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ADDIS ABABA UNIVERSITY SCHOOL OF INFORMATION SCIENCE AND SCHOOL OF PUBLIC HEALTH

M.sc in Health Informatics Program

Design and Development of Web Based Maternal and Child Nutrition Information System

By: Tigist Habtamu

**A Research Project Submitted to the School of Information Science and
Public Health for the Partial Fulfillment of the
Requirement for Degree of Master of Science in Health Informatics**

**June, 2017
Addis Ababa, Ethiopia**

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By: Tigist Habtamu

Signed by the Examining Committee:

Advisor : Rahel Bekele (PhD) Signature _____ Date _____

Advisor : Robel Yirgu (MPH) Signature _____ Date _____

Examiner: Solomon Teferra (PhD) Signature _____ Date _____

Examiner : Assefa Seme (PhD) Signature _____ Date _____

Acknowledgment

I would like to express my gratitude and heartfelt thanks to my advisors Dr. Rahel Bekele and Ato Robel Yirgu for their guidance and kindness throughout my thesis. I would also like to convey my deepest gratefulness towards them for their advice and comment to accomplish this research.

I also like to thank TEMAC project team for providing me relevant information and comment to my project work.

I very cordially thank all of my friends. Especially Debre and Addis you were really friendly and you make my stay in the university unforgettable.

Lastly, but not the least, my love and special thanks goes to my family. They are always encouraging me and they have helped me stay strong.

Tigist

Addis Ababa, Ethiopia

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Abbreviations and acronyms

BMI	Body Mass Index
CDC	Center for Disease Prevention and Control
CMS	Content Management System
CSS	Cascading Style Sheet
EDHS	Ethiopian Health and Demographic Survey
eHealth	Electronic Health
ENI	Ethiopian Nutrition Institute
EPHI	Ethiopian Public Health Institute
FAO	Food and Agricultural Organization
FMOH	Federal Ministry of Health
FNIC	Food and Nutrition Information Center
HAPCO	HIV/AIDS Prevention and Control Office
HIV/AIDS	Human immunodeficiency virus and Acquired immune deficiency syndrome
ICT	Information Communication Technology
IMNCI	Integrated Management of Neonatal and childhood illness
IT	Information Technology
LBW	Low Birth Weight
MCH	Maternal and Child Health
MOH	Ministry of Health
NNP	National Nutrition Program
OO	Object Oriented
PHP	Hypertext Preprocessor
SDG	Sustainable Development Goal
SQL	Structured Query Language
STI	Sexually Transmitted Infection
SUS	Standard User Satisfaction
TB	Tuberculosis
TEMACC	Technology Enabled Maternal and Child healthcare in Ethiopia
UML	Unified Modeling Language
UNICEF	United Nation Children Fund
WHO	World Health Organization
WWW	World Wide Web

Abstract

Under nutrition is one of the leading causes of morbidity and mortality of children in most developing countries including Ethiopia. Maternal and child nutrition related issues are main concerns of mothers, family or care takers, health care providers, organizations and governments that work in the field of nutrition. Since nutritional information has significant role in the reduction of maternal and child malnutrition, it is important to avail relevant nutritional data on various media including the web to enhance the effort that the health sector is putting to reduce maternal and child morbidity and mortality. Therefore, this study is intended to design and develop web based maternal and child nutrition information system that give hands for the health sector effort towards the reduction of maternal and child morbidity and mortality.

Interview and document analysis were used as main tools to capture the system requirement, and the data was analyzed using inductive approach .The project used selected artifacts of an object oriented system analysis and design technique to design the web based system.

The finding of the study shows that there is low level of awareness in the community about maternal and child nutrition. The prime source of Information on nutrition during pregnancy and lactation were not health professionals at the maternal and child health department, instead, they get it from other pregnant women, family or friends. Therefore, availing information is one way of intervention which strengthen the availability of information in a feasible and cost-effective manner

CHAPTER ONE

INTRODUCTION

1.1 Background

Ethiopia is a country with great geographic diversity. About 84 percent of the total population lives in rural areas, making the country one of the least urbanized country in the world. As mentioned in the Health Sector Transformation Plan, the knowledge of population about the value and preparation of disease preventing and body building foods such as vegetables and fruits, and animal products is limited (1)(2) The cultural practices of the population towards regularly feeding the family with these foods is not yet developed. The same is true with giving complementary food to children as an addition to breast milk. The main contributor of the above problems of malnutrition is not only low purchasing power of families, and inadequate supply of food but the belief of the society about nutrition. As such, social and traditional pressures may have a lot of contribution to the problem of malnutrition in Ethiopia. (3)(4) Social factors and cultural practices in most countries have a very great influence on what people eat, on how they prepare food, on their feeding practices and on the foods they prefer. Some traditional food practices and taboos in some societies may contribute to nutritional deficiencies among particular groups of the population.

WHO(5) defines Nutrition as the intake of food, considered in relation to the body's dietary need. Poor nutrition can lead to reduced immunity, increased susceptibility to disease, impaired physical and mental development, and reduced productivity. Based on the Nutrition Baseline Survey Report for the National Nutrition Program of Ethiopia; 2009/10(6)among children 6-23 months of age and still breastfed, 29 percent of children met the recommended minimum dietary diversity (4 food groups per day), seventy-five percent of breastfed children have received the minimum number of meals for their respective age. This is because of most mothers do not have enough knowledge what to feed for their children(7) (8)

The Nutrition Baseline survey 2009/10 (6)also assesses nutritional status of mothers during pregnancy and among the women respondents, during pregnancy 38 percent had eaten 1-2 food groups, 49 percent had eaten 3-4 and only 13 percent had eaten five or more food groups.

The more schooling a woman had, the more likely she was to eat more food groups. Women living in urban areas were also more likely to consume more food groups. Pregnancy-related health and nutritional problems affect a woman's quality of life, that of her newborn infant well beyond delivery, and that of her family and community. As indicated by Blössner (9) malnourished mother is likely to give birth to a low birth-weight (LBW) baby susceptible to disease and premature death, which only further undermines the economic development of the family and society, and continues the cycle of poverty and malnutrition.

According to UNICEF report (10) malnutrition is also an issue with children. Nutritional status of under-five children is an important outcome measure of children's health. Research shows that the level of resistance to infection is lower for malnourished children than other children, causing high levels of morbidity and mortality. Further, poor nutrition also affects the cognitive development of children.

Generally, malnutrition in both mothers and children remains one of the health challenges that Ethiopia has to deal with to remain on course to achieve the health-related Sustainable Development Goals (SDGs). (11) Reducing malnutrition does not only benefit maternal and child health and development, it also promotes the future, long-term growth and economic progress of the nation. Because there are strong synergies between health and nutrition that are well-documented; good health is not possible without good nutrition. According to UN 2014 report (12) being malnourished in any form carries significant risks to health. Resolving all forms of under nutrition and obesity would dramatically reduce the social burden of sickness and premature death, and the economic burdens of lost productivity and contribute to improving healthy lives and wellbeing for all.

There are lots of efforts to address the issue of malnutrition. Researchers do different surveys and assessment to know the available food sources in different regions of the country. In addition they study nutrition requirement for pregnant woman, child daily food intake, and nutritional value (content) of foods and how to prepare complementary foods based on the age groups (like complementary recipe book by ENI). But the preliminary survey indicates that the findings are not easily accessible to mothers and care givers because materials are kept in health related organizations in the form of hard copy so the public have no access for those documents.

To this end, it is important to avail the materials to the general public using ICT. According to Mengesha (13) ICT is a key area for improving service delivery, promoting easier information exchange. ICT is a cross cutting area which supports all function and operation areas by facilitating the automation of various processes. The Federal Ministry of Health (FMOH)(1) has recognized the benefits of Information and Communication Technology (ICT) as a tool to support the health sector and set it as a transformation agenda. Coincidentally the Ethio-telecom has upgraded its network service to enable clients to be the beneficiaries of a modern and efficient' service, which enable clients to get a fast internet connection. According to Internet world statistics (14) in Ethiopia internet users in the year 2000 were 10,000 but in the year 2017 the number of internet user developed to 11,538,000 and the number of Facebook users become 4,500,000.

Research on ICT brief shows that (15) 67% of Ethiopians Internet users first use the Internet on a mobile phone , while the first wave of Internet adoption rode on the back of desktop computers at the work place, schools and universities or public access facilities such as Internet Cafes, the second wave is sweeping across Africa through the use of mobile phones.

Therefore, this project is one of a kind to contribute to solutions related to malnutrition using the above mentioned opportunities. It specifically makes attempt to use web based technology. Web-based applications provide flexible and easy access of information. The reason for the Web success is largely due to its simplicity for use and information retrieval. (16)Web-based technology platforms allow integrated delivery of desired services to users with the right time and privileges. So this web based system for maternal and child nutrition information system is designed to support the effort to decrease maternal and child mortality. The WWW enhances human cognition, communication, and co-operation.

1.2 Statement of the Problem

Nutritional status is an outcome and impact indicator when assessing progress towards achieving the Sustainable Development Goals (SDG). Child nutritional status is related with SDG special Target 3.2. As malnutrition is a frequent cause of death for newborns and under-five children, the SDG aims to end all forms of malnutrition by 2030.

It is indicated in *EDHS* (17) Ethiopia has the second highest rate of malnutrition in Sub-Saharan Africa where women and children are the main victims of the problem. Poor maternal nutrition during pregnancy harms the health of the child in the womb with continued negative consequence of the child throughout life. Study by World Bank (18) indicates that if malnutrition is left untreated during the first two years of life, this damage can be irreversible and can cause lower intelligence and reduced physical capacity. These conditions in turn, reduce productivity, slow economic growth and are responsible for poverty amongst a population. Also (9) maternal under nutrition is considered to be the risk factor for neonatal deaths.

Similarly, the nutrition extension package, which is a subcomponent of the 16 Health extension packages (19) indicate that although Ethiopia is a producer of a variety of agricultural products, it is nevertheless, one of the countries in the world with the highest number of malnourished population. It is also mentioned that the health problem of the majority of the population of Ethiopia emanates from lack of adequate and balanced diet. It is also indicated children, pregnant women and lactating mothers are most affected by the problem.

Illiteracy and poverty may also influence the food intake of people in the community and become causes of malnutrition. Nutrition knowledge for lactating mothers is one key factor that determines the health and wellbeing of mothers and infants. If mothers have good Nutritional information, it is easy to understand different types of food, how food nourishes the body and powers health. According to Temesgen (20), Lactating mothers from low-income countries including Ethiopia are considered as a nutritionally vulnerable group due to different socio demographic factors and lack of nutritional knowledge which impact on the health and well-being of children.

What is more, mother and care givers have very limited information about maternal and child nutrition. They don't have enough information how to enrich complementary foods by adding vegetables or animal products, because of this the child couldn't get adequate nutrition and become malnourished. Furthermore, it is not easy for literate mothers to find information about child feeding practices, because materials in the country are not easily accessible.

In order to address such problems the FMOH developed family centered nutrition package. (19)Amongst the major objectives were to develop the knowledge and skills of the society about

nutrition and to build its capacity for identifying and taking appropriate actions to eradicate malnutrition and prevent its recurrence; enable/capacitate the society to have adequate concept/knowledge about the essence and value of nutrition; empower the society to understand the nutritional care that mothers and children require and create capacity to the implementation of the nutrition package. However, the available materials have limited circulation, mainly used by the health extension workers.

This project made an attempt to enable mothers and health professionals get basic maternal and child nutrition information using web based application. From the foregoing, it is understood that nutritional information plays a significant role in reducing maternal and child malnutrition. FAO report shows that (21) there is ample evidence that improving food security alone does not necessarily improve dietary diversity or child nutritional status. On the other hand, nutritional status can be improved through nutrition education even in the absence of improvements in food security.

FAO recommends nutrition information to be provided (21) through different channels: Integrating nutrition education into health sector and school are actively promoting use of food, particularly local foods to improve nutritional status of women and children in addition using mass media can broadcast nutrition education beyond the print media . Web based application is also an alternative system proposed to alleviate these problems. (16)Web-based technology platforms allow integrated delivery of desired services to users with the right time and privileges. According to world wide web foundation (22) the use of web-based application are

- It can be accessed from the personal computer or mobile phone;
- People become familiar using the Web to get the news, weather forecasts, cooking recipes, medical information, social media and the like.
- Information linked to social media can be transferred fast and can address multiple individuals at a time.
- It is cheap and efficient means of communication

Therefore the aim of this project is to assess materials available in maternal and child nutrition program to develop a web based maternal and child nutrition information system in a local language (Amharic) which enables mothers, care givers, health professionals and others to

get basic information on nutrition during pregnancy, lactating and complementary food content and preparation. The main goal of providing nutritional information is to make people aware of what constitutes a healthy diet and ways to improve their diets and their lifestyles.

1.3 Objective

General Objective

The general objective of this project is to design and develop web based Maternal and Child Nutrition information system to be used by mothers, health professionals ,caregivers and others .

Specific objective

- To identify Information seeking behavior of mothers
- To specify requirements from potential users
- To develop content in consultation with relevant experts
- To design appropriate user interfaces in Amharic language
- To develop a prototype web based application
- To test usability of the prototype

1.4 Scope and limitation of the project

The scope of the project is to design and develop web based Maternal and Child Nutrition Information System. It is designed to provide information only on nutrition during pregnancy, childbirth, and the postpartum period. The content of the web was collected from governmental and non governmental institutions working on the area of maternal and child nutrition , and also by consulting experts in the field .

The project has limitation to accommodate all available infant recipes of time constraint.

