**DEDAN KIMATHI UNIVERSITY OF TECHNOLOGY**

**FINAL PROJECT REPORT FOR FOURTH YEAR STUDY IN B.S.C IN INFORMATION TECHNOLOGY**

**PROJECT TITLE:**

**STUDENT SELECTION DECISION SUPPORT SYSTEM**

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**REGISTRATION NUMBER:** **C025-01-0501/2013**

**A project progress document submitted to the Department of information technology in the School of Computer Science and Information Technology in partial fulfilment of the requirements for the award of the Degree of information Technology, Dedan Kimathi University of Technology**

**November, 2016**

# **DECLARATION**

Student Declaration

This project documentation is my original work and has not been presented for a degree in any other University.

Makokha Barasa Fredrick

…………………. …………………

Signature Date

Supervisor Declaration

This project has been submitted for examination with my approval as the university supervisor.

Malanga/Senagi Kennedy

…………… … ……………….

Signature Date

# **ACKNOWLEDGEMENT**

First and foremost, I thank The Almighty God for the project idea and the good health during the development of the project and also for being with me throughout my entire education. I also thank God for providing for the great people who ensure my stay at school is well taken care of, starting with my parents.

Secondly, I thank my supervisor Mr. Malanga for the guidance and patience during the development of the project. He has helped me achieve my objectives with ease and above all has helped me learn new aspects of development that will be of immeasurable value in the job market. On the same note I also thank the IT department, school of CS and IT, Dedan Kimathi University of Technology and the entire university for providing the resources and environment conducive for development.

Lastly, I thank my classmates and friends for having a hand in ensuring my project development process runs smoothly, both through material and intellectual support.

May God bless you all.

# **ABSTRACT**

Student Selection Decision Support System is a system whose aim is placement of K.C.P.E candidates to secondary schools in Kenya. The project’s main aim is to provide a fast, cheap, reliable and fair means of placing form ones. This is achieved through realizing the following specific objectives: Registration of secondary schools, registration of candidates, uploading of results by KNEC, revision of schools (selection) by candidates using mobile devices, performing placement, and communicating results of the placement to all stakeholders by SMS. The system was developed using prototyping method. This project will offer fair placement, save the government resources like funds and time and save parents and students the anxiety that is associated with placement.

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# **DEFINITION OF TERMS**

1. DSS – Decision Support System.
2. SSDSS – Student Selection Decision Support System.
3. K-12 – sum of primary and secondary education as used in the USA. Short for kindergarten (K) for 4- to 6-year-olds through twelfth grade for 17- to 19- year olds.
4. KNEC – Kenya National Examination Council
5. MoE – Ministry of Education

# **CHAPTER ONE: INTRODUCTION**

## **1.1 Background**

Different countries in the world have different education systems but all education systems involve learners moving from one level of study to another. The level can either be a grade or just a level like A-level to O-level. When learners graduate from one level of study some criteria, majorly based on their performance and sometimes region of financial status of the family, is used to select and place them into their subsequent levels of study. This process of selection and placement is mostly done by humans who take some time going through the learners’ profiles among other things then do the placement.

Some schools have a placement office that works closely with families to assist them in making informed, confident decisions. Such a school is Trinity Episcopal School in Austin, Texas, USA, (Trinity Episcopal School). The school puts efforts to assist their students in finding best-fit options for high school. The efforts begin than in the eighth grade. These efforts are put in place to ensure that the students from the school land in the best high schools once the selection is done.

**School Selection and Placement in the United States**

In USA, public education is universally required at the K-12 level and is available at state colleges and universities for all students. K-12 public school curricula, budgets and policies are set through locally elected school boards, who have jurisdiction over individual school districts. State governments set overall educational standards, mandate standardized tests for K-12 public school systems and supervise, usually through a board of regents, state colleges and universities. The schools are funded by the government, both state, local and federal.

**Educational Stages and the Advancement through the Stages**

Most children in the US enter the public education system around ages five or six. Children are assigned into year groups known as grades. The school years begins at the end of August or the day after Labor Day, in September, after a summer recess. Children advance from one grade to the next as a “class” upon reaching the end of each school year in late May or early June.

Depending on their circumstances, the children may begin school in pre-kindergarten, kindergarten or first grade. They normally attend twelve grades of study in twelve calendar years of primary/elementary and secondary education before graduating, earning a diploma that makes them eligible for admission to higher education.

Each U.S. university and college sets its own admission standards and decides which applicants meet those standards, (Applying for Admission to a U.S. Program). For high schools, students select the best high schools for them depending on the results in the completed grade. There is no single national system for placement of all students.

**School Selection and Placement in Kenya**

**Education System Structure**

The current education system is organized into five main levels: Early childhood education (ECD) comprising of kindergartens for 2 years and one year nursery school, Basic education (KCPE-KCSE) comprising of 4 years of lower primary, 4 years of upper primary, 4 years of high school education and some adult education (Gumbaro), Vocational training for artisans and crafts, Professional training for technicians, technologists, specialists among others, and lastly University programmes comprising of certificate, diploma, undergraduate degree, postgraduate diploma, masters and doctor of philosophy. The curriculum is 8-4-4. (Education in Kenya).

**Educational Stages and the Advancement through the Stages**

**Primary education**

Primary education in Kenya begins at the age of 5 to 7 years after completion of kindergarten/nursery school/pre-unit. The first class or the first year of primary school is known as Standard 1, the final year is Standard 8. Primary school children are known as pupils. The school year in Kenya begins in January and ends in April, August and December.

At the end of the school year students advance to the next class. With the banning of repetition, students proceed to the next class even if they fail their examinations. Most primary schools are day schools with pupils living at home. Fewer schools at primary level are boarding schools compared to secondary schools. All public primary school pupils sit for the Kenya Certificate of Primary Education (KCPE) examination at the end of the school year in Standard 8.

**Secondary education**

Secondary schools in Kenya are either government, community or privately funded. Government funded schools are divided into national, county and district day schools. Harambee schools do not receive full funding from the government while private schools are run by private organizations or individuals. After taking the primary school leaving exam and successfully passing, government funded schools select students in order of scores.

Students with the highest scores in KCPE gain access to national schools while those with average scores join county and extra-county schools. Harambee schools accept students with low marks. Students who fail their examinations pursue technical and vocational education.

Students, currently, attend secondary school education for four years before sitting for the school leaving examination-Kenya Certificate of Secondary Education (KCSE) examination at the end of the fourth year. The first class of high school is known as form one while the last is form four. The KCSE examination is done by all registered candidates in October, the final year.

Students who manage a grade of C+ qualify for a degree course at the university. Those in B- and above are taken for degree courses at the public universities and benefit by paying government-subsidized fees. The rest join private universities or middle-level colleges, (Education in Kenya).

**Form one intake process**

The form one intake entails the admission into either National, Extra-County, County or District Day Schools depending on the candidate’s school choices captured during the year the candidate sat for the KCPE exam and the student’s KCPE performance. National schools distribute both based on candidature and affirmative action thus enabling each district to get a candidate selected to a national school.

The National School Quota is used to select candidates per Gender and Merit List per District. Cut-Off to each National School is automatically determined based on the last Candidate to be Selected to a given National Schools from a Given District in a County.

County Schools are selected on a 40% (National): 40% (to Districts within County and Inclusive Home District of the School): 20% (for Home/Host District of the School). Not all County Schools Can attract National Quota and may be allocated quotas to only Districts within host County.

**Target group**

The government, even after some computerization developments done, still spends money at both the national and county levels to pay the personnel in the form one selection and placement process. Parents and their pupils complain of unfairness in the selection process, similar to some principals and also the private schools’ association. The project targets these groups-The Ministry of Education, form one-bound students, Kenya Parents Association, Kenya School Heads Association and Kenya Private Schools Association.

## **1.2 Problem Statement**

The problems to be solved by this project include; The inconveniences secondary school heads go through every year when they spent days to go pick form ones at specific selection centers, the government funds consumed to cater for the placement process, the time consumed in the placement process and the unfairness often associated with the process.

## **1.3 Objectives**

### **General objective**

To provide a decision support system that will enable the Ministry of Education to perform the form one placement process in a fast, affordable, convenient and fair manner.

### **Specific objectives**

1. To register secondary schools.
2. To register candidates.
3. To enable KNEC to upload results of candidates.
4. To enable candidates to revise schools using mobile devices.
5. To perform placement of form ones.
6. To communicate results of the placement to all stakeholders by SMS.

## **Justification**

There have been cries about discrimination in the form one selection process, in 2015 for instance, the Kenya Private Schools Association (KPSA) (Form One selection dilemma), complained about discrimination of private schools’ pupils. Parents also accused the government for hiding information. In Feb, 2016, Principals protested as pupils with low marks joined top schools. The government also spends a lot of money to host principals and other officials who do the placement. The system built will enable the Ministry of Education to perform the placement of form ones as soon as results are out and students have revised their selection. This will give the parents and their children to prepare adequately for joining. The MoE will not have to summon school heads and so will save the money that would otherwise be spent on allowances among other expenditures. The school heads will receive the lists of students joining them via email, saving them from the inconveniences and time-wasting they would have otherwise underwent had they travelled to placement centers. The placement is automated, no human is directly involved in the actual placement process, fairness and speed will then be achieved.

## **Scope**

The project will be deployed to the Ministry of Education, which is mandated with the task of placing form ones.

# **CHAPTER TWO: LITERATURE REVIEW**

## **2.1 Introduction**

This chapter deals with review of relevant literature in the student selection processes area and the systems used then give a summary of the various case studies. The research gap and the proposed methodology are also discussed.

## **2.2 Case Studies**

### **2.2.1 ‘SHESHET’- Decision support system for guidance and placement of enrolling high school students**

‘SHESHET’ is a Hebrew word for a decision support system named after Robinson Crusoe’s servant Friday. It was developed to assist the principal and the counselors of Tel-Aviv University in Israel in the placement process. Many high schools have to tackle the problem of placement of the students who want to enroll in them, and into tracks, classes and programs. The decision-making process of matching between individual aspirants and the system capabilities is known to be complicated and ineffective. That’s why ‘SHESHET’ was developed.

The system comprises of five components namely: the data base, the computerized decision support system, the student placement plan, the school guidance operation and the operational student placement. The data necessary for decision-making are stored in two files, the school file and the student file. The school file consists of the names of the programs the school offers, the number of classes per program, qualitative dimensions of the classes and the list of school resources – such as workshops, science labs etc. The student file, on the other hand, contains data of the entire student body. The student file is complicated because the student data are not standardized and updated.

