

**THE EFFECT OF AN ELECTRONIC DATA CAPTURE AND RECORDS MANAGEMENT SYSTEM ON A SCHOOL'S ADMINISTRATION AND MANAGEMENT: A CASE STUDY OF CHIKOLA SECONDARY, KABUNDI SECONDARY, MAITENEKE SECONDARY, SACRED HEART CONVERT AND SEKELA SECONDARY SCHOOLS OF CHINGOLA, ZAMBIA.**

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## **ABSTRACT**

This research focused on bringing to light the use and benefits of an electronic data capture and record management systems (EDCRMS). There have been a lot of registration in our country, Zambia, towards the implementation of ICTs and e-governance, but none of it seems to focus on e-systems for administration and management for schools. According to literature, there also have been lots of development research concerning the same in the health industry, but little concerning the educational sector, especially secondary and primary schools. This paper discusses how an e-system simulating the existing paper-file system for data and record management in schools was designed, and how the e-system significantly benefits a school as compared to the paper-file system in place, as is evident from the research findings. The research was conducted by use of questionnaires and interviews, which were given to the respondents from schools, which are using the e-system (electronic school management system), and the schools, which are still using the paper-file system. Data from the two distinct school systems was compared for variations in workload completion time, work accuracy, efficiency, and effectiveness ratings of the systems, the respondents need for change and acceptance for the e-system, and how the respondents responded according to their degree of acceptance or rejection for the e-system. The findings from the research have established that the electronic school management system brings about workflow automation, better knowledge management, efficient communications management, management of records in effective and efficient manner, quality assurance, better productivity management, better performance management, better cost-effectiveness, ease in accessibility, accountability with better audit trails and more integration of all departments and offices in schools. Moreover, the e-system does 75% and above the work for the school, personnels whenever they are working seeing that most processes which involved human decisions, which are characterised with delays, have been automated.

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## **TABLE OF CONTENTS**

FIGURES .....	128
TABLES .....	129
1 CHAPTER ONE .....	1
1. INTRODUCTION .....	1
2 CHAPTER TWO .....	3
2. PROBLEM STATEMENT .....	3
2.1. High cost .....	3
2.2. Lost and Missing Documents .....	4
2.3. Hard to share .....	4
2.4. Editing problems .....	5
2.5. Security issue .....	5
2.6. Storage problem .....	5
2.7. Slow access .....	5
2.8. Information Consistency .....	5
3. RESEARCH DESIGN .....	6
3.1. Purpose of the Study .....	6
3.2. Research Objectives .....	6
3.3. Research Questions .....	6
3.4. Research Hypothesis .....	7
3.5. Research Variables .....	8
3.6. The Theoretical and Conceptual Framework .....	8
4. OPERATIONAL DEFINITIONS .....	10
5. LITERATURE REVIEW .....	14
5.1. Global Perspective .....	14
5.2. Zambian Perspective .....	15
5.3. Personal Critique Summary .....	17
3 CHAPTER THREE .....	18
10. METHODOLOGY .....	18
10.1. The Electronic Data Capture and Record Management System .....	18
10.1.1. Existing Methods Concerning Pupils' Data Management .....	18
10.1.2. E-Solution for the Pupils' Data and Records Management System .....	19
10.2. Design Specification - Electronic Data And Records School Management System .....	20
10.2.1. Introduction .....	20
10.2.2. System Overview .....	22
10.2.3. Design Considerations .....	22
10.2.3.1. Assumptions and Dependencies .....	22
10.2.3.2. Goals and Guidelines .....	23
10.2.3.3. Architectural Strategies .....	24
10.2.4. System Architecture .....	25
10.2.4.1. Basic Operation Subsystem Architecture .....	25
10.2.4.2. Data Retrieve and Updates to the Server - Basic Operation .....	25
10.2.5. Jephkapi ESMS Interface .....	25
3.2.5.0. Jephkapi ESMS Client-server Graphical User Interface .....	25

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3.2.5.1.	User Logon Screen .....	26
3.2.5.2.	User Password Recovery .....	26
3.2.5.3.	.....	27
3.2.5.4.	User Task Management Windows.....	27
3.2.5.5.	System Database Backup, Maintenance and Management .....	27
3.2.5.6.	Entering New School Details and Records.....	28
3.2.5.7.	Defining Jephkapi ESMS User Details .....	29
3.2.5.8.	Pupil Registration Form.....	29
3.2.5.9.	Viewing and Printing Pupils Details in a Class.....	30
3.2.5.10.	Importing of Data into the Central System Database.....	31
3.2.3.11.	The End of Term Test Results.....	33
3.2.3.12.	Master Results Data Entry Form.....	34
3.2.3.13.	Report Forms.....	35
3.2.3.14.	Pupils Financial Records.....	35
3.2.3.15.	Pupil's Payment Capture Form.....	36
3.2.3.16.	Pupil's Payment Report Sheets.....	37
10.2.6.	Jephkapi Esms Database Structures.....	37
10.2.6.1.	The School Main Administrative and Management Database Scheme.....	38
10.2.6.2.	The School Test Results Administrative and Management Database Scheme...	40
10.2.6.3.	The Base Cumulative Administrative and Management Database Scheme .....	42
10.2.7.	Policies and Tactics .....	43
10.2.8.	System Design .....	44
10.2.8.1.	Jephkapi ESMS Client-server Application .....	44
10.2.8.1.4.	System Component Design and Functions .....	44
10.2.8.1.5.	Subsystem Main Components and Functions .....	46
10.2.9.	Acronyms and Abbreviations .....	74
10.3.	RESEARCH DESIGN .....	75
10.3.1.	Target Population.....	75
10.3.2.	Sample and Sampling Technique.....	75
10.3.3.	Instruments for Data Collection.....	75
10.3.4.	Procedure for Data Collection .....	76
10.3.5.	Data Analysis Techniques.....	76
10.3.6.	Triangulation.....	76
10.4.	SCOPE OF THE STUDY.....	77
10.4.1.	Delimitations of the Study .....	77
10.4.2.	Limitations of the Study .....	77
10.4.3.	Ethical Consideration.....	78
10.4.4.	Justification for Deviations from the Methodology in the Proposal .....	78
4	CHAPTER FOUR .....	79
11.	PRESENTATION OF FINDINGS .....	79
11.1.	Section One: Background information of respondents .....	80
11.2.	Section Two: Description of respondents' opinions in relation to the independent variable .....	82
11.3.	Section Three: Verification of the Hypotheses.....	98
12.	DISCUSSION AND INTERPRETATION OF FINDINGS.....	111

12.1. Section One: Background information of respondents .....	111
12.2. Description of respondents' opinions in relation to the study objectives, research questions and variables	112
13. CONCLUSIONS .....	119
13.1. Conclusion .....	119
13.2. Implications and the Significance of the Study .....	121
10.1. Future Studies and Recommendations .....	123
ACKNOWLEDGEMENTS .....	124
11. BIBLIOGRAPHY .....	126
11.1. REFERENCES .....	126
11.2. APPENDIX .....	128
11.2.1. Appendix A- Quotation for the cost of ream paper in the year 2016 .....	131
11.2.2. Appendix B- School class statistics .....	132
11.2.3. Appendix C - Old Records in Storage .....	133
11.3. QUESTIONNAIRE .....	134
11.3.1. Research Instrument: Questionnaire One .....	134
11.3.2. Research Instrument: Questionnaire Two .....	138
11.4. INTERVIEW .....	142
11.4.1. RESEARCH INSTRUMENT: INTERVIEW .....	142

## CHAPTER ONE

### 1. INTRODUCTION

The world is changing, just a few centuries ago, we had cave men, later man discovered fire, built shelters, discovered how to write, made scrolls, and later made books for record keeping. Man has evolved to a point where he has invented machines to work for him. From relying, so much on paper and books to keep track of records and data to using machines called computers to keep data and records and to include the heavy workload of calculations and other computations the computers do for us. The 21st and late 20th century saw a boom in the semi-electronic office (e-office), where people started relying much on the computer and its storage capabilities to keep data, information and records of an office, the department, an entire country and even the entire world. This made data, information, and records to be accessible faster and securely than ever before, thanks to the computer's fast processing muscle.

Governments are now trying to migrate their offices, slowly to an e-offices, where the public can interact with them from far away using the internet (a system where computers are connected using data links like telephone lines, satellites, wireless connections, etc. so that they can store and share information and other resource to include). Today, we see the emergency of electronic governance (like the Zambia Health Management Information System (ZHMIS), the Zambia Immigration Management System (ZIMS), the Examination Council of Zambia Internet Registration System on <http://systems.exams-council.org.zm>, to mention but a few), where citizens and government departments interact using the internet or any other possible electronic means. Not all government and private offices/departments are able to adopt an e-office, and schools are no exemption. Most of these civic and private institutions see no necessity to adopt an e-office, especially in Africa.

Schools are coupled with lots of paper work every day, every term and every year due to the need to prepare their pupils' report forms, pupils' payment financial records, pupils' vital statistics details and records, pupils identification cards, to mention but a few. Much of that workload however, takes a lot of time to prepare, sort, and worse more to present, seeing that some of the records go missing due to accidents like water spillage, insect attacks such as termites eating the paper documents, to mention but a few (See Appendix C). Chikola, Kabundi, Maiteneke, Sacred Heart Convert and Sekela Secondary Schools of Chingola are no exception to the above mentioned paper-documents constraints.

Zambian secondary schools have classes ranging from Grade 8 to Grade 12, and the pupil populations are increasing every year with the increasing population of the young people entering primary school education in Zambia. Coupled to the population problem, most towns have few secondary schools as compared to the primary schools, as is the case in Chingola District, which has only the following secondary schools: Chikola, Chingola, Sekela, Nchanga

Trust, Maiteneke, Sacred Heart Convert and Kabundi. In addition, it has over 12 primary schools, to name but a few: Nakatindi, Chingola, Chiwempala, Lulamba, Lulamba Complex, Lubambe, New Mushishima Basic, St Marks, and Malemba. Despite the vast pupil populations, most schools still prefer to keep the pupils' data, details and records on papers stored in files, folders and cabinets. The administrative papers and files that follow the pupils and administrators behind the scenes most often has to be retained, organized, and accessed long after pupils and teachers leave the school system. Whether information is needed for internal administration, external administration or personal issues, pupil inquiries or audits, the time taken to enter the data, details or records on paper, the time taken to access or retrieve the same information from the cabinets is in turn costly, extensive and worst full. Most schools do not have an easy and secure data, details and records capture, access and storage system in place, which can in turn help save on money and time spent working on the details and records stored on the files, folders, etcetra.

This research serves to present an alternative system to the current manual data and records capture, access and storage management system, which most schools have in place as of current. Schools need a system that has fast access to the data, details, and records at any point in time. Unlike the old system for data and records' management system, which involves lots of ink work, paper, files, folders and filling cabinets, an electronic data-details and records management system allows for easy, fast access and storage system facility. In an electronic data and records management system, the data and information of pupils and staff is captured, stored and retrieved using a computer with a database system or connected to a database system. A database is simply a collection of information that is organized so that it can easily be accessed, managed, and updated in a computer easily. Not all electronic data management systems require a person to be knowledgeable with Microsoft (MS) Access, MySQL, Oracle, SQL or in any programming data queries.

Although most database systems are similar to database management software (DBMS), they lack the native language support, such as SQL, MySQL or any other database querying language. Users can purchase off-the-shelf-software or bespoke software with graphical user interface controls and features that can allow them to create, capture, manage, and query a database. With the easy usage of the database software systems, end users can evaluate data, store it, add to it, edit it, or delete it. The capture, storage and analysing of data with an electronic data and records management system can be performed by any persons who have basic computer knowledge, of which such trainings of computer basic operations are usually provided at low costs with durations of only a few minutes up to an hour or so at most. When we say basic computer knowledge, we refer to such knowledge that covers: how to power up a computer, navigate a mouse in a computer, type on the computer using a key board, navigate

on the start menu, open applications, and use the computer and its applications with minimum knowledge.

## 1 CHAPTER TWO

### 2. PROBLEM STATEMENT

Most schools in Zambia and the third world countries create and distribute an incredible amount of data, information, and records on paper every day. The materials created for administrative, management and progress-monitoring purposes typically last for a short time before newer materials are created. However, the materials that are stored on **paper** filed in folders that follow pupils, teachers, and administrators behind the scenes often has to be retained, organized, and accessible long after pupils or the staff leave the school system. From pupil enrolment, performance records, tuition payment and pupil details and vital statistics, a heavy paper trail always follows which poses a challenge during data entry, storage and access. On the administrative side, records of educational requirements, pupil payments, pupils end of term test performance records, and board meeting minutes lay an equally thick path of paper that must be organized and accessed. They are huge storage challenges with filing cabinets and boxes full of materials whose contents can be tough to find when they are needed quickly (see Appendix C, figure 4 to figure 6). Despite mounting regulations that affect school record retention patch and access, administrators today are allotted fewer staff resources to manage the excess paper. As such the current system (paper filing system) in place for managing pupil records, has the following challenges: high cost of materials, missing documents due to poor filing strategies, documents and files are hard to share during time of usage, editing challenges once documents are written on, security issues when sensitive materials fall in wrong hands, documents become difficult to store due to limited physical storage spaces, slow access to information due to poor indexing and multitude of papers on folders and storage, and information inconsistency due to lack of centralized data source.

#### 2.1.High cost

Among the problems faced by schools, are cost of materials and labour. The following calculation gives an idea of the labour and time cost associated with a paper-based filing system. It is assumed that an institution creates or receives or processes about 100 plus important new paper documents that are filed daily and that there is an efficient paper-based filing system in place. If on an average it takes 2 minutes to retrieve and file a document, total time taken to handle 100 documents a day equals  $2 \text{ minutes} \times 100 = 200 \text{ minutes per day}$  which is 3.33 hours. If the hourly rate is K2.5, the total labour cost per month equals  $(K2.5 \times 3.33 \times 20 \text{ (working days per month)} \times 8 \text{ (working hours per day)}) = K 1,332$  for handling documents. The above analysis does not include overhead cost for retrieving and filing old documents. If included, the cost of retrieving and filing paper documents is a lot more than one realizes. Then the hours a person is supposed to works per day according to the conditions of

civil service and the labour laws is 8 hours. Hence, if a person takes 10 hours to file a 100 documents, this results in a lot of over time each day. Either which is never a result, hence most registry officers leave document filling for the following day, or they end up just lofting the files in the cabinets un-catalogued which eventually gives rises to ‘missing’ files. The cost problem is not just limited to labour, but the cost of materials as well. A ream of paper costs about K 50 wholesale price, and about K 65 retail price, and each ream has 500 papers (See Appendix A). Thus, an average class of 120 pupils (Appendix B) costs a school a lot of money for teachers to put together the end of term results due to the over haul of work involved.

## **2.2.Lost and Missing Documents**

Many documents get lost in schools, and some of them are usually misfiled due to lack of either enough time to file them properly or exhaustion of the personnel because of understaffing. Moreover, seeing that most of these documents cannot be reproduced if lost, this presents a challenge as it dramatically increases the risks and costs associated with paper file systems. In most schools, each class is allocated a file with multiple report forms for various pupils and a master mark sheet for each class (see Appendix C for a case example). Every subject teacher for a class at each end of term before the open day (where the parents are availed the performance records for the pupils) needs access to the very file. However, one person at any given point can only handle the file in time. In addition, if an individual loses the file during the data entry period, the file has to be remade and teachers have to start filling it in one at a time all over again. In some circumstances, some forms are lost from the files due to improper handling, which leads to missing documents.

## **2.3.Hard to share**

Paper-based filing systems allow paper documents to reside in only one place at a time. To share the such-documents, teachers generally have to make their own copies, which is another added cost to either photocopy from a stationery shop or to buy ink for the photocopiers. Most average documents get copied several times, and of course, many of these copies also get filed too. If several departments need to confer on a document, they must have multiple copies printed, make amendments separately and then share their version with each other before pursuing further changes. For instance, the end of term test results report forms where teachers have to wait in a ‘queue’ for a file containing the master results sheet and the report forms, which they use to enter the results and comment for the pupil’s test performance results. When a teacher accidentally or by intention carries the file home, the rest of the teachers are stuck because there is nowhere to record the data can be apart from the very files and forms. Moreover, if one made a mistake on a form of a pupil, making a correction becomes difficult if the forms and file is with another teacher.