1.5 Significance of the project

This web based maternal and child information system will assist the community for better understanding of the nutritional value of food they provide for pregnant mothers and their infants. It also enables mothers, care givers, health professionals and others who have similar interests to find basic information on maternal and child nutrition. The system help them to make healthy food choices on available food sources in their environment and introduce measurement and preparation of complementary foods for their infant.

Mothers, care givers and infants are direct beneficiaries of the system, moreover this Web-based system help health professionals to access information which is relevant during MCH consultation. As such the lack of information regarding what to eat &how to eat during pregnancy and early childhood is addressed in this research for the advantage of mothers and children.

1.6 Organization of the Document

The thesis is organized as follows: **Chapter one** is the introduction part and it covers the background, the statement of the problem, objectives, significance of the project and scope of the project. **Chapter two** deals with the literature review. **Chapter three** presents the methodology used in carrying of the project. **Chapter four** is findings of the survey on information seeking behavior of mothers. **Chapter five** is requirement specifications, system analysis and modeling. It also talks about the design and development of the proposed system. While **chapter six** presents testing and evaluation **chapter seven** is conclusion and recommendation.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview of Malnutrition

Malnutrition is a condition that results from eating a diet in which nutrients are either not enough or are too much such that the diet causes health problems. According to UNICEF definition (23) *Malnutrition* is a term that includes over nutrition and under nutrition. **Over nutrition** results from too much nutrient intake relative to nutrient requirements based on age, gender, physical activity, height, weight, and health status of the individual; which is rare in Ethiopia. And **under nutrition** describes a range of conditions including being underweight, being short, being thin and being deficient in vitamins and minerals.

On the other hand Save the Children report (24) stresses that the magnitude of malnutrition as a silent killer – under-reported, under-addressed and, as a result, under-prioritized. Malnutrition-related deaths are often put down to the disease that the child eventually died from. According to the report every hour of every day, 300 children die because of malnutrition.

2.2 Cause of malnutrition

Under nutrition is caused by many different factors that often interact with one another. UNICEF conceptual framework for under nutrition, developed in the 1990s(25) provides a clear depiction of the various factors associated with under nutrition and the distinct levels at which these factors act. In the framework, the causes of under nutrition are divided into three levels: immediate, underlying and basic

- **Immediate causes (individual level):** Inadequate food intake and disease are immediate causes of under nutrition. These operate at the individual level.

- **Underlying causes (household and community level):** Household food security, social care for mothers and children, and the health environment and access to health services are underlying causes that contribute to under nutrition.
- **Basic causes (sub-national, national and international level):** Political, cultural, financial and environmental factors also contribute to under nutrition at the basic level.

On the other hand illiteracy and poverty also influence the food intake of people in the community and become causes of malnutrition.(24)the educational status of women is a key underlying factor in maternal and child feeding practices, and in child malnutrition.

2.3 Maternal malnutrition

A mother's nutritional status, (26) diet and lifestyle influence pregnancy and lactation outcomes and can have lasting effects on her offspring's health. Inadequate intakes of certain micronutrients during pregnancy, such as folic acid and iodine, can contribute to birth defects and/or the inability of the child to develop to his or her full cognitive potential.

Besides Mora and Nestel study shows (27) some 200 million women become pregnant each year, most of them in developing countries . Many of these women suffer from both ongoing nutritional deficiencies and the long-term cumulative consequences of under nutrition during childhood. Pregnancy-related health and nutritional problems affect a woman's quality of life, that of her newborn infant well beyond delivery, and that of her family and community.(9) A malnourished mother is likely to give birth to a low birth-weight (LBW) baby susceptible to disease and premature death, which only further undermines the economic development of the family and society, and continues the cycle of poverty and malnutrition.

Although Monika and Mercedes states(9)The nutritional status of women and children is particularly important, because it is through women and their off-spring that the pernicious effects of malnutrition are propagated to future generations. A malnourished mother is likely to give birth to a low- birth-weight (LBW) baby susceptible to disease and premature death, which

only further undermines the economic development of the family and society, and continues the cycle of poverty and malnutrition.

It is described in Linkage maternal nutrition manuals that (28) During pregnancy all women need more food, a varied diet, and micronutrient supplements. When energy and other nutrient intake does not increase, the body's own reserves are used, leaving a pregnant woman weakened. Pregnant women also require more protein, iron, iodine, vitamin A, folate, and other nutrients. Deficiencies of certain nutrients are associated with maternal complications and death, fetal and newborn death, birth defects, and decreased physical and mental potential of the child. Linkage manual also indicate that lactation places high demands on maternal stores of energy, protein, and other nutrients. These stores need to be established, conserved, and replenished. The energy, protein, and other nutrients in breastmilk come from a mother's diet or her own body stores. Women who do not get enough energy and nutrients in their diets risk maternal weakening. To prevent this, extra food must be made available to the mother. Breastfeeding also increases the mother's need for water, so it is important that she drinks enough to satisfy her thirst. Maternal deficiencies of some micronutrients can affect the quality of breastmilk. These deficiencies can be avoided if the mother improves her diet before, during, and between cycles of pregnancy and lactation.

Therefore, it is essential to inform the community that(29)Pregnancy is a critical time of human development, and anything that compromises the fetal environment may have important and lasting effects on the child's future health. It is important as a society to prioritize helping women understand the impact that their life-style choices have on their children. Maximizing the health of the pregnant mother will ensure her child the best start at life possible.

2.4 Child malnutrition

Blössner Mstudy shows (9)Malnutrition commonly affects all groups in a community, but infants and young children are the most vulnerable because of their high nutritional requirements for growth and development. According to global nutrition report (30) Malnutrition manifests itself as children who do not grow and develop to their full potential .On the other hand (10) nutritional status of under-five children is an important outcome measure of children's health .

Research shows that the level of resistance to infection is lower for malnourished children than other children, causing high levels of morbidity and mortality (UNICEF 2001). Further, poor nutrition also affects the cognitive development of children

As indicated in the Save children report (24) the world has enough food for everyone, so putting an end to the hunger and malnutrition crisis is the right thing to do. Every child has the right to a life free from hunger. No child should be born to die from a cycle of malnutrition and disease because they are not able to eat enough nutritious food

2.5 Malnutrition in Ethiopia

Under nutrition is a major public health problem in Ethiopia. (31) About five million people experience food shortages each year, and approximately 2.9 million people were expected to receive food assistance in 2015. According to Goal (17)malnutrition is the underlying cause of 57% of child deaths in Ethiopia, with some of the highest rates of stunting and underweight in the world. As for women in the country, over a quarter had a low body mass index (BMI) (<18.5) in 2005.

Based on the Nutrition Baseline Survey Report for the National Nutrition Program of Ethiopia; 2009/10(6), most mothers do not have enough knowledge what to feed for their infant and children. The result of the national nutrition survey 2009/10 indicate that, among children 6-23 months of age and still breastfeed, 29 percent of children met the recommended minimum dietary diversity (4 food groups per day), seventy five percent of breastfed children have received the minimum number of meals for their respective age. It is also mentioned in the Health Sector Transformation Plan, the knowledge of population about the value and preparation of disease preventing and body building foods such as vegetables and fruits, and animal products is limited(1) The cultural practice of the population towards regularly feeding the family with these foods is not yet developed. The same is true with giving complementary food to children as an addition to breast milk. The main contributor of the above problems of malnutrition is not only low purchasing power of families, and inadequate supply of food but the belief and the concept of the society about nutrition.

As such, social and traditional pressures may have a lot of contribution to the problem of malnutrition in Ethiopia. As Zerfu states (32)number of taboos related to the intake of certain food items and misconceptions that can adversely affect nutritional status during pregnancy. The most common taboos were related to the consumption of green leafy vegetables, yogurt, cheese, sugar cane, and green pepper. However, the frequency and extent of the practice varied by maternal age, family composition, and literacy level. Older mothers and those with no formal education were more likely to practice the taboos than younger and educated ones. Mothers disfavored weight gain during pregnancy in fear of obstetric complications associated with the delivery of a bigger infant.

2.6 Intervention practices of malnutrition in the country

National Nutrition program stresses (33)to life cycle nutritional intervention with greater emphasis and focus on the crucial period of pregnancy and the first 2 years of life - the 1000 days from conception to a child's second birthday during which good nutrition and healthy growth have lasting benefits throughout life.

Likewise, Global Nutrition report indicates(30)in 2015 Ethiopian government's commitment to redesign the largest social protection program in Africa to make it more nutrition focused. Combating malnutrition is the best development investment.(24) Investing in nutrition is investing in the future of a country; it creates stronger communities with a healthier, smarter and more productive population. Besides(30)in Ethiopia, the health extension system is taking on the delivery of nutrition interventions like infant feeding counseling and calcium supplementation. Because improving children's nutrition also leads to wider social and economic gains.

According to global nutrition report to address a problem of malnutrition (30) it is important to be supported by an informed and empowered civil society.(24)promoting the best foods and best ways to feed children between the ages of 6 to 24 months is one way of malnutrition intervention.

It is important to promote maternal and child nutrition , (34)such as focusing on the 1,000-day window, immediate and exclusive breastfeeding, complementary feeding, and food fortification and supplementation. It is also important to explore new approaches, such as improving nutrition

for women and adolescent girls, increasing advocacy and technical assistance, improving data systems. It is also important to enhance nutrition education with IT because (35) effective use of information technologies has become a critical success factor in modern society. Likewise ICT is a cross-cutting enabler to address the all-around nature of nutrition by improving access to healthy diets and improving knowledge for food choices, (30) when information is provided to mothers, the challenges are no longer barriers.

2.6.1 Complementary Feeding

Complementary feeding means giving other foods in addition to breast milk starting when an infant is 6 months old since at this time breast milk alone is not sufficient to meet a growing infant's nutritional needs. Complementary foods are needed to fill the calorie, protein and micronutrient gap between the total nutritional needs of the child and the amount provided by breast milk. FAO report define complementary feeding as (36) the period of transition from exclusive breastfeeding to family foods, referred to as complementary feeding, covers a child from 6-23 months of age, and is a very vulnerable period. It is the time when malnutrition starts in many infants, contributing to the high prevalence of malnutrition in children under two years of age. The report also indicate. The report also states that malnutrition in young children can be prevented by feeding them enough nutritious and safe complementary foods. Good complementary feeding means feeding your child enriched food every day and offer additional nutritious snacks between meals. You can prepare good enriched food from a variety of local foods that are available in your home, from your garden or the local market.

According to Alive and Thrive complementary feeding in-service training manual (37) most often, malnutrition during infancy starts when children transition from nutritious breast milk to thin cereal or starch-based gruel (atmit) usually fed in bottles, which can result in complications and diarrheal diseases. Traditional infant foods are thin gruels made of cereals that are very low in energy and the micronutrients needed to promote physical and cognitive development. Furthermore, the bulkiness of traditional infant foods and the concentration of fibers and inhibitors in staple food crops are major factors in reducing nutritional benefits of complementary foods. These foods fill the child's stomach but they do not provide enough energy and nutrients for good physical growth and mental development, often resulting in

malnutrition. Ideally, complementary foods should contain animal-source foods such as meat, chicken or eggs which have high biological value, foster growth and development and combat stunting, especially during the first two years of life. However, these foods are not fed to infants and young children due to various misconceptions and traditional beliefs in the country. Moreover statistics indicate that(1) among children older than 6 months only 4.3% of children in this age group consumed the requisite four food groups. Only 13% of children under age of two years consumed iron rich food.

2.6.2 Awareness creation plat forms

In 1986 EC the Ethiopian Nutrition Institute (ENI) publish complementary feeding booklet and distribute for the health institutes as a teaching guide. The major objective of this booklet was to improve the low level of awareness of nutrition in the society, because it is the major cause of malnutrition in the county. In addition this booklet introduces the basic principles of nutrition and how to prepare and feed children using available food sources at home. The complementary food preparations booklet designed by considering major food sources in different regions of the country. The assessment was done what food sources are available and used in different part of the country, and identifies that the southern part of Ethiopia uses Enset and corn and the northern and central part of Ethiopia uses Teff, wheat and sorghum as a major source of food. Based on the assessment the complementary food preparation was developed.

On the other hand Linkage –Ethiopia in collaboration with the Federal Ministry of Health of Ethiopia prepare a guide book in August 2006 entitled, “Complementary Feeding Recipes for Ethiopian Children 6-23 Months Old. A Practical Cooking and Feeding Guide”. The purpose of this book was to provide service providers with information necessary for counseling mothers and child caretakers on how to feed their children 6-23 months, specifically on aspects of complementary feeding in addition to continued breast feeding. The book contains simple nutritious complementary feeding recipes that can be prepared from locally available foods for three major staple eating areas of the country, including (1) maize/enset/teff, (2) wheat/barley, and (3) sorghum/maize. The recipes have been developed to meet the changing nutritional needs of children in two age groups, 6-11 months and 12-23 months, in terms of calories, consistency and thickness. These amounts conform to the recommendations contained in the internationally

accepted Guiding Principles on the Complementary Feeding of the Breastfed Child (PAHO 2002) as well as take into account the adaptation of these principles by the Federal Ministry of Health in Ethiopia

Alive & Thrive an initiative funded by the Bill & Melinda Gates Foundation and the governments of Canada and Ireland, start to demonstrate innovative approaches to improving feeding practices with three countries namely Bangladesh, **Ethiopia**, and Viet Nam in 2009 with the objective of to save lives, prevent illness, and ensure healthy growth and development through improved breastfeeding and complementary feeding practices and to promote good nutrition in the first 1,000 days, from conception to two years of age, is critical to enable all children to lead healthier and more productive lives. This initiative develop materials

- to encourage families to take action and monitor their personal progress in adopting the 7 excellent feeding actions by using a checklist,
- tool for health professionals for counseling on seven excellent feeding actions in Ethiopia in 4 languages (English , Amharic, Oromifa and Tigrigna) ,
- Provides frontline workers with a tool for counseling on age-appropriate feeding practices, from birth through the first 24 months.
- And also produce a TV spot on complementary feeding during sickness and thickness of complementary foods.