The relevant individual data are sent as an update into the DSS. The elimination criteria predetermined by the educational staff are used as rules that support the placement of each individual in a specific class and program. At the end, the system generates an output that consists of several alternatives for consideration of the staff. The decision-making is then entirely in the hands of educational team which examines the nature of the different programs, the kind of students that have entered each learning group and the degree of strain that each alternative has put on the school, (Chen, "SHESHET"\* - Decision support system for gnidance and placement of enrolling high school students, 1995).

The SSDSS will not involve the educational officials in decision-making, with the criterion fed into the system, output produced will be lists of students and schools they have joined, ready to be accessed by Kenyans.

### **2.2.2 CSSPS- Computerized school selection and placement system**

Children in Ghana write the Basic Education Certificate Examination (BECE) that determines whether they join senior high school or learning any vocation, after going through nine years of a compulsory system (ninth grade). The CSSPS, introduced in 2005, is the system used by the Ghana Education Service (GES) to place qualified BECE candidates into senior high school (SHS)/Technical Institutes (TI)/ Vocational Institute.

The CSSPS has instilled sanity, fairness and ease into the admission of students into the selection of schools. It has also wiped out bribery in the admission processes. It has promoted regional integration and also improve the drive of students. It ensures a more efficient and effective use of human and scarce financial resources of GES. It has also put an end to anxiety, frustrations and confusion that qualified candidates were going through due to delays in the placement of such candidates. It has also ensured that schools do not take more than their limits. (Yaa, 10).

The CSSPS, however, has many challenges, for instance, sometimes male students are posted to girl’s schools. The SSDSS will meet the above ups and be accurate to avoid frustrations.

### **2.2.3 Scotland Student placement system**

In June 2012, the General Teaching Council (GTC) for Scotland assumed responsibility for the system of placing students undertaking Initial Teacher Education courses into schools. The placement was initially done by the Practicum system. The Student Placement System (SPS) then completely replaced the Practicum System. The new SPS went live on 19th May, 2014.

The SPS incorporates the facility to calculate journey times by both private and public transport, ability to match students to suitable schools according to university set criteria, a set of processes and procedures which will ensure that Local Authority Coordinators maintain control and management of their placements, a number of automated processes within the system to facilitate efficient and transparent communication through the use of automated emails, the facility to run statistical reports allowing for analysis, a dedicated training for users and the creation of dashboard style interfaces for different user roles to facilitate data management and system processes. It is centrally managed by the Student Support Team, (Student Placement System, 2016).

However, SPS only deals with teaching students and their schools, other professions are left out.

### **2.2.4 KNEC Form One Placement**

The computer selects the top 1 and 2, for both gender, to their national school choices. In the absence of such choices, the computer places them in national schools that are equivalent to their stature. The computer then selects other national schools’ quotas based on the candidate ratio between public and private schools. The system also helps in calculating the variance to be used in selecting of extra-county schools. (Form one Intake 2016 – Selection Procedure, 2016).

The computer, however, does not automatically place all students to their high schools. For instance, district selection is still done manually. The system also helps to calculate selection figures like variance, selecting national, extra-county and county schools and selecting the number of students to join such schools. But the system does not do the full placement automatically, educational officials just use the figures produced by the computer to do the placement manually. The system also produces errors like male students posted in girls’ schools and vice versa.

## **2.3 Summary**

The systems depicted in the literature above are used in the placement of students to respective schools and have helped easing the process as much as possible. However, they’ve not fully automated the placement process. The ‘SHESHET’ system generates an output that consists of several alternatives for consideration by the staff leaving the educational staff with the task of making the final placement decision. The SSDSS project takes criteria from educational staff then does the placement automatically (without involving the educational staff).

The CSSPS has been successful and has instilled sanity, fairness and ease into the admission of students into the selection of schools but has many challenges, for instance, sometimes male students are posted to girls’ schools and vice versa. The SSDSS will be accurate to avoid frustrations. The Scotland Student placement system is developed such that it allows Local Authority Coordinators to maintain control and manage their placements, a feature that if incorporated into SSDSS, will see to it that form one placement is done both at national and county level for the different levels of secondary schools in the country-national, extra-county, county and district schools.

The KNEC form one placement process, on the other hand, is both a combination of manual and automated activities. The computer categorizes students then educational staff selects students from the categories for placement in various schools. The SSDSS place students automatically then outputs the final placement report to the educational staff and students.

## **2.4 Research Gap**

Existing applications do not offer a functionality effective enough to just take results and student school choices as input then produce high school lists, informing the students as soon as possible, without depending on the action of educational officials.

## **2.5 Proposed Methodology**

The project is developed by prototyping. A sample data was used to represent the whole country. The secondary schools are registered by uploading their details into the system. Details of candidates are also uploaded followed by the results (KCPE). The system then places the pupils in high schools based on the criteria given then produce lists of students and their schools-where they are placed.

# **CHAPTER THREE: METHODOLOGY**

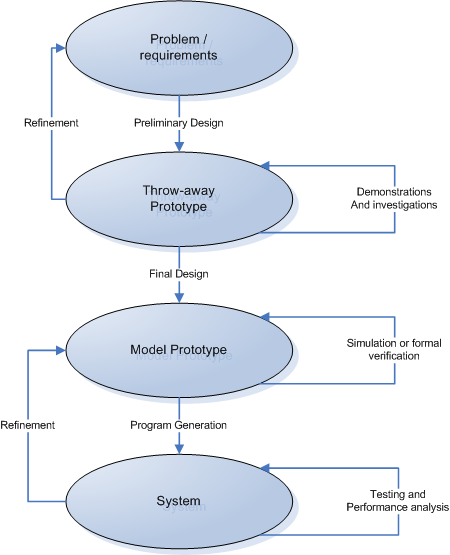
## **3.0 Introduction**

This chapter deals will software development methodology and procedures, data collection and data analysis techniques.

## **3.1 Software Design**

Prototyping methodology (*diagram shown in Fig 3.1*) will be used in this project since it allows users and the system designer to interact as much as possible therefore designing a system that is user-acceptable and one that addresses user needs to a larger extent. Users can try the system and provide constructive feedback during development. Prototyping helps to identify and address problems early. The method also helps to eliminate ambiguities and improve accuracy in interpretation of system requirements and functionality. Prototyping is also effective since the SDSS is meant to handle data about pupils from all over the country and so it is just important for the user to accept the prototype first instead of developing a whole complex system only for it not to be accepted by the users.

**Prototyping-based Methodology**



*Fig 3.1: Prototyping methodology diagram*

The phases of prototyping method as shown in Fig 3.1 include: Problem/requirements phase where the system requirements are established and preliminary design made, Throw-away Prototype phase where the preliminary design is demonstrated and investigated then refined appropriately then final design adopted, Model Prototype phase where the final design is simulated or verified then program generated to give the final system. The system is subjected to a series of testing and performance analyses then appropriate refinements made.

## **3.1.1 Prototyping-based software design procedure**

1. A preliminary design of the system is built using throw-away prototyping, based on the requirements collected from the users- KNEC, MoE.
2. Demonstrations to end users, as well as investigations on this prototype, allows for the design of more precise requirements as well as the evaluation of techniques to be used in the final system. Here, I will present the system to KNEC officials.
3. Refinements on throw-away prototype concerning the requirements are done.
4. Evolutionary prototyping is used to build a model prototype (an accurate and complete description of the system). These prototypes can be studied under various simulated conditions.
5. Refinement on model prototype, concerning the actual system, is done and final system is rolled out after testing.

## **3.2 Preliminary Data Processing and analysis.**

### **3.2.1 Fact finding techniques**

### **3.2.1.1 Questionnaires**

We administered some questionnaires to recently joined form ones and other stakeholders like private schools’ association, KNEC, The Ministry of education and Kenya Principals association.

### **3.2.1.2 Interview**

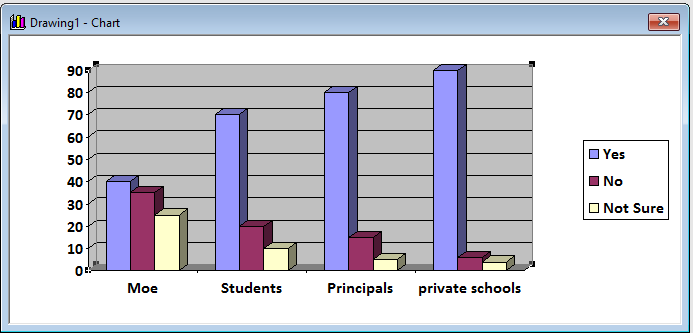
We also managed to ask some stakeholders some questions concerning form one selection and placement, though they couldn’t allow me to record clips or voice.

### **3.2.1.3 Research**

Much of the information used here was gathered from secondary reliable forces like the internet. A research on the issues arising just before and after the release of KCPE examinations and form selection process provided enough data to aid in developing the system.

## **3.2.2 Data Analysis Methods and Techniques**

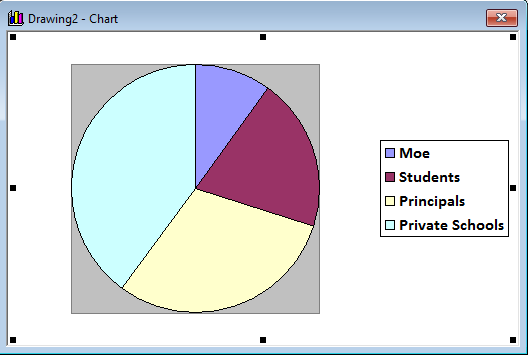
### **3.2.2.1 Bar Charts**



*Fig 3.2: Findings Bar chart*

As displayed above, most people in the named groups had problems with the current placement system and wished for another one or an improvement.

### **3.2.2.2 Pie Charts**



*Fig 3.3: Findings Pie chart*

The private schools’ association led in complaining about unfairness in the current selection and placement process, followed by principals on unfairness grounds too, then students on unfairness and slowness and MoE for tedious work done, too much manual work required.

## **3.3 Resources**

A number of resources and tools were required in order to design and implement the system. The following are the resources required to develop the system up to where we are now..

### **3.3.1 Hardware**

* Computer (laptop)

With the following specifications:

2GB RAM (Giga Byte Random Access Memory)

2.30 GHZ (Giga Hertz) processor speed

500GB hard disk capacity

### **3.3.2 Software**

* Windows 7,8,8.1 or 10 Operating System-to provide the platform for developing the project.
* A web browser. (Preferably Firefox)-to the provide the platform for executing the system.
* A computer antivirus. (Preferably Avast)-to protect the project files against computer viruses.
* A localhost (preferably XAMP)-to host the system for web access.
* A text editor (preferably Dreamweaver)-where the project codes are typed.

# **CHAPTER FOUR: ANALYSIS AND DESIGN**

## **4.0 Introduction**

The Student Selection Decision Support system is required to meet a number of requirements so that all the objectives of its development can be said to have been achieved. These requirements are divided based on the functions of the system and the attributes that the system is expected to have.

