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SCHOOL OF COMPUTING AND INFORMATICS

SMS BASED SYSTEM TO PROVIDE FIRST AID INFORMATION IN KENYA

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Submitted in partial fulfillment of the requirements of the Masters of Science in Information
Systems

DECLARATION

STUDENT

This project being presented is my original work and has not been published for the award of any university degree.

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This research project is submitted as partial fulfillment for the degree of Masters of Science in Information systems with my approval as the university supervisor.

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DEDICATION

To my parents who raised and educated me; to my wife and son who encouraged me when I was writing this thesis and to Rev. Fr. Joseph Healey, MM who funded part of my MSc. Studies.

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ABSTRACT

Emergencies resulting from accidents and illness occur all around us in everyday life and knowledge of what action needs to be taken to manage a crisis can make the difference between life and death. Basic first-aid skills can be helpful in taking care of small injuries that usually occur from accidents as well as assisting in emergency ill health such as epilepsy, nose bleeding, choking, burns, scalds, asthma attacks and trauma management to mention but a few.

The main objectives of this project was to develop SMS based first aid Information system and test it to look at the potential of SMS in improving access to first aid information in Kenya.

The system development followed the waterfall system development life cycle. We first conducted a requirements and data gathering exercise to understand the user requirements as well as get credible first aid information. First aid information for use in the system was provided and approved by the Kenya Red Cross organization for testing purposes. After developing the system all the 54 participants were introduced to the system and asked to try it out. Following the intervention, questionnaires were issued to the participants to get their feedback on areas such as system usability, efficiency and effectiveness.

All participants were able to interact with the system by initiating the system and getting SMS responses to first aid interventions queried. System usability tests conducted using questionnaires to the participants showed that 100% were satisfied with the system ease of use and would use it when officially launched. 78% of the participants felt that the system had the potential to create first aid awareness in Kenya and since most Kenyans own or have access to mobile phones with 98% of the participants owning a mobile phone then most Kenyans would be able to access and use the system.

Following the test results on the system, SMS text messaging was perceived as a suitable and accepted medium to promote first aid awareness in Kenya.

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LIST OF ABBREVIATIONS

SMS-Short Message Service

CCK-Communications Commission of Kenya

USSD-Unstructured Supplementary Service Data

IEEE-Institute of Electrical and Electronics Engineers

DVT-Deep Venous Thrombosis

BSL-Blood Sugar Monitors

PHP-Hypertext Pre-Processor

St. -Saint

ITU-International Telecommunication Union

J2ME- Java 2 Micro Edition

GPS-Global Positioning System

HbA1c- Glycated Haemoglobin

HIV/AIDS- Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome

CHWs- Community Health Workers

MSI- Marie Stopes International

TB-Tuberculosis

Dots- Directly Observed Treatment Short

PNLT- National Tuberculosis Control Programme

M4RH- Mobile for Reproductive Health

FHI 360- Family Health International 360

USAID- United States Agency for International Development

SDLC- Systems Development Life Cycle

CM-Configuration Management

CHAPTER ONE: INTRODUCTION

1.1 Background

Mobile health (mHealth) is the use of mobile computing and communication technologies in health care and public health (Caroline et al., 2013). mHealth involves the use of mobile and communication technologies to provide health information and health care services through the use of mobile electronic devices. It is an emerging field though test applications have been successfully implemented in health care promotion and illness prevention; health care service delivery, health care training and supervision, ePayments and other information systems applications and integrations.

According to the Communications Commission of Kenya report (CCK, 2013), mobile penetration stands at 96 per cent worldwide, with 128% in developed countries and 89% in developing countries. Mobile cellular network penetration in Kenya together with the drop in the cost of mobile phones and other portable mobile devices has created the platform for the implementation of mobile applications. Notable technologies in the mHealth field include mobile telephony, Short Message Service (SMS), SMS short-code service, Unstructured Supplementary Service Data (USSD), Android Applications, Bluetooth, Wi-Fi etc.

These technologies have enabled and supported mobile devices which help physicians in the health care sector. For instance specialized devices have been manufactured which are either small and mobile or large and bulky pieces of equipment, such as ultrasound scanners, devices for deep venous thrombosis (DVT) prophylaxis¹², or devices which interface with smartphones, such as blood sugar level (BSL) monitors which can monitor and transmit results to physicians (Perera, 2012).

The use of mHealth technologies in the health sector not only makes health care service delivery more efficient but also solves the problem of human resource shortage in the health institutions (Goel et al., 2013).

1.2. Problem Statement

Onlookers in an accident scene can use their first-aid skills to advance outcome levels by providing emergency aid to emergency medical condition victims as well as staying around to help the victims and comfort them. However, in most incidences some bystanders express fright of doing more damage while others lack self-confidence in trying out emergency aid (Kano et al., 2005).

Basic first-aid skills can be helpful in taking care of small injuries that usually occur from accidents as well as assisting in emergency ill health such as epilepsy, nose bleeding, choking, burns, scalds, asthma attacks and trauma management to mention but a few. Unfortunately not many Kenyans have been trained in first aid and only a few of those who have attended emergency aid training are proficiency in first-aid skills due to lack of practice.

Cases of people spectating road accidents and terror attack scenes without offering emergency Aid to the victims have been witnessed in Kenya on different occasions. We have also witnessed epileptic people fall on the streets without anybody taking appropriate measures to help them. The most worrying cases are those we see on the media of reported babies who have died in the hands of their parents or house helps due to simple incidents such as choking. We envisage that the system under development will not only increase access to first aid information to the untrained but also serve as a reference and refresh tool to those trained.

1.3. Objectives of the System

The general objective of this project is to develop a working prototype of SMS based first aid Information system and a database with information on first aid. The system shall be accessible through self-initiated trigger via SMS enquiry. A web portal for detailed diagram representation of the practical aspects will also be available both on computers and internet enabled mobile phones. Consequently, the specific objectives include

- i. To look at the potential of SMS in improving access to first aid information in Kenya.
- ii. To get the needs of the system users and other stakeholders.
- iii. To determine the SMS interface design considerations for users and stakeholders of the system.

1.4. Scope

This project will involve the development of SMS based system prototype for providing first aid information in Kenya. Both textual description and diagrammatic representation of the practical areas will be stored in the database. A web portal developed in hypertext pre-processor (PHP) language with a Mysql database back end will be used as the data entry point. An SMS will be used to query first aid information from the database and the output will only be limited to the textual description. A link to the diagrammatic representation will be provided at the end of the reply SMS and internet enabled mobile phones will be able to open it for further details. Additionally, a website with the same information will be used to provide advanced details especially where Video clips have been used to illustrate first aid procedures. A detailed review of other related SMS based systems in Africa and other parts of the world will also be provided under literature review.

1.5. Justification

Knowledge of what action needs to be taken to manage a crisis can make the difference between life and death. Emergencies resulting from accidents and illness occur all around us, in everyday life. Since ambulances hardly arrive on time “the more people trained in basic first aid that may be able to keep a person alive until an ambulance arrives – the safer both our workplace and communities will be” (Jones, 2009). This system will therefore provide the following benefits to users and stake holders:-

- i. Enhance self-training on first aid procedures since users will be able to query information using SMS and learn about first procedures for various incidents and ill-health conditions.
- ii. Provide a reference and refreshing tool to the first aid trained users in case of emergency hence improving the chances of saving life.
- iii. Help stakeholders most especially first aid training institutions like St. John Ambulance Kadets to disseminate credible information about first aid procedures. Create a wider awareness of first aid procedures to Kenyans by creating a first aid SMS theory manual.

CHAPTER TWO: LITERATURE REVIEW

2.1 Overview

Short message service SMS is “a communication feature among mobile, web or phone communication systems, allowing an exchange of short messages between mobile phone or fixed line devices” (Riaz et al., 2012). Over the past decade, text messaging based on mobile phone short message service (SMS) has been used successfully in mHealth interventions in many countries.

Mobile health applications facilitate the ability for the engagement of patients and health care providers and are a new means of improving health outcomes (Sama et al, 2014). Sama et al further notes that Mobile applications have a reliable application in the prevention of cardiovascular diseases or in the treatment of patients with chronic diseases such as diabetes and congestive heart failure. This study further points out that the power of smart phones and affordable development costs of health related mHealth applications provides an opportunity to tailor and customize care for individual patients on the basis of health needs and behavioral attributes.

From International Telecommunication Union report (ITU, 2010) in the year 2009, two –thirds of world population owned a mobile phone and 4.2 trillion text messages were send. Today these statistics have grown enormously owing to the increased affordability and hence increased ownership of mobile phones. According to Ofcom (2009), there are more mobile phone subscriptions than the population in higher income countries while the mobile communications technology is the highest and fastest growing sector in low income countries. For this reason and considering the technological features such as text messages (SMS), software applications and multiple media have been used to deliver health care interventions across many countries.

2.2. Related work

A study in Norway shows how kids in kindergarten in Bergen, were able to gain knowledge and offer first aid from a training session using the ‘five-finger-rule’ system (Bollig et al., 2011). In this system the kids learnt how to “look at person, talk to them, touch them to try to wake them up, call emergency services and lastly, stay and give comfort”. They also acquired skills on how to “keep an airway open and put each other into recovery position”. In a follow up exercise Dr. Bollig noted that two months later the kids were still able to use the ‘five-finger rule’ to determine if somebody was unconscious or asleep and if the casualty was breathing. They could also recall emergency numbers accurately. Following these findings Dr. Bollig recommended that first Aid should start in school like in kindergarten level and then reinforced throughout all levels of education.

One of the applications of SMS in first AID and emergency help is a J2ME (Java 2 Micro Edition) application developed to rescue earth quake victims. This application goes by the brand name “Rescue SMS”. According to a conference proceedings paper (Shirali-Shahreza, 2006) the Earth Quake

Emergency Centre is able to use this mobile application to send an SMS to all people at the place where the earth quake has occurred enquiring about their status and need for help.

A specialized program on the recipient's cell phone is able to receive the message and ask the recipient whether they need help. If the recipient does not respond then the special device assumes that they need help and it therefore sends a request for a rescue team through the Earth Quake Emergency Center and within this message it also states the location of the mobile phone which is also the most probable location of the victim. The victim's mobile phone is then triggered to start vibrating in a special pattern so that the rescue team which may include robots can locate the victim even in devastated buildings. Shirali-Shahreza points out that this is a low cost application and it can work with most mobile phones. Currently it has been tested with Nokia 6680 and Nokia N71.

Emergency first AID before transferring an accident victim or a patient to a health facility can be the key to the victim's survival. In Shirali-Shahreza (2006), another SMS application called "Emergency SMS" is also discussed. Shirali-Shahreza describes how this application which has been successfully tested on Nokia N71 can be used to effectively and reliably call for emergency help from trained medics. Emergency SMS was developed using Java 2 Micro Edition (J2ME) and all a patient has to do in the event they fall sick or they need medical attention is to long press a specified button on the mobile phone which in return activates a special program.

The special program is then able to send an SMS to the family doctor or emergency centre. The emergency SMS so send contains the location of the patient using GPS system, brief bio data of the patient, secondary habits like smoking and a brief medical history. It also alerts a relative or next of kin who has been keyed into the database. Upon scrutinizing the SMS the emergency centre is then able to dispatch a team of medics to the patient's house for help hence saving the life of the patient in most cases.

Following the increased prevalence of diabetes in many countries of the world, SMS interventions have been tried in countries like Iran to educate and help patients manage diabetes mellitus. A recent study (Zolfaghari et al., 2012) was conducted to compare "the effectiveness of a nurse short message service (SMS) by cellular phone and telephone follow-up by nurse on glycosylated haemoglobin (HbA1c) levels in people with type 2 diabetes." The results of the sampled study showed that SMS intervention with a call follow-up had a significant average changes in HbA1c. Comparing SMS and telephone follow up the study results showed that "($p=0.001$) with an average change -0.93% for telephone group and for the SMS group ($p=0.001$) with a mean change of -1.01%" hence proving SMS as a reliable tool for managing type 2 diabetic patients.

Another study (Riaz et al., 2012) in Pakistan on "the future of SMS reminders as a future self care to manage diabetes mellitus" revealed that constant tailored SMS reminders send to diabetes mellitus

patients increased adherence to treatment and also educated the patients on the need to take care of their diet and live healthy. Through healthy living the patients were able to manage diabetes mellitus and prevent it from being acute. This study also established that SMS text messages offered a means of supporting and encouraging adolescents with diabetes and could be adapted to other chronic disease management. Providing health care and support via constant tailored SMS text messages reminders also improves self-drive and with the popularity of SMS and penetration of mobile phones in the world text messaging can lead to improved self-care outcomes in diabetes mellitus management (Krishna and Boren, 2008).

HIV/AIDS (human immunodeficiency virus/acquired immune deficiency syndrome) has been around for decades now and with no known cure discovered as yet, victims have been surviving through proper and routine management of the disease. In the United States for instance, men who have sex with men are the most affected victims but with effective antiretroviral therapy they have managed to tame the HIV epidemic and it is no longer acute but only chronic (Furberg et al., 2012). This has been achieved through the use of SMS reminders where patients are subscribed to a database which then sends them SMS to remind them to take their medication as prescribed. These antiretroviral therapies are now available in all countries including Kenya and the only challenge now is to ensure that patients live healthy by adhering to the medication and adapting a behavioral change to stop spreading the disease.

