding towards the importance of every single nutrient.

Apart from that, the system will suggest a complete balance meal plan and total calories for breakfast, lunch and dinner. The suggested meal plan is based on users' gender, age and personal information. From there, users can understand more on their health condition and what type of food and nutrient, which is necessary for them to manage a healthy lifestyle.

### 4.2.3 Module Three: Food Selection Analysis

After users have identify their health requirement through "Health Diet Analysis", they understand better on their body system requirement and the amount of calories they should take to maintain a healthy diet.

In this module, they can choose their favourite food based on the provided food categories. Each category contain different group of food, such as beverages, fruits, vegetables, traditional 'kuih', fast food and others. The list of food categories is located in "categories" table while the list of food items is located in "product" table. Both are saved in "Food.mdb" database.

Users can choose their favourite type of food from the list. The system will calculate and show the total amount of calories for the selected food to guide the user.

Besides choosing the food one by one from the food categories, user can search for their favourite food by using "Search for Food" function. They can type in the name of the food and the system will match any food, which is similar to the user's choice. Apart from that, users can view their selected food items from "View Food Selection" function. They can make changes or delete any item by unclick the checkbox and click recalculate.

From this module, users can practice a healthy diet based on their favourite food selection.

### 4.2.4 Module Four: Disease Option Analysis

Users can analyze and identify what they shouldn't eat and what are the recommended treatments based on the selected disease. The information on

disease and their prevention is located in "Disease" table in "system.mdb" database. Users can restore their own health and maintain it in prime condition when they start to understand how disease originates from within the body or mind.

From this module, users can look at themselves as a combined physical, emotional and spiritual being and change the way their body's chemistry functions to regain a fit, young, active and full of the joy of living at all times.

### 4.2.5 Module Five: Feedback Section

This section will allow the administrator to receive feedback from users, based on the contact information provided. Users can write in their comment, suggestion or help by writing to the administrator.

## 4.3 Non-Functional Requirement

A non-functional requirement or constraint describes a restriction on the system that limits one choice for constructing a solution to the problem (Pfleeger, 2001). The non-functional requirement for this project is described below.

- **User Friendly**

  Users are allowed to browse and use the site without any problem. The description is easy to understand and not complicated. A beginner computer user must be able to use the system from the simple description.

- **Security**

  Only authorized access is allowed into the administrator module. Unauthorized access is strictly prohibited. All the data in the database can be remain confidential and safe.

- **Fast retrieval of information**

  Users should be able to retrieve the information needed within a reasonable time and fast.

- **Attractive Interface**

  With attractive interfaces, user will be able to enjoy surfing the website more and have a better understanding of the icon. This will attract more users to use the system in their daily lifestyle.

- **Consistent**

  The result on the number of user using the system is consistent all the time. For example, there is a maximum of 20 users can be using the system at one time.

- **Reliability**

  The result provided by the system is reliable and trustworthy. All the information given is collected from varieties of nutrition books.

- **Consistency**

  The system will show a consistent result as the output. For example, the system will show the same outcome when the user enters the same information as the input.

## 4.4 Development Tools Analysis

The choices of selecting the appropriate tool for the project were largely based on five golden factors. These factors are budget allocated, time constraints, application type, technical expertise and distribution media (Chai, 1999).

**Table 4.4: A Comparison of Popular Development Tools**

| *Factors* | *Reasons* |
|---|---|
| 1. Budget | This factor is important, as the allocation of money for the project has got everything to do with it. Thrifty way of spending money on software is the rule of thumb in every project development. |
| 2. Time Constraints | The time allocated for the project is also important to determine what type of hardware and application is suitable. Choosing the applications that need ample time to learn and train will not be feasible for projects that are small and mid-range or needed a fast turnaround result (Chai, 1999). |
| 3. Application Type | The type of application is important because by understanding the type of application to be developed will surely need a fair deal amount of consideration to judge the application's ability to provide the correct and best functionality that most suited for the development (Chai, 1999). |
| 4. Technical Expertise | Another area of high importance is the ability of the right set of technical expertise in term of utilizing the application throughout the development duration. No point starting a project that need a lot of time to learn the concept and materials that are very difficult to accept when knowing |

| | |
|---|---|
| | there is limited time for the entire project. |
| 5. Distribution Media | When choosing the application, there is also need to determine the intended distribution media after completion of production. Having the right platform will ease the conversion and distribution (Chai, 1999). |

### 4.4.1 Development Tools Evaluation Criteria

It is important to go through a series of assessment when selecting the right choice of development tools. The criteria below are the considerations taken to for evaluation.

1. **Authoring Environment**

   Considering the environment for development is important, as it will contribute very much to the entire production process.

2. **Multi-platform Support**

   Generally, it will be best if the application is created on the same platform it will be applying later on. This will eliminates the problem of conflicts or instability. There is development tool that provides the development on several different platforms. Some tools may have the functionality embedded into it for multi-platform development but most of the development tool needs an additional piece of conversion software to be able to run the application on another platforms (mmedia, 2002).

3. **Price**

Prices for software and hardware development tools varies from product to product. It can range from few hundred dollars to thousand of dollars. There will be extra costs that are related directly to the production tool such as run cost of runtime version of the software (Chai, 1999).

4. **Text and graphic support**

The application being developed will depend on what type and how much text and graphics needed in the development. Therefore, the tool selected should be able to handle these media efficiently. The development tool should also be able to handle different file formats being used in the application (mmedia, 2002).

5. **Market Acceptance**

Knowing in great detail what development environment is most used in the larger academic community is important to understand the general user needs among the community to produce the most effective system to help the user (Chai, 1999).

### 4.4.2 Hardware Requirement

After doing the evaluation on development tools based on the criteria discussed earlier, the hardware requirement is listed below:

**Table 4.4.2: Minimum Hardware Requirements**

| *Resources* | *Description* |
|---|---|
| Processor | IBM compatible computer with Pentium 3 processor 950 Hz or equivalent. |

| | |
|---|---|
| Display Card | RIVA TNT2 (128 bit colours) |
| Memory | 128 MB RAM |
| CD-Rom Drive | PC compatible |
| Hard Disk | 100 MB free |
| Mouse and keyboard | Windows compatible. |
| Media and driver support graphics | GIF, JPEG |

### 4.4.3 Software Requirement

After doing the evaluation on development tools based on the criteria stated earlier, the hardware requirement is listed below:

**Table 4.4.3: Minimum Software Requirements**

| **Components** | **Description** |
|---|---|
| Operating System | Microsoft 2000 |
| Web Server | IIS Web Server, Personal Web Server |
| Database | Microsoft Access |
| Web Page Development | Macromedia Dreamweaver 4, ASP, HTML, VB Script |
| Graphic Editors | Macromedia Flash, Adobe Photoshop |

## 4.5 Conclusion

The analysis stage of the development has been successful due to the ample effort allocated in it. The choice of platform usually depends on the client or targeted audiences. It is possible to develop an application that will work on more than one platform but this will lead to performance changes.

It is wise to understand the constraints and work within them. This will create fewer problems when it is time for implementation and to ensure the smoothness of project development.

# Chapter 5: Design

## 5.1 System Life Cycle

The most vital aspect of system development is the design phase. Many developers would spend the longest duration of development time for a specific program. It all depends on the degree of interactivity of the program.

In Smart Diet system development, it involves a set of process. A process is a series of steps involving activities, constraints, and resources that produce an intended output of some kind (Pfleeger, 2001). The system development process is represented in a software lifecycle by using waterfall model.

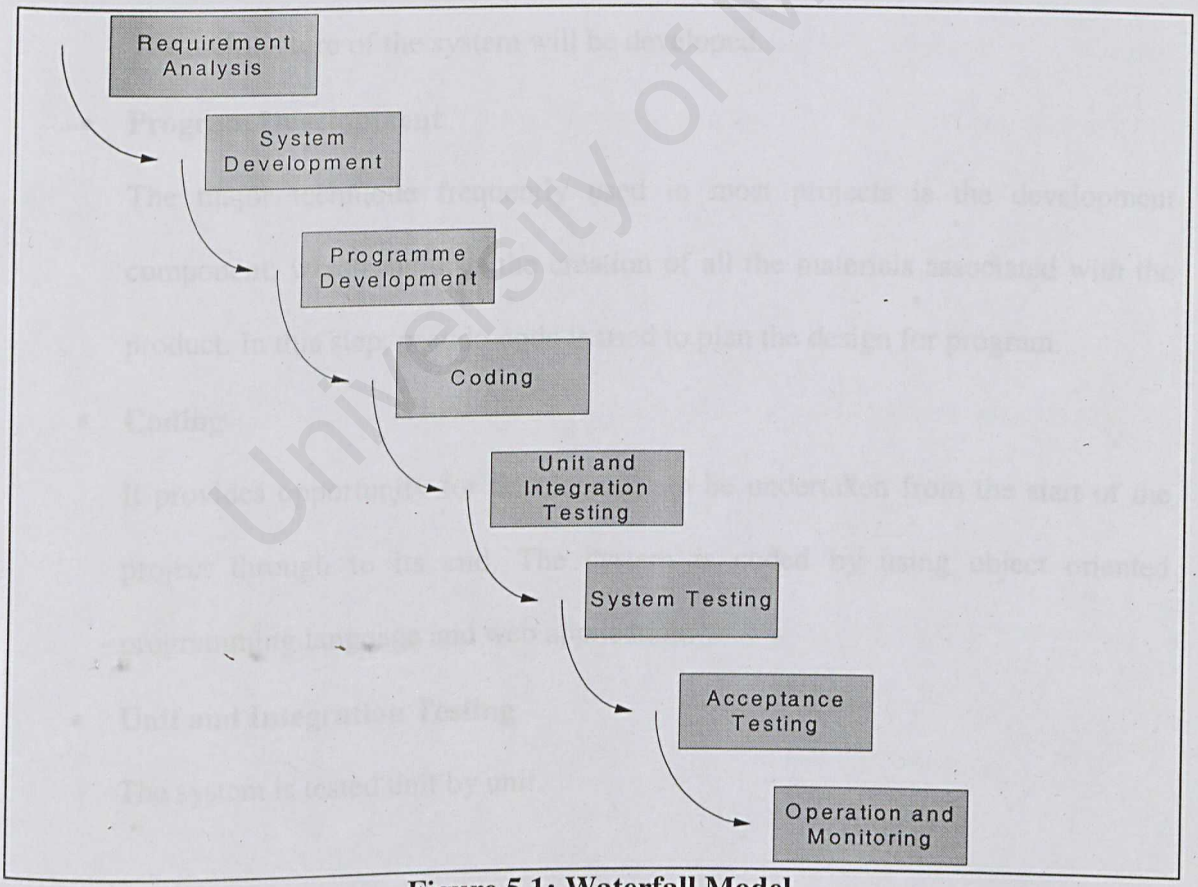



**Figure 5.1: Waterfall Model**

The process in developing Smart Diet system is illustrated in Figure 5.1. As figure implies, one development stage should be completed before the next begins. It suggests the sequence of events from start until the end.

There are eight steps in developing software:

- **Requirement analysis**

  Analysis the functional requirement, non-functional requirement, hardware requirement and software requirement as indicated in chapter 4. There should be an initial input statement of desired function and features that the system requires (Pfleeger, 2001).

- **System Development**

  After verified the requirement for the system, the next process is system design. The architecture of the system will be developed.

- **Program Development**

  The major technique frequently used in most projects is the development component, which includes the creation of all the materials associated with the product. In this step, pseudo-code is used to plan the design for program.

- **Coding**

  It provides opportunity for development to be undertaken from the start of the project through to its end. The system is coded by using object oriented programming language and web application.

- **Unit and Integration Testing**

  The system is tested unit by unit.

- **System Testing**

  Ensures that the system has implemented all the requirements, so that each function can be traced back to a particular requirement in the specification (Pfleeger, 2001).

- **Acceptance Testing**

  Ensure that each function works correctly and make sure that the system was built according to user needs (Pfleeger, 2001). An assessment will be performed to determine whether the application perform according to specifications.

- **Operation End Monitoring**

  This is normally being performed after the implementation process to determine whether the overall outcomes have been achieved. Area such as determining whether there has been any discrepancy between current and desired performance and seeing that it has been resolved. It will provide maintenance and monitor make sure that the system runs smooth without any problem.

## 5.2 System Design Model

It is important to structure the project and the important task is done during the design process. The structure is referring to the organization of the content and their module. The structure should be rational, as it will basically reflect some natural order within the content. It provides a graphical overview of the project.

### 5.2.1 Branch Linear

Branch linear is a linear structure, whereby the user has choices on which path to take, but limited to a one-way direction at a time. For example, if the user choose to run "Health Diet Analysis", the analysis will be limited to its direction at a time. It would not go for other analysis such as "Food Diet Analysis" or "Disease Option Analysis".

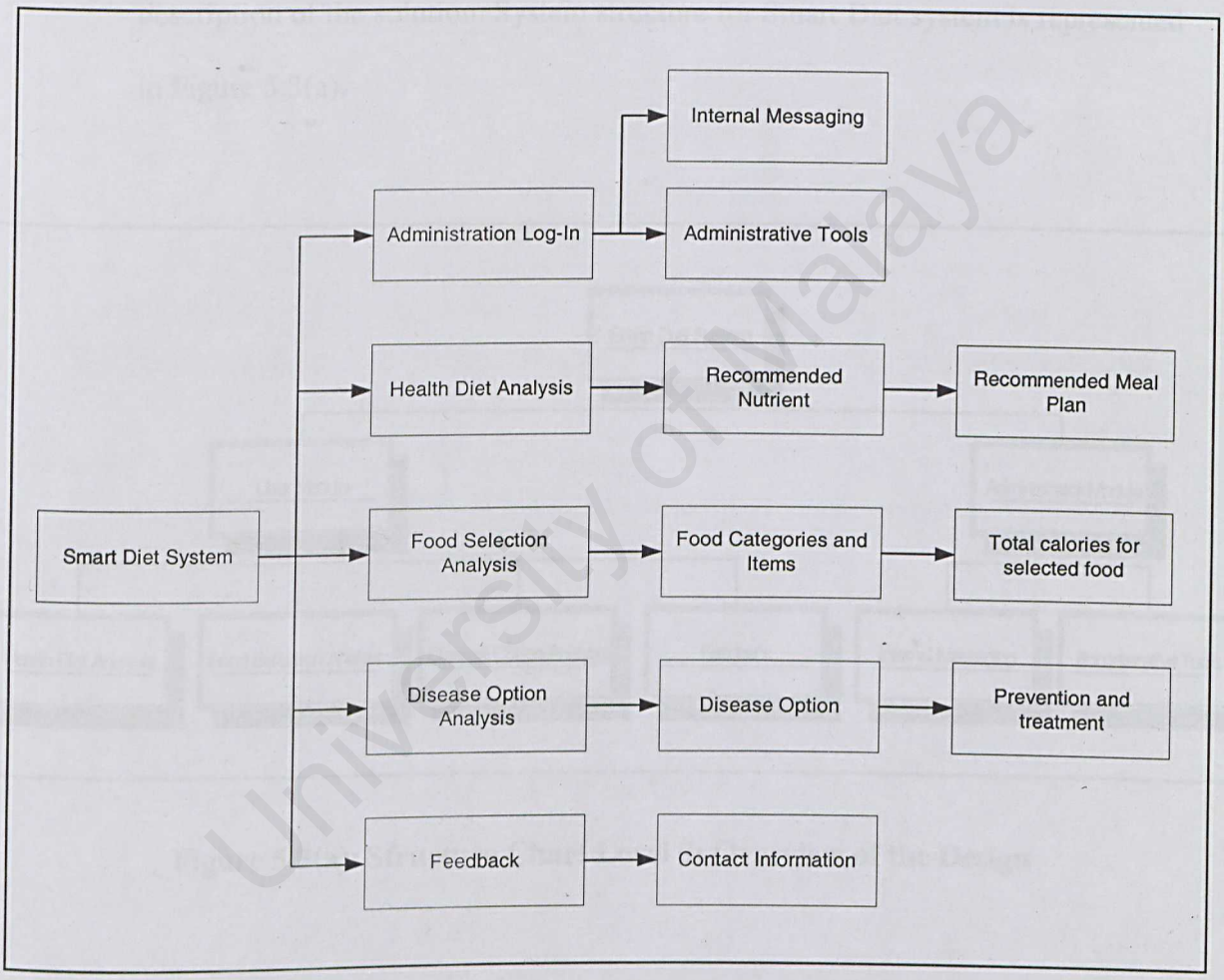



**Figure 5.2.1: Illustration of branch linear technique**

By using this technique, it will generally increase the design pace during the design phase as such tools provide the necessary platform for fast and efficient designing.

## 5.3 System Architecture Design

Design is a creative process of transforming the problem into a solution and the description of the solution. System structure for Smart Diet system is represented in Figure 5.3(a).

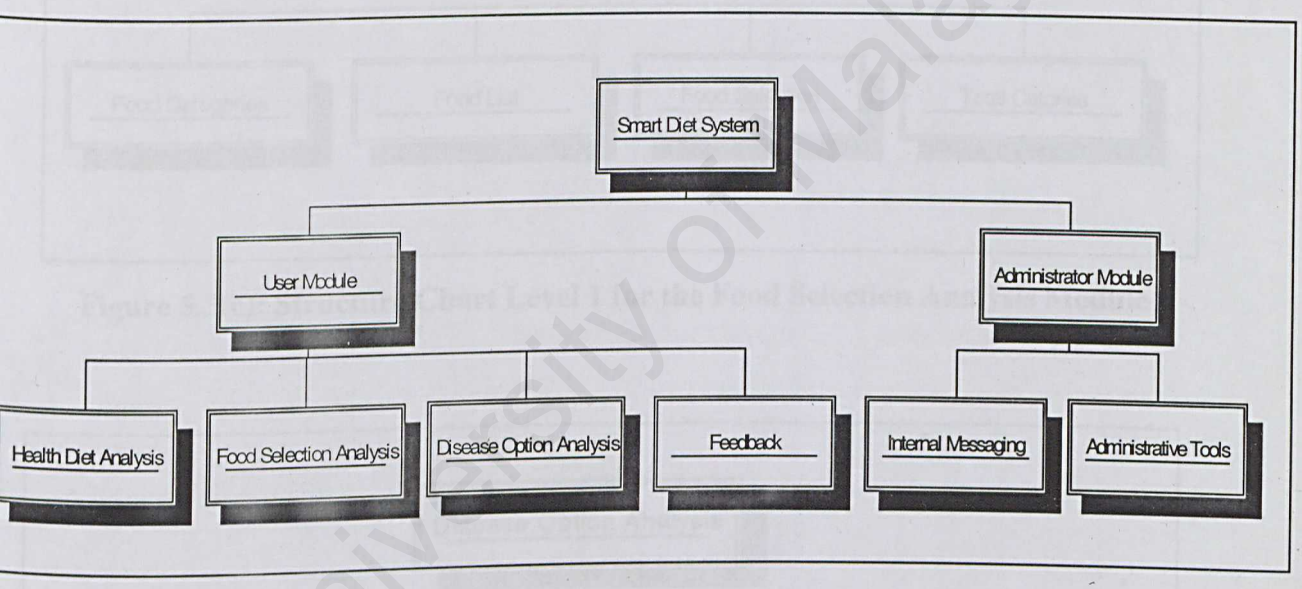



**Figure 5.3(a): Structure Chart Level 0: Overview of the Design**

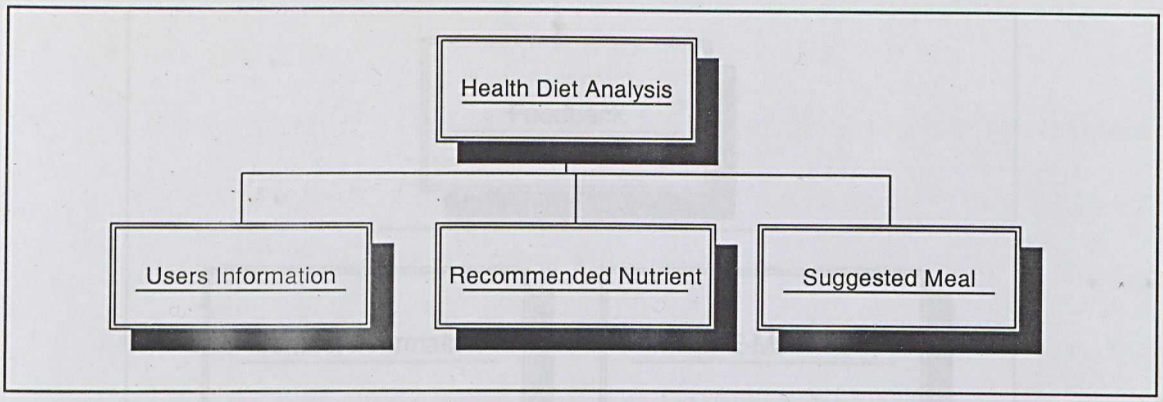



**Figure 5.3(b): Structure Chart Level 1 for the Health Diet Analysis Module**

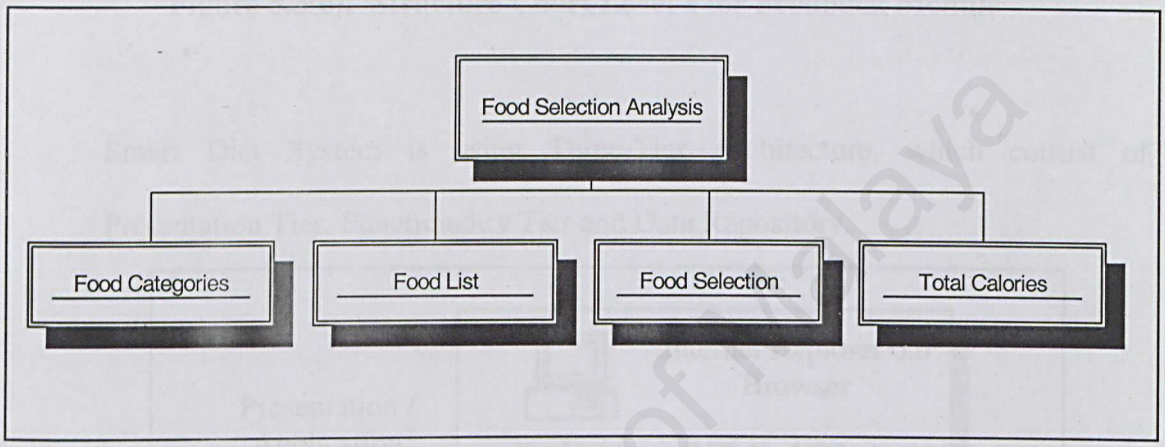



**Figure 5.3(c): Structure Chart Level 1 for the Food Selection Analysis Module**

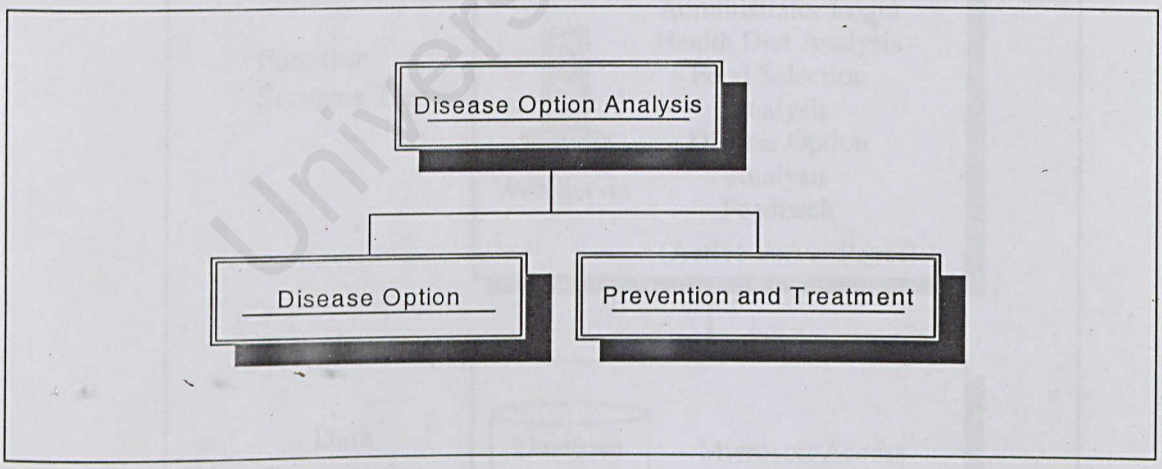



**Figure 5.3(d): Structure Chart Level 1 for Disease Option Analysis Module**

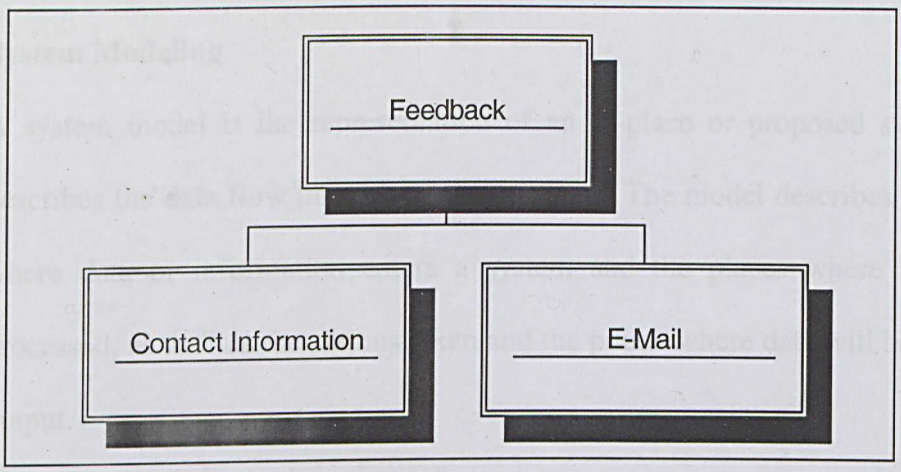



**Figure 5.3(e): Structure Chart Level 1 for Feedback Module**

Smart Diet System is using Three-Tier Architecture, which consist of Presentation Tier, Functionality Tier and Data Repository.

