

**SCHOOL OF SCIENCE AND INFORMATION SCIENCES**

**BSC IN COMPUTER SCIENCE**

**COM 423 COMPUTER SCIENCE PROJECT**

**TITLE: HIGH SCHOOLS ONLINE INFORMATION SYSTEM**

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# Declaration

This software project idea has never been into existence until I discovered it a few months ago, therefore, I can confirm with greater confidence that this is wholly and purely my own idea. To the best of my knowledge, such a proposal has never been submitted to any institution of higher learning, either in Kenya or elsewhere.

# Abstract

There is more than just developing a software product, a good product should meet various standards. This product meets most if not all of the required standards.

The product will be based on JavaEE, use the best coding styles out there and most important, enhance security, speed and high dependability. However, there is more than just enhancing speed and dependability in a software product, these are the issues this product will be addressing. To mention just but a few, such issues include cost and distribution.

Otherwise, as mentioned above, the proposed software products is web based. It will be designed in such a way that it manages as many schools as possible, a school will have an account. Just like the way one opens an account in a Bank or maybe an email account.

The system will have different users, the key users being a principal, HOD/CM, teacher, Secretary and account clerk, however, with time more users will be added, such include librarian, lab technicians etc.

The product will manage various key and basic aspects of a typical high school in Kenya, one of such aspect is examination. This will include submitting scores, generating reports and setting exam, however the later will be implemented later.

Other aspects include students management, staff management etc.

**Table of Contents**

[Declaration 2](#_Toc442180631)

[Abstract 2](#_Toc442180632)

[CHAPTER ONE 4](#_Toc442180633)

[Introduction 4](#_Toc442180634)

[**1.0** **Background of Study** 4](#_Toc442180635)

[**1.1** **Problem statement** 4](#_Toc442180636)

[**1.2** **Objectives** 5](#_Toc442180637)

[**1.3** **Scope and Limitation of the Study** 6](#_Toc442180638)

[1.3.0 Scope of study 6](#_Toc442180639)

[1.3.1 Limitation 6](#_Toc442180640)

[**1.4** **Justification** 6](#_Toc442180641)

[CHAPTER TWO 8](#_Toc442180642)

[**2.0 Literature Review and Conceptual Framework** 8](#_Toc442180643)

[2.0.0 Entities in a school setup 9](#_Toc442180644)

[CHAPTER THREE 10](#_Toc442180645)

[**3.0** **System Development Methodology.** 10](#_Toc442180646)

[3.0.0 Joint Application Development (JAD) 10](#_Toc442180647)

[3.0.1 Project suitable with JAD 11](#_Toc442180648)

[3.0.2 Generic JAD Life Cycle 11](#_Toc442180649)

[3.0.3 Advantages of JAD 12](#_Toc442180650)

[3.0.4 Collecting Facts and Data. 12](#_Toc442180651)

[**3.1** **Time schedule and project cost** 12](#_Toc442180652)

[3.1.0 Project cost 12](#_Toc442180653)

[**3.2** **Time schedule** 13](#_Toc442180654)

[**3.3** **Coding and programming tools** 14](#_Toc442180655)

[3.3.0 Coding 14](#_Toc442180656)

[3.3.1 Programming tools 14](#_Toc442180657)

[3.3.2 Server Requirement 14](#_Toc442180658)

[3.3.3 User Requirement 14](#_Toc442180659)

[References 15](#_Toc442180660)

# CHAPTER ONE

# Introduction

## **1.0 Background of Study**

On line school information management system intend to address such issues like speed, ` efficiency and cost.

Looking at the world today, the technology is changing radically, with many organization shifting their system from standalone desktop application to on line applications. Others are shifting to hand held devices like tablets.

Almost every person above18 years owns a smart phone, every organization in today’s world owns some computers and most of these organization have access to fast Internet connections , those that don't have any Internet have a well networked computers.

With this in mind, the kind of information systems that are acceptable out there is obvious, these are on line based information systems and those that can run on hand held devices.

