# Online Symptoms and Diseases Management System

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*Abstract:* **This paper reports on the findings of a research project that had the objective to build an online symptoms and diseases management system, simply the e-governance system in the Ministry of Health that can replace the manual handling of data collection of symptoms and diseases data. Provision of quality health services is a cost that affects even the richest of economies. Its poor management can result into a social problem. It is therefore imperative for the Ministry of Health to be prepared and to be able to adequately manage the health status of the country. It is the collected data on symptoms and diseases, and areas of prevalence of this data that is critical in the management of health services. In the information era, information is generally managed through an information system. It defines the functions of specific offices and the type of data they require. The symptoms and diseases management system is a tool that will help in the management of health service delivery. Functions such as disease prevalence analysis, deployment of resources, searching capabilities, and event modeling can be performed using this system. This is a major significance of this project.The paper explores the development of the system that has far reaching implications beyond the Ministry of Health but will also help in prudent decision making by the government as it strategizes towards public health care in the country. This is a contributing factor to the agenda of E-Governance that the government has adopted. By having a central repository of symptoms and diseases, other miscellaneous aspects related to the management of public health, the indexing and locating of records relating to diseases will be greatly streamlined. This streamlining will greatly improve inter department communication and enhance the effective management of public health.**

*Keywords:* **E-governance; Social problem; Symptoms; Diseases; Information; Ministry of Health.**

## 1. INTRODUCTION

Every student of ICU is required to come up with a research project in the final year of study. This student decided to conduct a research in the health services in Zambia particularly in the operations of the Ministry of Health in the specific area of management of symptoms and their related diseases. The era we live in is described as the information age. This phenomenon necessitates the use of information communication technology in the management of organizational and governmental information.

Governments can be more proactive, responsive and analytical through the use of technology. One of the ways this can be done is through the implementation of e-governance in government agencies. The Ministry of Health is a government department that can also use information technology in the management of its symptoms and diseases information. This is an opportunity for the ministry to have a centralized data store of all reported and researched symptoms and diseases.

E-Governance is an opportunity to transform commitment by governments to be citizen centric, provide cost-effective services and enhance governance through improved access to accurate information and transparent and responsive democratic institutions. E-Governance should not be an experiment in administrative reform but a permanent part of the governing process. These factors are the impetus for the Symptoms and Disease Management System.

This research resulted into a web based application which shall facilitate collection of symptoms and diseases data and its subsequent analysis. Government hospitals, clinics and medical centers will have access to the system and report symptoms and diseases in their areas of jurisdiction. Designated personnel shall manage the submitted data and use it to conduct analytical strategic planning to combat diseases. The symptoms data shall make it possible for the ministry to identify diseases that are yet to be known and those still under research. The advantage of web based applications is that they are available 24/7 and therefore there is no limitation on the time that identified symptoms and diseases can be reported. The system is developed to be easily accessible on hand held devices. This will make it possible for medical staff to submit data using smart phones in areas where computers are not available. It is the focus of this document to outline the various activities leading up to the development of the Symptoms and Diseases Management System. The following sections will describe the problem statement necessitating this research, the purpose of the project, a review of existing literature in this field of study, the methodology used in the development of the system, the subsequent implementation of the system, and lastly the significance of the developed system.

**Problem Statement:**

One of the findings of this research revealed that the major impediment to the current system in the ministry of health is that no specific system exists as regards the reporting of symptoms and diseases data. Health personnel rely on what disease symptoms that they were as a way of identifying a particular disease. There is no way of distinguishing new symptoms from old ones. This sometimes leads to wrong patient diagnosis and hence fatal consequences when wrong treatment is administered.

Information cannot be over emphasized in the fight and discovery of medical conditions. Arguably, the most important tool in medical practice is information that comes from the affected communities. The location of disease prevalence and unusual symptoms is vital information for the Ministry of Health and other health agencies. The correct use of information is highly dependent on the information management system in place.

As symptoms of new diseases continue to escalate in growing populations due to changes in eating habits and the type of food that is eaten, it is becoming increasingly difficult for the ministry of health to be in each affected area with the expected preparedness to effectively combat disease. This research has revealed that there is currently no diseases and symptoms management system at the Ministry of health. A non-governmental disease research agency called The Tropical Diseases and Research Center does exist. This organization is however independent of government and conducts research into tropical diseases but does not specifically capture information on symptoms and diseases in general. Its focus is on research of existing diseases and how to best combat them. Furthermore, there is no direct sharing of this information with government because it is regarded as research data. The ministry of health is therefore still left lacking in information on symptoms and diseases data that is has direct control over.

The lack of this information has made it difficult for the Ministry to respond effectively to contemporary symptoms. Lack of information in the ministry has led to inefficiencies which have negatively affected the effective delivery of medical services in the country. It is a well-known fact that symptoms of diseases not yet experienced such as Ebola, are taking root in our communities and the only records that the Ministry relies on are patient records of those patients that have been previously treated with similar symptoms. This is not an effective way of gathering symptoms and diseases data because records that are held by private health agencies are not visible to the ministry. There is also no regulatory framework that exists to guide private health agencies on how to treat new symptoms or where they should be reported. The problem of information gathering and sharing is further elevated by the fact that the ministries web site focuses on disseminating information about the ministry's structure and locations of health centers rather than how members of the public should report symptoms and diseases of an unusual nature.