In a proof of concept study Furberg et al. (2013) noted that the popularity, affordability and handiness of short message service (SMS) suggests its prospective appropriateness for supporting the treatment of conditions which must be managed over an extended period. This study adopted a methodology of sending messages and questions to respondents via SMS. Examination of the data was restricted to figures including regularity division and standard deviations. As a result a total of 7194 messages were sent to the study participants. Overall, 705 SMS responses to questions were received and 317 spontaneous SMS messages acknowledgements were received from participants. These results confirm the possible success and technical feasibility of SMS in helping HIV patients remember their medication schedule and reinforce behavioral change.

In Shaw et al. (2013), he explains how text messaging has been used in the United States to sustain weight loss among obese patients. This study points out that Short Message Service (SMS) text messaging is affordable by many health care providers and patients and due to its use popularity among all age groups, cultures and socioeconomic background it's a reliable mHealth intervention tool. A related study (Shapiro et al, 2012) showed that SMS reminders had a lot of positive impact of weight loss behavior over 12 months such as adherence to adequate exercise and a healthy diet. This study further points out that weight loss intervention using short message text does not only help in weight loss but also motivates patients to continue with the weight loss program through constant SMS reminders.

Another well-known application of SMS based systems is in reproductive health and family planning. In Ngabo et al. (2012), the successes of Rwanda in implementing a family planning SMS alert system are discussed. The system aimed at availing and reinforcing expectant women education and ensuring increased uptake of vital motherly and child clinical services. The system under the brand name “RapidSMS-MCH” ensured real time communication between community health workers (CHWs), ambulance drivers and staff at health facilities. RapidSMS-MCH is an open source Short code SMS application developed in python and Django and works on reverse billing where the Rwandan Ministry of health agreed to meet all SMS bills so that users are not charged to text.

Through this application, health workers are able to register pregnant women in the villages and also send them reminders on when they should attend antenatal clinics and their expected date of delivery. Communication is purely between the community health Officers phone numbers and not the patients’ phone numbers. Data has to be send in a specified format and when the application receives data in the wrong format it is able to send a reply back to the sender advising on the right format. From registering pregnant women to making clinical follow ups, the alerting system is also used to call the nearest ambulance in case of emergency and to also alert the nearest health facility staff to start preparing to receive the emergency. This alert message contains the nature of the emergency serving to advise the health facility staff on the nature of emergency to prepare for. A web-based application integrated with the SMS system is then used for system administration and data analysis which forms a clinical health records database.

The latest development in SMS based interventions has seen applications of SMS in data collection. A case study (Gold et al., 2012) is that of Marie Stopes International (MSI) where SMS system was developed to collect data from their social franchises in Kenya, Madagascar and Philippines. In Kenya MSI runs the AMUA social franchise while in Madagascar and Philippines their social franchises are known as BlueStar. All their franchise offer reproductive health services through clinics to the unprivileged and low revenue earners in peri-urban and countryside areas. MSI contracted independent consultants to develop SMS based applications in each of the three countries. The consultants were locally selected from the respective countries. Kenya adopted a short code SMS platform while the other two countries adopted normal SMS.

MSI used the SMS systems to send messages to the social franchises to remind them to submit health care service data, place stock orders and report any payments done. The system in Philippines also allowed MSI to send any enquires to the central programme office. Though the Kenyan system did not last long due to poor training of the end users, for the short time it worked it led to increased timeliness in reporting. The other two systems in Madagascar and Philippines were implemented successfully and saw an increased efficiency and timeliness in data reporting as compared to manual paper systems. Over the years of use, these systems have showed that SMS based data collection interventions can enable

service delivery organizations to gather service data systematically, accurately and efficiently leading to improved monitoring and management.

Cameroon is another country in Africa which has piloted SMS based mHealth application to remind tuberculosis (TB) patients to adhere to their medication. Despite the implementation of directly observed treatment short (Dots) to fight TB, most African countries have limited resources to do so and hence TB is still a big challenge (Bediang et al., 2014). Funded by the state and the international funding partners such as Global fund, Cameroon established the National Tuberculosis Control Programme (PNLT) to lead the fight against tuberculosis. The system worked by sending general reminder SMS messages to all patients under TB medication. The use of the automated SMS reminders led to less therapeutic failures and relapses. The level of morbidity and death has also reduced.

Smoking prevalence poses a public health challenge in most countries in the world. College students and other adolescents who engage in smoking not only harm themselves but also harm other students in their company through secondary smoking. A study (Haug et al., 2013) using SMS based intervention was piloted in Switzerland targeting college students. Haug and his team focused on finding out the “efficacy of a text based smoking cessation for young people”. In this study a randomized class was used as the study unit including both male and female students. Students who smoked were proactively recruited via online selection in vocational school classes. Text messages customized to demographic and smoking related variables were sent at least 3 times per week over a period of three months. Six months later a follow up was done and the findings were quite encouraging. Though the study did not have statistically significant short term effects on smoking cessation it resulted to statistically significant lower cigarette use. The study established the potential of an SMS message based intervention to get to a high percentage of young smokers with low education level.

Kenya and Tanzania through the sponsorship of USAID and other organizations also piloted a short code application to assess the use of family planning methods (FHI 360, 2009). In both Kenya and Tanzania, Family Health International 360 piloted an application branded as Mobile for Reproductive Health (M4RH) through Short Code SMS Interaction. The results provided useful insights into how and why users interact with family planning methods and how this could affect change in behavior.

In spite of the ability and communication power of SMS interventions via mobile phones, most previous studies as shown by literature reviews have not revealed the practical implementation details. Additionally very little automation of first aid training on SMS seems to have been done. This gap necessitates the need for a practical approach and automation of first aid training through SMS. To fill this gap this study will systematically provide the technical implementation details and processes for SMS design and delivery which we believe will help strengthen the evidence base of this emerging area and future studies on the same. It will also inform and help structure future studies on the same.

CHAPTER THREE: METHODOLOGY

3.1. Overview

This chapter discusses the methodology to be used to design and test the system, sources of data to be used as sample data in the system, requirements gathering, how the data will be collected and the analysis techniques to be applied in analyzing the data. This section also shows the arrangement of conditions for the collection, measurement and analysis of data that is consistent with the objectives stated.

3.2. System Development Methodology

The development of the first aid system followed the water fall system development life cycle process. SDLC or Systems Development Life Cycle is a series of steps observed by the software developers on building specific software. Developers follow the specified steps to ensure they have the right software for the right demand. The SDLC process is an organized way to determine client needs and user requirements such that technology can be applied through systems development and help software developer perform their jobs more effectively and efficiently.

3.2.1 Review of the Choice of methodology

The SDLC methodology was adopted because of its strengths which include the following

- This process is procedural and follows steps and careful adherence to all the steps will most likely capture and meet all the user requirements.
- Since key issues are considered before the design of the software, the end product software created is of high quality.
- SDLC ensures that controls of the software are stable through creation of proper documentation to help developers in controlling the specific function of the software.

3.3 System Development Life Cycle Stages

The following steps were followed during the development process

1. Conceptual Planning. This is the first stage and it involves identifying the need to improve a system or to acquire a new system. Once this has been established the system feasibility is assessed, costs estimated and risks evaluated. Roles and responsibilities are also assigned to different parties such as the sponsor, Asset Manager, System Development Agent System Support Agent etc

2. Planning and Requirements Definition. Once the project has been defined and the appropriate resources defined, this stage starts. It involves collection, definition and validation of functional, training and support requirements. Once this has been established the life cycle management is defined and this may include planning and management of the project, configuration management (CM), operations, support and training management

3. Design. At this stage, functional, training and support requirements are converted into preliminary and Comprehensive designs. Decisions on how the functional requirements will be achieved are also made at this stage.

4. Development and Testing. This is the stage at which the system is developed or acquired based on the detailed system specifications. The system is also thoroughly tested to ensure optimal performance and to also ensure that all the sponsor's requirements are satisfied.

5. Implementation. During this phase the new or improved system is availed to the sponsor and installed. Users are also trained on how to use it. Any system problems are identified and efforts to solve them and plan to sustain them are identified during the process.

6. Operations and Maintenance. This is the phase in which the system becomes operational. The objective here is to ensure that sponsor needs continue to be met and hardware and software upgrades take place as and when required. User training also continues so as to ensure that they fully understand how the system works and are comfortable performing their roles in the system.

7. Disposition. This phase marks the end of the system's life cycle. This phase is occasioned by the system being declared as obsolete or surplus and has been scheduled for a final shut down. However, data from the system is backed up and preserved for future use in other systems or migrated to a new system before the shutdown.

3.4. Feasibility Analysis

The feasibility of this project was carried out as follows:-

3.4.1 Operational Feasibility

System's operational feasibility is the assessment how effective the system will operate after it has been deployed. It also checks on how well the system requirements have been implemented in the system to solve the problem and advantage of the opportunities identified during the scope definition (Shelly and Rosenblatt, 2009). Our operational feasibility analysis showed that the system would highly benefit the public since there is no other similar system at the moment.

3.4.2 Technical Feasibility

According to Shelly and Rosenblatt (2009) "A project or request is said to have technical feasibility if the organization has the resources to develop or purchase, install, and operate the system". An assessment of the technology available for development and implementation showed that the technology is available and mature with support of the existing mobile based companies in Kenya.

3.4.3 Economic Feasibility

This measures the financial benefits and costs associated with the development project. "Economic feasibility is achieved if the projected benefits of the proposed system outweigh the estimated costs involved in acquiring, installing, and operating it" (Shelly and Rosenblatt, 2009).

Our cost analysis showed that it's more effective to implement. The benefits greatly outweigh the costs incurred in the design and implementation.

3.4.4 Schedule Feasibility

Schedule feasibility means that a project can be implemented in an acceptable time frame (Shelly and Rosenblatt, 2009). This determines whether the time allocated to the project is reasonable and realistic. The technical experts define milestones and deadlines for each milestone.

Our Schedule analysis showed that the study can be developed and implemented within an acceptable period of time.

3.4.5 Political Feasibility

Political Feasibility is a measure of the impact of the solution to the existing policies and how it will be accepted by decision makers and the general public.

The following questions were asked:

- i. What will the reaction of the existing training institutions to this system?
- ii. How will the end users feel about their role in the proposed system?
- iii. Are the end users or stakeholders likely resist or not use the system?
- iv. How will the working environment of the end users change with the proposed system?
- v. What ethical issues arise during the development of this system?

3.4.6 Legal Feasibility

This is a measure of how well a solution can be implemented within existing legal and organization's policy. In line with the legal framework in the Kenyan health sector, issues of ethics, confidentiality and privacy of personal information were taken care of.

3.5. Requirements Gathering

Mugenda and Mugenda (2003) define population as the entire group of individuals, events or objects having a common observable characteristic. The system stakeholders were drawn from the St. John Ambulance Kadets Kenya and Emergency Response Trainers (ERT) who had already confirmed willingness to provide credible data on first aid procedures and emergency care.

For the sake of this system every Kenyan was considered a potential user of the system since first aid is very crucial. A total of 10 male and 10 female users were picked randomly but representing different home counties in Kenya. A diversity of careers was also considered while sampling the respondents in order to gather information on what users think of such a system and how it would be developed to meet their first needs.

Though all health facilities in Kenya can be classified as stakeholders in this system, St. John Ambulance Kadets Kenya and Emergency Response Trainers who offer training on first aid were sampled as the key stakeholders. A total of five senior first aid trainers from the two organizations were interviewed and also issued with questionnaires on the requirements of such a system in regard to usability, reliability and credibility of data queried by users.

3.5.1 Sources of Requirements Data

Systems requirements and design considerations were obtained from interviews and questionnaires with stakeholders and users as identified above. The study further made use of both primary and secondary data. Secondary data was obtained from approved first aid training manuals, e-journals, websites, conference papers, reports and books. Primary data was obtained from questionnaires and interviews administered to users and stakeholders.

3.5.2 System Requirements Collection Instruments

The following research instruments were used in the collection of data while carrying out the study.

3.5.2.1 Questionnaires

Questionnaires were used because of their ability to reach a large number of respondents. They were also cost effective and helped curb biasness. Questionnaires did not require respondents to provide their identity thus encouraging them to give more reliable information. Two types of questionnaires were used i.e. One for users to collect user requirements and the other one for collecting user feedback after testing the system. The questionnaires were largely closed-ended but being more of a qualitative research, open-ended questions were also included to allow the respondents to give their opinion.

3.5.2.2 Observation

We made observations as the respondents tried out our system and this gave us an indication of the level of user acceptance.

3.5.2.3 Secondary Research Methods

To understand the problem, domain literatures related to the system were reviewed to understand how SMS applications had been used elsewhere. Case studies for instance in Rwanda and Kenya M4RH services were closely investigated. Approved first aid training manuals, e-journals and websites were also reviewed in order to gather credible documentation on first aid procedures.