Similarly, most of the employees in any organizations that has got Internet are always active in the Internet, they are used to the Internet because of the social networking systems like Facebook, Twitter etc. This necessitate a system that best suite what the users are used to.

This system will incorporate every possible artifact that makes it best to it users.

## **1.1 Problem statement**

Many schools in Kenya have got information management systems, however some of these systems end up frustrating the users where they often fail, they are very slow, and they aren't secure. Some of them are so complex for a typical user who is computer illiterate, others are so expensive.

Thus, understanding users’ needs is important. However, there is more than just developing a system that is user friendly.

A system that is easy to maintain, uses best coding style, easier to upgrade and integrate with other systems is the kind of system we need in today’s world. These are the key thing that many developers ignores.

It makes little sense to create a very user friendly system that can't be integrated in other systems or integrate other systems.

On the other hand, creating a very user friendly system that is too expensive has been overtaken by events. The market is so competitive that developers can’t afford creating expensive systems, but its funny many developers trade off code maintainability for low cost system.

The proposed system will address these key problems that lazy developers ignores often, these include:

1. Cost
2. Code maintainability
3. Ease of upgrading and integrating with other systems
4. Security
5. Speed
6. Efficiency

Problems with current SIMS

1. Cost, many systems are too expensive and those that are relatively cheap are of low quality
2. No distribution, most of the current systems can't be integrated with other systems nor integrate other systems.
3. Most of the systems out there uses very awkward programing styles. The rarely have systems docs, they don't employ any programming models like MVC, they rarely have well commented code.
4. Security, many of the systems out there are not secure at all, this is mostly due to the nature of the programming language used and or the programming style used. For example failure to use MVC model.
5. Dependability, many systems out there are neither reliable nor available when they are needed. To worsen the matter, some are very slow and inefficient.

## **1.2 Objectives**

This system will accomplish the following.

1. Student Management.
2. Staff Management.
3. Exam Management.
4. Fee Management
5. Communication with Parents

* Here, the school will be required purchase a mask or a short code from MNOs (Mobile Network Operators) this will be used for communicating to parents via SMS (Short Message Service).
* On the other hand, the school will also be required to have a secure SMTP (Simple Mail Transfer Protocol) for the purpose of sending emails.

## **1.3 Scope and Limitation of the Study**

### 1.3.0 Scope of study

This software project will capture only the basic aspect in a school environment, such aspects includes:

1. Student Management
2. Exam Management
3. Staff Management
4. Communication with parents

There are more that can be included but due to time and the given budget, we can't manage to include all.

### 1.3.1 Limitation

1. We could have captured exam setting aspect where the system enable teacher to set exam, but such features will be included later.
2. Completion of the basic aspects depends on the time span and cooperation of the parties involved in the JAD sessions.
3. Some other aspects like sending email will depend on the SMTP server used for testing purposes, sometimes Google SMTP doesn't work for security purposes.
4. Sending messages for demo will depend on the availability of a mask and a short code for demo purposes and completion of more priority tasks.

## **1.4 Justification**

This systems will greatly improve performance, increase speed, enhance security, enhance reliability and maintainability and ease the upgrading and integration with other system.

**How to the** **system will enhance Performance**

1. In most system, performance is lost in generating various reports, this is as a result of many third party software’s used. This system will not include any third party software, reports will be generated using Java libraries. Such include *itext java* libraries.
2. In many system, performance is again lost in the misuse of data structures and control structures. For example using nested for each loops is very costly, however, it can be used sparingly. Here this system will used *HashMaps* to get rid of nested for each loops,
3. Caching, the system will implement a caching mechanism that will pull data from the database and cache it in memory.
4. Database pooling, to increase efficiency in database pooling, the system will integrate connection and pooling libraries.

**How the system will enhance Security**

1. The system uses MVC model that enhances great security, the model dictate separation of concerns that is the view is separated from controller and from model. The view has the user interface parts comprising of the Java server pages, Cascading style sheets, Java scripts and system file. The model has the Servlets the accept data from the view. The model has the beans and the Data Access Objects.
2. The system also will have Captcha on login page.