## **4.1 Requirement analysis**

### **4.1.1 Functional Requirements**

These are the requirements that users expect the system to functionally meet and satisfy. Users (candidates, KNEC and MoE officials) expect to submit information into the system and get appropriate feedback. The following are the functions that users can perform on the system.

* The Ministry of Education (an official there) should be able to log in to the system and add other users like KNEC.
* The Ministry of Education should be able to register (and update) secondary schools in the country, recording such information as their level and capacities into the system.
* KNEC should be able to log in to the system and upload lists of registered candidates before KCPE exams are sat for.
* Students should be able to log in to the system and submit their high school choices.
* KNEC should be able to log in to the system and upload KCPE results as soon as they (the results) are ready.
* The system should be able to automatically place students in high schools based on in-built criteria after being triggered to do so by Ministry of Education officials.
* The system should be able to automatically communicate the placement report to the public (viewing), students/parents (email) and high schools (email).

### **4.1.2 Non-Functional Requirements**

* Availability-the system should always be available to be accessed by all users when they need.
* Usability-the system should be user-friendly, requiring less user efforts, with clear instructions, user guides, and clear error messages.

## **4.2 System Analysis and Design**

### **4.2.1 System Analysis**

In this phase, one does the analysis of the data that was collected in the previous phase and put it in a way that it’s easier to automate, best done by a diagrammatical representation of the information. For this project we will use the UML modelling language because it’s a visual language that assists one to analyze and design systems. (SIMON BENNETT, 2001)

### **4.2.1.1 Use Case Diagram**

The diagram shows the actors and the use cases and the relationship between the two. It is a diagrammatical representation of how the MoE, KNEC, schools and the students will interact with the system in order to make the placement process efficient, reliable, affordable and fair.

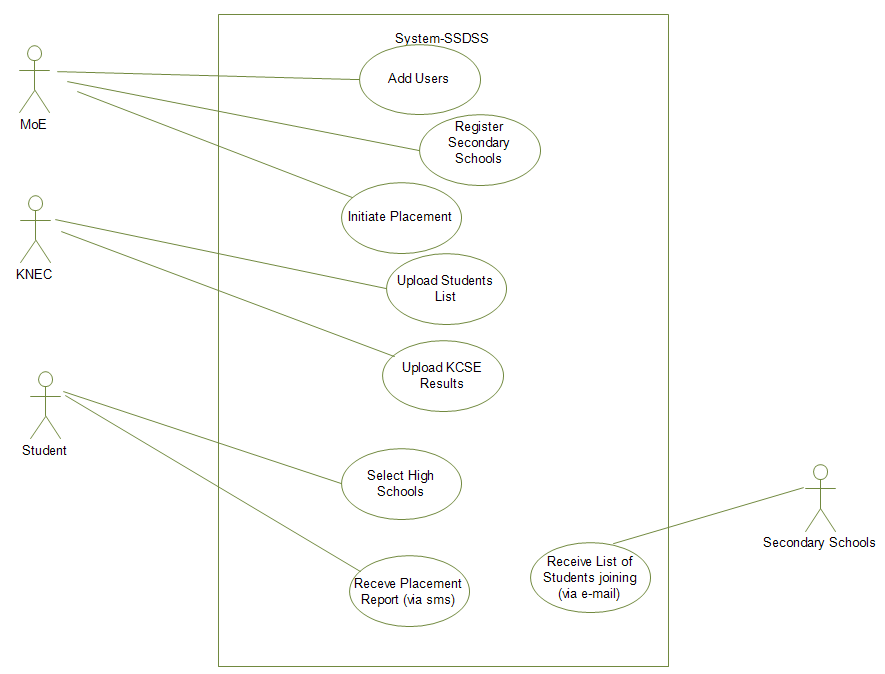


Fig 4.1: Use Case Diagram.

The use case diagram shown in Fig 4.1 depicts the users of the system and the actions they perform on the system. The key users (MoE, KNEC and students) log and perform various actions like adding users, registering schools and initiating placement for MoE, KNEC officials log in and upload candidates and results while students log in to select schools and await reception of placement results. Other users like secondary schools receive placement results-list of students joining them.

### **4.2.1.2 Data Flow Diagram**

Data flow diagram shows how data flows through a sequence of processing steps which represent software processes or functions.

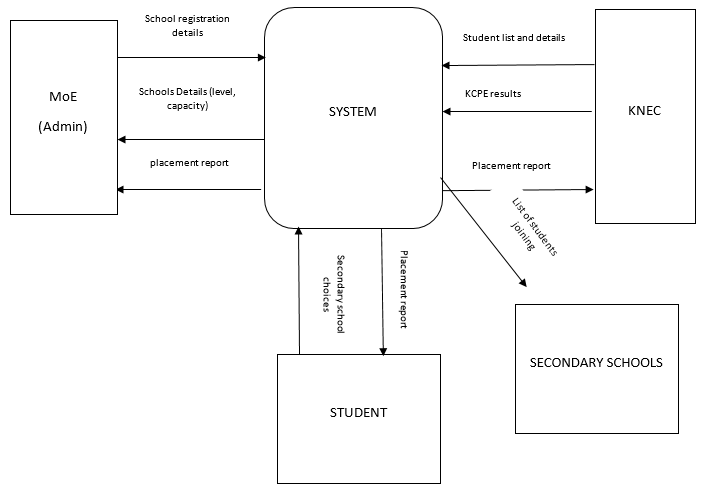


Fig 4.2: Data Flow Diagram.

## **4.2.2 System Design**

Student Selection Decision Support System is a data driven system in that the functionality of the system is controlled by the data input to the system with relatively little external event processing. Therefore, the best models to use to design this system is the data-driven models.

### **4.2.2.1 Workflow Diagram**

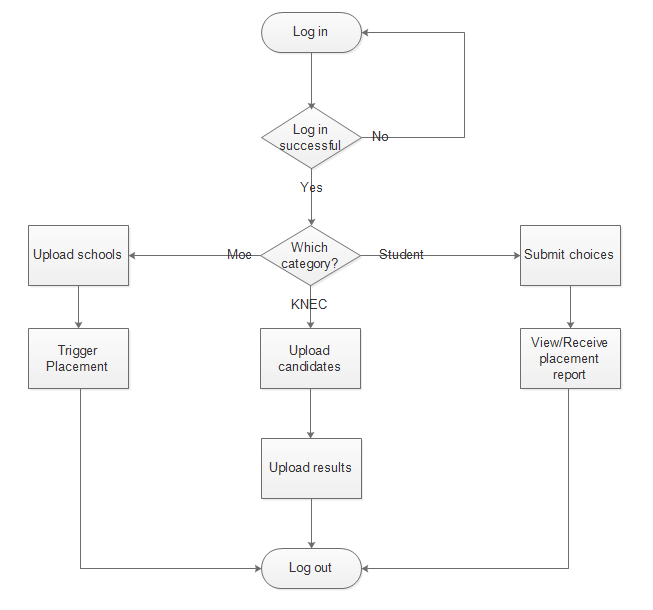
 

Fig 4.3: Workflow Diagram.

### **4.2.2.2 Activity Diagram**

All unified processes are defined in terms of activities which are then grouped into workflows that are represented graphically using activity diagrams.

**The main process of student selection and placement**

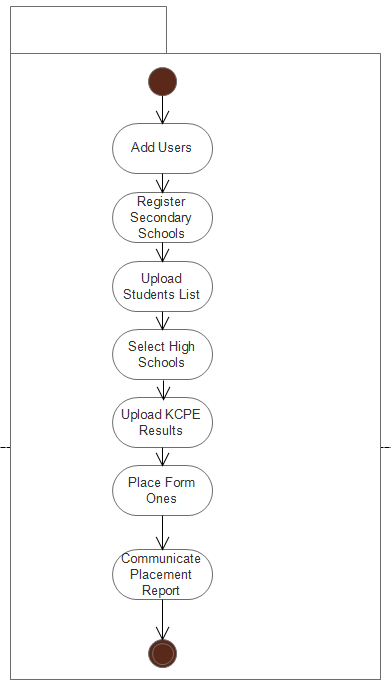
****

Fig 4.4: Main process activity diagram.

**The MoE adds system users like KNEC**

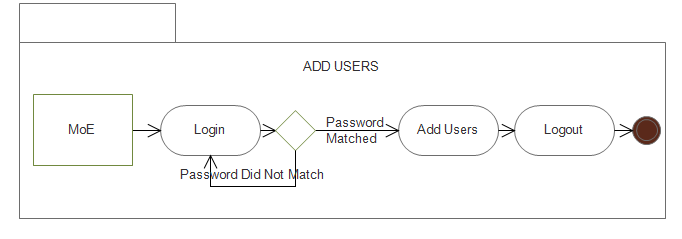


Fig 4.5: Users registration activity diagram.

**The MoE registers secondary schools in the country**

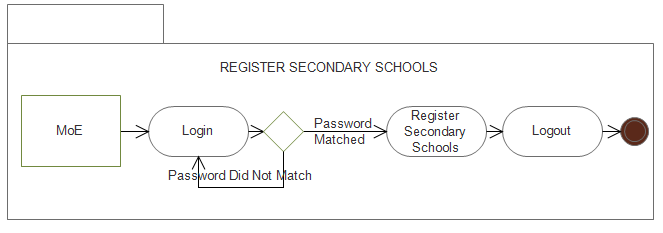


Fig 4.6: Schools registration activity diagram.

**The KNEC uploads a list of KCPE candidates**

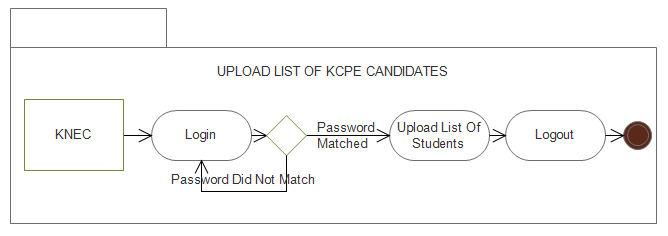


Fig 4.7: Candidates details uploading activity diagram.