## **2.4.Editing problems**

Editing a document is another problem associated with a paper office. Unlike where a document is soft copy, it is easy to make a correction on it. However, when it come to a paper office, where a pupil's names are misspelled on the master sheet, most teacher copy the misspelled names on the report forms. And when a correction follows, the rest of the report forms need correction provided one remembers to. If you want to make changes to a paper-based document for a pupil or an office, you need to photocopy the original first - otherwise you ruin it with edits and comments. This process is always repeatative every time you want to make more amendments and you may end up running out of space if significant alterations are required.

## **2.5.Security issue**

It is hard to keep track of who has used or copied which paper documents, as they are low security controls with a paper document. A school usually risks leaking critical information to unauthorized personnel, and such records include the pupils' payment records, the pupils' performance records, the pupils or staff health records to mention but a few.

## **2.6.Storage problem**

There is also the cost associated with storing documents both on and off-site. One can tell the difference by comparing a one-time charge of say K 1000, to buy a one terabyte external hard drive to store data/records electronically, store electronic copy of the documents and the electronic system backup data as to the overhead cost of maintaining a huge number of files, folders and file cabinets for storing say 500,000 documents annually which cost far more seeing that a ream of paper costs no less than K65, laser jet cartridges about K1200, a folder at least about K5 each and not to mention the price of the file cabinets which is usually no less than K1000.

## **2.7. Slow access**

Finding and retrieving a document using a paper-based filing system in schools is slow. In situations where information of a pupil contained in a document is required immediately to respond to a request say from a sponsor, the delay may cause the sponsor to be dissatisfied and think the school office is either manipulating the records of a pupil or that there is something else wrong in the system. In addition, re-filing paper documents wastes time and may result in misplacement of the files. When records are electronically stored, finding them only requires pressing a button to search for the document. Which is by far faster than going through a pile of papers just to find a document.

## **2.8. Information Consistency**

In a paper-based system, information consistency is very difficult to achieve. Even when policies and communications dictate what must be collected, and how much detail are provided; execution is left to the individual. Although a check-and-balance system may be in

place to guard against omissions and lack of details, some files purposefully or inadvertently lack some of the details that is needed. Returning to the original source for added information is time consuming, and eventually costly. In some circumstances, different offices have inconsistent details of a **pupil** because of not collaborating and not keeping data in place.

### **3. RESEARCH DESIGN**

#### **3.1. Purpose of the Study**

With the surplus of details and records of pupils of ever-increasing populations nowadays in schools, it is getting more and more difficult to find the information or documents one wants. A lot of time and resources are wasted because the needed information or documents gets lost somewhere or takes a long time to find. Consequently, this study served the purpose of finding out how an electronic data records' management system effects a school's administration and management. Transforming the school old methods of data and record keeping paper based system into a modern e-office or a mixture where data and records are processed by computers and keep on paper can change the effectiveness, efficiency, and easy accessibility of data, records, and information in schools.

#### **3.2. Research Objectives**

The main objectives of this research work were to determine which system is more cost efficient, useably efficient and effective between the paper-file system and the e-system for pupil data and record management in school.

Having mentioned the main objective, the specific objectives of this research work include:

- Highlight the importance of introducing an electronic data capture and records' management system in schools.
- Compare and contrast which system between the old paper-based and the new electronic data capture and records system has easy and quick access to add, update and view the records stored by a school.
- To make recommendations from the findings, on which system has an increased number of people accessing the data simultaneously in a faster manner.
- To help schools have a centralized data centre, where data can be accessible by multiple authorized users, at any time independently of anyone who may be working on the same record.
- To automate the current school system processes and functions and save 75% of the teacher's work time concerning the pupil data and record process management.

#### **3.3. Research Questions**

To facilitate the thesis research activities and findings, a number of questions needed to be answered, and these included:

- What is an electronic data capture and records management system?
- What is the necessary background information?

1. Brief history of an electronic data captures and records management system.
  2. What are the benefits of an electronic data management system?
  3. What are the existing data and records management systems in most institutions especially schools?
- How has the electronic data capture and records management system changed over time?
  - What are the potential benefits of an electronic data and records management system to an institution or organization?
  - What research identifies the positive effects of the change from a paper-pen dependent system to an e-system on an institution, like schools?
  - What research identifies the negative effects of the change from a paper-pen dependent system to an e-system on an institution, like schools?
  - What are the drawbacks of an electronic data capture and records management system in schools?
  - Are their viable alternatives to an electronic data capture and records management system?
  - What percentage of a school staff population supports an electronic data capture and records management system?
  - What are the blocking of an electronic data capture and records management system in schools as an alternative to the traditional methods of data capture and storage?

### **3.4. Research Hypothesis**

#### **Null hypotheses:**

1. An electronic data capture and records management system does not change a school administration and management core functioning over time.
2. They are no potential benefits of an electronic data capture and records management system to an institution or organization.
3. They are more drawbacks of an electronic data capture and records management system in schools than the old paper-file system.
4. Most school staff do not support an electronic data capture and records management system because it is alien to them.
5. The introduction of an electronic data capture and records management system cannot bring about workflow automation.
6. There is better management of records with effectivity with the paper-file system than with the electronic data capture and records management system.
7. The old method of handling data, records and information using paper and files has more quality assurance than with the modern methods of using computers.

8. It is not easy to track productivity and performance of a pupil with an electronic data capture and records management system than with the old methods.
9. An electronic data capture and records management system is not cost-effective and not ease in accessibility than the old system of using papers and files.

### 3.5. Research Variables

- Workflow automation
- Better knowledge management
- Efficient communications management
- Management of records in effective manner
- Quality assurance
- Better productivity management
- Better performance management
- Better cost-effectiveness
- Ease in accessibility
- Accountability with better audit trails
- More integration of various departments

### 3.6. The Theoretical and Conceptual Framework

The theoretical framework employed in this research study is the Technology Acceptance Model (TAM). According to Davis et al (1985 and 1989), a TAM has two factors which are relevant in the use of technology and its systems, and these are the perceived usefulness (U) of a new technological system and it is perceived ease of use (E). Davis et al (1985 and 1989) defined the technology perceived usefulness as the prospective user's subjective probability that using a specific application system enhances the subject's job or life performance efficiency and effectiveness and the perceive ease of use of the software system application as the degree to which the user expects the target system is free of effort.

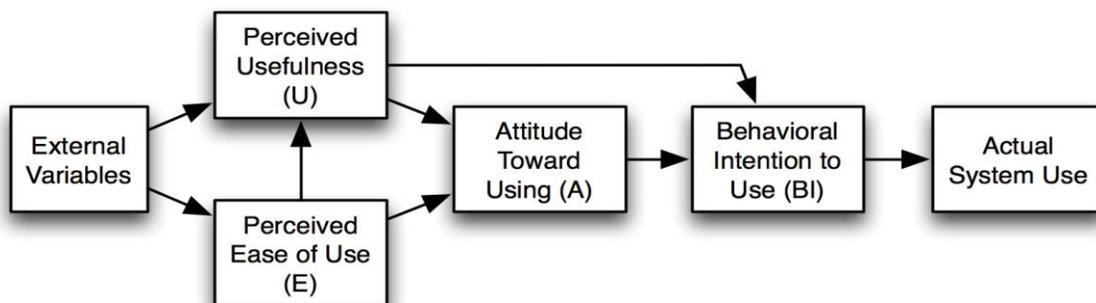


Figure 1: Technology acceptance model (Davis, 1985 & 1989)

The two factors are also influenced by external variables, which are social, cultural and political inclined. The social variables are but not just the language, skills and other facilitating conditions. The political variables include the impact of using technology in an institution establishment, the institutions guidelines and aspirations, to mention but a few. The attitude to use is concerned with the user's evaluation of the desirability of employing a particular information system application. Thus to measure the likelihood that a person employs and use a new system's application, the TAM employs a variable called a Behavioural intention (BI), which is given by the formula  $BI = U + A$ . (Davis F, 1985) and (Fred D. Davis, Richard P. Bagozzi, & Paul R. Wars, 1989)

As such, his research, used the behavioural intention to use the new e-system from the respondents' perceived usefulness, the utility value of the e-system and how much workload it did for the user, and the respondent's attitude to use the e-system-application (the attitude that the technology can help them save time, money, energy to mention but a few). This was tabulated from the perspective of how respondents rated the system's ease of use.

Having discussed the theoretical technology acceptance model for the e-system that school can use, the research objectives, research variables and the significance of the study, the research designed the conceptual framework for this research. With the introduction of the electronic data capture and records management system from the old paper-file system of records and data management. The conceptual framework for this study has the independent variables which include: workflow automation, better knowledge management, efficient communications management management of records in effective manner, quality assurance, better productivity management, better performance management, better cost-effectiveness, ease in accessibility, accountability with better audit trails and more integration of various departments. And the dependent variables, which are affected by the new e-system core functions and processes include: the way the school's administration and management functions, how its major administration and management processes changed, how the teacher core duties and the administrators' core duties were affected. The conceptual framework for this proposal is illustrated in figure below:

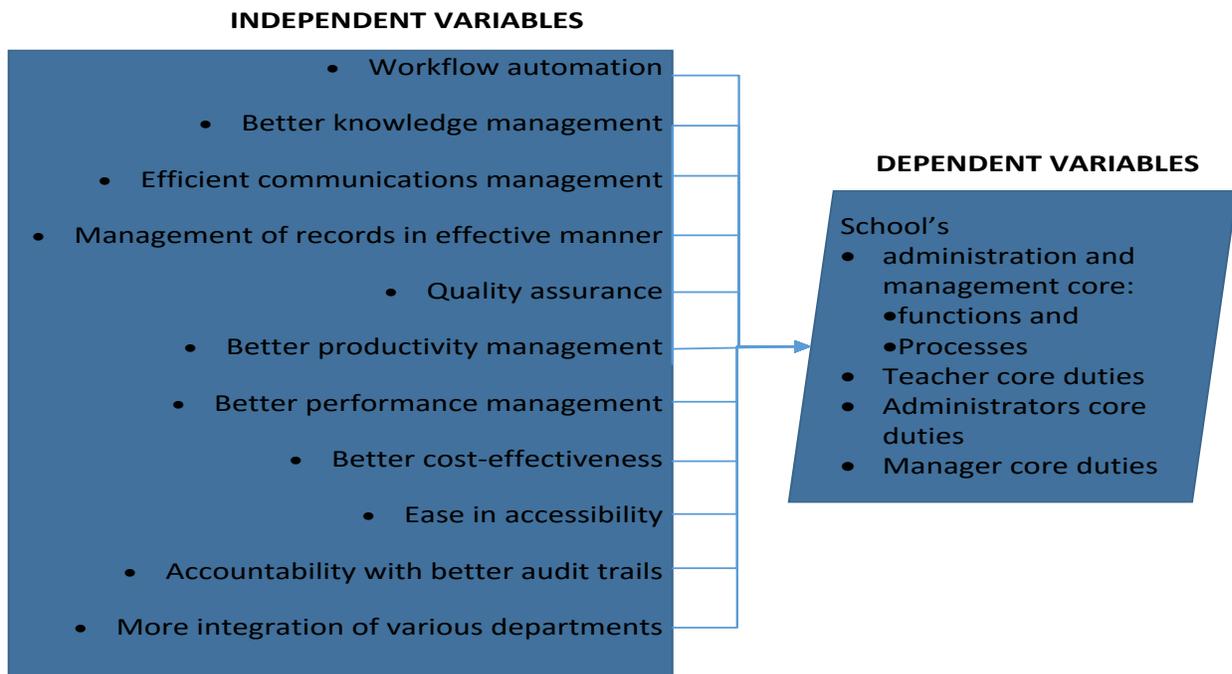


Figure 2: Conceptual framework for the E-solution for school data and record management system

## 4. OPERATIONAL DEFINITIONS

This section presents operational definitions of key terms used in this study:

### i. Access

The term access in this paper refers to an activities related to storing, retrieving, or acting on data housed in a database or other repository in a computer. Users who have data access can store, retrieve, move, or manipulate stored data, which can be stored on a wide range of hard drives and external devices.

### ii. An application

It is any program, or group of programs, that is designed for end users, which include database programs, and text processors to mention but a few which help people to perform an activity. An application allows a user to do their everyday tasks on the computer such as writing a letter, sending an email, making a poster, or downloading a web page. Depending on the activity for which it was designed for, an application can manipulate text, numbers, graphics, or a combination of these elements. Some application packages focus on a single task, such as word-processing; others, called integrated software include several applications.

### iii. Capture

The term capture in this paper refers to the process or means of obtaining and storing external data, particularly images or sounds, for use later. There are various ways in which this can be done; the best method depends on the application.

### iv. Computer

A computer is generally a programmable machine. The two principal characteristics of a computer are: it responds to a specific set of instructions in a well-defined manner and it can execute a pre-recorded list of instructions (a program). A computer can be programmed to carry out a set of arithmetic or logical operations automatically. A computer consists of at least one processing element, typically a central processing unit (CPU), and some form of memory. The processing element carries out arithmetic and logic operations, and a sequencing and control unit can change the order of operations in response to stored information. Peripheral devices allow information to be retrieved from an external source, and the result of operations saved.

## **v. Computer System**

Computer system is the combination of hardware software user and data with referring to communication and procedure involved in between them. This extends to include a system of interconnected computers that share a central storage system and various peripheral devices such as a printer, scanners, or routers. Each computer connected to the system can operate independently, but has the ability to communicate with other external devices and computers.

## **vi. Data**

Refers to information in raw or unorganized formate (such as alphabets, numbers, or symbols) that refer to, or represent, conditions, ideas, or objects.

## **vii. Database**

A database is an organized collection of data. It is the collection of schemas, tables, queries, reports, views and other objects. The data are typically organized to model aspects of reality in a way that supports processes requiring information, such as modelling the availability of rooms in hotels in a way that supports finding a hotel with vacancies. Databases are used to hold administrative information and more specialized data, such as engineering data or economic models. Examples of database applications include computerized library systems, flight reservation systems, computerized parts inventory systems, and many content management systems that store websites as collections of webpages in a database.

## **viii. Graphical user interface (GUI)**

A GUI is human-computer interface which allows users to interact with electronic devices through graphical icons and visual indicators such as windows, folders, secondary notation, text boxes, buttons, labels to mention but a few as opposed to text-based interfaces, typed command labels or text navigation. A GUI is also any program interface that takes advantage of the computer's graphics capabilities to make the program easier to use. Well-designed graphical user interfaces can free the user from learning complex command languages. In addition to their visual components, graphical user interfaces also make it easier to move data from one application to another. A true GUI includes standard formats for representing text and graphics. Because the formats are well defined, different programs that run under a common GUI can share data. This makes it possible, for example, to copy a graph created by a spreadsheet program into a document created by a word processor.

## **ix. Information**

Data that is accurate and timely, specific and organized for a purpose, presented within a context that gives it meaning and relevance, and can lead to an increase in understanding and decrease in uncertainty. Information is valuable because it can affect behaviour, a decision, or an outcome.

## **x. Information technology**

Information technology (IT) is the application of computers to store, retrieve, transmit and manipulate data, often in the context of a business or other enterprise. IT is considered a subset of information and communications technology (ICT). Technology is the collection of techniques, skills, methods and processes used in the production of goods or services or in the accomplishment of objectives, such as scientific investigation. It is the knowledge of techniques, processes, etc. or it can be embedded in machines, computers, devices and factories, which can be operated by individuals without detailed knowledge of the workings of such things. Technology has many effects such as helping to develop more advanced economies (including today's global economy) and it gives a rise of a leisure class in society. Humans have been storing, retrieving, manipulating and communicating information since the Sumerians in Mesopotamia developed writing in about 3000 BC (Jeremy Butler G, 1998). However, the term information technology in its modern sense first appeared in a 1958 article published in the Harvard Business Review; authors Harold J. Leavitt and Thomas L. Whisler commented, "The new technology does not yet have a single established name. We shall call it information technology (IT)." Their definition consists of three categories: techniques for processing, the application of statistical and mathematical methods to decision-making, and the simulation of higher-order thinking through computer programs. (Harold Leavitt J & Thomas Whisler L, 1958)

## **xi. Network**

A computer network or data network is a telecommunications network that allows computers to exchange data. In computer networks, networked computing devices exchange data with each other using a data link. The connections between computers are established using either cable media or wireless media, where any type of computer can use wireless data connections for connecting. A computer network facilitates interpersonal communications allowing users to communicate efficiently and easily via various means, thus providing access to information on shared storage devices (an important feature of many networks). A network allows sharing of files, data, and other types of information giving authorized users the ability to access information stored on other computers on the network. A network allows sharing of network and computing resources. Users may access and use resources provided by devices on the network, such as printing a document on a shared network printer.