**Purpose of the Project:**

This research culminated into the development of a web application that shall be used to collect data on symptoms and diseases as well as symptoms and diseases exhibited by patients in government hospitals, clinics and health centers. This web application here in referred to as the system shall be available on the World Wide Web and designated users in various government hospitals, clinics and health centers shall have access in order to submit symptoms and diseases data. The specific purpose and functionality of the system shall be to:

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- Collect symptom data

- Collect disease data

- Collect disease symptoms data

- Collect patient data

- Collect patient symptoms and disease data

- Support symptoms and diseases prevalence analysis

- Analyze disease prevalence based on location and demographic data

- Support the Ministry of Health's decision making process to effectively deliver quality health services to affected communities

- Better exploit information, communication and technology capabilities

- Facilitate availability of a data collection system that is available across disparate geographic locations 24/7

- Encourage members of the community to be on the lookout for unusual medical conditions in their communities

- Create a data store of medical information that can be used as referral information efficient and accurate diagnosis of patients' medical conditions

The system's aim is to provide an easily accessible data store of symptoms and diseases data for health services stakeholders. The system is developed as a highly comprehensive and intuitive web application that is easy to use. Other health services stakeholders shall also be able to participate in submitting symptoms and diseases data once approved by the ministry. This participation by stakeholders will help bridge the information sharing gap that currently exists between the Ministry and other players in the medical arena.

**Existing System:**

Sadly the research revealed that the ministry of health in Zambia does not have an information technology system for capturing symptoms and diseases data. The closest semblance to a system for capturing such data is in the use of patient records that the different medical agencies keep when a patient is attended to. These manual records are the current storage for symptoms and diseases on a case by case basis. The inefficiency of such a system cannot be over emphasized.

**Proposed System:**

The Symptoms and Diseases Management System provides functionality which tries to automate the entire symptoms and diseases data collection process. The data capture is not limited to symptoms and diseases but also includes disease symptoms as well as capture of symptoms and diseases exhibited by patients at health centers. The system shall provide but not limited to the following functionality:

- Facilitate secure login of approved government and private health facilitators.

- Facilitate submission of patient data and symptoms and diseases exhibited by patients from approved medical centers.

- Facilitate collection of symptoms and diseases data from approved government and private health facilitators.

- Enable statistical analysis of collected data to aid in effective disease control.

- Enable searching of symptoms and diseases based varied combination of variables including location and demographics.

- Provide a centralized data store of symptoms and diseases data from government as well as private health facilitators.

- Provide a referral system during the diagnosis of patient symptoms and diseases.

- Provide symptoms and diseases reports to approved health facilitators.

- Provide disease symptoms and patient symptoms reports to approved health facilitators.

## 2.   REVIEW OF LITERATURE

The development of a successful project is based on solid and deep research. The research for this project was an ongoing process up to the point of the development of the system. In order to justify the feasibility of this project a review of literature regarding adoption models of information technology in governments and the use of it in primary health care was conducted. The review of literature also examined how development of web based applications in the field of health care is conducted.

The literature review that was conducted involved discussions with medical practitioners and implementers of medical systems that are already on the market. Internationally robust tele-medicine systems are already available which help patients with an Internet connection to perform guided self-diagnosis (Australian Government Department of Health, 2015). Such systems make it possible for health information to be readily available to patients thereby making the provision of primary health care much easier. It is estimated that in Zambia one out of every six child does not reach the age of five. This is mainly due to inaccessible primary health care and the poor doctor to patient ratio especially in rural Zambia. Additionally poor and inaccurate diagnosis which is due to unavailability of symptoms and diseases data makes the situation if worse.

The adoption of information communication development holds great promise in improving primary health care in Zambia. Some advances have been made in this area with the implementation of systems such as SMART CARE which is pioneered by the United Kingdom government in Zambia. This literature review took time to gain knowledge from systems that have already been developed in other parts of the world. The following books and websites were used in the review.

* Pressmen, RS 2001, Software Engineering - A Practioner's Approach, Tata McGraw Hill, New York.

* Jalote, P 2005, An Integrated Approach to Software Engineering,Narosa Publishing House Pvt. Ltd., Kolkatta.

* RamaKrishnan, R & Gehrke, J 2000, Database Management Systems, Tata McGraw Hill, Singapore.

* Shneiderman, B 2005, Designing the User Interface Strategies for Effective Human- ComputerIinteraction, Pearson Education, New Delhi.

* Welling, L & Thompson, L 2006, PHP and MySQL Web Development, Dorling Kindserley Publishing Inc., New Delhi.

* Dubois, P 2004, MySQL Cook Book, Shroff Publishers & Distributers Pvt. Ltd., New Delhi.

* Kendall, EK & Kendall EJ 2004, System Analysis and Design, Prentice Hall of India Pvt. Ltd., New Delhi.

* American Medical Association Guide to Talking to Your Doctor, The American Medical Association, New York.

* Navathe, B, Elmasri, R, Somayajulu, VLN, Gupta, SK 2008, Fundamentals of Database Systems, Dorling Kindserley, New Delhi.

* Mercer, DW, Kent, A, Nowicki, SD, Mercer, D, Squier, D, Choi, W & Eide-Goodman, H 2004, Beginner's PHP, Willey Dreamtech India Pvt. Ltd, New Delhi.

It is disturbing to acknowledge that there are still many places in the world where you cannot find a single doctor. For example it is estimated that in Africa there are only doctors per  Optimists of cyber innovations have believed for some time now that 100, 000 people. Zambia has only about 3000 doctors to cater for a population of close to 12 Million. Unnecessary deaths of children and the elderly occur in many parts of Zambia from easily treatable diseases. The Symptoms and Diseases Management System is envisioned to be a contributing information technology innovation that will help to reduce mortality rates in Zambia. Some of the websites that were used in this literature are as follows:

* http://www.freemd.com/

* http://www.consumercomplaints.in/complaints/virtual-pc-doctor-c403217.html

* http://www.everydayhealth.com/

- http://web-md.com/

- http://cs.pervasive.com/blogs/sql4psql

- http://www.php.net

- http://www.mysql.com

- http://www.w3schools.com/Ajax/Default.Asp

- http://www.w3schools.com/CSS/Default.Asp

- http://www.crm2day.com/index_6.php

- http://crm.ittoolbox.com/

- http://www.pmi.org/Pages/default.aspx

- http://www.phpfreaks

- http://www.visual-prolog.com/

Information technology holds great promise for the delivery of many types of health services. The advent of Internet technologies is far reaching than just for provision of information. It includes facilitating public feedback mechanisms on the provision of public services, enabling more direct participation into the decision making process including consultation exercises at local level. The functions of the Internet do not end here but can also include direct support for the health care provision process, such as efficient administration of medical issues specifically diseases and symptoms. Such a function of the information communication technology more specifically the Internet can be achieved through the use of the Symptoms and Diseases Management System.