FMOH health extension nutrition package (19) is prepared to develop the knowledge and skills of the society about nutrition and to build its capacity for identifying and taking appropriate actions to eradicate malnutrition and prevent its reappearance. The health extension workers will be the implementers of the package.

2.7 Information Technology in Health Practice

As Wilson states (17) Information and Communication Technology applications are useful in numerous instances to facilitate the developments of various aspects of the society, it is considered as an enabler for various disciplines. It is applied in different areas and witnessed an effective result. Such as improving the quality of life for citizens in health and education plus sharing knowledge and improving access to information. States

WHO defines eHealth(38) as ‘the cost-effective and secure use of information and communication technologies (ICTs) for health and health-related purposes’. However, the use of ICT in the area of health care is very minimal compared to other disciplines. But nowadays the advancement in Information Technology (IT) and telecommunications is forcing the utilization of ICT in healthcare area. Besides Information Revolution is a transformation agenda for the federal Ministry of Health of Ethiopia, because appropriate and timely use of health and health-related information is an essential element in the process of transforming the health sector. Decisions at different levels of the health sector can only be effective if they are backed with accurate and reliable information. (1)Information Revolution is not only about changing the techniques of data and information management; it is also about bringing fundamental cultural and attitudinal change regarding perceived value and practical use of information. Make the data accessible for the wider public and promoting the culture of information use is very important to create informed and accountable citizens.

2.7.1 Web Technology

The World Wide Web (39) is a very large distributed digital information space, it has grown to encompass diverse information resources. The World Wide Web is a techno-social system to interact humans based on technological networks. The WWW enhances human cognition, communication, and co-operation. The reason for the Web’s success is largely due to its simplicity for use and information retrieval. (16). Web-based technology platforms allow integrated delivery of desired services to users with the right time and privileges.

Web based technology influence the community by improving literacy and the information displayed is going to be tailored for the audience and the situation. According to world wide web foundation (22)some of the benefits of web-based application are : It can be accessed from the personal computer or mobile phone; people become familiar using the Web to get the news, weather forecasts, cooking recipes, medical information, social media and the like.

The purpose of using web technology for maternal and child nutrition system is to

- increase audience knowledge and awareness of maternal and child nutrition

- influence behaviors and attitudes towards nutrition
- demonstrate the benefits of good nutrition to public health outcomes
- argue against misconceptions about child feeding practices

Public awareness can be part of an overall approach to preventing child malnutrition. Find resources and information on the web help the public to prevent maternal and child morbidity and mortality due to malnutrition.

2.8 Related work

The Food and Nutrition Information Center (FNIC) is a leader in online global nutrition information. Located at the National Agricultural Library of the United States Department of Agriculture, the FNIC website contains over 2500 links to current and reliable nutrition information. FNIC strives to serve the professional community (including educators, health professionals and researchers) by providing access to a wide range of trustworthy food and nutrition resources from both government and non-government sources. The FNIC website provides information about food and human nutrition.

Nutritionix is a web based application with the objective to help the community to understand easily what to eat. Through interactive nutrition tools and nutrition database, the system help millions of consumers understand nutrition every single day. The content of the web developed by monitoring over 600 restaurant chains to detect new and changed menu items. The registered dietitian team help on organize and analyze recipes to make sure the coverage on common food dishes from all over the world. The system also have a mobile application for easy access.

The Ethiopian Diabetes Association develop a website to empower diabetic patients, their families and the wider public through up to date information on diabetes prevention care and the right kind of treatment. It strives to see positive change in the lives of all people affected by the condition. The website has patient education materials, basic diabetes information, also post events and news related to diabetes in Amharic and English language.

MSc. Project done by Dawit Girma with the title of Web Based Nutritional Decision Support System for Diabetics Patients, is a system counseling diabetic patients with nutritional decisions they should be making in their day to day life; and what kind of food and drink they should take or avoid.

HIV/AIDS Prevention and Control Office (HAPCO) in collaboration with CDC-Ethiopia develop a Web based National AIDS Resource Center (NARC), with the objective to expand CCP/ARC user driven collections and services of up to date and accurate local and international materials on HIV/AIDS, VCT, STI and TB. NARC serves as Ethiopia's Premier source of HIV/AIDS information. The website is modified, upgraded and maintained based on the usability assessments done periodically.

CHAPTER THREE

METHODOLOGY

3.1 General approach

The study followed qualitative research approach which uses survey method in order to gather information for the proposed system. The project focuses on assessing awareness level of mothers and care givers towards maternal and child nutrition.

3.2 Study design

Object oriented analysis and design methodology is used for requirement analysis and design. This methodology makes the process of developing system more flexible, easily maintainable and scalable. It also supports the use of an iterative process model which helps to improve the system step by step.

3.3 Situational analysis

During the initial phase, preliminary survey was conducted using cross sectional study design that employ qualitative research approaches to assess the information seeking behavior and knowledge of mothers and care givers. The survey was used as a tool to identify

- a. Traditional source of information on child feeding practice
- b. Problems and constraints regarding access to information.
- c. Awareness level of mothers and care givers about maternal and child nutrition information
- d. Participants access to ICT
- e. Participants level of information communication technology skill
- f. Mothers and care givers information sharing culture

3.4 Study area

The project was conducted in Addis Ababa, Addis Ketema sub city. Addis ketema sub city is one of the 10 sub cities in Addis Ababa city administration. The district is located in the northwestern area of the city, with a total area of around 898 hectare and with a total population of 271,503. It borders with Gulele sub city in the north, Lideta sub city in the south, Arada sub city in the east, Kolfe keranio sub city in the west. The data in the Sub city shows that out of population 132,657 are males and 138,466 are females. Under this sub city there are 10 health centers.

In each health center there are different departments including outpatient, inpatient pharmacy, laboratory, and MNCH units. The MNCH unit is the one responsible to provide services on pre-natal, delivery, post-natal, family planning, vaccination and IMNCI. Everyday around 75 mothers visit the MNCH unit for herself or for the baby. Generally the health centers serve more than 200 patients per day

3.5 Source population

The source population was mothers and MCH focal person in Addis Ketema sub city.

3.6 Study population

The population of the study was mothers and MCH focal person from randomly selected 5 health centers from Addis Ketema sub city. 25 mother and 5 MCH focal person were selected using purposive sampling technique to participate on the preliminary survey. The health centers were selected based on the previous knowledge of the facility for easy access, and purposive sampling technique was used because the researcher was looking for small number of participants. Eventually from chosen health facilities a total of 30 respondents were interviewed, because the researcher reaches at the saturation point of sampling by observing more data will not lead to more information related to the interview questions.

3.7 Data collection instruments

Interview and document analysis were used as the main technique to capture the system requirement.

3.7.1 Interview

The interview was conducted with 30 selected individuals from the selected 5 health centers. The informant (participants) were mothers and MCH focal persons. The health centers were identified based on the sampling criteria discussed earlier.

In each health facility, mothers were identified, and informed consent was obtained prior to the beginning of the study. The respondents were briefly introduced about the purpose and the nature of the study, what the study focuses on and the benefits of the findings. Respondents were interviewed using interview guide specifically designed for the study. The interview guide has several sections to collect different kinds of data required for this study. The first section assesses demographic information, the second section assesses information access and the third section assesses their exposure to information technology tools.

Their responses were used as an essential input for defining the requirements which is important for designing of the web based maternal and child nutrition information system.

3.7.2 Document Review

Information was gathered from different governmental and non-governmental institutions in addition experts were consulted who works on the area of maternal and child nutrition to develop the web content.

Information was gathered from Ethiopian Public Health Institute (the former Ethiopian Health and Nutrition Institute) and Federal Ministry of Health.

The following documents were reviewed in order to develop the content for the web

- FMOH , Nutrition Package ,2003(MOH)
- በከተማ ጤና ኤክስቴንሽን ፕሮግራም የሰርዓተ-ምግብ ፓኬጅ (ጤና ጥበቃ ማ/ር)
- ሕፃን ፤ ለሕፃን ጤንነት ምግብ ነው መሰረት (የኢትዮጵያ ምግብ ጥናት ድርጅት)
- የሕፃናት ተጨማሪ ምግብ (የኢትዮጵያ ምግብ ጥናት ድርጅት)

- CF Training Manual May 13 2011_Amharic
- CF Training Manual Nov 2012_English
- Ethiopia-counseling-tool-on-feeding-actions English
- Ethiopia-posters-for-complementary-feeding Amharic
- Focusing on improving complementary (IYCN project)
- Indicators for assessing infant and young child feeding practices (I &II) (IYCF project)
- Complementary feeding recipe book (Linkage)

In addition experts were consulted who work in the area of maternal and child nutrition. Finally the information obtained was customized based on the user requirement and uploaded to the database.

The data gathering process was held by the researcher.

3.8 Data analysis

Inductive approach was used to analyze data collected through interview because this approach is comprehensive and suitable where little or nothing is known about the study phenomenon. Inductive analysis is the most common approach to analyze qualitative data. The analysis is done to identify the common issues (challenges and perceptions) that happen again across the entire data collected using semi structured interview. Then the results in each identified themes are presented in narrative form.

For the designing of the web based maternal and child nutrition system Object Oriented software design methodology an iterative and incremental Object Oriented Analysis and Design Cycles was used. The object-oriented methodology uses a set of diagrams or models to represent various views and functionality of a system and is commonly known as Unified Modeling Language or UML. This modeling language is selected because it increase reusability and modification, it is easy and understandable and it is fast system developing approach. The result of the system modeling that helps to understand the system was done using:

Use case diagram: it is the simplest illustration of interactions of actors of the system showing relationships of actors with uses cases of the system while describing the main actions performed in the system (40)

Activity diagrams: are graphical representations of activities and actions with support for alternative, iteration and concurrency.

Class diagram: class diagram is an integral part of the unified modeling language. This diagram shows the object classes in the system and the associations between these classes.

Deployment diagram: these diagrams show the assignment of executable files on the computing elements and the communication that involves between these entities. (40)

3.8.1 Tools

Tools that were used for analysis and style during this project were:

Frontend (in the Client Side):

WordPress content management system (CMS) was chosen because it is easy to use, to update and it's flexible and can be opened by any browser.

CSS: was designed primarily to enable the separation of document content from document presentation, including aspects such as the layout, colors, and fonts and basically designs, This separation can improve content accessibility, provide more flexibility and control of the system.

Backend (in the server side):

PHP: this code was used because it could be embedded into WordPress and it uses as link to connect the system with the database. It could be opened with any browser and it could easily be connected to most databases including MySQL.

MySQL database server was used because it is an open source easily accessible and compatible with the above applications

The applications used to design the system were: -

- **Adobe Dreamweaver** was used for the designing of the prototype.
- **Microsoft Visio** for drawing various modeling diagrams
- **xampp server** to access MYSQL Database

3.9 Prototype design

This web based maternal and child information system is designed after conducting qualitative study and analyzing the respondents input from the collected data using the interview guide also analyzing comments and suggestions from the experts in the field of maternal and child nutrition. The contents of the web were collected from governmental and non-governmental institutions working on the area of maternal and child nutrition program and by consulting experts in the field.

3.10 Testing and evaluation

After designing the system, prototype was developed and usability assessment of the systems was carried out with mothers and health care providers. The purpose of this usability testing is to understand whether users can use the system well, to assess users' acceptance of the system, to assess the effectiveness of the system, to assess user satisfaction and to improve user experience. For the process Morea usability testing software were used to evaluate the system.

3.11 Ethical consideration

Ethical clearance was provided from Addis Ababa University School of Public Health to conduct this project and official letter was provided to Addis Ketema sub city from Addis Ababa University school of Information Science. Information sheet and consent forms were delivered along each interview and all interviewees have been asked their willingness to participate in requirement gathering; and informed verbal consent were also be obtained from all study participants and from every interviewee after the objective of the study informed. Besides, the convenience, confidentiality, privacy and comfort of the participants were considered.

CHAPTER FOUR

RESULT AND DISCUSSION

4.1 Overview

The result of this survey was intended to provide an insight on mothers and care givers understanding of maternal and child nutritional information for the development of the web. Among the project participants 25 were mothers and the remaining 5 informants were MCH focal persons from the selected 5 health centers.

4.1.1 Demographic Information of mothers

The respondents were asked for their educational level and the report shows 5 of them have a bachelor degree, 3 of them have diploma, 10 participants attend secondary education and 4 participant attend elementary level of education.

Table 1 : mother's educational background

No.	Education	Frequency
1	Degree	5
2	Diploma	3
3	Elementary	4
4	No education	3
5	Secondary	10
Total		25

Out of the total respondents, 20 of them were between the age of 20 and 34 years old, while 2 of them were below 20 and 3 of them were above 34 years of age. Amharic language was the mother tongue language for the majority (eighteen) of the participants.

4.1.2 Information access during pregnancy and lactating

4.1.2.1 Information during pregnancy

The survey asked mothers whether they request information about what to eat during pregnancy. Out of 25 participant fourteen mothers request the information and eleven mothers where not. Among those who request information seven mothers consult health facilities, three mother consult both family and health facilities and the rest consult family and friends. Only one mother use internet to check the status of her pregnancy and to check what to take and not.

