A Secure Web Based Records Management System for Prisons: A Case of Kisoro Prison in Uganda

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Abstract

Most Prisons in the developing countries are still using the traditional system – pen and papers, to keep track of their records. This system takes long to finish a single transaction; this has led to loss of information of some cases (crimes files), insecurity and data redundancy. Similarly, some cases have been reported where some prison staff connives with clients (victims) to change and hide some information or files hence leading to compromising the evidence of the matter. This has consequently resulted in time wastage to handle cases, increased corruption and insecurity of important files hence making the whole process costly. Also when reports are needed especially about prisoners, it takes a long time and therefore makes it hard for Prison Management to take urgent decisions. This has created a lot of loopholes in the system because there is no tracking and/or monitoring of the information available in the different Departments and there are no security measures in place to safe guard the available information. This necessitated automating the system to make it more efficient and effective. There was close study of the existing manual file based system that was in use, it was compared to the proposed system. A prototype of a proposed system was developed to ease data access, security and retrieval for instant report production by the prison management. The prototype was developed using MySql database, PHP, CSS, JavaScript and HTML.

Keywords: Prisons; Records management system; Prisoners; prison management system; web based system.

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1. Introduction

A prison also known as gaol is a place in which people are physically confined and usually deprived of a range of personal freedoms. Imprisonment or incarceration is a legal penalty that may be imposed by the state for the commission of a crime [1]. Other terms used are penitentiary, correctional facility, remand centre, detention centre, and gaol or jail. As well as convicted or suspected criminals, prisons may be used for internment of those not charged with a crime. Prisons may also be used as a tool of political repression to detain political prisoners, prisoners of conscience, and "enemies of the state", particularly by authoritarian regimes. In times of war or conflict, prisoners of war may also be detained in prisons. A prison system is the organizational arrangement of the provision and operation of prisons.

There is no centralized management information system to keep track of records, manage automatic generation of the prisoner's information and reports for efficient and effective management at Kisoro prison. Currently the management of Uganda Prisons Service (UPS) particularly Kisoro prison is still using papers and files system to keep track of information thereby leading to delayed work and time wastage. This approach of generating prisoner's information is totally manual hence requiring additional manpower, time and produces a lot of errors and this may lead to inappropriate planning and financial loss in future. More so, with the ever increasing number of prisoners, a lot of documentation and recording has increased and this kind of paper work and manual handling of data is not a user friendly way of collecting and managing information. This approach creates delay in creating reports more over it's a hectic and costly exercise. It is against this background that a web based information system for tracking records in prisons that allows automatic generation of prisoner's information, centralized management and automatic generation of reports without errors is developed for Kisoro prison.

2. Related Works

2.1 Web-based Systems

A web-based system should be an easy-to-use system that provided Web-based access for all staffs, rules-based, entry of preferences and viewing of data, credential management, and ability to retrieve information in prisons [2]. Reference [3] confirmed that web-based system increased the convenience and accessibility of Management Information System (MIS) services and information about prisoners in order to develop prisoners' details with an Integrated Management Information System (IMIS). Web-based System made work easier for an organization to produce presentations, dramatically speeding time to get the required reports.

2.2 Current Systems used for Tracking Records in Prisons

This explains how the current systems used to track records in prisons work, their benefits and their limitations.

2.2.1 Integrated Prisons Management System

Integrated Prison Management System (IPMS) is used to enhance the administrative capabilities of the jails in terms of monitoring and security of the prison while improving the efficiency and productivity of the Prisons by government of the Jharkhand [4]. IPMS have the following advantages; Integrated Prison Management System is a secure system to modernize inmate record maintenance and searching operations. It also facilitates electronic processing of inmate records and the management of such activities to provide higher level of compliance and faster service with lower cost and higher efficiency. However IPMS have the following limitations; the system is stand alone and therefore centralized access and securing of information by the government is difficult, Also the system does not track records of visitors of the prison who may be future reference when need arises. Furthermore the system does not keep track of other records that are handled in the prison for example the information about the equipments used in prison and the prison staff available in a particular prison.