In developing societies, the Internet can potentially help with multiple challenges facing the effective delivery and administration of basic government services such as the Ministry of Health operations, especially given the amount of technological exposure the public has (Heeks, 2001b; Norris, 2001).

## 3. SYSTEM IMPLEMENTATION

The Symptoms and Diseases Management System proposal document outlined the methodology and plan of work that was to be performed in the development of the system. Web-based applications are playing an increasingly important role in a number of applications. The demands placed on these systems and their complexity has also increased. There is an increased need for improved quality, performance and availability of web-based systems. This is because current times have a heavy dependency on web-based system than ever before. Due to poor web-based system development, most such systems exhibit poor performance and are susceptible to major failures. To avoid such pitfalls an agile approach to software engineering and the web engineering method were employed in the development of the Symptoms and Diseases Management System. The Agile methodology encourages delivery of high quality software components at each development life cycle. This methodology has been complemented by Web engineering which advocates a process and a systematic approach to development of high quality web-based systems and aims at enhancing scalability, maintainability and quality. Web engineering life Agile methodologies is an evolving development methodology dedicated to the development of superior Internet and Web applications. It advocates a standardized process and follows a systematic approach (S. Murugesan, Y. Deshpande, S. Hansen and A. Ginig, 1999).

The following sections describe the activities that were performed following an adapted Agile Development Life Cycle using the Web Engineering process.

**Requirements Gathering:**

One of the main objectives of software engineering is to deliver a system that addresses and meets user needs. This objective is achieved by performing a requirements analysis. This is done through the use of a number of different methodologies. This project followed an Agile methodology which emphasizes user involvement at every stage to the

project life cycle. This activity involved understanding the current system from the user's perspective. Users were engaged to solicit the requirements of the proposed system. This facilitated gaining knowledge of how the users envisioned the system to function, what constraints the system presented and how the new system would solve these problems.

**Scope:**

The *Symptoms and Diseases Management System* is intended to address the problem to collecting symptoms and diseases data in government and private health centers. It is an integrated, web-enabled system having most of the features that are detailed in this document. It is an innovation that is hoped to act as a foundation that will facilitate future enhancements as more user needs are identified. The system shall include a relational database management system for storing system data; facilitate submission of symptoms and diseases data and searching the database for data that has been submitted to assist accurate patient diagnosis.

This system shall be used and benefit stakeholders in the following ways:

- Real time submission of identified symptoms and diseases.

- Associating symptoms to submitted diseases data.

- Real time submission of patient and patient symptoms data

- Real time search of submitted symptoms and diseases

- Provide a centralized data store of symptoms and diseases data

- Increase the rate of patient diagnosis by over 50%

**System Users:**

The users of the system shall include designated ministry of health personnel from various hospitals, clinics and health centers. Other users of the system shall include medical personal in private hospitals and health centers approved by the ministry of health.

**Functional Requirements:**

The functional requirements of the Symptoms and Diseases Management System are considered as the core functional areas that the system will use to meet user requirements and needs in the collection of symptoms and diseases data. The following are the functional requirements of the system:

- Secure login functionality – this will be a module that facilitates a secure login area for approved medical personal from different health facilitators. The functionality shall include the use of username password pair to gain access to the system. The administrator of the system shall be responsible for creating and approving system users.

- Group membership and permissions functionality – this module will be used by the system administrator to create system groups and assign permissions to the groups. Permissions shall designate what functions members of a specific group can perform within the system.

- Patients data collection functionality – this module will be used to submit and edit patient data by approved members of the system

- Diseases data collection functionality – this module will be used to submit and edit disease data

- Symptoms data collection functionality – this module will be used to submit and edit symptoms data

- Patient Symptoms data collection – this module will be used to associate submitted symptoms to those exhibited by patients

- Disease Symptoms data collection – this module will be used to associate submitted symptoms to disease data in the system

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**Non-Functional Requirements:**

The following non-functional requirements will exist for the attributes listed below. These requirements shall be achieved at system level unlike the functional requirements which are achieved at function or module level.

*Performance:*

- A modular component design will help achieve a 95% uptime of requests made to the server

- The system shall be monitored and hosted with reliable servers to ensure that downtime shall not exceed 10 minutes per day

- Creation of a comprehensive symptoms and diseases data store within the first month of system deployment that will include and overall 50% of known symptoms and diseases

- Each web page of the system is expected to not exceed two minutes in load time. This will enable Internet bandwidth of as low as 256Kbps to be able to access the system.

*Reliability:*

- In order to ensure reliability, the system is built on sound application architectural practices and compliance to Object-Oriented best practices

- Coding best practices have also be employed so that the system is less prone to failure

- Adherence to the afore mentioned standards reduces the level of application failure by over 90%

- Robust error handling is programmed in the core system to ensure that all runtime errors are handled without any impact on reliability. The system shall rollback any uncompleted system transactions within 30 seconds of a runtime error

- The system shall be backed up using a scheduled backup every day at midnight. Two backup schedules shall run to backup data onsite and offsite. This will enable quick recovery in case of a complete system failure. Loss of data will only be for the last 12 hours.

- A parallel offline recovery system shall be kept in readiness for any unforeseen technical downtimes. This shall act as a disaster recovery site that will be used in cases of catastrophic natural disasters

*Availability:*

- Availability of the system refers to the ability for users to access the system, whether to submit data, update or alter existing data, or view previously submitted data. If the user is unable to access the system, it is – from the users' point of view unavailable.