Table 2 : Information source of mothers

No.	Who was consulted	Frequency
1	Did not consult	11
2	Family	2
3	Family, Health facilities	3
4	Friends	1
5	Health facilities	7
6	Internet	1
	Total	25

Based on their request six of them were advised to eat vegetable and fruit and two of them were advised to eat balanced diet and the rest six of the respondent advised to eat available foods (bet yaferawn). When the health facilities provide information beforehand they judge the economic background of the mothers, if they consider that the mother is from well to do family they tell her to add vegetable and fruit in her daily meal, but if they assume that the mother is from low economical background they just tell her to eat what is available at home (bet yaferawn), with no clear guidance. On the other hand among the respondents there were mothers who were consulted by families to limit what they eat during pregnancy because the kid becomes fat and causes problem during the time of delivery.

4.1.2.2 Information during Lactating

Of all the respondents seventeen mothers didn't consult anybody what to eat during lactating because they have no problems to breastfeed and the rest eight mothers consult family, friends and health facilities to get information on what to eat during lactating, those mothers consult family and friends advised to eat available food, kolo, salty food and drink liquid to produce more milk and those who consult health facilities advised to add vegetable and fruit in their meal.

4.1.3 Understanding of mothers about child feeding practice

4.1.3.1 Balanced diet

For the question about mothers understanding of feeding balanced diet for the children; thirteen mothers respond that balanced diet for kid's means to prepare 'mitin' flour as gruel or porridge regardless of their educational background, and seven mother have no idea what balanced diet means at all. Only two mothers clearly understand what balanced diet means.

Table 3 : understanding of mothers about balanced diet

No.	What is balanced diet for your children	Frequency
1	Available food	1
2	Egg, Meat, Available food	1
3	Fruit, Vegetable	1
4	Mitin flour as porridge or gruel	13
5	No idea	7
6	Food contain (Vitamin, protein Carbohydrate and liquid)	1
7	what a child like	1
Total		25

4.1.3.2 Complementary feeding

According to the survey result twelve mothers didn't ask information on what to feed to their infants as complementary, they just feed them commercially available foods or fruit or cereals gruel, or available foods at home (bet yaferawen), six mothers who consult family, friend and health facilities were advised to feed commercially available foods, and the rest six mothers advised to feed fruit and vegetable, available foods (bet yaferawen) and not to use commercially available foods when they start complementary feeding.

There is no clear guidelines or educational materials to be used by health professionals when they provide nutritional information during pregnancy, lactation or complementary feeding they just use their previous knowledge. When the focal persons respond for this kind of problems, it is because of unavailability of educational materials on the field of maternal and child nutrition in the facility.

4.1.4 Information technology access

Access to information communication technology was also assessed and only ten respondents use the computer and mobile phone to access current information and to communicate with their friends through e-mail and Facebook, but they never search information about maternal or child nutrition because they did not know the availability of the information on the web. Two mothers mention that their husband browse the web to find information during their pregnancy period and after delivery about child care.

4.1.5 Interview with health care provider

At the health centers maternal and child care education is given by health professionals in each MCH unit, but there is the challenge of assuring that the counselor has good interpersonal skills and conveys accurate information as intended, and also conversations with the mothers to identify major issues and to provide helpful solutions. Most of the time they advise the mothers to eat and feed their kids available foods at home (bet yaferawen) instead of teaching what is balanced diet means and the benefits of eating balanced diet during pregnancy and lactating. The assessment also shows that mother are aware to ask information from the health facilities but the

health facilities have no enough information to transfer. Due to this many children were receiving very little energy through the foods that they consumed in addition to breast milk. Out of 5 MCH focal person four of them know the availability of complementary feeding materials and one respondent didn't know any materials on the subject.

Table 4: Health education at the health center

When did you give the training	Did you give maternal and child feeding education in your facility	How did you give education		Total
		Brochure professional,	professional	
Pregnancy follow-up, vaccination, family planning	yes	1	3	4
Pregnancy follow-up, vaccination, family planning, using HEW	yes		1	1
Total		1	4	5

The FMOH puts strong focus on information and communication technology which shows the commitment to develop the access of information for the health sectors. We also observe that all the selected health facilities have adequate computers with internet access and 42 inch Television is hanged in each waiting areas with receivers, on the other hand the health professionals complain about lack of educational resources. However, the internet services are used for personal communication and the Televisions broadcast news and entertainment movies.

Generally the assessment indicates that mothers try to get information on what to eat during pregnancy, lactation and about complementary feeding of their infants, but almost all of the respondents did not get clear information about balanced diet, the importance of nutrition during pregnancy, lactating and about feeding infant's supplementary foods.

4.2 Discussion of Result

The project assessment reveals that there is lack of maternal and child nutrition information in the community. As Lisa indicate (29) information about maternal care during pregnancy and childbirth is associated with nutritional status of young children, poor care of mothers in pregnancy and childbirth could pose a longer term risk to the health of the child, as well as increasing the more immediate risks for both mother and child. What a woman eats when she is pregnant can have profound and lasting effects on her child's health.

According to save the children (41) Inappropriate infant and young child feeding practices play a significant role in chronic child malnutrition and stunting in Ethiopia. Children who are stunted have lower life expectancy, are more vulnerable to disease, have decreased cognitive development, are less productive, and typically perform poorly in school. The effects of stunting are permanent. Therefore; educating the community is very important to eradicate infant mortality due to malnutrition.

Complementary feeding means giving other foods in addition to breast milk. Linkage complementary recipe manual indicate that (42) when an infant become 6 months old breastmilk alone is not sufficient to meet a growing infant's nutritional needs, it is essential to start complementary foods to fill the calorie, protein and micronutrient gap between the total nutritional needs of the child and the amount provided by breast milk. As Lisa mentioned (29) it is important that knowledgeable health care providers should be available to support the mother-to-be with strategies to help her achieve the most balanced diet possible, thus ensuring the health of both mother and child.

According to the National Nutrition Program (33) The government's efforts to address under-nutrition will be strengthened through the Lifecycle approach, a comprehensive approach that emphasizes the first 1,000 days of a child's life. For instance, ensuring that a newborn is breastfed within 1 hour of birth could cut all neonatal mortality by 22 percent. Exclusive breastfeeding for the first 6 months of life can cut by about 15 percent the number of child deaths, and adequate complementary feeding could prevent an additional 6 percent of all such deaths. The first 1,000 days of life, from the first day of pregnancy until the child is 24 months old, is a critical window of opportunity for health and development. This is the period in which nutrition requirements are greatest and when adolescent girls, pregnant women and young children in Ethiopia in particular are most vulnerable to inadequate care, inadequate access to health services and unsuitable feeding practices. Hence FMOH transfer this information for the general public using mass medias, fliers and posters to create awareness about the topic; however most of the respondents have no idea about 1000 days of a child life, some of them have seen the TV spot but did not understand the message, and the rest have not heard about the topic at all.

To conclude this section availing maternal and child nutrition information on the web enable users in a way that they can manage their own health and their infants.

CHAPTER FIVE

REQUIREMENT SPECIFICATION

5.1 Overview

Documents reviewed and situational analysis were performed to understand the current status of Maternal and Child Nutrition Information. The functional and non-functional requirements of the proposed system are described and modeled using Unified Modeling Language (UML). Object oriented analysis and design methodology is chosen over structural approach to improve quality and complexity management. This methodology is suitable to use UML modeling. The main reasons for using UML are: increased domain and design model reuse and increased customer involvement/understanding of the system. Based on this methodology, the researcher tried to identify basic functional and non-functional requirements of the system. Details are discussed in the following sections.

5.2 Functional Requirements

Requirement definition determines the functional requirement which refers to what fundamental functionality the system should perform for the users in the future. (40) A functional requirement is a description of activities and services a system must provide. These are requirements identified in terms of inputs, outputs, processes, and stored data that are needed to satisfy the system improvement objectives .Even though there were many Functional requirements identified, not all were common across for all users of the system. Only functions mentioned below are found to be essential for the proposed system.

Display: The system should display the result of the search and enable users to select what they want

Read: users can read/view documents from the system

Search: it is about searching complementary feeding recipes from the Maternal and Child Nutrition Information System This system is capable of searching recipes using title, category, and keywords from the content of the document.

Share: the system should enable users to share information with others using e-mail or social medias (Facebook , twitter, ...)

5.2 Non-functional Requirement

A non-functional requirement (qualities of the system) describes (40) user-visible aspects of the system that are not directly related with the functional behavior of the system. It defines how a system is supposed to be. The following are the non-functional requirements of the proposed system:

Usability / ease of use: The system shall have a user friendly menu driven interface that is easy to navigate with.

Reliability: the ability of a system to perform its required functions under stated conditions for a specific period of time. There shall be a frequent and full backup mechanism to avoid any information loss and inconsistency.

Availability: The system shall be available all the time when needed by the users.

5.3 Analysis Model

5.3.1 Use Case Diagram

List of Actors

Table 5: list of actors

Actor	Description
user	Search, view, share information on the web
Content developer	Add or modify content

5.3.2 Use Case Model

A system comprises of functions, features, etc. with specific outputs contributing to the system goal. These functions are initiated by users that can be inside or outside the system. (43) Use case diagrams describe these behavioral requirements of the system as it is. The use case diagram is followed by a description of each use case given separately in a use case description.

Table 6: use cases

No	Use Case	Description
1.	Search	Used to search maternal and child nutrition information
2.	View	Used to view
3.	Read	Used to read the requested document
4.	Print	Used to print selected document
5.	Share	Used to share information using social media

Web based maternal and child nutrition system use case diagram

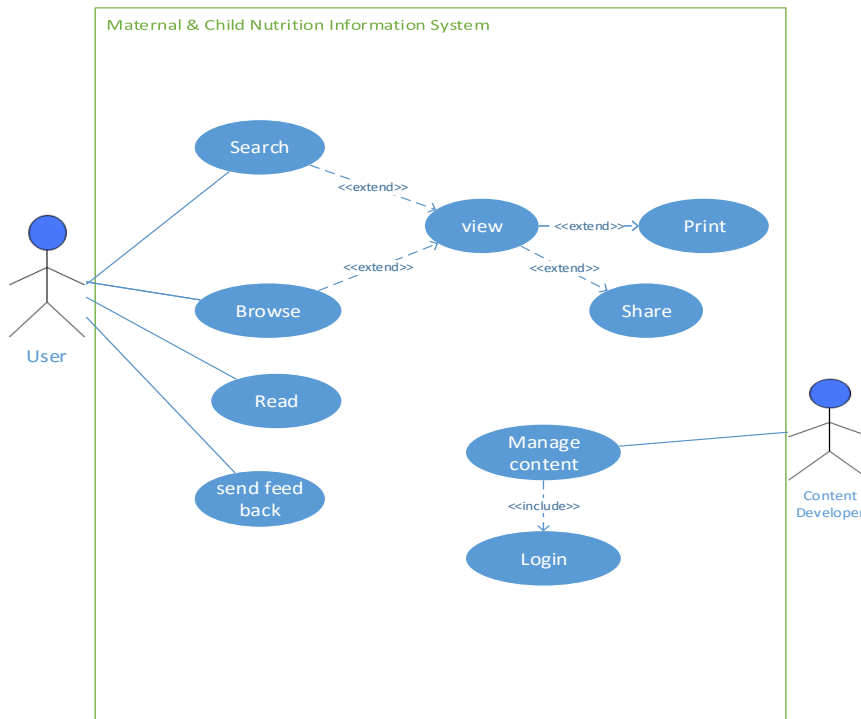


Figure 1: use case diagram

5.3.3 Use Case Description

Description is required for each use case to show how it is accomplished and what

UC001	Read
UC002	Search
UC003	View
UC004	Print
UC005	Share
UC006	Login
UC007	Update content
UC008	Send feedback

Use case description to read information

Table 7 use case description to read information

Name	Read document
Identifier	UC-001
Description	Read information on the web
Actor	user
Pre-Condition	Access the web
Post Condition	Read information
Includes	
Extend	
Basic Course of Action <ol style="list-style-type: none">1. The user insert the URL on browser address bar2. The system displays the home page along with different menus and tabs3. The user views the information and click on his/her preference tab/link.4. The system display the clicked tab/link5. The user read information6. The use case ends	
Alternative Course of Action A: No alternative course of Action	

Use case description to Search information

Table 8: use case description to search information

Name	Search document
Identifier	UC-002
Description	Search document on the web
Actor	user
Pre-Condition	Access the web
Post Condition	Post search result
Includes	
Extend	“UC-004:print”, “UC-005:share”
<ol style="list-style-type: none"> 1. Basic Course of Action 2. The user want to search a document 3. The system displays the main menu which have the “search” interfaces 4. The user clicks on search box from home page 5. The User insert the text (word) and press the search button 6. The system display list of documents based on category 7. The user select the document 8. The system display details about the selected document (Title, content, summary) 9. The user evaluate the document 10. The use case ends 	
<p>Alternative Course of Action A: The selected document is not relevant</p> <ol style="list-style-type: none"> 11. The use case resumes at step 5 of the basic course of action <p>Alternative Course of Action B: The user want to print the document</p> <ol style="list-style-type: none"> 12. The use case resume at step 8 of the basic course of action 13. The system display “print” 14. buttons 15. The user select “print ” button extend “UC-004:print” 16. The system enable to print the document <p>Alternative Course of Action C: The user want to share the document</p> <ol style="list-style-type: none"> 17. The use case resume at step 8 of the basic course of action 18. The user select “share ” button extend “UC-005:share” 19. The system display sharing mechanism buttons “ Face book, twitter” 	

20. The user select one of sharing mechanism
21. The system open selected sharing tool
22. The user share the document

Use case description to update web content

Table 9 : use case description to update web content

Name	Update content
Identifier	UC-007
Description	Develop document for the web
Actor	Content developer
Pre-Condition	
Post Condition	Update web content
Includes	“UC-006: login”
Extend	
Basic Course of Action	
<ol style="list-style-type: none"> 1. The Content developer want to update web content 2. The Content developer log to the system using “UC-006: login” 3. The system allows access and display Admin Main Menu 4. The Content developer clicks on “Add new data” link. 5. The system displays Add New Data Form 6. The Content developer enter all the required information and presses the <i>Save</i> button. 7. The system validates the data & displays confirmation message. 8. The use case ends 	
Alternative Course of Action A: No alternative course of Action	

5.3.4 Activity diagram

Activity diagram is a technique that shows the workflow using stepwise activities and actions which has beginning and ending events. Activity diagrams show the interaction among business processes. It conveys what is happening inside a use case or inside a class through activity description. These are used to model the flow of the system.