**Students login using their index numbers and birth certificate number then select high schools**

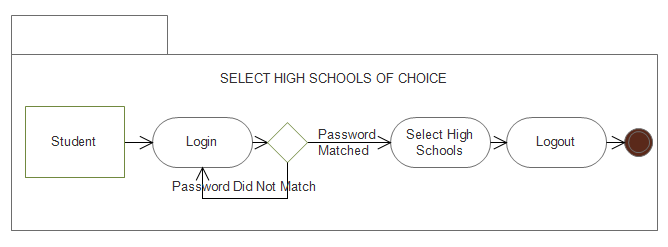
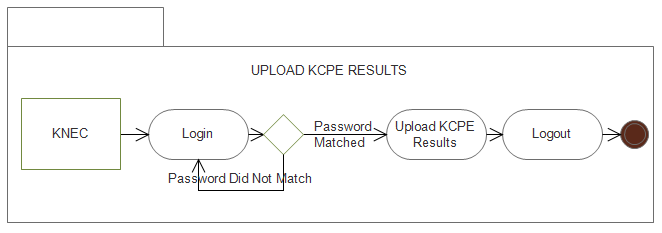


Fig 4.8: School selection activity diagram.

**The KNEC uploads KCPE results**Fig 4.9: Results uploading activity diagram.

**The MoE officials trigger the placement process by pressing a button**

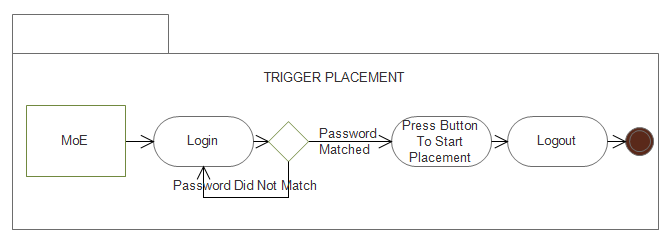
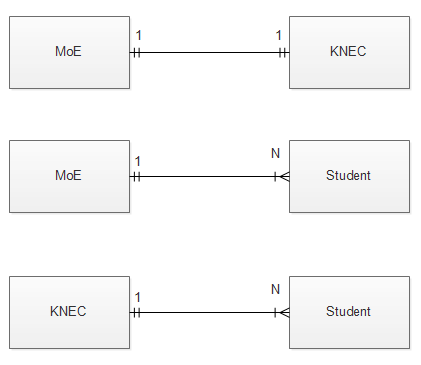


Fig 4.10: placement triggering activity diagram.

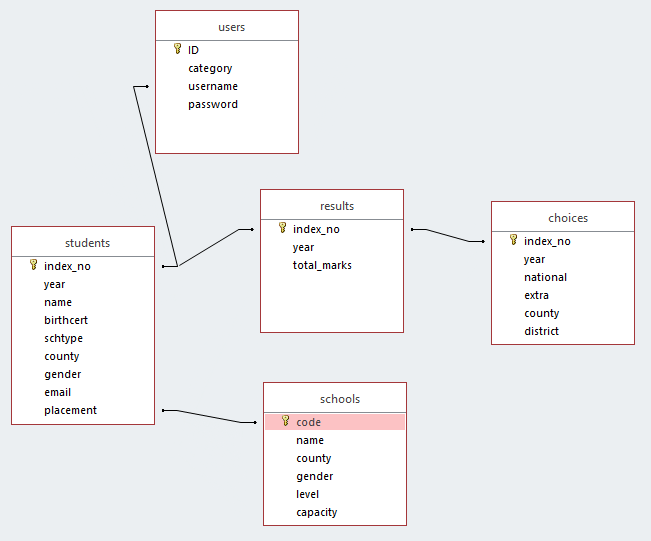
## **4.2.2.3 Entity Relationship Diagram**



*Fig 4.11: E-R diagram*

## **4.2.3 Database Design**

### **4.2.3.1 Database Relation Schema**



*Fig 4.12: Database Relation Schema*

**TABLE 4.1: users**

|  |  |  |
| --- | --- | --- |
| **Field** | **DataType** | **Description** |
| Id (primary key) | INT(11) | Identifies users uniquely |
| category | VARCHAR(50) | Whether KNEC/MOE… |
| username | VARCHAR(50) | Login username |
| password | VARCHAR(30) | Login password |

**TABLE 4.2: schools**

|  |  |  |
| --- | --- | --- |
| **Field** | **DataType** | **Description** |
| Code (primary key) | INT(11) | Identifies schools uniquely |
| name | VARCHAR(50) | School name |
| county | VARCHAR(50) | County where school is |
| gender | VARCHAR(50) | Whether girls, mixed or boys |
| level | VARCHAR(50) | Whether national, extr-county…. |
| capacity | VARCHAR(50) | The total capacity of the school |

**TABLE 4.3: students**

|  |  |  |
| --- | --- | --- |
| **Field** | **DataType** | **Description** |
| Index\_no (primary key) | INT(11) | Identifies students uniquely |
| year | INT(11) | Year of exam |
| name | VARCHAR(50) | Student’s name |
| birthcert | INT(11) | Birthcert number |
| schtype | VARCHAR(50) | Type of primary school attended (Private/Public) |
| county | VARCHAR(50) | county of origin |
| gender | VARCHAR(50) |  |
| email | VARCHAR(50) |  |
| placement | VARCHAR(50) |  |

**TABLE 4.4: choices**

|  |  |  |
| --- | --- | --- |
| **Field** | **DataType** | **Description** |
| Index\_no (primary key) | INT(11) | Identifies students uniquely |
| year | INT(11) | Year of exam |
| national | INT(11) | National school choice (school code) |
| extra | INT(11) | Extra-county school choice |
| county | INT(11) | County school choice |
| district | INT(11) | District school choice |

**TABLE 4.5: results**

|  |  |  |
| --- | --- | --- |
| **Field** | **DataType** | **Description** |
| Index\_no (primary key) | INT(11) | Identifies students uniquely |
| year | INT(11) | Year of exam |
| total\_marks | INT(11) | Total marks (/500) for each student |

# **CHAPTER FIVE: TESTING AND RESULTS**

## **5.0: Introduction**

In this chapter, we test the objectives of the system to find out if we have achieved them. The testing methodology used was Unit Testing where every unit was tested independently.

## **5.1: Unit Testing**

### **5.1.1: Schools uploading**

Excel file containing data about schools should be uploaded to the database. The code that follows is expected to do this.

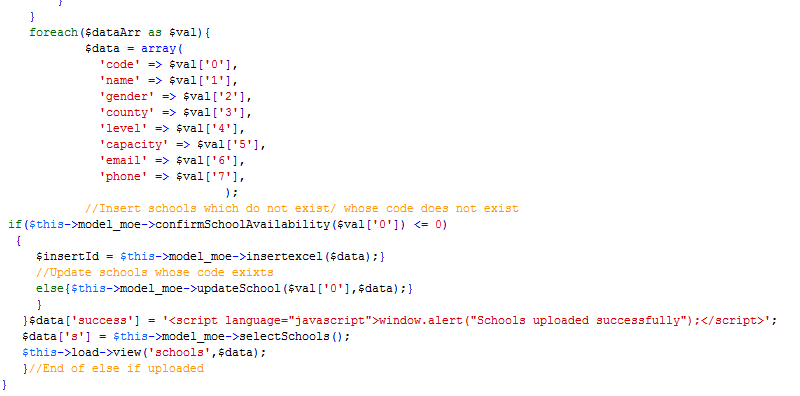


Fig 5.1 Code for uploading schools

The file is indeed uploaded successfully as shown in the Fig 5.2(a) below.

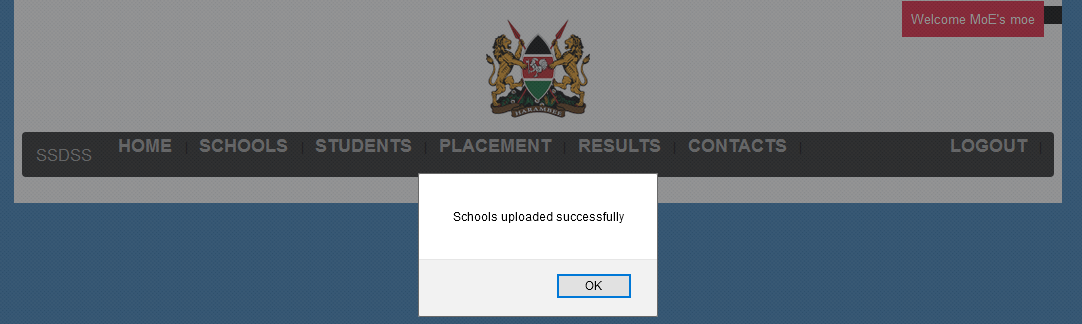


Fig 5.2(a) School registration (uploading)

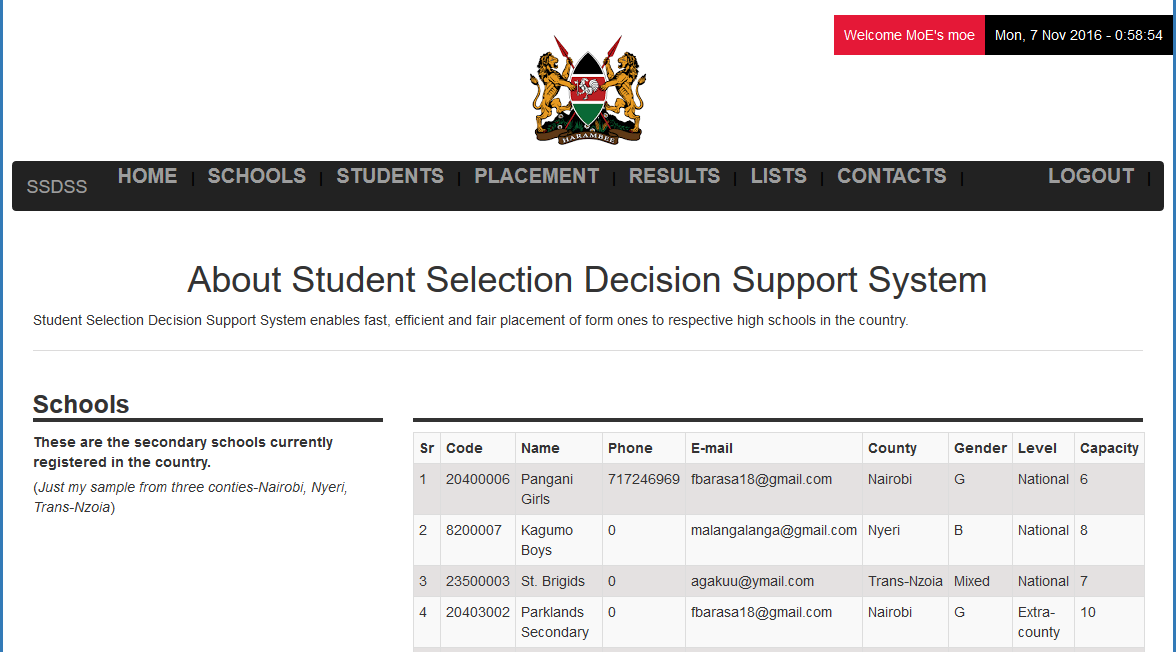
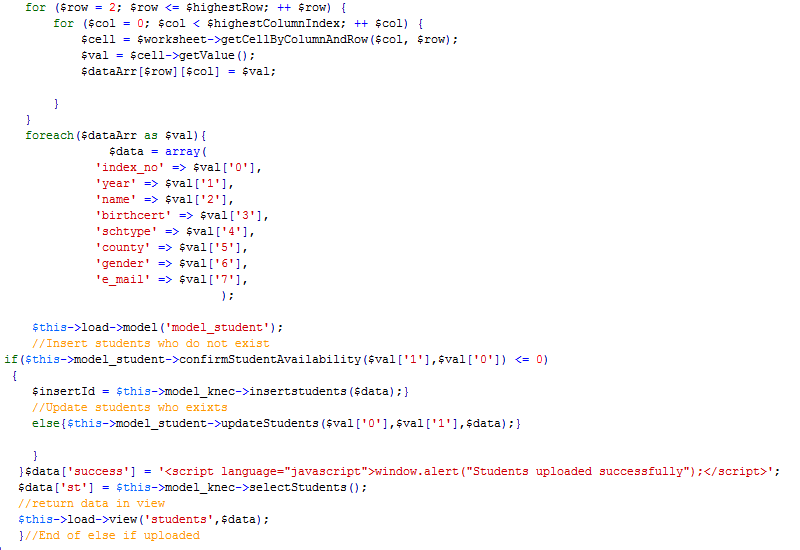