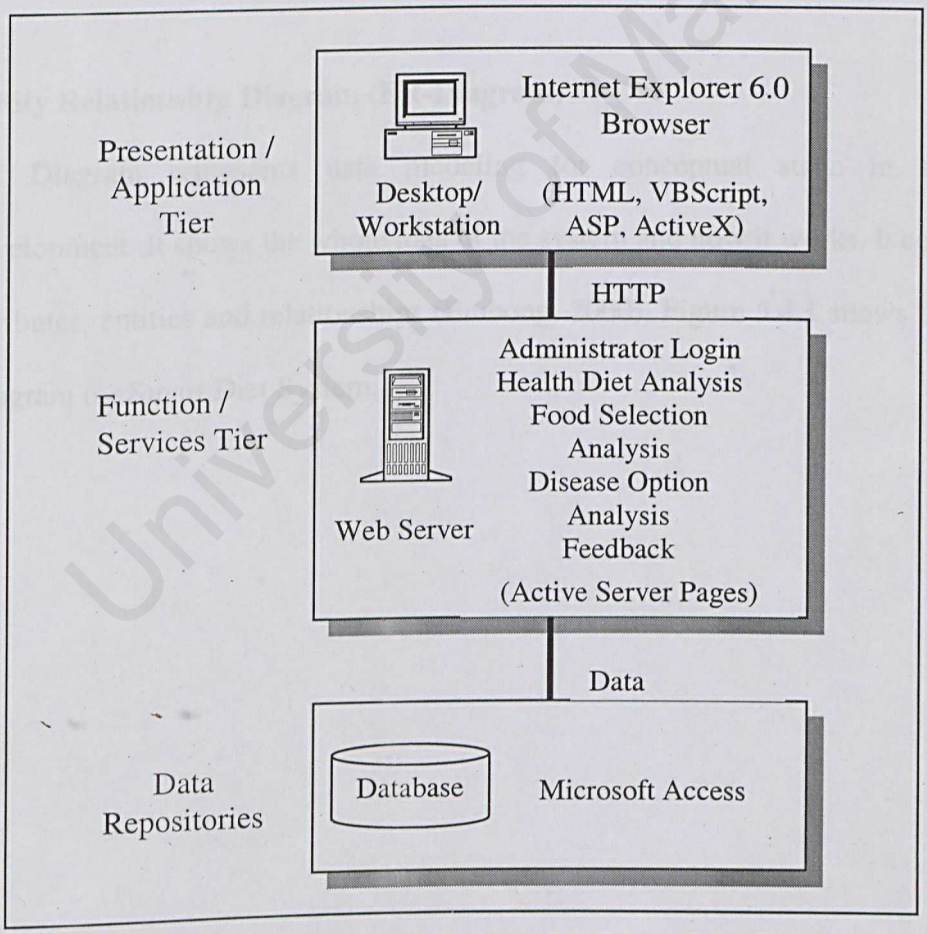



**Figure 5.3(f): Three-Tier Architecture for Smart Diet System**

## 5.4 System Modeling

A system model is the representation of an in-place or proposed system that describes the data flow throughout the structure. The model describes the points where data or information enters a system and the places where it will be processed, as well as the actions taken and the points where data will become the output.

A system model is documented through a variety of design diagrams. A design diagram is a graphics or visual representation of a structure. Design diagrams include data flow diagrams (DFD), entity relationship diagram (ER-D) (Silver et al, 1989).

### 5.4.1 Entity Relationship Diagram (ER-Diagram)

ER Diagram represents data modeling for conceptual stage in system development. It shows the whole idea of the system and how it works. It contains attributes, entities and relationships (Embong, 2000). Figure 5.4.1 shows the ER Diagram for Smart Diet System.

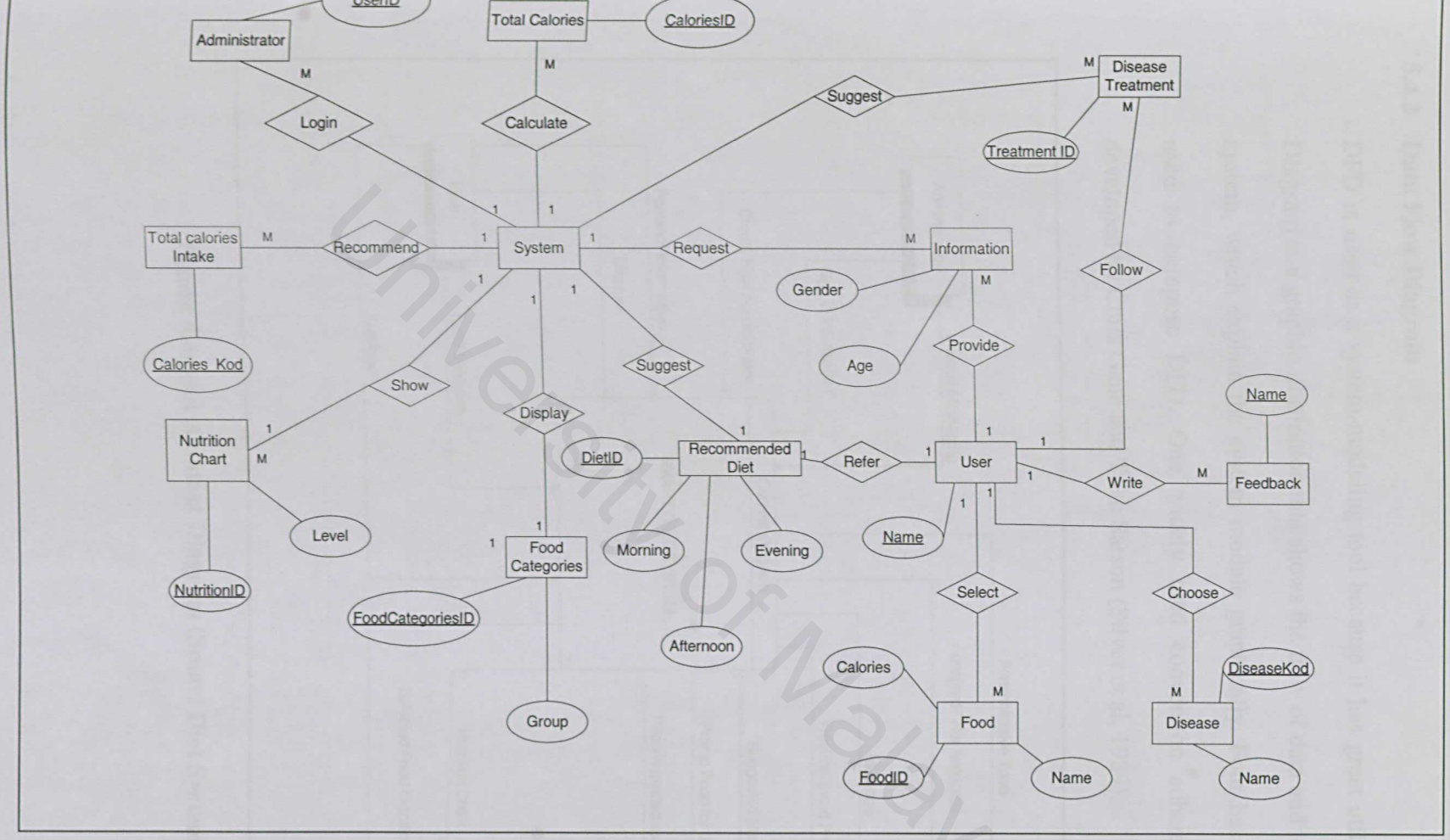



**Figure 5.4.1: Entity Relationship Diagram (Smart Diet System)**

### 5.4.2 Data Flow Diagram

DFD is used as a system-modeling tool because it has great utility. Data Flow Diagram is a graphic illustration that shows the flow of data and logic within the system, which explain the system module graphically. Four basic symbols are used to compose DFD. One widely used convention adheres to symbols developed by Chris Gane and Trish Sarson (Silver et al, 1989).

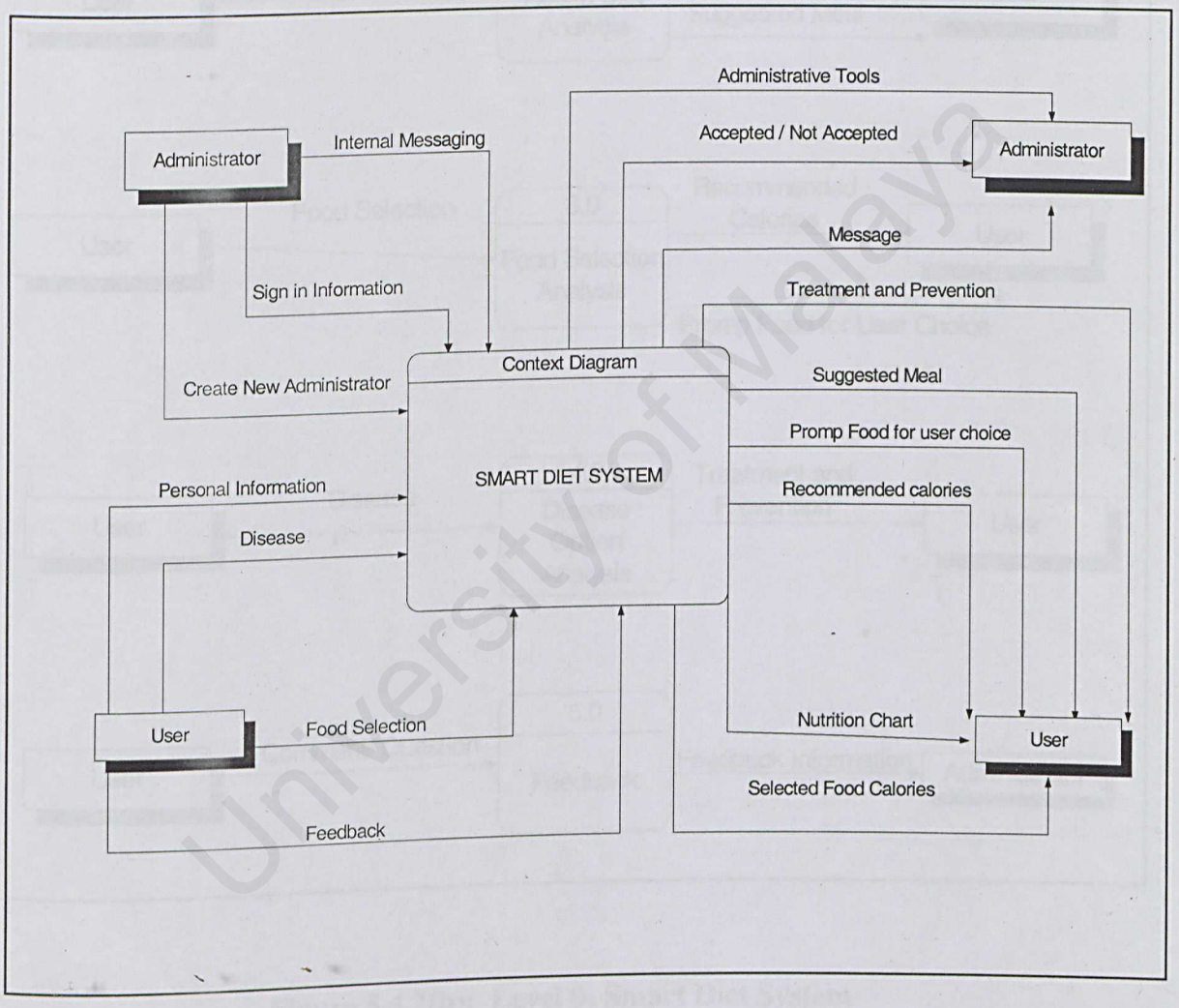



Figure 5.4.2(a): **Context Diagram (Smart Diet System)**

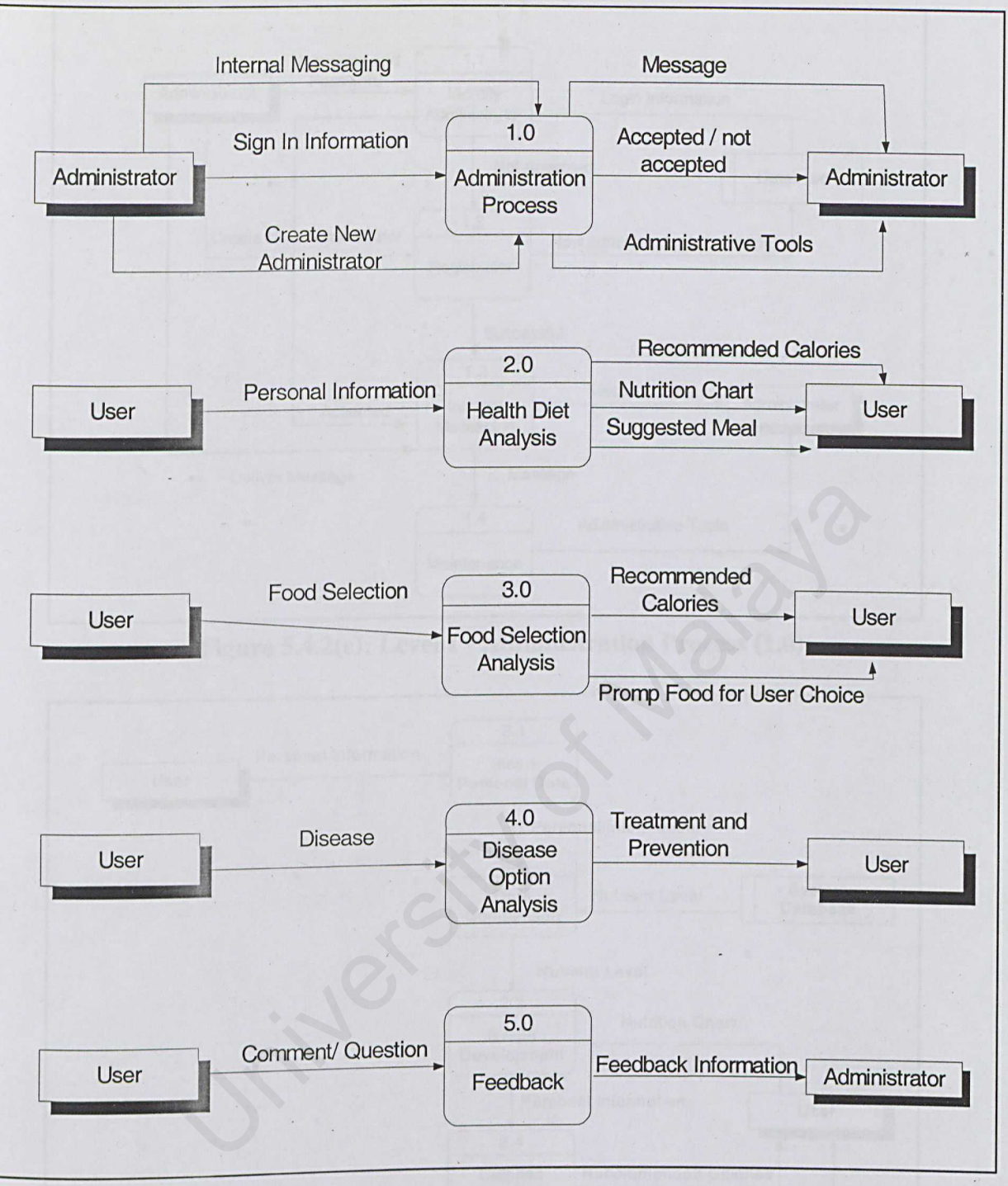



**Figure 5.4.2(b): Level 0: Smart Diet System**

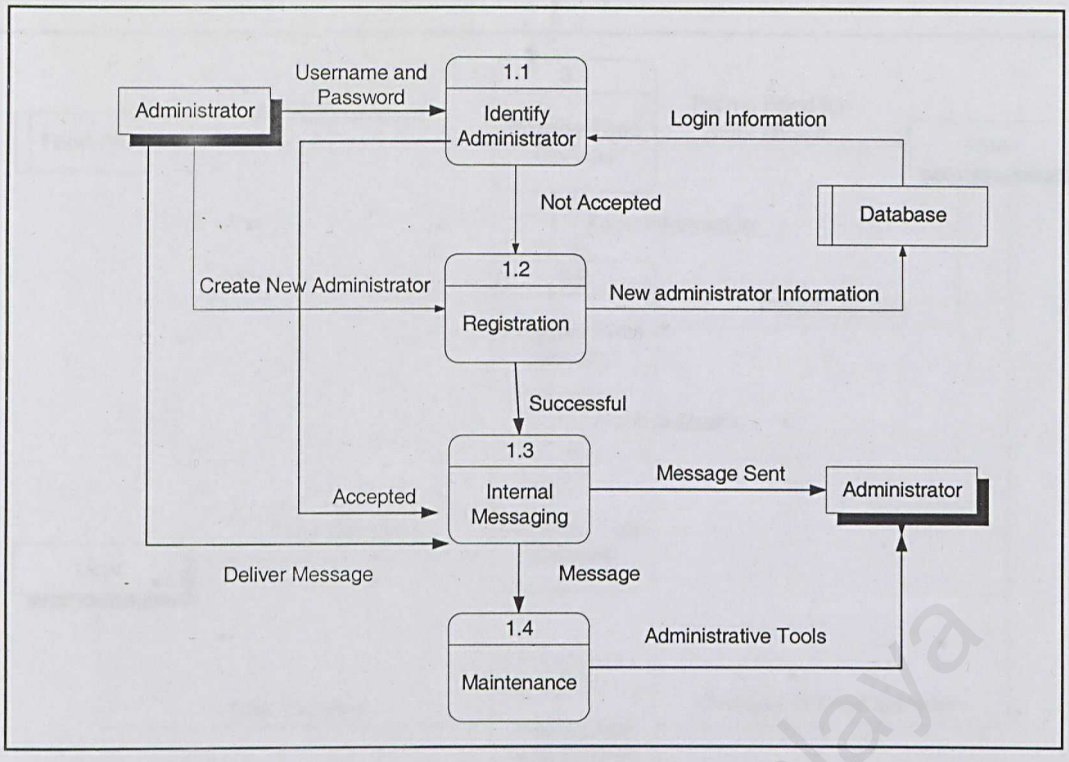



**Figure 5.4.2(c): Level 1 - Administration Process (1.0)**

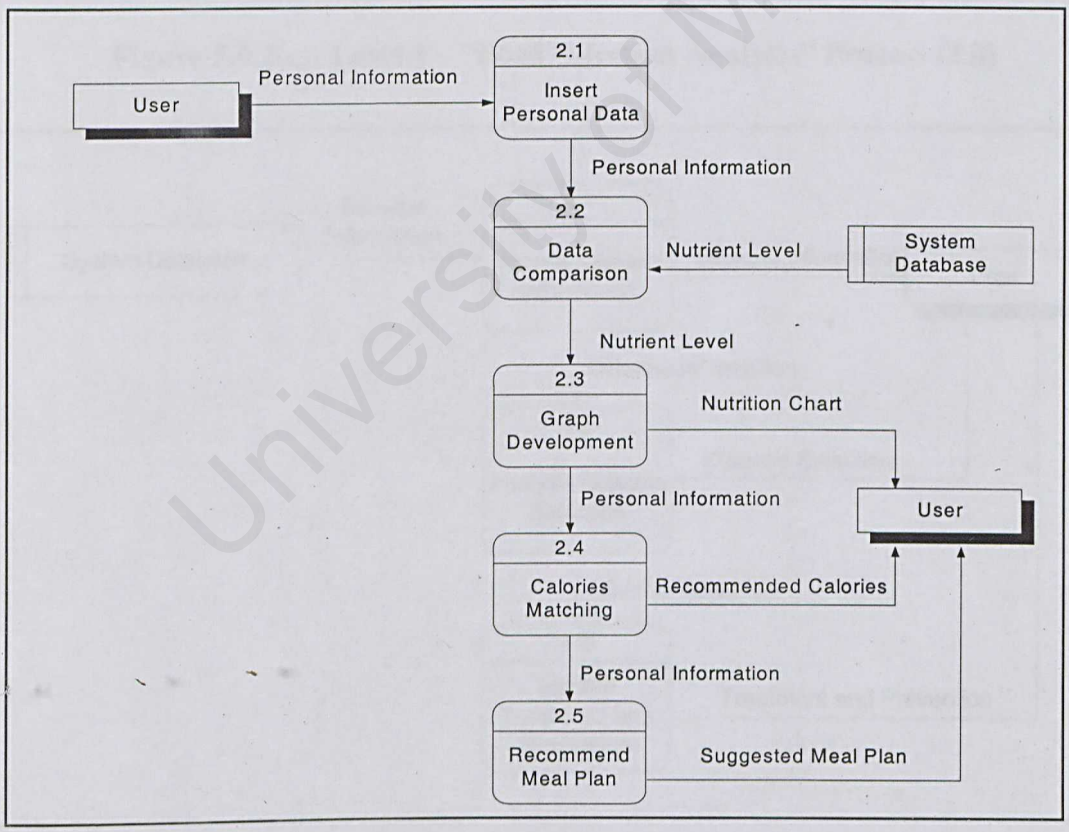



**Figure 5.4.2(d): Level 1 – "Health Diet Analysis" Process (2.0)**

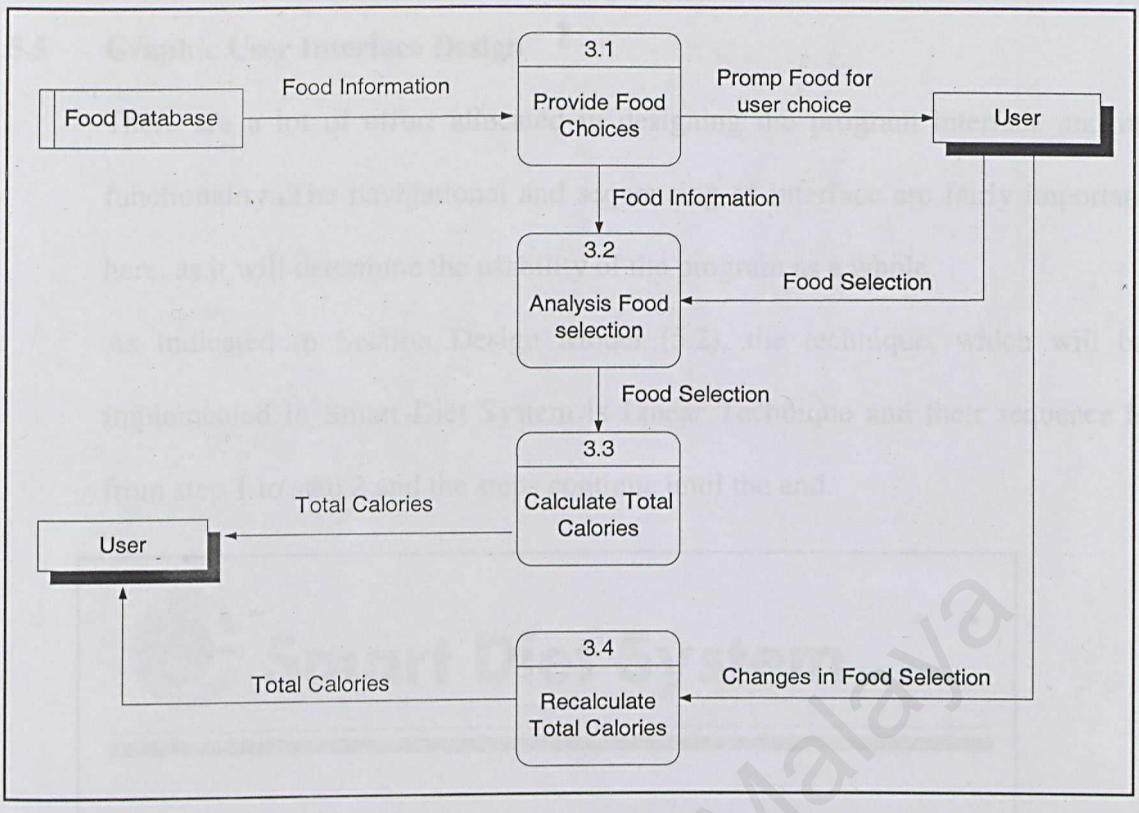



**Figure 5.4.2(e): Level 1 – "Food Selection Analysis" Process (3.0)**

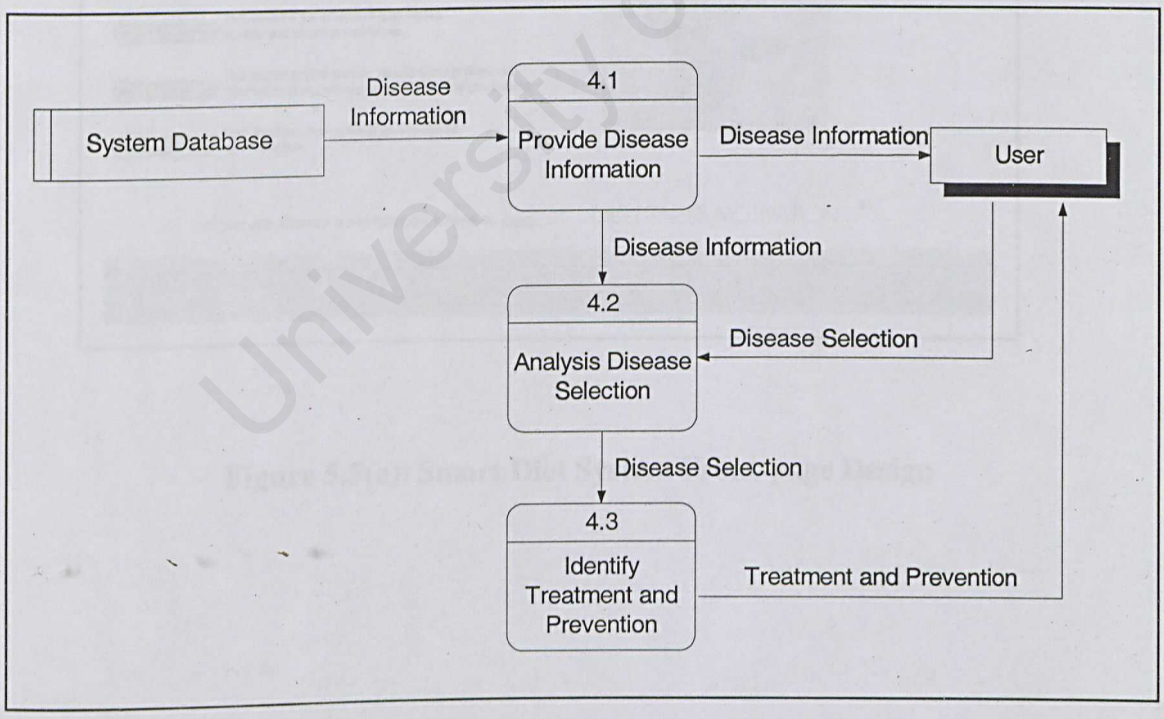



**Figure 5.4.2(f): Level 1 – "Disease Option Analysis" Process (4.0)**

## 5.5 Graphic User Interface Design

There are a lot of effort allocated in designing the program interface and its functionality. The navigational and sequencing of interface are fairly important here, as it will determine the usability of the program as a whole.

As indicated in Section Design Model (5.2), the technique, which will be implemented in Smart Diet System is Linear Technique and their sequence is from step 1 to step 2 and the steps continue until the end.