Users can access the document by searching the key word and find what they are looking for. Or they can browse the listed document and select the document and evaluate the result

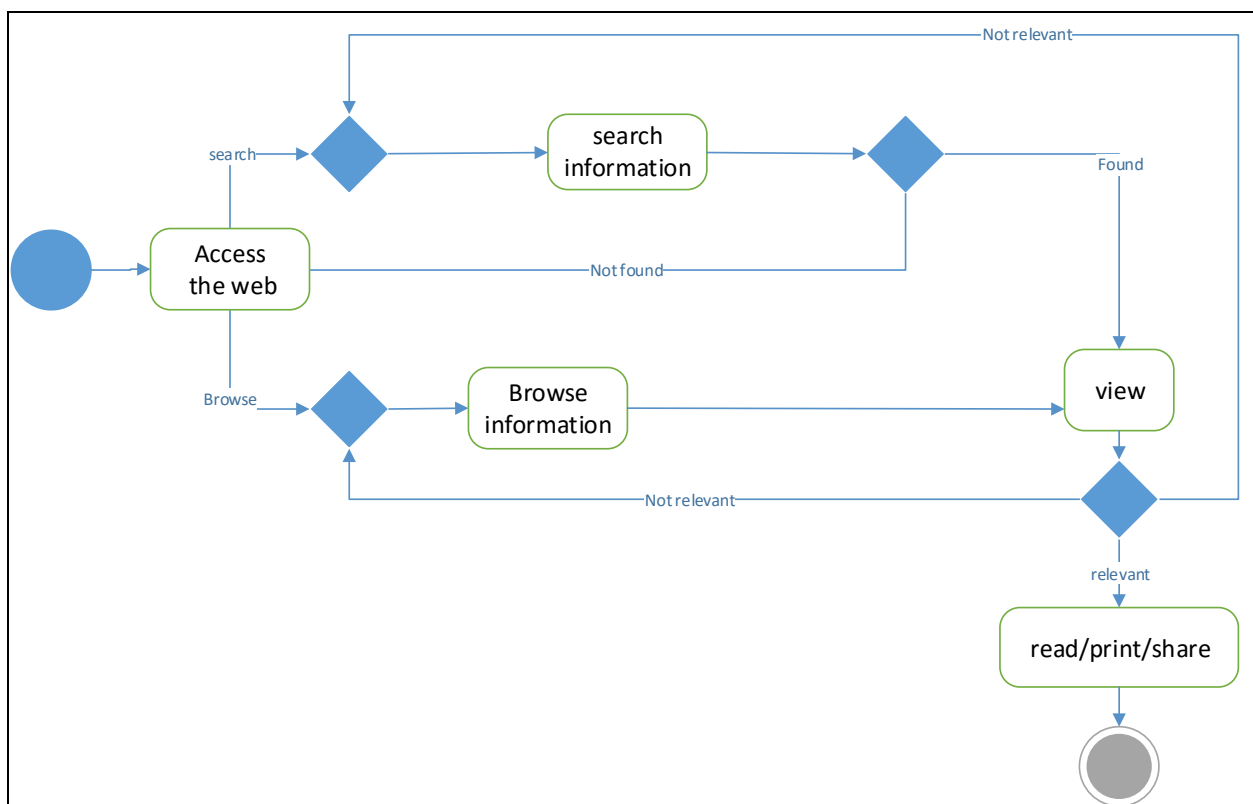


Figure 2: Activity Diagram

5.3.5 Class Diagram

Class diagram is an integral part of the unified modeling language. This diagram shows the object classes in the system and the associations between these classes. Class diagrams are used when developing an object-oriented system model to show the classes in a system and the

associations or link between classes that indicates the relationship between these classes. Consequently, each class may have to have some knowledge of its associated class (attribute) and the actions that class performs (operations). These attributes, operations are found together in a single block of box during the designing of the class diagram(44)

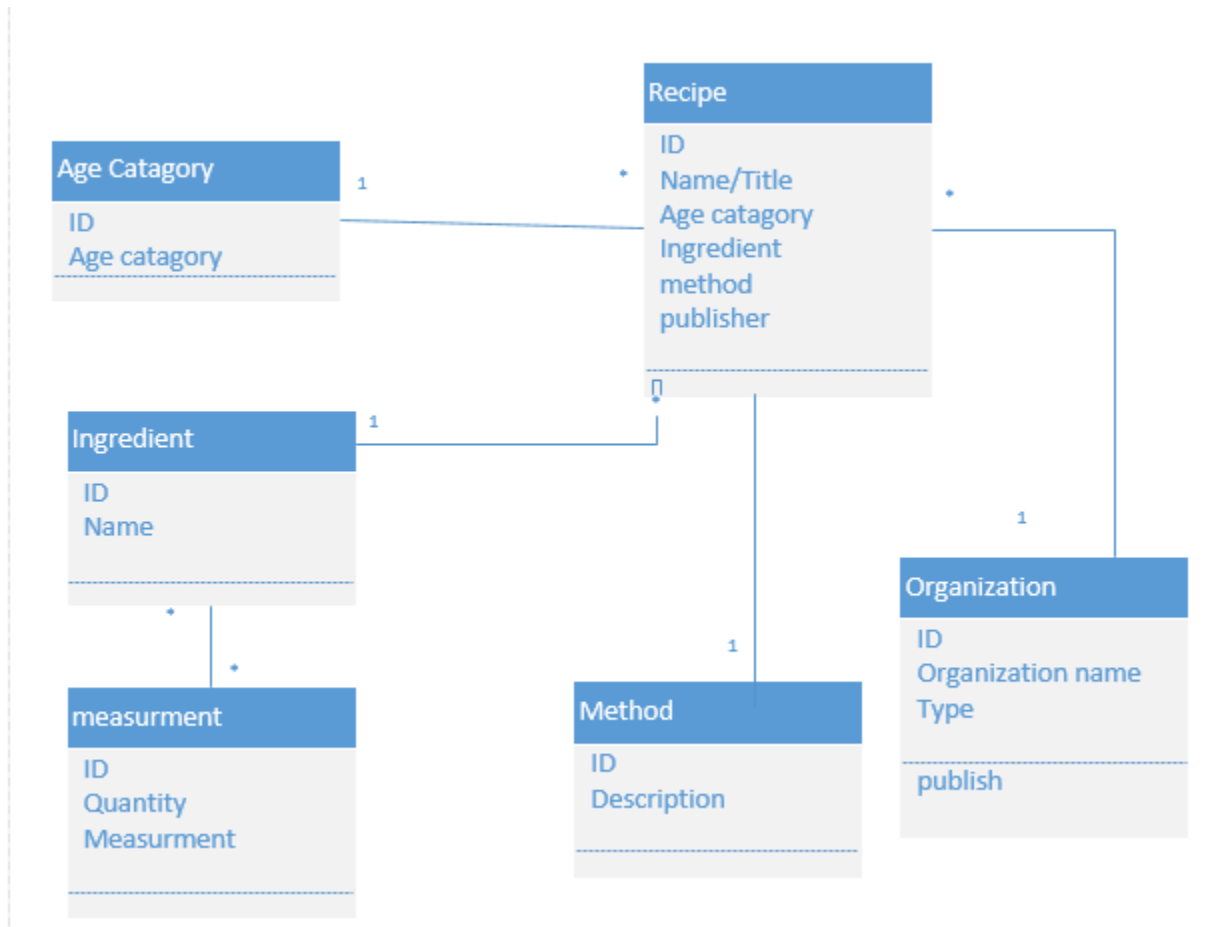


Figure 3: Class Diagram

5.3.6 Deployment Diagram

Deployment diagram describes the physical deployment of information generated by the software program on hardware components. (40) An object-oriented system consists of a number of executable files sometimes distributed across multiple computing elements. These diagrams show the assignment of executable files on the computing elements and the

communication that involves between these entities. As shown below this maternal and child information system have a web server, a database server, and the user's machine where they view the website.

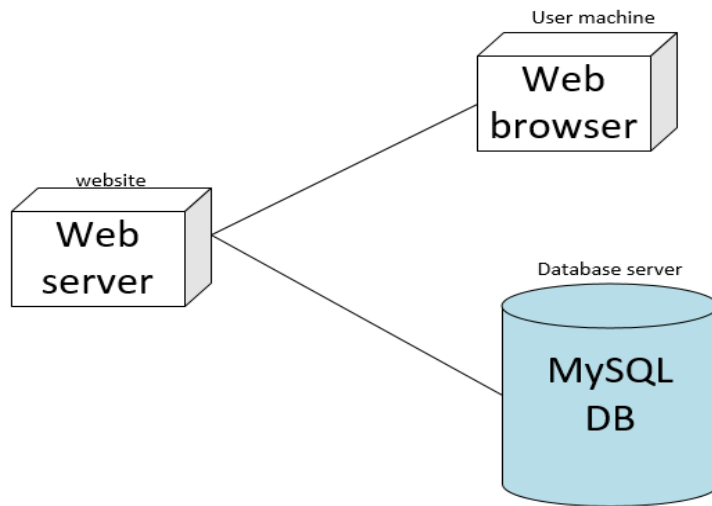


Figure 4 Deployment diagram

The essential components within three-tier architecture are client work station, application server and database server

- Presentation tier refers to the user interfaces of the system that helps to present data to the end user.
- Middle tier is concerned with the retrieval, processing, transformation, and management of application data.
- The database is the last tier in the architecture. This is the back-end of the system. It is all about the database and its structure.

5.3.7 Prototype

Web based Maternal and Child Nutrition Information System should be accessible at anytime, anywhere and display maternal and child nutrition information.

It will

- Provide basics of maternal and child nutrition information
- Provide complementary feeding recipes according to age group
- Display benefits of balanced diet
- Promote maternal and child nutrition for the general public
- Enhance the awareness of the public toward maternal and child nutrition
- Easy to search specific recipes

Each page and its components are discussed below for the easy understanding and usage.

5.3.6.1 Home Page

This maternal and child nutrition information system is detail information source that helps mothers to find basic maternal and child nutrition information. The first page (the home page) of maternal and child nutrition information system, allow any users to access the web who have interest to know about maternal and child nutrition. Different navigation tabs takes you to different contents of the web. People can share the page using social media links, can search information by inserting key work or search complementary food recipe using available food sources links. In addition to that user can send their message to the content developer using message box at the bottom of the page. The following figure illustrates the home page.

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የአመጋገብ ሥርዓት



CATEGORY ARCHIVES: መግቢያ

May 25, 2017 | መግቢያ | No comments

መግቢያ

እንኳን በደህና ወደዚህ ዓምድ መጡ።

በዚህ አምድ ላይ አመጋገብ ስርዓት ለእናቶች በእርግጥና እና በማጥጋት ወቅት፣ ለህፃናት ክልደት እስከ ሁለት አመት ፣

የጡት የማጥጋት ጥቅሞች | መሰረታዊ የሆኑ የምግብ ይዘቶችን፣ ሃጂ የሆኑ የአመጋገብ ስርዓቶች እንዲሁም ሌሎች ጠቃሚ መረጃዎችን ያገኛሉ።

እነዚህን መረጃዎች በመጠቀም እናቶች ፣ ህፃናት ተንከባካቢዎች እንዲሁም የጤና ባለሙያዎች የራሳቸውን እና የሌሎችን ህይወት ይታደጋሉ።

ፈልግ

Search

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Figure 5: home page

5.3.6.1.1 Search and retrieval

In this menu user can search any document on the web by inserting a key word in the search tab or user can access the database by selecting the age category through the recipe menu. In both ways the system display the list of recipe based on the request. The recipes are categorized based on the age groups 6-8, 8-12 and 13-24 months to meet the changing nutritional needs of the children in terms of calories, consistency and thickness.



Figure 6 user interface to search and retrieval

5.3.6.1.2 Feature of the site

The site have responsive feature, essentially resizable in portrait and landscape mode which is suitable for different devices desktop, laptop, tablet, or mobile devices.

