How to reduce child mortality and improve maternal health?

With technology

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Abstract—*"One out of every 22 women in Africa dies from pregnancy or childbirth"* **[1]**, *"Approximately 11 million children under five still die annually in developing countries"* **[1]** or *"The equivalent to more than 1,000 children dying ever hours"* **[1]**. **From above information is showing the important problem which many people in many countries are explored. Lack of maternal healthcares is one from many causing in a large burden of babies' deaths in many countries. In order to mitigate the critical problems in developing countries, The United Nations has addressed the Millennium Development Goals (MDGs) [2]. MDGs are eight goals [3] to be achieved by 2015 that respond to the world's main development challenges and helping countries improve their capacity to achieve the MDGs. The top 2 priorities from 8 goals are Goal 4: to reduce child mortality and Goal 5: to improve maternal health [4] if 2 problems are solved will reduce the maternal and children deaths ratio. This paper proposed the application which consists of many component and synthesis in a single package for to achieve the MDGs goals. Our system applies mobile technology, web services, healthcare social networking, health based contents and health care service provider for reducing child mortality rates with technology.**

I. INTRODUCTION

The issues of mother and child life protection and the quality of life improvement have been addressed by many world class organizations such as World Health Organization (WHO), The United Nation (UN), The United Nations Development Programme (UNDP) and The United Nations Children's Fund (UNICEF). The United Nations has addressed the Millennium Development Goals (MDGs). MDGs are eight goals to be achieved by 2015 which respond to the world's main development challenges. Two of eight Goals are to reduce child mortality (Goal 4) and to improve maternal health (Goal 5). They are considered to be the most critical goals for better human life to be achieved by 2015. Nowadays, the millennium computer technology has grown rapidly. The innovative technology and software can be brought to our considerations in order to achieve the UN's goals. What kind of technology would have the extra-ordinary ability to fulfill the MDGs 4 and 5? It is the great challenge for human being to overcome such problems. This application is the brilliant solution to those critical issues.

Maternal and Child Care version 1 is a software prototype, which is an intelligent Maternal & Child Care system for increasing and improving the quality of mother and child's life. It provides lot of utilities such as family planning, training of skilled birth attendants, deliver emergency obstetrical care and newborn care when life-threatening complications arise, etc. It can easily be utilized by people, organizations, companies or foundations with multiple purposes. The application is an innovative application that can particularly help us achieve the millennium development goals 4 and 5 addressed by the United Nations.

The remainder of the paper is organized as follows. Sections 2 and 3 describe a motivational scenario and a brief description of the involved technologies in order to provide a background for the rest of the paper. Section 4 describes the Implementation that provided the data for the application described above. Finally, section 5 introduces general conclusions about the work.

II. BACKGROUND

This section describes a definition terms that related to our solution as following:

A. MDGs

The Millennium Development Goals (MDGs) [2, 3] are eight goals to be achieved by 2015 that respond to the world's main development challenges. The MDGs are drawn from the actions and targets contained in the Millennium Declaration that was adopted by 189 nations-and signed by 147 heads of state and governments during the UN Millennium Summit in September 2000. The eight MDGs break down into 21 quantifiable targets that are measured by 60 indicators. The MDGs consist of eight goals as shown in below:

--Goal 1, Eradicate extreme poverty and hunger

--Goal 2, Achieve universal primary education
--Goal 3, Promote gender equality and empower women
--Goal 4, Reduce child mortality
--Goal 5, Improve maternal health
--Goal 6, Combat HIV/AIDS, malaria and other diseases
--Goal 7, Ensure environmental sustainability
--Goal 8, Develop a Global Partnership for Development

Figure 1 illustrates the significant of the Millennium Development Goals that defined by The United Nation.

Figure 1: The United Nation Millennium Development eight Goals.

B. MDGs 4-5

UN developed out of the eight chapters of the United Nations Millennium Declaration. There are eight goals with 21 targets and a series of measurable indicators for each target.