3.5.3 Testing data collection instruments

The results of a research depends on a large extend on the accuracy of the data collection procedures (Mugenda and Mugenda, 2003). Therefore, it is important to test the quality of the research instruments used. This is done to increase the reliability and validity of the data collected. We tested the questionnaires by doing a test run with a few respondents to gauge their understanding and interpretation of the questions. Ambiguous statements identified were revised and another test run carried out to ascertain clarity.

3.6. Analysis

3.6.1 Data Analysis

Raw data from the field is not easy to interpret. It needs to be processed and analysed to make sense. After collecting the data, it was arranged first in a manner that enabled analysis to take place. The following process then took place; editing of data to detect errors, identifying omissions and doing corrections where possible; coding of closed-ended questions for efficient analysis; classification of data in order to come up with meaningful relationship; and tabulation of the data to facilitate the analysis. Both qualitative and quantitative methods of data analysis process were thus made easier and more accurate.

3.6.1.1 Qualitative analysis

Qualitative analysis was used to analyze data which could not be quantified, which included data collected using open-ended questions and interviews. This was used to assist in analysing data collected from different respondents in a systematic way in order to arrive at a useful conclusion and recommendation. Phrases or words from different respondents were also studied to identify similarities and differences and establish a pattern.

3.6.1.2 Quantitative analysis

Quantitative analysis was used to analyse closed-ended questions that had predefined responses and could not be assigned numerical values. This made it easier to come up with statistics that assisted in describing distribution of scores or measurements using few indices.

3.6.2 Prototype Requirements Analysis

3.6.2.1 The current System

From the analysis of the questionnaires and the confirmation of user requirements by the public and stakeholders as shown above the following was discovered.

- i. None of the public members had used any first aid systems before.
- ii. 78% of our sample respondents were not trained in first Aid.
- iii. Among the three first aid stakeholder organizations interviewed only Kenya Red Cross had a first aid application adopted from the British Red Cross in England.

3.6.2.2 The proposed system prototype Requirements

In line with the objectives of this system and the user requirements gathered from the respondents who were interviewed or returned filled in questionnaires, the following features of the system were envisaged.

- i. A system with a database ability to receive first aid information sent through SMS.
- ii. Systems with the ability to compare the different search statistics per first aid information searched and produce both tabular and graphical reports.

- iii. A system with a provision of Options to guide the users on the available first aid information options.
- iv. A chat oriented SMS interaction but with specified options to guide the user.
- v. A system with an extended web interface so as to support pictorial and video illustrations on practical aspects.

Use Case Diagrams

Both the Web and SMS content is available to the public without logging into the system. To Access the Content all users are provided with a system initiation code which is 100 for the sake of this prototype. A user is required to send an sms with the message 100 to a short code number which is 22285.

Once the system receives the request, it replies with a welcome message and lists the content categories and their respective codes. The User / Client is then asked to reply with the code of the appropriate option. Once the system gets the reply code, it lists all the items in the category selected earlier and asks the user/ client to reply with the preferred first aid item code. Once the User replies the system brings data for reading. The user can choose to terminate the system at this point or go back to the previous options and select another option. User can also go back to any stage by resending the appropriate code. In cases where the users are aware of the first aid item codes they can query the database directly without initiating the system.

On the web the system is presented in the format of a website open to the public without logging in. All a user needs to do is to open the website URL and then from first Aid Menu choose the option of first aid they would like to read.

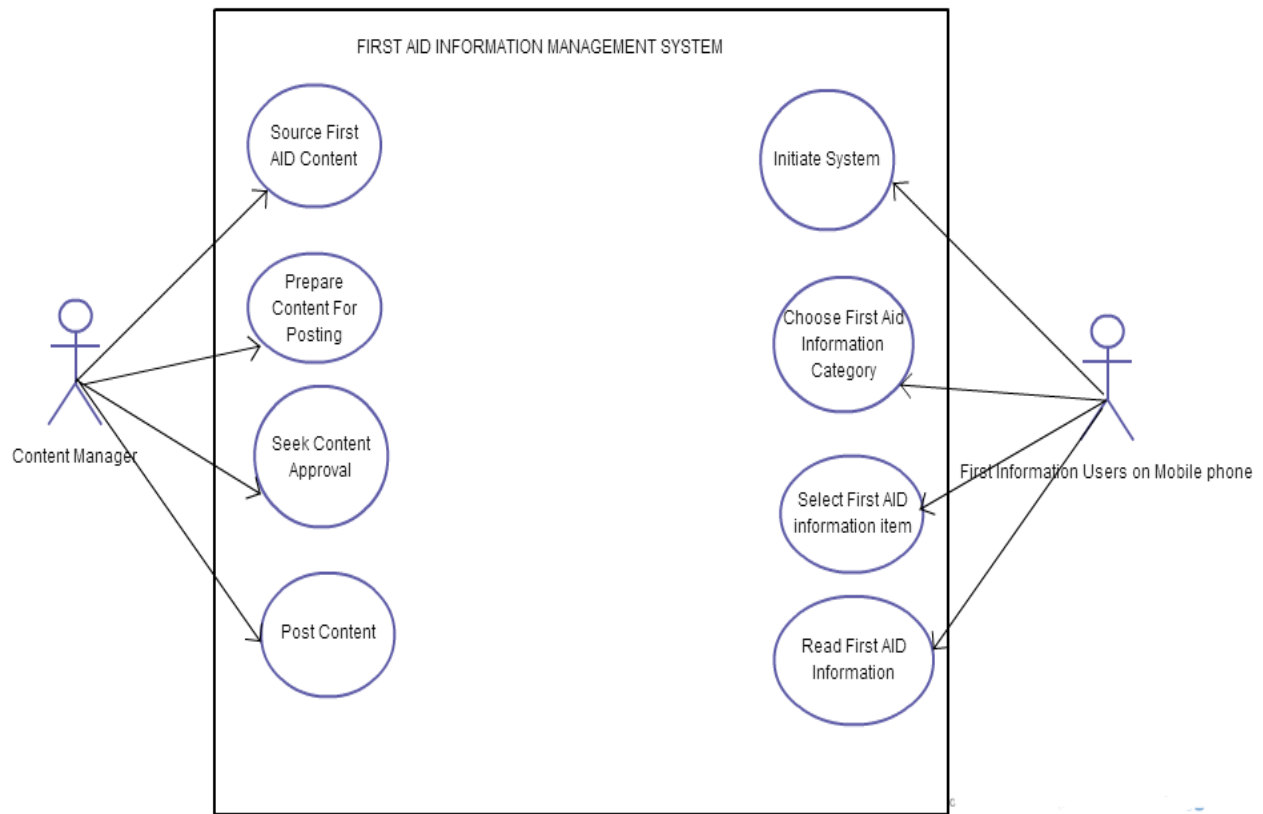


Figure 1: User Case Diagram for Functional Interactions on Mobile

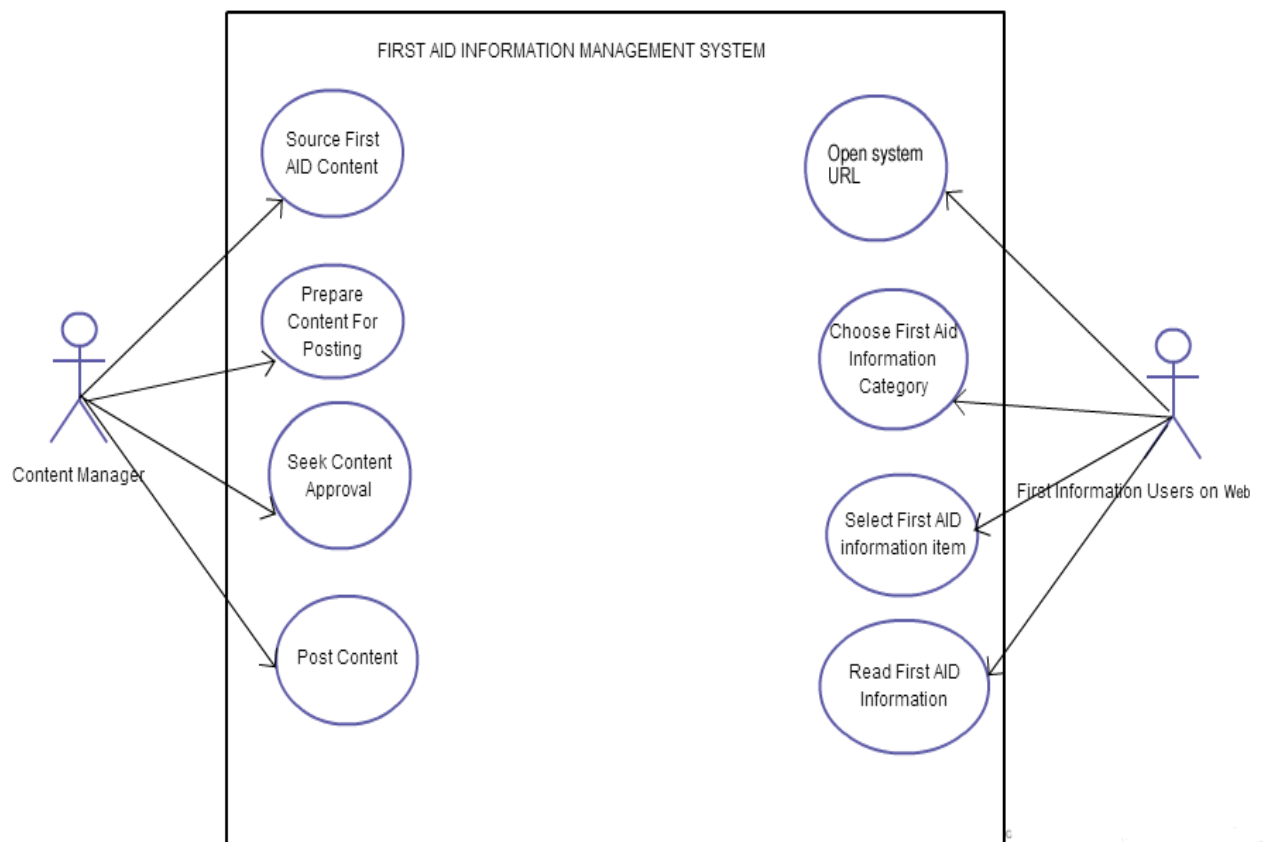


Figure 2: User Case Diagram for Functional Interactions on Mobile

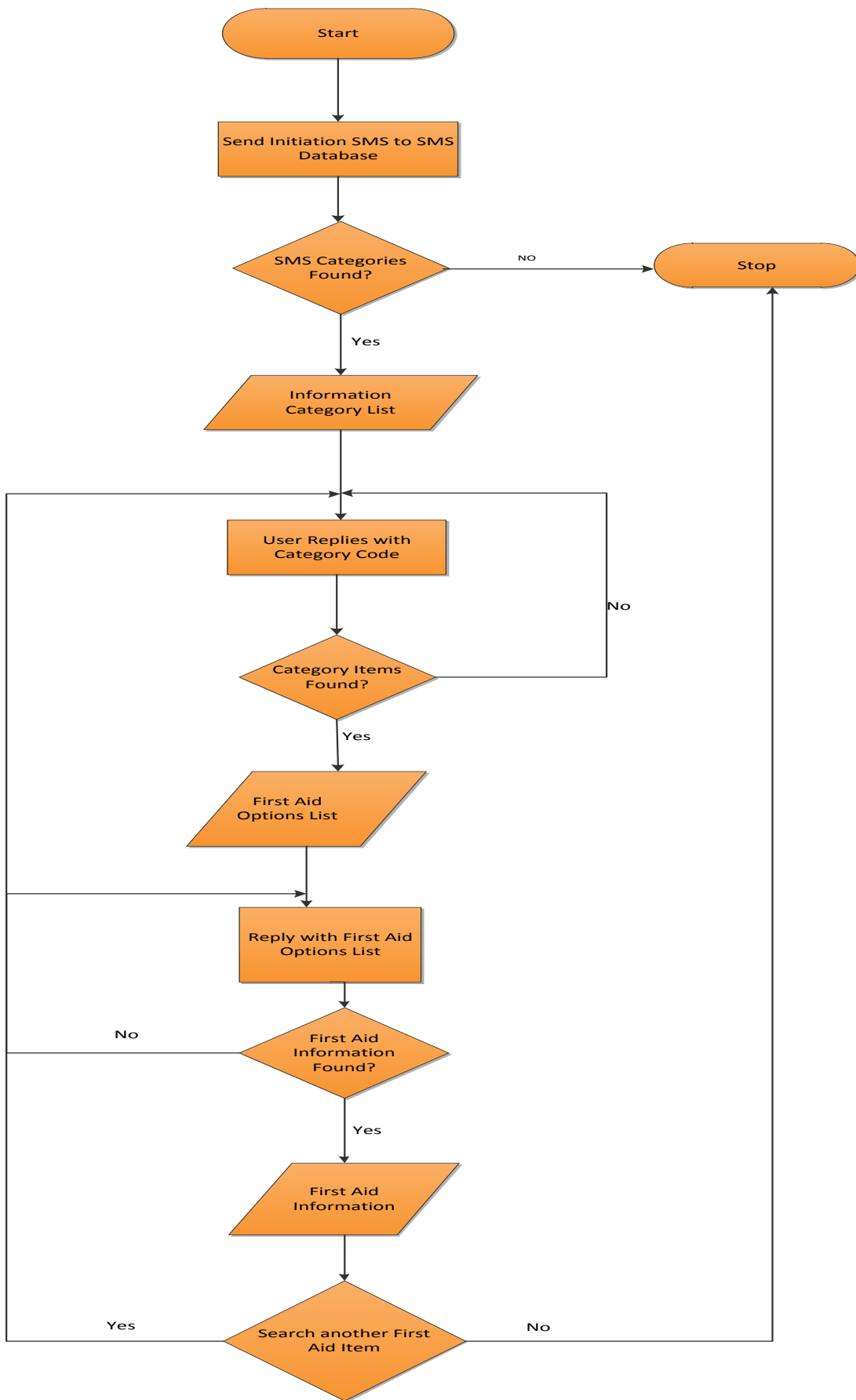


Figure 3: System Flow Chart for accessing first aid information via SMS

Non Functional Requirements

This type of requirements specified the constraints, goals or control mechanisms for the envisaged system.