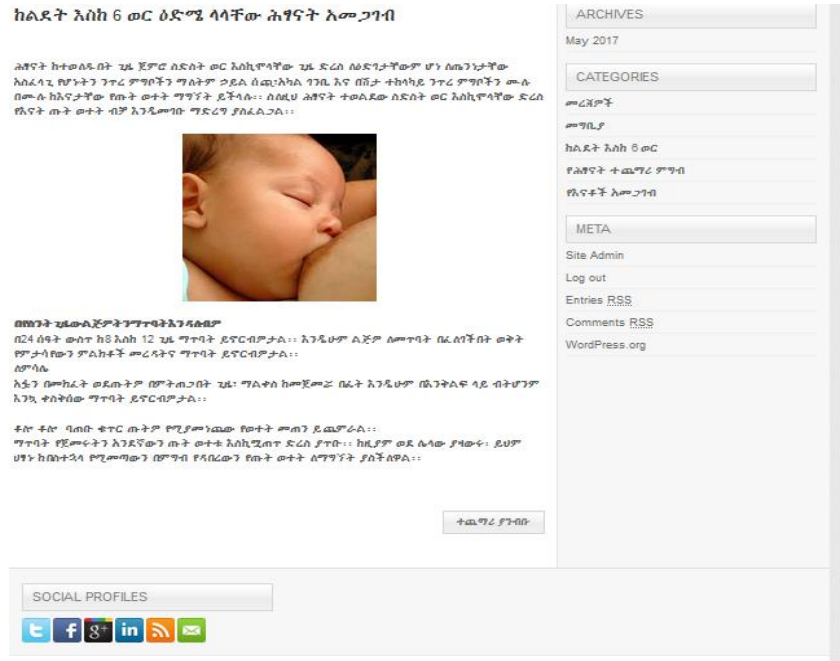


Figure 7 : example of responsive site with landscape mode



Figure 8 example of responsive site with portrait mode

5.3.6.2 Maternal Nutrition menu

This maternal nutrition page contains information about maternal nutrition during pregnancy and lactation. Nutrition requirement in each trimester, and the problems caused by malnutrition during pregnancy. The benefits of breastfeeding for the mother are also included.



Figure 9: Maternal information page

5.3.6.3 Child Nutrition menu

The child nutrition page contains basic information on child nutrition, when to start and content of complementary foods. The page presents techniques for mothers and caretakers how to introduce and effective child feeding practices. It also has information on what and how to feed sick child. Traditional malpractices in child feeding are part of the content of the web.

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የሕፃናት አመጋገብ

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ህፃናት ከተወለዱ ጋር ማዕከላዊ ሕይወት እንዲኖራቸው ድረስ የእናታቸውን ጡት ብቻ መውገብ ይኖርባቸዋል። በቀን እና በማታ ህፃናት ጡት መውጣት በፊሊፒንስ ጊዜ ሁሉ ጡት መውጣት ይኖርባቸዋል። (ቢያንስ ከ10-12 ጊዜ) ቶሎ ቶሎ ባጠቡ ቁጥር ጡትም የሚያመነጨው የወተት መጠን ይጨምራል። ማጥባት የጀመሩትን እንደሻውን ጡት ወተቱ እስኪጠጥ ድረስ ያጥቡ። ከዚያም ወደ ሌላው ያሳውሩ። ይህም ህፃን ከበስተኋላ የሚመጣውን በምግብ የሳበረውን የጡት ወተት ለማግኘት ያስችላል።

ከዚህ ወጭ በኋላ የሕፃናት ጡት ወተት መጠን ደረጃ በደረጃ ስለሚቀንስና በሌላ በኩል ደግሞ የህፃናት ዕድገት እየጨመረ ስለሚሄድ ሕፃናት የጡት ወተት ብቻ እየጠቡ ጥሩ እድገትና ጤንነት ሊኖራቸው አይችሉም ስለዚህ ተጨማሪ ምግብ መውሰድ ይኖርባቸዋል።

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- በንፁር ጉድለት የተነሳ የጤና ጠንቅ የሆኑ ሕፃናት ከምግቡ ጋር አብረው ወደ ልጅ እንጀት ሊገቡ ስለሚችሉና በጣም በለጋ ዕድሜ ያለ ሕፃን ይህን ለመቋቋም እቅም ስለሌላው በቀላሉ በበሽታ ሊጠቃ ይችላል።

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Search

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Test of Content

Hello world!

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A WordPress Commenter on Hello world!

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Screen

Figure 10: child Nutrition Information page

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ንጥረ ነገር

- 30 ግ (1 መካከለኛ የቡና ሲኒ ድርቅብ) የቡቆሎ ፍጅት
- 150 ሚሊ (1 ተኮል ትልቅ የቡና ሲኒ) ወተት
- 6 ግ (1 የጃይ ግንዚያ) ቅጠ ወይም ዘይት
- 1 ኮቢያ (1 ትልቅ የቡና ሲኒ) ወተት
- 1 ቅንጥር (ለጣቢያ ያህል) ጨው

አዘገጃጀት

- 1 ፍጅትን ጠቅሙ
- 2 በወተትና በወጥታ እትጥፍ ጨው ጥምር ጠግቱ
- 3 ቅጠ ወይም ዘይት ጨው ለማጣሰስ ጥብቃቅ
- 4 አወጥቶ ሲቆርድ ሕፃኑን በግንዚያ ጠግቱ

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Search

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Figure 11: Complementary feeding information page

5.3.6.5 Resources Page menu

The resource page contain resources like brochures, manuals, guidelines, complementary feeding recipe books in the area of maternal and child nutrition, produced by different governmental and non-governmental institutions. The materials are useful for those who need additional information in relation to maternal and child nutrition, it also provide relevant information for counseling mothers and child caretakers on how to feed their children 6-24 months, specifically on the aspect of complementary feeding. Related educational videos produced by FMOH are also uploaded.

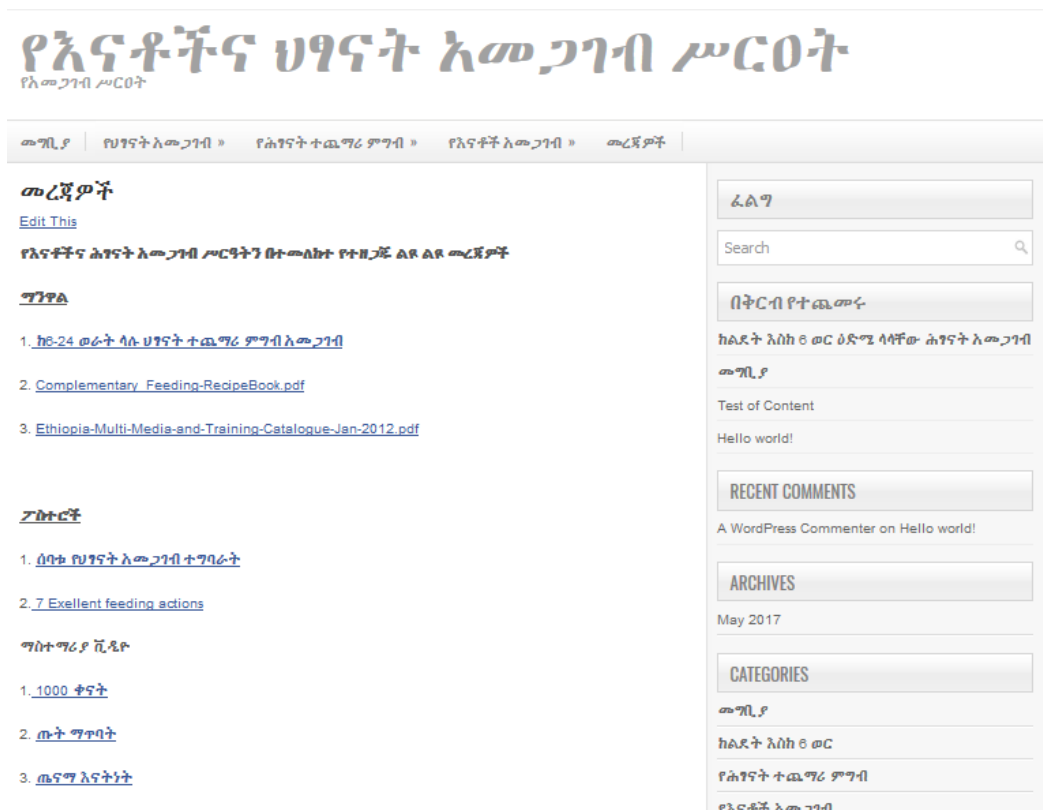


Figure 12: Resource Page

CHAPTER SIX

TESTING AND EVALUATION

6.1 Testing

Usability testing is a technique used in user-centered interaction design to evaluate a product by testing it on users. This can be seen as an irreplaceable usability practice, since it gives direct input on how real users use the system. (45) The primary goal of usability is to have products developed to maximize the users' ease of use, to better understand how real users interact with the product and to improve the product based on the results.

According to Jackson Dom definition (46) Usability tests are a way to gather useful feedback on the website, from a select sample of typical users. The tests are run with a user using the website with the aim to gather as much information about how the user interacts with the website as possible. This will then provide sufficient evidence and cause, then make changes to a website in order to make it more usable. It is the only real way to test whether or not the website is actually of any use to a user in the real world.

Usability of a system is defined by five main components (47)

Learnability: - How easy is it for a user to complete a basic task at their first use of a system?

Efficiency: - How quickly can a user familiar with the system perform tasks?

Memorability: - How easy is it for a returned user to reestablish proficiency regarding the system?

Errors: - How many errors does a user make using the system? How severe are the mistakes, and how difficult or easy is it to recover from the mistakes?

Satisfaction: - How satisfactory is it to use the product

To evaluate the proposed system Morea usability testing software were used. (48)Morae's three components, Manager, Recorder and Observer, work together to provide a complete picture of the user experience. Morea's software performs the usability testing, analysis and presentation. It is possible to find specific user activities in the recording—such as Web page changes, keystrokes, mouse clicks, or window events. Morea's manager automatically calculating and graphing standard usability measurements including effectiveness, efficiency, and satisfaction. It also lets create and save custom measurements as templates that can be reused as consistent measures across studies. A standard user satisfaction survey (SUS) is built into Morae, and scores are calculated and graphed automatically.

In order to understand the user's need and how they interact with the system empirical usability evaluation methods were used. (47)Empirical evaluation methods which is most popular and common methods in usability engineering were , empirical evaluation methods basis on end users or actual user of the system. The goal of this evaluation method is not to set rank between the participant rather to find out the actual problems in the software usability process.

Participants of the test perform a list of tasks using Web based Maternal and Child information system, beforehand brief explanation was provided on the system (the flow and the features of the system). After the tasks were completed, participants were asked to provide feedback on their likes and dislikes of the system. Users try to accomplish real tasks, with a product under controlled conditions; it can provide objective performance data, such as time on task, error-rate, and task success. Therefore, the following performance measures were used for Maternal and Child Nutrition Information System usability test

- Time to complete each task (minute and second)
- Mouse Click and Mouse Movement

6.2 Evaluation methods

The Maternal and Child Nutrition Information System usability was conducted at Abyssinia Health center which is found in Addis Ketema sub city, using Morea installed laptop. The session captured each participant's navigational choices, task completion rates, comments,

overall satisfaction ratings, questions and feedback. The purpose of the test was to assess the usability of the web interface design, information flow, and information architecture. Five mothers and one MCH focal person involved in a usability test. Each individual session lasted approximately 15 minute

The evaluation of the interface for Maternal and Child Nutrition information system used a method of questionnaires with major usability criteria to evaluate the interface for the prototype developed. The tasks summarized as follow

Table 10: Expected task performance measure per time

No.	Task	Time measurement
1.	Access the web by selecting the URL	It should be completed within 15 second
2.	Access maternal nutrition information	It should be completed within 7 minute
3.	Access child nutrition information, and find how to introduce supplementary foods	It should be completed within 24 second
4.	Access complementary feeding and select how to prepare food for an infant	It should be completed within 21 second
5.	Browse information on feeding 0-6 month child	It should be completed within 24 second
6.	Browse a manual	It should be completed within 8 second
7.	Return to the home page	It should be completed within 7 second

6.2.1 Time to complete each task (minute and second)

The testing software recorded the time on task for each participant. Some tasks were more difficult to complete than others and is reflected by the average time on task. Participants were expected to do left clicks only in all task, however they made attempts to use the right click to perform these tasks due to this they take loge time to perform a single task. Task 3 required participants to access child nutrition information and estimated time to be completed within 24 seconds but user 5 took 42 seconds which is the longest time to be completed. This is because of lack web browsing experience, introducing complementary feeding was found at the bottom of the page she have to scroll down to find the page but she couldn't find it so she ask for support.