2.2.2 Spreadsheet Application (file based approach)

In recent years, as a result of the global rise in application of computers in various aspects of life, desktop applications such as Microsoft Excel were adopted, thereby causing the approach to become both manual and slightly computerized in Uganda. However, this method of record keeping results in inconsistencies, wastage of disk space and poor control and coordination of data [5]. The employment of this method results from reasons such as:

1. Inadequate funding

2. Corruption and extortion and

3. Lack of necessary skills and resources for statistical and information management.

2.2.3 Prison Management and Visitor Management System

This application is used in Tihar Prisons Complex in New Delhi which is the biggest prison complex in Asia. It encapsulates the manual working-pattern of the prison rule book that is to say registration, movement within the jail and outside and release of the inmate. It captures the inmate's photograph and stores the same in the database after reducing it to less than 2.5 KB size.

This is directly stored in the central database such that duplicate entry of the prisoner can be identified in a global manner, which helps in tracing out the 'frequent flyers' to the jail. The application has the following advantages; it helps to generate more reports of administrative, performance and statistical nature, it also helps in dealing with over populous prison that is housing inmates, which are more than 3 times of the sanctioned capacity. Furthermore it also facilitates, regulates and simplifies the processes of meeting between the visitors who are coming to visit their relations and friends lodged in the correctional home [6].

However the system has the limitations below; the system requires very big memory space and also acquisition of other hardware requirements for example those needed to work with finger print software. Also very well

trained personnel are required to work on the system that is expensive in terms of payment.

3. Methodology

This describes how a web based system for tracking records in prisons was developed. These include; requirement identification; design; implementation and testing and validation. However, the development process will be iterative, though it will be depicted as comparing of phases.

3.1 System study and investigation

There was a thorough study of the existing systems in the Uganda prisons service particularly Kisoro prison in order to understand the loop holes before developing the web-based system for tracking records in prisons. This was achieved through interactions, use of questionnaires, interviews, document review and observations.

3.1.1 Interviews

Oral interviews were conducted between the researcher and the members of staff of Kisoro prison department, officers in charge of prisons and prisoners. This was instrumental in gathering information about the current manual system of record tracking and its loopholes since it gave the researcher a chance to interact with the system users. Different staff members were asked questions about how useful or tiresome their current data keeping method is if compared to other systems. This helped the researcher to take the decision of developing the standard automated system for tracking records in prisons. The researcher interviewed 2 officers, 5 staff members and 3 prisoners to clearly understand how the current system works.

3.1.2 Observation

The researcher moved around different departments at Kisoro prison to see how data was being handled, how reports were being produced and what methods were in place for producing reports. Through observation the researcher found out how data was collected and the methods used for producing reports.

3.1.3 Questionnaires

In this approach, printed questionnaires were given to some of the prisoners and staff members to fill in the blank spaces. This helped the researcher to know the operation of the existing system. Questionnaires allow the analysts to collect data from large number of people while maintaining uniform response, when dealing with large audience, no other fact finding technique can tabulate the same facts as efficiently.

3.1.4 Documentary Review

Some of the information was collected by studying documents from within and out of the Kisoro prison. Information from Literature review clearly brought out the need for a computerized system to serve as a records management system and how critical information circulation should be in such an environment like a prison.

However, most of the records have been printed on papers and could not be retrieved since they had already been lost. This clearly indicated the need for a web based system for tracking records in prisons that could keep and retrieve such information on demand. Documentary review helped the researcher to perceive the views of people elsewhere in the world towards web-based systems. The researcher's findings clearly indicated that there was a need for a web based system for tracking records in prisons particularly Kisoro prison.

3.2 Requirements Specification

The requirement specifications from the first phase are studied in this phase and the system design is conducted. Analysis of existing system is also carried out in this phase; the limitations of the existing system are analyzed and improved upon.

Software Requirement

  i.   Operating System: Windows (XP, Vista, 7 and 8)
 ii.   Graphical User Interface: html, CSS & JavaScript
iii.   Application Logic: JavaScript & php
 iv.   Database: MySql
  v.   IDE/Workbench: wamp (APACHE SERVER), win7

Hardware Requirements

  i.   Processor: Pentium IV – 900 MHz
 ii.   512 MB RAM (minimum main memory space recommended)
iii.   768 MB RAM (main memory space recommended)
 iv.   4GB Hard disk space (recommended)

3.3 System Design

The analysis of the requirements acquired in the requirements identification phase led to the development of the web based system for tracking records in prisons. The Database system was developed using MYSQL and the programming frame work of the system was done using HTML, CSS, PHP, and JavaScript. There was removal of redundancies by normalization of the data in order to get the right material to be entered into the tables to be used for the system. There was conceptual database design by having the Entity Relational Diagram and the Entity Relations. There was also the Logical design where entities, attributes, data lengths were made to remove the redundancies in the system and duplicates. This led to physical database design where MySql with PHP script was used to design the system that enabled get the graphical user interfaces to be used by the system as it is free software. The system design objectives includes: Usability, performance, reliability, software architecture and package.