The Proposed Non Functional requirements

The following major nonfunctional requirements were be implemented

- a) **Reliability**-The system availability to carry out key tasks it was made for.
- b) **Integrity**- A database and data designed such that data stored is well organized to ensure integrity.
- c) **Security**- The software to only allow authorised users to use the system
- d) **Usability**-The user interface should be designed such that screens are similar therefore facilitating ease of use and learnability.
- e) A user interface designed using Human Computer Interaction design principles i.e aesthetically pleasing, clarity, consistency and efficient.

3.7 System Design

This first aid system comprised of different interrelated and interacting entities which required a model to aid in its comprehension, while at the same time meeting various user needs and supporting decision making. In system design we examined the design elements of the system taking into cognizance the user requirements both functional and non-functional. The interfaces were designed with the screen layout in mind.

3.7.1 Conceptual Design

For the purposes of the objectives of the project modeling emphasis was on the SMS interaction with the database.

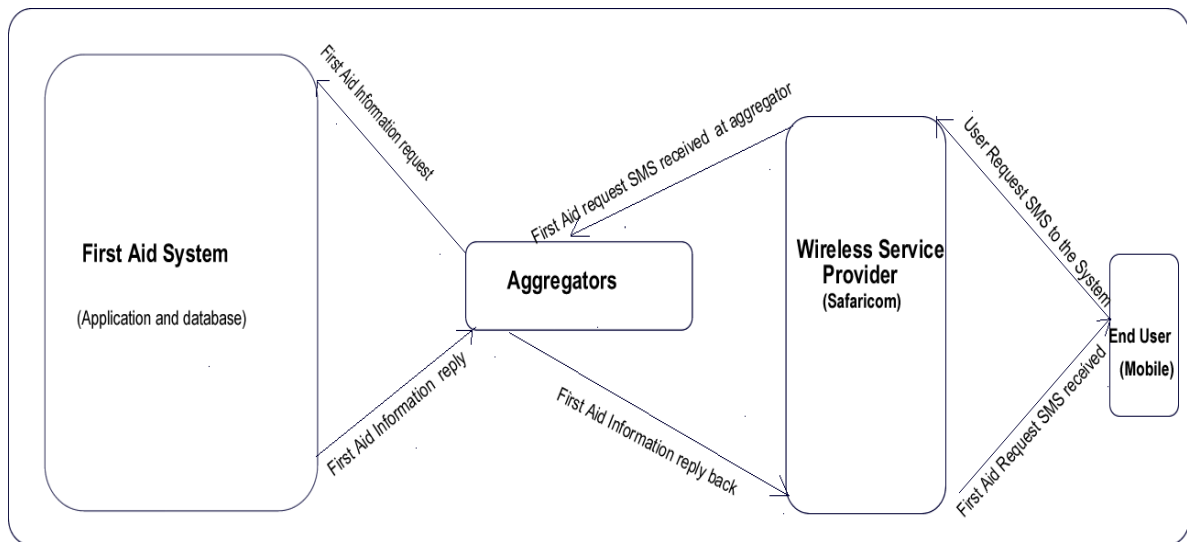


Figure 4: Conceptual Diagram

3.7.2. Data movement within the system

This was illustrated using a Data Flow diagram (DFD). A DFD is a graphical representation of the "flow" of data through an information system, modeling its process aspects. A DFD creates an overview of the system which can be elaborated later. There are four major components used in the construction of a DFD.

- i. External entities-they represent the source of data as input to the system. These are represented by squares.
- ii. Data stores-they represent stores of data within the system for instance computer files or databases. An open-ended box represents a data, which implies store data at rest or a temporary repository of data.
- iii. Processes- they represent activities in which data is manipulated by being stored or retrieved or transferred in some way. Circles stand for a process that converts data into information.
- iv. Data flow represents the movement of data from one component to the other. An arrow (→) identifies data flow, i.e. data in motion. Data flows are generally shown as one-way only.