## **xii. Records**

A record is a collection of fields, possibly of different data types, typically in fixed number and sequence. Records can exist in any storage medium, including main memory and mass storage devices such as magnetic tapes or hard disks. Records are a fundamental component of most data structures, especially linked data structures. Many computer files are organized as arrays of logical records, often grouped into larger physical records or blocks for efficiency.

### **xiii. Retrieval**

Retrieval is a term, which refers to a process the process of getting something back from somewhere, an action of obtaining or consulting material stored in a computer system. Retrieval of information can also be looked as an activity of obtaining information resources relevant to an information need from a collection of information resources. Searches can be based on or on full-text (or other content-based) indexing. Information retrieval (IR) systems are used to reduce what has been called "information overload". Many universities and public libraries use IR systems to provide access to books, journals and other documents. An information retrieval process begins when a user enters a query into the system. Queries are formal statements of information needs, for example, search strings in web search engines. In information retrieval a query does not uniquely identify a single object in the collection. Instead, several objects may match the query, perhaps with different degrees of relevancy.

### **xiv. Server**

A server is a computer program or a device that provides functionality for other programs or devices, called "clients". This architecture is called, the client–server model, and a single overall computation is distributed across multiple processes or devices. Servers can provide various functionalities, often called "services", such as sharing data or resources among multiple clients, or performing computation for a client. A single server can serve multiple clients, and a single client can use multiple servers. A client process may run on the same device or may connect over a network to a server on a different device. Typical servers are database servers, file servers, mail servers, print servers, web servers, game servers, and application servers. The request–response model today most frequently implements client–server systems: a client sends a request to the server, which performs some action and sends a response back to the client, typically with a result or acknowledgement.

### **xv. Software**

It is that part of a computer system that consists of encoded information or computer instructions, in contrast to the physical hardware from which the system is built. The word software is roughly synonymous with computer program, but it is more generic in scope. A software can also be defined, as a collection of instructions that enable the user to interact with a computer, its hardware, or perform tasks. Without software, computers would be useless. For example, without an Internet browser, one cannot surf the Internet and without an operating system, the browser could not run on your computer.

## 5. LITERATURE REVIEW

### 5.1. Global Perspective

There has been a lot of research and advancement in electronic data capture systems in most parts of Europe and American states. Much of that research and technological advancements concerning the electronic data capture systems has been for the medical data, population vital statistics data and clinical trial data collection, to mention but a few. Few research and technology advancement has occurred in the educational sectors' electronic data capture systems for schools. This can be attributed to the lack of sponsorship to facilitate acquiring the technology and maintaining it. However, the same technology is used in transmitting election data records, patients' health data records, text messages, and others however.

The research and development of the electronic data capture system started somewhere between the 1980's and 1990's, when remote data entry systems were introduced for the pharmaceutical industry. Personal computers were provisioned at clinical sites, thereby making them easier to scale and distribute as compared to the mainframe computers. As technological devices became more connected, a signal sent by telephone line made the transfer of data easier. Floppy disks and a smaller hard diskette were also developed during the same time to help in collecting greater amounts of data as they were easy to transport due to their small size and lightweight. (Bill Gluck, 2014)

According to Bill Gluck (2014), the remote data entry (RDE) systems were developed to assist health personnel to directly capture data. Bill Gluck (2014) states that the RDE systems "allowed the doctor or clinical site staff to enter the data directly into the computer, eliminating the need for a third party to enter/transpose data from the paper forms. In doing so, the RDE computer programs could provide a first level of programmatic 'checks' on the data entered. For example, dates and range values could be flagged for verification before saving the data to the computer and either connecting the computer to the phone to transfer the data or write the data to a disk to send to the sponsor." This technology for the 1990's, became the next generation of computer applications specifically designed to address the needs of the pharmaceutical, biotechnological, and medical device industries, and it was known as the Electronic Data Capture (EDC) systems. The initial adopters of the system were supporting companies with IT sections who built their own custom applications similar in purpose to the EDC systems. In the mid-to-late 1990's, specialized vendors such as DATATRAK began to introduce applications in what we now know as commercial-off-the-shelf (COTS) solutions. This opened the gateway to the electronic data capture and record management (EDCRM) applications and systems. (Bill Gluck, 2014)

Later in the 1990,'s a syndicate of companies come together and defined the global standards aimed to rationalize clinical research. The main mission of the syndicate was to develop and support global, platform-independent data standards that enabled information system interoperability to improve medical research and related areas of healthcare." (Cahill, 2013)

Despite the efforts, some institutions up until date still prefer data collection methods focused on a paper-based forms. In other parts of the world however clinical and scientific trials use paper-based case report forms followed by double data entry into relational databases on computers. Walther et al (2011), captured some literature as to why electronic data capture and record management systems' use has become wide spread, in the literature, the wide spread use was attributed to the technological advances and considerable reduction in prices for portable computers. This made the electronic data capture system an intriguing alternative in both the health and the educational sector. Coupled with its major advantages which included the ability to enter, review and analyse data in real-time and to implement online data validation checks to assure data quality more effectively at the point of entry, the electronic data capture system (EDCS) was anticipated to soon replace the paper based data capture systems in place. (Walther, et al., 2011)

The EDCS solutions have the potential to produce better data accuracy as compared to paper-based methods. Given the considerable reduction in the time from data collection to database lock, EDCS holds the potential to decrease the research-associated costs. However, the successful implementation of EDCS in most institutions requires a little adjustment of work processes and reallocation of resources. (Walther, et al., 2011)

According to Carina King et al (2014) literature, all electronic data capture systems can submit data using an Internet connection which is faster and in real time, than when paper is used... but instead of having SIM cards in fieldworkers' phones, data was submitted when supervisors met interviewers, via the local Wi-Fi networks that were set up on supervisors' laptops using USB dongles connected to a cell phone network. This was so because the project managers noted that data could be transferred directly from the phone if fieldworkers were given airtime but this system was open to abuse, where project phone credit was used for personal reasons. The EDCS technology efficiency relays on network of computers be it on a local area network, metropolitan area network or on an international network. However, given that social media (like Facebook for instance) access which is accessible on the internet, most workers forget their primary job description and prefer to visit the social media and work later. This negative aspect of the internet, has caused the introduction of EDCS in most institutions to be received with much reluctance, especially in secondary schools and primary school setups. (Carina King, et al., 2014).

The benefits of the electronic data capture system are so overwhelming to ignore nonetheless, as they include improving the staff computer basic knowledge sets and an institution's productivity, increased operational effectiveness and IT efficiency. (Anon., 2010)

## **5.2. Zambian Perspective**

There has been number of pilot studies covering the acceptability and feasibility of electronic data capture and record management systems (EDCRMS) in Zambia, among the most significant ones is by Wall, et al (2015). The study looked at the implementation of an

electronic fingerprint-linked data collection system; it is a study looking at feasibility and acceptability among Zambian female sex workers of EDCRMS. Wall, et al (2015), says among the institutions, which had invested in the research concerning the electronic data capture, and record management systems are the International AIDS Vaccine Initiative (IAVI) and Rwanda Zambia HIV Research Group (RZHRG). He says they “entered in to a contract with Biometric and purchased 38 electronic fingerprint scanning and data collection systems which consist of a Google Nexus 7 tablet with a portable single-finger multi-spectral imaging sensor connected via USB. Each device has security software for real-time tracking and clearing if stolen. The contract includes technical design, software customization, on-site training and testing, master database security and maintenance, and annual site licenses. The device scans both thumbs and index fingers and transmits encrypted templates and inputted data to a central server via Global System for Mobile (GSM). Mobile coverage in Zambian urban and rural areas is relatively high, with the GSM network operated by Zambian carrier MTN covering 75% of the population and increasing. Records are collected in a database were viewable on a password-secured website. Service-specific data entry workflows for FSW recruitment and clients of HIV testing, family planning, male circumcision, and antiretroviral treatment services have been developed.” (Wall, et al., 2015)

In Zambia the health care have benefited from the electronic data capture and records management systems greatly. According to Chelsea Bailey (2013), ‘Most clinics in Lusaka, Zambia have embraced the “Smart Care Card,” a thin plastic card that is revolutionizing the way clinicians and health care workers manage a patient’s medical records.’ This technological advancement was introduced according to Chelsea Bailey (2013) “in 2010, by the Zambia’s Ministry of Health in conjunction with the U.S. Centers for Disease Control and Prevention (CDC)”. The smart card was meant to replace the paper “exercise books” that have been in use to document medical records for some time now. The introduced smart card, despite its small size is able to store details of individuals' diagnoses and treatments. According to Chelsea Bailey (2013), the smart card technology just does not only store data but also can transmit it across the network of clinics as well, he adds that, “The card will also help infectious disease specialists track outbreaks of diseases to specific communities and in turn, lead to more targeted prevention programs. If there is any outbreak, we will catch it. The system will show if we see six cases of the measles within one day in people coming from the same area,” community health care manager Ingicious Bulongo told Fox in an interview. He added that he is collaborating with health care officials to tailor the program data to depict accurately the local health landscape. "We're working with a developer to make the system more unique to our area, because we know, for example, which seasons we have which diseases.” (Chelsea Bailey, 2013)

### 5.3. Personal Critique Summary

There has been a lot of advancement in the use of technology and the use of electronics to capture, analyse, store, and transmit data in the health and pharmaceutical industry across the world. This acceptance of technology trend has made the health industry to not just improve the health care services, but in disease forecast as well. The use of computers and its peripheral devices has brought up accuracy, efficiency, effectiveness and cost saving in the health sector around the world, Zambia included as they are less reliance on papers and files which tend to go missing, misplaced, mishandled, or to be held up by individuals.

However, the educational sector with secondary and primary school especially, with an exception of a few institutions has not documented their appreciation nor research on the use of technology in their institutions. For instance, the Zambian Examination Council of Zambia, just recently introduced the online candidate registration system, prior to the standalone registration system of examination system which was in place. The University of Zambia, Copperbelt University, Cavendish University, Information and Communication University, Mulungushi University to mention but a few have in place well established electronic data capture systems. However, none of these higher learning institutions has ever done a well published documented research on the matter.

As such, much research nor knowledge on how the electronic data capture systems impact or affect secondary schools is scarce.

## 2 CHAPTER THREE

### 10. METHODOLOGY

This chapter presents how the existing methods of how schools' current system of paper-files processes was modified by use of an electronic system, how the electronic system functions and the tools that were used to design and develop it. Most importantly presents an explanation of the research types, the research designs, the population that was studied, sample size and sampling techniques used, data collection procedures, which were used and the data analysis.

#### 10.1. The Electronic Data Capture and Record Management System

##### 10.1.1. Existing Methods Concerning Pupils' Data Management

The schools in Chingola for our case study, as of end of 2015, had as the method of the pupil data-record management system involving a pen and paper. When a pupil is accepted in to school, the head teacher ensues an admission slip that the accounts uses in order to accept payment from the pupil for the academic year, that the class teacher uses as proof of admission into school in order to enter the pupil's details into the class register.

When the term is ending, the school examination and guidance office refers to the class register to plan the running of the end of term tests by collecting the statistics of pupils in each class.

The school examination and guidance office also prepared a new file every term where subject teachers had to record the scores of the pupils in the test, and a master sheet to accompany the files. After the end of term tests, the subject teacher marks, calculates totals and percentages for each pupil. Then after, a teacher collects the file from the deputy head teacher, uses a master mark sheet generated by the school examination and guidance office to enter the marks of the pupils which they then after record on individual report forms. After a teacher has recorded the marks of a pupil on a report form, the teacher refers to the Zambian Secondary School Examination Grading System to grade and comment on the marks of a pupil. When the teacher has finished working with the subject of the class on the file, the file goes back to the deputy head teacher's office so that another subject teacher can access it.

With the school pupil identification cards, the school hires a contractor to capture the photo portraits of each pupil. Once that done, the contractor then collects the details of each pupil, that includes the pupils' full names, class, examination numbers and gender.

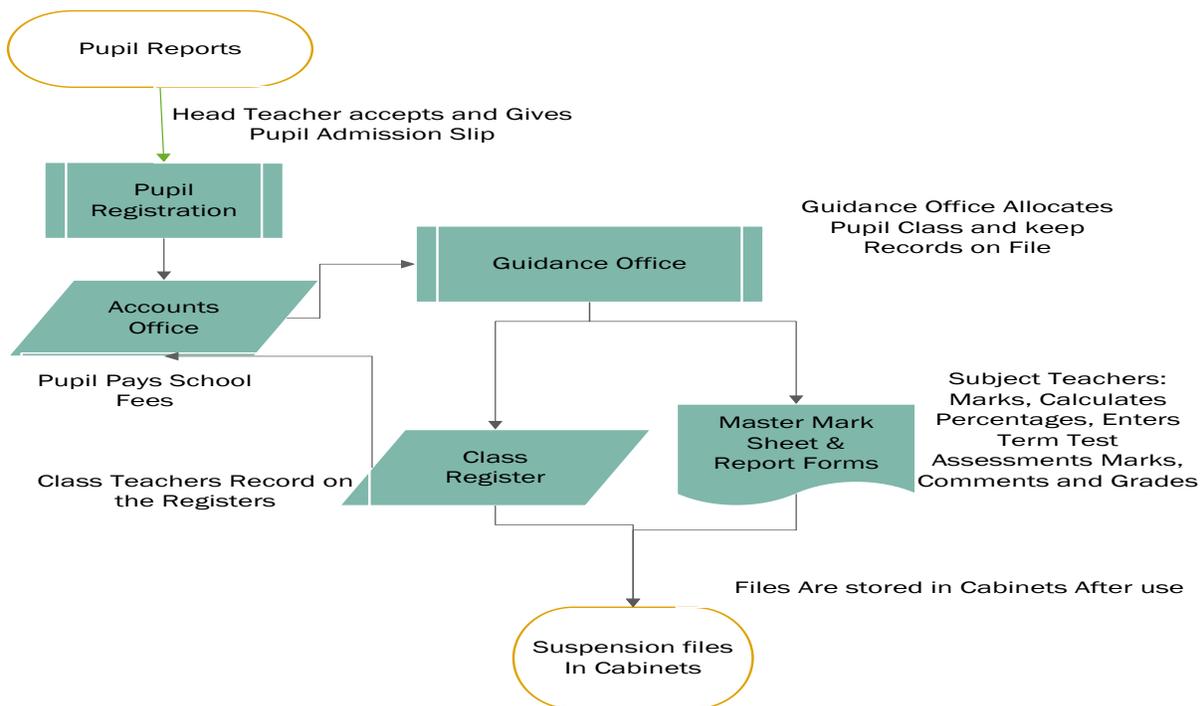


Figure 3: Current system of the pupil data and record file-paper flow from office to office

### 10.1.2. E-Solution for the Pupils' Data and Records Management System

Unlike the paper-based filing systems for record keeping, the electronic data, and record management system is assessable 24/7, with an unlimited number of users per any given time by use of a network and workstations (which includes personal computers and laptops). The electronic system simulates the existing paper-file system, including its processes and functions.