Data Flow Diagram (DFD)

Data flow diagrams show the flow of information in and out of the system. It shows the various processes used by the Application users. It shows the information accessed by the users and the process that takes place which includes, input, process and output.

Table 1: Identification of Entities and Their Attributes

Entity	description	attributes
prisoner	A person who has committed or accused of a crime	Pid(pk),fname, lname, sex, age, address, crime, entry date, last date, cell number, health status.
Visitor	Any person who visits the prison	Vid (pk), fname, lname, age, sex, Relationship, address.
Member Login	This allows the user or administrator to login the system	Userid (pk), Username, password,
Staff	These are the people who work in the prison.	Sid (pk), fname, lname, age, Title, address, sex, marital status, education level.
Equipments	The various equipments that are used in prison.	Eid (pk), Eqpname ,eqpuse, Eqtstore no.
cell	The rooms where the prisoners are Detained.	Cellid (pk), cell name, pid.
Crime	The charge a prisoner is being charged of.	Crid (pk), datein, dateout, chargedof.
Remand	When the prisoner is not yet charged of an offence.	Rid (pk), awaiting, charged.
Convict	How long the prisoner is going to serve and also the sentence given.	Coid (pk), crid(fk), short term, medium term, long term, life, death penality.

3.4 Security

Being an information sharing and storage system, the researcher took a deeper insight in user security, data security and interface standard [7] as indicated below:

i). User Security

User access security is by User IDs and passwords. User IDs and Passwords are entered at the time of accounts application (sign up) by the client. To enhance security, the researcher used challenged response where a client must answer several personal questions correctly, according to his /her answers at the time he signed up.

ii). Data Security

This was mainly on the encryption provided by user's browsers, with the added security of requiring up-to-date versions with encryption.
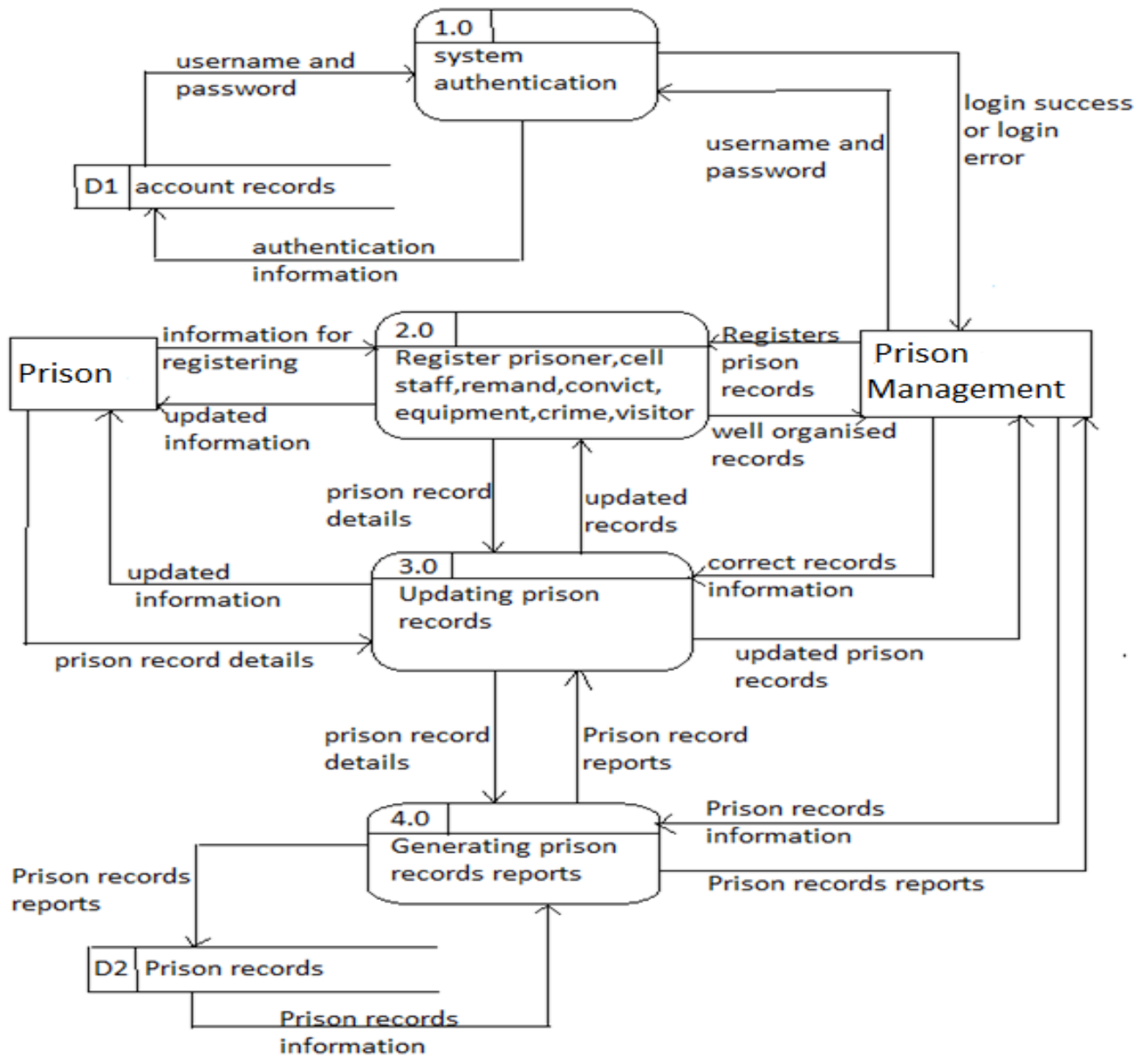