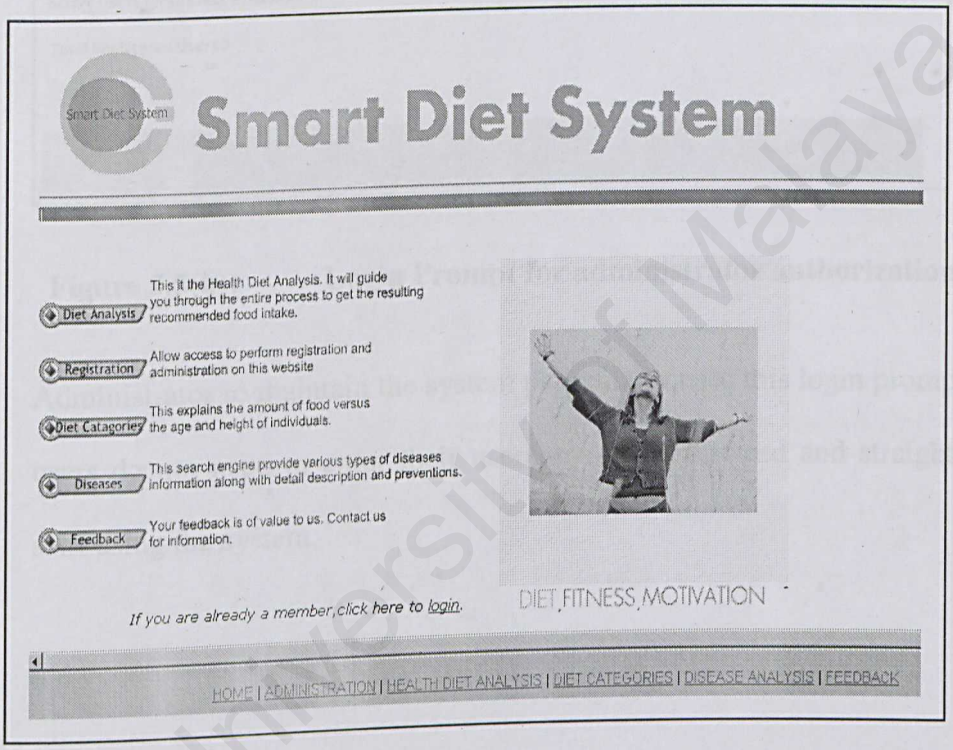



**Figure 5.5(a): Smart Diet System Front-page Design**

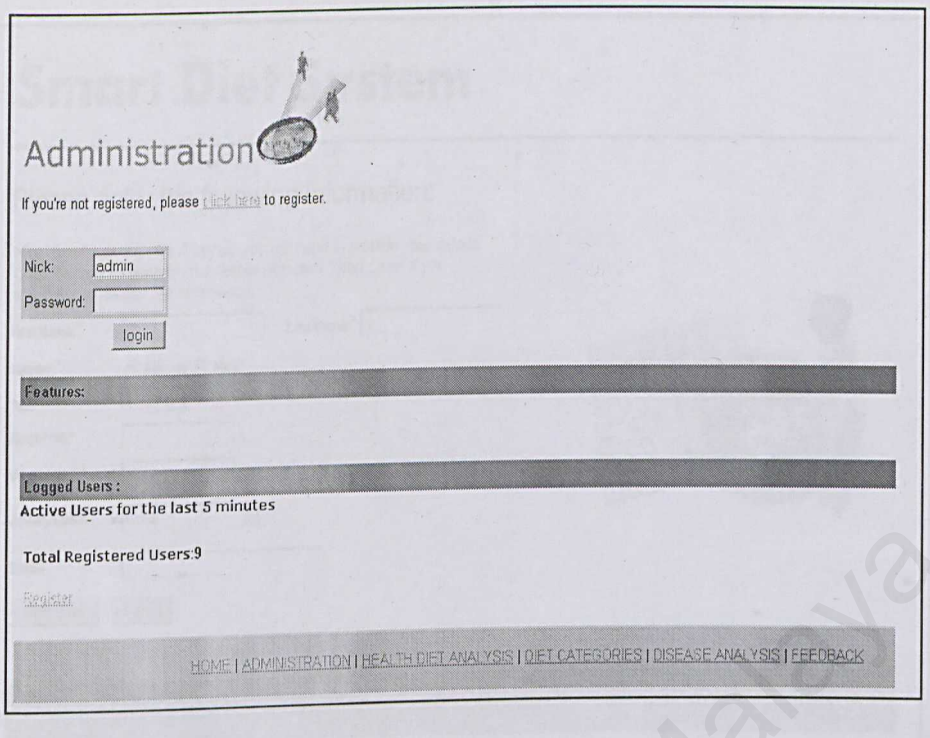



**Figure 5.5(b): Login Prompt for administrator authorization**

Administrator to maintain the system particularly uses this login prompt. Normal users do not need to enter their username and password and straightaway can start using the system.

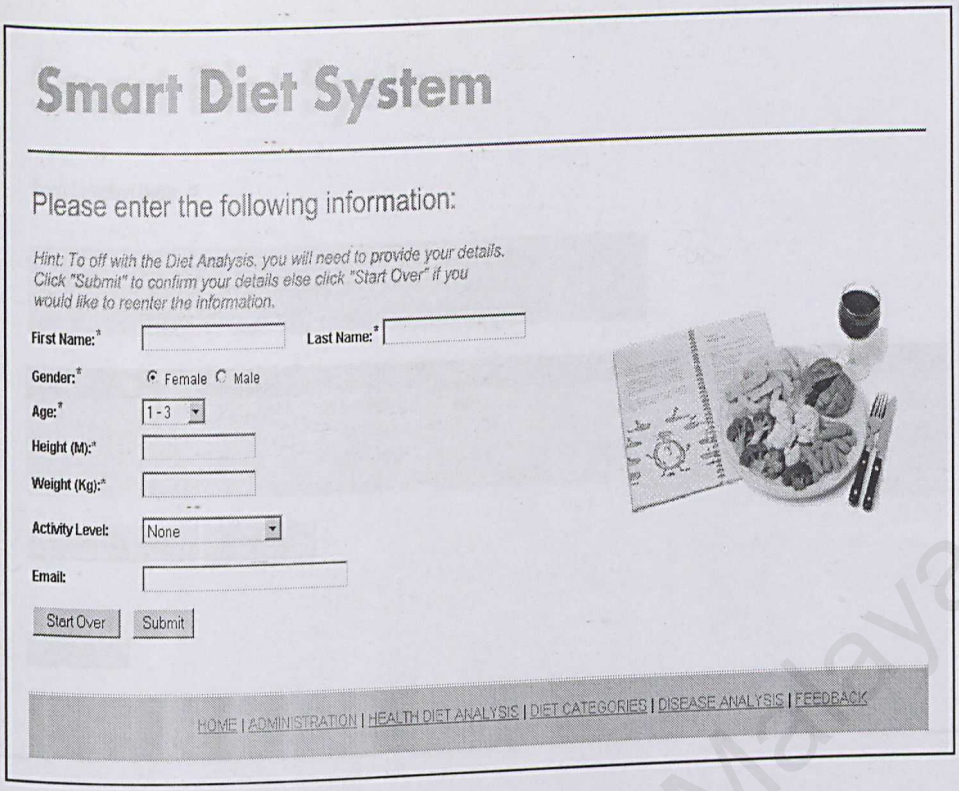



**Figure 5.5(c): Data Entry Process**

In this process, user needs to enter their personal information and submit the details to get the "Health Diet Analysis". User will know better on what type of nutrient they need to take more in order to stay healthy. Lastly the system will recommend a basic meal for the user to follow.

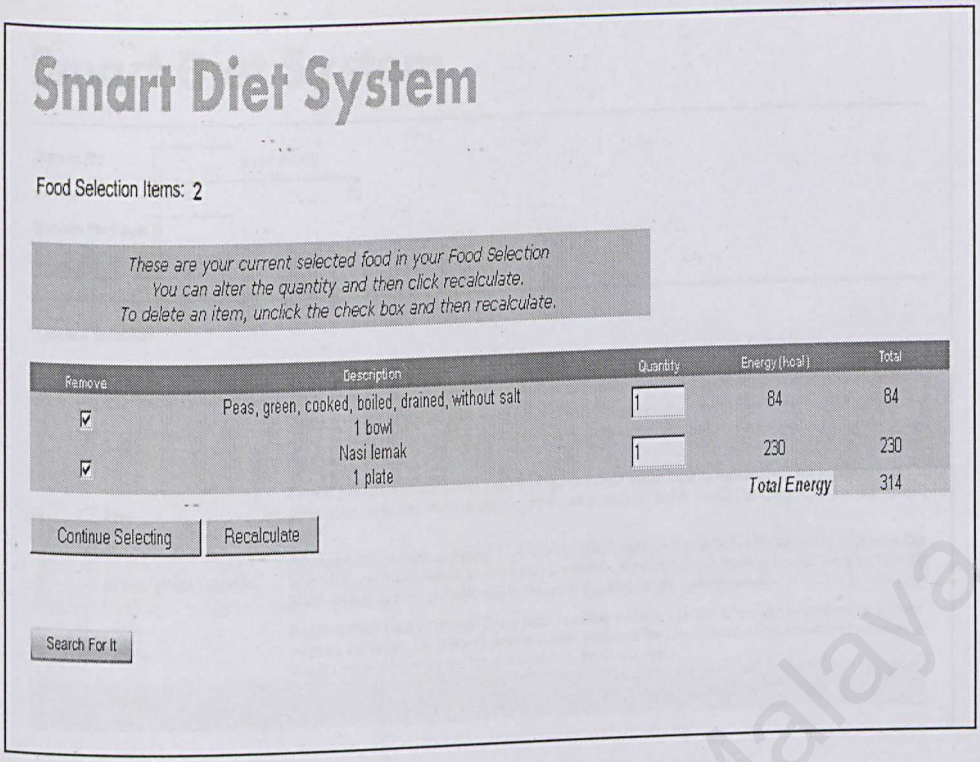



**Figure 5.5(d): Food Selection**

User can select the food according to their personal taste. The system will calculate the total calories based on the selected food. This will act as the guidance and make sure that they do not exceed the total amount of recommended calories from "Health Diet Analysis". Users can uncheck the checkbox and click "Recalculate" to delete some food. Users can continue their selection by clicking "Continue Selecting" and find the food by placing the keyword after selecting "Select for it".

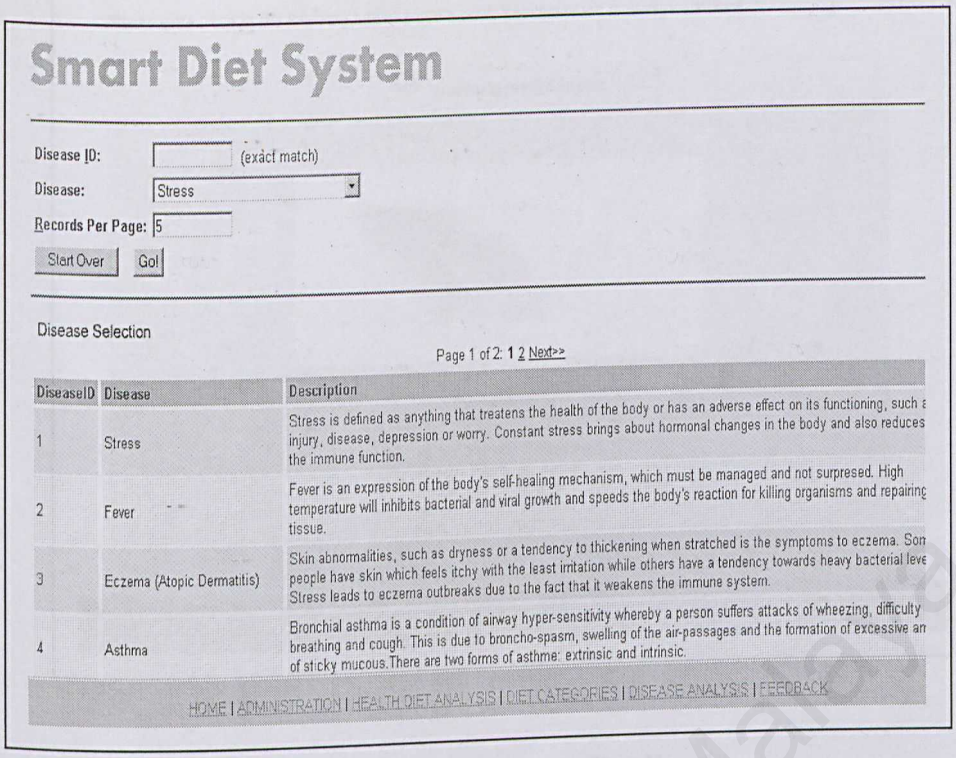



**Figure 5.5(e): Disease Selection**

Users are required to select the disease that they want to analyse. Users can press "Go" to get he disease analysis or click "Start Over" to select it again. Users will know what type of treatment and prevention which is necessary to overcome the disease.

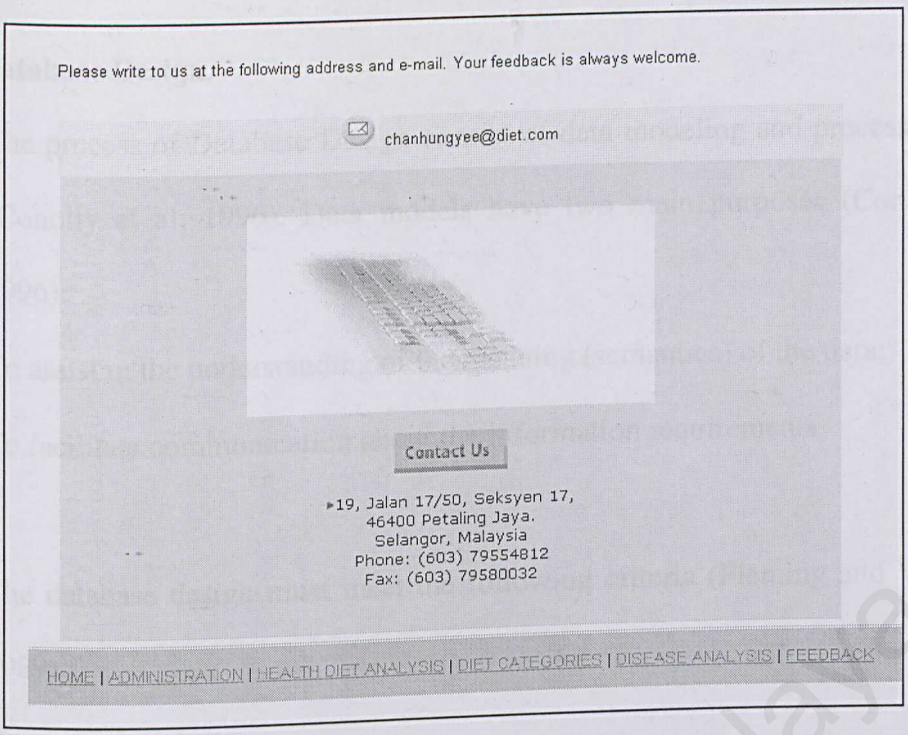



**Figure 5.5(f): User's Feedback**

User can give their comment, suggestion or feedback to the administrator to upgrade and maintain the system according to user's need.

The expected outcome from this system is to be able to analyse a healthy diet analysis based on their gender and age, provide a calories analysis based on users selected food and provide treatment and prevention for selected disease. This is a good system, which can provide fast, reliable and useful data to enjoy a healthy living.

## 5.6 Database Design

The process of Database Design consist of data modeling and process modeling (Conolly et al, 1996). Data models have two main purposes (Conolly et al, 1996):

- To assist in the understanding of the meaning (semantics) of the data;
- To facilitate communication about the information requirements

The database design must meet the following criteria (Fleming and Von Halle, 1989):

- **Structural Validity**

  Consistency with the way the enterprise defines and organizes information.

- **Simplicity**

  Ease of understanding by information systems professionals and users including non-technical professionals.

- **Expressability**

  Ability to distinguish between different types of data, relationship types and constraints.

- **Nonredundancy**

  Exclusion of extraneous information; in particular, the representation of any one piece of information exactly once.

- **Shareability**

  Not specific to any particular application of technology; thereby usable by many.

- **Extensibility**

  Ability to evolve to support new requirements with minimal affect on existing users.

- **Integrity**

  Consistency with the way the enterprise uses and manages information.

- **Diagrammatic representation**

  Ability to represent a model using easily understood diagrammatic notation.

There are five tables, which form a complete Smart Diet System Database. The tables are Administrator Log-In table, Disease table, Food Selection Table, Nutrient Description and Nutrient Recommendation table. The information can be retrieve by authenticated Smart Diet System staff only through Administrator Log-In.

This database enables users to choose their favourite type of food based on the foods' calories. With this database, Smart Diet System's users do not need to key in their selection, but instead they just have to choose from the database given.

This database was built using a template, which is integrated with Microsoft Access 2000.

### 5.6.1 Administrator Log-In Module

Users information is stored in "Database" and located in "Users Table". The contents of the table are usernames, passwords and their personal details.

Username and password will be used for every log-in. Screenshot below shows the content of the database.

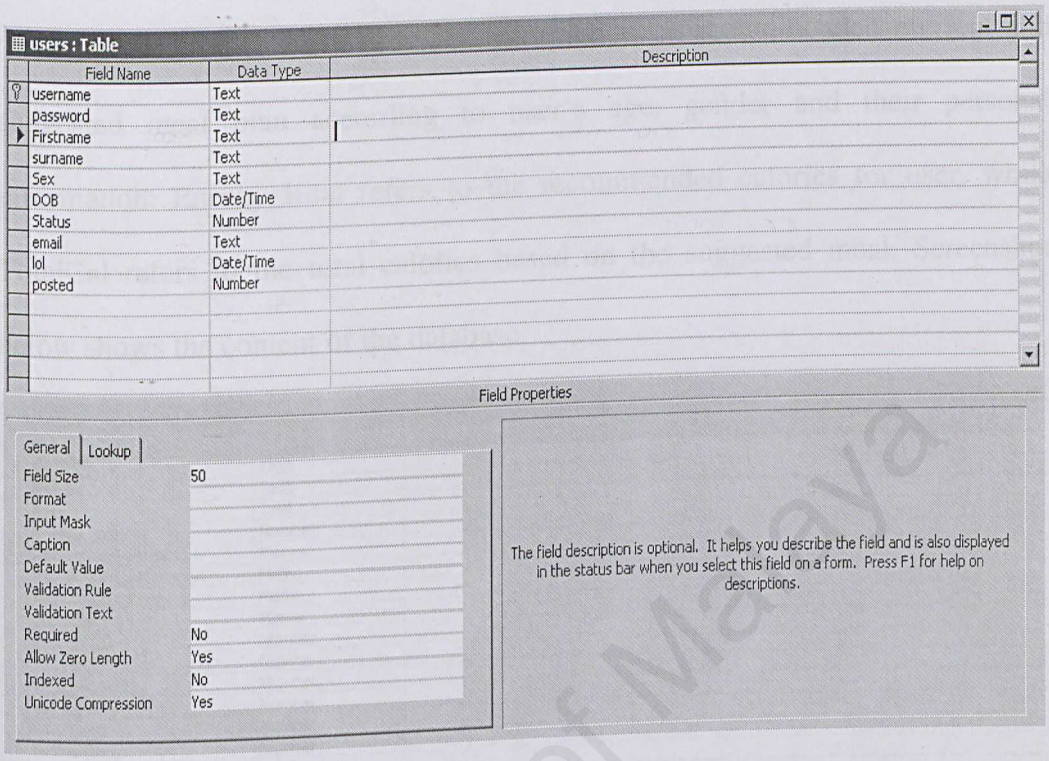



**Figure 5.6.1 (a): Users Table**

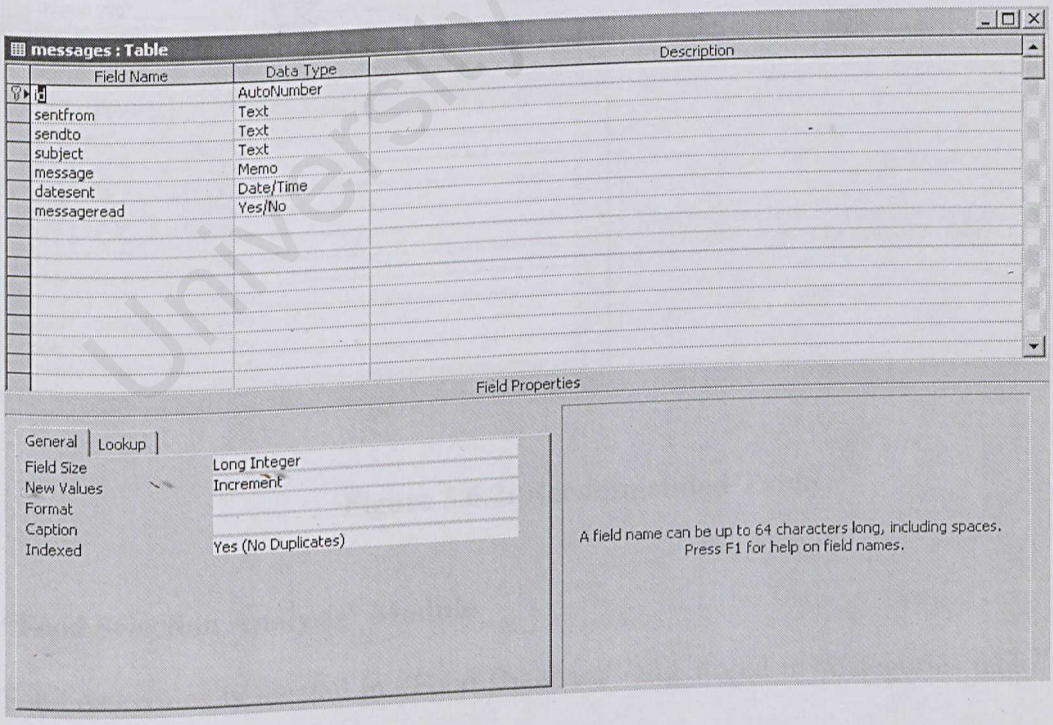



**Figure 5.6.1 (b): Message Table**

### 5.6.2 "Health Diet Analysis" Module

Nutrient Recommendation is stored in "System Database" and located in "Recommended Table". It provides information on recommended nutrient and suggested meal plan according to user's age, gender and their personal information. Energy_Kcal refers to the recommended calories for user, while TotalCal refers to the total calories based on the suggested meal. Screenshot below shows the content of the database.

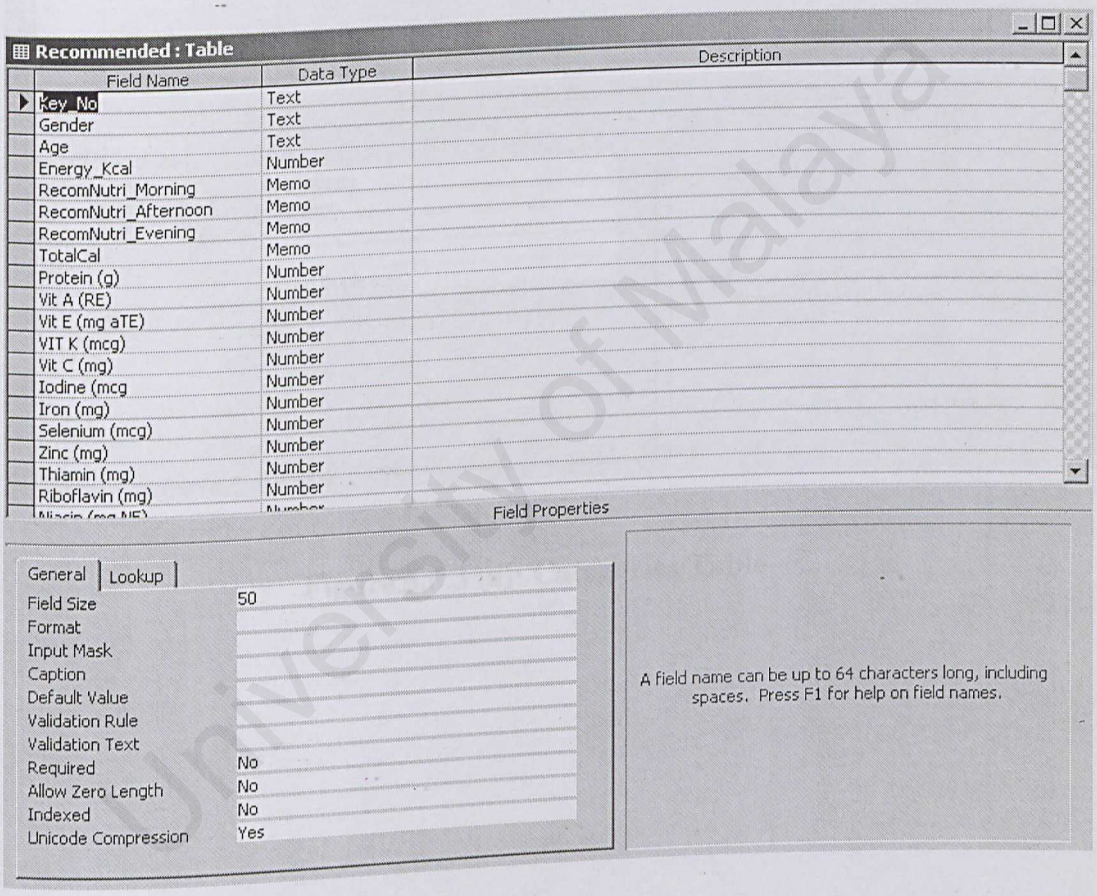



**Figure 5.6.2: Recommended Table**

### 5.6.3 "Food Selection Analysis" Module

Food categories is located in "Food Database" and stored in "categories table". Food items is located in the same database but stored in "Products Table".

"Categories table" consists of CategoryID and Category Description. "Products Table" contains ID, Code, Name, Description and their calories. Screenshot below shows the content of Categories and Products table.