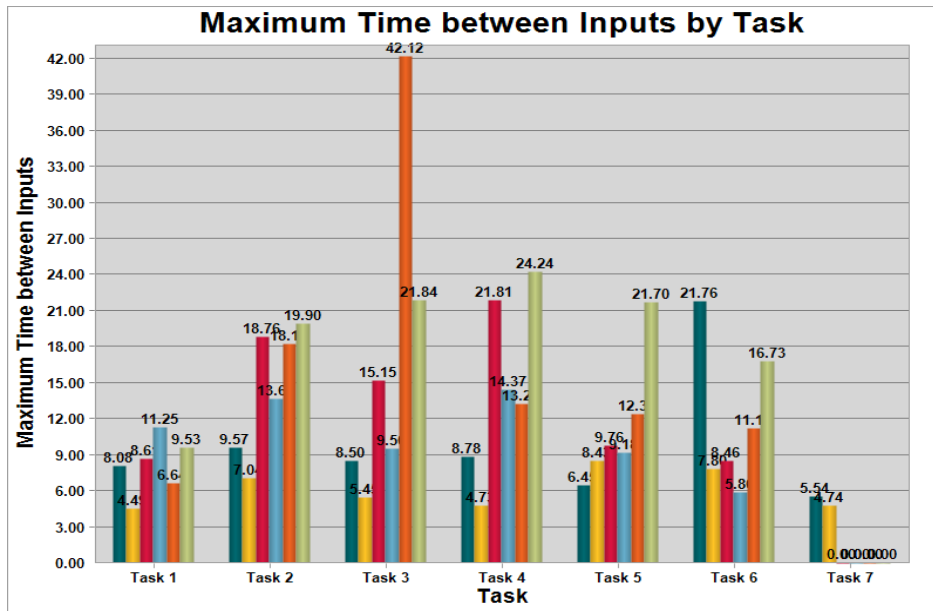


Figure: 13 Average time to perform each task

Average time to complet task

It is observed that previous experience using the computer determine the time taken to complet a task . As the evaluation indicate almost all of the participants have similar level of computer skill exept user 5, she use unnecesary mouse movment and wrong clicks that is why she took loger time to complet the tasks . The average time to complete all the given tasks by each participant is illustrated below

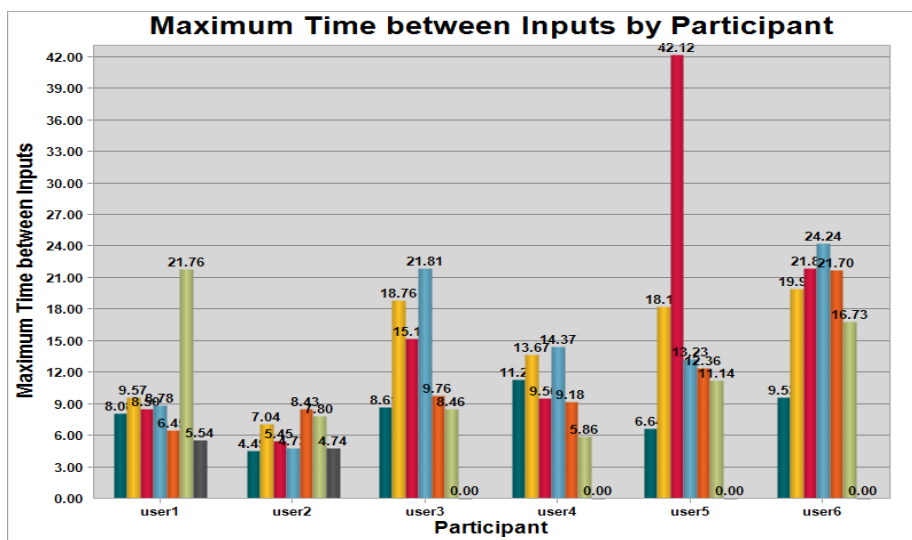


Figure 14: Time taken to perform task by participant

6.2.2 Average number of mouse clicks per task

The average number of mouse clicks showed the tasks which were most confusing or difficult to perform. Task 4 (accessing complementary feeding information) and Task 6 (access resources page and selecting manual) take the greatest number of mouse clicks as compared to the number of mouse clicks for the other tasks. For instance, browsing resources should not take more than 2 clicks, but it is observed that an average of 4 mouse clicks was done in order to perform this task. The following graph shows the average number of mouse click per task.

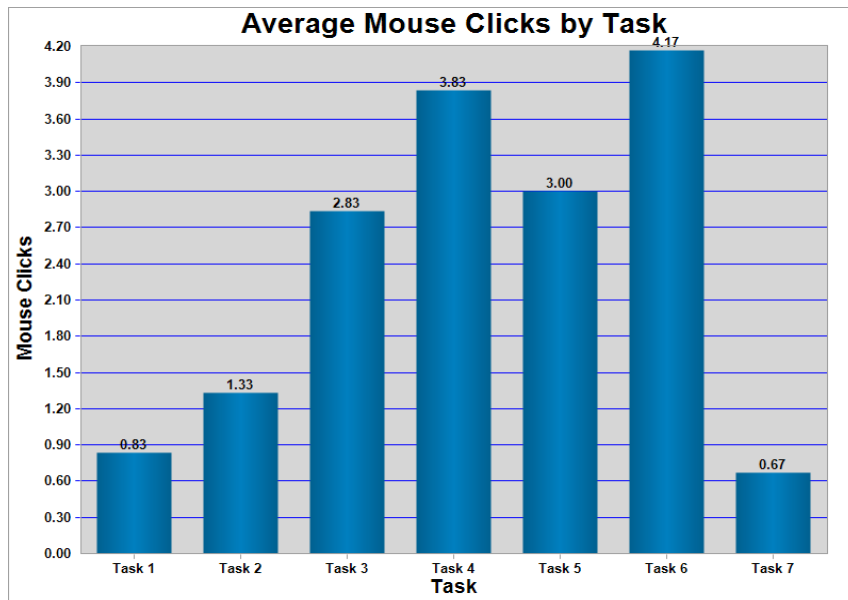


Figure 15 : Average mouse click by task

6.2.3 Post-test survey

Users were able to complete all the tasks successfully. Most of the participants agreed that the site was easy to use and they would like to use the site frequently and that the site's content would keep them coming back. For better understanding and readability of the presentation, the survey question are changed to positive statements and are analyzed accordingly.

Table 11: Response summary of participants' satisfaction

	Agree	Undecided	Disagree
Satisfaction			
I think that I would like to use this system frequently	80%	20%	
The system compose basic information	100%		
I found the various functions in this system very well integrated	100%		
I found the system very easy to use	100%		
Learnability			
I found the system very simple		60%	40%
I would imagine that people with minimum computer skill will use the system easily	50%	20%	30%
The system was easy to use	100%		

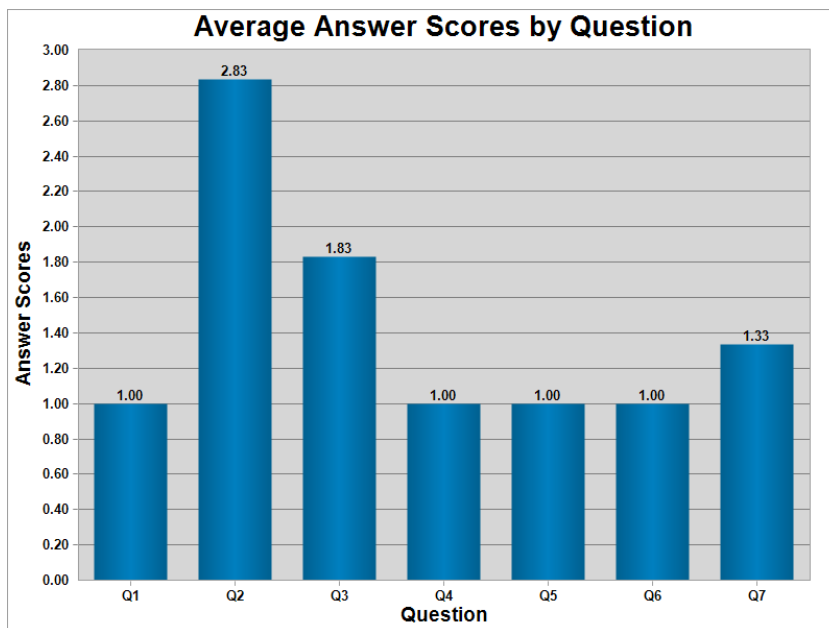


Table 12 : User Satisfaction Survey

After the survey was completed participants were asked to give their feedbacks/ feelings about the system. Overall participants had the impression that the system have relevant information about maternal and child nutrition. Users responded favorably towards the graphics of the site. They felt that the information is very useful, easy to use and to locate; moreover they appreciate using Amharic language for the development of the site.

CHAPTER SEVEN

CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

Maternal and Child Nutrition Information System is a web based application which provide basic information on maternal and child nutrition. The site introduce balanced and healthy eating practice during pregnancy and lactating. It also promote breastfeeding and introduce complementary feeding contents and way of food preparation for the community. The primary goal of providing information on maternal and child nutrition is to create awareness on what constitutes a healthy diet and ways to improve diets and addresses major causes of morbidity and mortality occurred due to malnutrition at the national level.

This Maternal and Child Nutrition Information System comprise basic information on food contents, nutrition causing problems, benefits of breastfeeding, maternal nutrition in each trimester and during lactating and how to introduce supplementary foods. It also provides educational materials in the form of manual and video.

This project represent an electronic version of maternal and child information which enable easy access of information. In order to develop the prototype system, information is acquired through interviews with mothers. Relevant documents were reviewed and consultation from experts in the field was received.

Unified modeling language method was used to analyze the collected requirements and to create the design of the system. The system is developed using word process content management sys system. Testing and evaluation of the prototype system was done to describe to what extent the system is usable, then the users were asked to evaluate the usability of the system through user satisfaction survey. The result of the test shows almost all respondents are happy with the system.

Generally, this Maternal and Child Nutrition Information System will serve as a basic source of information. Hence, the prototype system achieves a good performance and meets the objectives of the project. Above all, the system operates in Amharic language and the site has a responsive feature to be used in different platforms like desktop, laptop, tablet, or mobile devices and can be accessible in all areas and personal use.

7.2 Recommendations

The following recommendations are made based on the findings:

- The system should add more functionality and content
- The system should be upgraded to the full-fledged site
- The content of the web should be periodically updated
- The content of the web should be translated in multiple local language
- In order to enhance easy access of information, the system should be deployed in all facilities that provide maternal and child health service
- Mobile app should be developed for the system

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Annex

Information Sheet

Thank you for taking the time to complete this survey. I am a student at Addis Ababa University in Health Informatics, graduate studies. The title of my project is “Design and development of web based maternal and Child Nutrition information system” .The aim of this preliminary survey is to assess the existing source of information, access and awareness level of mothers and care givers about maternal and child nutrition information

This project will support the intervention of maternal and child morbidity and mortality due to malnutrition. Mothers, care givers, the government, the community at large are expected to benefit from the results of this project. Your cooperation in this survey is much appreciated. Your responses will be used as an essential input for the defining of requirements which is important for designing of the web based maternal and child nutrition information system.

This interview will take you approximately 10-15 minutes to complete the survey.

As a participant of this survey, please note the following: You may seek clarification on any of the questions and you may withdraw from the survey at any time you wish to.

Your responses will be kept absolutely confidential. The results collected from the survey will be used for the purposes of the research only.

Once again, thank you for your kind cooperation.

Yours sincerely,

ጤና ይስጥልኝ

ስሜ ትዕግስት ኃብታሙ ይባላል። ከአዲስ አበባዩኒቨርሲቲ የድህረ ምረቃ ፕሮግራም በእናቶች እና ህፃናት አመጋገብ ላይ ጥናት ለማድረግ ወ-የመጣሁት።

የመጠይቁ ዋና አላማ በእናቶች እና ህፃናት አመጋገብ ላይ ማህበረሰቡ መረጃዎችን በምን አይነት መንገድ እንደሚያገኙ እንዲሁም እናቶች ኮምፒውተር ቴክኖሎጂ ያላቸው ግንዛቤ ምን ያህል እንደሆነ ለማወቅ ሲሆን፡

የምትሰጡን ምረጃ እናቶች በእርግዝና ወቅት ስለሚመገቡት እና ህፃናት ልጆቻቸውን ስለሚመገቡት ምግብ ቀለሉ መረጃ ለማግኘት የሚያስችል የመረጃ ምንጭ (web base application) ለማድረጅ ከፍተኛ እገዛ ይኖረዋል።

ይህ መጠይቅ ከ10-15 ደቂቃ የሚሆን ጊዜ ያችሁን ብቻ የሚወስድ ይሆናል። ስለመጠይቁ ማወቅ የምትፈልጉትን ሁሉ መጠየቅ ትችላላችሁ። እንዲሁም መጠይቁ አሰልጅኖ ከሆነባችሁ ማቋረጥ ትችላላችሁ።

የምትሰጡን ምላሽ ሚስጥራዊነቱ የተጠበቀ ሲሆን ከዚህ መጠይቅ የሚገኘው መረጃ ለሚደራጀው በእናቶች እና ህፃናት አመጋገብ የመረጃ መረብተግባራዊነት ከፍተኛ እገዛ ይኖረዋል።

ስለትብብራችሁ በቅድሚያ አመሰግናለሁ።

Consent form

I the undersigned have been informed that this interview is part of the study that explore maternal and child nutritional information requirement analysis. I have been told that the study will help to develop web based maternal and Child Nutrition information system, which enables mothers and care givers to access maternal and child nutrition information easily. And also have been told about the time it took to complete the interview i.e. approximately 10 minutes.

Therefore, I am consented to participate in the study by signing this form.