The guidance office may allocate class to a new pupil and enter the details into the electronic system main database. Once the details of a pupil are entered into the system's database, all the stakeholders, who may include the class teachers, subject teachers, the account, the planners and the human resource officer, are able to access the data and information. They may use the various details, the pupil's names, sex, class given, examination number, school the pupil is coming from, date of birth, parents' contacts and addresses, of interest to them. The pupil then may go to the accounts office to pay school fees, of which the accounts office only need to query the system central database for the pupil names, class and any record of payment for the very school and then record the amount the pupil has paid for tuition fees into the system. The class teacher is able to view and print the list of pupils allocated to the class from the database system. After the end of term tests, the subject teachers need to mark the papers and tabulate the total marks scored by each pupil. Each subject teacher then enters the raw mark totals for each pupil for the class he/she is teaching into the electronic system and saves the data to the

main system centralized database using the e-system. The system then, calculates the percentages, tabulate the grades, and develop comments for the subject performance score for each pupil upon the saving process. During open day, the report forms and the master mark sheet are printed from the electronic data and records management system application. Below is the pseudo diagram showing how the system will operate.

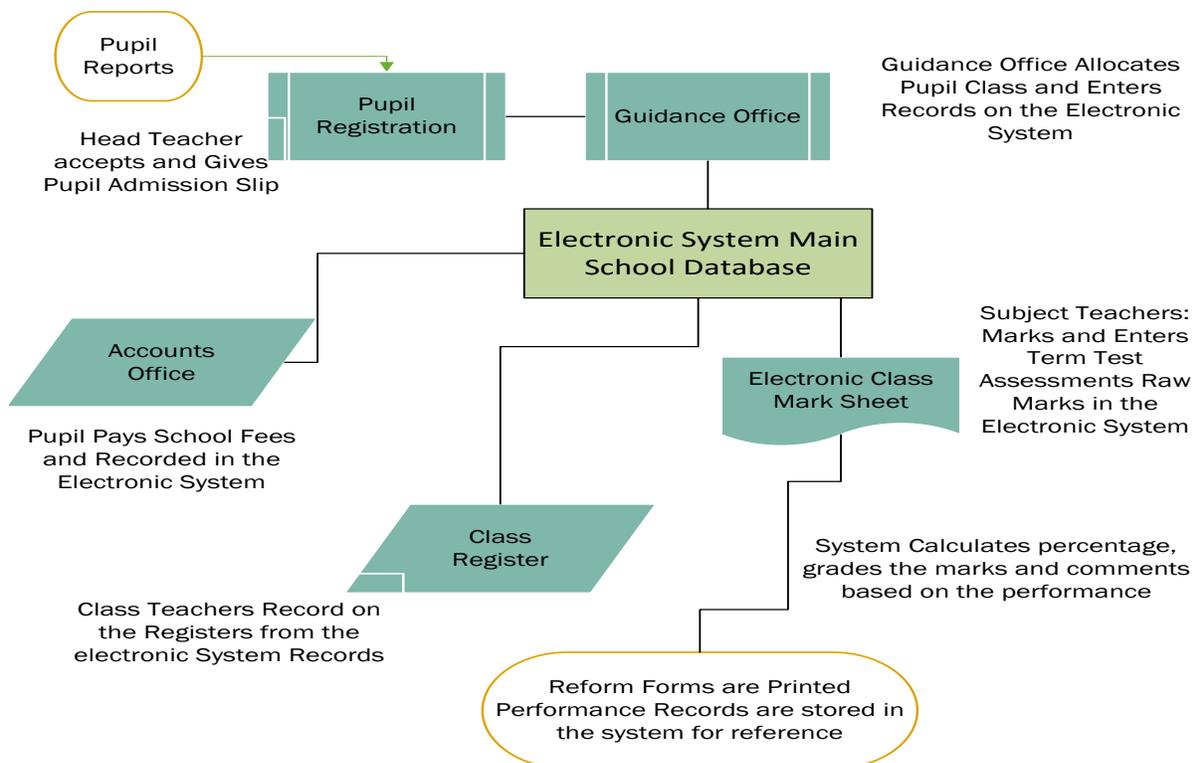


Figure 4: The proposed school electronic data and record management system pseudo

The electronic system was designed and developed using Visual C# programming language (because of its rich robust flexibility and rich wide range of syntax), net framework 3.5 to net framework 4.5 libraries and runtimes, SAP Crystal Reports 2013 v14, Visual Studio Crystal Report Runtime v13 (for reports), in Microsoft Visual Studio Enterprise 2015 due to its ease of use graphical integrated development environment. The database system was designed and developed using Microsoft Access 2016, due to its robustness, accessibility, and easy configuration. The network can consist of a local area network, with a wireless router for long distance coverage and easy accessibility for laptops and desktop computers.

## 10.2. DESIGN SPECIFICATION - ELECTRONIC DATA AND RECORDS SCHOOL MANAGEMENT SYSTEM

### 10.2.1. Introduction

This section is designed to be a reference for any person wishing to do any further research or any person interested in the architecture of an electronic data capture and records management system client-server application, called Jephkapi Electronic School Management System (Jephkapi ESMS), but not for anything that may include monetary profitability. This section describes the system application's architecture and sub-architecture their associated interfaces, database schemas, and the motivations behind the chosen design. Both high-level and low-level designs are included in this section of the research proposal document.

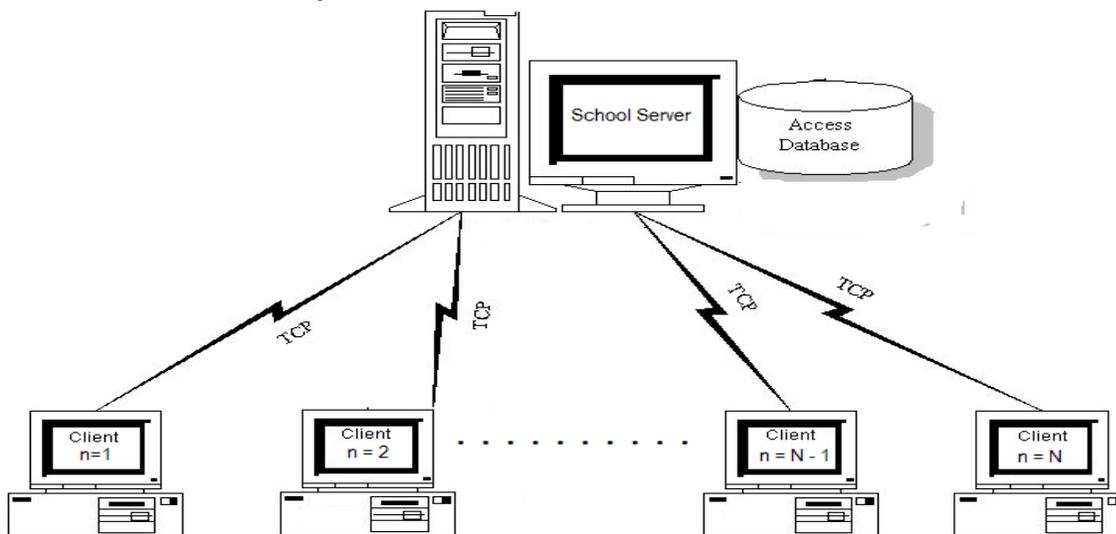
This section can be read by an individual with a technical background and has experience reading data flow diagrams, interface designs, development experience with object oriented Visual C# programming, artificial intelligent basic designs development and event driven programming.

This design specification is for the electronic data capture and records management system specification version 3 series. Any previous or later revisions of the specifications require a different revision of this design specification seeing that the system was designed and developed using the software incremental design model.

This section includes but is not limited to the following information for an electronic data capture and records management system, system overview, design considerations, architectural strategies, system architecture conceptual designs, policies and tactics, and conceptual system designs.

The figures and diagrams used in this illustration are from a functioning system of a test environment. Thus for ethical reasons, some figures and diagrams are redacted to protected the privacy of the subjects and ensure system security and integrity.

## 10.2.2. System Overview



**Figure 5:** Jephkapi ESMS System Overview

Jephkapi Electronic School Management System is a partially deterministic-episodic intelligent system with multiple access for unlimited number of users per any given time.

## 10.2.3. Design Considerations

This section describes many of the issues that needed to be addressed or resolved before attempting to devise a complete design solution.

### 10.2.3.1. Assumptions and Dependencies

This design of the Jephkapi Electronic School Management System makes minimal assumptions about software and hardware, and has few software dependencies. All environmental requirements of the Jephkapi ESMS client-server application can be found in the Jephkapi Electronic School Management System Requirements 3.0 document.

The client-server application makes the following assumptions about the environmental variables;

- The system can be described by the environmental requirements associated to this document.
- The system and its application executes provided the required resources available as necessary are meet. This entails sufficient memory and permanent storage space, an adequate CPU for the necessary application running, and a wired and/or wireless local network area network connection.

The Jephkapi ESMS client-server application makes the following assumptions about its operation environment;

- The client machine will have Microsoft Windows 7 as a minimum operating system installed. The client application is dependent on this set of minimum operating system component.
- The client and the server machine will have wired and/or wireless connectivity capability.
- The server will communicate with the client computer using a wired or less network.

### *10.2.3.2. Goals and Guidelines*

The Jephkapi Electronic School Management System (Jephkapi ESMS) application needs a very clear and concise graphical user interface and prompts for the user since this will be the highest level of interaction between the application, the central database and the user. It is also important that series of prompts and responses be tested with users before being deployed as part of the product so that all interaction is “approved” by a potential user.

The second major goal of the application is that the user should get a response in a shortest possible timely manner. This is why the system software core design should implement parallel intelligent computing programming so that large amounts of data can be processed by the client computer with fewer resources and the end-products complete meaningful information should be transferred between client and server simultaneously. Parallel computing is a type of computation in which many calculations or the execution of processes are carried out simultaneously by a computer. While intelligent computing is where the application makes choices based on the given set of conditions to act logically and do the load that should have been done by the human user. The design implementation should ensure a minimum set of information is transferred to the server in order to retrieve the necessary information, and the server only returns the requested data that is then stored temporary on the client computer while the user works on it. This allows the network not to be congested.

The Jephkapi Electronic School Management System application is intended to have a simple interface that is relatively easy to work with. A minimal yet complete set of options should be provided for the user to have control of specific data and records from the server. These options should include, but are not limited to; querying the central database from the server with maximum efficiency, effectivity and specificity, updating the central database from server with the least time possible, reduction of user work load by 75%, to mention but a few.

The fourth major goal of Jephkapi Electronic School Management System application is to allow mobility of the users. The user should be enabled to work from home, ie offline, of which they will be required to sync the data with the central database as soon as they are back at the work place. The system should be able to operate on both a wired and wireless network.

The fifth major goal of Jephkapi Electronic School Management System application is to maintain data confidentiality, integrity, and availability. As such, the Jephkapi ESMS should be configured with three login details, the user name, the user password, and the level at which the user is accessing the data at. To ensure that no one can see or revise engineer the passwords, the Jephkapi ESMS should employ salt cryptography algorithms. Salt algorithms generate random data that are used as an additional input in a one-way login function, by hashing password with generated unique salt values.

### *10.2.3.3. Architectural Strategies*

The Jephkapi ESMS design has been divided into four major sub-systems; client-server application, the central database on the server, the local database on the client computer and the local area network. The client-server application is then separated into two major sub-sections; the user graphical interface component and the communications.

The Jephkapi ESMS client-server application's major design considerations include easy data retrieval, easy database updates, unlimited multiple client computer support, and a minimal set of administrative features.

The client-server application is designed to support the following major features; a simple and intuitive graphical text and command input user interface, easy to understand dialogs, flexible dialog structure support, and support of a local area network records' retrieval and feeding database system.

Given the system's requirement that the client-server application must be supported on a Microsoft Windows platform, this design uses windows specific technology: Microsoft Jet Object Linking and Embedding Database (OLEDB) version 4.0 and any Microsoft Windows 7 operating system or latest. These technologies were chosen because they require the least amount of research, learning time and are readily available, of which we are limited in.

## 10.2.4. System Architecture

### 10.2.4.1. Basic Operation Subsystem Architecture



Figure 6: Jephkapi ESMS Basic Operation Subsystem Architecture

### 10.2.4.2. Data Retrieve and Updates to the Server - Basic Operation

The system application will first retrieve data from the server, if the data is retrieved successfully, then the system should display the data and acknowledge that the process was successful. Otherwise, if the system application failed to retrieve the data, it should communicate to the user the possible reason and a possible solution.

When one is done working on the records then needs to update the central database on the server. The system application will first send the batch data to the server, if the data is updated successfully, then the system should acknowledge that the process was successful. Otherwise, if the system application failed to update the data, it should communicate to the user the possible reason and a possible solution but still save the data temporarily on the local database for the computer. Of which this data should be accessible once the error is ratified.

## 10.2.5. Jephkapi ESMS Interface

The system has two distinct components:

- 1) The Database is implemented using MS Access Version 2003. It functions as storage to keep the entire school database.
- 2) The application itself is written in Visual C#, its primary purpose is to query the database to fetch and then to feed the server with the updated new records.

### 3.2.5.0. Jephkapi ESMS Client-server Graphical User Interface

The purpose of the user interface infrastructure is to take input from the user who is a teacher. More specifically, it present the information to the user and accept responses if they are accurate. When the user has completed a login query on database on the server. A result is read from the server and read to the user. The process then begins again. The client-server application for the Jephkapi ESMS component can be broken up into several distinct sub-parts:

### 3.2.5.1. User Logon Screen

Once the system's application opens, the user can enter the credentials that he/she had registered with the school system manager (who oversees the system overall operations and maintenance): the password, the username and the level. The accountant level is accountant, for the subject teacher is subject teacher, for the head teacher and the system manager is system manager, for the guidance teachers and the examination officers is guidance teacher. Once the user has entered the credentials,

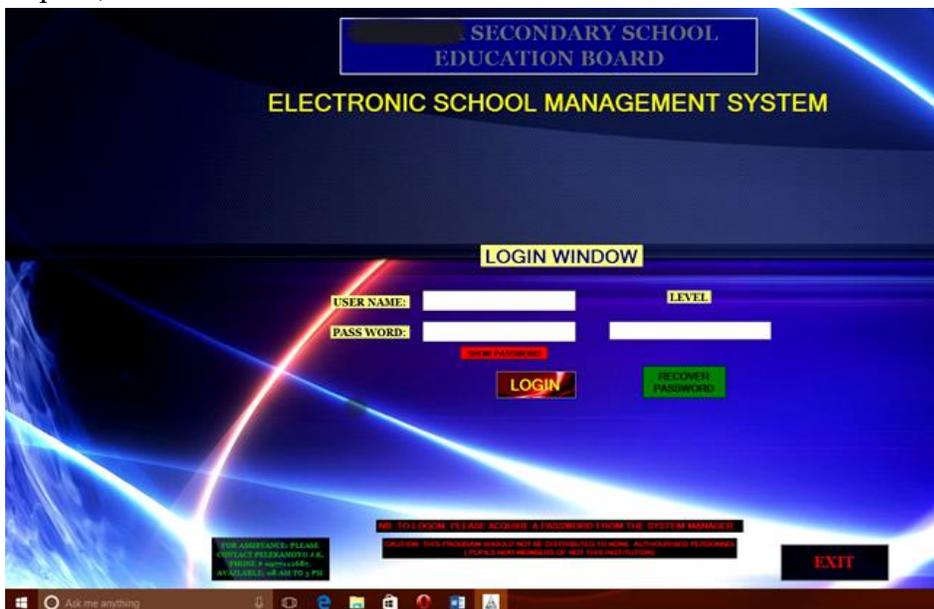


Figure 7: Jephkapi ESMS Login System

he/she can check the password by hovering over the label 'Show Password'. When satisfied that all details are correct, the user click the 'login' button to have access to the electronic records data management system.