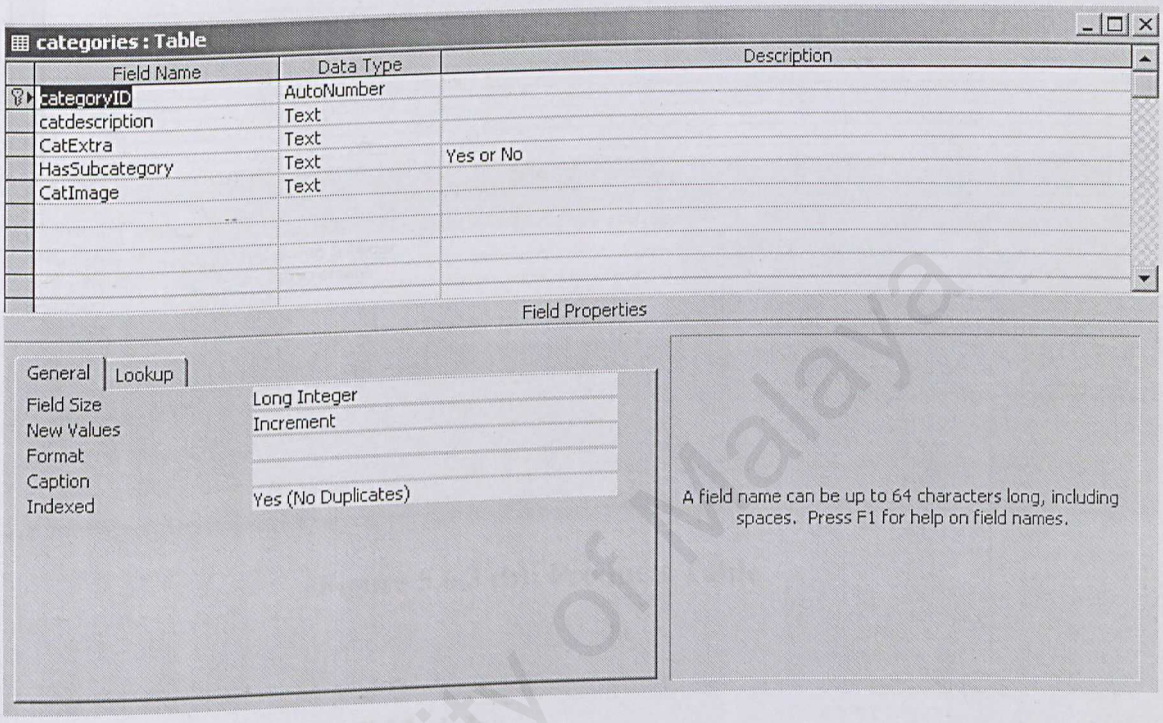



**Figure 5.6.3 (a): Categories Table**

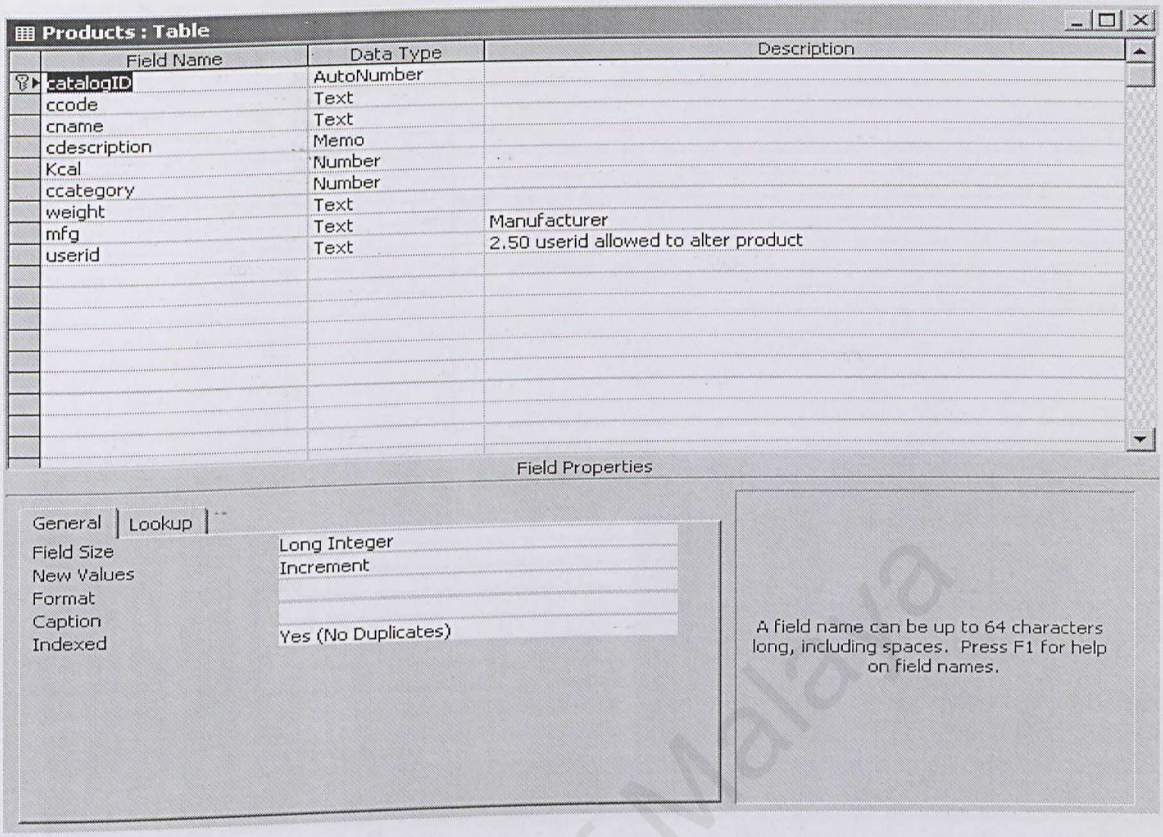



**Figure 5.6.3 (b): Products Table**

### 5.6.4 "Disease Option Analysis" Module

Disease Information is located in "System Database" and stored in "Disease Table". The table consists of Disease ID, Disease, Description, Prevention and Treatment. Screenshot below shows the content of the database.

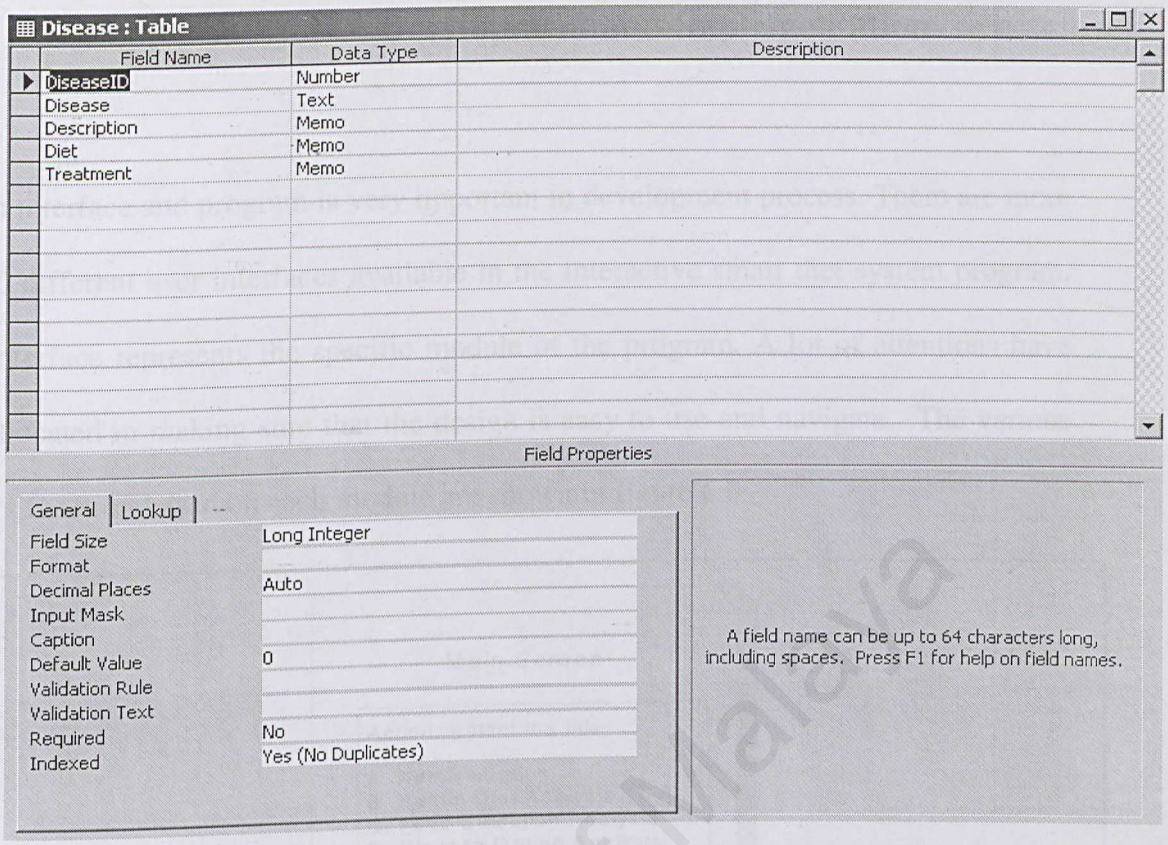



**Figure 5.6.4: Disease Table**

## 5.7 Conclusion

Designing normally takes up to 20 percent of the entire production period where great emphasis is focus on constructing a concrete set of design platform. This chapter is emphasizing on system structure design, the relationship between entity and attributes in ER-Diagram, Data Flow Diagram and User Interfaces Design.

# Chapter 6: System Development and Implementation

System interface and program is very important in development process. There are more than 20 different user interfaces available in the interactive smart diet system program. Each interface represents the specific module of the program. A lot of attentions have been allocated in making sure that the design is easy to use and navigate. The various screen's function based on each module are shown in figure 6.0.

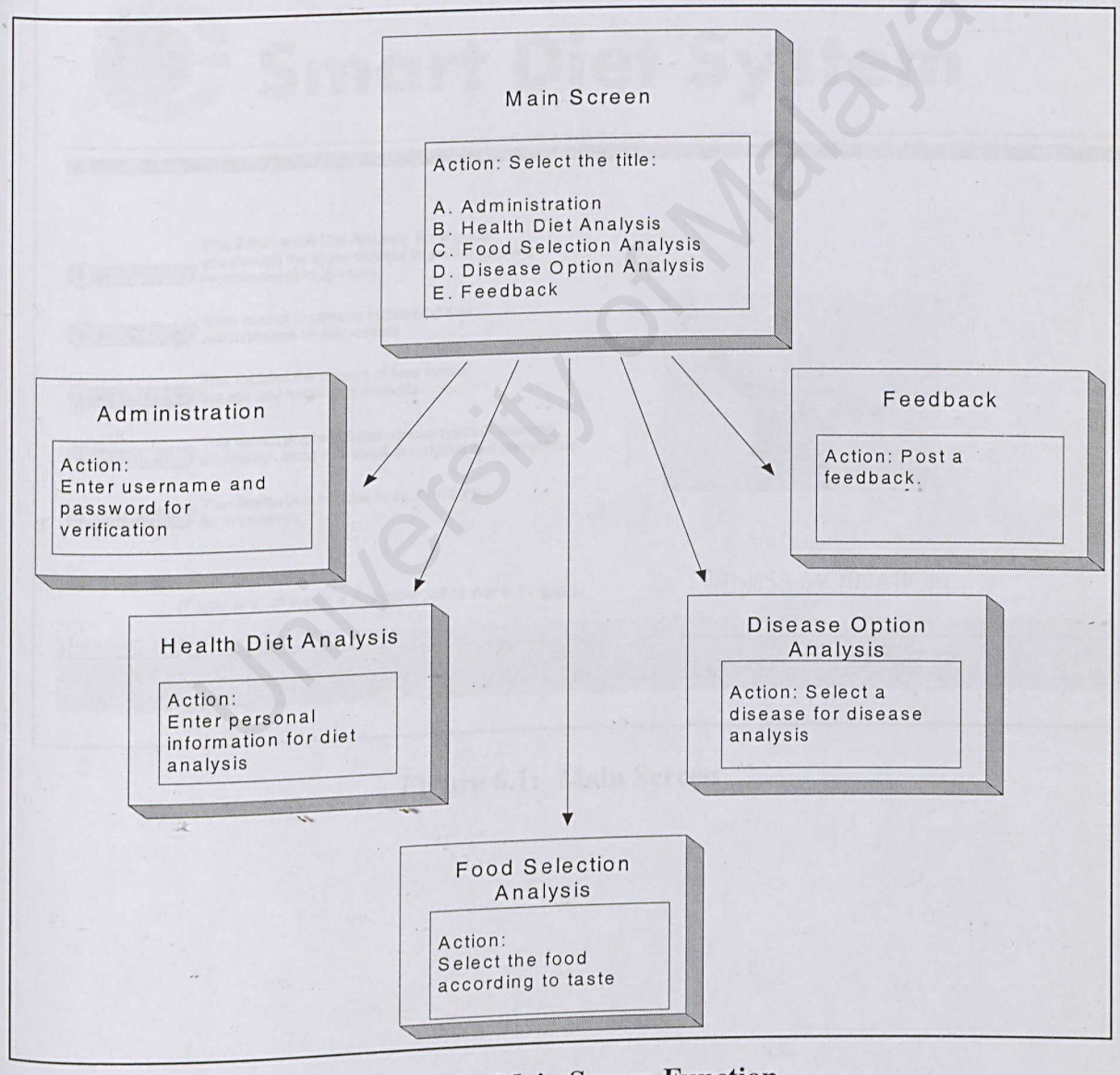



**Figure 6.0: Main Screen Function**

## 6.1 Main Screen

Main screen is the place where users can select which analysis to carry on or to view other related information about its functionality to have a better understanding of the usage of the program. The structure is broken down to administration log-in, health diet analysis, diet categories, disease analysis and feedback. Figure 6.1 shows the screenshot of the main screen.

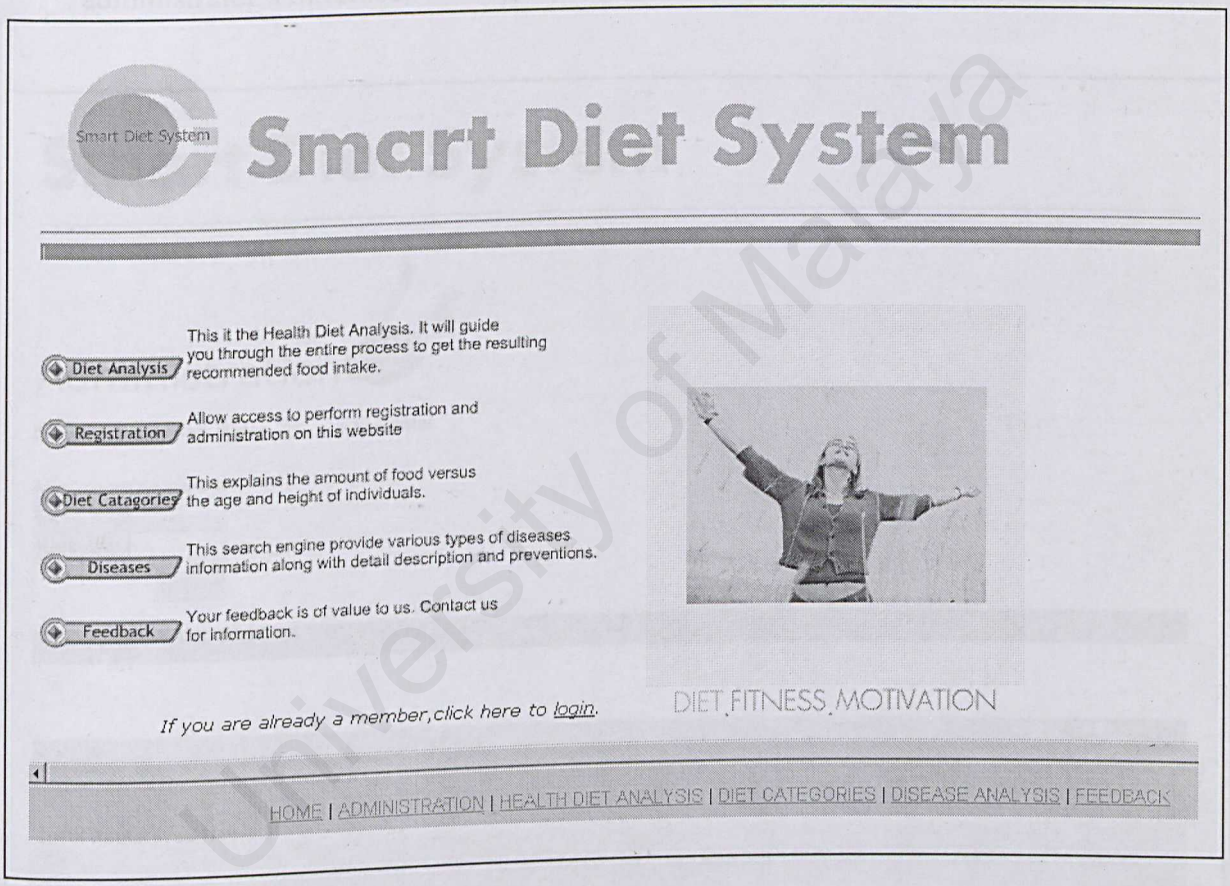



**Figure 6.1: Main Screen**

## 6.2 Administrator Log-In Screen

Administration log-in is a place where site administrator can maintain and update the information of the page. They are required to enter a valid username and password to login to the site. Users can register and become a standard user. Communication between site administrator and standard user can be done through internal messaging. The screenshots below show some example of administrator's interface.

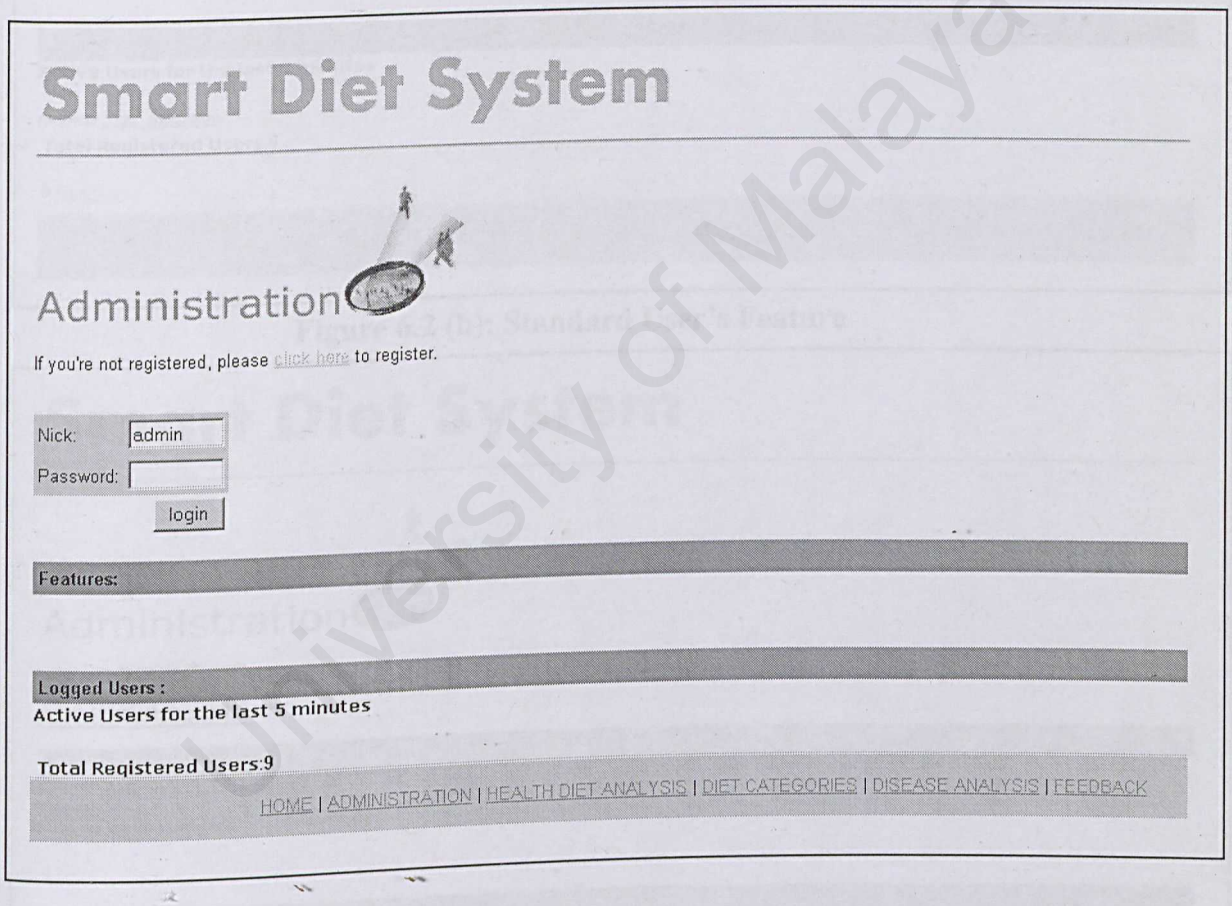



**Figure 6.2 (a): Login Page**

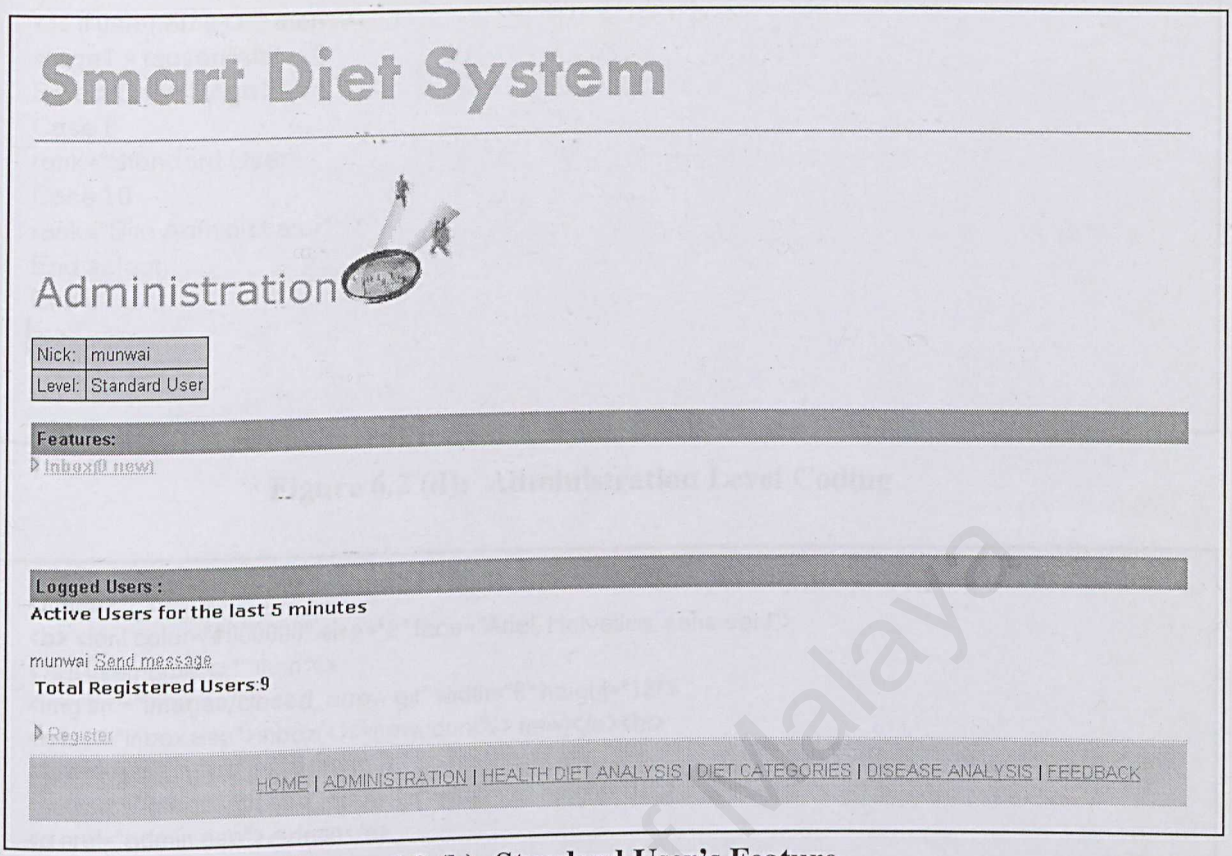



**Figure 6.2 (b): Standard User's Feature**

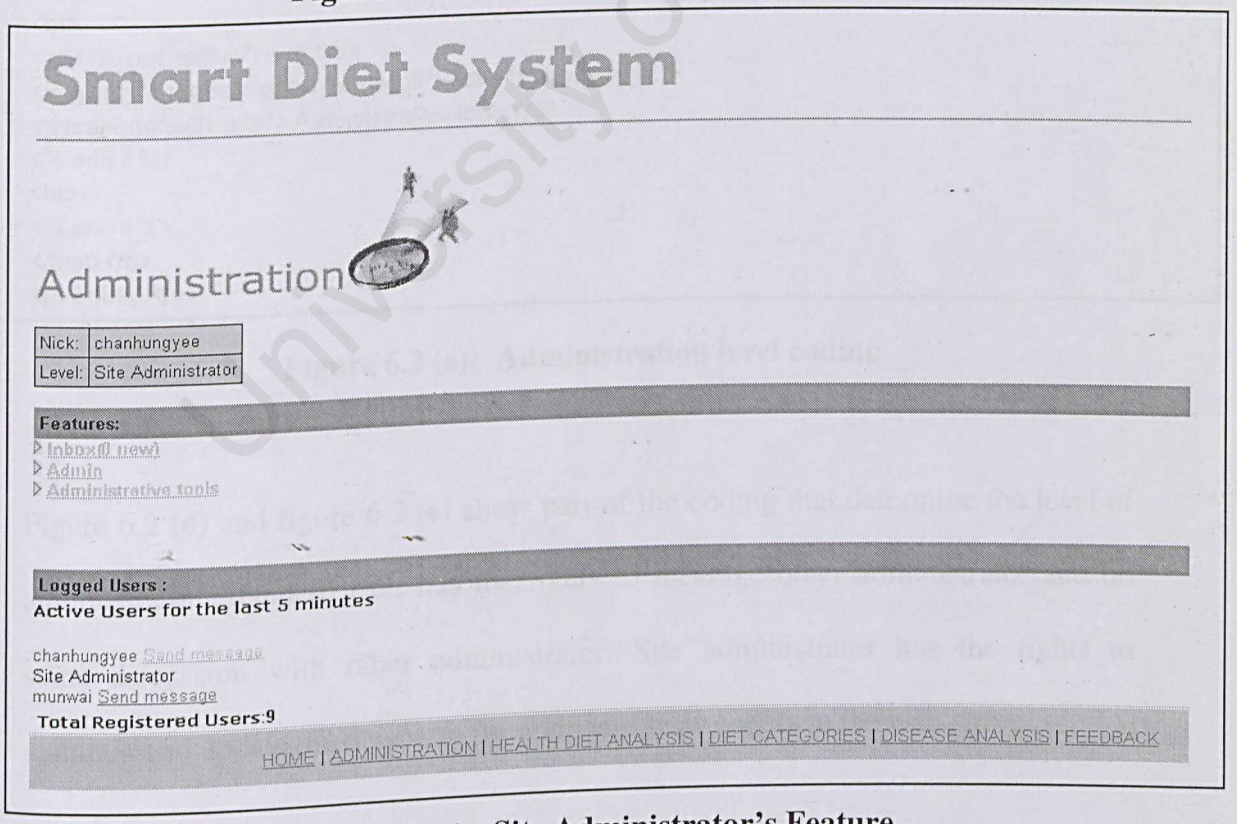



**Figure 6.2 (c): Site Administrator's Feature**

```
<% if username<>"" then
stage1 = rsuser("status")
Select Case stage1
Case 0
rank="Standard User"
Case 10
rank="Site Administrator"
End select
End if
%>
```

**Figure 6.2 (d): Administration Level Coding**

```
</table>
<b> <font color="#000000" size="2" face="Arial, Helvetica, sans-serif">
<% if username <>"" then%>
<img src="images/closed_arrow.gif" width="6" height="12">
<a href="inbox.asp">Inbox(<%=newcount%> new)</a><br>
<% if rsuser("status") = 10 then %>
<img src="images/closed_arrow.gif" width="6" height="12">
<a href="admin.asp"> Admin</a>
<% end if %>
<br>
<% if rsuser("status") = 10 then %>
<img src="images/closed_arrow.gif" width="6" height="12">
<a href="default1.asp"> Administrative tools</a>
<% end if %>
<br>
<% end if %>
</font></b>
<p> </p>
```

**Figure 6.2 (e): Administration level coding**

Figure 6.2 (d) and figure 6.2 (e) show part of the coding that determine the level of administrator. Standard user has the rights to message other administrator and do some discussion with other administrator. Site administrator has the rights to maintain and update the database, program and fully access to the web site.