Fig 5.2(b) Uploaded schools’ details

### **5.1.2: Candidates uploading**

Excel file containing details of candidates should be uploaded to the database. Fig 5.3shows the code that is expected to do the uploading.



*Fig 5.3 Code for uploading candidates’ details*

The file is indeed uploaded successfully as shown in the Fig 5.4(a) below.

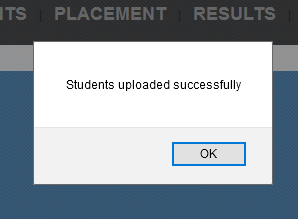


Fig 5.4(a) Candidates registration (uploading)

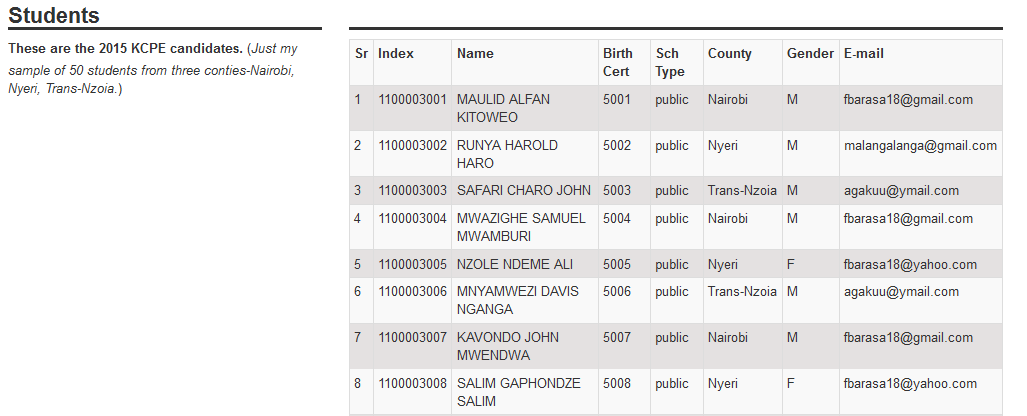


Fig 5.4(b) Uploaded students’ details

### **5.1.3: Results uploading**

Excel file containing details of candidates’ KCSE performance should be uploaded to the database. Fig 5.5 belowshows the code that is expected to do the uploading.



*Fig 5.5 Code for uploading candidates’ results*

The file is indeed uploaded and read into the database successfully as shown in Fig 5.6(b).

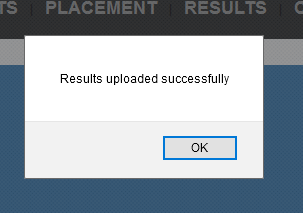


Fig 5.6(a) Results uploading

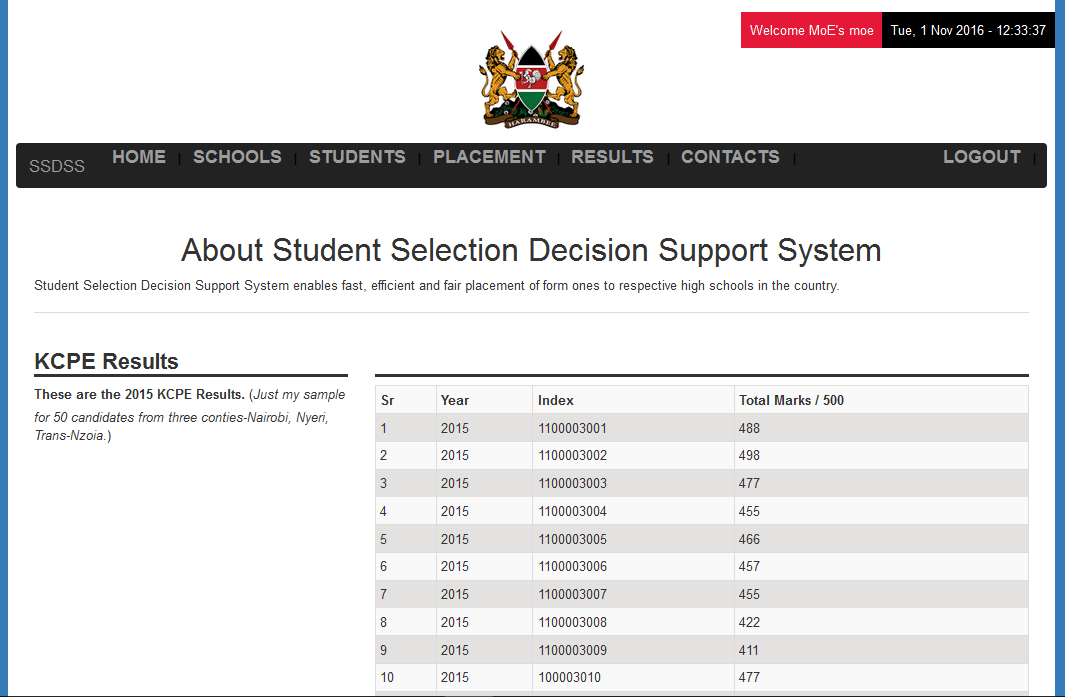


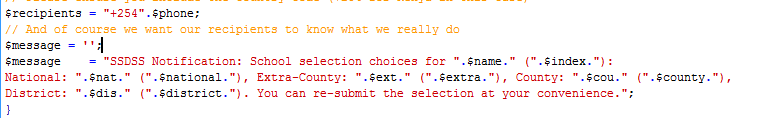
Fig 5.6(b) Uploaded results

### **5.1.4: School selection**

A candidate should be able to select schools after logging. The code in shown in Fig 5.7(a) below shows the code that submits the choices. Fig 5.7(b) shows the code that sends the candidates SMS notification after successful selection.

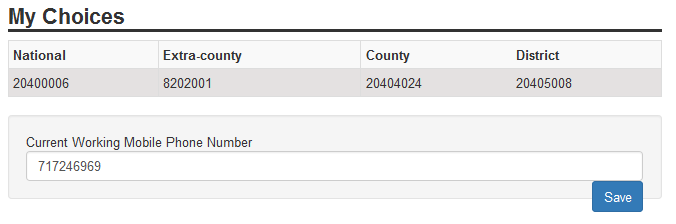


*Fig 5.7(a) Code for submitting candidates’ choices*



*Fig 5.7(b) Code for sending candidates SMS notification after successful selection*

Fig 5.8(a) shows the submitted choices while Fig 5.8(b) shows the SMS notification.



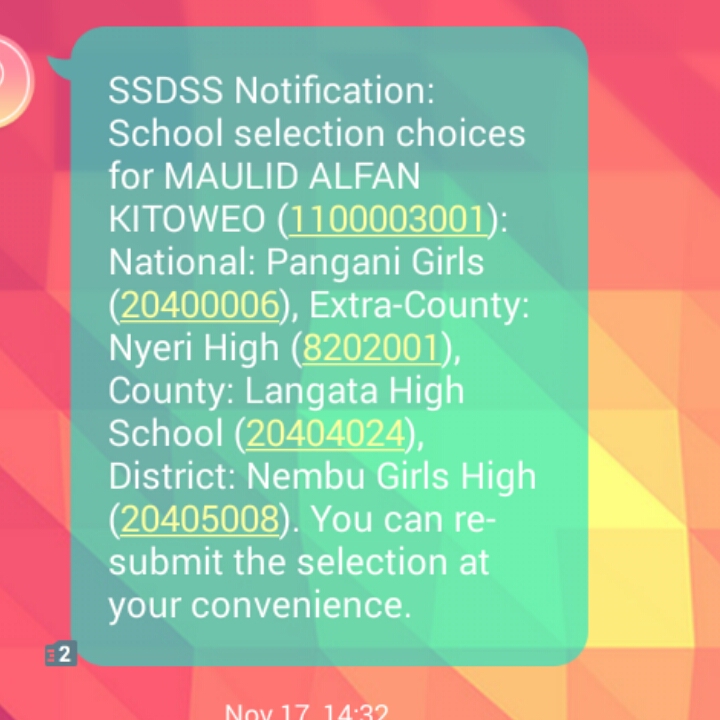
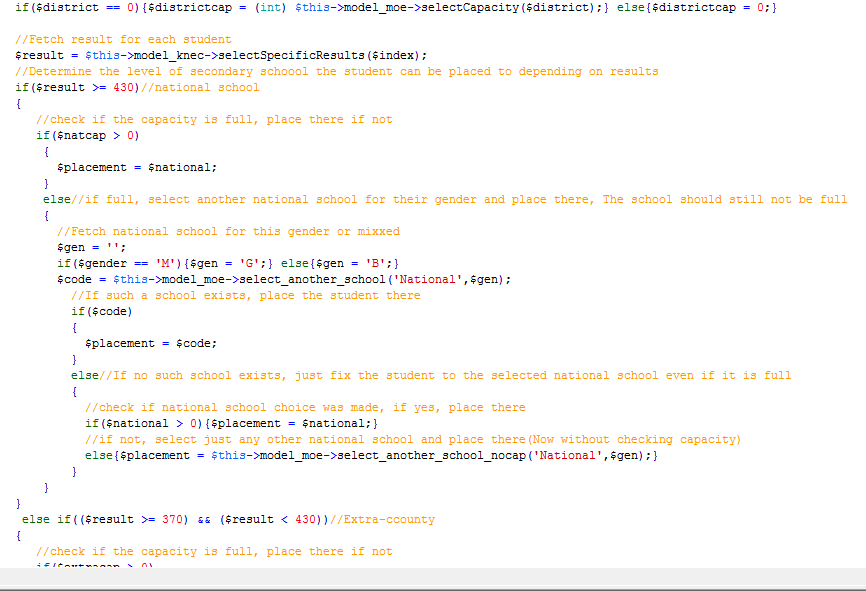
Fig 5.8(a) Schools selected by student

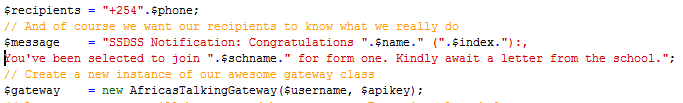
Fig 5.8(b) SMS sent to students after successful selection

### **5.1.5: Student placement**

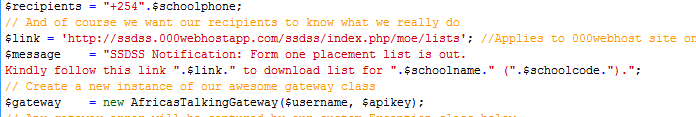
After uploading of details of schools, candidates and results, placement of students follows. Fig 5.9(a) shows part of the code expected to do the placing. As placement takes place, students are to be sent SMS notifications informing them about where they’ve been placed as expected to be performed by the code in Fig 5.9(b). After placement, schools are also supposed to be send by SMS, a link to follow and download list of students set to join them. Fig 5.9(c) shows code expected to SMS links to schools.