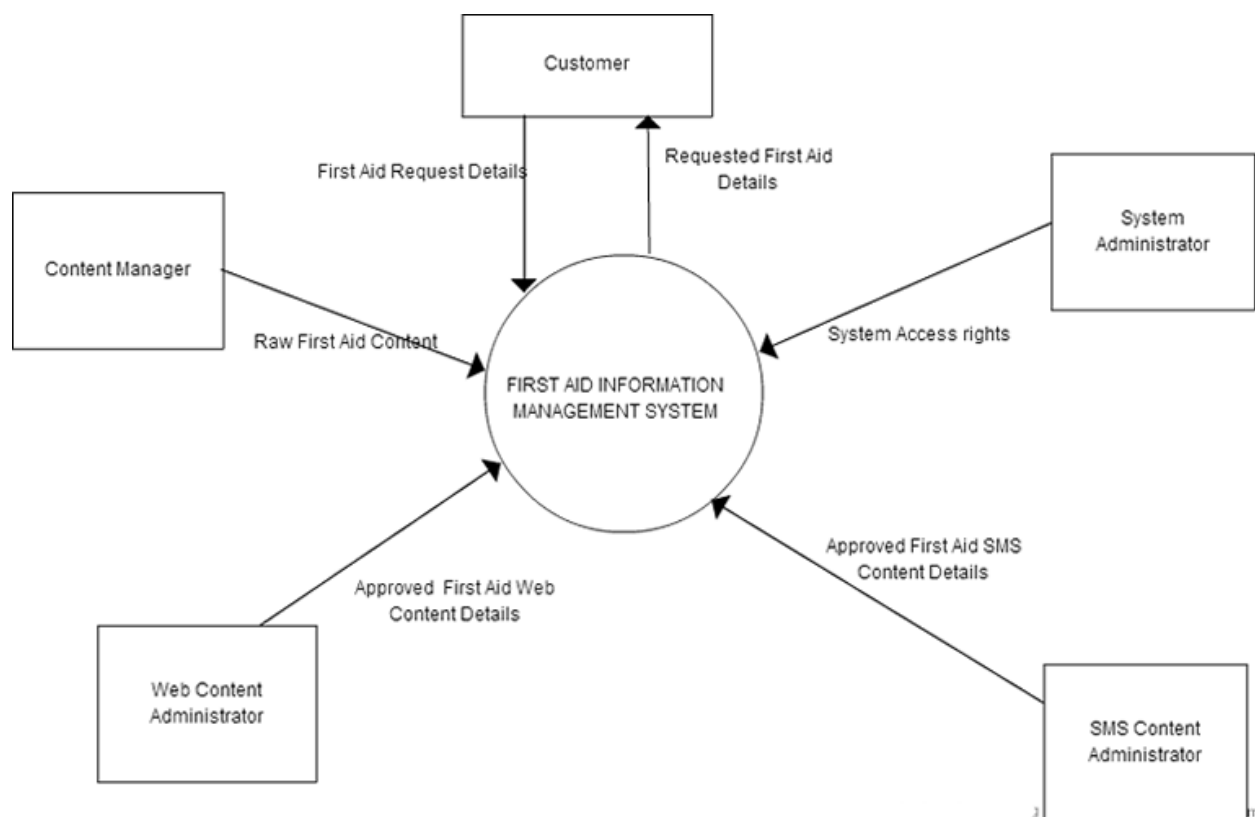


Figure 5: Context Diagram

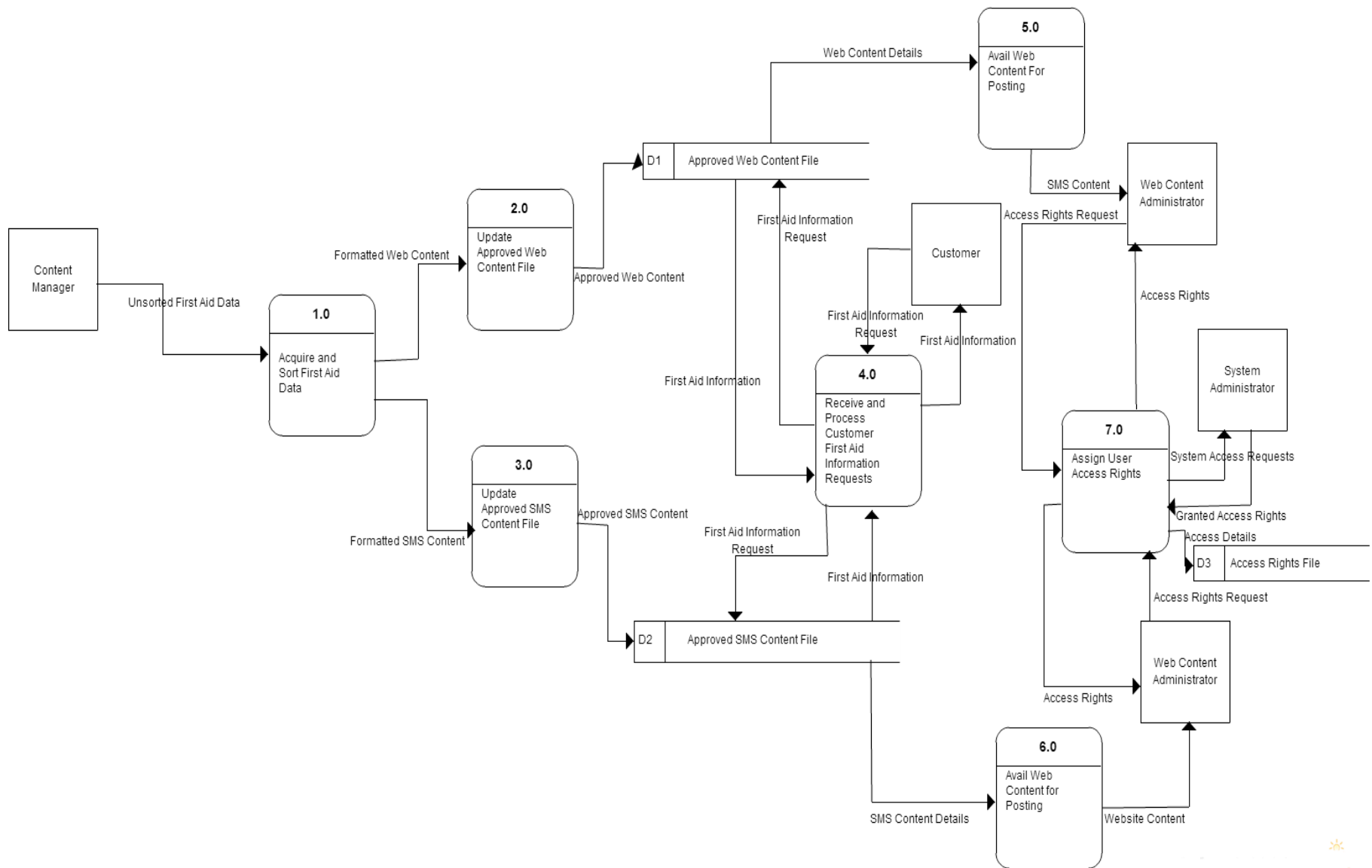


Figure 6: Level 0 Diagram showing the decomposition of the Context Diagram

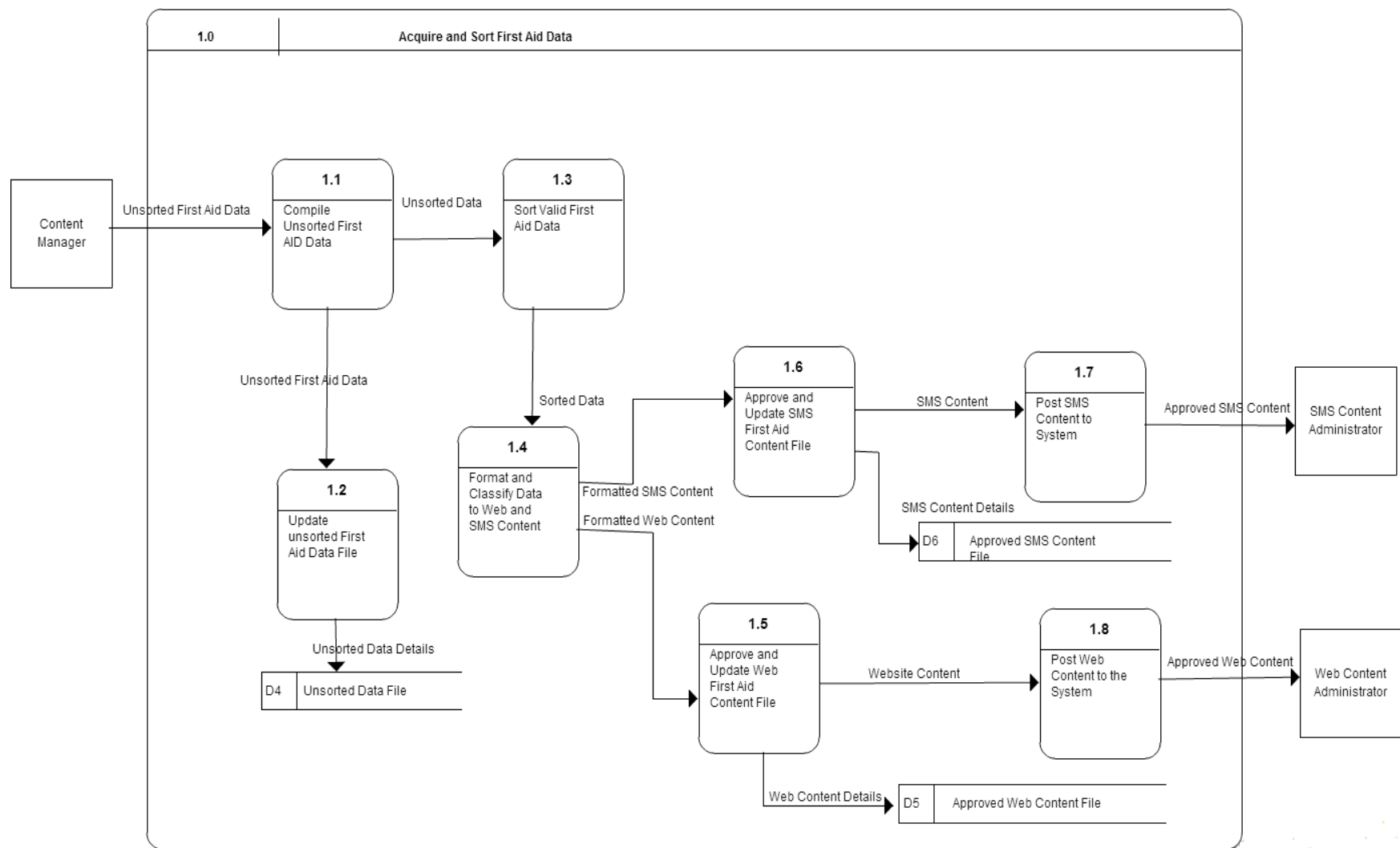


Figure 7: Level 1 Diagram showing the decomposition of process 1.0 of level 0 diagram

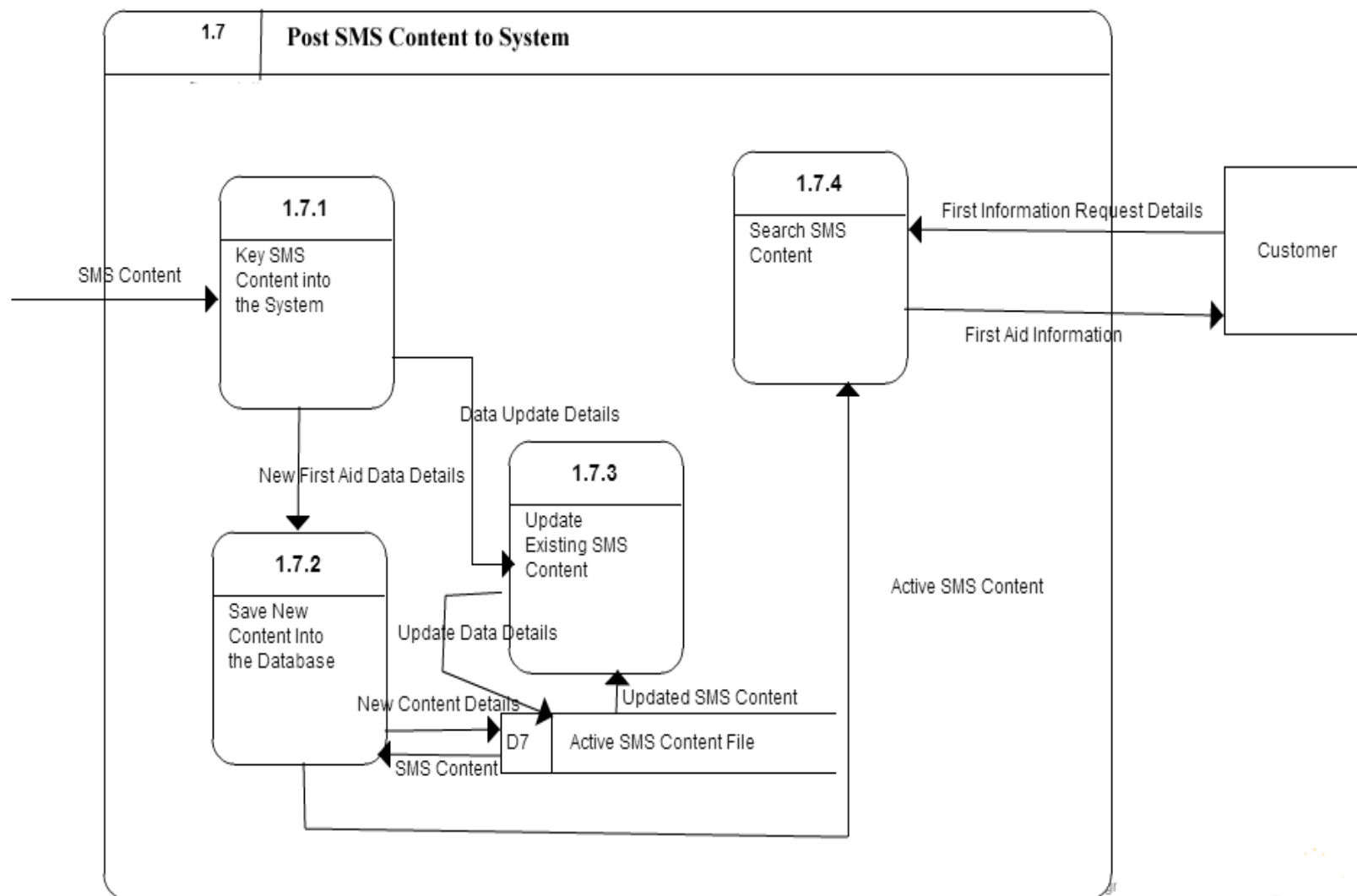


Figure 8: Level 2 Diagram showing the decomposition of process 1.7 of level 1 diagram

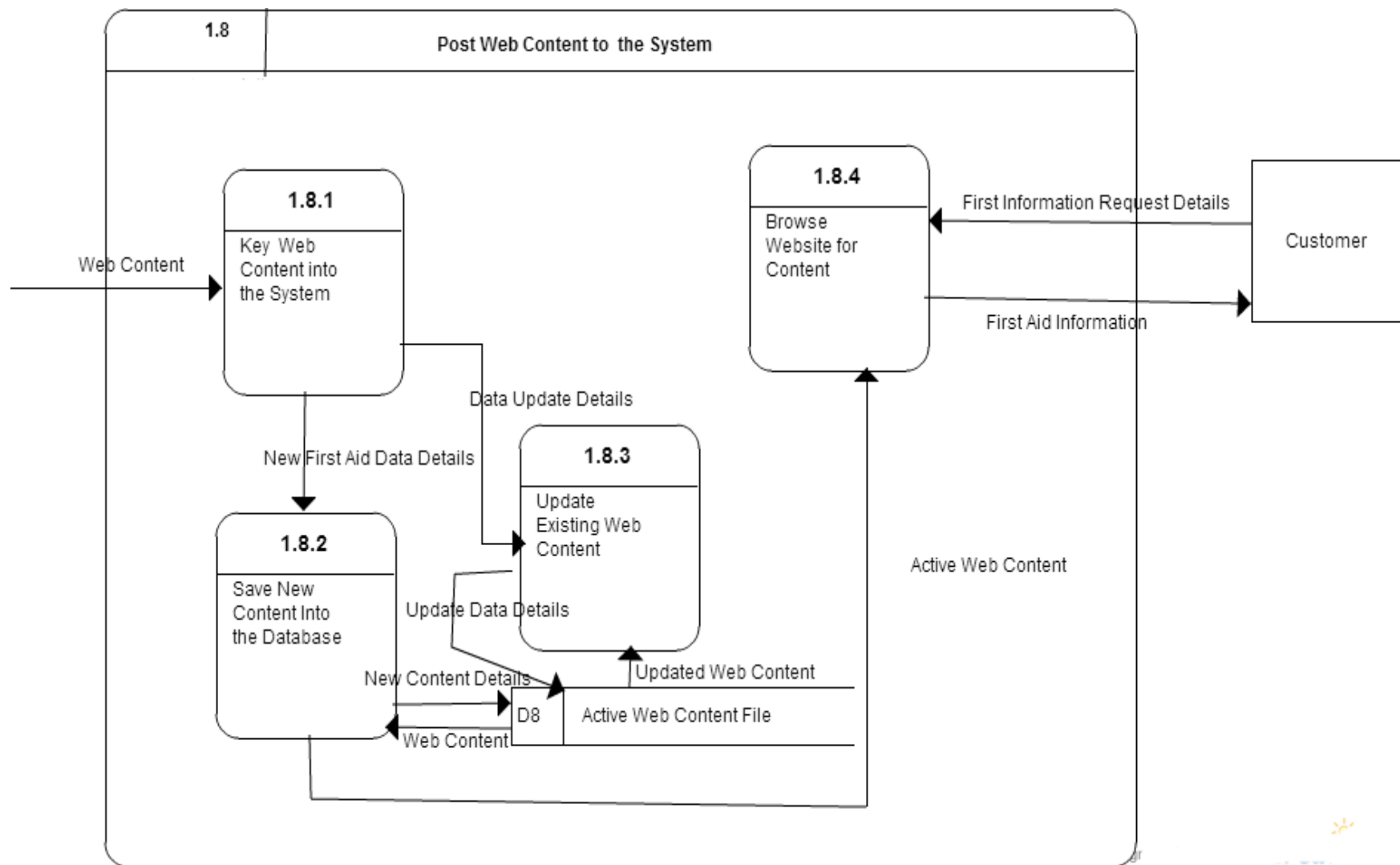


Figure 9: Level 2 Diagram showing the decomposition of process 1.8 of level 1 diagram

3.7.3 Database design

This was represented using entity relationship diagrams. The role of an ER was to capture the conceptual model of the data to be managed in a database in regard to what there is and how it is connected. The E-R diagram has three main components:-

- i. Entity- this can be any object, place, person or class. In E-R Diagram, an entity is represented using rectangles.
- ii. Attribute- this describes a property or characteristic of an entity. For example, Name, mobile number, email etc can be attributes of a mobile phone user in this system. An attribute is represented using eclipse.
- iii. A Relationship describes relations between entities. Relationship is represented using diamonds.