## 6.3 Health Diet Analysis

This is the core of the program where users can actually analyze their personal diet and understand more on the level of nutrient consumption. Users must provide their name, gender and age to run the analysis. The system will shows the following:

- Recommended nutrient level (protein, carbohydrate, etc.)
- Recommended calories
- Nutrient description
- Recommended meal plan

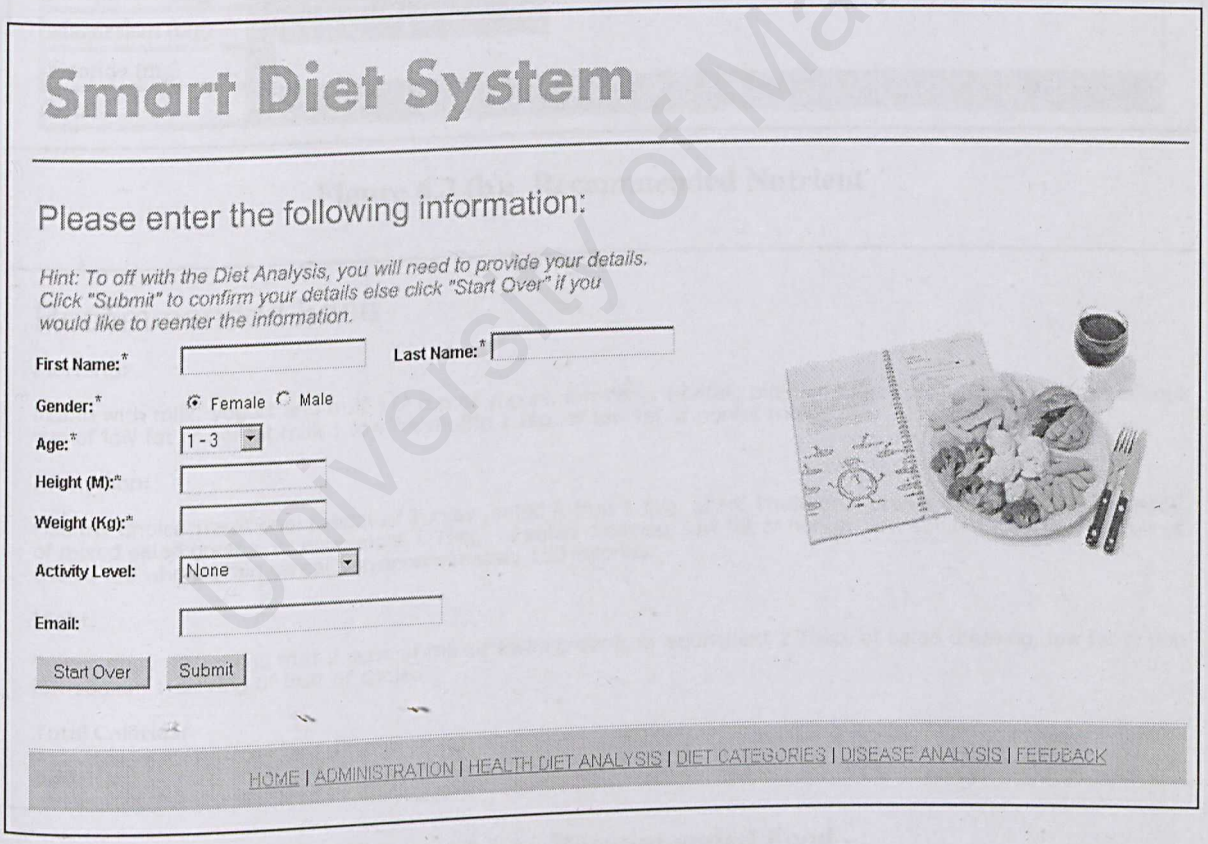



**Figure 6.3 (a): Data Entry**

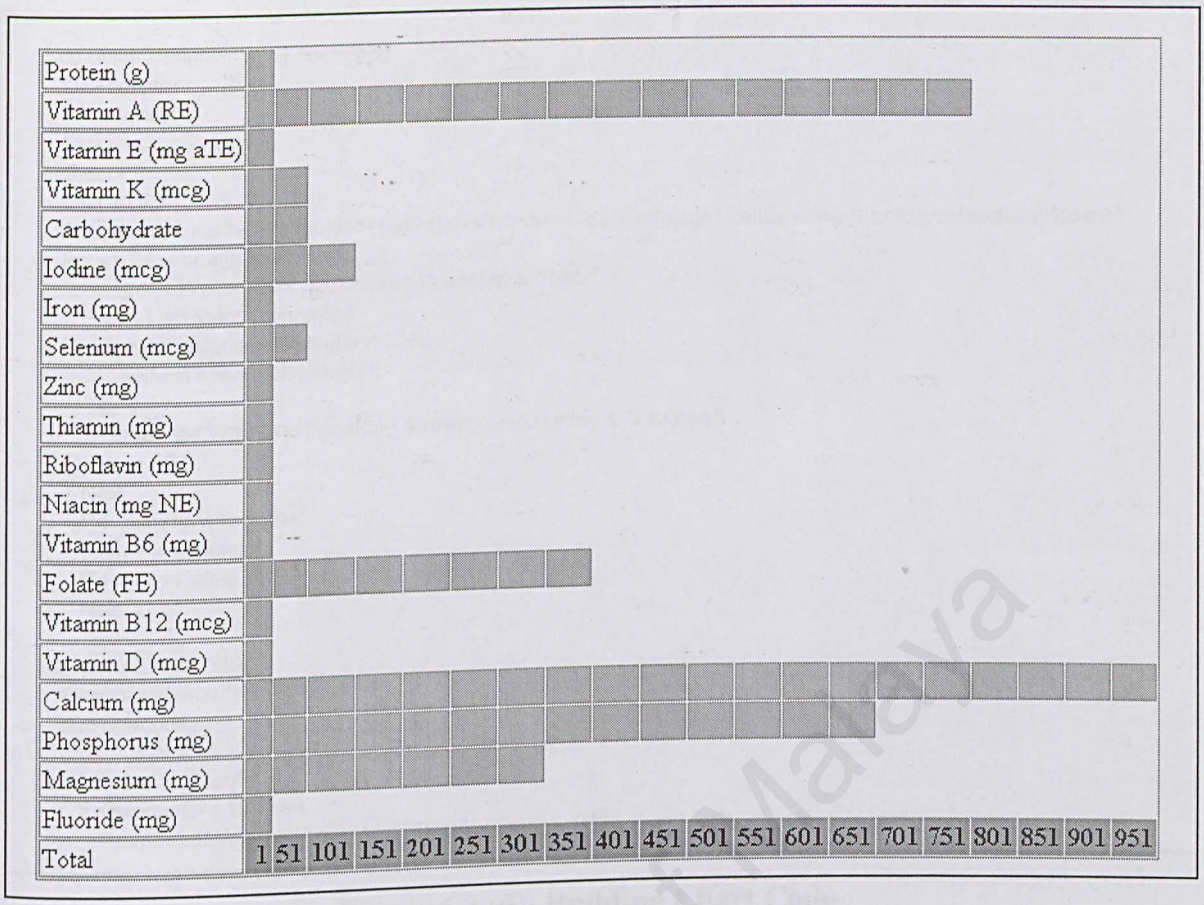



**Figure 6.3 (b): Recommended Nutrient**

## Recommended Food

**Morning:**

Muffin with milk, yogurt and fruit 1/2 cup of yogurt, low fat or nonfat; plain or sugar-free 1 serving of fruit of choic
cup of low fat or nonfat milk 1 low fat muffin 1 tsp. of low fat or nonfat margarine

**Afternoon:**

Healthy Choice Traditional Breast of Turkey ,salad & fruit 1 svg. of HC Traditional Breast of Turkey (300 calories) ;
of mixed salad greens, or equivalent 1 Tbsp. of salad dressing, low fat or nonfat; low sodium 1 serving of fruit of
choice 1/2 whole grain cereal bar/approximately 150 calories

**Night:**

Turkey Stew, salad and fruit 2 cups of mixed salad greens, or equivalent 2 Tbsp. of salad dressing, low fat or non
low sodium 1 serving of fruit of choice

**Total Calories:**

2050 Kcal

**Figure 6.3 (c): Recommended Food**

```
Sub BuildChart(rownames,rowtotals)
  Dim counter
  Dim highest
  Dim x, i, c
highest = 0
  counter = 0
  Response.Write "<div align=left><left><table border=1 cellPadding=1 cellSpacing=1 bordercolor=#669900><tr>"
  For x = 0 to ubound(rowtotals)
    Response.Write "<td>" & rownames(counter) & "</td>"
    For i = 1 to rowtotals(counter)
      if rowtotals(counter) > highest Then
        highest = rowtotals(counter)
      End If
      Response.Write "<td bgcolor=" & rowcolors(counter) & ">  "
      i = i + 50
    Next
    Response.Write "</td>"
    counter = counter + 1
    Response.Write "</tr>"
    Next

Response.Write "<tr>"
  Response.Write "<td>Total</td>"
  dim newcounter
  newcounter = 1
  for c = 1 to highest/50
    if newcounter < 10 Then
      Response.Write "<td bgcolor=#669900><strong><left> " & newcounter & "</td>"
```

**Figure 6.3 (d): Building Chart Code**

Figure 6.3 (d) shows the coding for nutrient chart development. The chart shows the consumption level based on each nutrient.

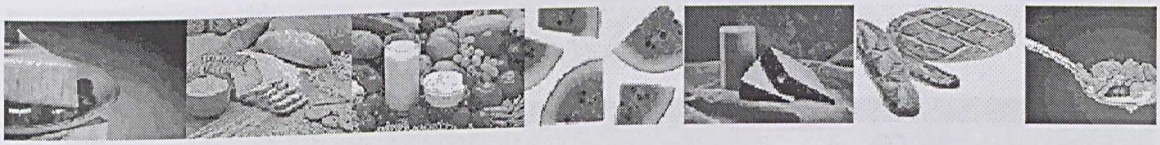
## 6.4 Food Categories Analysis

This page has the information of the food categories available and the local food based on each category. The function of this analysis are:

- Calculate the total calories based on the selected food
- Change the food selection and recalculate it again
- Search for the requested food

# Smart Diet System

## Choose the type of food



Below are the categories of food available

Beverages
Cooked Food
Fast Food
Fruits
Traditional 'Kuih'
Traditional 'Kuih' (Rice flour based)
Traditional 'Kuih' (Wheat flour based)
Vegetables and Vegetable Products

HOME | ADMINISTRATION | HEALTH DIET ANALYSIS | DIET CATEGORIES | DISEASE ANALYSIS | FEEDBACK

**Figure 6.4 (a): Food Categories**

**Cooked Food**

| Description | Serving Size | Quantity | Energy (kcal) | Select |
|---|---|---|---|---|
| Kueh tiau bandung/Kueh tiau bandung | 1 bowl | 1 | 450 | Add |
| Mi kari/Curry mee | 1 bowl | 1 | 450 | Add |
| Nasi dagang | 1 bowl | 1 | 410 | Add |
| Mi hoon bandung/Mee hoon bandung | 1 plate | 1 | 250 | Add |
| Nasi briyani, rice only | 1 plate | 1 | 245 | Add |
| Nasi minyak/Oily rice | 1 plate | 1 | 245 | Add |
| Nasi lemak | 1 plate | 1 | 230 | Add |
| Kueh tiau goreng/Fried kueh tiau | 1 plate | 1 | 170 | Add |
| Roti canai/Roti canal | 1 piece | 1 | 95 | Add |
| Capati/Capati | 1 piece | 1 | 100 | Add |

[1 2]

HOME | ADMINISTRATION | HEALTH DIET ANALYSIS | DIET CATEGORIES | DISEASE ANALYSIS | FEEDBACK

**Figure 6.4 (b): The list of food based on each category**

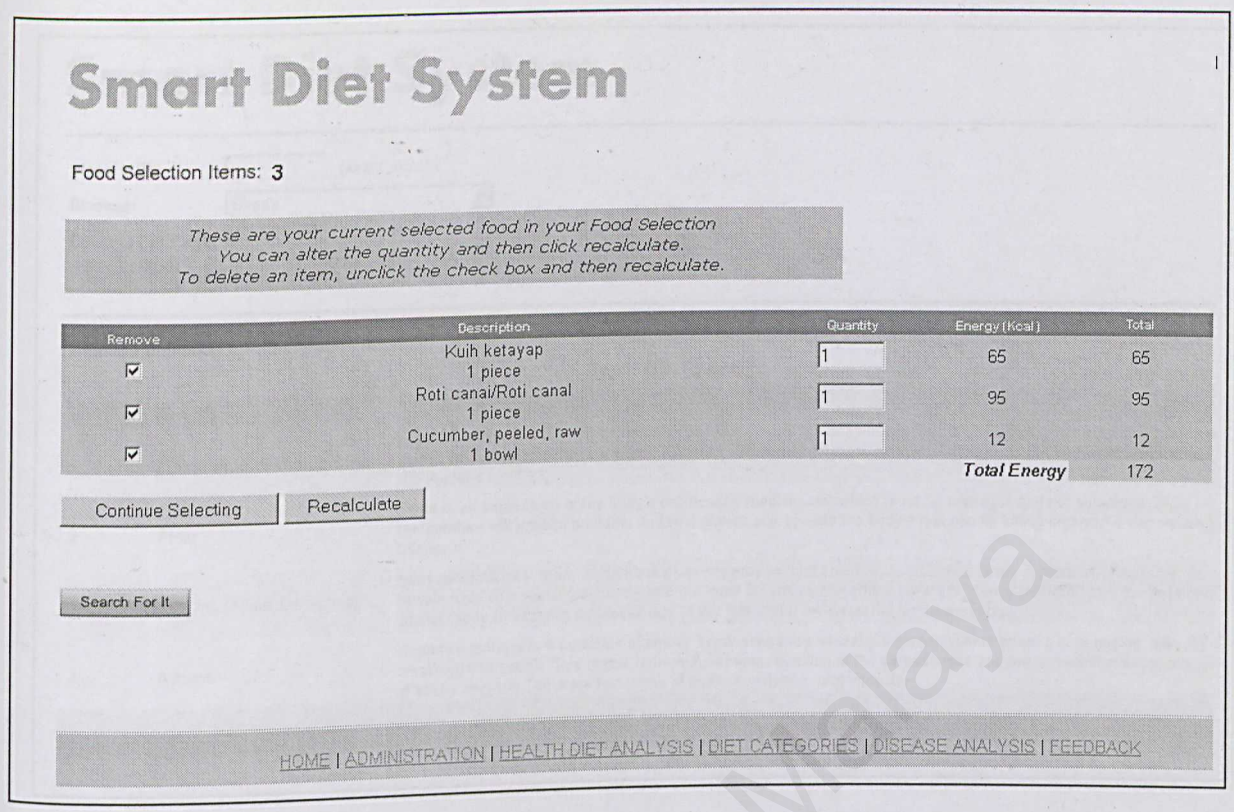



**Figure 6.4 (c): Total energy from the selected food**

## 6.5 Disease Analysis

This is also the core of the program where users can do analysis on certain disease. Users need to select a certain disease and the program will provide the following analysis:

- Disease
- Description
- Treatment
- Prevention

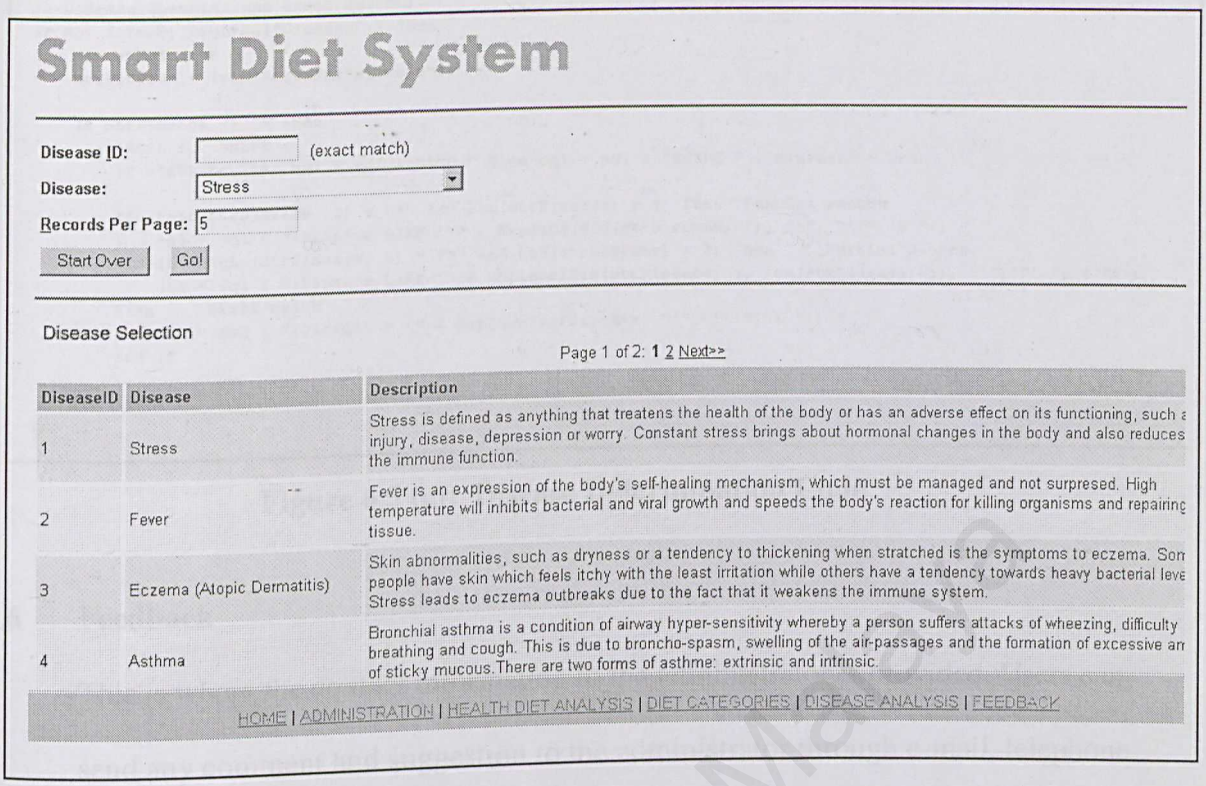



**Figure 6.5 (a): List of disease for users to select**

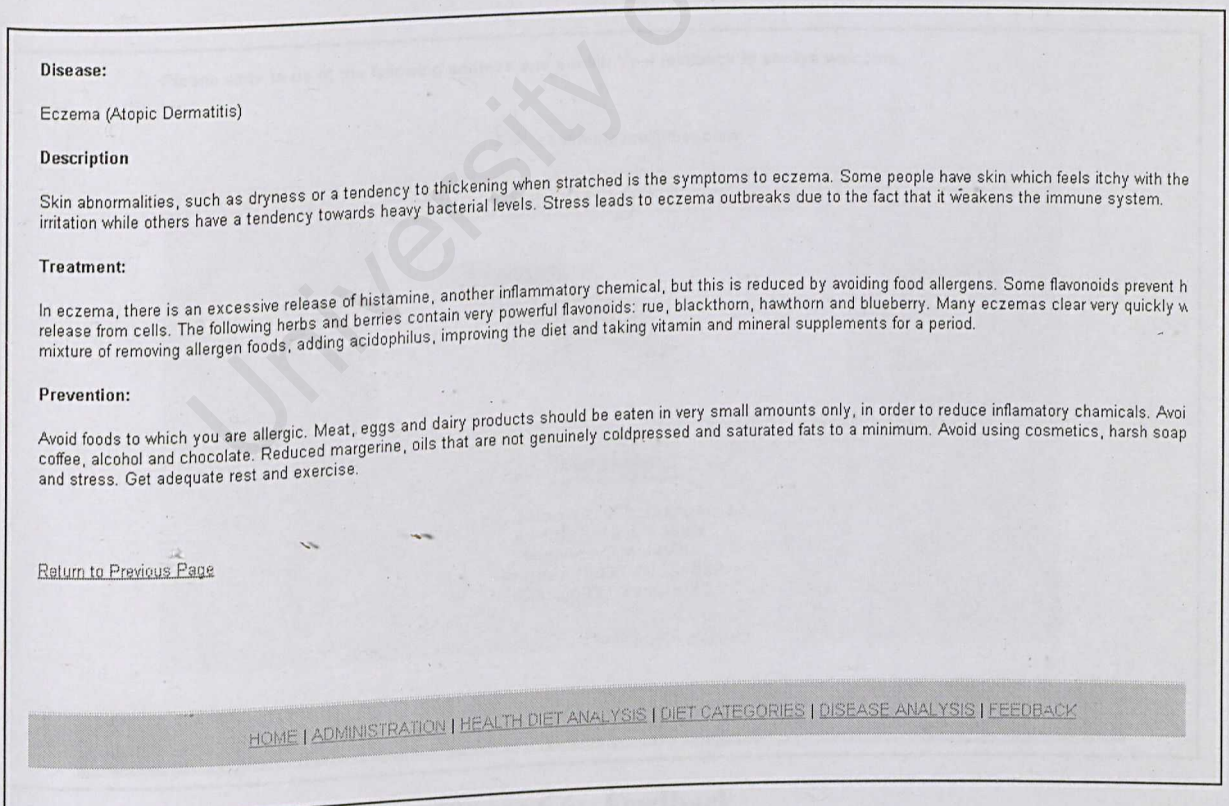



**Figure 6.5 (b): Disease Analysis**

```
'--Disease (partial and exact search)
If Not IsEmpty(Request("Disease")) Then
    Dim strDisease
    strDisease = Trim(Request("Disease"))

    If strDisease <> "" Then
        'Test for WHERE
        If blnWhere Then sql = sql & "AND " Else sql = sql & "WHERE " : blnWhere = True

        If (Left(strDisease, 1) = "*" And Len(strDisease) > 1) Then 'Partial search
            sql = sql & "(Disease LIKE '%" & Replace(Mid(strDisease, 2), "'", "''") & "') "
        ElseIf (Right(strDisease, 1) = "*" And Len(strDisease) > 1) Then    'Partial search
            sql = sql & "(Disease LIKE '" & Replace(Mid(strDisease, 1, Len(strDisease)-1), "'", "''") & "%') "
        Else    'Exact match
            sql = sql & "(Disease = '" & Replace(strDisease, "'", "''") & "') "
        End If

    End If
End If
```

**Figure 6.5 (c): Disease Determination Code**

## 6.6 Feedback

This is where the contact information to the administrator is provided. Users can send any comment and suggestion to the administrator through e-mail, telephone, fax or the address provided.

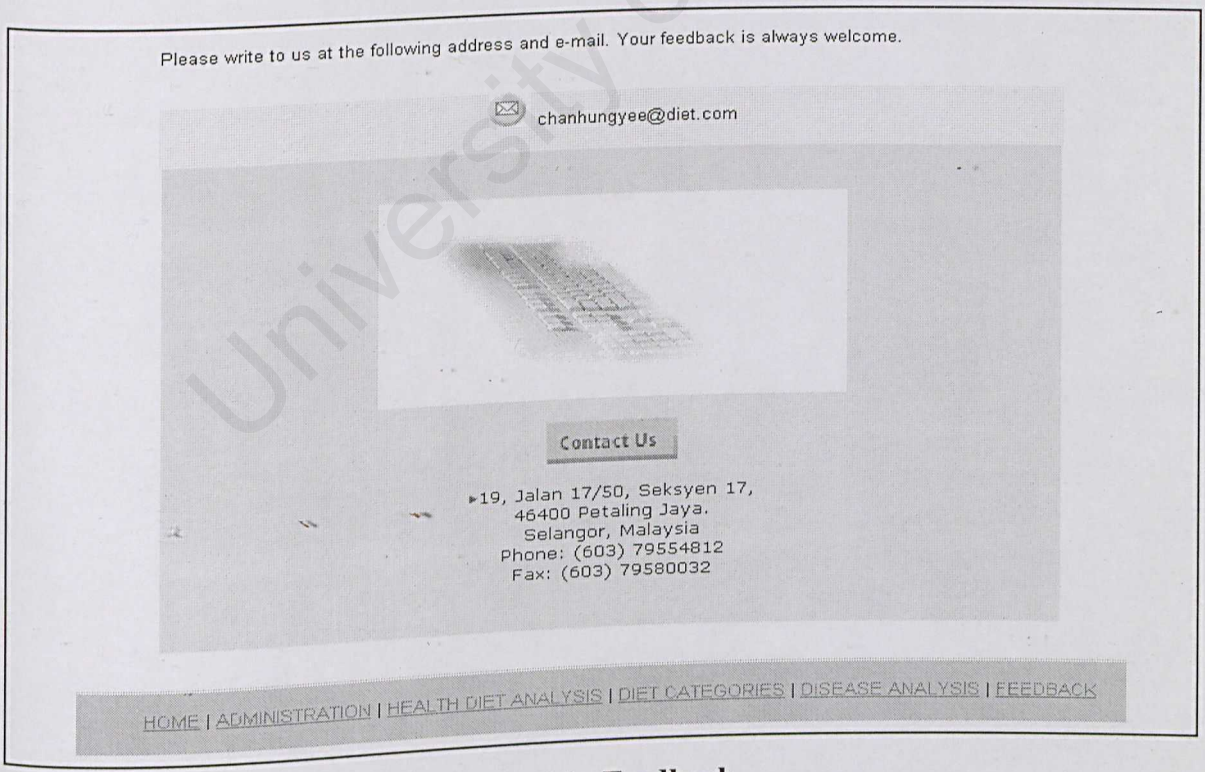



**Figure 6.6: Feedback**

## 6.7 Summary

From this chapter, the way each module is being developed and design is shown and explained above. The design for each module is user friendly to enable users navigate through the site without much difficulty.

# 7.0 Evaluation and Testing

## 7.1 What is evaluation?

Evaluation is a technique employed to access designs and test system to ensure that they behave as expected and meets the requirement of the users. Evaluation should occur throughout the life cycle of the product development. Considerations have to be taken when evaluating the system such as how easy to use, how easy the system is to learn and user's attitude towards it.

## 7.2 Goals of evaluation

There are three golden goals of evaluation. Firstly, evaluation is used to assess the context of the system functionality. Secondly, evaluation is seen as a tool to assess the effect on the interface on the user. And lastly, to identify any specific problems with the system. In terms of functionality capability, it is important to be able to measure the impact of the design on the user.

## 7.3 Functional Requirement Testing

The levels of tests and the types of test data are important aspects of the actual test process. Both unit testing and system testing is important to perform analysis.