1) MDG 4 - Reduce Child Mortality: The target is to reduce by two-thirds, between 1990 and 2015. Reaching the MDG on reducing child mortality will require universal coverage with key effective, affordable interventions like: care for newborns and their mothers; infant and young child feeding; vaccines; prevention and case management of diarrhea; pneumonia and sepsis; malaria control; and prevention and care of HIV/AIDS. In countries with high mortality, these interventions could reduce the number of deaths by more than half. UNICEF's defined a basis measure to help children survive as following: [6]

2) MDG 5 - Improvement of Maternal Health: On goal 5, they set two targets as following:

--Target 5a: Reduce by three quarters the maternal mortality ratio
--Target 5b: Achieve, by 2015, universal access to reproductive health

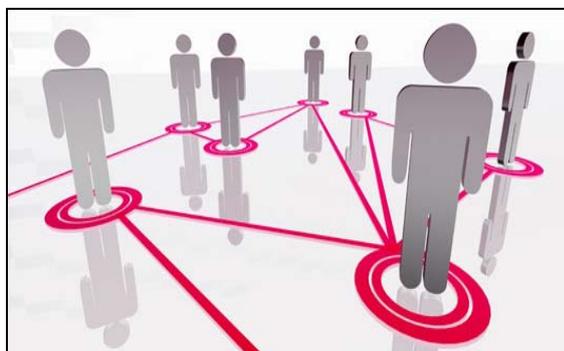### C. Social Network and Mobile Social Network

Figure 3: Social Network

From figure 3: Social Network is the grouping of individuals into specific groups, like small rural communities or a neighborhood subdivision. A current trend for social networking such as MySpace and Facebook, the internet is filled with millions of individuals who are looking to meet other internet users to develop friendships and business relationships together. In addition, Social Network makes connection with people with similar interests and goals. Now the social networking is to turn on mobile and become Mobile social networking. Mobile social networking is social networking where one or more individuals of similar interests or commonalities, conversing and connecting with one another using the mobile phone. 3G Network achieved, the mobile social network is applied to support full function of multimedia as streaming VDO, Movie and Voice.

III. USER SCENARIOS AND OUR PURPOSED

This section separates into 2 subsections as section one describes all functionalities of this application through user scenarios and on section two describes the architectural overviews as following:

A. User Scenarios

Rose was a Mom-to-be who was 3 months pregnant. She had heard that currently the child mortality rate was increasing rapidly. She was so anxious about her pregnancy and how to take good care of her baby until she gave birth safely. She needed some advices from doctors or experienced persons about maternity & child care instructions during her pregnancy. But she was facing the problems about not getting the exact information she needed. So she went to seek advice from her best friend "Bee", who had just given birth to her 2 months old twins. Bee advised that during her pregnancy, she used a new technology for mother and child's care to guide her on: family planning, advice on having a baby and maternity care. This new technology works perfectly and successfully, the application can work incorporation with the doctors. When Bee and her husband went to consult the doctor on their family planning and having children, the doctor recommended on its. Bee shared her experience with Rose about using this application for maternity and child care.

What the application can do?
1)The doctor first entered Bee's general information such as age, weight, height, blood group and provided an appointment schedule into this application as a control center. The information was personally recorded and generated the maternity care program for Bee.

2) The application will track and monitor the doctor appointment schedule. It also reminds Bee and her husband by alerting before the appointment date arrives. In addition, it sends useful information about the week-by-week pregnancy guide to Bee so that she can take good care of herself and her child. Moreover, Bee and her husband are

able to record into this application all useful information about doctor appointment, taking medicine, getting vaccines, diet eating and so on.

3) When Bee was 5 months pregnant, she had an accident by slipping and falling in her house. She was hurt badly in her stomach and bleeding a lot. But there was nobody around to help her at that time. So, she used our application to contact the hospital for emergency.

4) The hospital retrieved address information from the system and checked for the traffic information via GPS and location-based services, but the traffic volume was high from her house to the hospital. So, they used this application to contact another hospital which located in the neighborhood area of Bee's house. Shortly the ambulance arrived at her house and Bee was taken to the hospital.

5) The application facilitated the hospital in preparing for treatment just before her arrival. The doctor was able to obtain Bee's profile from her previous doctor. All information including the ultrasound images that were previously recorded in this application can be retrieved and analyzed in details. When Bee arrived at the hospital, the doctor knew what's going on and did the ultrasound again to check if everything was OK. Fortunately, Bee and her babies were safe. He recorded the ultrasound VDO streaming into the application. After that, Bee sent that ultrasound images to her husband who was out of town via our application.

6) This application constantly and continually sends useful information about maternity and child care to Bee as organized by the program.

After safely giving birth to her babies, Bee used the application to memorize information about her babies such as date of birth, weight, images, VDOs and so on. She enjoys sharing pictures and information with other Moms via this application in chat room.