### 3.2.5.2. User Password Recovery

If the user has forgotten the password, he/she can reset the password by clicking the password recovery button which will open the form for password recovery. Once the window opens, the user needs to enter the details in the fields provided and then verify the details. If the details are correct, the user can create a new password. And once the new password is

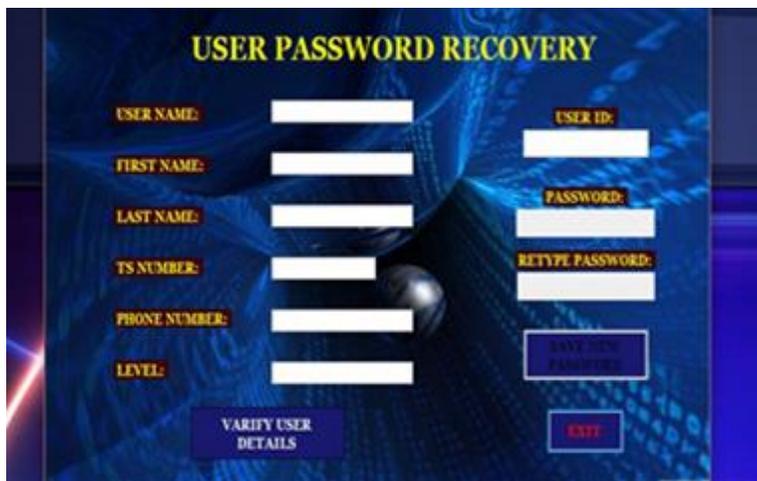


Figure 8: Jephkapi ESMS Password Recovery

saved, exit and re-enter the credential on log on screen and log on.

### 3.2.5.3.

#### 3.2.5.4. User Task Management Windows

Once logged on, the user needs to choose which task he/she needs to perform. Either to register a new pupil, enter end of term or mid-term test results, print IDs, view or print the pupils of a class, view or print report forms, view or print school statistics, make or amend the time table, change the details for the school on the system database, or manage the database systems, etc.

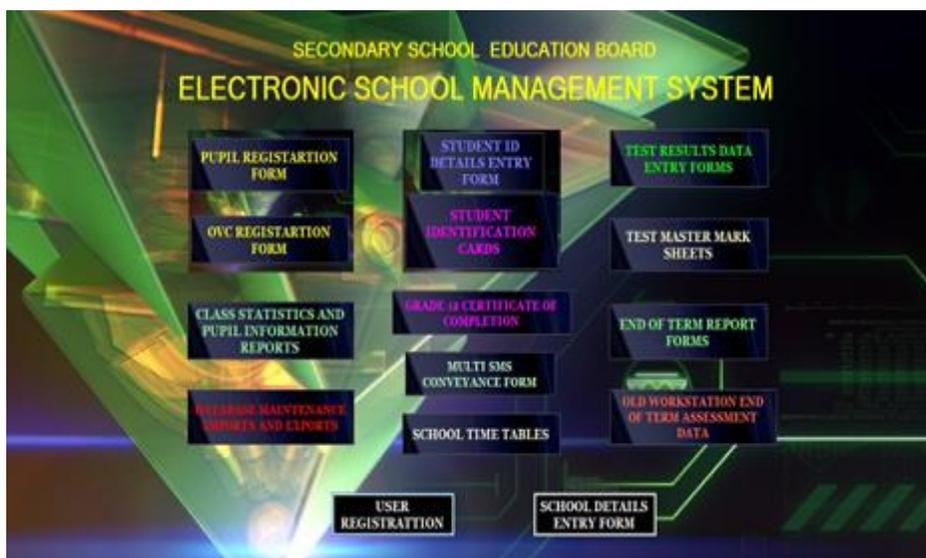


Figure 9: Jephkapi ESMS System Administration Management GUI

#### 3.2.5.5. System Database Backup, Maintenance and Management

Once logged in, for the first time only, the system manager needs to recreate the databases, he/she needs to call the 'Database Management Section' window using the database maintenance button. The user who is the system manager needs to be able to work on the database, ie. To either create new database files, backup the existing databases, export data, import data, restore database, etc., the user needs to call these functions by clicking on the database maintenance. Once it opens, the system manager needs to recreate the database structure by clicking the button: 'Create new Term Pupils' Assessments Database' and 'Create New Annual Pupils' Details Database'.

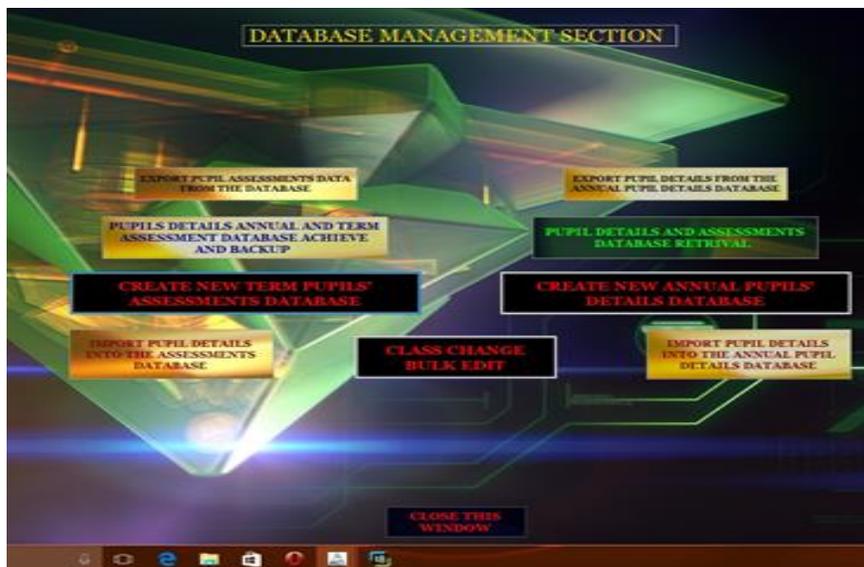


Figure 10: Jephkapi ESMS System Database Maintenance and Management

Once this is done, the system can now be accessed by anyone and will be ready to use.

### 3.2.5.6. Entering New School Details and Records

Once the system manager is logged one, the details for the school can be registered into the system. The school system manager needs to click the button school details registration to open the form to enter/edit the school details and records that include: the school names, postal address, term, year, amount of school fees, the pathways and class teachers for each class, etc. The whole idea of this section of

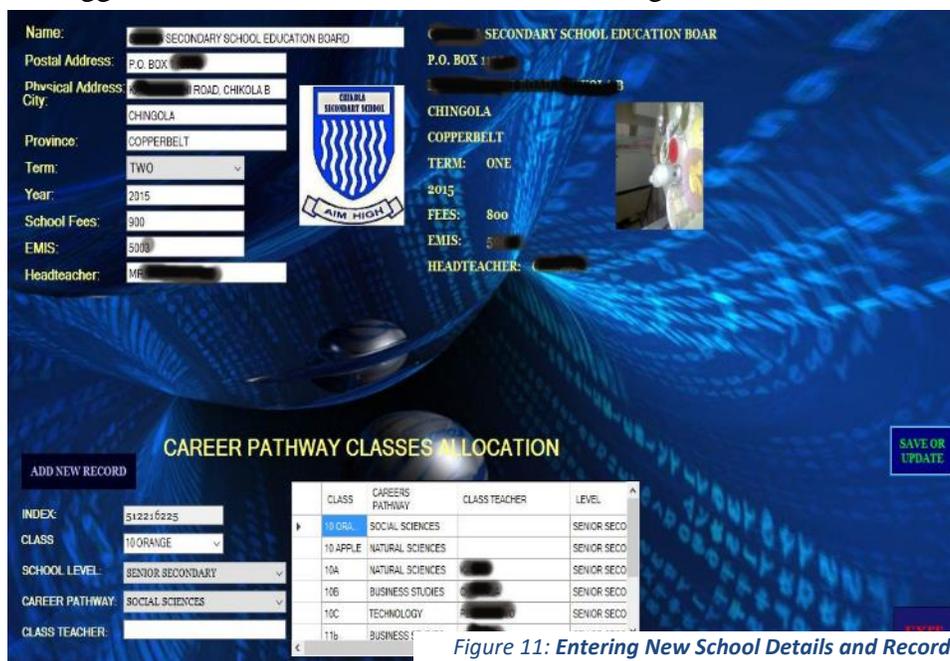


Figure 11: Entering New School Details and Records

the system software is to have a generic but personalized system in place. Once the details are filled in or edited, the system manager needs to save the data, by clicking the save or update button.

### 3.2.5.7. Defining Jephkapi ESMS User Details

Once the school details are entered, and the various databases are ready, and a list of users has been established, the system manager can register the users. He/she will need to click the user registration button to open the user registration form. The system manager will need to allocate the users their respective level access so as to control who views or edits the respective various data details and records in the system, once any user details are entered in the systems database, the system manager will need to save the user's respective records. User who have been entered into the system, should be able to use the by entering their user name, password and level on the login screen for the software.

USER ID	FIRST NAME	LAST NAME	USER NAME	TS NUMBER	PHONE NUMBER	LEVEL
41014						SYSTEM ...
40917						SYSTEM ...
40917						SYSTEM ...
41010						SYSTEM ...
41013						ADMINIST...
41014						SECRETAR...
50410						SUBJECT ...
50410						ADMINIST...
50504						ACCOUNT...

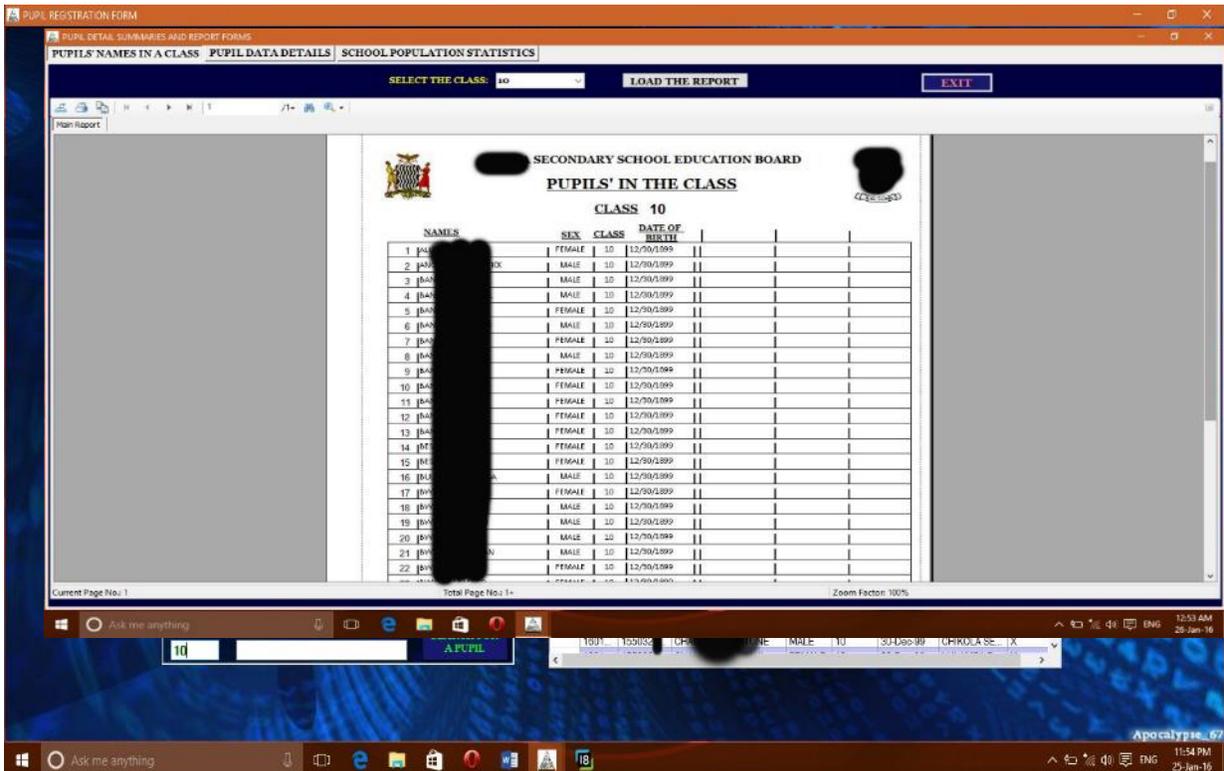
Figure 12: Jephkapi ESMS User Details Definition

### 3.2.5.8. Pupil Registration Form

The e-system for the school data and records management, needs pupils to be registered in to the system's main database. At a school, once the other system managers (who include the head teacher and the deputy head teacher) and the guidance officer have been defined in the system, they need to enter the new pupils as they report in school or are admitted into school, edit records of the existing if they need editing, to mention but a few. The details or changes are saved to the central database by pressing the button save or update on the pupil registration form. Once the pupils are registered in the system, anyone using the system can query the central database system using the application to see the records, and add respective records

Figure 13: Jephkapi ESMS Pupil Registration Form

which may include end of term test results, pupil financial payments records, to mention but a few.



### 3.2.5.9. Viewing and Printing Pupils Details in a Class

Figure 14: Jephkapi ESMS Viewing and Printing Pupils Details

Once the details of pupils are in the system, the user is able to view the reports showing the pupils' basic details in a class, and other details like the school population statistics to mention but a few. The reports can be viewed by clicking on the button pupil information and school

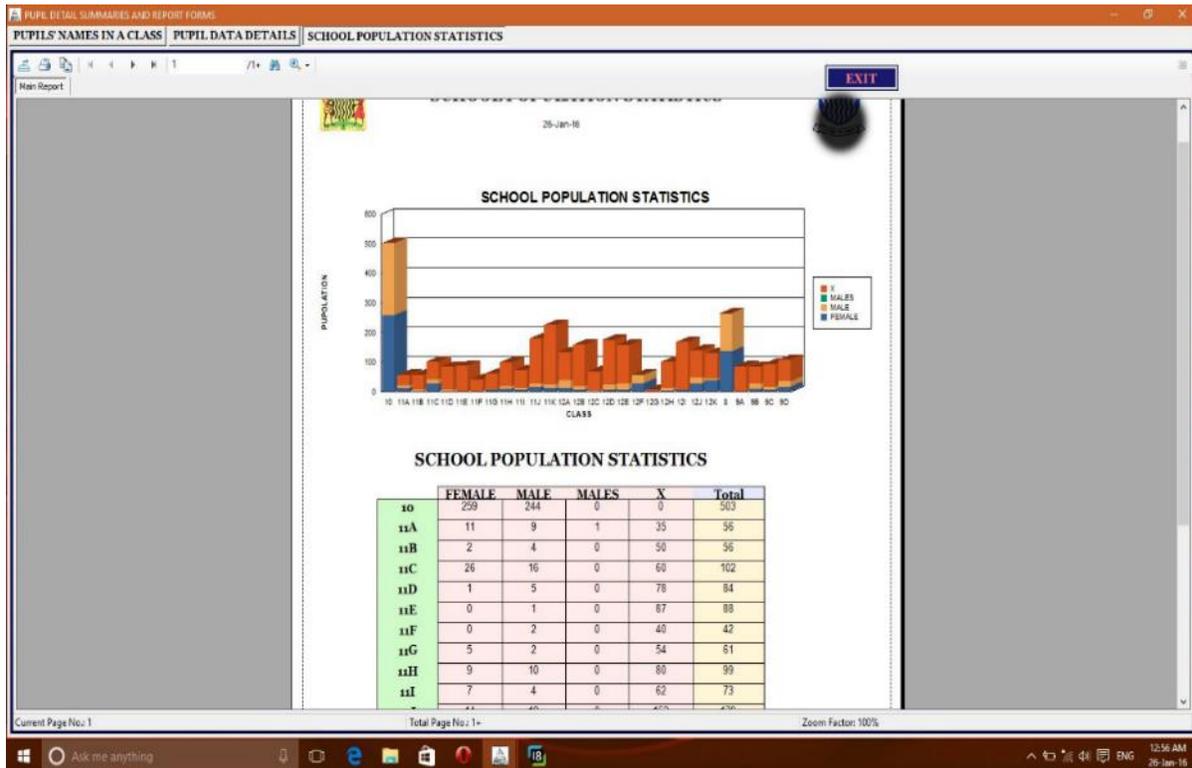


Figure 15: Jephkapi ESMS School Population and Statistics

statistics on the main welcome screen of the client-server application, and the user is able to select to select the class and load the details to view and print out. The user needs to be able also to view the school statistics, by clicking the tab school population, which will display the bar graph to show the distribution of pupils in each class at the school and the gender distribution per class.

### 3.2.5.10. Importing of Data into the Central System Database

The user (who is the System Manager), can import bulk data in to system's main database if it's empty, or if there is a new list of new pupils admitted into school not entered into the system's database. The list of details of pupils to be imported should be stored in the excel sheet 1. This section of the program should be accessible by clicking on the import pupils' details on the database management section.