- The Symptoms and Diseases Management system has been developed with high availability in mind by undertaking the following:

o Elimination of single points of failure – redundancy shall be added to the system so that failure of a single component does not mean failure of the entire system

o Reliable failover – the failover point may be regarded as a single point of failure as well so the Symptoms and Diseases Management System has implemented a reliable failover through a cold disaster recovery site

o Detection of failures as they occur – the maintenance activity is responsible for tracking failures ensuring that they are responded to and the user never gets to experience system downtime

- Scheduled downtime for maintenance and upgrade purposes shall be planned and communicated to users at least 24 hours before commencement of maintenance

*Security:*

Most security vulnerabilities result from poor coding and architectural practices such as SQL injection or cross-site scripting.

- The system is built on standards complaint technologies to avoid cross site scripting. Cross site scripting allows hackers to deface a website or web application through the use of active X or JavaScript scripting

- All database access or queries shall be performed using parameterized queries and stored procedures. This is a way of preventing SQL injections

- The database has been configured with a one way password encryption scheme coupled with MySQL inherent security to prevent remote access by unauthorized users

- The system shall be hosted using a Secure Sockets Layer protocol (https) on the Internet. This adds a layer of security by encrypting all requests and responses between the server and the client thereby facilitating secure communication

- All system users will use a username password pair to access the system. The system also enforces a password strength mechanism which does not allow a password to be created if it does not meet this requirement

- A unique username shall be maintained in the system for each user and no duplicate usernames shall be allowed

- Unique email address shall be enforced by the system preventing users from having the same email address

- A future enhancement to the security architecture shall be to enforce a password expiration period of six months and history of not less than four previous passwords

*Maintainability:*

- In order to ensure system maintainability best programming and system development practices have been followed to facilitate system modularity, understandability, changeability, testability, reusability, and transferability from one developer to another

- A strategy of complexity avoidance and basic programming practices was embraced in the implementation of the system to make the code clean and easy to read thereby improving maintainability of the system

- In addition, to make the system even more maintainable, low level code documentation is embedded within the source code of the system

**User Interface Design:**

User interface design is an important component of application usability. An intuitive design helps reduce the users' learning curve and encourages users to use the system as opposed to resisting it. The following best practices were employed in construction the user interface of the Symptoms and Diseases Management System:

- The user interface was design with a professional yet warm and inviting look and feel

- The system has a consistent look and feel across all its modules

- The navigation system is intuitive for the user. The user can access common functionality from any module that they may be working from

- Intuitive error messages are displayed inline to indicate exactly where the user has made and error

- The system is operable on all standards compliant browsers including Internet Explorer, Mozilla, Firefox, Chrome, and Opera

- If a runtime error occurs, the system issues and human readable message notifying the user about the error and the possible causes and actions to take to remedy the error

## 4. SYSTEM ANALYSIS AND DESIGN

The system is designed based on a three tier application design methodology. In this methodology the system is design at three tiers:

**The Application or Presentation Tier:**

This is the system's user interface and is used to display information and receive user input.

**The Business Logic Tier:**

This is the business rule validation and processing layer. It is the layer responsible for ensuring that user input conforms to the rules of the application. When a user makes a request, it is processed at this layer and sent to the layer below to fetch results.

**The Database Tier:**

This is the system's data store. All the system data is stored in the database. This layer also enforces any integrity rules to ensure consistent data. When a user makes a request it is processed by the business layer and an instruction is sent in form of a query to this layer. The query is analyzed and if results exist, the database layer sends those results back to the business logic layer above it.
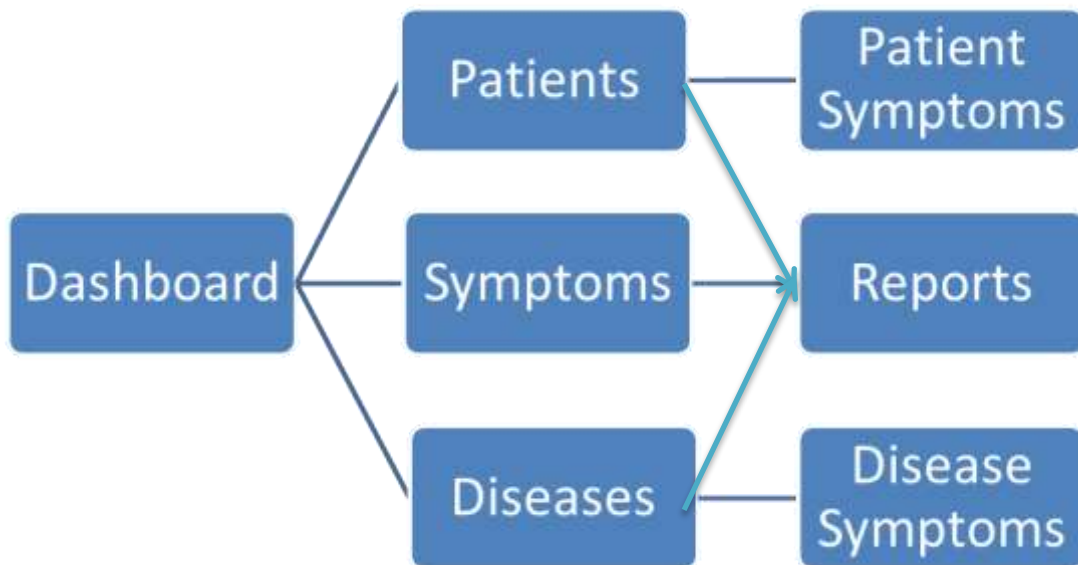
**System Diagrams:**

The following sections depict the system as a series of pictorial representations called models. These models show the flow of data in and out of the system as well as the relationships of the items of interest to the system. The interaction of actors with the system is also depicted in these models.