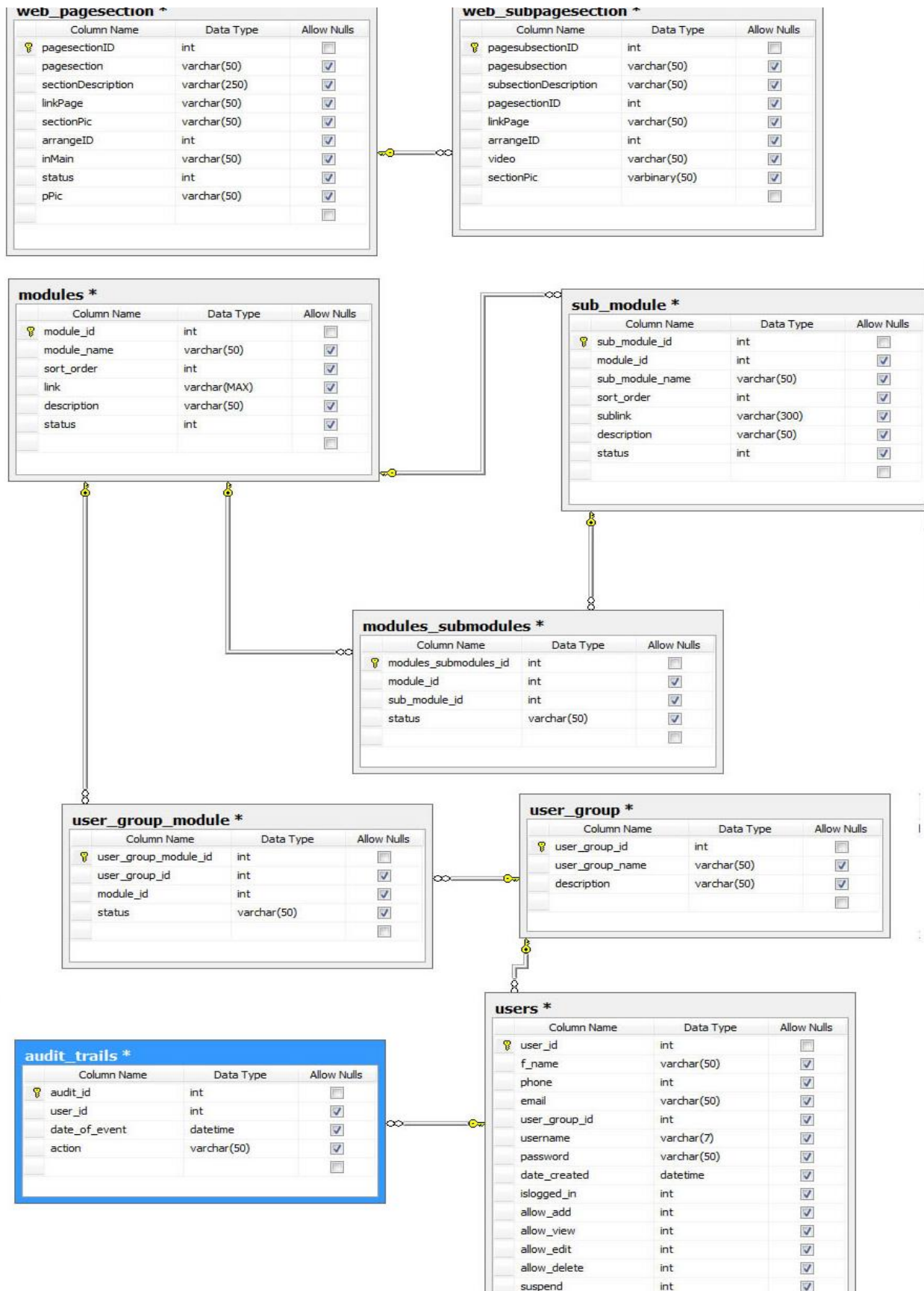


Figure 10: Database Design

3. 8. System testing methodologies

Upon successful completion of the development phase, the system was tested as follows:-

- **Stub testing-** This test was performed on individual modules of the system in isolation to ensure an optimal performance per module.
- **Program testing-** This type of testing was carried out after integrating the SMS module with the web portal to ensure that the events and modules that had been coded and stub tested for the program were tested as an integrated unit.
- **Regression testing-** This was carried out in order to extrapolate the impact of any changes on system performance (throughput and response time) by analyzing before-and-after performance against the test script.
- **Acceptance testing-** The system acceptance testing was carried out by helping participants to interact with the system so as to get their feedback. Their feedback was used to improve the system.

3.9 Implementation

This section explains the activities carried out in the implementation stage. The end product of this project at this stage was a first aid system fully supported on web and mobile SMS platform to provide information to the public. This phase also involved the construction of the new system and the delivery of that system into production.

3.9.1 System Development tools and Technologies

3.9.1.1 Database Management System

We opted for a database that is easy to use and which ensures the security and integrity of data. The database should avoid data redundancies by implementing the use of primary keys and create relationships between entities through introduction of foreign keys. MySQL version 5.0 database management system was therefore the best tool and was used to design the database. MySQL database management system was preferred due to features such as size of data it can hold, speed of query execution, concurrency and control of security as well as the fact that it is open source therefore free.

3.9.1.2 PHP5 (Preprocessor Hypertext), HTML

PHP 5 was used as the front-end tool. It provided a link between the front end and the database. We opted for it because PHP5 provides an Integrated Development Environment that is easy to learn and use so long as one has the basic Hypertext Markup language knowledge. Apart from this, PHP5 programming language supports object orientation and therefore it has advantages emanating from object oriented Programming.

3.9.1.3 Hypertext Mark Up Language (HTML)

HTML was used for creation of tables, forms and form objects that were vital for saving records into the database, deleting, manipulating data items in the database as well as retrieving data from the database.

3.9.1.4 Adobe Fireworks

This was used as the basic graphics software for designing the template and manipulating images.

3.9.1.5 Cascading Style sheets (CSS)-

This was used for layout and presentation.

3.9.1.6 JavaScript

The JavaScript language is a Web-enhancing technology. When employed on the client computer, the language can help turn a static page of content into an engaging, interactive, and intelligent experience.

JavaScript was therefore used to provide the following solutions

- i. Getting Web pages to respond or react directly to user interaction with form elements (input fields, text areas, buttons, radio buttons, checkboxes, selection lists) and hypertext.
- ii. Distributing small collections of database-like information and providing a friendly interface to that data.
- iii. Controlling multiple-frame navigation, plug-ins, or Java applets based on user choices in the HTML document.
- iv. Preprocessing data on the client before submission to a server.
- v. Changing content and styles in modern browsers dynamically and instantly in response to user interaction.

3.9.1.7 Macromedia Dream weaver

This was used as the basic code editor which also helped in compilation of the source code.

3.10 System Security

3.10.1 Access Control

The First Aid information provided by the system must be credible and accurate and to ensure this, we created access control matrix where different users were able to access the system with rights and privileges adequate for them to perform their duties and nothing more. Users were also put into different user groups. The system also maintained an audit trail to capture all user activity.

3.10.2 Backup utility

The system was hosted in a remote server with write permissions only granted to a user accessing through the provided Control panel. A strong password was also provided for the control panel. The Control panel also has a facility for daily automated backups. The Host Package was also installed with

Site Lock add-on to help prevent malware. However, a trained User administrator was recruited to keep copies of the database in a CD-Rom.

3.10.3 Data fields Input validation

Key and required fields were validated to ensure that only correct data formats were keyed into the system so as to ensure data integrity and minimize on error from data entry.

3.11 Project deliverables

The following products were delivered at the end of the development period

- a. Working system prototype (Working SMS Query and an administrative web interface)
- b. Documentation-Project Report
- c. Research paper

CHAPTER FOUR: TESTS, RESULTS AND DISCUSSIONS

4.1 Usability Tests

To conduct tests the researcher actually went to the field and interacted with members of the public. Members of the public were introduced to the system and guided on how it works and they successfully tried it. The researcher also issued questionnaires to the respondents aimed at finding out whether if the system was released to the market they would use it.

4.1.1 System Usability

All the users (100%) who tested the system after development found it easy to use since they had prior knowledge of text messaging. They found the guide to navigate and interrogate the system via SMS very user friendly.

4.2 User acceptance tests

A good percentage (78%) of participants who tested the system was happy with the system and accepted the system on the following grounds:-

- i. Most People have access to or own mobile phones and even the most basic mobile phone could be used on the system.
- ii. They found out that SMS was a quick way to pass information.
- iii. They found it cheap to use the system not only because SMS is cheap but also because the system does not charge users i.e. it is toll free.
- iv. SMS is a popular means of communication among many Kenyans.
- v. The capability of querying a database using a guided mobile phone SMS and getting response without direct human intervention was among the most acceptable features of the system especially due to the fact that it promotes consistency in response for the same question even if asked again and again.

4.3 Availing the system to users

From the sample of respondents who filled the questionnaires, 98% own mobile phones and therefore most of them would be able to access the system. For this reason the system is highly available for as long as the SMS service provider does not experience technical problems affecting SMS.

4.4 Summary

Majority of Kenyans are not trained in first AID in spite of having first aid training institutions in Kenya. Of the 54 respondents only 11% were trained in First aid and 89% percent were not. It is therefore hoped

that through an SMS based System many Kenyans would be able to access first aid information on their phones since we have seen that majority in the study sample like to use SMS and most of them have mobile phones.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

The objectives of this project were met as discussed below

5.1 Review of Objectives in Relation to the prototype

The main objective was to develop a first aid information management system and this was achieved and the system is currently running on both SMS and web platform.

The second objective was to look at the potential of SMS in improving access to first aid information in Kenya and this was successfully achieved through tests run using the live system. The third objective was to get the needs of the system users and other stakeholders. This requirement was met through interviews conducted and improved using the user feedback after testing the system.

The last objective was to determine the SMS interface design considerations for users and stakeholders of the system. Different prototypes were developed presenting content in different ways. Presentation by Listing options and user interaction appeared the most user friendly than continuous prose in one page.

Having developed a working system for first aid information management and dissemination both Achievements and limitations of SMS were discovered.

5.1.1 Achievements

Among the strengths include

- a. The developed system provided an opportunity to overcome communication barriers that limit access to first aid information for both emergency and learning purposes. This was made possible through the use of SMS.
- b. The system offered a linkage between first aiders in the community helping them remember first aid procedures when they cannot access first aid manuals or when they have forgotten what to do in certain incidents.
- c. The system provided consistency in response once queried again and again on the same first aid skill.
- d. The system also served as a mobile tool to learn first aid theory using SMS exchange between the user and the system with practical aspects demonstrated by use of Video on the web-portal.

5.1.2 Limitation

Limitations of the system included the following

- a. Poor support to video and graphical information.

- b. SMS dependency on the service provider network was an inevitable threat which could cripple the system if the service provider network suffered a technical hitch. This created a limitation to the system.
- c. Due to the use of SMS the system could only support procedures with Characters limited to a single SMS length.

5.2 Further work

We recommend further work in developing an integrated first aid system with a centralised database accessible on Android, Web, USSD and SMS platforms so that different users can access it using their preferred platform. This will create a wider awareness on first aid information especially with proper advertising on the media to inform the public on the existence of such a system and how to use it.

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7.0 APPENDICES

Appendix 1: System Installation Guide

The end product of this project at this stage was a first aid system prototype fully supported on web and mobile SMS platform to provide information to the public. The system was implemented both locally and on a remote server. Both machines met the following minimum installation prerequisites.

Installation Pre-requisites

The system required the following installation pre-requisites

Hardware requirements

A Computer (Host Server)

The Host server required at least the following features

- Processor - Intel x86 Architecture 3GHz processor or equivalent
- RAM - 2 GB RAM
- Hard Disk - 100GB and above
- Must be on for 24 hours every day.

Client Machines

The following requirements were necessary for the optimum performance the system on the accessing client machines

- Processor - Intel x86 Architecture 3GHz processor or equivalent
- 2 GB RAM .
- 40 GB hard disk space.
- CD-ROM drive or a floppy drive.
- VGA or higher resolution monitor.
- Mouse or other pointing device.

Software Requirement of the Host Server

- Operating System - Windows XP, Windows 7, Windows 8, Windows Server 2003, Windows Server 2008, Linux distributions such as Ubuntu, Fedora, Redhat.
- Apache Version - Apache 2.2
- MySQL Version - 5.1.36
- PHP Version - 5.3.5, 5.2.10-2Ubuntu6.4
- Browser - Internet Explorer 8, Firefox, Google Chrome, Safari

- *Note: JavaScript should be enabled in all the browsers
- Web Server Packages - XAMPP, WAMPP , LAMPP

Installation and configuration process

The system was deployed on Apache. A remote server with AMP (Apache, Mysql and PHP) stack configured was used to host the system. During the testing phase on a local machine a laptop installed with WAMP was used and this provides a good set up for the system at localhost. . After installing the wamp.exe the user will just place the database in MySQL/data folder and the system in wamp/www folder. This meant that the system could also be hosted locally. The system was main installation was however hosted remotely due to lack of a public internet protocol (IP) on the local machine so as to provide a connection and an interaction with the SMS Application Interface.

Appendix 2: Questionnaires

2.1 Feasibility Study Questionnaire

General Public (Users Questionnaire)

Close-ended/Open-ended questionnaire conducted by MR. PETER K.KING'OO:

Project Title: Development of SMS Based System to Provide First Aid Information in Kenya

Project Overview

This questionnaire is aimed at engaging system users to gauge their experience with mobile phones texting, their level of training in first aid if any and previous experience with any other first aid system. In order to fully understand the envisaged system and its expected impact on improving life saving skills in Kenya it would be greatly appreciated if you could take 2-10 minutes to complete the following 10 questions.

Confidentiality:

You are not required to put your name on the questionnaire though a space has been provided if you wish to do so. If you add your name you will not be identified by the name within the project. If you have any concerns regarding the questions below or use of the questionnaire within the research project please do not hesitate to contact me at petchaloo@gmail.com

Please answer the following questions as comprehensively as possible and to the best of your knowledge. Answer by ticking the appropriate checkboxes as provided.

Name

Organization

Please Turn over

SECTION I: PERSONAL INFORMATION

Q1. In what age group are you?

- ☐ 19 years and under
- ☐ 20 - 29 years
- ☐ 30 - 39 years
- ☐ 40 - 49 years

☐ 50 - 59 Years

☐ 60 + years

Q2. Kindly specify your Gender:

☐ Male

☐ Female

Q3. Kindly Specify your Occupation?

SECTION 2: USER SYSTEM REQUIREMENTS

Q4. What is your understanding of the word first aid?

Q5. Are you trained in first aid?

Please mark your answer in the appropriate option below.