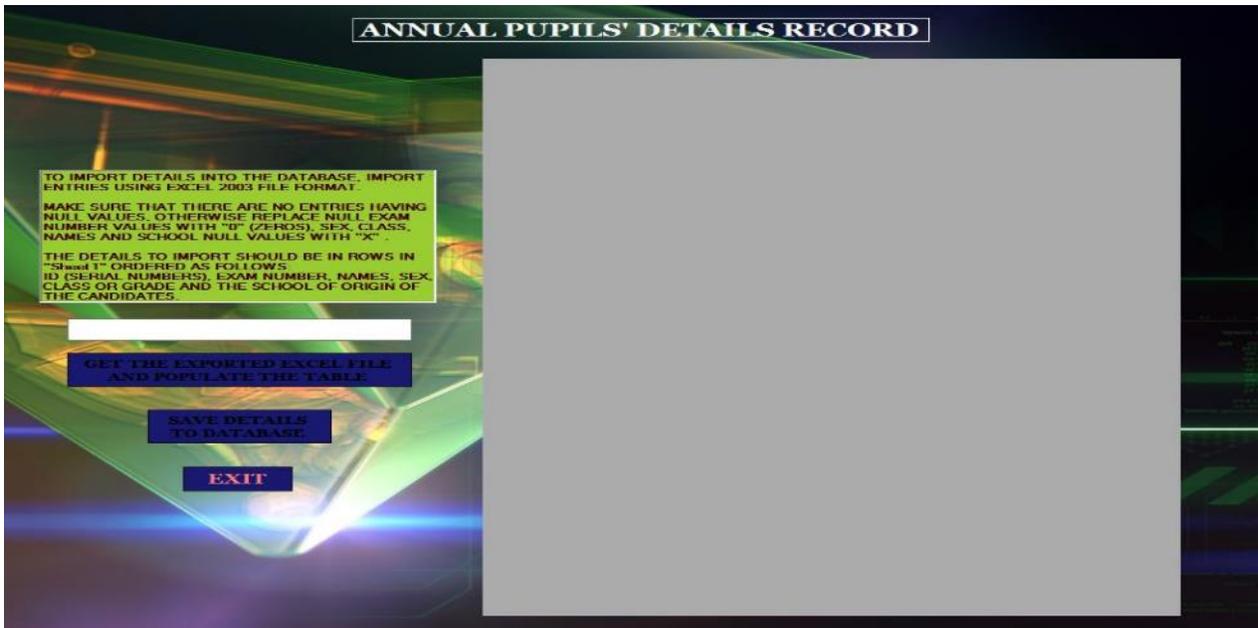
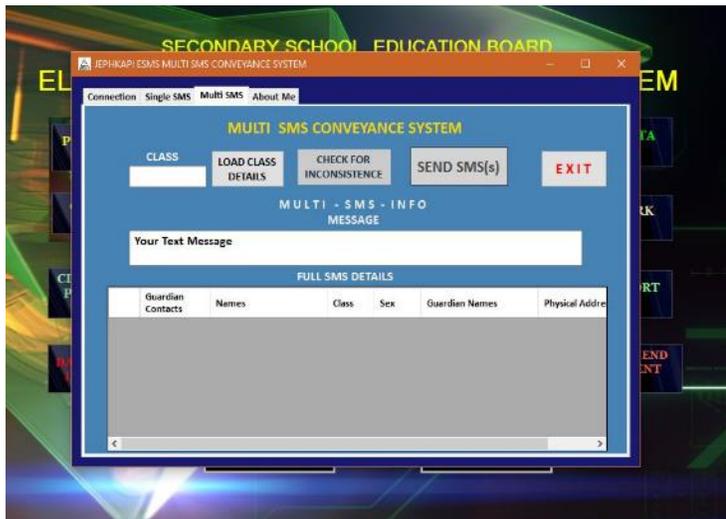


Figure 16: Jephkapi ESMS Pupil Details Import



### 3.2.3.10. Correspondences with Parents

If the school needs to make correspondences with parents, the user should open the multiple SMS conveyance system window, and load the class details. Then the phone numbers automatically appear on the data grid view first column. The user can then type the message to send to parents, connect a dongle or a phone to the respective computer, and send the text message to the various parents by using the COM port of the dongle or the phone.

### 3.2.3.11. The End of Term Test Results

Once the subject teachers' finish marking the scripts for the end of term answered test papers, they need to be able to open the test results data entry window and choose the department that the subject they want

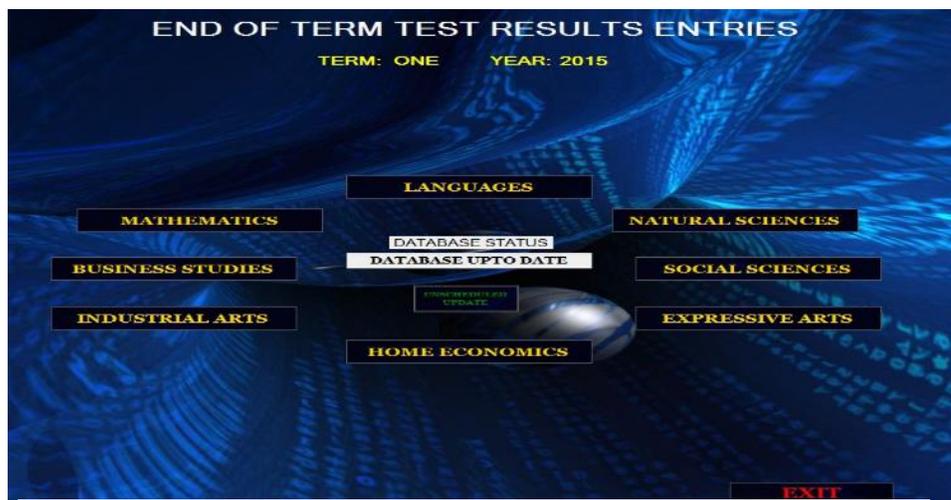


Figure 18: Jephkapi ESMS End of Term Test Results Capture-Choosing Department

to enter the marks for belongs.

Once that departmental window opens, the user needs to be able to enter the class they wish to enter the results for and click the subject button to display the names and column for which they wish to enter on, the marks. The teacher should not waste time to calculate any percentages, they only need to total the raw mark for each pupil for that subject. Then after, put the total marks for that paper in the box total marks, and should be able to press calculate percentages. The software should be able to calculate the percentages for them. Once done, the teacher should then be able to save the data to the server.

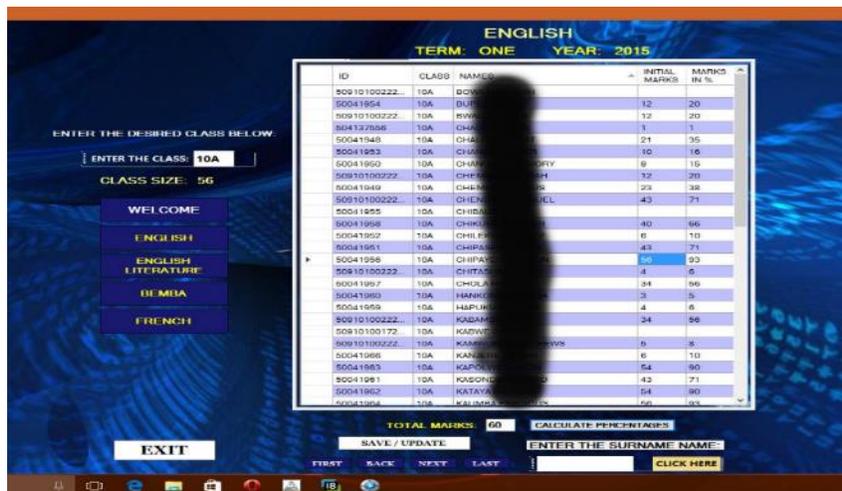


Figure 19: Jephkapi ESMS End of Term Test Results Capture-Entering of Results

### 3.2.3.12. Master Results Data Entry Form

Once the teachers have finished entering the results for the class, the class teacher should be able to use the master results data entry form, and tabulate the number of subjects sat for each pupil, the subjects passed by each pupil, the certification of the results obtained by each pupil and the points scored by each pupil. Once done, he/she should be able to save the data to the school server's central database, by pressing the update button.



Figure 20: Jephkapi ESMS End of Term Test Results Capture-Class Master Marks Entry Form

### 3.2.3.13. Report Forms

Once the subject teachers and class teacher have finished working on the results for the class, the guidance office, or the any user who is part of the school management should be able to view and print the report forms, by calling the report form window which is accessed by pressing button report

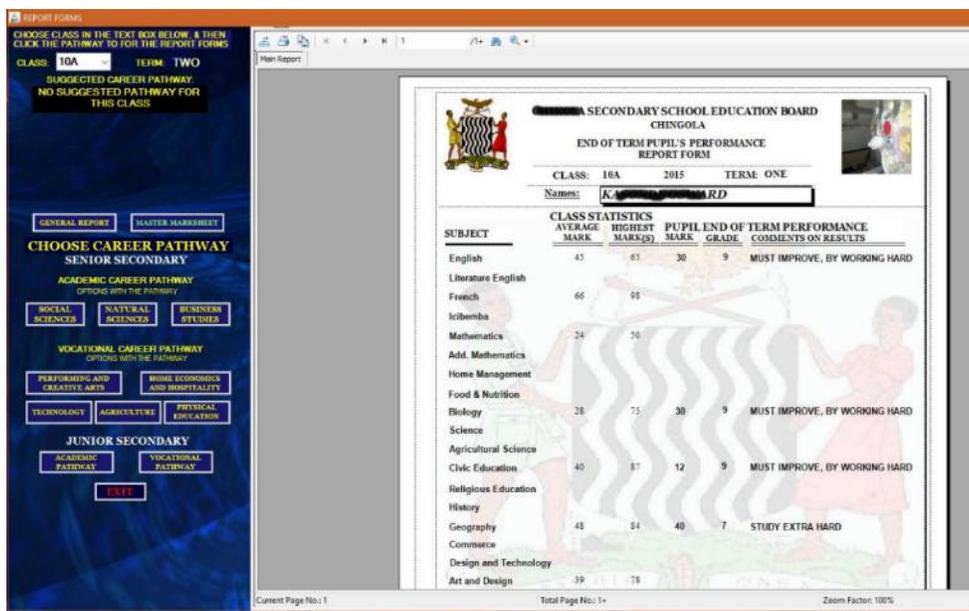


Figure 21: Jephkapi ESMS Report Form for a Class

forms. The user should be able to view specific report forms for a specified class.

### 3.2.3.14. Pupils Financial Records

Apart from users using the electronic school data and record management system (Jephkapi ESMS), they should also be able to use it for capturing pupil payments records. A user who is an accountant of a school should be able to record and view pupils' payment records. The account officer, on the other hand, should not be able to register new pupils, edit nor enter the **pupils'** end of term test performance records. The user (an accountant of a school) should only be able to edit, enter, view and print the payment records of the pupils. If the officer needs to enter a payment, they should be able to click the button pupil payment capture form, if they need to view and print the pupil payment records, they should be able to click on the pupil financial statistics and reports to view and print the pupils' payment records.

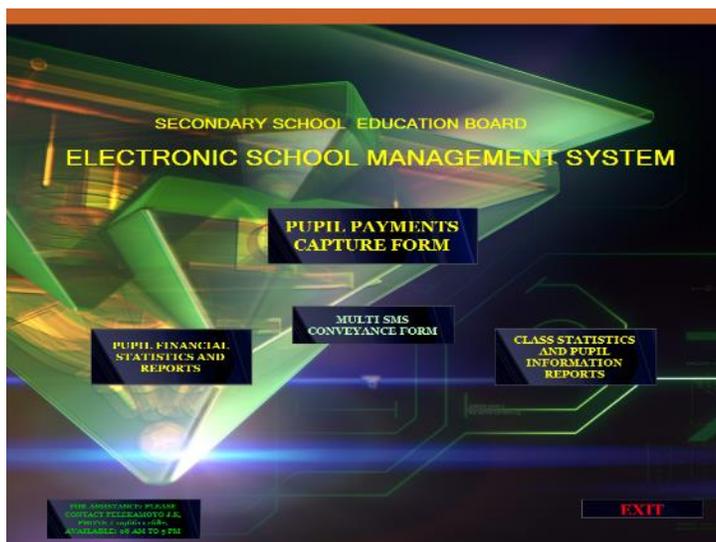


Figure 22: Pupils' Payments Capture and Financial Report Form Screen

### 3.2.3.15. Pupil's Payment Capture Form

With the pupil payment records entry form window open for pupil payments, the user should be able to enter the payment made by a pupil. The system software should be able to automatically calculate the balance to be paid, the total payments made by the pupil, how many times the pupil has made payments and also be able to retrieve the pending balance the pupil needs to pay.

ID	Names	Class	Total Payment	Balance Payment	Payment No	Payment	Receipt Number
16011...	MANAUTE, MILDRED	10	0	0	0	0	0
16011...	CH...	10	0	0	0	0	0
16011...	PH...	10	0	0	0	0	0
16011...	LUN...	10	0	0	0	0	0
16011...	MW...	10	0	0	0	0	0
16011...	CH...	10	0	0	0	0	0
16011...	CH...	10	0	0	0	0	0
16011...	MU...	10	0	0	0	0	0
16011...	CH...	10	0	0	0	0	0
16011...	NAL...	10	0	0	0	0	0
16011...	NAN...	10	0	0	0	0	0
16011...	KAB...	10	0	0	0	0	0

Figure 23: Jephkapi ESMS Pupil's Payment Capture Form

### 3.2.3.16. Pupil's Payment Report Sheets

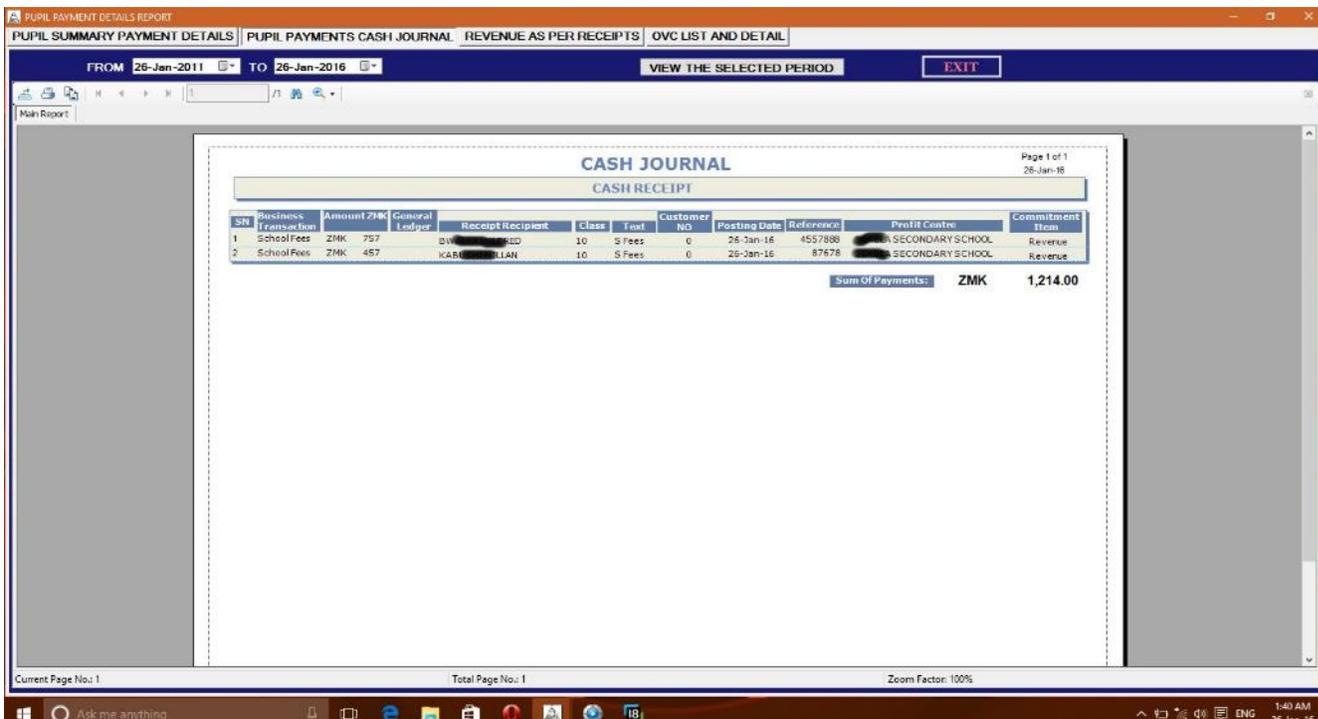


Figure 24: Jephkapi ESMS Pupil Payment Records Reports

If the user who is the accountant in this instance wants to view and print the financial reports, he /she should be able to open the window for pupil financial payments reports. This window should be able to print the pupil payment summary for each class, the pupil payment cash journal, **and the** revenue as per receipts, and the lists of the vulnerable pupils in schools.