**System Context Diagram:**

The system context diagram depicts the highest level of the system. The system is viewed as a black box that interacts with external actors. This diagram also defines the scope of the system.
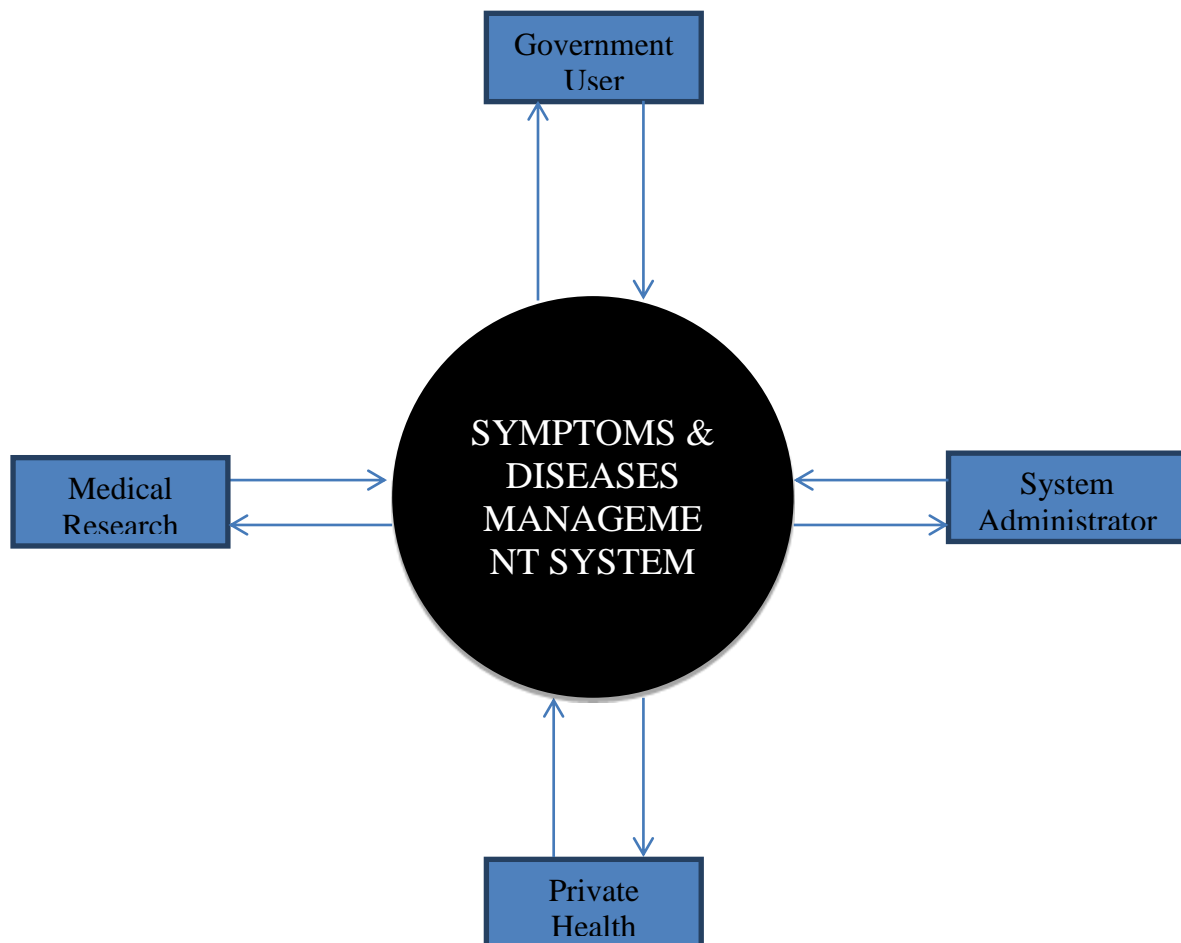
**System Navigation Diagram:**



**Data Flow Diagrams:**

A Data Flow Diagram is a graphical representation of a system that shows data flow to, from and within the system, processing functions that change data in some way and the storage of the data.

DFDs are nothing more than a network of related system functions (processing of data) that indicate from where data is received (inputs) and to where it is sent (outputs). The symbols used in most data flow diagram modeling methods to represent system components are as follows:

- Processes – rounded rectangle
- Data stores – open ended rectangle
- Data flows – arrows lines
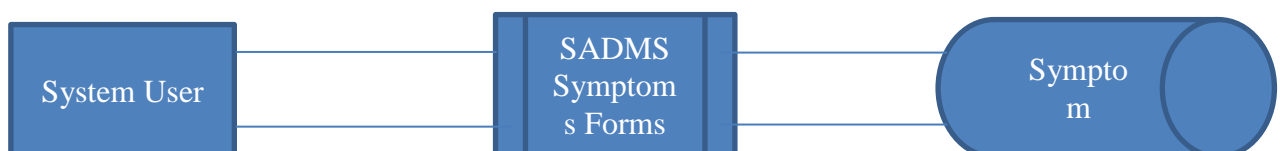- External entities – rectangles
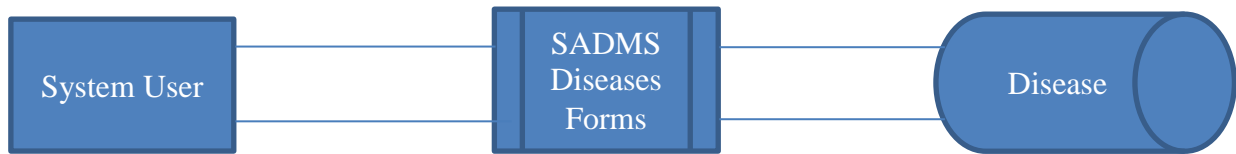
*System Login DFD:*
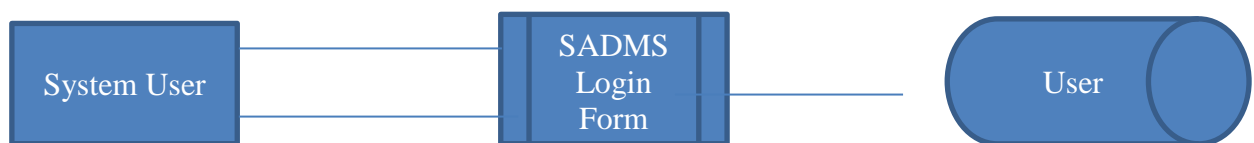