The Study participant's

Signature _____

Date _____

Investigator

Name _____

Mobile Number _____

ይህ መጠይቅ እናቶች በእርግዝና ወቅት ስለሚመጡት እና ህፃናት ልጆቻቸውን ስለሚመጡት ምግብ በቀላሉ መረጃ ለማግኘት የሚያስችል የመረጃ ምንጭ (web base application) ለማድረግ የሚሰበሰቡ መረጃ መሆኑን ተረድቻለሁ። እንዲሁም መጠይቁ የሚፈጀው ጊዜ ከ10-15 ደቂቃ ብቻ እንደሚሆን ተነግሮኛል።

ስለዚህ በዚህ መጠይቅ ላይ ለመሳተፍ ተስማምቻለሁ።

መረጃ ሰጪ

ስም _____

ፊርማ _____

ቀን _____

የስልክ ቁጥር _____

የመረጃ ሰብሳቢ

ስም _____

Interview Guide

እናቶች እና የሀፃናት አሳዳጊ (ሞግዚቶች) ስለ እርጉዝ እናቶች እንዲሁም ሀፃናት አመጋገብ መረጃዎችን በምን አይነት መንገድ እንደሚያገኙ እንዲሁም ለኮምፒውተር ቴክኖሎጂ ያላቸው ግንዛቤ ምን ያህል እንደሆነ ለማወቅ የሚረዳ መረጃ ማሰባሰቢያ መጠይቅ።

መግቢያ

ዕድሜ

----15-19 ----20-24 ----25-29 ----30-34 ----35-49

የትምህርት ደረጃ

- ምንም አልተማርኩም
- የመጀመሪያ ደረጃ ትምህርት ተምረያለሁ
- የሁለተኛ ደረጃ ትምህርት ተምረያለሁ
- ሌላ _____

የአፍ መፍቻ ቋንቋዎ

ልጆች አለዎት _____ ስንት _____

ክፍል 1 : መረጃ ስለማግኘት

1. በእርግዝና እና ወቅት ስለሚመጡት ምግብ መረጃ ሌሎችን ጠይቀው ያውቃሉ?
---አዎ ---አይ አላውቅም

2. መልስዎ አዎ ከሆነ መረጃውን ለማግኘት ማንን ያማክራሉ ?
---ቤተሰቤን ---ጓደኞቼን
---ከመፀሀፍት ላይ መረጃዎችን እፈልጋለሁ
---ከጤና ተቋማት ትምህርት አገኛለሁ
--- ሌላ _____

3. ምን አይነት መረጃ ነበር ያገኙት

4. መልስዎ መረጃ ሌሎችን ጠይቄ አላውቅም ከሆነ ምን ይመጡ ነበር?

5. በሚያጠቡበት ወቅት ምን መመገብ እንዳለብዎ መረጃ ጠይቀው ያውቃሉ?

---አዎ ---አይ አላውቅም

6. መልስዎ አዎ ከሆነ መረጃውን ለማግኘት ማንን ያማክራሉ ?

---ቤተሰቤን ---ጓደኞቼን

---ከመፀሀፍትላይ መረጃዎችን እፈልጋለሁ

---ከጤናተቋማትትምህርት አገኛለሁ

--- ሌላ _____

7. ምን አይነት መረጃ ነበር ያገኙት

8. መልስዎ አላውቅም ከሆነ ምን ይመገቡ ነበር?

9. ስለ ሕፃን ልጅዎ አመጋገብ መረጃ ጠይቀው ያውቃሉ?

---አዎ ---አይ አላውቅም

10. መልስዎ አዎ ከሆነ መረጃውን ለማግኘት ማንን ያማክራሉ ?

---ቤተሰቤን ---ጓደኞቼን

---ከመፀሀፍትላይ መረጃዎችን እፈልጋለሁ

---ከጤናተቋማትትምህርት አገኛለሁ

--- ሌላ _____

11. ምን አይነት መረጃ ነበር ያገኙት

12. ስለ ሕፃን ልጅዎ አመጋገብ መረጃ ጠይቀው የማይውቁ ከሆነ ልጅዎን ምን ይመግባሉ?

13. መረጃዎቹን በምን መልኩ ነበር ያገኙት?

-----በቃል -----በፅሁፍ ሌላ _____

14. ያገኙትን መረጃ ለሌሎች የሚያካፍሉበት ወይም እርስ በርስ መነጋገር የሚያስችሎት አጋጣሚ ነበር ? ካለ ቢጠቅሱልን

15. ልጅዎን ጡት ያጠባሉ?

---አዎ ---አይ አላውቅም

16. መልስዎ አላጠባም ከሆነ ለምን?

17. የተመጣጠነ ምግብ ለልጆች መመገብ ሲባል እንዴት ይረዱታል

18. ስለ አንድ ሺህ ቀናት የሚነገሩትን

--አውቃለሁ --አላውቅም --ስምቻለሁ ግን አልገባኝም

ክፍል 2 : ስለቴክኖሎጂ አጠቃቀም

19. የኮምፒውተር አጠቃቀም ችሎታዎ በምን ደረጃ ላይ ይገኛል?

--አልጠቀምም --ዝቅተኛ --መካከለኛ --ከፍተኛ

20. የኢንተርኔት አገልግሎት ተጠቅመው ያውቃሉ? ለምን አገልግሎት

21. በሞባይል ስልክዎ መረጃዎችን ፈልገው ያውቃሉ?

--አውቃለሁ --አላውቅም

ሰጠና ባለሞያ

1. ስለእናቶችና ሕፃናት አመጋገብ ስርዓት የተዘጋጁ ፅሁፎች እንዳሉ ያውቃሉ?

--አውቃለሁ --አላውቅም

የሚያውቋቸውን ቢጠቅሱልን _____

2. ስለ እናቶችና ሕፃናት አመጋገብ በተቋሙ ትምህርት ይሰጣል?

--ይሰጣል --አይሰጥም

3. መልስዎ ይሰጣል ከሆነ በምን አይነት መልኩ ነው ትምህርቱ የሚሰጠው

--- በቲቪ --- በሬዲዮ --- በባለሞያ ሌላ _____

4. የእናቶችና ሕፃናት አመጋገብ ስርዓት ትምህርት በየትኛው ወቅት ይሰጣል?

-----በእርግዝናክትት ወቅት

,,,,,,ለክትባት በሚመጡበት ወቅት

,,,,,,ለቤተሰብ ምጣኔ አገልግሎት በሚመጡበት ወቅት

ሌላ _____

5. በእናቶችና ሕፃናት አመጋገብ ስርዓት ትምህርት በሚሰጥበት ወቅት ያጋጠመዎ ችግር አለ?

6. በጠና ጣቢያው የኢንተርኔት አገልግሎት አለ

----አለ ---የለም

ለምን አገልግሎት ትጠቀሙበታላችሁ

----ከሙያ ጋ የተገናኙ መረጃዎችን ለመፈለግ

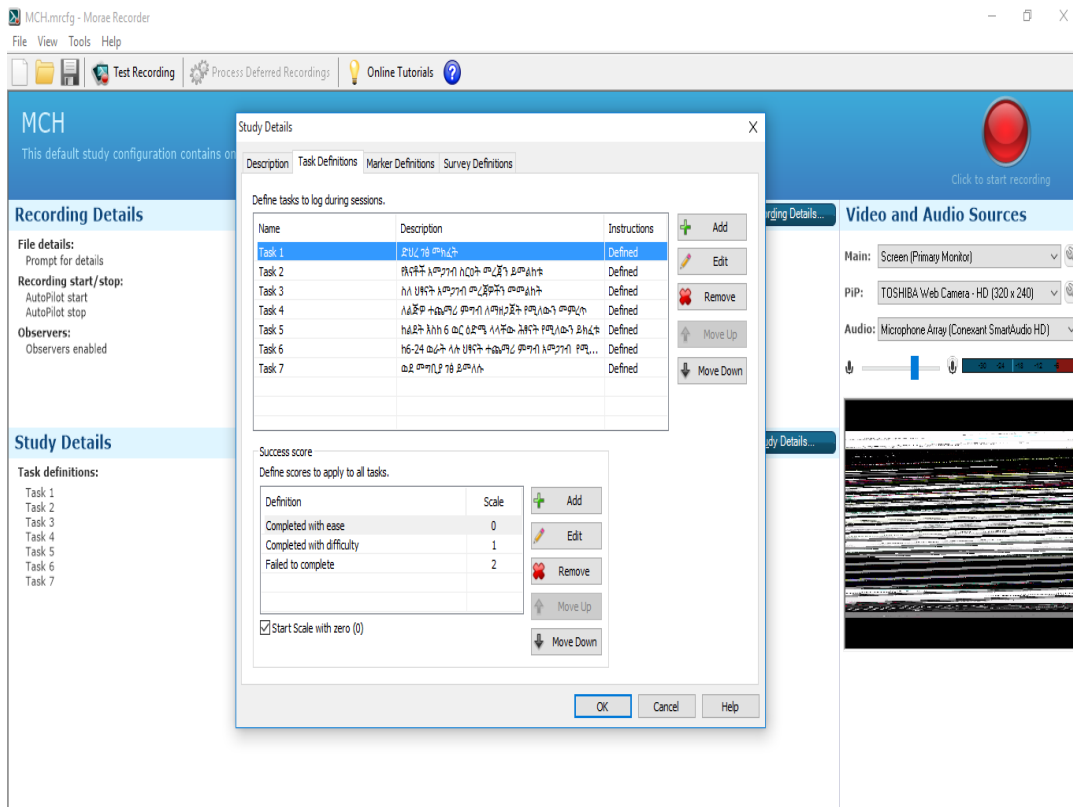
---ለግል መጠቀሚያ

7. ስለእናቶችና ሕፃናት አመጋገብ የማስተማሪያ ሪሶርስ አላችሁ

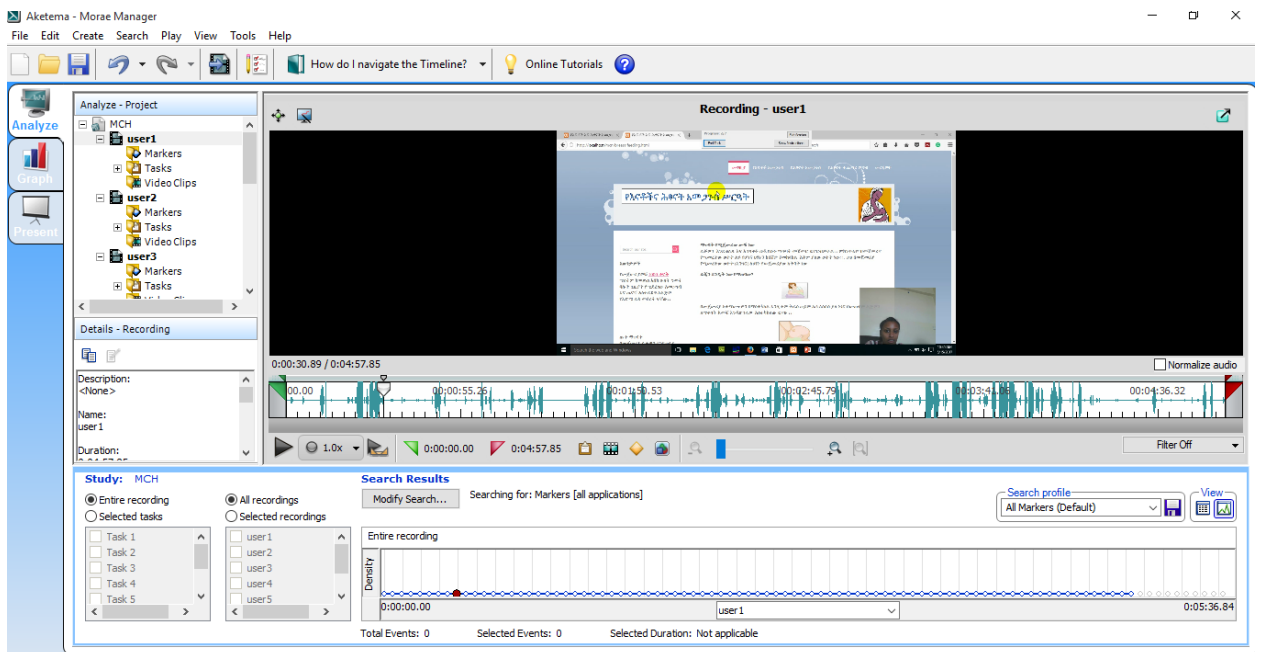
---አለ ---የለም

8. በጠና ጣቢያው ከዚህ ቀደም የተጀመሩ ኮምፒውተር ይዘድ ሲስተሞች አሉ


Morea usability test questions



Morea observer screen shot



Morea survey question

 Survey1

1. ድረ ገፁ ለአጠቃቀም ቀላል ነው

1 2 3
እስማማለ አልስማማ

2. ድረ ገፁ ለአጠቃቀም አስቸጋሪ ነው

1 2 3
እስማማለ አልስማማ

3. ድረ ገፁ ለመጠቀም የኮምፒውተር እውቀት ያስፈልጋል

1 2 3
እስማማለ አልስማማ

4. ድረ ገፁ ስለ እናቶች አመጋገብ ጠቃሚ የሆኑ መረጃዎችን ይዟል

1 2 3
እስማማለ አልስማማ

5. ድረ ገፁ ስለ ህፃናት አመጋገብ ጠቃሚ የሆኑ መረጃዎችን ይዟል

1 2 3
እስማማለ አልስማማ

6. ድረ ገፁ በተለያዩ ዕውቀት ደረጃ ላይ ያሉ ተጠቃሚዎች ሊጠቀሙበት ይችላሉ

1 2 3
እስማማለ አልስማማ

7. በድረ ገፁ ላይ ያገኙት መረጃ በድጋሚ እንዲጠቀሙበት የሚጋብዝ ነው

1 2 3
እስማማለ አልስማማ

Close

Declaration

I, the undersigned, declare that this thesis is my original work in partial fulfillment of the requirement for the Degree of Masters of Science in Health Informatics and has not been presented for a degree in this or any other university. All source of material used for this thesis and all people and institutions who gave support for this work have been duly acknowledged.

Name: **Tigist Habtamu**

Signature: _____

Place: Health Informatics Program, Faculty of Informatics, Addis Ababa University

Date of submission: May 30/2017

This thesis has been submitted for examination with our approval as the university advisors.

Name of the advisors

Signature

Rahel Bekele (Phd) _____

Robel Yirgu (MPH) _____