B. The Architectural Overview

Furthermore, the application also follows up the child's development by providing the growth chart which shows how your child is growing compared to the standard growth rate. The system will send parents tips on how to take good care of children. The application also alerts parents in order to remind them when to bring their child to get vaccine, what vaccinations their child needs, the recommended age to get them, the possible side effects and where they can find the nearest health center.

IV. IMPLEMENTATION

A. The System Architecture

This application provides a lot of functionalities which can be used in both normal and emergency situations. In normal situation, the users can use desktop application or mobile application for generating information; contact the doctor or another mom with our application. In the case of emergency such as when an accident occurs, our solution provides the location-based services via GPS for addressing the location of mother and taking her to the nearest hospital suddenly. See the Architecture Overview on figure 4.
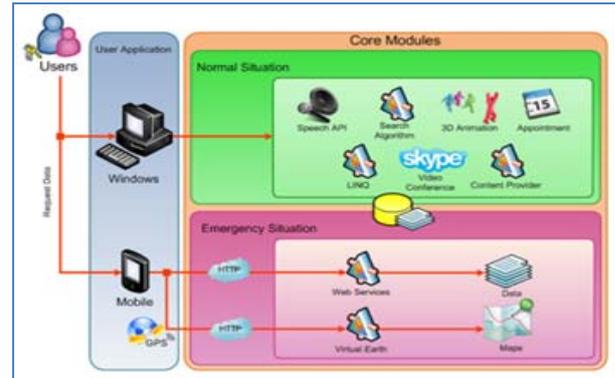

Figure 4: Architecture Overview

The application consists of three main components as follows:

1) The control center stores and manages all maternal and child health care information in one place. The doctor enters medical information such as medical conditions, medications, and allergies into the system. The mother creates additional profiles for kids, parents, and caregivers. If the mother has medical history records located at other hospitals or systems, they can transfer the medical history data to the application based on security and privacy parameters. This application system synchronizes medical history records. We provide 35 tables in the database such as Appointment, Child, Condition, Disease, and Doctors etc. (see the database diagram in figure 5: Shown 35 tables in this application.

Figure 5: Shown 35 tables in this application
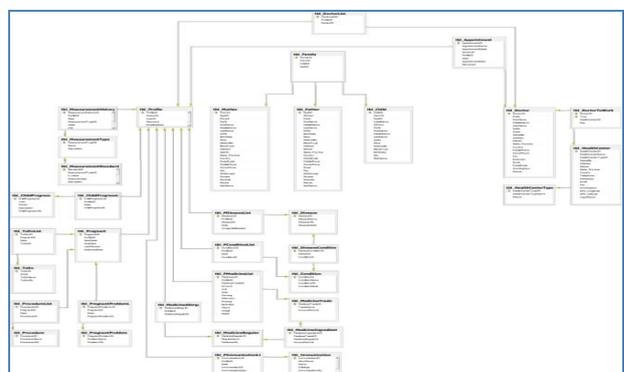
2) Windows Component: the system provides individual health information for mothers so that they can contact their doctors for appointments and inquires. They can also set alert notification for important date reminder. On windows side, the system provides social mother network such as chatting with other moms or sharing the knowledge with the expert-moms. Furthermore, mother(s) can compare the weight/ height with standard information. See the figure 6 as Windows Components.

Figure 6: Windows Components

3) Mobile Component: The mobile side enhances communication channel which available everywhere via GPS. Mothers/Users can use their mobile phones to connect to the system and login to system for getting personal information. On the mobile side, the system provides RSS news from control center, Remainder/Alert for doctor appointments, Display SMS or MMS message on an appointment, get GPS Map. In the figure 7, the system calculates the mobile phone's position by using longitude and latitude, and then locates three nearby hospitals for their choices.

Figure 7: The result from system calculates 3 nearby hospitals.

V. CONCLUSIONS AND FUTURE WORK

This paper proposes an effective solution which provides many functions for mothers to take good care of themselves and their children, and especially in emergency situation to reduce the risk of miscarriage and child death. Now it's about six years until the year 2015 when the United Nation (UN) has addressed the MDGs to be achieved. It is realized that reducing maternal deaths is not a purely technical action, but one that challenges the political and social status quota that requires actions within and beyond the health sector. If our solution is pragmatically implemented, it will fulfill our goals to reduce child mortality and improve maternal health. In the future, we will apply a sensor networking on next generation of this application version-II. It will be a major advance considering the large amount of network-based positioning systems as Ultra Wideband (UWB) that can be used at very low energy levels for short-range high-bandwidth communications by using a large portion of the radio spectrum. We will use UWB in our system for helping mothers on tracking and protecting their babies.

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