*Patient DFD:*
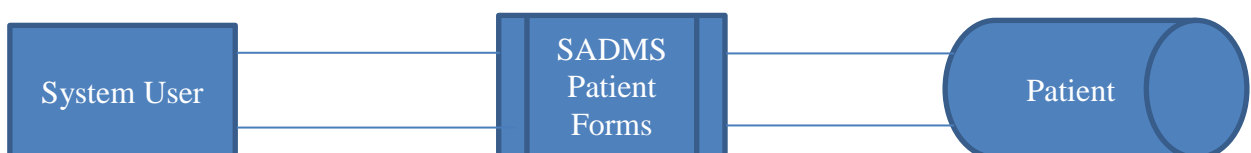


*Symptoms DFD:*

*Diseases DFD:*



**Entity Relationship Diagrams:**

An entity-relationship diagram (ERD) is a data modeling technique that graphically represents the entities of the system as data stores. These are the items of interest for which data is captured. The ERDs also depict the relationships that exist between these entities. Detailed ERDs will show all relationships including the cardinality for those relationships. Below is a high level ERD for the Symptoms and Diseases Management System.

*Logical Entity Relationship Diagram:*
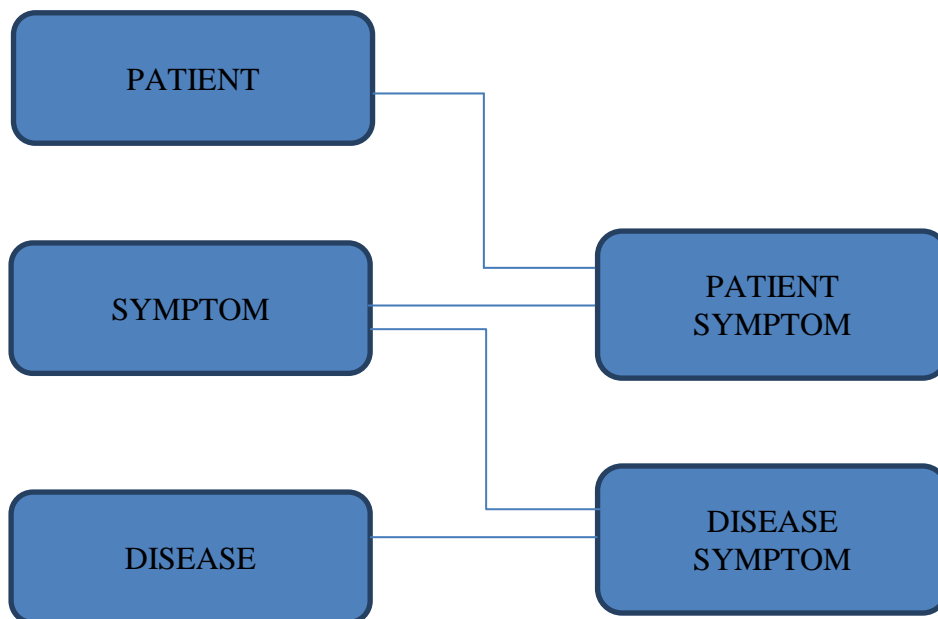


*Data Dictionary"*

The data dictionary lists all the database tables with a description of what the fields are and any comments for those attributes.

*Fully Attributed Data Models"*

- *Patient*

| Column | Type | Null | Default | Links to | Comments |
|---|---|---|---|---|---|
| id *(Primary)* | int(10) | No | | | |
| last_name | varchar(40) | No | | | |
| first_name | varchar(40) | No | | | |
| gender | varchar(10) | No | | | |
| birth_date | date | No | | | |
| age | int(11) | No | | | |
| address | text | No | | | |
| city | varchar(40) | No | | | |
| province | varchar(15) | No | | | |

| Column | Type | Null | Default | Links to | Comments |
|--------|------|------|---------|----------|----------|
| home_phone | varchar(40) | Yes | *NULL* | | |
| work_phone | varchar(40) | Yes | *NULL* | | |
| mobile | varchar(40) | Yes | *NULL* | | |
| other_details | text | Yes | *NULL* | | |
| comments | text | Yes | *NULL* | | |
| filed | datetime | Yes | *NULL* | | |
| last_modified | datetime | Yes | *NULL* | | |

- *Symptom:*

| Column | Type | Null | Default | Links to | Comments |
|--------|------|------|---------|----------|----------|
| id *(Primary)* | int(10) | No | | | |
| name | varchar(80) | No | | | |
| description | text | No | | | |
| comments | text | Yes | *NULL* | | |

- *Patient Symptom:*

| Column | Type | Null | Default | Links to | Comments |
|--------|------|------|---------|----------|----------|
| id *(Primary)* | int(10) | No | | | |
| patient | int(10) | No | | | |
| symptom | int(10) | No | | | |
| observation_date | date | No | | | |
| observation_time | time | No | | | |
| symptom_value | varchar(40) | No | | | |

- *Disease:*

| Column | Type | Null | Default | Links to | Comments |
|--------|------|------|---------|----------|----------|
| id *(Primary)* | int(10) | No | | | |
| short_name | varchar(40) | No | | | |
| latin_name | varchar(40) | Yes | *NULL* | | |
| description | text | Yes | *NULL* | | |
| other_details | text | Yes | *NULL* | | |
| comments | text | Yes | *NULL* | | |

- *Disease Symptom:*

| Column | Type | Null | Default | Links to | Comments |
|--------|------|------|---------|----------|----------|
| id *(Primary)* | int(10) | No | | | |
| disease | int(10) | No | | | |
| symptom | int(10) | No | | | |
| expected_probability | varchar(40) | No | | | |
| minimum | varchar(40) | No | | | |