Figure 1: Data flow diagram for the proposed system

3.5 Database Design

Relational database model was used. Data and relationships are represented as tables, each of which has a number of unique names also known as attributes and each table has a unique attribute called primary key that uniquely identifies it from other tables.

4. System Implementation

The system was designed using MySql RDBMS because of its ease and ability to store different data types and manipulate it. The researcher also used Wamp5, an inbuilt DBMS to implement the backend of the system, here the a graphical user interface is available which enables an administrator to create customized database objects such as tables in case he or she does not prefer using the SQL command prompt. The frontend of the system was implemented using the web pages in PHP programming and scripting, therefore the web pages are accessed using web browsers such as; internet explorer, Firefox and chrome. Using PHP programming and scripting, the application's code was written to implement and ensure the system meets its complete functionality. Therefore this system has a graphical interface which has made it user friendly and easy to use. The system should also run on a computer platform that runs MYSQL Server software like Wamp5 server or a higher version.

4.1 System Execution Sequence

The system operates beginning with the Login page, login success, system interfaces for manipulations which includes add information, update data and view information(reports) in the database as shown below.
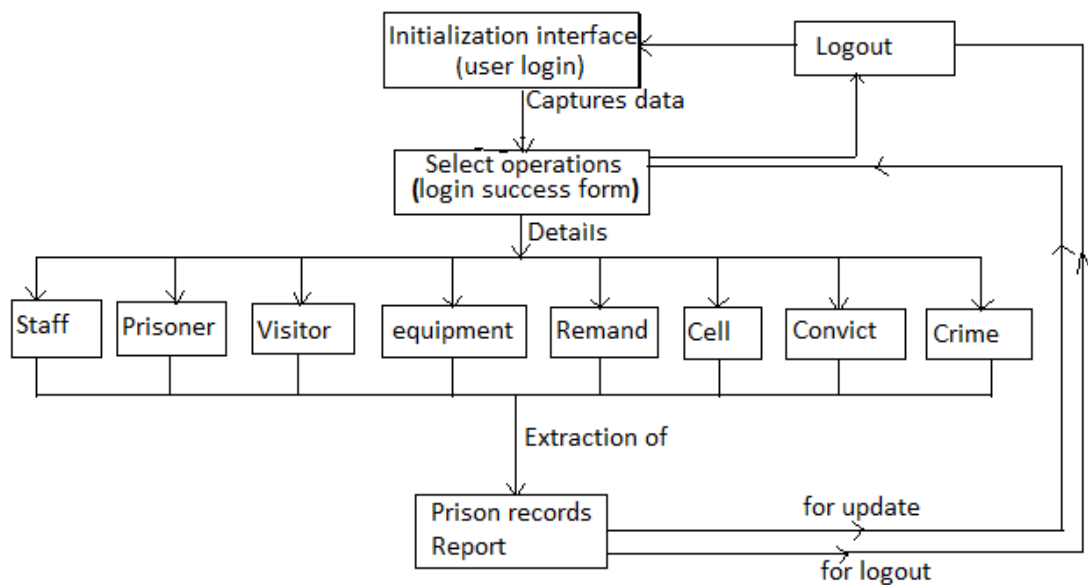