*Fig 5.9(a) Part of code for placing students*



*Fig 5.9(b) Code to send SMS notification to students after successful placement*



*Fig 5.9(c) Code to send SMS notification with links to schools after successful placement*

Fig 5.10(a) shows that the placement has been done successfully, Fig 5.10(b) shows the SMS notification sent to candidates while Fig 5.10(c) shows the link sent to schools via SMS.

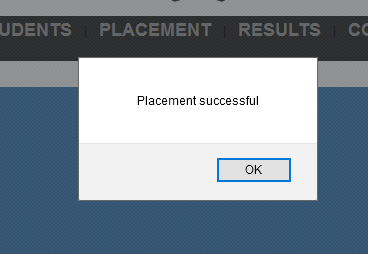


Fig 5.10(a) Placement status-successful

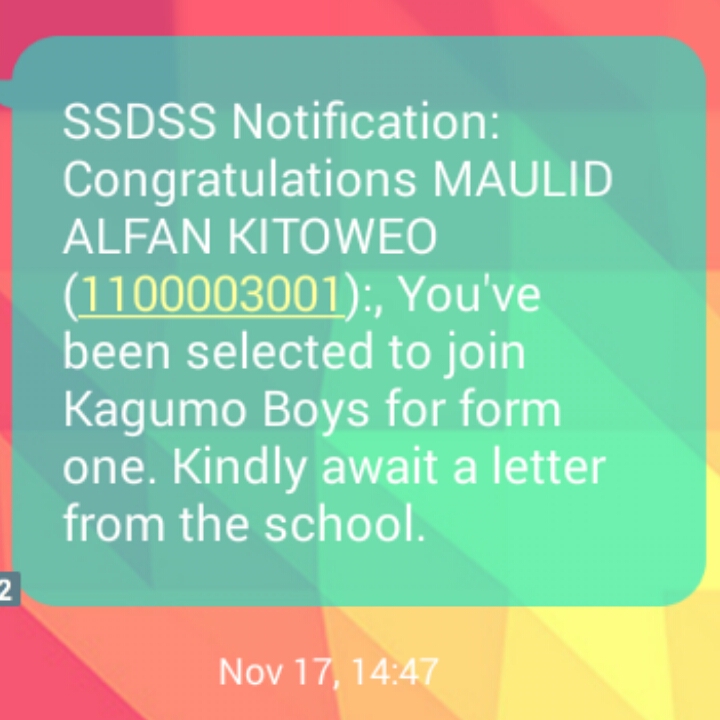


Fig 5.10(b) SMS sent to students after successful placement

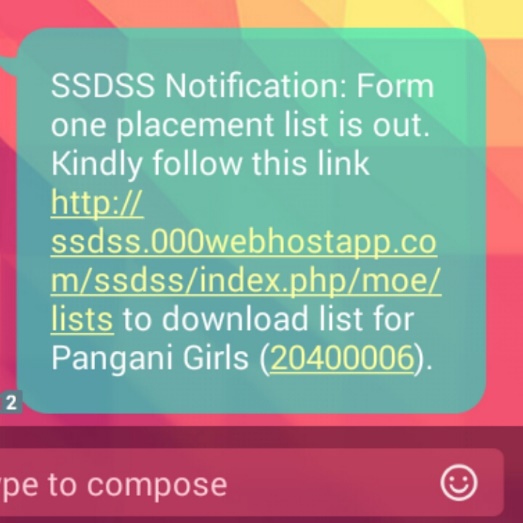


Fig 5.10(c) SMS sent to schools with link to download form one lists

### **5.1.9: Placement report downloading**

Finally, it is expected that when schools follow the link received they will be able to view a download page where they can enter the school code and download the list. Fig 5.11(a) shows the download page seen after following the link, Fig 5.11(b) shows part of the code for downloading the list in PDF format while Fig 5.11(c) shows the downloaded file.

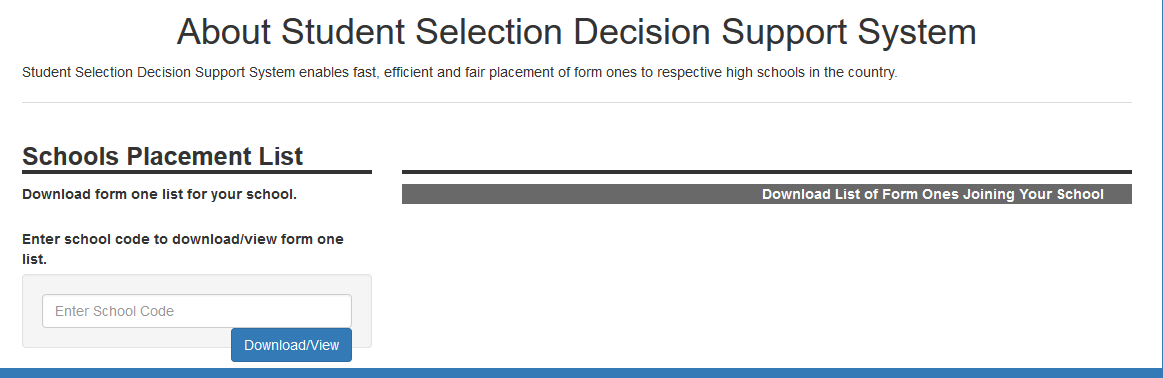


Fig 5.11(a) Placement report downloading page



Fig 5.11(b) Part of code for downloading report

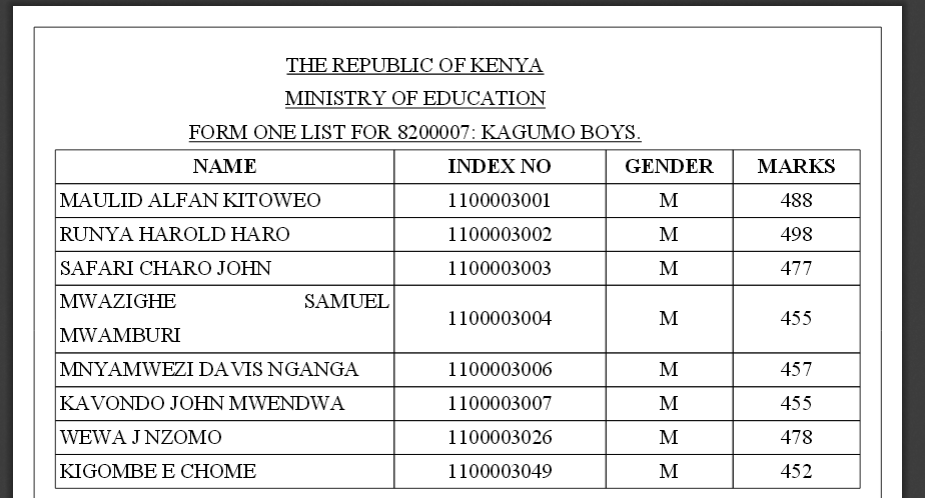


Fig 5.11(c) Placement report downloaded

## **5.2: Results summary**

### As shown in the screenshots, all the stated objectives have been sufficiently achieved. The objective of disseminating placement information to students and schools has been achieved through three different ways namely; SMS notifications, downloading of the pdf files and viewing of placement report on the site directly.

# **CHAPTER SIX: IMPLEMENTATION AND DEPLOYMENT**

## **6.1: Implementation**

## **6.1.1: Introduction**

Having requirements set and all resources available, I embarked on the development of the system beginning with various interfaces for the various users of the system.

## **6.1.2 User Interfaces**

The SSDSS system has three main users namely; The MoE who acts as the admin and uploads schools and triggers placement, The KNEC who uploads candidates’ details and results, and students who log in to make secondary school choices then later await receipt of placement information. The other users are schools who can view and receive lists of students joining them. The following interfaces show the various implementations of the system functionalities.

### **6.1.2.1: The main interface**

The main interface contains information about the site and a login form for MoE, KNEC and students.