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| Column | Type | Null | Default | Links to | Comments |
|---|---|---|---|---|---|
| maximum | varchar(40) | No | | | |
| reading_other_value | varchar(40) | Yes | *NULL* | | |
| comments | text | Yes | *NULL* | | |

- *User Group:*

| Column | Type | Null | Default | Links to | Comments |
|---|---|---|---|---|---|
| groupID *(Primary)* | int(10) | No | | | |
| name | varchar(20) | Yes | *NULL* | | |
| description | text | Yes | *NULL* | | |
| allowSignup | tinyint(4) | Yes | *NULL* | | |
| needsApproval | tinyint(4) | Yes | *NULL* | | |

- *User Group Permissions:*

| Column | Type | Null | Default | Links to | Comments |
|---|---|---|---|---|---|
| permissionID *(Primary)* | int(10) | No | | | |
| groupID | int(11) | Yes | *NULL* | | |
| tableName | varchar(100) | Yes | *NULL* | | |
| allowInsert | tinyint(4) | Yes | *NULL* | | |
| allowView | tinyint(4) | No | 0 | | |
| allowEdit | tinyint(4) | No | 0 | | |
| allowDelete | tinyint(4) | No | 0 | | |

- *Users:*

| Column | Type | Null | Default | Links to | Comments |
|---|---|---|---|---|---|
| memberID *(Primary)* | varchar(20) | No | | | |
| passMD5 | varchar(40) | Yes | *NULL* | | |
| email | varchar(100) | Yes | *NULL* | | |
| signupDate | date | Yes | *NULL* | | |
| groupID | int(10) | Yes | *NULL* | | |
| isBanned | tinyint(4) | Yes | *NULL* | | |
| isApproved | tinyint(4) | Yes | *NULL* | | |
| custom1 | text | Yes | *NULL* | | |
| custom2 | text | Yes | *NULL* | | |
| custom3 | text | Yes | *NULL* | | |
| custom4 | text | Yes | *NULL* | | |
| comments | text | Yes | *NULL* | | |
| pass_reset_key | varchar(100) | Yes | *NULL* | | |
| pass_reset_expiry | int(10) | Yes | *NULL* | | |

## 5. TECHNOLOGIES USED

The following sections describe the technologies that were used in the development of the Symptoms and Disease Management System. The Internet has become a popular platform for hosting applications in many disciplines. Popularity of online medical systems is growing every day. A lot of Internet users and doctors especially in developed countries are already using these systems. Such systems include web-md, virtual doctor, symptom-checker, everyday health, etc. These systems are designed using technologies including Hyper Transfer Protocol (HTTP), ASP.NET, PHP, JavaScript, and Secure Sockets Layer (SSL). These are technologies that drive the Internet. They follow the well-known Client Server Architecture.

The client-server architecture is the ideal architecture for the Systems and Diseases Management System. The client is provided with an interface, implemented as XHTML, pages formatted using CSS. Validation and processing is performed by JavaScript on the client side and PHP on the server side.

**Hypertext Preprocessor:**

PHP is a server-side scripting language designed for web development. The language can also be used for general purpose programming. It is one of the most widely used programming languages for web application development with an installation base on web servers close to 2.1 million.

PHP code is ideal for development of this project because it can be simply mixed with HTML mark-up. The language is usually processed by a PHP interpreter, which is usually implemented as a web server's native module or a common gateway interface (GUI) executable. After the PHP code is interpreted and executed, the web server sends resulting output to its client, usually in form of a part of the generated web page – for example, PHP code can generate a web page's HTML code, an image, or some other data.

**HTML and XHTML:**

Hyper Text Markup and Extensible Hyper Text Markup languages are the standard markup language used to create web pages. HTML is written in the form of HTML elements consisting of tags enclosed in angle brackets (like <html>). HTML tags most commonly come in pairs like <h1> and </h1>, although some tags represent empty elements and so are unpaired, for example <img>.



A web browser can read HTML files and compose them into visible web pages. The browser does not display the HTML tags, but uses them to interpret the content of the page. HTML and XHTML describe the structure of a website semantically along with cues for presentation, making it a markup language rather than a programming language.

**Cascading Style Sheets – CSS:**

Cascading Style Sheets (CSS) is a style sheet language used for describing the look and formatting of a document written in a markup language. It is often used to style web pages and user interfaces written in HTML and XHTML. It is designed primarily to enable the separation of document content from document presentation, including elements such as the layout, colors, and fonts.
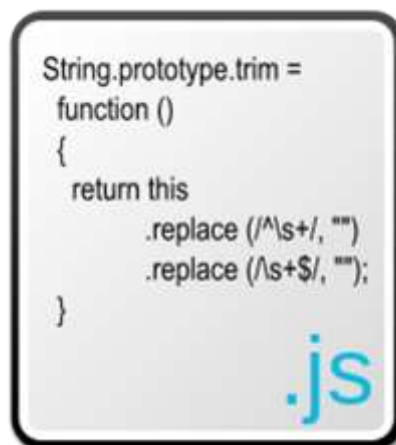
This separation can improve content accessibility, provide more flexibility and control in the specification of presentation characteristics, enable multiple pages to share formatting, and reduce complexity and repetition in the structural content (such as allowing table less web design). CSS also allows the adaptation of layout to different types of devices, such as large screens, small screens, or printers. It is independent of HTML and can be used with any XML-based markup language.