**How to enhance ease of Upgrading**

1. The system will be extremely easy to upgrade, the developer will updates the repository and the clients will then update their codes from the repository using subversion software control.

# CHAPTER TWO

## **2.0 Literature Review and Conceptual Framework**

School Information Management System (SIMS) have existed since long time ago, particularly Student Information System designed for high schools. In Kenya such systems came into existence a few years ago (10 years ago). They began in bigger High Schools (National Schools), here they were basically used for exam results processing.

Later these systems found more and more uses in a school environment, such include fee monitoring, exam management, student management, staff management etc. They did pretty good job in those days.

Nowadays we have better and faster systems, majority of them being standalone desktop applications. However, a few of them are embracing the shift in technology where Internet and hand-held devices have mushroomed.

Why on line?

On line systems doesn’t limit the mobility of their users because, one can work from anywhere as long as they have access to the Internet.

On line technology enables distribution of Systems. For example, a school management system can integrate Banks APIs to enable monitoring student fees.

Today’s SIMS are doing quite pretty good word, the systems can register students, keep track of the student fee payment by integrating Banks APIs, help teachers set exams, accept exam results and process the data into very smart reports. However, different systems accomplish this in different ways and this makes some systems better than others. 2 out of 3 boarding schools have got these systems, and only a few days’ schools have so far managed to acquire one. His is due to lack of enough capital and awareness.

We visited two schools in Tharaka Nithi County, both had systems. In school A, the system was standalone, it was installed in every workstation but the database was running in a separate server. The system was doing some good job but it was slow. If power went off while submitting exam results, then one must wait for not less than ten minutes for the system to roll back.

In school B the system was also standalone desktop application, here the computer was one, this computer acted as a server and a client, the weakness of this system was low speed, complicated process of submitting exam result and also generating reports.

There is no perfect system out there, however, a few are very efficient but at the same time very costly. During a visit to Chuka Boys High School, we realized that their system was so nice that we couldn't find anything to improve. The system was so smart in processing exams where at the end of the year, it generates a very simple and comprehensive reports of year performance. For example, a student get performance for all the three terms. Then the system gives a general comment. Submitting exam results was again as simple as one can imagine. Here a form appears with student names and blank field for the score. Then it saved the score on key press. Hence no worries in case the power went off.

The system integrated KCB, COOP and Equity Banks APIs such that immediately a student pays school fees, the transaction is reflected in the school servers. The only issue with the system was cost, it was said that the system cost was 0.9M, not many school can afford this.

### 2.0.0 Entities in a school setup

In a typical school, we have the following entities

1. Students

A student is the basic entity in any school, below are the key attributes of a student

1. Student’s name
2. Student’s admission number
3. Student’s class
4. Student’s subjects
5. Student’s dormitory

A student must also have a parents, he/she may have a sponsor and a guardian and primary school details. Basic details about the parent name, contact, location and occupation. Primary school details include K.C.P.E index number, marks and Primary School name.

Staff

A staff can either be teaching staff or non-teaching staff, teaching staff are teachers, teachers are assigned a class and some subjects.

1. Teachers

A teacher can either be a class teacher or just a normal teacher who only teaches a subject.

After marking exam, a teacher submits the score to the system and it generates the various reports.

1. Curriculum master and Head of Departments

These deals with subject’s management and report generation.

1. Account clerks

Deals with fees and pocket money and any issues dealing with money and payments.