### 7.3.1 Unit Testing

Unit testing focuses first on the modules, independently of one another to locate errors. This enables to detect errors in coding and logic that are contained within that module alone. The test cases involve exercise of each condition and option. Structured walkthrough are a very effective method to review many systems development deliverables, including logical and physical design specification as well as code (Hoffer et al, 1996). Cognitive walkthrough evaluation method will be use in unit testing.

### 7.3.2 System Testing

System testing will test on the integration of each module in the system. It also tests to find discrepancies between the system and its original objective, current specifications and system documentation. Under system testing, not only do individual modules get tested, so do the interfaces between modules and programs (Hoffer et al, 1996). System testing is also intended to demonstrate whether a system meets its objectives (Hoffer et al, 1996). Heuristic evaluation and usability testing method will be use in system testing.

## 7.4 Non Functional Requirement Testing

The types of test are determined by the type of non-functional requirements specified.

- **Stress Test**

  Stress test evaluate the system when stressed to its limits over a short period of time. If the requirements state that a system is to handle up to a

specified number of devices or users, a stress test evaluates system performance when all those devices or users are active simultaneously (Pfleeger, 2001).

- **Environmental Tests**

  Environmental tests look at the system's ability to perform in the installation site. If the requirements include tolerances for heat, humidity, motion, moisture, disruption of power or any other environmental characteristic of the site, then the test should guarantee the system's proper performance under these conditions (Pfleeger, 2001).

- **Compatibility Tests**

  Compatibility tests are needed when a system interacts with other systems. If the system is to communicate with a large database system to retrieve information, a compatibility test should be done to examines the speed and accuracy of data retrieval.

## 7.5 Evaluation Methodology

There is much evaluation methodology available in unit testing and system testing. There are at least 30 approaches in evaluating design. Three approaches of modal were taken into consideration for evaluation. There are Cognitive Walkthrough, Heuristic Walkthrough and Usability Testing. Each approaches has their pros and cons. But the choice of selecting it as a method to perform evaluation depends very much on the following factors:

- The style in the cycle at which the evaluation is carried out

- The style of evaluation
- The level of subjectivity of objectivity of the technique
- The type of measures provided by the approach
- The importance of quick response
- The level of interference implied
- The information provided
- The resources required for performing the evaluation

## 7.6 Heuristic Evaluation

### 7.6.1 What is Heuristic Evaluation?

Heuristic Evaluation is a modification of usability inspection where usability specialists judge whether each element of a user interface follows established usability principles (Nielsen et al, 1994). This method is the part of the so-called "discount usability engineering" method. Basically, heuristic evaluation is a method for structuring the critique of a system using a set of relatively simple and general heuristics (Nielsen et al, 1994). There will be several evaluators independently criticising a system to come up with potential usability problems.

### 7.6.2 The Steps in Performing a Heuristic Evaluation

#### 7.6.2.1 Getting the experts

A group of experts is gathered to perform the evaluation. The more experts the better because more experts looking at the system will definitely provide more accurate results. Experts will evaluate on their own, then combing their findings. Once gathered all the experts needed, they will be sent to perform evaluation

individually. They need to look at the system on their own so that there would not be any bias (Nielsen et al, 1994).

#### 7.6.2.2 Experts provide feedback

When each expert performs an evaluation, he or she can provide feedback in a number of ways (Nielsen et al, 1994). The following are a few of these feedback methods:

- **Structured Report**

In this method, the expert will need to write a formal report about his own findings. This is probably the easiest to digest, since the evaluator will have compiled and summarized all findings in report format, but it will delay to turnaround time.

- **Verbalized Findings**

In this method, while evaluator evaluating the interface, the expert dictates his or her findings to another person beside them.

- **Categories**

In this method, the expert will have to agree on specific categories to log into before evaluations begin. It is easy to analyse but it may misses some problems that the other methods might find.

## 7.7 Cognitive Walkthrough

### 7.7.1 What is Cognitive Walkthrough?

A cognitive walkthrough evaluate the degree of difficulty for a user to work out what to do next (Lewis, 1988). It also test how easy is it to do what is required and having to perform a step, how does the system let the user know that he is closer to his 'goal'.

### 7.7.2 The Steps in Performing a Cognitive Walkthrough

The evaluation is basically task oriented, with a task or tasks identified, and the procedure described (Lewis, 1988). As the task progresses, the evaluator answers a series of questions about each procedure. For each step in a task the evaluator gives the user's current goals, and the correct action the user will need to perform to move to as close to that goal. The method asks how easy it is for a user to identify this as the next step, and also how easy it is to execute this next step. The evaluator then assesses the system response, and decides its effectiveness. Finally the evaluator decides the ease a user has in formulating their next goal, or in deciding whether the task is completed.

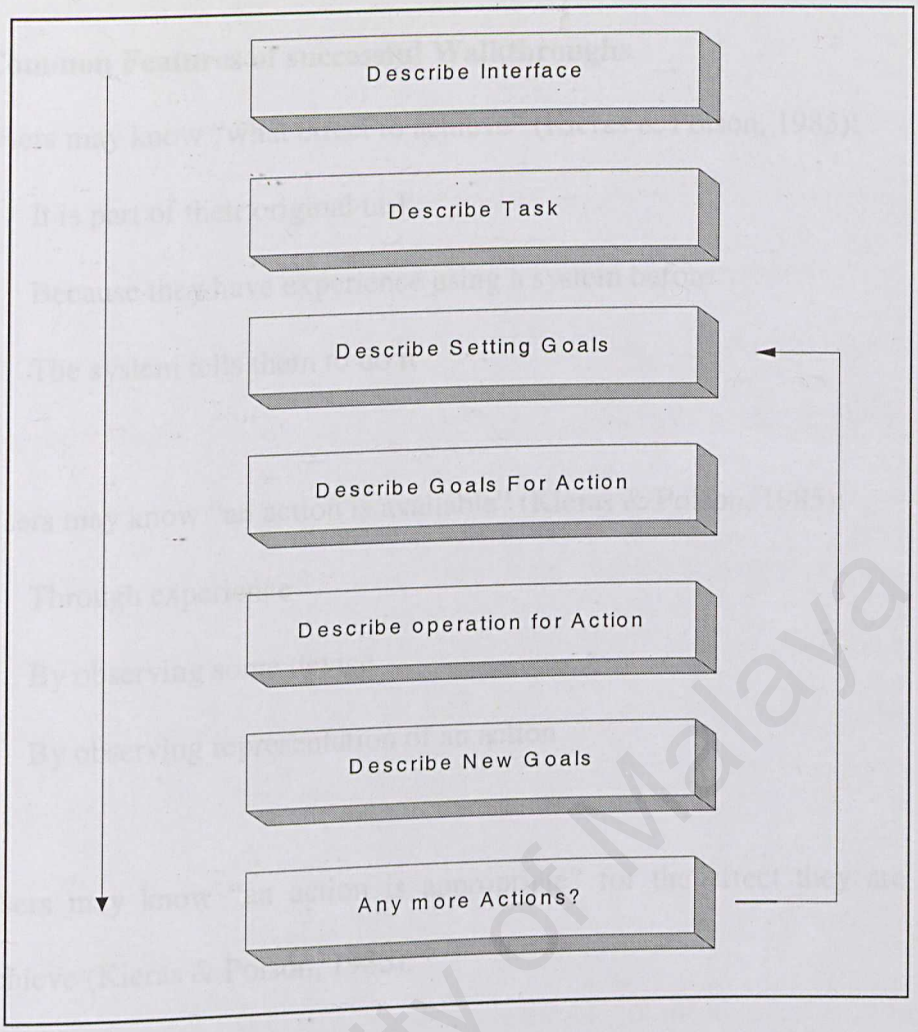



**Figure 7.7.2: Process of Forming a Cognitive Walkthrough**

### 7.7.3 Process of Forming a Cognitive Walkthrough

1. Start the process by filling in Startup Sheet.
2. For each action, fill in a Goal Structure for this step.
3. Choosing and executing the action.
4. Modifications of goal structure sheet.

### 7.7.4 Common Features of successful Walkthroughs

Users may know "what effect to achieve" (Kieras & Polson, 1985):

- It is part of their original task.
- Because they have experience using a system before
- The system tells them to do it

Users may know "an action is available" (Kieras & Polson, 1985):

- Through experience
- By observing some device
- By observing representation of an action

Users may know "an action is appropriate" for the effect they are trying to achieve (Kieras & Polson, 1985):

- By experience
- Due to the interface provides a prompt or label that connects the action to what they are trying to do
- Because all other actions seem wrong

Users may know "things are going OK" after an action (Kieras & Polson, 1985):

- By experience
- By recognizing the system response and know what they were trying to do

## 7.8 Usability Testing

### 7.8.1 What is Usability Testing

Usability testing carrying out experiments to find out specific information about a system (Nielsen et al, 1994). Current trend is emphasizing more on the interpretation of the results rather than the actual data-driven figures. There is less importance given to the hard numbers and more to the other things found out during the test. For example, many of the tests which are done today make use of the think-aloud protocol a long with some sort of performance measurement. Information gathered from the think aloud protocol frequently makes its way into the product faster because it does not need to be compiled and analyzed before acting on it.

### 7.8.2 Process of Performing Usability Testing

To perform usability testing, there is a need to get some users and find out how they work with the product. Observation will be adequate to overlook at the users performing specific task with the product. Data are collected from the observation. For example, the duration taken to perform the task or the number of errors made throughout the process. Lastly, an analysis is done on the data collected from all the experiments to look for trends.

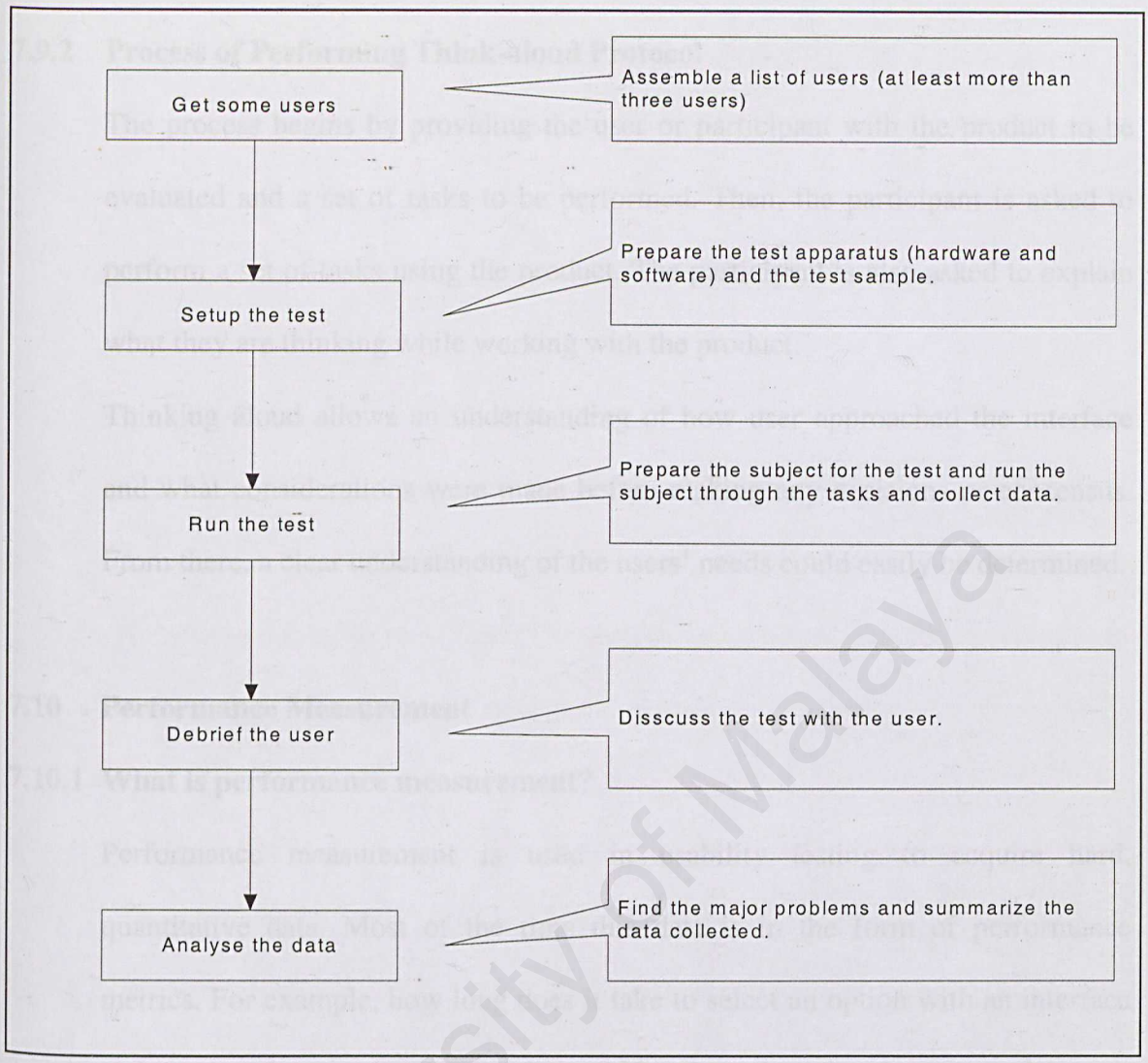



**Figure 7.8.2: An illustration on the steps taken to perform the Usability Testing**

## 7.9 Think-aloud Protocol

### 7.9.1 What is Think-aloud Protocol?

The think-aloud protocol is a popular technique used during usability testing. The technique emphasized very much on cooperation between the evaluator and the user of the system. During the test, the participant is being asked to vocalize his or her thoughts, feelings, and opinions while interacting with the product.

### 7.9.2 Process of Performing Think-aloud Protocol

The process begins by providing the user or participant with the product to be evaluated and a set of tasks to be performed. Then, the participant is asked to perform a set of tasks using the product. The participant is also asked to explain what they are thinking while working with the product.

Thinking aloud allows an understanding of how user approached the interface and what considerations were made before making any decisions or consensus. From there, a clear understanding of the users' needs could easily be determined.

## 7.10 Performance Measurement

### 7.10.1 What is performance measurement?

Performance measurement is used in usability testing to acquire hard, quantitative data. Most of the time this data is in the form of performance metrics. For example, how long does it take to select an option with an interface style such as linear, pie or menu-driven? How long does the placement of the exit button influence the response rate?

The process begins by following the basic usability test concepts of deciding a purpose, describing test objectives, design the tests and executing the experiment. Objectives must be quantifiable when utilizing the approach. For example, "What is more efficient, using keyboard shortcuts or toolbar buttons?" Experimental design is really important because the design must take into account possible disturbing factors and eliminate possible sources of contamination.

Data does not explain everything when it comes to using it as a source of reference. Most developers do not have the time to do research on this kind of testing. Furthermore, this testing is often at a very micro level. It does not really matters if it is a second faster to use a keyboard shortcut than a toolbar button.

## 7.11 Empirical comparison studies

Studies have been conducted on the comparison of different evaluation methods. The studies were aimed to identify the evaluation method with the most cost effective and reliable technique. The studies focus on the problems arising from previous experience with file system.

**Table 7.11 (a): Comparison of the three evaluation techniques**

| Techniques | Advantages | Disadvantages |
|---|---|---|
| Heuristic Evaluation | • Able to identify more serious problems<br>• Low in cost for performing the evaluation | • Requires the evaluator to have some form of knowledge or experience in user interface<br>• Requires a few evaluators for evaluation. |
| Usability Testing | • Able to identify serious and repetitive problems (Module integration)<br>• Avoids low priority problems | • Require the evaluators to have user interface experience.<br>• High in cost<br>• Misses consistency |

| | | |
|---|---|---|
| | | problems |
| Cognitive Walkthrough | • Help define users' goals and assumptions<br>• Be able to used by software developers | • Needs task definition methodology<br>• Tedious |

**Table 7.11 (b): When to apply this techniques?**

| Techniques | Implementation |
|---|---|
| Heuristic Evaluation | • Best suited in the early stage when the system can run and perform. |
| Usability Testing | • Testing can be done throughout the entire product development lifecycle |
| Cognitive Walkthrough | • Early stages of development due to fact that they can be performed using just system specifications as a basis.<br>• Suitable for program code testing |

## 7.12 Summary

There are many issues to concern when choosing an evaluation method for evaluation. Firstly, it is important to collect data that is reliable and that the evaluation can be replicated. There is a great concern in terms of comparing the results from different evaluation studies. Although most of the significant problems can be identified by each of the methods, it is important to identify trade-off between each method because there is a tendency to be complementary rather than producing the exact same results.

Other issues to be considered are planning an evaluation. Planning must be done with the fact the evaluation is reliable and valid. No biases should be place within the scope of evaluation and testing.

# Chapter 8: Discussion

## 8.1 Evaluation results

### 8.1.1 Using Heuristic Evaluation

#### A. Applying the evaluation techniques

The method was applied during the deliver and evaluation stage. It is used to identify issues that are not seen by easily (normally program error could not be detected by the developer themselves). The questionnaire was distributed to 20 persons after they have tried the program.

A group of 20 users ware gathered to play with the program and fill up the questionnaire form. Most of the users have little experience in using the computer. Below is the summarized evaluation depicted in table depicting the overall results of the evaluation. (Appendix B has a sample of the questionnaire.)

#### B. Summarized Evaluation

**Table 8.1.1: Summarized result of the evaluation**

| User Level | Analyzed Results |
|---|---|
| Beginner | • Based on the evaluation, when they perform the tasks in the program, they normally face with problems of knowing where to click. They do not know which is the button to click to go next and back.<br>• But after a few times, they got the hang of it.<br>• They were happy with the guidance that provides them with the necessary information to start |

| | |
|---|---|
| Intermediate | • Based on the analysis, the immediate users find little problem accessing the program.<br>• They find the system having good flexibility in navigation<br>• They only have problem understanding some of the concepts such as "what is the function of administration?"<br>• To them, the system is structured clearly and explicitly |
| Advance | • Base on the conclusion, the advance users have very little or no problem running the program.<br>• Most of them asked for more function such as reduce weight method. |

Based on the overall evaluation, it was very clear that the program excel in consistency and navigates effectively. Even beginner users find it easy to use after for a while. As for the more experienced users, they seem comfortable navigating the program. Only some of them did not really understand the titles and concept. And for the advance users, they may seem a bit impatient due to the program having to display the screen quite moderately.

### 8.1.2 Usability Testing

#### A. Critique on Interaction

A set of sample questionnaire has been distributed to users especially professionals to test on the system usability and the data reliability.

**Table 8.1.2: Interaction of Usability Testing**

| Interaction Factors | Critique |
|---|---|
| 1. Use of terminology throughout system | • There has been a consistent use of terminology throughout the system |
| 2. Use of computer terminology | • The use of computer terminology is also clear and precise. |
| 3. Technical jargon used | • There is very little use of technical jargon |
| 4. Words use on screen | • The words used on the screen are clear and straight to the point |
| 5. Messages which appear on the screen | • Messages appear on the screen is clear and understandable |
| 6. Use of animated cursor | • There is no animated cursor |
| 7. Performing and operation leads to a predictable result | • The result is not predictable because they are all facts |
| 8. Length of delay between operations | • The length of delay on the screen is acceptable and it depends on the computer that the user used. |

The usability of the program has been carefully designed. Therefore, in terms of interaction, the users find very little problem in using it. The modules are clearly design and there are guidance throughout the navigation process. The complexity of the program is moderate, thus performing tasks in it is not difficult at all.

### 8.1.3 Using the Cognitive Walkthrough Method

The method was applied when the program was used as the platform for running the evaluation.

A group of 20 users were gathered to perform the evaluation. The users age were raging from 21 to 27 years old and most of them are students. Most of the evaluator has some experience in using the computer. Below is the summarized evaluation depicted in table and graph depicting the overall results of the evaluation.

**Table 8.1.3: Problems found in Experiment**

| Type of Evaluation | Number of Evaluator | Total known Problems | Average No. Problems Found per Evaluator |
|---|---|---|---|
| 1. Starting the program | 20 | 4 | 0.2 |
| 2. Administrator Log-In | 20 | 4 | 0.2 |
| 3. Analysis output | 20 | 3 | 0.15 |
| 4. Exiting the program | 20 | 2 | 0.1 |

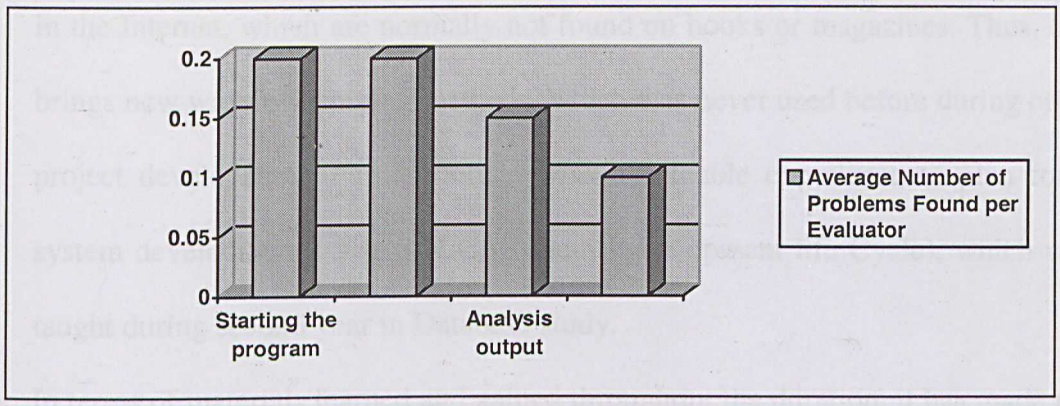



**Figure 8.1.3: Illustration of the Average Number of Problems Found per Evaluator during the evaluation process**

The overall result shows that the tasks create fewer problems because the navigation structures were clear and precise. Users find very little problem in exiting the program because the use of good metaphor buttons and the placing of it.

## 8.2 Things learned throughout the project

As the saying goes " Nothing can replace the experience of a person who have been to a place compared to a person who hears about it".

The quote above expresses the feeling and experiences that have compiled since the start of the project. The experience is majestic. Having the fear of unable to produce a quality project was the first thought that came to my mind when receiving the supervisor for this project. The fear came in as a force to push me to go even further to produce even quality project.

Throughout the duration of the project, new concepts and methodologies have been flowing in and out of the research process. Many new concepts were found

in the Internet, which are normally not found on books or magazines. Thus, this brings new ways of applying methods, which was never used before during other project development. Furthermore, it was a valuable experience to plan for a system development using SDLC (System Development life Cycle), which was taught during second year in Database study.

In terms of materials learned and gained throughout the duration, it has made me a more careful and integrated person. The project has enlightened me to many aspects in diet and nutrition analysis. Take for example diet system; there are many criteria for evaluating each development tools to fulfill their functional and non-functional requirement. The critical factors will actually determine the right choice of development platform and further setting the right path for smooth sailing project duration. The information on diet has never been study until a through research was approached. For example, BMI (Body Mass Index), which help user to have a balance body weight and height.

A new area of diet applications that emerged has injected much consideration into the way the development takes place and its importance in producing quality acceptable output. The emergence of these high-end products truly helps in creating programs that are high quality, acceptable and incurred less production overheads.

The authoring tools and development tools have granted a wide range of techniques in diet system development. The feature on each product is analyst by different kind of survey techniques to choose the best tools for system development. From there the understanding on the product function and usage become much stronger.

Basically, learning taken place even before getting a supervisor for the project. This was something like environmental scanning, to practically scan for tools that would just fit the project development. Being able to fully utilize such tool efficiently will result in better control over the design and development phase of the project.

Other areas that gave valid experience to me throughout the project duration are developing a good and analytical thinking skill. Being able to evaluate the pros and cons of a given methodology and concept, knowing the way to apply the methods, and dealing with survey sample gave me a good experience in handling requirements and pressure. Communication skills were also improved dramatically.

## 8.3 Contribution of Research

As mention earlier, researching for the nutritional information is very important to support the system to make sure that it is correct and the system is reliable.

Study on well balance diet increases the basic knowledge on nutritional information; what is the dietary reference intake and study on balance food intake as a basic for good nutrition and good health. Apart from that, there is a study on the recommended food and nutrient intake, which consists of whole grain, water, fruits, vegetables, protein, milk and fat. This will help to prepare the list of food for user to choose in from the system. Eight guidelines for healthy diet increase the understanding on what are the main criteria for maintaining a healthy lifestyle. For example, this will help to prepare a list of variety food for the system.

The importance of diet discuss on the various kind of diseases when people is lack of certain nutrition (under-nutrient) or overtaken a few nutrient (over-nutrient). For example, if user consumes higher cholesterol food than recommended average serving, they may face a higher risk for getting high blood pressure. A study on Body Mass Index (BMI) help to understand more on what is the balance and healthy weight and height for user. This is the basic requirement to determine the meal suggestion.

Understanding on different types of existing e-diet system will help to find the best e-diet system solution in the market. The advantages and disadvantages for each e-diet system were compared to find the best system according to user's requirement. For example, some of the system does not provide food analysis or personal diet calculation and none of them suggest or recommend the best type of food for user according to their health condition.

Questionnaire on user characteristic analysis was conducted to study the public diet knowledge and their concern on the importance of diet. Most of the reply stated on their concern to use a diet system in their daily personal diet analysis to stay healthier.

Well-designed interface system may produce a sense of eagerness to use where by new users to the system can learn and use the basic functions quickly and providing the advance users the ability to carry out the wider range of task rapidly. It is important to gain confident and master the usage of the system, and this will ensure a smoother task orientation. The analysis on system interface development is done in Human Computer Interaction (HCI).

## 8.4 Problem Encountered

Based on the result of the project, it shows that the selection and application of each methodology used have been accurate. New methods were to be used in order to build an effective and efficient smart diet system. It was hard at the beginning when no proper path was laid as to determine where and what to search for. Mrs. Sri Devi explained in details on what should be research and written in the project as well as the process of the system development and design.

Researching for the nutritional information and development methodology have been rather difficult and constraint. It was found that throughout the research and analysis period, many articles related to nutrition and diet (lose weight) was published by researchers from international bodies all over the world. The concept of interactive diet system is still new and many professionals are still venturing and analyzing on this field. However, some of the system requires registration fees before using it for personal purpose. This will limit the scope for research.

Apart from that, there are constraints on issues such as copyrights, the degree of difficulty in applying multiple use of media such as sample codes, limited skilled designers and developers and lastly and most importantly the hesitation of people in accepting the concept of interactive smart diet system. From there, understanding on research techniques becomes better I'll keep on trying to find the best material to support the system.

Apart from realizing the issue above, much thought were focused in the methodologies used in designing, authoring, designing and analyzing methods.

The surveys conducted in methodologies are inflexible in that they require an initial study design (the tools and administration of the tool) to remain unchanged throughout the data collection. These survey methods also ensure that a large number of the selected sample will reply, which sometimes quite difficult to achieve.

