KABARAK UNIVERSITY

4th Annual International Research Conference

Student Exhibition

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Introduction

The design and implementation of a comprehensive student information management system and user interface is to replace the current state of uncertainty in Kenya where key information regarding the education sector is not readily available.

Education officials are able to directly access all aspects of a student's academic progress through a secure online interface that will be embedded in the school management website. The system will utilize user authentication, displaying only information necessary for an individual's duties. Additionally, all data will be subjected to strict integrity checks before actual record alteration occurs.

The system is expected to increase efficiency and improve transparency of academic management in Kenya thereby decreasing the work hours needed to access and deliver student records to users.
Achieving this objective is difficult using a manual system as the information is scattered, can be redundant and collecting relevant information may be time consuming. All these problems are solved using the online student management system.

This paper focuses on proposing a school management system that will provide facilities for the capture and management of academic information around the country.

Purpose

The purpose is to design an online system, which contains up to date information on the state of education in the country that will improve efficiency in education record management.

Objectives

- Provide an online interface for head teachers to adequately capture student, teacher and school information
- Increase the efficiency of record management in the education sector
- Decrease time required to access and deliver student records
- Create a secure system to handle education information
- Decrease time and money spent on non-value added tasks

DATABASE DESIGN

Entity Relationship (ER) Modeling
Goals of ER

- Capture all required information
- Ensure that information appears only once (to reduce redundancy)
- Ensures information is in a predictable logical phase
- Helps model new information that is derivable from other information already modeled

ER Modeling is independent of hardware or software that is to be used for implementation purposes.

Summary of Definitions

- Entity
- Attribute

Entity	Attribute
Student	Student ID, Gender, DOB, age
School	ID, Name, County

- Relationships

Relationships express how entities are mutually related together.

The recommended procedure is:

- Determine the existence of a relationship between entities
- Choose a name from both perspectives
- Determine optionality
- Determine the degree of the relationship and Non Transferability

Constraints

1. **Identification**

This is about clearly knowing what or whom you are talking about.

Problems with Identification

- Identification in the Real world
- Identification with a Database System
- Representation

2. Unique Identifier

A unique identifier exists to solve the problem of Identification.

3. **Domains**

A set of values that shows the possible values a given attribute can have.

4. Special Constraints

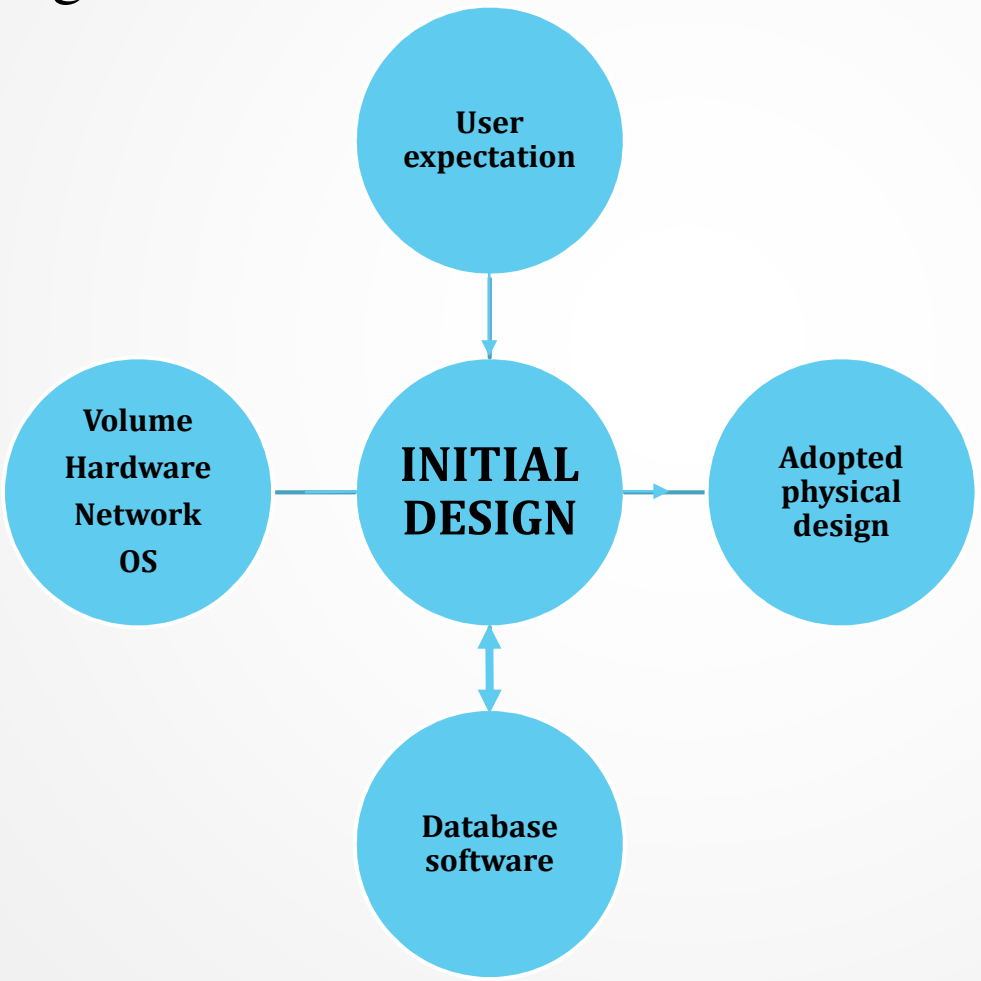
There exist other special constraints that we should consider, such as:

- Range Check; A Numeric attribute must take the form of a range of specific values. E.g. Age should be between 1 – 18.

- State Value Triggered Check– A check must take place when a value is given that indicates a certain state.

Database Design Considerations

Here, we have to analyze a large number of parameters to obtain a correct adapted physical design from the initial design



Design Recommendations

Mapping the Entity Relationship Model

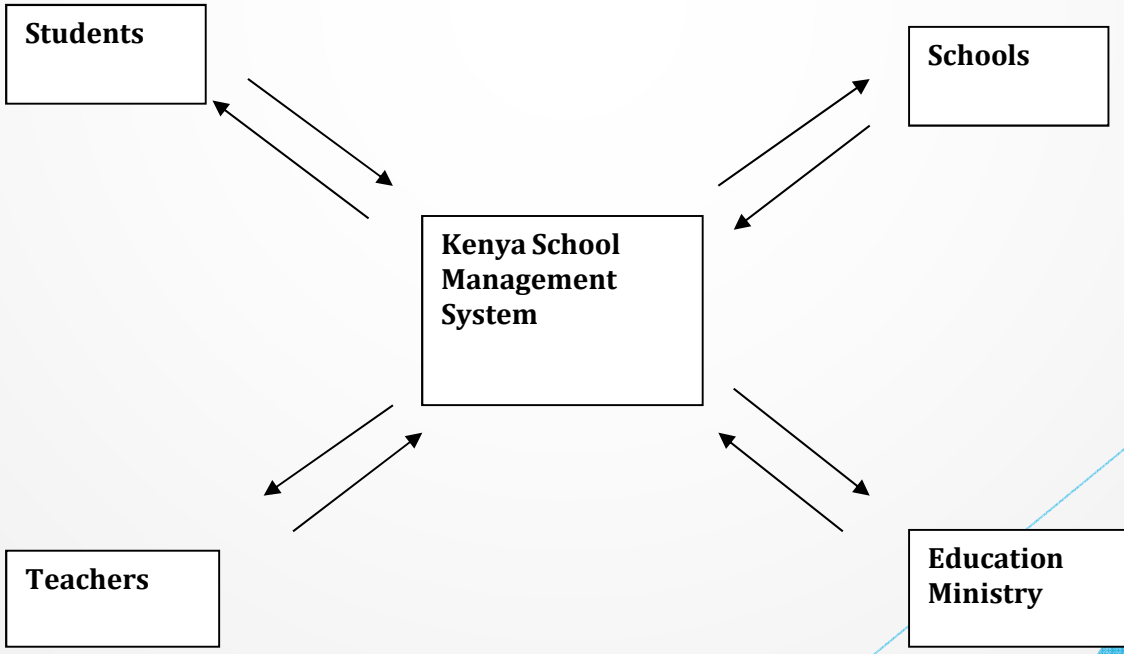
Mapping can be used as a basis for any type of Database management System (DBMS) or file system implementation.

The importance of a database design model is:

- It gets us closer to implementing the actual solution
- Facilitates discussion between designers, developers and other stake holders.
- The ideal model can be easily adapted to a RDBMS model
- Sound basis for physical database design

System Design – Kenya School Management System

Kenya adopted an 8-4-4 System of public education since 1985 to date where public education in Kenya has been based on 8 years of primary education followed by 4 years of secondary school and 4 years of college or university. The data flow diagram below helps show how the various entities are connected to the management system and particularly how data flows among the various entities and the system.