☐ Yes

☐ No

If you answered YES, kindly LIST the first aid skills you have been trained in.

Q6. Do you have a mobile phone?

☐ Yes

☐ No

Q7. If you were provided with first aid information on SMS how likely are you to read it?

☐ Very Likely

☐ Likely

☐ Un likely

Q8. How often do you use the Short Messaging Service (SMS) feature of your mobile phone to communicate to your friends?

☐ Daily ☐ Weekly ☐ Monthly ☐ Yearly ☐ I never use it

Q 9. Have you used any first aid information system before?

☐ Yes

☐ No

If you answered YES, briefly describe the system?

Q 10. Do you think SMS can be an effective means of passing first aid information to the public?

☐ Yes

☐ No

☐ May be

Kindly explain the reasons for your response above.

SECTION 3: STAKEHOLDER USER REQUIREMENTS

Q11. For how long have you been training first aid?

Please mark your answer in the appropriate option below.

☐ Less than 3 Years

☐ 4-5 years

☐ 6-10 years

☐ Above 10 Years

Q12.What Methods do you use to train first aid?

- ☐ Issuance of first aid Manuals and Books to students
- ☐ Issuance of Brochures to students
- ☐ Training theory and Practical Sessions
- ☐ Training theory in Classroom sessions
- ☐ E-Learning (Website portal content)

List any others

END OF QUESTIONNAIRE

Thank you for participating in the above questionnaire. Please return it in person to PETER K.KING'OO or e-mail to petchaloo@gmail.com.

Stakeholder Questionnaire

2.2 User Acceptance Questionnaire

Closed-ended/Open-ended questionnaire conducted by MR. PETER K.KING'OO:

Project Title: Development of SMS Based System Prototype to Provide First Aid Information in Kenya

Project Overview

This questionnaire was administered after the system was deployed and sought to get user feedback from the users who used the system.

Confidentiality:

You are not required to put your name on the questionnaire though a space has been provided if you wish to do so. If you add your name you will not be identified by the name within the project. If you have any concerns regarding the questions below or use of the questionnaire within the research project please do not hesitate to contact me at petchaloo@gmail.com

Please answer the following questions as comprehensively as possible and to the best of your knowledge.
Answer by ticking the appropriate checkboxes as provided.

Name

Organization

SECTION I: PERSONAL INFORMATION

Q1. In what age group are you?

- ☐ 19 years and under
- ☐ 20 - 29 years
- ☐ 30 - 39 years
- ☐ 40 - 49 years
- ☐ 50 - 59 Years
- ☐ 60 + years

Q2. Kindly specify your Gender:

- ☐ Male
- ☐ Female

Q3. Kindly Specify your Occupation

SECTION: USER FEEDBACK

Q4. In the Scale of 1 – 5, Please tick the best option for the following questions (5 =Excellent, 4 = Very Good, 3=Good, 2=Poor, 1=Very Poor)

	Very Poor	Poor	Average	Good	Excellent
i. How do you rate the functionality of the system in terms of performance?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ii. How do you rate the graphical user interface presented on mobile SMS?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
iii. How do you rate the system in terms of user-friendliness?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
iv. What would you rate as the likely acceptability of this system if deployed for all users in Kenya?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q5. Do you think this first aid system is better than the class room approach?

☐ Yes

☐ No

Q6. Did you encounter any difficulty while using the system?

☐ Yes

☐ No

Q7. Kindly recommend any improvement(s) for this system (if applicable).

END OF QUESTIONNAIRE

Appendix 3: Permission to use Red Cross First AID information data

Request for Demo Data - X

https://mail.google.com/mail/u/0/#search/red+cross/148d1f5a6e219c52

Apps www.logbook.co.ke... Matunda's Blog » R... ebrary: Advanced Se... Security of Vehicular...

Google red cross

Mail

COMPOSE

Inbox (125)

Starred

Important

Sent Mail

Drafts (205)

Circles

Friends (22)

Family

Search people...

Dee Enn

Kamau Gatheru

Sammy Njoroge

Griffins Osero

Kennedy Chongwo

Peterson G. Waru...

Richard Musyoka

Venant Madedo

Biz Edge (E.A) Li...

Steve Jirongo

Christine Boase <CBoase@redcross.org.uk> to me

Oct 8

BritishRedCross

My children cannot understand why we can't go home... Every crisis tells a story. This is mine... >

Hello Peter,

Thanks you for that further explanation. I am happy to grant you permission to populate your project

DEVELOPMENT OF A TOLL FREE mHealth SMS SHORT-CODE SYSTEM

SERVICE TO PROVIDE FIRST AID INFORMATION IN KENYA

with British Red Cross content from Everyday First Aid (redcross.org.uk/everydayfirstaid) for academic purposes.

This agreement prohibits any release of your project to public market, or any marketing activity related to the app within your place of study or beyond. The British Red Cross reserves the right to withdraw the licence. This agreement is valid until 31 December 2015.

Good luck with your project. I hope you have success.

Christine J. Boase

Product development manager – Education

Int: 17750

T: 01273 227 826

M: 07525 902 578

E: cboase@redcross.org.uk

New tab Ctrl+T

New window Ctrl+N

New incognito window Ctrl+Shift+N

Bookmarks

Recent Tabs

Edit Cut Copy Paste

Save page as... Ctrl+S

Find... Ctrl+F

Print... Ctrl+P

Zoom - 90% +

History Ctrl+H

Downloads Ctrl+J

Sign in again...

Settings

About Google Chrome

Help

More tools

Exit Ctrl+Shift+Q

1:51 PM 18-Dec-14

Appendix 4: System User Manual

Accessing the system

The system is hosted on a remote server running linux operating system but users can access it remotely by typing the url <http://41.139.208.179:8020/firstaidMIS/>

Once you type in the Url the following login screen will appear

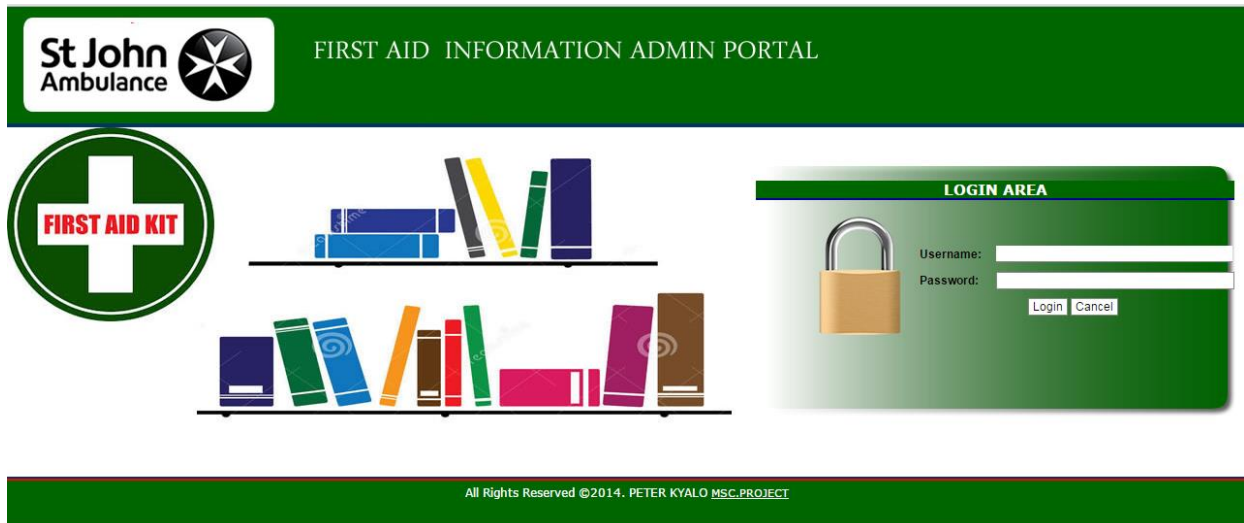


Figure 11: Login Screen

Login

To log into the system, Key in the username and Password provided by the administrator in the appropriate section as shown on the screen shot above

Adding SMS Content Categories

Once Logged in the screen on figure 23 will be loaded.

From the Main menu go to

SMS CONTENT MANAGER then choose Search Categories and add categories as shown in the form on figure 25

Once done click on the Save button.

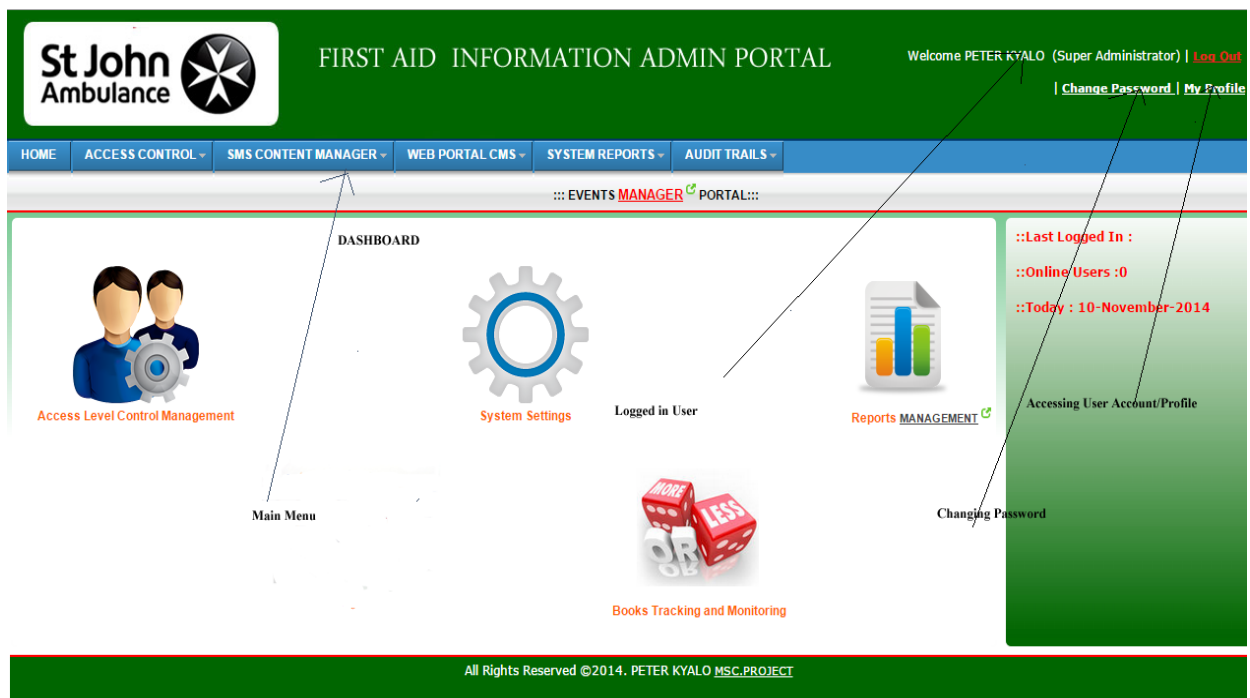


Figure 12: Dashboard

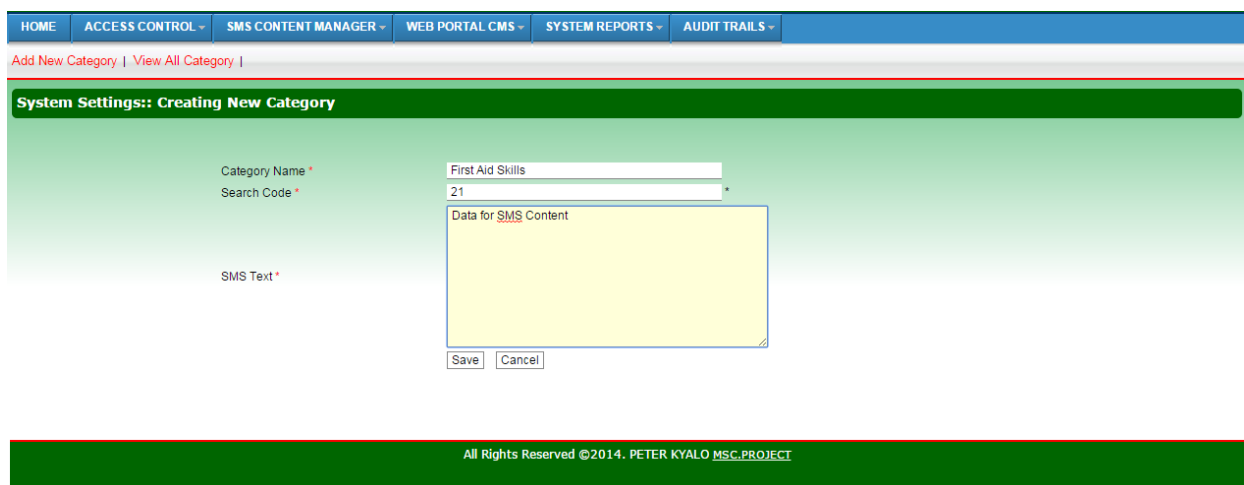


Figure 13: SMS Content Listing

St John Ambulance FIRST AID INFORMATION ADMIN PORTAL Welcome PETER KYALO (Super Administrator) | [Log Out](#) | [Change Password](#) | [My Profile](#)

HOME ACCESS CONTROL SMS CONTENT MANAGER WEB PORTAL CMS SYSTEM REPORTS AUDIT TRAILS

[Add New Category](#) | [View All Category](#) |

System Settings:: Creating New Category

Category Name *

Search Code *

SMS Text *

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Figure 14: Add New SMS Content Category

Adding SMS Content

From the main Menu go to SMS CONTENT MANAGER then choose SMS Content Entry. The form on figure 27 below will appear. Click on on the menu as shown in figure 26

Proceed to add the first aid information as shown in the figure 28 below then click to the add button to save the record.