Performing selection for the right tools to be employed to the right place of development is also considered vital. Not many people will spend time searching and evaluating the various kinds of tools and platform. It is not wrong to do it that way but it is inefficient to do so. As for Smart Diet System, a lot of time has been taken to review a huge amount of software that is available in the market. It is true that, a lot of time would be wasted in searching and downloading this software from the web but it does allow better judgement.

There are many tools with different functionalities and capabilities. A thorough research and analysis need to be done before selecting the best tools, which fits the development framework comfortably.

Furthermore, there are many difficulties and constraint during the process of system development. A lot of research on sample codes, software, programming language and nutrition information need to be done to develop a flexible and user-friendly system. Time constraint limits the system development process to become better.

## 8.5 Limitation and Weaknesses

### 8.5.1 Browser Limitation

The web system is best to be view with Internet Explorer 4.0 and above. This may limit those who are using below Internet Explorer 4.0 user from using this system.

### 8.5.2 Food Selection

The list of food used by user for selection in the system is limited to Asian foods as it is developed based on he status in Malaysia. User from west may face problem to select their favourite food.

### 8.5.3 Database

The data on recommended food is not completed due to time constraint. The recommended meal plan is available for users from 19-50 years old. Further enhancement on the database is important to provide user with more and complete information.

The amount of disease stored in database is limited to only 8-9 diseases for testing purpose. Further enhancement and additional type of disease is important to help user and more informative.

### 8.5.4 Accuracy

The accuracy level of information is very important to build the confidence and trust from users. Most of the diet information in this system is based on nutrition and diet books, Internet and nutritionist. To make the diet information more

accurate and reliable, consultation from professional such as experienced dietitian and nutritionist is very important and needed to form a better and reliable diet system.

## 8.6 Further Improvement and Recommendation for Further Study

Some functionality of the system can be enhanced in order to improve the quality of the system. The following are the functionality that can be enhance on this system

### 8.6.1 Maintenance of User Interface and Database

The system interface can be updated of change according to the administrator needs. System can give the opportunity to let user to develop their own homepage as well as record their daily activity and result for user to track their information easier and faster.

The system should provide some useful link and latest news for user to understand better on nutrition and diet. The link could be nutrition, dietary and sites related to restaurants in the country.

Apart from that, administrator can maintain and update the database by providing more information and selection on disease, food and healthy meal plan. This is very important to make sure that the web based system is useful not only now but in the future.

### 8.6.2 Support Multiple Language

The current system is only limited to one language, which is English. It needs to be enhances so that it can support more than one language. This is due to different organization support Multiple Language. For example, the system can be translated to Chinese or Indian words for easier understanding to those who do not understand English, especially those who are not educated or exposed in English.

### 8.6.3 Expansion of Information and Provide more Services

Smart Diet System plans to expand its business and should published information not only in ASEAN countries but also the world's food selection and general requirement. It can also be expanded to provide e-commerce services for user to do transaction and business online. For example, user can purchase vitamin pills through the Internet using their credit card.

### 8.6.4 System Usability

If there is an extension to the project, it is certain that development will carry on to evaluate on the usability of the system. Improving on the user interface would be suggested. It really does matter how user would react to the program interface. How well the users perform the interactive process depends very much on the interface of the program. In other words, the user-friendliness is the core competency.

Extra features may be feasible depending on the extra duration given. Adding or improving the help module would be feasible because this module is an important component not only to this proposed program but also to any other program in the world.

Putting extra food to the food list may enhance the scope not only to Asians but also suitable for other west countries.

### 8.6.5 CD-ROM

Rather than developing the program and distribute it on the web, the program can be published in CD-ROM format for the purposed of those who do not have Internet access or bad network coverage.

### 8.6.6 Performance

When developing a project for an adult, it is very important to understand their needs and most of the time, performance is the issues that they really concern. Users have very little patience for poorly streamlined media. For a user who wants to get the analysis result immediately, they do not intend to wait for minutes to watch the result. What they need is a smooth running program with very little interruption.

### 8.6.7 Professional Consultation

In order to provide a better and more reliable system, the opinion from professional and expert is very important to make sure that the system provide accurate information and always flexible to users in various kind of environment.

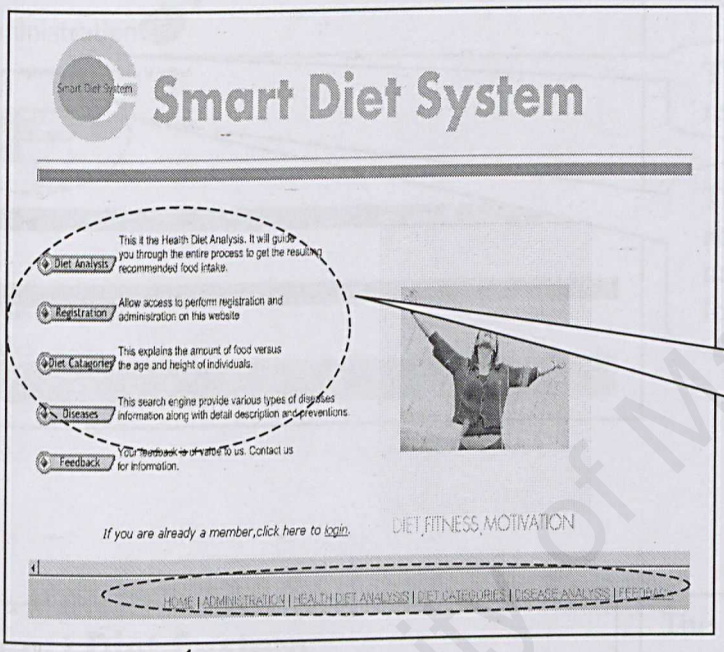
## 8.7 Conclusion

Base on the result of the project, it shows that the selection and application each methodology used have been accurate. Though face with difficulty in searching for methodology that suits the smart diet development, it was clear and concise that the development methodology selected produce what was planned and defined during the early stages of project.

It was a need to understand the way the technology works before using it to apply in the stages of development. For each and every activity in stages of development, learning took place every moment when new concepts flow in and it is only made possible to digest these concepts, models and techniques after analyzing its core concept carefully. By understanding its capabilities, possible solutions were drafted and implemented into the design and authoring processes.

There are five main modules available in smart diet system program. They are administration module, health diet analysis module, food analysis module, disease module and lastly feedback module.

## Main Page

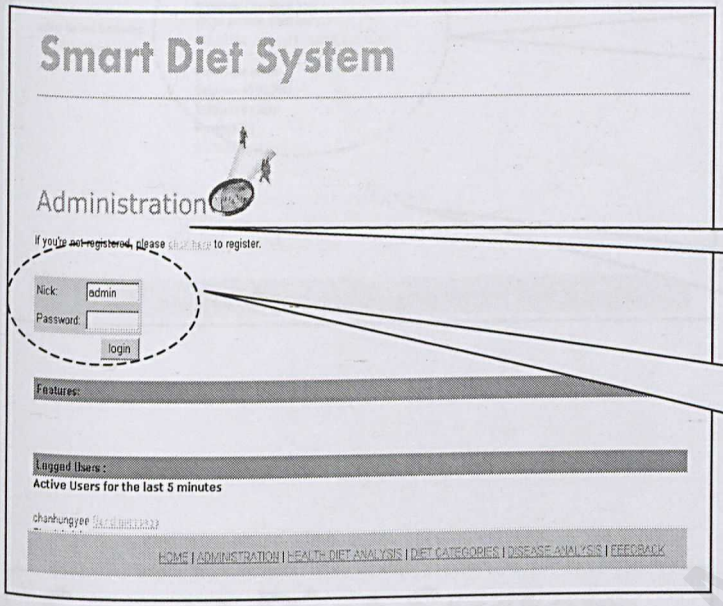



Main screen is a place where user can select which analysis to carry on. This is the default page when user enters the system's URL.

User can 'click' on the button to proceed to another function. User can select which analysis they need.

This is a standard link to other pages. It appears in other pages.

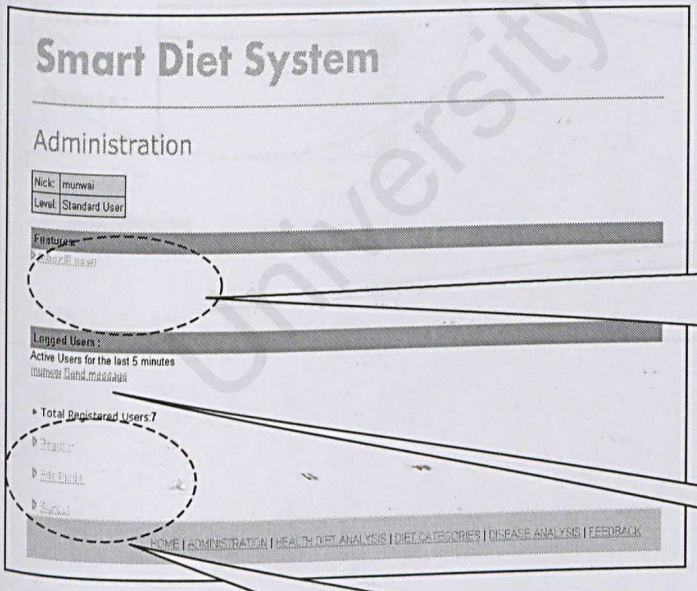
**Administrator Log In**




This screen is the login screen that prompts the administrator to have their name entered.

Those who have not registered can register here.

This is the login box that administrator can enter their name and password. Press login to proceed.

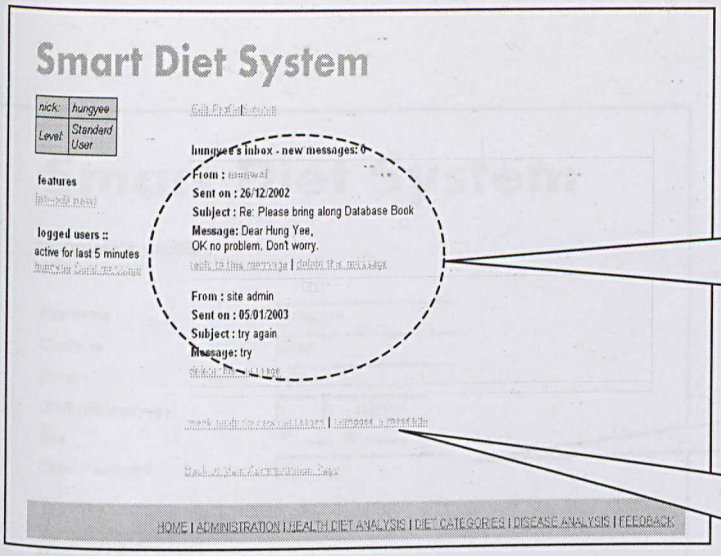



This screen is the proceeding screen right after the name has been confirmed. The system will determine the user's level.

For **Standard User**, they only have the rights to message other administrator. Administrator can check the message from inbox feature.

Shortcut to send messages to other administrator.

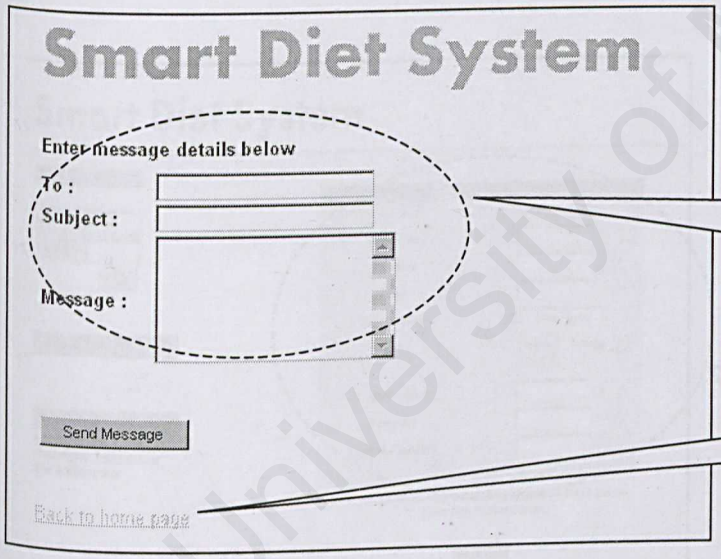
Administrator can edit their profile or sign out here.




This is the screen where administrator can see all the messages in the inbox

They can delete or reply to the message by clicking 'reply to the message' or 'delete the message'

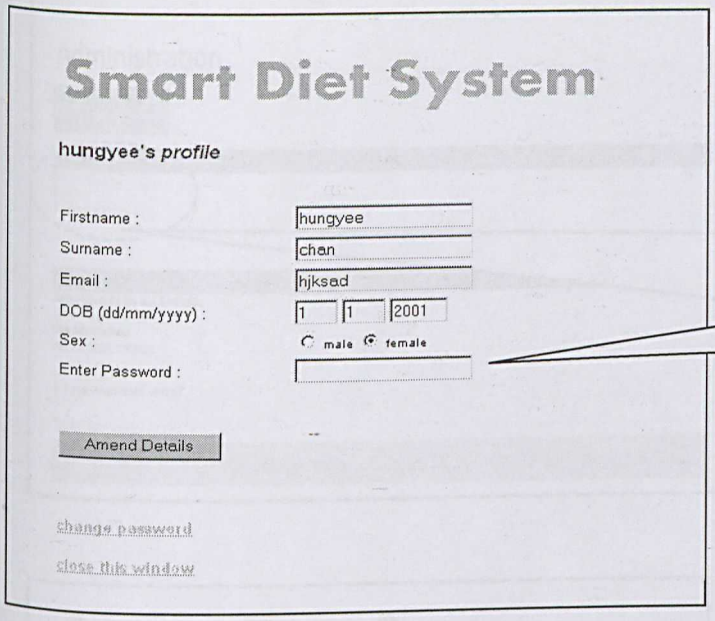
Administrator can compose a new message by clicking 'compose a message'




Enter the details and click 'send message' when finish

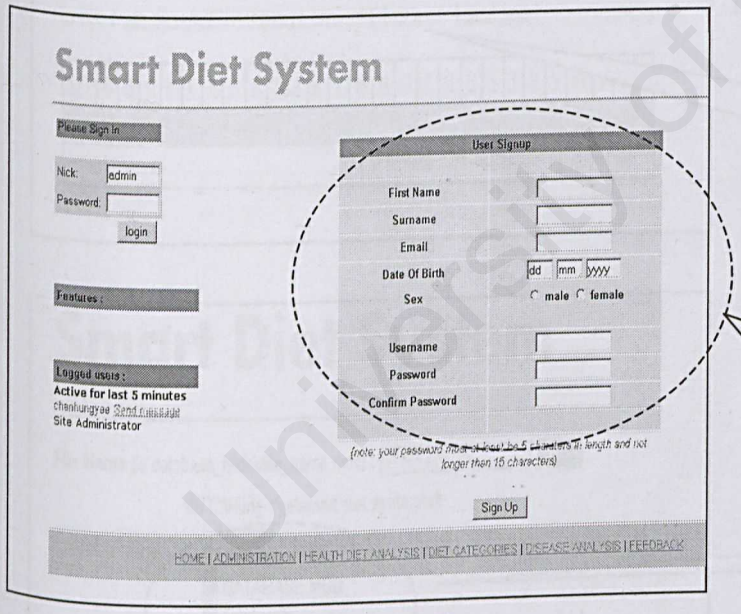
All the details must fill up in order to send out the message.

Back to admin home page.



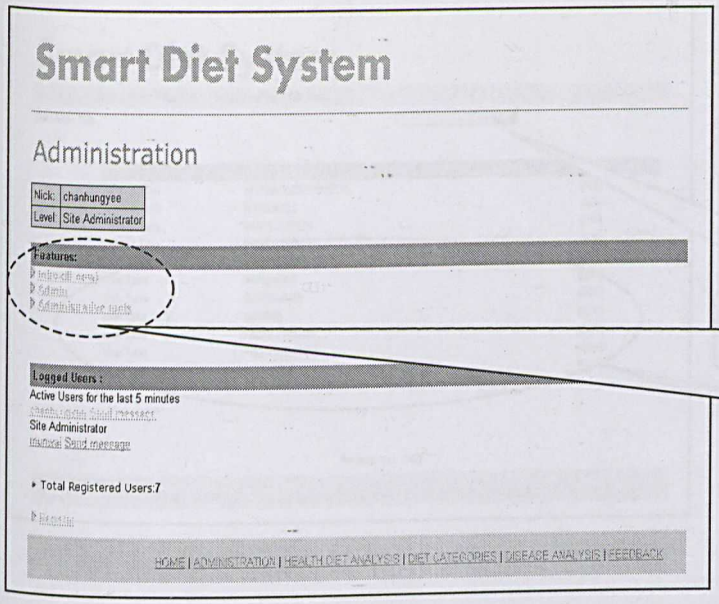

Administrator can edit their profile or change their password form this screen.

Password is required to make any changes to the profile.



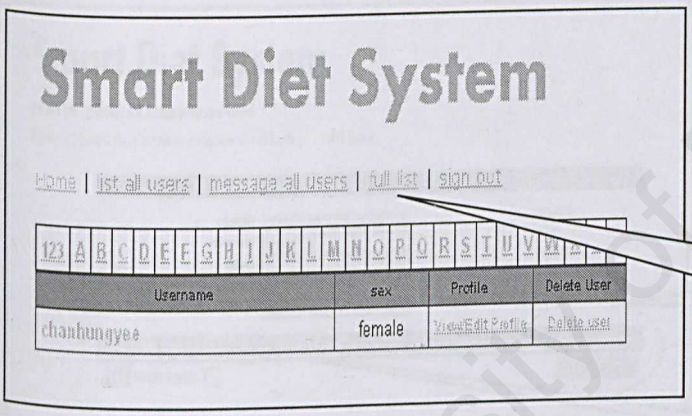

For those who are not an administrator, they can register to become a standard user by signing up the form

Sign up Form. All the required information must be fill in to get an account. Click 'Sign Up' after everything is ready.



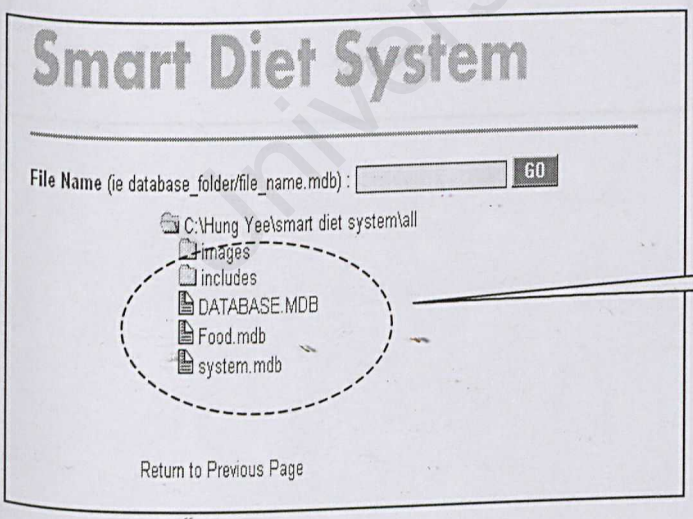

This screen is the proceeding screen right after the name and password has been confirmed. The system will determine the user's level.

For **Site Administrator**, they have the full rights to access the database and maintain the web site. They also can check the full list of user that registers as standard admin.



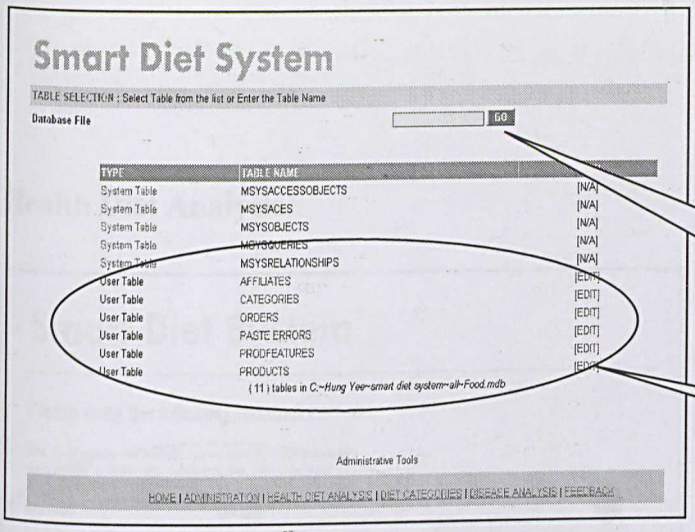

The list of registered administrator according to alphabetical order.

A full list of registered admin can be found here




This screen provides the list of database required in the system.

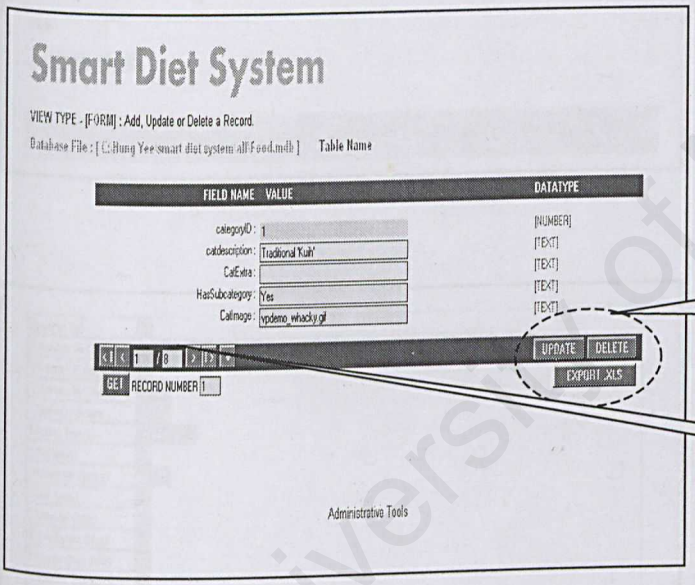
Type of database.




Site administrator can add, update or delete a table of a selected database here.

Press 'Go' after choosing a table

List of tables

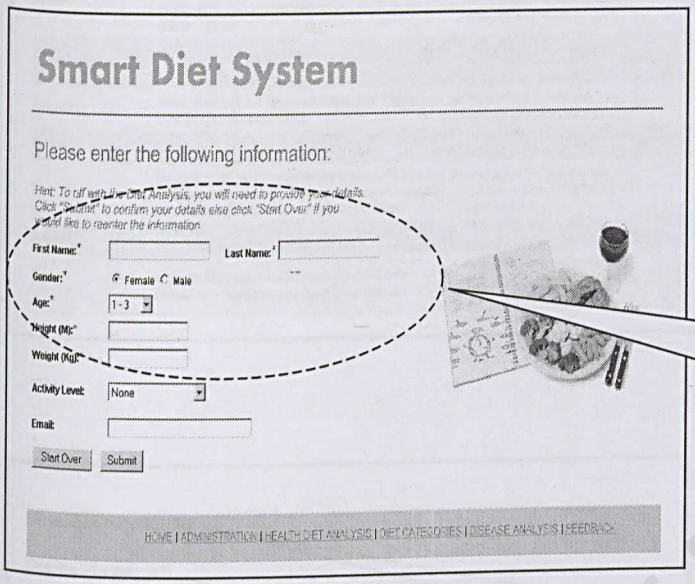



Site administrator can add, update or delete a record from a selected table here.

Update and delete record

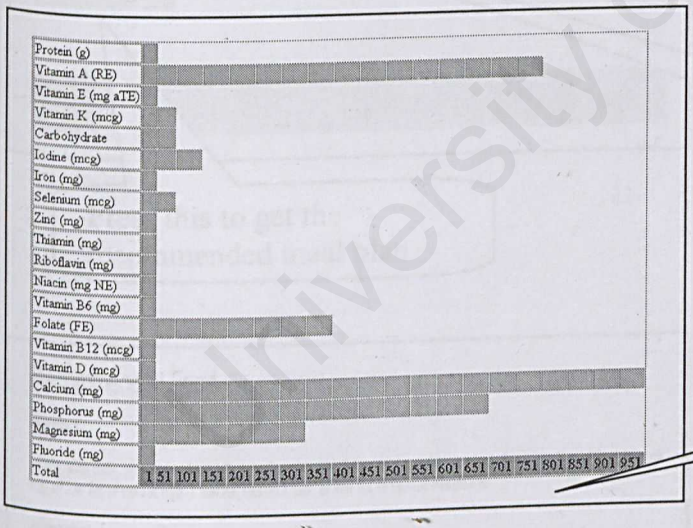
Add a new record

## Health Diet Analysis



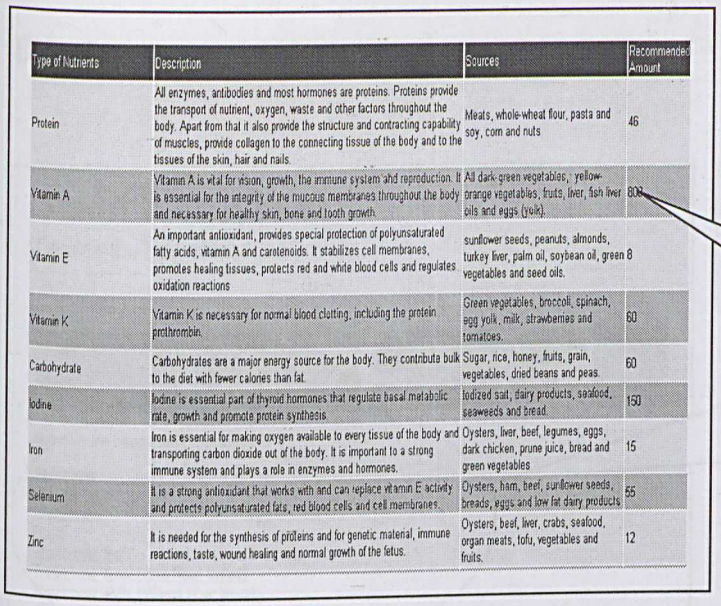

This screen is the first screen when the user selects health diet analysis. Click 'submit' to enter the information or 'start over' to reenter the information.

This information is compulsory for the analysis. They are mark with (*)




This screen provides information on recommended nutrient for the user.