1. Secretary

Deals student registration

1. Librarian

Keeping books records

1. Lab Technicians

Keeps the records of the usage of lab chemicals

1. Store keeper

Keeps records of the miscellaneous objects like farm items after user

1. Principal

Deals with users’ registration

Deputy Principal – helps the principal in carrying out his/her duties

# CHAPTER THREE

## **3.0 System Development Methodology.**

This is a framework used to structure, plan and control the process of developing an information System. A lot of methodologies exists out there, such include:

1. Agile Software Development – a conceptual framework. It has the following types, Crystal Methods, Dynamic Systems Development Model and Scum.
2. Extreme Programming (XP) – used in very unstable environment, it allows flexibility within the modeling process.
3. Rapid Application Development – a variation of JAD that attempts to create an application more quickly via such strategies like reusing components.
4. Waterfall (Traditional) – it describes a development method that is rigid and linear. It has distinct goals for each phase where each phase is completed then the next one started and no turning back.
5. Rational Unified Process – attempts to capture many of the modern software development best practices.
6. Joint Application Development etc.

For reasons that will become apparent, this particular software can be best developed using JAD Model.

### 3.0.0 Joint Application Development (JAD)

Developed by some two employees of IBM, in 1970s.

This methodology emphasis much on requirement definition and user interface design. Here, end users, executives and developers attend intense offside meeting discussing the system requirement.

1. Executive Sponsor- is a person from the customer's organization who has the ultimate authority to make decisions about the project. E.g. the CEO.

**Responsibilities**

1. Set the vision for the projects
2. Honor the results of the JAD process.
3. Resolve business policy conflicts by being the ultimate decision maker.
4. Ensure the project team has access to and commitment from the right business user experts.
5. Users

**Responsibilities**

1. Serves as the main focus of JAD
2. Provide business Expertise.
3. Represent the strategic and tactical directives of the business
4. Represent all major user groups affected by the project.
5. Developer (IT Representative)

**Responsibilities**

1. Lend technical advice when required.
2. Help develop logical model and specifications.
3. Help build prototypes
4. Ensures all technological constraints are represented
5. Develop an understanding of user business goals, priorities and strategies.
6. Represent job functions such as data administration, business analysis, programming etc.
7. Ensures a solution that is realistic for the budget.

Since this is a high school information system where users are always active on the system, it requires much client’s involvement in the design and development, this ensures that the system meets its requirements and zeros down chances of client rejecting it. To accomplish this, a series of workshops called JAD sessions are organized. For this system, it requires intense meeting with teachers and other stake holders in a school environment. During such meetings, the developer get to know what users’ needs most, for example, to know what's convenient for a teacher while submitting exam results, the developer must interact actively with a number of teachers.

This model focuses on the business problem rather than technical details, thus, it’s more suitable for developers of business systems.

When compared to other methodologies, JAD is found to lead to shorter development time and greater client satisfaction.

### 3.0.1 Project suitable with JAD

1. A System that involves many groups of users whose responsibilities cross traditional department
2. A System that is considered critical to the future of the organization.
3. A System that is a first time project for the organization.

### 3.0.2 Generic JAD Life Cycle

1. Planning/Definition
2. Preparation
3. Design Sessions
4. Finalization

### 3.0.3 Advantages of JAD

1. It shortens the time taken while collecting user requirements. This in turn reduces the number of requirement changes that are so costly. However, it success depends on effective leadership of the JAD sessions. Key users, executives and developers should participate to achieve the above benefits.
2. Enhances quality
3. Promote teamwork with the customer
4. Lowers development and maintenance cost
5. Reduces development time, cost and errors.

### 3.0.4 Collecting Facts and Data.

Some sample data is generated on line, such include names.

Other data and facts are collected during the JAD sessions from the users.

**Tools used to analyze the data**

1. PhAdmin3 is used to as a graphical user interface that enable easier viewing of data from the database since the database management system used has no graphical interface.
2. A command interface (terminal) is needed for initialization of the database

**Tools to implement and test the system**

1. Ant, a product from Apache is used to deploying the system.
2. Junit, used for module testing.

## **3.1 Time schedule and project cost**

### 3.1.0 Project cost

For the success of this project, KSH 10,000 is allocated for organizing JAD sessions, and visiting various schools.

KSH 7,000 is allocated for preparing various documents that are required in the whole process. Such include this proposal document, System documentation and questionnaires.