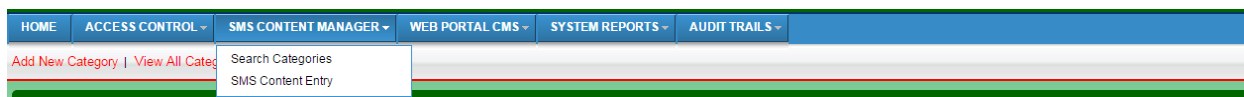


Figure 15: Menu to add New SMS Content

St John Ambulance FIRST AID INFORMATION ADMIN PORTAL Welcome PETER KYALO (Super Administrator) | [Log Out](#) | [Change Password](#) | [My Profile](#)

HOME ACCESS CONTROL SMS CONTENT MANAGER WEB PORTAL CMS SYSTEM REPORTS AUDIT TRAILS

[Add New subcategory](#) | [View All Subcategory](#) |

System Settings:: View All Sub Categories

Filter By Category * Or By subcategories Name*

categories Name	subcategories Name	Edit	Delete
FIRST AID SKILLS	Asthma Attack		
FIRST AID SKILLS	poisoning and harmful substances		
FIRST AID SKILLS	Choking		
FIRST AID SKILLS	Head Injury		
FIRST AID SKILLS	Broken Bone		
FIRST AID SKILLS	Heart Attack		
FIRST AID SKILLS	Bleeding Heavily		
FIRST AID SKILLS	CPR		

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Figure 16: SMS first AID Content Listing

Figure 17: Adding SMS Content

Accessing SMS Content via Mobile Phone

Follow the following steps to access first AID Information using your mobile phone

- i. From your mobile phone send a message “100” to a short code 22281.
- ii. The following reply will be received

Welcome to emergency response first AID information portal. Reply with

21 for first aid Options

22 for emergency contact

Choose 21 to proceed and click on send

- iii. The following message will then come up giving you the available options

Reply with:

201 for Asthma Attack

202 for poisoning and harmful substances

203 for Choking

204 for head injury

205 for broken bone

206 for Heart Attack

207 for Bleeding Heavily and

100 to return to the main Menu

Reply with the code for your preferred option

- iv. Reply with the code for your preferred option from step iii above
- v. Wait for the content in the chosen area to load. Reply with another option for different option or 212 to go back to the main Menu

Appendix 5: Sample Source Code

```
<?PHP
//code for database connection
//error_reporting(0);
$base_url="http://localhost/event_manager/";
$hostname_conneastan = 'localhost';
//set database user
$username_conneastan = 'root';
//set database pass
$password_conneastan = '';
//set database name
$database_conneastan = 'firstaidmis';
//connect to db
$conneastan = mysql_connect($hostname_conneastan,
$username_conneastan, $password_conneastan)
    or die("connection error");
mysql_select_db($database_conneastan)
    or die("cannot select database");
?>

<?php
//code for adding main search categories dynamically
#include connection
include('includes/session.php');
include('Connections/fundmaster.php');
//function for adding categories
function add_category($categoryname,$smstext,$code,$user_id)
{
$categoryname=mysql_real_escape_string($_POST['category_name']);
$code=mysql_real_escape_string($_POST['search_code']);
$smstext=mysql_real_escape_string($_POST['sms_text']);
$sqlprof= "SELECT * from categories where
categoryname='".$categoryname'";
$resultsprof= mysql_query($sqlprof) or die ("Error
$sqlpo.".mysql_error());
$rowsprof=mysql_num_rows($resultsprof);
if ($rowsprof>0)
{
header ("Location:home.php?addcategory=addcategory&recordexist=1");
}
else
{
$sqlplo= "insert into categories
VALUES('','$categoryname','$code','$smstext')";
$resultslpo= mysql_query($sqlplo) or die ("Error
$sqlplo.".mysql_error());
$sqlauditsav= "insert into audit_trails
values('','$user_id',NOW(),'Created a category $categoryname into the
system ')"';
$resultsauditsav= mysql_query($sqlauditsav) or die ("Error
$sqlauditsav.".mysql_error());
?><script type = "text/javascript">

                                <!--
                                alert('Record
Updated Successfully!');
                                var
myurl="home.php?viewcategory=viewcategory"
```

```

window.location.assign(myurl)
// -->
</script> <?
}
//mysql_close($cnn);

}??>

```

API code for managing SMS Logic

```

my $categories = "SELECT * FROM sdpm.categories ORDER BY code ASC";
my $results = $dbh->selectall_hashref($categories, 'code');
my $messo = "";
foreach my $code (sort keys %$results){

    my $cat_id = $results->{$code}->{id};#$results->{$id}-
>{dest_msisdn};
    my $cat_code = $results->{$code}->{code};
    my $cat_name = $results->{$code}->{categoryname};
    my $messo = "$cat_code FOR $cat_name ";
    print"captured is $messo.....\n";

    print"capture.....\n";
    #get all the required columns

    my $textm = "SELECT * FROM sdpm.cat_message ORDER BY lid";
    my $results = $dbh->selectall_hashref($textm, 'lid');
    foreach my $lid (keys %$results){
    my $messo2 = $results->{$lid}->{messagetxt};

        print" In the table is
$messo2...=====..\n";

        my $messo5 = "$messo2\n$messo";

        print"$messo5.....\n";

        #my $quote = 'Love is like quicksand, the deeper you fall in it,
the harder it is to get out.';
        my $sql1 = "update sdpm.cat_message set messagetxt = '$messo5'";
        $dbh->do($sql1);
        print"$sql1.....\n";
    }

}

my $textm2 = "SELECT * FROM sdpm.cat_message ORDER BY lid";
my $results = $dbh->selectall_hashref($textm2, 'lid');
foreach my $lid (keys %$results){
my $messgt = $results->{$lid}->{messagetxt};

```

Codes for deleting in all sections

```
<?php
#include connection
include('Connections/fundmaster.php');
include('includes/session.php');

// code for deleting donors
$id=$_GET['id'];
function delete_subcategories($id,$user_id)
{
    $sql= "delete from subcategories where id='$id'";
    $results= mysql_query($sql) or die ("Error $sql.".mysql_error());
    $sqlauditsav= "insert into audit_trails
    values('','$user_id',NOW(),'Deleted a subcategory from the system')";
    $resultsauditsav= mysql_query($sqlauditsav) or die ("Error
    $sqlauditsav.".mysql_error());
    ?><script type = "text/javascript">
                                <!--
                                alert('Record
Updated Successfully!');
                                var
myurl="home.php?viewsubcategory=viewsubcategory"
window.location.assign(myurl)
                                // -->
                                </script> <?

mysql_close($cnn);
}
$id=$_GET['id'];
function delete_categories($id,$user_id)
{
    $sql= "delete from categories where id='$id'";
    $results= mysql_query($sql) or die ("Error $sql.".mysql_error());
    $sqlauditsav= "insert into audit_trails
    values('','$user_id',NOW(),'Deleted a categories from the system')";
    $resultsauditsav= mysql_query($sqlauditsav) or die ("Error
    $sqlauditsav.".mysql_error());
    ?><script type = "text/javascript">
                                <!--
                                alert('Record
Updated Successfully!');
                                var
myurl="home.php?viewcategory=viewcategory"
window.location.assign(myurl)
                                // -->
                                </script> <?

mysql_close($cnn);
}
// page sub sections
$pagesubsectionID=$_GET['pagesubsectionID'];
```



```

function delete_pagesubsection($pagesubsectionID,$user_id)
{
$sql= "delete from pagesubsection where
pagesubsectionID='$pagesubsectionID'";
$results= mysql_query($sql) or die ("Error $sql.".mysql_error());
$sqlauditsav= "insert into audit_trails
values('','$user_id',NOW(),'Deleted a pagesubsection from the
system')";
$resultsauditsav= mysql_query($sqlauditsav) or die ("Error
$sqlauditsav.".mysql_error());
header
("Location:home.php?viewpagesubsection=viewpagesubsection&deleteuniver
sityconfirm=1");
mysql_close($cnn);
}
// page sections delete

$pagesectionID=$_GET['pagesectionID'];
function delete_pagesection($pagesectionID,$user_id)
{
$sql= "delete from pagesection where pagesectionID='$pagesectionID'";
$results= mysql_query($sql) or die ("Error $sql.".mysql_error());
$sqlauditsav= "insert into audit_trails
values('','$user_id',NOW(),'Deleted a pagesection from the system')";
$resultsauditsav= mysql_query($sqlauditsav) or die ("Error
$sqlauditsav.".mysql_error());
header
("Location:home.php?viewpagesection=viewpagesection&deleteuniversityco
nfirm=1");
mysql_close($cnn);
}
?>

```

Code for Editing data in various tables

```

<?php
#include connection
include('includes/session.php');
include('Connections/fundmaster.php');
//functioning editing search Categories
function edit_categories($categoryname,$smstext,$code,$user_id)
{

$id=$_GET['id'];

$categoryname=mysql_real_escape_string($_POST['category_name']);
$smstext=mysql_real_escape_string($_POST['sms_text']);
$code=mysql_real_escape_string($_POST['search_code']);
$sqlupdt= "UPDATE categories SET
categoryname='$categoryname', smstext='$smstext', code='$code' WHERE
id='$id'";
$resultsupdt= mysql_query($sqlupdt) or die ("Error
$sqlupdt.".mysql_error());
$sqlauditsav= "insert into audit_trails
values('','$user_id',NOW(),'Update category into the system ')" ;
$resultsauditsav= mysql_query($sqlauditsav) or die ("Error
$sqlauditsav.".mysql_error());

```

```

?><script type = "text/javascript">
                                <!--
                                alert('Record
Updated Successfully!');
                                var
myurl="home.php?viewcategory=viewcategory"

window.location.assign(myurl)
                                // -->
                                </script> <?

mysql_close($cnn);
}
function
edit_pagesubsection($pagesectionID,$pagesubsection,$subsectionDescript
ion,$arrangeID,$linkPage,$video,$user_id)
{
$id=$_GET['id'];
$pagesubsection=mysql_real_escape_string($_POST['pagesubsection']);
$subsectionDescription=mysql_real_escape_string($_POST['description'])
;
$arrangeID=mysql_real_escape_string($_POST['txtsortID']);
$linkPage=mysql_real_escape_string($_POST['txtlink']);
$pagesectionID=mysql_real_escape_string($_POST['pagesectionID']);
$video=mysql_real_escape_string($_POST['txtVideo']);
$sqlupdt= "UPDATE pagesubsection SET
pagesubsection='$pagesubsection',subsectionDescription='$subsectionDes
cription',arrangeID='$arrangeID',linkPage='$linkPage',pagesectionID='$
pagesectionID',video='$video' WHERE pagesubsectionID='$id'";
$resultsupdt= mysql_query($sqlupdt) or die ("Error
$sqlupdt.".mysql_error());
$sqlauditsav= "insert into audit_trails
values('','$user_id',NOW(),'Update category into the system ')" ;
$resultsauditsav= mysql_query($sqlauditsav) or die ("Error
$sqlauditsav.".mysql_error());
?><script type = "text/javascript">
                                <!--
                                alert('Record Updated Successfully!');
                                var
myurl="home.php?viewpagesubsection=viewpagesubsection"

window.location.assign(myurl)
                                //
-->
                                </script> <?

mysql_close($cnn);
}
function
edit_smscategories($categoryname,$description,$code,$category_id,$user
_id)
{
$id=$_GET['id'];
$categoryname=mysql_real_escape_string($_POST['pagesubsection']);
$description=mysql_real_escape_string($_POST['description']);
$code=mysql_real_escape_string($_POST['txtsortID']);
$category_id=mysql_real_escape_string($_POST['category_id']);

```

```

$sqlupdt= "UPDATE subcategories SET
categoryname='$categoryname',description='$description',code='$code',c
ategory_id='$category_id' WHERE id='$id'";
$resultsupdt= mysql_query($sqlupdt) or die ("Error
$sqlupdt.".mysql_error());

$sqlauditsav= "insert into audit_trails
values('','$user_id',NOW(),'Update category into the system ');";
$resultsauditsav= mysql_query($sqlauditsav) or die ("Error
$sqlauditsav.".mysql_error());

?><script type = "text/javascript">
                                <!--
                                alert('Record Updated
Successfully!');
                                var
myurl="home.php?viewsubcategory=viewsubcategory"

window.location.assign(myurl)
                                // -->
                                </script>  <?

mysql_close($cnn);
}
?>

```