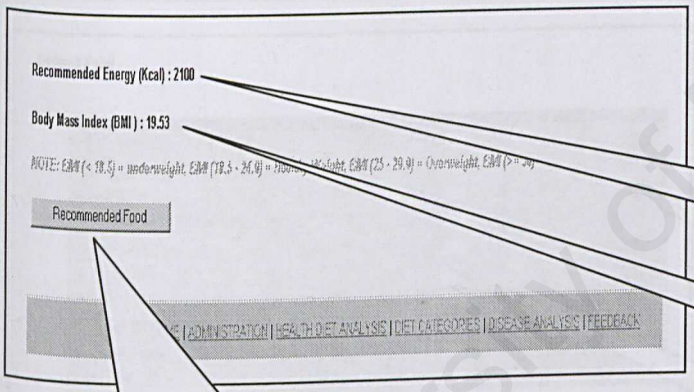
Scale (nutrient level).



| Type of Nutrients | Description | Sources | Recommended Amount |
|---|---|---|---|
| Protein | All enzymes, antibodies and most hormones are proteins. Proteins provide the transport of nutrient, oxygen, waste and other factors throughout the body. Apart from that it also provide the structure and contracting capability of muscles, provide collagen to the connecting tissue of the body and to the tissues of the skin, hair and nails. | Meats, whole-wheat flour, pasta and soy, corn and nuts | 46 |
| Vitamin A | Vitamin A is vital for vision, growth, the immune system and reproduction. It is essential for the integrity of the mucous membranes throughout the body and necessary for healthy skin, bone and tooth growth. | All dark-green vegetables, yellow-orange vegetables, fruits, liver, fish liver oils and eggs (yolk). | 800 |
| Vitamin E | An important antioxidant, provides special protection of polyunsaturated fatty acids, vitamin A and carotenoids. It stabilizes cell membranes, promotes healing tissues, protects red and white blood cells and regulates oxidation reactions | sunflower seeds, peanuts, almonds, turkey liver, palm oil, soybean oil, green vegetables and seed oils. | 8 |
| Vitamin K | Vitamin K is necessary for normal blood clotting, including the protein prothrombin. | Green vegetables, broccoli, spinach, egg yolk, milk, strawberries and tomatoes. | 60 |
| Carbohydrate | Carbohydrates are a major energy source for the body. They contribute bulk to the diet with fewer calories than fat. | Sugar, rice, honey, fruits, grain, vegetables, dried beans and peas. | 60 |
| Iodine | Iodine is essential part of thyroid hormones that regulate basal metabolic rate, growth and promote protein synthesis. | Iodized salt, dairy products, seafood, seaweeds and bread. | 150 |
| Iron | Iron is essential for making oxygen available to every tissue of the body and transporting carbon dioxide out of the body. It is important to a strong immune system and plays a role in enzymes and hormones. | Oysters, liver, beef, legumes, eggs, dark chicken, prune juice, bread and green vegetables | 15 |
| Selenium | It is a strong antioxidant that works with and can replace vitamin E activity and protects polyunsaturated fats, red blood cells and cell membranes. | Oysters, ham, beef, sunflower seeds, breads, eggs and low fat dairy products | 55 |
| Zinc | It is needed for the synthesis of proteins and for genetic material, immune reactions, taste, wound healing and normal growth of the fetus. | Oysters, beef, liver, crabs, seafood, organ meats, tofu, vegetables and fruits. | 12 |

This screen is the continuation from the above graph

Explicit amount of recommended nutrient

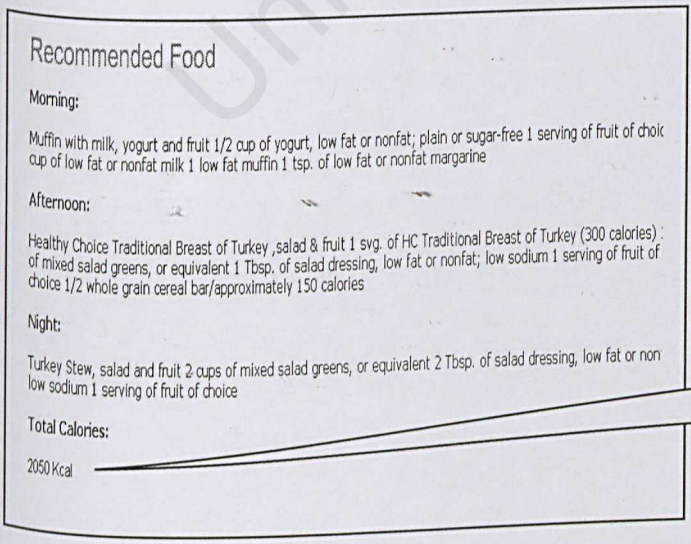



This screen is the continuation from the above table

Recommended amount of calories / energy for user (daily intake)

User's Body Mass Index (BMI)

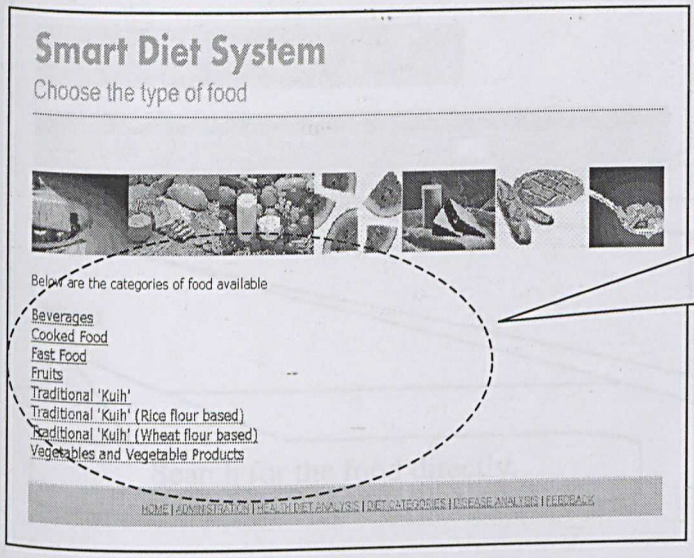
Press this to get the recommended meal plan




This screen will provide the recommended meal plan for user after they click on 'Recommended Food'

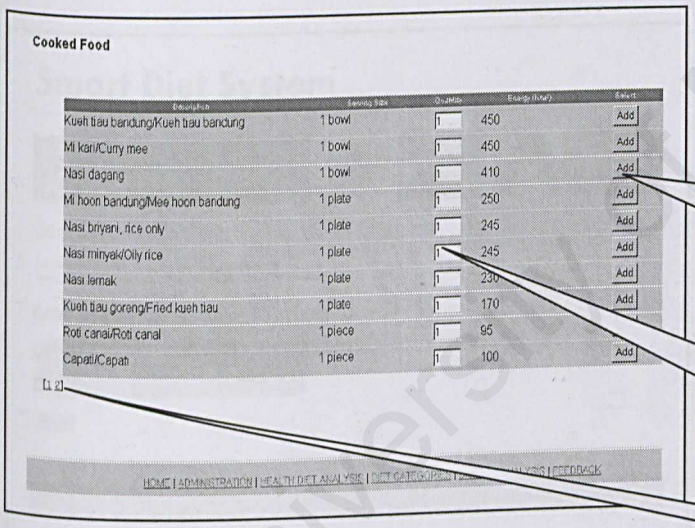
This is the total calories based on the recommended meal plan

## Diet Categories Analysis




This screen is the first screen when user selects diet categories.

This is the categories of food. Users have to click on the category option in order to proceed.

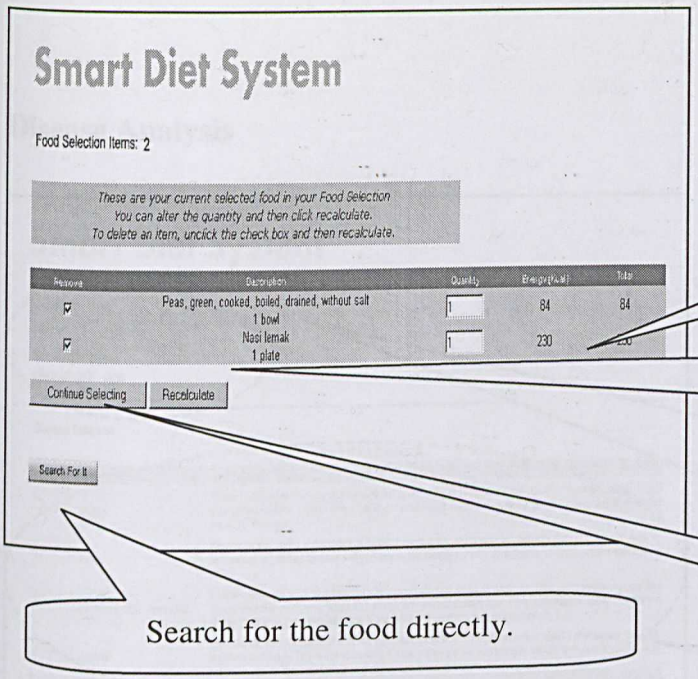



This screen shows the list of food based on the categories selected.

Users can click 'Add' to add an item to the selection list.

The quantity can be change based on the users need.

Page number



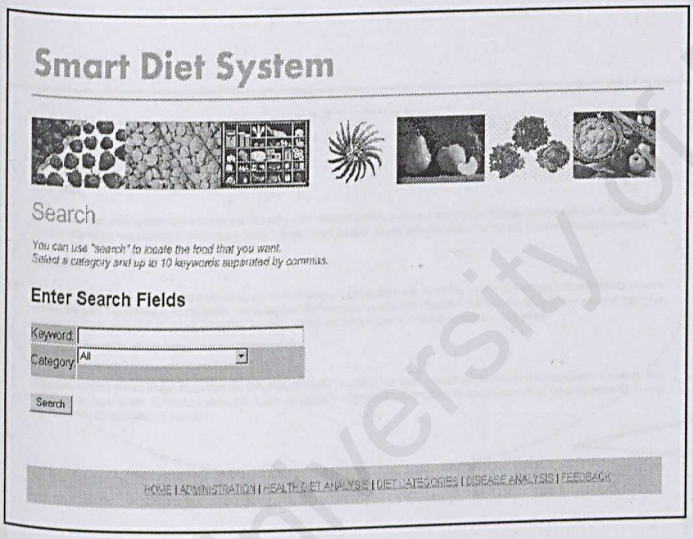

This screen is more like a preview screen that provides the information on the selected food.

Total energy based on the selected food.

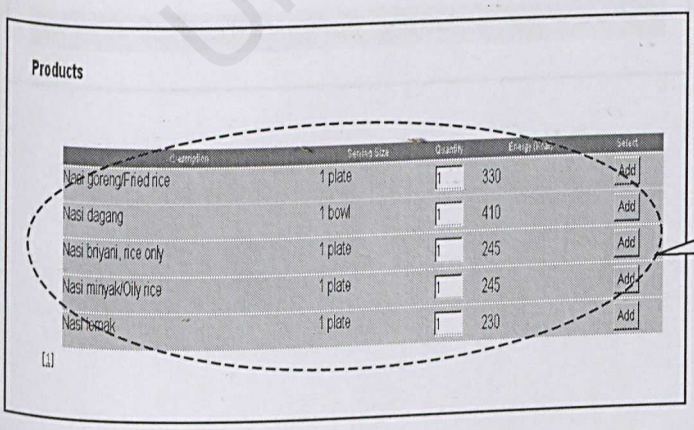
Users can uncheck the checkbox and click 'Recalculate' to delete.

This will bring you back to the food categories.

Search for the food directly.

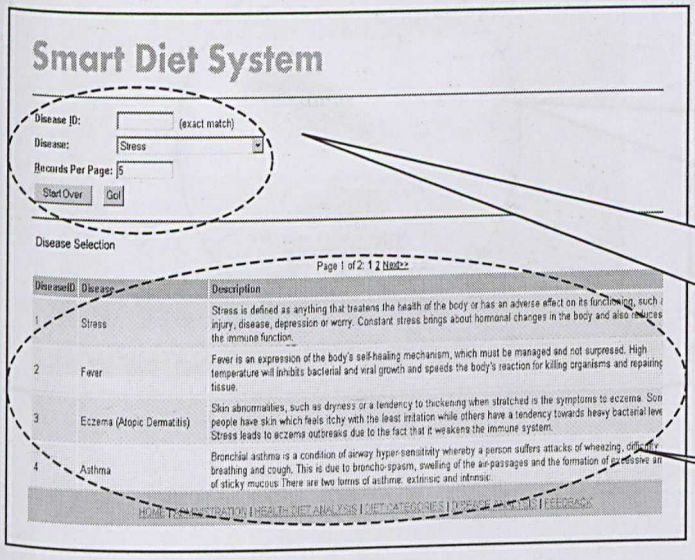



This is the screen where users can search on some food by filling in the keyword and press 'Search'.




This is the sample result when user type in 'nasi' as the keyword.

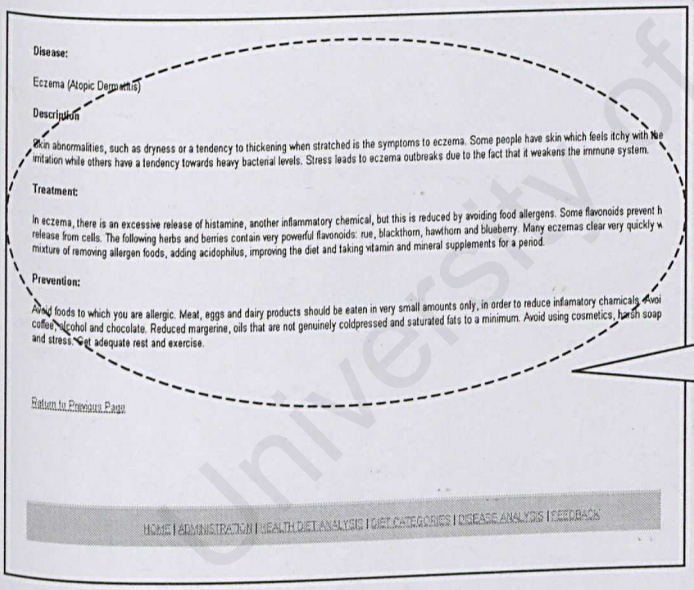
## Disease Analysis




This screen is the first screen seen after click on 'Disease Analysis'.

Users need to select the disease based on the option below. Users can key in the ID, select the disease from the drop down option or both.

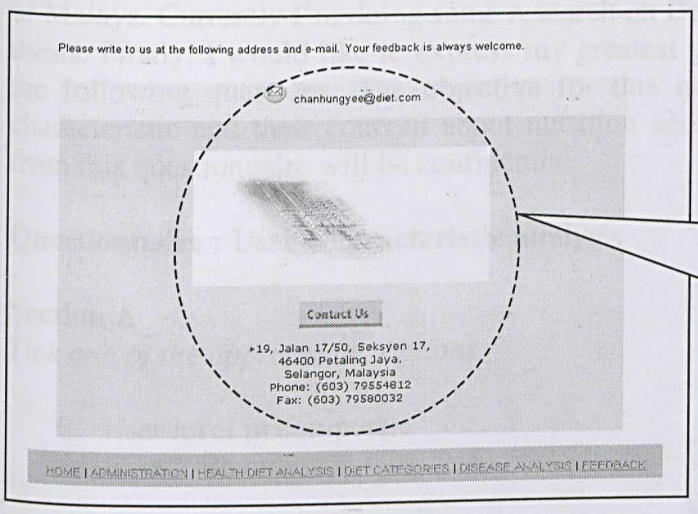
Disease option and its description.




This screen shows the output after a disease has been selected.

Description of the selected disease, its treatment and prevention is listed here after users have selected a disease.

## Feedback




This is the screen when users click on 'Feedback'

Contact information: E-mail, phone number, fax number and contact address. Any suggestion and question can be sent through here.

My name is Chan Hung Yee, final year Information Technology student from University of Malaya. Currently I'm doing some research on Diet System for the requirement in my thesis. Firstly, I would like to express my greatest gratitude for your help in answering the following questions. The objective for this questionnaire is to analyse the user characteristic and their concern about nutrition and diet system. All the data provided from this questionnaire will be confidential.

**Questionnaire : User Characteristic analysis**

**Section A**

*Tick **one** of the appropriate options.*

1. User level in computer:
   a. Beginner
   b. Intermediate
   c. Advance
   d. No idea
2. Usage of computer?
   a. Regularly (5-7 times a week)
   b. Often (3-4 times a week)
   c. Rarely (1-2 times a week)
   d. Never
3. Operating system used?
   a. Window 95/98
   b. Window NT
   c. Window 2000
   d. Others : _____
4. How long have you been using a computer?
   a. Less than a month
   b. Less than a year
   c. More than a year
   d. More than 10 years
5. How often do you use internet access?
   a. Regularly (5-7 times a week)
   b. Often (3-4 times a week)
   c. Rarely (1-2 times a week)
   d. Never
6. What is the bandwidth in your area?
   a. 19.2 Kbps
   b. 33.6 Kbps
   c. 56.6 Kbps
   d. 64 Kbps and above
7. If you choose a web-site, what are the criteria you will look for?
   a. Performance (fast browsing)
   b. Usability (user-friendly)
   c. Attractive (colourful)

d. Interactive (feedback)

8. What type of browser do you use?
   a. Internet explorer
   b. Netscape
   c. Others:_____
9. Where do you get internet access?
   a. Home
   b. Office
   c. Cyber-cafe
   d. Others:_____

**Section B : Diet analysis**

*Tick **one** of the appropriate options.*

1. Please specify your age range
   a. Less than 10 years old
   b. 10 – 25
   c. 26-50
   d. More than 50
2. What is your sex
   a. Male
   b. Female
3. Please specify your height
   a. Less than 150cm
   b. 150cm to 162.5cm
   c. 162.5cm to 180cm
   d. more than 180cm
4. Please specified your ethnic group
   a. Malay
   b. Chinese
   c. Indian
   d. Others:_____
5. Type of activity in daily life
   a. Sedentary (office work)
   b. Moderate ( sport once a week)
   c. Heavy (sports man/woman)
   d. Very Heavy ( labour )
6. How much do you know about diet?
   a. Very much
   b. Moderate
   c. Less
   d. No idea
7. Do you think diet is a medical requirement?
   a. Disagree
   b. Agree
   c. Slightly Agree
   d. No idea
8. How often do you eat outside
   a. Regularly (5-7 times a week)
   b. Often (3-4 times a week)
   c. Rarely (1-2 times a week)
   d. Never
9. What kind of food do you prefer to eat?
   a. Malay
   b. Chinese
   c. Indian
   d. Others Please specified_____

10. Do you consume alcohol?
    a. Regularly (5-7 times a week)
    b. Often (3-4 times a week)
    c. Rarely (1-2 times a week)
    d. Never

**Section C: Diet System Analysis**

*Tick **one** of the appropriate options.*

1. Have you ever experience any diet program before?
    a. Yes
    b. No

2. How much do you know about diet system?
    a. Very much
    b. Moderate
    c. Less
    d. No idea

3. Have you used any diet system before?
    a. Yes Please specify _____
    b. No

4. What is your opinion towards the diet system in the market?
    a. Very Good
    b. Good
    c. Moderate
    d. Can be improve

5. Have you ever test your personal nutrition (calories per day) through any system provided in the market or through the internet?
    a. Regularly (5-7 times a week)
    b. Often (3-4 times a week)
    c. Rarely (1-2 times a week)
    d. Never

6. If yes, does the system fulfill your request?
    a. Disagree
    b. Agree
    c. Slightly Agree
    d. No idea

7. How often do you go for medical checkup (diet checkup)?
    a. Very often (Once a week)
    b. Often (Once a month)
    c. Less (Once a year)
    d. Never

8. How often do you get consultation about diet routinely from a doctor?
    a. Very often (Once a week)
    b. Often (Once a month)
    c. Less (Once a year)
    d. Never

9. If there is a system in the market which can helps you to check the nutrition level in your diet fast and easy, will you try to use it?

   a. Definitely ☐
   b. Maybe ☐
   c. No ☐
   d. No idea ☐

   Please state the reason for your answer.

   _____
   _____
   _____

Comment and suggestion:

_____
_____
_____
_____
_____
_____
_____

## Interview Outline (Diet)

**Interviewee:** **Interviewer:**

**Location / Medium:** **Appointment Date :**
**Start Time :**
**End Time :**

**Objectives:**

- To collect data on diet information
- To clarified the system accuracy

**Reminder:** Nutritionist / Dietitian

**Agenda:**

| | |
|---|---|
| Introduction | 1 minute |
| Background on Project | 2 minutes |
| Topics to be covered | 1 minute |
| Questions | 25 minutes |
| Summary of major points | 2 minutes |
| Question from interviewee | 5 minutes |
| Closing | 1 minute |

General Observations:

Unresolved Issues, Topics not covered:

*(continue)*

**Interviewee:** **Date:**

| **Question:** | **Notes:** |
|---|---|
| **Question: 1**<br>Have you ever used any diet system product before? If so, how often?<br><br>If yes, go to question 2. | **Answer:**<br><br>**Observation:** |
| **Question: 2**<br>What are the details needed to calculate the personal nutrition level? For example, height and weight. | **Answer:**<br><br>**Observation:** |
| **Question: 3**<br>What is the best practice to maintain A balance healthy lifestyle? (factor) | **Answer:**<br><br>**Observation:** |
| **Question: 4**<br>How to face the difficulties while maintaining a balance diet? | **Answer:**<br><br>**Observation:** |

*(continue)*

**Question: 5**
How to get an accurate measurement for a certain meal. For example, 1 serving of "nasi lemak"?

**Answer:**

**Observation:**

---

**Question: 6**
How to measure a balance meal. What is the type of food needed in term of grouping such as vegetables, fruits, meat and etc.

**Answer:**

**Observation:**

---

**Question: 7**
What is required from user point of view where we can map health details ( personal disease) with the appropriate food?

**Answer:**

**Observation:**

---

**Question: 8**
Based on users' personal disease, how do we know which type of physical activities which is suitable for them?

**Answer:**

**Observation:**

---

**Question: 9**
Normally there are users who do not want to change their food selection because they are used to take the food. Is there a supplement of similar type of food due to geographical environmental constrain?

**Answer:**

**Observation:**

---

## Written Survey (Hardware and Software Requirement)

**Objectives:**

- To collect data on hardware and software requirement.

**Reminder:** IT Expertise

General Observations:

Unresolved Issues, Topics not covered:

| **Question:** | **Notes:** |
|---|---|
| **Question: 1**<br>What is the average requirement to run an internet based system?<br><br>• CPU<br>• Hard Disk<br>• Memory<br>• Input and Output devices | **Answer:**<br><br>**Observation:** |

*(continue)*

**Question: 2**
What is their advantages and Disadvantages (hardware)?

**Answer:**

**Observation:**

---

**Question: 3**
What is the average requirement to develop the application program?

- Browser
- Database
- Development program
- Testing

**Answer:**

**Observation:**

---

**Question: 4**
What is the advantages and disadvantages?

**Answer:**

**Observation:**

---

## Cognitive Walkthrough Evaluation Form

*Checklist for doing a cognitive walkthrough*

**Cognitive Walkthrough start-up sheet**

**Start-up Form**

Date :

***Please describe the task that you have done and what is your expectation before testing the system.***

**Task Case Description:**

| |
|---|
| |

**User's Initial Goals:**

| |
|---|
| |

**Action Form**

*Please circle the correct answer after evaluating the program.*

**Description:**

| **Goal structure for this step** |
|---|
| **Correct Goals.** |
| **Mismatch with likely goals.** **(% 0/25/50/75/100)** |

| Correct action when executing the program. | |
|---|---|
| Availability. | (% 0/25/50/75/100) |
| Label. | (% 0/25/50/75/100) |
| Code reliability | (% 0/25/50/75/100) |
| Link of label to goal | (% 0/25/50/75/100) |
| No label. | (% 0/25/50/75/100) |
| Functions are running properly. | (% 0/25/50/75/100) |
| Time-out. | (% 0/25/50/75/100) |
| Confusing. | (% 0/25/50/75/100) |
| Code error | (% 0/25/50/75/100) |

Circle the appropriate answer after analyzing the web application

| Assume the correct action has been taken. What is the system's response? | |
|---|---|
| Quit or backup. | (% 0/25/50/75/100) |
| Incomplete goals but look accomplished. | (% 0/25/50/75/100) |
| System hanged. | (% 0/25/50/75/100) |
| No response. | (% 0/25/50/75/100) |

*Tick the appropriate answer*

**A. Application profile**

1. Proposed style of use
   a. Sustained / regular use by people ☐
   b. Brief / regular use by people ☐
   c. Mixed usage ☐

2. Application purpose
   a. To inform ☐
   b. To entertain ☐
   c. To train ☐
   d. For reference ☐
   e. To educate ☐
   f. Other _____

**B. General Interface Assessment**

*Circle the appropriate answer*

| | | Inappropriate | | | Appropriate | |
|---|---|---|---|---|---|---|
| 1. | Match to users need | 1 | 2 | 3 | 4 | 5 |
| 2. | Match to use | 1 | 2 | 3 | 4 | 5 |
| 3. | Functionality | 1 | 2 | 3 | 4 | 5 |
| 4. | Simple Functionality | 1 | 2 | 3 | 4 | 5 |
| 5. | Style suits purpose | 1 | 2 | 3 | 4 | 5 |
| 6. | Use of colour | 1 | 2 | 3 | 4 | 5 |
| 7. | User Friendly | 1 | 2 | 3 | 4 | 5 |

## C. Overall Assessment

*Circle the appropriate answer*

| | | Poor | | | | Excellent |
|---|---|---|---|---|---|---|
| 1. | Ease to use | 1 | 2 | 3 | 4 | 5 |
| 2. | Design style | 1 | 2 | 3 | 4 | 5 |
| 3. | Consistency of functionality | 1 | 2 | 3 | 4 | 5 |
| 4. | Data reliability | 1 | 2 | 3 | 4 | 5 |
| 5. | System flexibility | 1 | 2 | 3 | 4 | 5 |
| 6. | Amount of details | 1 | 2 | 3 | 4 | 5 |
| 7. | Effectiveness | 1 | 2 | 3 | 4 | 5 |
| 8. | Response to no input (error message) | 1 | 2 | 3 | 4 | 5 |
| 9. | Response to heavy volume of input | 1 | 2 | 3 | 4 | 5 |

***Base on the type of operating system used; tick on the appropriate columns. Only a tick to applied on each row.***

| | | Always | Often | Sometime | Never |
|---|---|---|---|---|---|
| 1 | Is the system compatible?<br>*(Does the sequence of activities resemble the way the user thinks it should work?)* | | | | |
| 2 | How is the visual clarity of the system?<br>*(Is each screen clearly identified with an information title or description?)* | | | | |
| 3 | How consistent is the user interface?<br>*(Is it easy to find the required information on a screen and consistent throughout the system?)* | | | | |
| 4 | Is the system provides good informative feedback?<br>*(Does the system provide any accurate feedback after a certain tasks has been accomplished?)* | | | | |
| 5 | Is the system structured clear and explicit?<br>*(Is it clear what are the steps to be taken in order to complete a task?)* | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 6 | Is the system providing the appropriate functionality in an accurate manner?<br>*(Is the way in which information is presented appropriate for the specific task?)* | | | | |
| 7 | How flexible is the system?<br>*(Is there any reversible actions allowed in the system?)*<br>*(Are there any shortcuts available in the system?)* | | | | |
| 8 | Does the system provide any error prevention and correction?<br>*(Does the system clearly and promptly inform you when it detects an error?)* | | | | |
| 9 | Did you experience any problems when using the system?<br>*(Knowing where to find for solutions)*<br>*(Knowing what to do next)* | | | | |
| 10 | Does the data reliable and informative?<br>*(Does the nutrition and disease information provided in the system reliable and informative?)* | | | | |
| 11 | Does the system help to increase the level of awareness in healthy living?<br>*(Knowing what is the daily calories intake)*<br>*(Knowing what is the level of nutrient recommended)* | | | | |
| 12 | Does the system face any problem when running?<br>*(Does the system hanged?)*<br>*(Does the system link to another page correctly?)* | | | | |

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