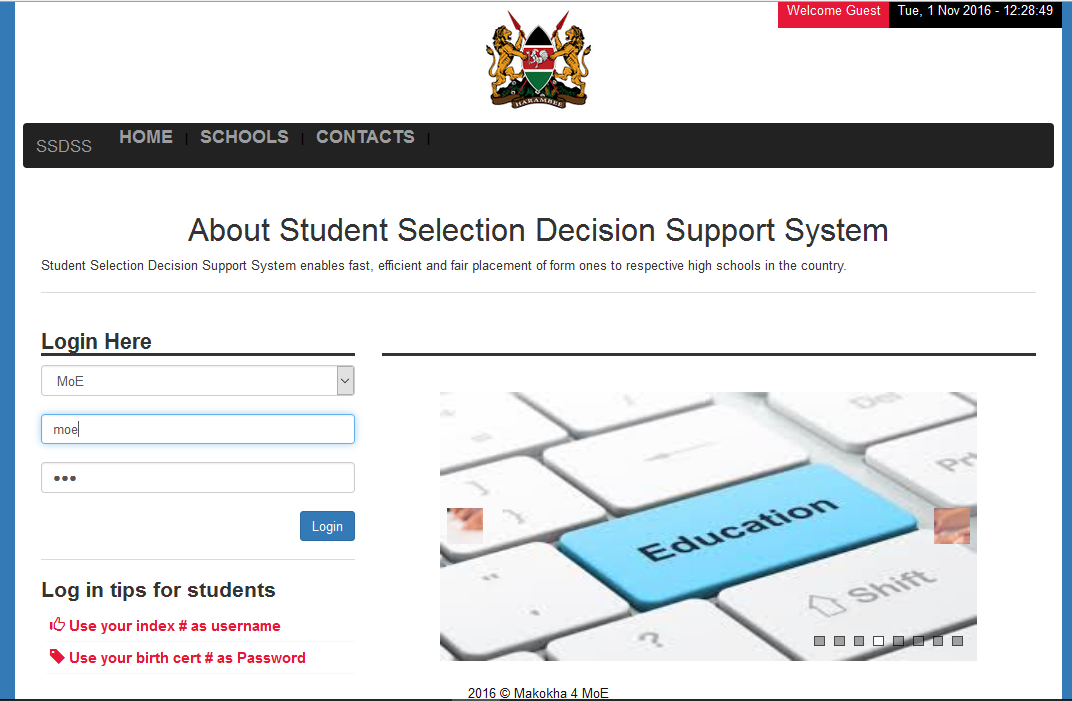


Figure 6.1 Main interface

### **6.1.2.2: The school uploading and user registration interface**

This is the interface where MoE employees upload excel files containing information about the secondary schools in the country. Uploading a file updates existing records and inserts new ones. It is also the interface where MoE adds users to the system.

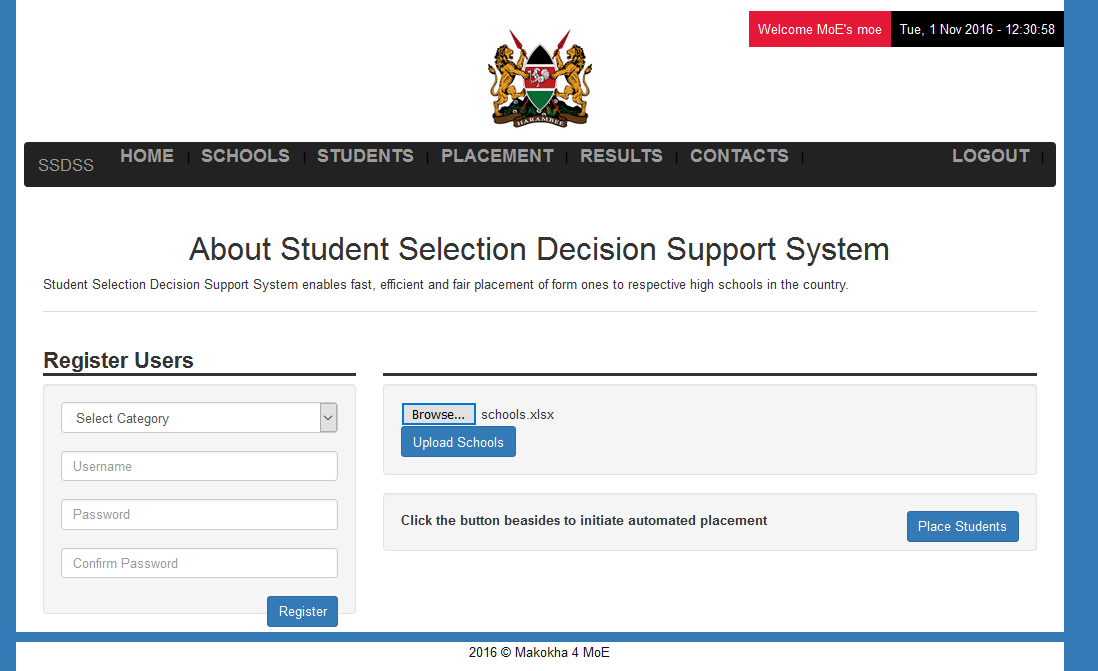


Figure 6.2 Schools uploading interface

### **6.1.2.3: The candidates and results uploading interface**

This is the interface where The KNEC officials upload candidates’ details as soon as they are registered and later uploads the results as soon as they are released. Both these details are also updated as excel sheets.

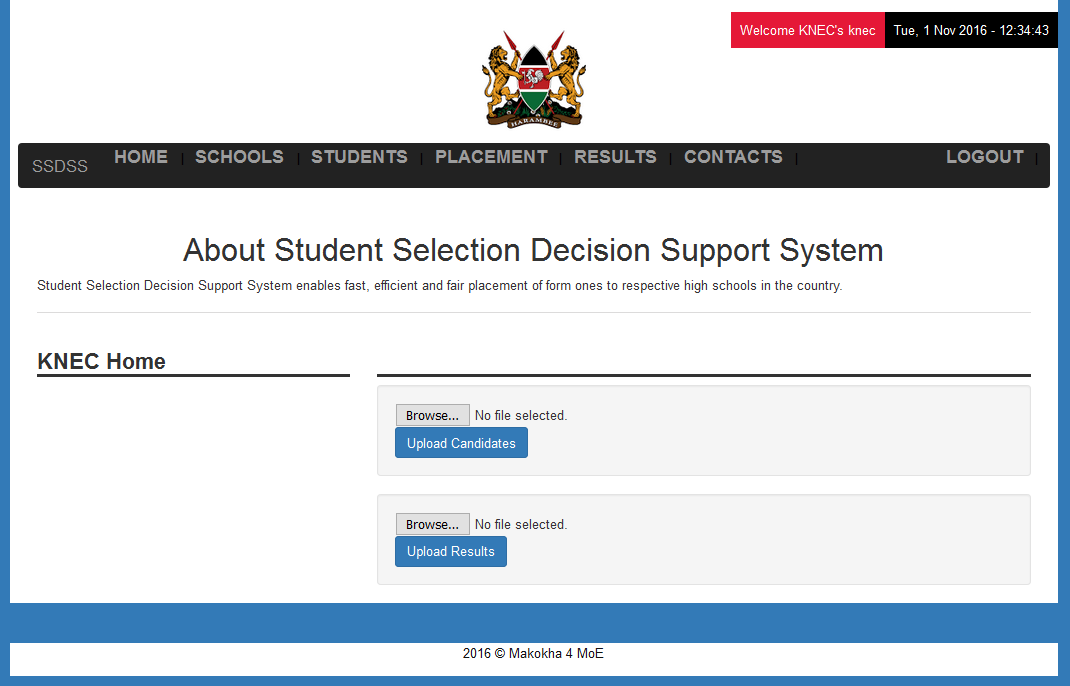


Figure 6.3 Candidates and results uploading interface

### **6.1.2.4: The secondary school choices interface**

This is the interface where students make secondary school choices depending on their results. They view their choices as soon as they submit them and can also edit them anytime they want before placement.

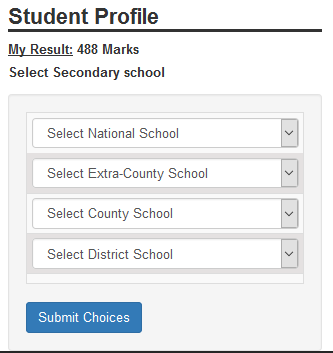


Figure 6.4 School choices interface

### **6.1.2.5: The placement interface**

This is the interface where MoE starts placement by pressing a button.

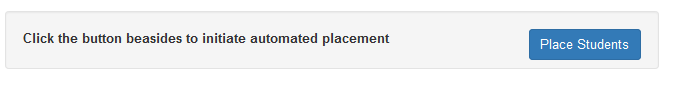


Figure 6.5 Placement interface

### **6.1.2.6: The placement information interface**

This is the interface where MoE and KNEC officials and students can log in and view placement information for all students placed.

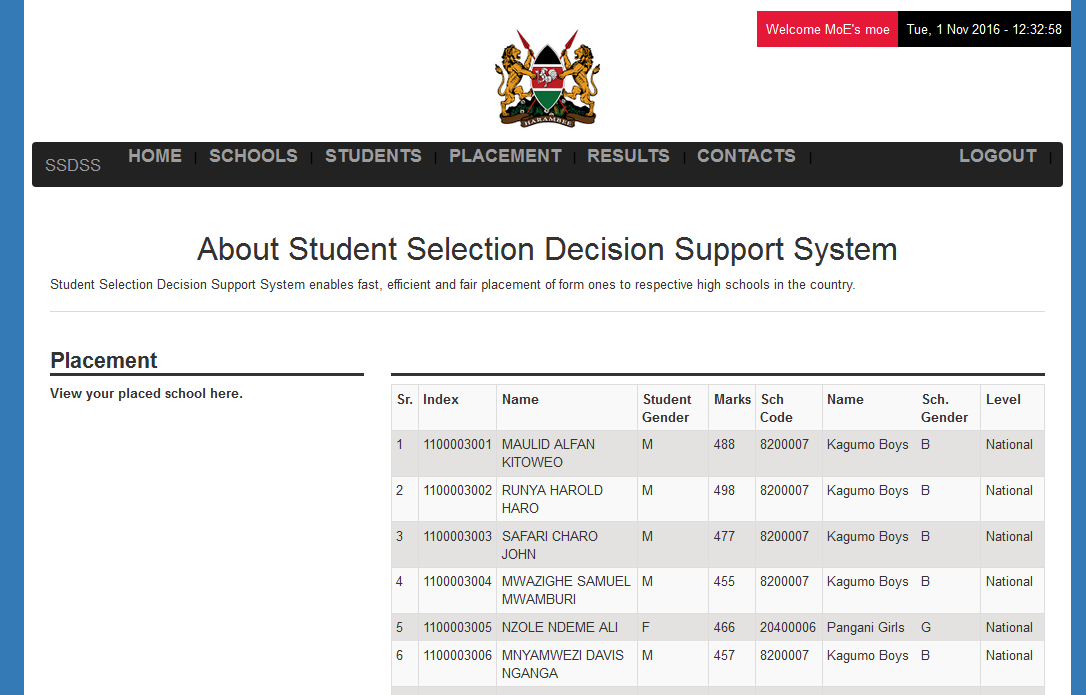


Figure 6.6 Placement information interface

## **6.2: Deployment**

There are various approaches to system deployment out of which we chose pilot approach. This is where a prototype of the system is deployed and teste for user acceptance. If the test proves successful, the complete system is then finished and deployed. Otherwise, the pilot is taken back development and the issues observed corrected before re-piloting it.

## **7.1: Limitations**

There were challenges faced during development of the SSDSS system which include:

### **7.1.1: Insufficient funds**

Developing a system requires funds both from the data collection stages through development all the way to implementation. There are costs for printing, internet bundles, travelling among others. I had no sufficient funds and so the development process affected adversely.