Some amount totaling to KSH 3,000 are kept aside for emergency purposes

The above totals to KSH 20,000.

## **3.2 Time schedule**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | FROM | TO | JAN | | FEB | | MACH | | APRIL | | | MAY | |
| TASK |  |  | 1-15 | 16-28 | 1-15 | 16-31 | 1-15 | 16-30 | 1-15 | 16-30 | 1-15 | | 16-30 |
| SYSTEM PLANNING AND | 01/14/16 | 01/18/16 |  |  |  |  |  |  |  |  |  | |  |
| PROPOSAL WRITTING | 01/18/16 | 01/29/16 |  |  |  |  |  |  |  |  |  | |  |
| SYSTEMS ANALYSIS AND DESIGN | 01/28/16 | 02/01/16 |  |  |  |  |  |  |  |  |  | |  |
| SYSTEMS IMPLEMENTATION | 02/01/16 | 03/10/16 |  |  |  |  |  |  |  |  |  | |  |
| DOCUMENTATION | 03/10/16 | 5/11/16 |  |  |  |  |  |  |  |  |  | |  |
| DELIVERY | 5/11/16 | 5/19/16 |  |  |  |  |  |  |  |  |  | |  |

## **3.3 Coding and programming tools**

### 3.3.0 Coding

The system is based on JavaEE (Enterprise Edition), using MVC (Model, Controller View) model. A lot of java server pages (jsp) a written plus servlets containers and other java classes like POJOS (Plain Old Java Objects) and DAOs (Data Access Objects) .On the view, cascading style sheet, java Scripts libraries and some html are used for Designing the UI. On top, some more files are still included, these are the deployment descriptors (web.xml), configuration file, build.property file, log configuration file, scheduler configuration file, cache configuration file and database initialization files. All these are properly groped and put in various directories within the programming machine. Such directories include

1. Web for the java server pages and the deployment descriptors
2. src for Java codes
3. etc for persistence management , this has cache files, database files , schedulers and configuration files
4. the root directory is the webapp

### 3.3.1 Programming tools

1. Subversion, this tool is used for version control, in this project I have used github as a repository.
2. Apache ant, this tool is for deployment. It is more efficient than IDEs (Integrated Development Environment).
3. Wildfly (JBOSS), this is a server
4. Postgres, this is a database Management System (RDMS)
5. Eclipse IDE for Java coding and testing
6. Netbeans IDE for Jsp coding
7. Linux Operating System

### 3.3.2 Server Requirement

Fast machine with at least 4GB RAM and at least 500GB HDD running UNIX based OS

### 3.3.3 User Requirement

A web browser that can support java script

# References

1. Antonio Goncalves. (2010). Beginning Java EE 7. Washington: Apress publishers.
2. Ben Collins Sussman. (2004) .Version Control with Subversion. Gravenstein Highway North, Sebastopol: O’Reilly Media, Inc. Publishers.
3. Duane K. Fields, Mark A. Kolb. (2002) Web Development with Java Server Pages. 2nd Edition. Shawn Bayern, Bruce Park Avenue: Manning Publisher Co.
4. Ivor Horton. (2011). Beginning Java. 7th Edition. Canada: John Wiley & Sons Inc. Publishers.
5. Jason, L. (2010) *Pro jQuery*. New York: Apress.
6. Joshua Bloch. (2008). Effective Java. 2nd Edition. Santa Clara California: Sun Microsystem Inc.
7. Wei Li (2007) Frontiers of Computer Science. Journal no.11704. Higher Education press: China
8. <http://www.umsl.edu/~sauterv/analysis/488_f01_papers/rottman.html>
9. <http://www.itinfo.am/eng/software-development-methodologies>
10. <http://www.theserverside.com/news/thread.tss>
11. <http://www.docs.oracle.com/javase/tutorial/collections/interfaces/order.html>
12. <http://www.stackoverflow.com/questions/23365307/java-treeset-order>