### 10.2.6. Jephkapi Esms Database Structures

The electronic school administration and management data capture and records management system database structure is as follows:

- It should have three database structures each serving a specific purpose.
- The main database structure should serve as a base of reference for system and users
- The other database structures should serve the purpose of enabling the users to work offline.

The systems' database structures are split into distinct parts so as to reduce the computer server processing load, data traffic congestion, and occupied by frequently used database structures. The table below illustrates the database structures schemes:

## 10.2.6.1. The School Main Administrative and Management Database Scheme

**Table 1: School Details Table**

SchoolName			
Column Name	Condensed Type	Nullable	
ID	int	No	
Name	nvarchar(MAX)	Yes	
Head_Teacher	nvarchar(MAX)	Yes	
Postal_Address	nvarchar(MAX)	Yes	
Physical_Address	nvarchar(255)	Yes	
City	nvarchar(255)	Yes	
Province	nvarchar(255)	Yes	
Term	nvarchar(255)	Yes	
Year	int	Yes	
LOGO	image	Yes	
School_Fees	int	Yes	
EMIS	int	Yes	

**Table 2: System Users Table**

Users			
Column Name	Condensed Type	Nullable	
USERID	int	No	
USERNAME	nvarchar(MAX)	Yes	
FIRSTNAME	nvarchar(MAX)	Yes	
LASTN <sup>Users</sup>	nvarchar(50)	Yes	
PASSWORD	nvarchar(MAX)	Yes	
TSNUMBER	nvarchar(255)	Yes	
PHONENUM...	nvarchar(255)	Yes	
[LEVEL]	nvarchar(255)	Yes	

**Table 3: Pupils' Payments Records Table**

SchoolFees			
Column Name	Condensed Type	Nullable	
ID	float	No	
ID_MainDB	float	Yes	
Payment_No	int	Yes	
Business_Transaction	nvarchar(255)	Yes	
Amount_ZMK	int	Yes	
General_Ledger	nvarchar(255)	Yes	
Receipt_Recipient	nvarchar(255)	No	
Class_Allocated	nvarchar(255)	Yes	
Text_SF	nvarchar(255)	Yes	
Customer_Number	int	Yes	
Posting_Date	datetime	Yes	
Reference	int	Yes	
Commitment_Item	nvarchar(255)	Yes	
Total_Payments	int	Yes	
Balance_Payment	int	Yes	

**Table 4: Pupils' Vital Statistics and Details Table**

PupilDetails			
Column Name	Condensed Type	Nullable	
ID	float	No	
Names	nvarchar(255)	No	
Class_Allocated	nvarchar(255)	Yes	
Sex	nvarchar(255)	Yes	
Exam_Number	float	Yes	
Date_Of_Birth	datetime	Yes	
Guardian_Names	nvarchar(MAX)	Yes	
Guardian_Contacts	nvarchar(MAX)	Yes	
Physical_Address	nvarchar(MAX)	Yes	
Former_School	nvarchar(MAX)	Yes	
Date_Enrolled	nvarchar(255)	Yes	
Payment	int	Yes	
Receipt_Number	int	Yes	
Date_of_Payment	datetime	Yes	
Payment_No	int	Yes	
PTA_Fees	smallint	Yes	
PTA_Receipt	int	Yes	
Date_of_PTA_Paid	datetime	Yes	
Total_Payments	int	Yes	
Balance_Payment	int	Yes	
Outstanding_Balance	int	Yes	

**Table 5: OVC Details Vital Statistics Table**

OVC Details			
	Column Name	Condensed Type	Nullable
▶	ID	float	No
	Names	nvarchar(255)	Yes
	Sex	nvarchar(255)	Yes
	Date_of_Birth	datetime	Yes
	Guardian_Names	nvarchar(MAX)	Yes
	Guardian_Contacts	nvarchar(MAX)	Yes
	Class_Allocated	nvarchar(255)	Yes
	Type_Of_Orphan	nvarchar(MAX)	Yes
	Guardian_Occupation	nvarchar(MAX)	Yes

10.2.6.2. *The School Test Results Administrative and Management Database Scheme*

**Table 6: Career Pathway Table**

CAREERPATHWAYS			
Column Name	Condensed Type	Nullable	
ID	int	No	
[LEVEL]	nvarchar(255)	Yes	
CAREERS_PATHWAY	nvarchar(255)	Yes	
CLASS	nvarchar(255)	Yes	
CLASS_TEACHER	nvarchar(255)	Yes	

**Table 7: Test One Results Table**

TestOneResults			
Column Name	Condensed Type	Nullable	
ID	float	No	
Names	nvarchar(255)	Yes	
Class_Allocated	nvarchar(255)	Yes	
English	smallint	Yes	
Civic_Education	smallint	Yes	
Religious_Education	smallint	Yes	
History	smallint	Yes	
Geography	smallint	Yes	
Mathematics	smallint	Yes	
Add_Mathematics	smallint	Yes	
Physics	smallint	Yes	
Chemistry	smallint	Yes	
Biology	smallint	Yes	
Science	smallint	Yes	
Computer_Studies	smallint	Yes	
Business_Studies	smallint	Yes	
Principals_Of_Accounts	smallint	Yes	
Social_Studies	smallint	Yes	
Design_Technology	int	Yes	
Foreign_Language	int	Yes	
Physical_Education	int	Yes	
Zambian_Language	int	Yes	
.....			
SatFor	int	Yes	
Passed_How_Many	int	Yes	
Certification	nvarchar(255)	Yes	
Points	int	Yes	
CLASS_TEACHER	nvarchar(255)	Yes	

**Table 8: School Details Table**

SchoolName			
Column Name	Condensed Type	Nullable	
ID	int	No	
Name	nvarchar(MAX)	Yes	
Head_Teacher	nvarchar(MAX)	Yes	
Postal_Address	nvarchar(MAX)	Yes	
Physical_Address	nvarchar(255)	Yes	
City	nvarchar(255)	Yes	
Province	nvarchar(255)	Yes	
Term	nvarchar(255)	Yes	
Year	int	Yes	
LOGO	image	Yes	
School_Fees	int	Yes	
EMIS	int	Yes	
Date_Modified	nvarchar(MAX)	Yes	

**Table 9: End of Term Test Results Table**

EndOfTermTestResults		
Column Name	Condensed Type	Nullable
ID	float	No
Names	nvarchar(255)	Yes
Class_Allocated	nvarchar(255)	Yes
English	smallint	Yes
Civic_Education	smallint	Yes
Religious_Education	smallint	Yes
History	smallint	Yes
Geography	smallint	Yes
Mathematics	smallint	Yes
Add_Mathematics	smallint	Yes
Physics	smallint	Yes
Chemistry	smallint	Yes
Biology	smallint	Yes
Science	smallint	Yes
Computer_Studies	smallint	Yes
Business_Studies	smallint	Yes
Principals_Of_Accounts	smallint	Yes
Social_Studies	smallint	Yes
Design_Technology	int	Yes
Foreign_Language	int	Yes
Physical_Education	int	Yes
Zambian_Language	int	Yes
.....		
SatFor	int	Yes
Passed_How_Many	int	Yes
Certification	nvarchar(255)	Yes
Points	int	Yes
CLASS_TEACHER	nvarchar(255)	Yes

**Table 10: Test Two Results Table**

TestOneResults T2		
Column Name	Condensed Type	Nullable
ID	float	No
Names	nvarchar(255)	Yes
Class_Allocated	nvarchar(255)	Yes
English	smallint	Yes
Civic_Education	smallint	Yes
Religious_Education	smallint	Yes
History	smallint	Yes
Geography	smallint	Yes
Mathematics	smallint	Yes
Add_Mathematics	smallint	Yes
Physics	smallint	Yes
Chemistry	smallint	Yes
Biology	smallint	Yes
Science	smallint	Yes
Computer_Studies	smallint	Yes
Business_Studies	smallint	Yes
Principals_Of_Accounts	smallint	Yes
Social_Studies	smallint	Yes
Design_Technology	int	Yes
Foreign_Language	int	Yes
Physical_Education	int	Yes
Zambian_Language	int	Yes
.....		
SatFor	int	Yes
Passed_How_Many	int	Yes
Certification	nvarchar(255)	Yes
Points	int	Yes
CLASS_TEACHER	nvarchar(255)	Yes

### 10.2.6.3. The Base Cumulative Administrative and Management Database Scheme

**Table 11: Pupils Details Big Data Student IDS Database Table**

PupilDetails		
Column Name	Condensed Type	Nullable
ID	float	No
Exam_Number	float	Yes
Names	nvarchar(255)	No
Sex	nvarchar(255)	Yes
Guardian_Contacts	nvarchar(MAX)	Yes
Physical_Address	nvarchar(MAX)	Yes
Class_Allocated	nvarchar(255)	Yes
Date_Of_Birth	datetime	Yes
Date_Enrolled	nvarchar(255)	Yes
Photo_ID	image	Yes
Barcode	image	Yes
EMIS_ID_Number	nvarchar(MAX)	Yes

**Table 12: Pupils' Payments School Pupil Financial Records Database Table**

PupilDetails		
Column Name	Condensed Type	Nullable
ID	float	No
ID_MainDB	float	No
Names	nvarchar(255)	No
Class_Allocated	nvarchar(255)	Yes
Payment	int	Yes
Receipt_Number	int	Yes
Date_of_Payment	datetime	Yes
Payment_No	int	Yes
PTA_Fees	smallint	Yes
PTA_Receipt	int	Yes
Date_of_PTA_Paid	datetime	Yes
Total_Payments	int	Yes
Balance_Payment	int	Yes
Outstanding_Balance	int	Yes

The databases has a structure that supports the following guidelines:

- All tables contain unique record identifiers as in a normal database structure.
- All database structures and their tables were created from database existing template structures installed in the system software.
- A test case table was created to store the test scenarios the system ran on during system first run and initiation mode.
  - Each test case contains text to be read to the user before the system starts for the first time.

## 10.2.7. Policies and Tactics

This design was attempted to be made as modular as possible. This provides flexibility between component developments. In design, the designer and programmer attempted to partition the development into sections that were created independently of another, and have a clearly defined interface between components. This make compilation of the client-server applications trivial. For example, the database communication internal components and the software interface work together, and are nearly independent of the data that they are transferring to and from the database structure. With a clearly defined interface for the software components, integration of these components is made simple and painless.

This design also took the policy of using coding standards such as Visual C# (c sharp) variable prefixes and caption. Generally, method/property purposes are easily deciphered by their descriptive name.

## **10.2.8. System Design**

### **10.2.8.1. Jephkapi ESMS Client-server Application**

#### **10.2.8.1.1. Classification**

Modular subsystem of the client-server application for the Jephkapi ESMS.

#### **10.2.8.1.2. Purpose**

This modular implements the necessary commands and queries to derive user and pupil information from the database. This modular is used as part of the client-server application to enable the user interact with the system and all its sub-modular.

#### **10.2.8.1.3. Uses/Interactions**

This module is to be used by the client computer. This subsystem is invoked when the user opens it on the desktop or start menu. This enables the user send queries and commands to the server and its database.

#### **10.2.8.1.4. System Component Design and Functions**

This section describes the system main components and component's function over view. The design is illustrated using a pseudo diagram in figure 25 below.