REQUIREMENTS OF THE KENYA SCHOOL MANAGEMENT SYSTEM

Functional Requirements

- **The Administrator** will be given more powers in the system to enable/disable, update, backup, create new tables and any other administrative requirement that may arise during system use
- **Head Teacher / Administration** who are responsible for updating school, students and teachers records should be trained on how well to use the system
- **Ministry / Education Stakeholders** are responsible for querying information from the system and verification of information as may apply.

The Kenya school management system will primarily be based on four entities / objects of interest namely:

- Students
- Teachers & Administration
- Schools

Non Functional Requirements

- **Performance Requirements** – It is expected that the designed database would perform functionally all the requirements that are specified
- **Safety Requirements** – The database may crash at any particular time and thus it is important to provide provisions for backup and redundancy to enable preservation of information
- **Security Requirements** –The database to be developed will be secure and security measures will be applied to the various classes of users who have access to the database and the entire system, to prevent against malicious access, hacking.

TECHNOLOGIES TO BE USED

To create the system, we will use freely available open source technologies that power most of the websites around the world.

These include

- HTML & CSS
- JavaScript
- PHP
- MySQL

Platforms to be Used

1. **Web Based Application**

These is the main website that one can primarily access data, update and generate reports after logging in to the system.

2. **Android Application**

These require the use of Smartphone application that utilizes phones which are internet enabled. Android application to be developed for the system will have a user friendly graphical user interface that will enable one remotely log in to the system and easily input or update data. This method of collecting is easy since the user can submit all the information in one session. Its shortcomings is that training the primary on the use of smart phones and reliance on the internet most smart phones perform best in places where 3 g network has reached. Also the cost of daily internet bundle purchase is another problem which is encountered.

3. Mobile USSD Application

Another way of implementing this project is by utilizing the Unstructured Supplementary Service Data (USSD).First I will describe what USSD is all about and how it will be utilized for this project.

USSD is a GSM (Global System for Mobile) based interactive communication between the subscribers and applications. This communication takes part at a very high speed; it has no delay between receiving the response and sending the query. It also acts as a gateway between applications and GSM networks and lets an individual to deliver messages up to 182 characters on a network between mobile stations and applications

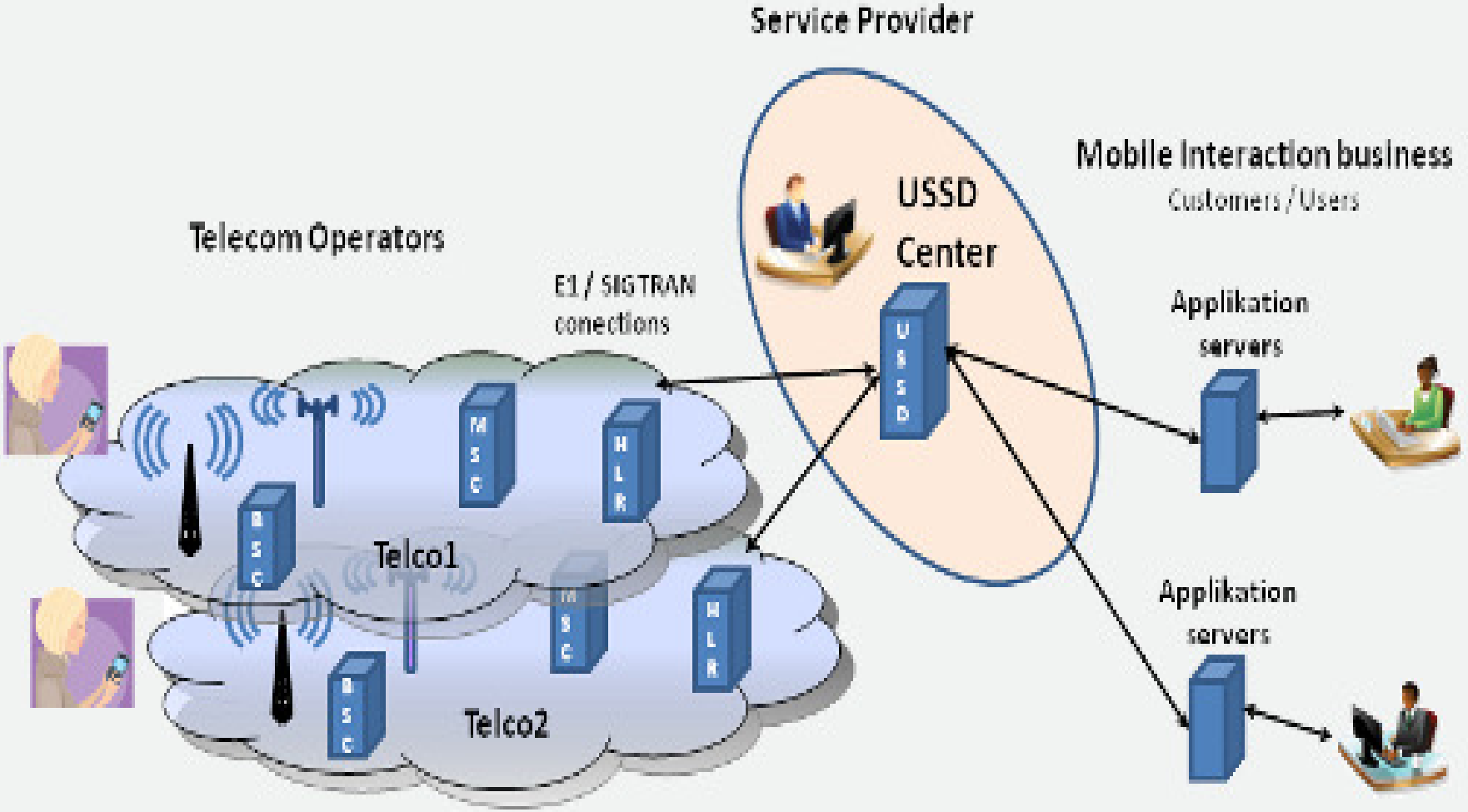
In the project, the need for the use of USSD is due to the following reasons;