Figure 2: System Execution Sequence

4.2 Available System Operations

Various forms are available in the login success form after the user has successfully logged in, where users of the system can perform various manipulations that is to say, to add information, view or read information and delete the information that is no longer wanted from the database. Since all the forms for the available attributes that is the Staff, Prisoner, Visitor, Equipment, Cell and Store, Crime, Remand and convict has forms that are arranged in order of Add data, View data and Delete data and the manipulations performed are the same. The following are some of the operations that can be done while using the system.

4.2.1 The Login operation

This is the first page of the system that is displayed when the system is loaded for use, it is called index.php. When the user in puts correct username and password, the page redirects to login success.php which contains all the necessary links required for the system manipulation. When the user in puts wrong username or password, the system loads poorlogin.php which contains hyper link to login form and also logout. This authenticates only registered user to login. The fig below illustrates the login form.

A WEB BASED SYSTEM TO KEEP TRACK OF RECORDS IN KISORO PRISON

LOGIN FORM

PLEASE LOGIN

USERNAME:

PASSWORD:

Login *LOGOUT*

Designed by Ahishakiye Emmanuel, Reg No:10/U/3226/ITD/PD

Figure 3: Welcome Form

4.2.2 Operations after successful login

When the user in puts correct username and password in the login form, login success form is displayed, this contains all the system manipulations that is to say CRUD which means Create or Add information, Read or View information, Update or Edit information and Delete information. Fig below is a log in success form.

A WEB BASED SYSTEM TO KEEP TRACK OF RECORDS IN KISORO PRISON

LOGIN SUCCESS FORM

PLEASE CHOOSE THE OPERATION HERE

STAFF	*PRISONER*	*VISITOR*	*EQUIPMENT*	*CELL AND STORE*	*REMAND,CONVICT,CRIME*
ADD STAFF	*ADD PRISONER*	*ADD VISITOR*	*ADD EQUIPMENT*	*ADD CELL OR STORE*	*ADD REMAND*
VIEW STAFF	*VIEW PRISONER*	*VIEW VISITOR*	*VIEW EQUIPMENT*	*VIEW CELL OR STORE*	*ADD CONVICT*
UPDATE STAFF	*UPDATE PRISONER*	*UPDATE VISITOR*	*UPDATE EQUIPMENT*	*UPDATE CELL OR STORE*	*ADD CRIME/CHARGE*

BACK TO LOGIN *LOGOUT*

Designed by Ahishakiye Emmanuel, Reg No:10/U/3226/ITD/PD

Figure 4: operations after successful login

4.2.3 Add Information operation

The forms available for adding information in the database include add equipments form, add staff form, add

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visitor form, add cells form, add remand form, add crime form, add convict form and add prisoner form. These forms have the fields that are necessary to capture the required information that is necessary to be stored in the WBTR database. All these forms are represented by the add equipments form, it has fields; equipment name, equipment use and equipment store number. The fig below shows registers equipment form that is available in Kisoro prison.

Figure 5: add Equipments operation

4.2.4 View Available Information operation

The forms available for viewing information in the database include view equipments form, view staff form, view visitor form, view cells form, view remand form, view crime form, view convict form and view prisoner form. These forms have the fields that are necessary to view the required information from system database.

All these forms are represented by the view equipments form. This form acts as a report and it is essential to view all the information about the equipments that is available in the system database. The fig below shows the report of the equipments that are available in Kisoro prison.