### **7.1.2: Uncooperative correspondents**

During development, I need information that was crucial to the implementation of the system and so I wrote an e-mail requesting that information from the ones responsible. However, I wasn’t given the information for reasons not known to me. I was tossed around and finally I had to settle on somehow unreliable and incomplete information from the internet.

## **7.2 Conclusion**

This project has helped open up my mind to focus on the bigger picture in my career. Developing an application that is meant to hold and manipulate data about people from all over the country pushes one to do more research. I also was able to learn a new framework of web development (Codeignitor) and perfect in it because it supports M-V-C patter required in the current development market. Finally, I have also been able to achieve all the four set objectives of Student Selection Decision Support System hence being successful.

## **7.3: Recommendations**

The following are my recommendations to the School of Computer Science and Information Technology regarding the challenges I faced.

### **7.3.1 Provision of project finances to students**

The school should find a way of supporting students financially so that thay may be able to carry out all the activities that pertain to their project.

### **7.3.2: Provision of cover letter**

The school should also be give students cover letters to accompany their requests for information from correspondents and organizations so that we may be assured of getting reliable information.

# **APPENDICES**

## **A: Budget**

Table 1: The project's budget.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S/NO** | **TASK DESCRIPTION** | **QUANTITY** | **PRICE** | **TOTAL AMOUNT** |
| 1 | Printing | 5 Times | 100.00 | 500.00 |
| 2 | Stationery | 1 Rim | 600.00 | 600.00 |
| 3 | Transport | 4 trips | 500.00 | 2000.00 |
| 4 | Laptop | 1 | 38000.00 | 35000.00 |
|  | **TOTAL** |  |  | 38100.00 |

## **B: Schedule-Gantt Chart**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **TASK NAME** | **DURATION IN WEEKS** | | | | | | | | | | | | | | | | | | | | |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** |
| **PROJECT IDENTIFICATION** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **PROPOSAL WRITING** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **PROPOSAL PRESENTATION** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **DATA COLLECTION** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **DATA ANALYSIS** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **PROJECT DESIGN** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **IMPLEMENTATION** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **PROJECT TESTING** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **DOCUMENTATION** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **PROJECT PRESENTATION** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Fig 1: Gantt chart

## **C: Sample questionnaire**

**DEDAN KIMATHI UNIVERSITY OF TECHNOLOGY**

**BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY**

**STUDENT SELECTION/PLACEMENT DECISION SUPPORT SYSTEM (ESPECIALLY FORM ONE PLACEMENT)**

**QUESTIONNAIRE**

**TARGET: FORM ONE STUDENTS**

(*Kindly tick once (appropriately) where necessary*)

1. Were you called to a secondary school of your choice? YES NO

2. How can you rate the form one placement process in terms of fairness?

VERY FAIR SOMEHOW FAIR UNFAIR

3. Please give reason(s) for your answer in (1) above.

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4. How long did it take you to get your placement information (From the time results were released)? LESS THAN A WEEK

A WEEK

MORE THAN A WEEK

5. What challenge(s) did you experience during the secondary schools selection process?

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6. How would you suggest the above challenge(s) to be solved?

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7. If there was to be developed as system that will ensure fair and fast selection and placement, would you consider it (Would you like that)? YES NO

8. What additional information would you suggest to the system developer concerning form one placement (Meant to give subsequent candidates an easier and fair selection and placement)?

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Thank you for participating in this questionnaire

## **D: Sample Code**

Placing students

public function place(){

$placement = 0;

foreach ($this->model\_knec->selectStudents()->result() as $row)

{

$index = $row->index\_no;

$phone = $row->phone;

$name = $row->name;

$gender = $row->gender;

//Fetch choices

$national = $this->model\_student->selectChoicesnat($index);

$extra = $this->model\_student->selectChoicesex($index);

$county = $this->model\_student->selectChoicescou($index);

$district = $this->model\_student->selectChoicesdis($index);

//Get the capacity of the chosen schools

$natcap = $extracap = $countycap = $districtcap = 0 ;

if($national == 0){$natcap = (int) $this->model\_moe->selectCapacity($national);} else{$natcap = 0;}

if($extra == 0){$extracap = (int) $this->model\_moe->selectCapacity($extra);} else{$extracap = 0;}

if($county == 0){$countycap = (int) $this->model\_moe->selectCapacity($county);} else{$countycap = 0;}

if($district == 0){$districtcap = (int) $this->model\_moe->selectCapacity($district);} else{$districtcap = 0;}

//Fetch result for each student

$result = $this->model\_knec->selectSpecificResults($index);

//Determine the level of secondary schoool the student can be placed to depending on results

if($result >= 430)//national school

{

//check if the capacity is full, place there if not

if($natcap > 0)

{

$placement = $national;

}

else//if full, select another national school for their gender and place there, The school should still not be full

{

//Fetch national school for this gender or mixxed

$gen = '';

if($gender == 'M'){$gen = 'G';} else{$gen = 'B';}

$code = $this->model\_moe->select\_another\_school('National',$gen);

//If such a school exists, place the student there

if($code)

{

$placement = $code;

}

else//If no such school exists, just fix the student to the selected national school even if it is full

{

//check if national school choice was made, if yes, place there

if($national > 0){$placement = $national;}

//if not, select just any other national school and place there(Now without checking capacity)

else{$placement = $this->model\_moe->select\_another\_school\_nocap('National',$gen);}

}

}

}

else if(($result >= 370) && ($result < 430))//Extra-ccounty

{

//check if the capacity is full, place there if not

if($extracap > 0)

{

$placement = $extra;

}

else//if full, select another extra-county school for their gender and place their, The school should still not be full

{

//Fetch extra county school for this gender or mixxed

$gen = '';

if($gender == 'M'){$gen = 'G';} else{$gen = 'B';}

$code = $this->model\_moe->select\_another\_school('Extra-county',$gen);

//If such a school exists, place the student there

if($code)

{

$placement = $code;

}

else//If no such school exists, just fix the student to the selected extra county school even if it is full

{

//check if extra county school choice was made, if yes, place there

if($extra > 0){$placement = $extra;}

//if not, select just any other extra-county school and place there(Now without checking capacity)

else{$placement = $this->model\_moe->select\_another\_school\_nocap('Extra-county',$gen);}

}

}

}

else if(($result >= 280) && ($result < 370))//ccounty

{

//check if the capacity is full, place there if not

if($countycap > 0)

{

$placement = $county;

}

else//if full, select another county school for their gender and place their, The school should still not be full

{

//Fetch county school for this gender or mixxed

$gen = '';

if($gender == 'M'){$gen = 'G';} else{$gen = 'B';}

$code = $this->model\_moe->select\_another\_school('County',$gen);

//If such a school exists, place the student there

if($code)

{

$placement = $code;

}

else//If no such school exists, just fix the student to the selected county school even if it is full

{

//check if county school choice was made, if yes, place there

if($county > 0){$placement = $county;}

//if not, select just any other county school and place there(Now without checking capacity)

else{$placement = $this->model\_moe->select\_another\_school\_nocap('County',$gen);}

}

}

}

else //District school

{

//check if the capacity is full, place there if not

if($districtcap > 0)

{

$placement = $district;

}

else//if full, select another county school for their gender and place their, The school should still not be full

{

//Fetch district school for this gender or mixxed

$gen = '';

if($gender == 'M'){$gen = 'G';} else{$gen = 'B';}

$code = $this->model\_moe->select\_another\_school('District',$gen);

//If such a school exists, place the student there

if($code)

{

$placement = $code;

}

else//If no such school exists, just fix the student to the selected district school even if it is full

{

//check if district school choice was made, if yes, place there

if($district > 0){$placement = $district;}

//if not, select just any other district school and place there(Now without checking capacity)

else{$placement = $this->model\_moe->select\_another\_school\_nocap('District',$gen);}

}

}

}

// finalize by sending data to db

//Fetch school details

$schphone = $this->model\_moe->selectSchoolPhone($placement);

$schname = $this->model\_moe->selectSchoolName($placement);

$schgender = $this->model\_moe->selectSchoolGender($placement);

$schlevel= $this->model\_moe->selectSchoolLevel($placement);

$data = array('placement' => $placement,);

$st = $this->model\_moe->updateStudents($index,$data);

//SMS students

require\_once(APPPATH.'/third\_party/AfricasTalkingGateway.php');

// Specify your login credentials

$username = "FREDDY";

$apikey = "570b40cda1aee799872e8986c67106cdd78d1e9cb841a2f56782684bf54605a4";

$phone = '0717246969';

$recipients = "+254".$phone;

$message = "SSDSS Notification: Congratulations ".$name." (".$index."):, You've been selected to join ".$schname." for form one. Kindly await a letter from the school.";

$gateway = new AfricasTalkingGateway($username, $apikey);

try

{

$results = $gateway->sendMessage($recipients, $message);

foreach($results as $result) {

echo " Number: " .$result->number;

echo " Status: " .$result->status;

echo " MessageId: " .$result->messageId;

echo " Cost: " .$result->cost."\n";

}

}

catch ( AfricasTalkingGatewayException $e )

{

echo "Encountered an error while sending: ".$e->getMessage();

}

//We update school capacity (less by 1)

//First, fetch the school's capacity

$cap = (int) $this->model\_moe->selectCapacity($placement);

//less by 1

$cap = $cap - 1;

$data = array('capacity' => $cap,);

$st = $this->model\_moe->updateSchool($placement,$data);

}//End of foreach student

//SMS download link to each school here

foreach ($this->model\_moe->selectSchools()->result() as $row)

{

$schoolcode = $row->code;

$schoolphone = $row->phone;

$schoolname = $row->name;

require\_once(APPPATH.'/third\_party/AfricasTalkingGateway.php');

// Specify your login credentials

$username = "FREDDY";

$apikey = "570b40cda1aee799872e8986c67106cdd78d1e9cb841a2f56782684bf54605a4";

$recipients = "+254".$schoolphone;

$link = 'http://ssdss.000webhostapp.com/ssdss/index.php/moe/lists'; //Applies to 000webhost site only, change for others

$message = "SSDSS Notification: Form one placement list is out. Kindly follow this link ".$link." to download list for ".$schoolname." (".$schoolcode.").";

$gateway = new AfricasTalkingGateway($username, $apikey);

try

{

$results = $gateway->sendMessage($recipients, $message);

foreach($results as $result) {

// status is either "Success" or "error message"

echo " Number: " .$result->number;

echo " Status: " .$result->status;

echo " MessageId: " .$result->messageId;

echo " Cost: " .$result->cost."\n";

}

}

catch ( AfricasTalkingGatewayException $e )

{

echo "Encountered an error while sending: ".$e->getMessage();

}

}//Download link sent

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