- USSD is user friendly; since it's a menu based direct access from the mobile phone key board. Anyone who has used mobile money transfer services such as M-pesa can easily use the USSD with ease.
- USSD has got an open dialogue since it's an interactive and has a predetermined response time to the service request.
- USSD-based applications do not require any special software to be installed on the mobile handset, or a data connection (such as GPRS or 3G) to operate.

For the **service providers**, use of USSD applications to implement this project has the following advantages to the mobile service providers:

- The USSD services reduce costs especially operational cost such as maintenance costs and voice calls which are not charged or billed.
- USSD can also be easily interfaced to already exciting technologies or information services that are executable on SMS/WAP.
- The use of USSD will also minimize costs in various ways.

USSD ARCHITECTURE



The client side or the school's principal side and other user, we will acquire a dialing code for example *676# so as to get access to the USSD server of the mobile service provider. From the USSD server of the mobile service provider, we will be given a provider account and a configure URL which will be used for our service. When the principal or user dials our codes, the USSD server browser will direct the request to our website (third party) application.

A website/ application will be designed to analyze the requests send by the school principal and generate menus by taking data from database and back to the USSD server which will direct the response to the school principal handset. Formats available for response include: **VXML, http, xml depending on the USSD browser in the USSD server**. In each response we get from the principal, there will be a function assigned to it.

[An example of one session is as follows]