It obviates those portions of markup that would specify presentation by instead providing that information in a separate file. For each relevant HTML element (identified by tags), it provides a list of formatting instructions.
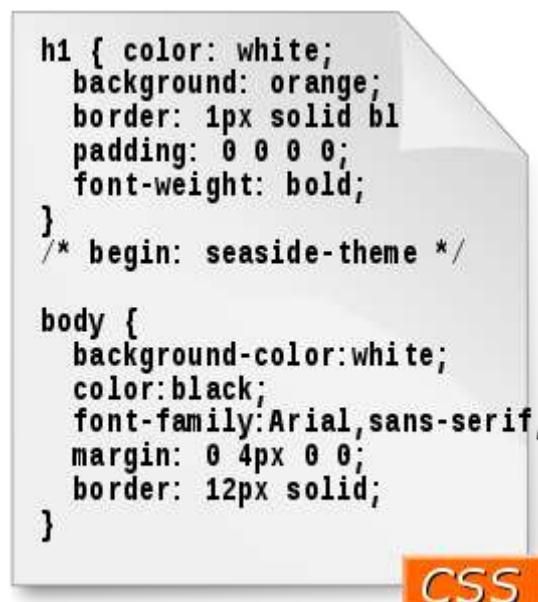


**JavaScript and the JQuery Library:**

A script is program code that doesn't need pre-processing (e.g. compiling) before being run. In the context of a web browser, scripting usually refers to program code written in JavaScript that is executed by the browser when a page is downloaded, or in response to an event triggered by the user.

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JavaScript is a dynamic computer programming language. It is most commonly used as part of web browsers, whose implementations allow client-side scripts to interact with the user, control the browser, communicate asynchronously, and alter the document content that is displayed. It is classified as a prototype-based scripting language with dynamic typing and has first-class functions. It is because of the client side scripting features that it was chosen as the validation language for this project. In addition the free JQuery JavaScript library was used in validation functionality and AJAX implementation.

**MySQL Relational Database Management System:**

This is the second most widely used open source relational database management system (RDBMS). It is a popular choice of database for use in web applications, and is a central component of the widely used LAMP open source web application software stack. LAMP is an acronym for "Linux, Apache, MySQL, Perl/PHP/Python." This project uses MySQL for the database because it is free and fairly easy to install. It also comes with robust security features at no cost.

**Apache Webserver:**

The Apache HTTP Server is a web server application notable for playing a key role in the initial growth of the World Wide Web. Apache is developed and maintained by an open community of developers under the auspices of the Apache Software Foundation. This is the web server that is used to render the project and make it available in a web browser.

## 6. SUMMARY

Provision of quality health services is a cost that affects even the richest of economies. Its poor management can result into a social problem. It is therefore imperative for the Ministry of Health to be prepared and to be able to adequately manage the health status of the country.

It is the collected data on symptoms and diseases, and areas of prevalence of this data that is critical in the management of health services. In the information era, information is generally managed through an information system. It defines the functions of specific offices and the type of data they require. The symptoms and diseases management system is a tool that will help in the management of health service delivery. Functions such as disease prevalence analysis, deployment of resources, searching capabilities, and event modeling can be performed using this system. This is a major significance of this project.

The development of the system has far reaching implications beyond the Ministry of Health but will also help in prudent decision making by the government as it strategizes towards public health care in the country. This is a contributing factor to the agenda of E-Governance that the government has adopted. By having a central repository of symptoms and diseases, other miscellaneous aspects related to the management of public health, the indexing and locating of records relating to diseases will be greatly streamlined. This streamlining will greatly improve inter department communication and enhance the effective management of public health.

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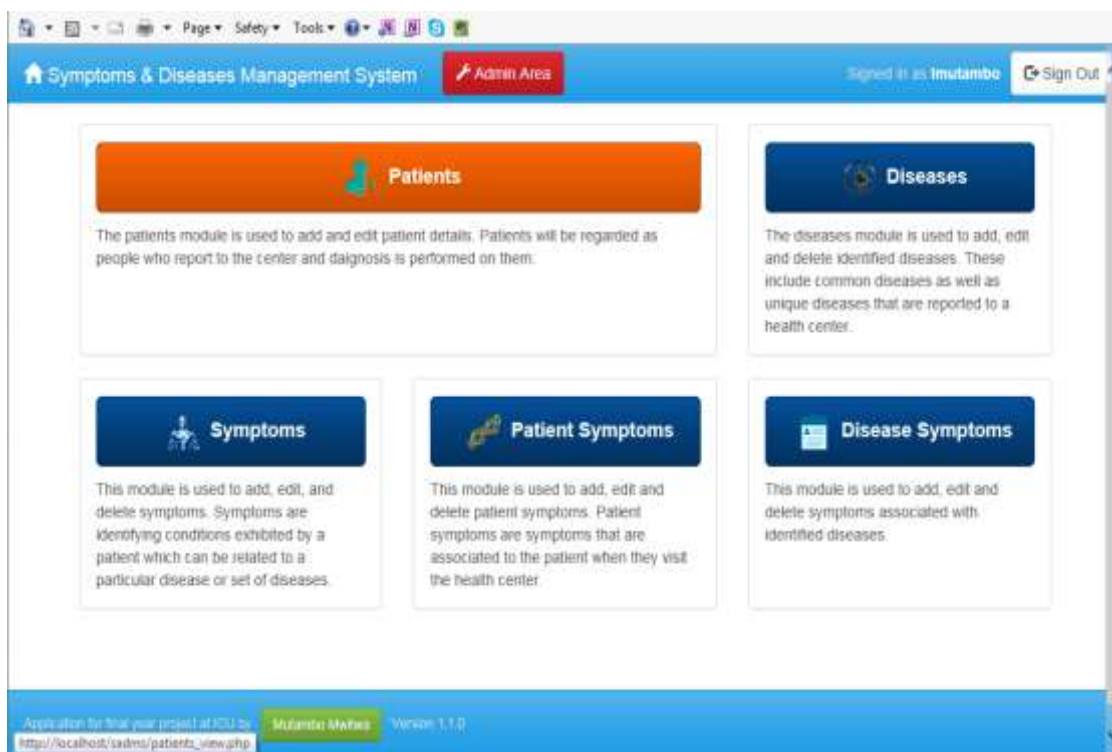
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# APPENDIX

**System Screenshots:**

This section appendix illustrates the Symptoms and Diseases Management System in the form of Screenshots.

**Login page:**



**System Dashboard:**

**Patients Module:**



**Disease Module:**

**Symptoms Module:**



**Patient Symptoms:**

**Disease Symptoms:**