Figure 6: view the available prison Equipment

4.2.5 Update Equipments operation

The forms available for updating information in the database include update equipments form, update staff form,

update visitor form and update prisoner form. These forms have the fields that are necessary to updating the required information from system database. All these forms are represented by the update equipments form. This form contains all the system manipulations for the form. These include update or edit, delete and add. This form enables the storage of well organized data or information in the database. The fig below shows updates equipment form with all necessary manipulations.

Figure 7: Update Equipment operation

4.2.6 System Verification operation

All the forms for registering information have JavaScript which does not allow to submit empty forms, that is to say all the fields must be filled first in order for the form to submit data to the database. The figure below illustrates an example.
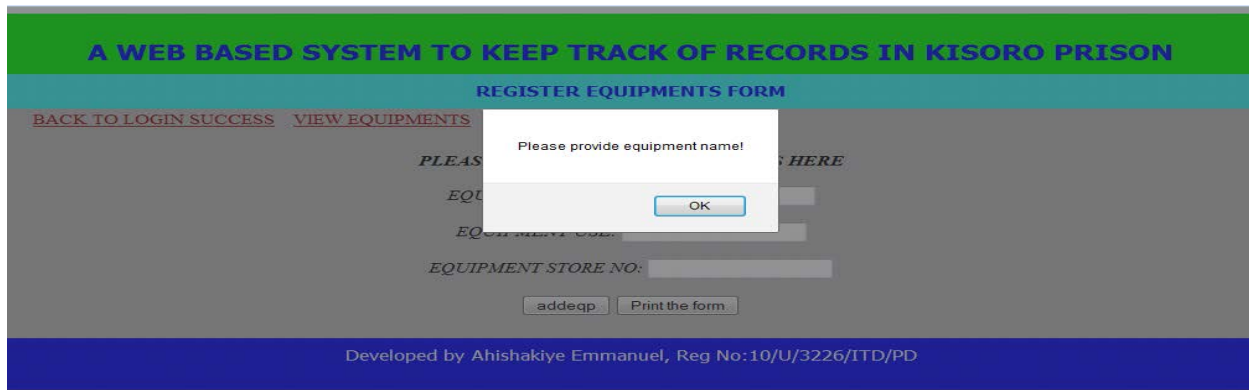

Figure 8: JavaScript system verification

4.3 Benefits of using the developed system

  i.   The system is easy to use with very good user interfaces.
 ii.   The system does not allow duplicate information and therefore no redundancy.
iii.   The system can be used everywhere on the globe as long as there is internet connection.
 iv.   Enhances faster decision making by the management because reports and other actionable information

can be obtained by a single click.

5. Limitations, Conclusion and future work

5.1 Limitations of the study

The researcher faced the challenges during the study:

i. The unwillingness of some prison management staff to disclose all the information that would otherwise help in the development of the system with complete features.

ii. The researchers faced a problem of limited time. Time allocated was not enough and therefore the researchers focused on developing a model that reflect the challenges being faced by kisoro prison, there is therefore a need by future researchers to visit and collect information from across the country prisons in order to develop a general system.

5.2 Conclusion

This study was set out to develop a secure web-based records management system for prisons using a user-centered approach to software development. The scope set at inception was restricted to developing a system for tracking records. The study led to design and implementation of a prototype for a web based system for tracking records. The system was tested and validated for functionality. The system was implemented using a 3-tier approach, with a backend database (specifically MYSQL database), a middle tier of Apache server and PHP, and a front end web browser (client). This paper has also discussed each of the underlying techniques used to design and implement the application and the steps undertaken to achieve this. The study provided solution of providing easy and faster way for managing prisons centrally and tracking the records with ease by the authenticated users and even the top government officials who need information about a particular prison. The system will also update the records and improve performance of the man power, as well as reducing maintenance and repair costs. The desired aim of providing centralized access to information and records tracking on prisons are more applicable to developing countries, Uganda in particular is among.

5.3 Future Work

It's recommended that the following modules, be added to the developed system (web based system to keep track of information in prisons) so as to perform more tasks:

i. The system should be integrated with the criminal justice system to form a mega system that spans over all facets of the justice system. This will enhance synchronization and transfer of information between the court of law and Uganda Prisons Service.

ii. The developed system component can have the capability to be used in different languages. Further work is recommended so that it can have the capability of being usable in local Languages like Luganda, Rufumbira/Runyarwanda and Swahili for the East African region.

Acknowledgment

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