Principal dials *123#

Response is “input the school id” 513102

Please enter the school password ******

Submit class 1 attendance 25

Submit class 2 attendance 23

Submit class 3 attendance 22

Submit class 4 attendance 24

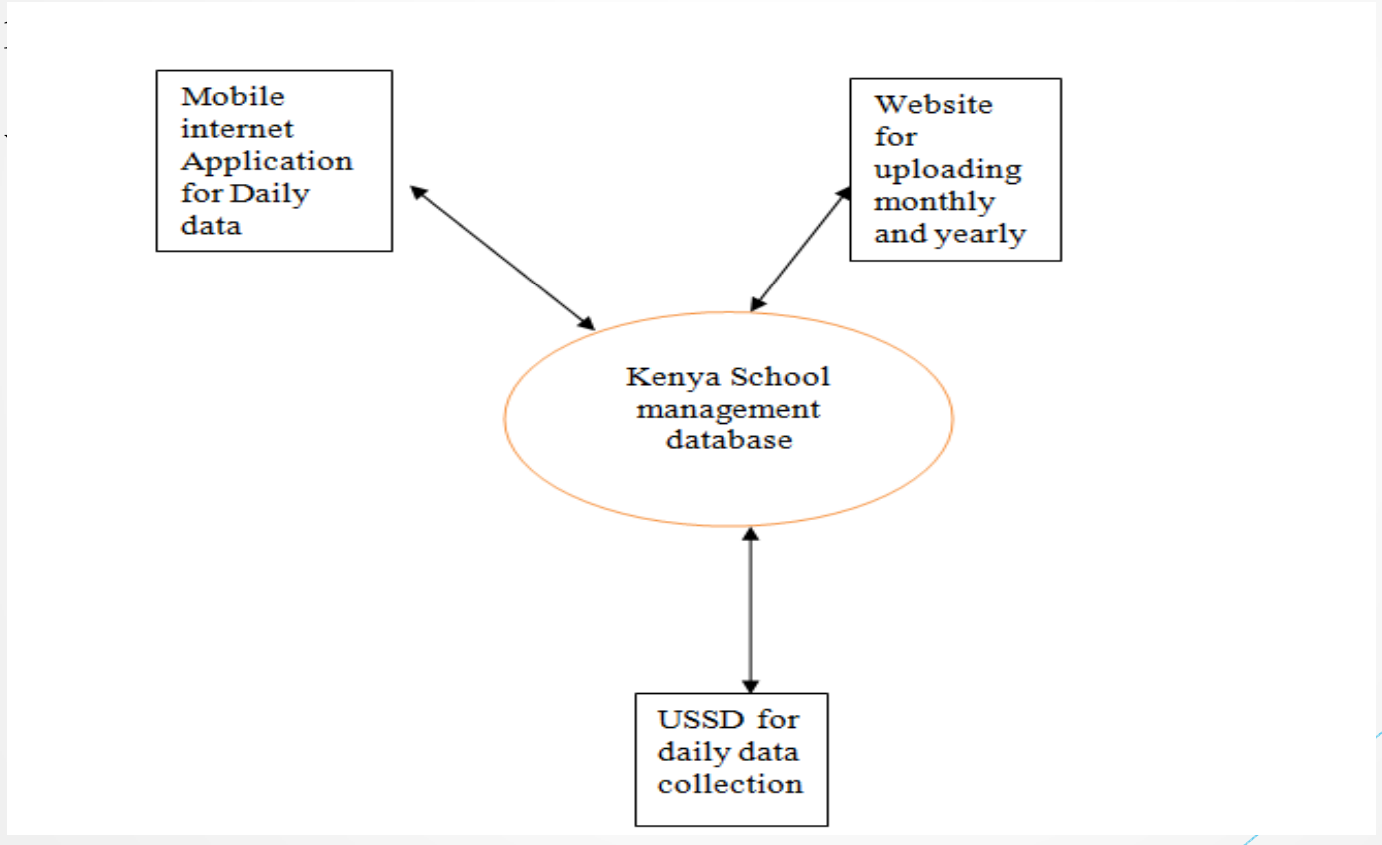
USSD Viability

USSD is an upcoming technology which is interactive and optimizes the use of all mobile phones. It allows for roaming without extra chargers.

Example of services that uses/utilizes these applications includes:

***MPESA** service- It handles up to 17 million accounts and makes transaction worth **1.64 billion or Ksh 139 million** and majorly utilizes the USSD for the services

For this system, USSD will be used to collect day to day data from primary schools. There will be also monthly information which will mainly



Hosting to be used

Hosting allows for one to remotely access the website through the internet. As the internet continues to grow, web hosting has become more and more cheap.

An ideal web host for the Kenya school management system should have:

- Support for MySQL and PHP Version 5+
- Unlimited Disk Space
- Unlimited Bandwidth
- Email Hosting and Support etc.

Companies exist both internationally and locally that offer unlimited webhosting at a considerable price with many important features needed to run the modern day website.

CONLUSION

This research proposal purposes to explain a system that will gather and automate information about the education sector in Kenya.

The system will be paperless and can be remotely monitored and controlled. It reduces the man power required and provides accurate information and analytics on the current state of the education system in Kenya which will help the government appropriately budget and provide resources to ensure a balanced learning environment.

Malpractices' and corruption to a great extent will also be reduced because all information submitted to the system will be subjected to strict integrity tests.
This system is essential in Kenya to contribute to improvement in the Education sector especially for the achievement of vision 2030
education goals.

Thank You!