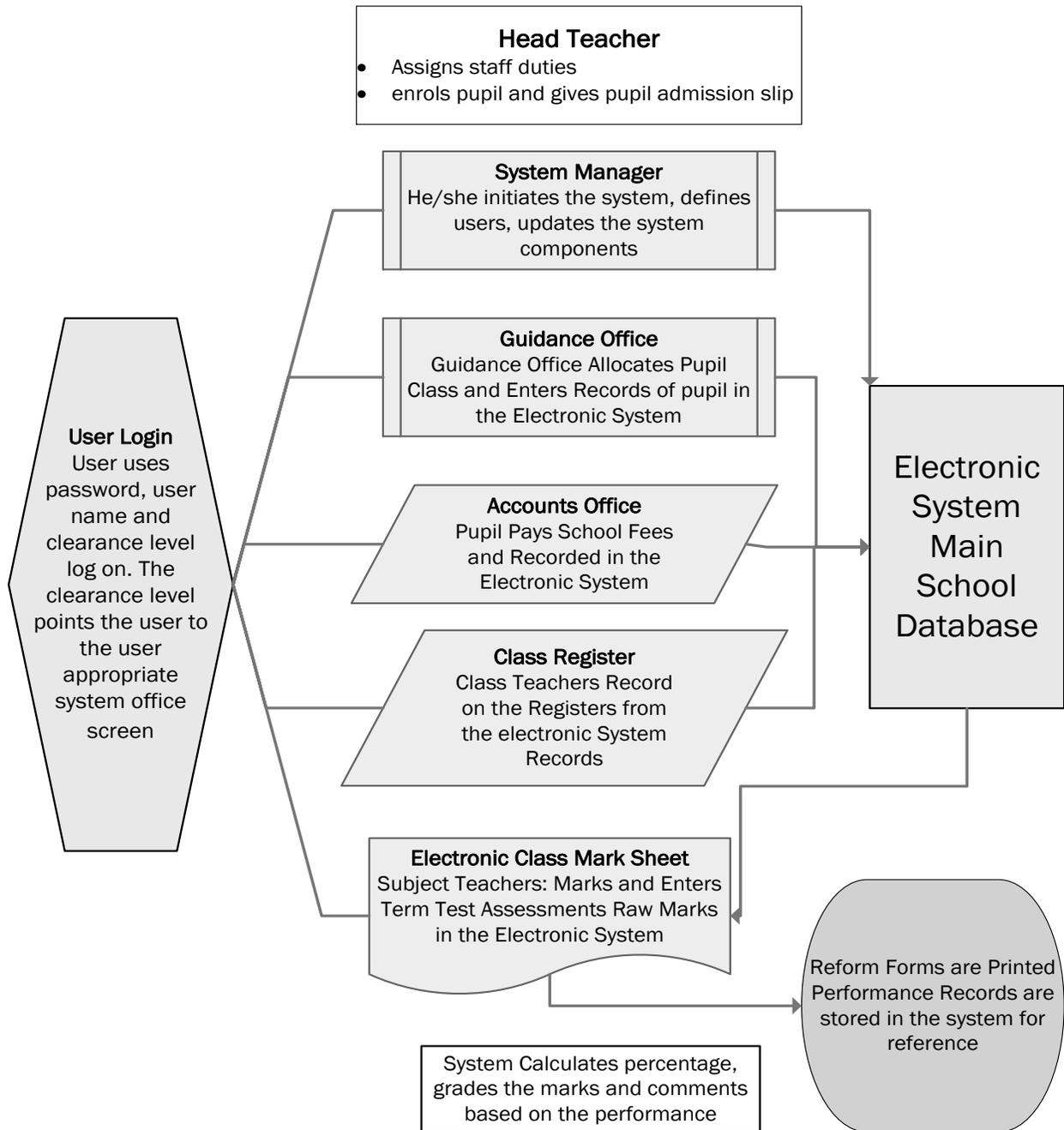


Figure 25: System Design Overview and Component Function

## 10.2.8.1.5. Subsystem Main Components and Functions

### 10.2.8.1.5.1. Database Unique ID Generation Component

```
private void btnADDNEW_Click_2 (object sender, EventArgs e)
{ btnSAVEUPDATE.Enabled = true; panel2.Enabled = true; pupilDetailsDataGridView.Enabled = false; {
    try { int a = Convert.ToInt32(DateTime.Now.ToString("yyMMddhhmm"));
int f = Convert.ToInt32(DateTime.Now.ToString("mmss")); int g = (a - 1000000000) * 10;
int h = Convert.ToInt32(DateTime.Now.ToString("hh")); int i =
    Convert.ToInt32(DateTime.Now.ToString("mm")); int p =
    Convert.ToInt32(DateTime.Now.ToString("ssff")); long ff =
    Convert.ToInt32(DateTime.Now.ToString("yyMMddHH"));
long gf = Convert.ToInt32(DateTime.Now.ToString("mmssff"));
long gg = Convert.ToInt32(DateTime.Now.ToString("hh"));
long hg = ((ff * 10000000) + gf)- 1000000000000000; iDTextBox.Text = hg.ToString();
this.namesTextBox.Text = ""; this.sexComboBox.Text = "";
this.guardian_NamesTextBox.Text = ""; this.guardian_ContactsTextBox.Text = "";
this.former_SchoolTextBox.Text = ""; this.class_AllocatedComboBox.Text = "";
this.txtPhysicalAddress.Text = ""; this.exam_NumberTextBox.Text = "";
    } catch (System.Exception) { MessageBox.Show(new Form() { TopMost = true, BackColor =
    Color.Green }, "ENTER THE DETAILS AND THEN SAVE");
{ int a = Convert.ToInt32(DateTime.Now.ToString("yyMMddhhmm"));
int f = Convert.ToInt32(DateTime.Now.ToString("mmss"));
int g = (a - 1000000000) * 10; int h = Convert.ToInt32(DateTime.Now.ToString("hh"));
int i = Convert.ToInt32(DateTime.Now.ToString("mm"));
int p = Convert.ToInt32(DateTime.Now.ToString("ss"));
long ff = Convert.ToInt32(DateTime.Now.ToString("yyMMddHH"));
long gf = Convert.ToInt32(DateTime.Now.ToString("mmss"));
long gg = Convert.ToInt32(DateTime.Now.ToString("hh"));
long hg = ((ff * 10000000) + gf)- 1000000000000000;
iDTextBox.Text = hg.ToString(); this.namesTextBox.Text = ""; this.sexComboBox.Text = "";
this.guardian_NamesTextBox.Text = ""; this.guardian_ContactsTextBox.Text = "";
this.former_SchoolTextBox.Text = "";
this.class_AllocatedComboBox.Text = ""; this.txtPhysicalAddress.Text = "";
this.exam_NumberTextBox.Text = ""; } }
    finally { if (exam_NumberTextBox.Text.Length == 0)
{ exam_NumberTextBox.Text = "0000000000"; }
btnSAVEUPDATE.Enabled = true;
} } }
```

### Function

The function of the unique database identification (ID) number automatic generation is to ensure that the system should at always generate a 100 unique sequential ID numbers per second. This method makes it almost impossible for at least less than 50 registration officers to generate the same ID number per second. This method uses the principle of time unique feature, seeing that time can never be the same in recent past and present.

## 10.2.8.1.5.2. Password Encryption Component

```
public byte[] AES_Encrypt(byte[] bytesToBeEncrypted, byte[] passwordBytes)
{ byte[] encryptedBytes = null;
  // Set your salt here, change it to meet your security and storage size requirements:
  byte[] saltBytes = new byte[] { 1, 2, 3, 4, 5, 6, 7, 8 };
  using (MemoryStream ms = new MemoryStream())
  { using (RijndaelManaged AES = new RijndaelManaged()) {
    AES.KeySize = 256; AES.BlockSize = 128; var key = new Rfc2898DeriveBytes(passwordBytes, saltBytes,
      1000); AES.Key = key.GetBytes(AES.KeySize / 16); AES.IV = key.GetBytes(AES.BlockSize / 16);
    AES.Mode = CipherMode.CBC;
  } using (var cs = new CryptoStream(ms, AES.CreateEncryptor(), CryptoStreamMode.Write))
  { cs.Write(bytesToBeEncrypted, 0, bytesToBeEncrypted.Length);
    cs.Close(); } encryptedBytes = ms.ToArray(); } }
  return encryptedBytes; }
```

### Function

This method of encrypting passwords provides a one-way password generation path. Thus, it becomes almost impossible for anyone to decrypt the password by using brute force, reverse engineering by using the password hash characters, or by intercepting the passwords during transmission. The system re-encrypts the login details in order to verify the details accuracy with the hash characters stored in the database.

## 10.2.8.1.5.3. System User Definition Component

```
private void button1_Click(object sender, EventArgs e)
{ OleDbCommand OleDbCommand = new OleDbCommand();
  OleDbCommand.Connection = OleDbConnection; if (textBox1.Text != txtPASSWORD.Text)
  { MessageBox.Show("PASSWORDS DO NOT MATCH, RETYPE THEM"); }
  else if (txtUSERNAME.Text.Length < 2 || textBox1.Text.Length == 0 || txtFIRSTNAME.Text.Length < 2 ||
    txtLASTNAME.Text.Length < 2 || txtPHONENUMBER.Text.Length < 10 || txtLEVEL.Text.Length < 8)
  { MessageBox.Show("ONE OF THE REQUIRED FIELDS NEEDS ATTENTION, PLEASE ENTER
    THE DETAILS"); }
  else {
    byte[] bytesToBeEncrypted = Encoding.UTF8.GetBytes(txtPASSWORD.Text);
    byte[] passwordBytes = Encoding.UTF8.GetBytes(txtUSERNAME.Text);
    passwordBytes = SHA256.Create().ComputeHash(passwordBytes);
    byte[] bytesEncrypted = AES_Encrypt(bytesToBeEncrypted, passwordBytes);
    string PASSWORD = Convert.ToBase64String(bytesEncrypted);
    { try {
      OleDbConnection.Open(); OleDbConnectionT.Open(); try
      {
        OleDbCommand update = new OleDbCommand("INSERT INTO Users (USERID, USERNAME,
          FIRSTNAME, LASTNAME, [PASSWORD], TSNUMBER, PHONENUMBER, [LEVEL]) VALUES("
          + txtUSERID.Text + ", " + txtUSERNAME.Text + ", " + txtFIRSTNAME.Text + ", " +
          txtLASTNAME.Text + ", " + PASSWORD + ", " + txtTSNUMBER.Text + ", " +
          txtPHONENUMBER.Text + ", " + txtLEVEL.Text + ")", OleDbConnection);
```

```
int n = update.ExecuteNonQuery();
if (n > 0)
{ MessageBox.Show("USER DETAILS SUCCESSFULLY SAVED"); }
else { MessageBox.Show("USER DETAILS NOT SAVED");
} } catch (System.Exception) {
Try {
OleDbCommand update = new OleDbCommand("UPDATE Users SET USERNAME=" +
txtUSERNAME.Text + ", FIRSTNAME=" + txtFIRSTNAME.Text + ", LASTNAME=" +
txtLASTNAME.Text + ", [PASSWORD]=" + PASSWORD + ", TSNUMBER=" +
txtTSNUMBER.Text + ", PHONENUMBER=" + txtPHONENUMBER.Text + ", [LEVEL]=" +
txtLEVEL.Text + " where USERID=" + txtUSERID.Text + "", OleDbConnection);
int n = update.ExecuteNonQuery(); if (n > 0)
{ MessageBox.Show("USER DETAILS SUCCESSFULLY SAVED"); }
else { MessageBox.Show("USER DETAILS NOT SAVED");
} }
catch (System.Exception ex)
{ System.Windows.Forms.MessageBox.Show(ex.Message);
} }
} catch (Exception ex)
{ } finally
{ OleDbConnection.Close(); OleDbConnection.Dispose(); OleDbConnectionT.Close();
OleDbConnectionT.Dispose();
} } } }
```

## **Function**

This component allows users to be registered in the system, so that they should be able to login into the system and work. This function records the users' basic details which can later be used to reset the login details, should a user forget the login details.

### **10.2.8.1.5.4. Login Component**

```
OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
OleDbConnection; try
{ OleDbCommand = new OleDbCommand("SELECT * FROM Users WHERE USERNAME=" +
txtUSERNAME.Text + " AND [PASSWORD]=" + PASSWORD + " AND [LEVEL]=" +
txtLEVEL.Text + "", OleDbConnection); OleDbConnection.Open();
OleDbDataReader usrRow = OleDbCommand.ExecuteReader(); if (usrRow.HasRows == true)
{ while (usrRow.Read()) { OleDbCommand OleDbCommand2 = new OleDbCommand();
OleDbCommand2.Connection = OleDbConnection2; try
{ OleDbCommand update2 = new OleDbCommand("INSERT INTO Users (USERID, USERNAME,
[PASSWORD], [LEVEL]) VALUES(" + usrRow["USERID"].ToString() + ", " + txtUSERNAME.Text +
", " + PASSWORD + ", " + txtLEVEL.Text + ")", OleDbConnection2);
OleDbConnection2.Open(); update2.ExecuteNonQuery(); OleDbConnection2.Close();
} catch (System.Exception) {
OleDbCommand OleDbCommand3 = new OleDbCommand();
OleDbCommand3.Connection = OleDbConnection3;
```

```
OleDbCommand update3 = new OleDbCommand("UPDATE Users SET USERNAME=" +
    txtUSERNAME.Text + ", [PASSWORD]=" + PASSWORD + ",[LEVEL]=" + txtLEVEL.Text + "
    where USERID=" + usrRow["USERID"].ToString() + "", OleDbConnection3);
OleDbConnection3.Open(); update3.ExecuteNonQuery(); OleDbConnection3.Close();
OleDbConnection3.Dispose(); } }
if (txtLEVEL.Text == "SUBJECT TEACHER")
{ fmSUBJECTTEACHERSMAINCONTROLWINDOW fmTMCW = new
  fmSUBJECTTEACHERSMAINCONTROLWINDOW(); fmTMCW.Show(); this.Hide();
} if (txtLEVEL.Text == "CLASS TEACHER" || txtLEVEL.Text == "SECRETARY")
{ fmCLASSTEACHERSMAINCONTROLWINDOW fmCTMCW = new
  fmCLASSTEACHERSMAINCONTROLWINDOW(); fmCTMCW.Show(); this.Hide();
} if (txtLEVEL.Text == "ADMINISTRATORS AND MANAGERS" || txtLEVEL.Text ==
  "ADMINISTRATOR" || txtLEVEL.Text == "MANAGER")
{ fmADMINISTRATORSVIEWWINDOW fmAMCW = new fmADMINISTRATORSVIEWWINDOW();
  fmAMCW.Show(); this.Hide(); }
if (txtLEVEL.Text == "SYSTEM MANAGER" || txtLEVEL.Text == "HEADTEACHER" || txtLEVEL.Text
  == "SCHOOL MANAGER")
{ fmADMMAINCONTROLWINDOW fmADM CW = new fmADMMAINCONTROLWINDOW();
  fmADM CW.Show(); this.Hide(); }
if (txtLEVEL.Text == "ACADEMIC OFFICE" || txtLEVEL.Text == "GUIDANCE OFFICE" ||
  txtLEVEL.Text == "GUIDANCE TEACHER" || txtLEVEL.Text == "CAREERS AND GUIDANCE" ||
  txtLEVEL.Text == "EXAMINATIONS" || txtLEVEL.Text == "EXAMS OFFICER" || txtLEVEL.Text ==
  "CAREERS OFFICER" || txtLEVEL.Text == "CAREERS TEACHER")
{ fmGUIDANCEOFFICEMAINWINDOW fmGOMW = new fmGUIDANCEOFFICEMAINWINDOW();
  fmGOMW.Show(); this.Hide(); }
```

## **Function**

This component of the software should allow users with proper authentication to use the system. Any user who cannot be authenticated by the system should not be able to use the system. Because some of the data on the system is sensitive, users should only be able to view and edit the records they are cleared to edit and view.

### **10.2.8.1.5.5. Pupil Details Insert and Update Functions**

```
private void btnSAVEUPDATE_Click_2(object sender, EventArgs e)
{ this.TopMost = false; DataTable dt = new DataTable(); DateTime theDate; theDate = DateTime.Now;
  date_EnrolledDateTimePicker.Text = theDate.ToString("ddd, dd-MMM-yyyy, HH:mm:ss");
  this.namesTextBox.Text = this.namesTextBox.Text.ToUpper();
  this.sexComboBox.Text = this.sexComboBox.Text.ToUpper();
  this.guardian_NamesTextBox.Text = this.guardian_NamesTextBox.Text.ToUpper();
  this.guardian_ContactsTextBox.Text = this.guardian_ContactsTextBox.Text.ToUpper();
  this.former_SchoolTextBox.Text = this.former_SchoolTextBox.Text.ToUpper();
  this.class_AllocatedComboBox.Text = this.class_AllocatedComboBox.Text.ToUpper();
  this.txtPhysicalAddress.Text = this.txtPhysicalAddress.Text.ToUpper();
  string CLASSALLO = class_AllocatedComboBox.Text; string SEXCB = sexComboBox.Text;
  { if (idTextBox.Text.Length == 0 || namesTextBox.Text.Length == 0 ||
    exam_NumberTextBox.Text.Length == 0 || SEXCB.Length == 0 || CLASSALLO.Length == 0)
```

```
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA NOT SAVED,
ENTER ALL THE NECESSARY DETAILS (NAMES, EXAM NUMBER, SEX AND/OR CLASS AND
OTHER RELEVANT DETAILS )");
} else
{ OleDbCommand OleDbCommand2 = new OleDbCommand();
OleDbCommand2 = new OleDbCommand("Select * from PupilDetails WHERE Class_Allocated LIKE '%"
+ CLASSALLO + "%' and [Names] LIKE '%" + namesTextBox.Text + "%'", connection2);
OleDbDataAdapter da = new OleDbDataAdapter("Select * from PupilDetails WHERE Class_Allocated
LIKE '%" + CLASSALLO + "%' and [Names] LIKE '%" + namesTextBox.Text + "%'", connection2);
connection2.Open(); OleDbDataReader namesRow = OleDbCommand2.ExecuteReader();
if (namesRow.HasRows == false) { Parallel.Invoke (() => {
try
{ OleDbCommand OleDbCommand=new OleDbCommand();
OleDbCommand.Connection=OleDbConnection;
OleDbCommand update = new OleDbCommand("INSERT INTO PupilDetails(ID, Exam_Number,
[Names], Sex, [Guardian Contacts], [Class Allocated], [Date Enrolled], [Date Of Birth], [Physical
Address]) VALUES(" + idTextBox.Text + ", " + exam_NumberTextBox.Text + ", " +
namesTextBox.Text + ", " + SEXCb + ", " + guardian_ContactsTextBox.Text + ", " + CLASSALLO +
", " + date_EnrolledDateTimePicker.Text + ", " + date_Of_BirthDateTimePicker.Text + ", " +
txtPhysicalAddress.Text + ")", OleDbConnection); OleDbConnection.Open(); int n =
update.ExecuteNonQuery(); OleDbConnection.Close();
// if (n < 1) {MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA
NOT INSERTED IN THE DATABASE"); }
} catch (System.Exception)
{ OleDbCommand OleDbCommand = new OleDbCommand();
OleDbCommand.Connection = OleDbConnection;
OleDbCommand update = new OleDbCommand("UPDATE PupilDetails SET Exam_Number=" +
exam_NumberTextBox.Text + ", [Names]=" + namesTextBox.Text + ", Sex=" + SEXCb + ",
[Guardian Contacts]=" + guardian_ContactsTextBox.Text + ", [Class Allocated]=" + CLASSALLO + ",
[Date Enrolled]=" + date_EnrolledDateTimePicker.Text + ", [Date Of Birth]=" +
date_Of_BirthDateTimePicker.Text + ", [Physical Address]=" + txtPhysicalAddress.Text + " WHERE
ID = " + idTextBox.Text + "", OleDbConnection); OleDbConnection.Open(); int
n=update.ExecuteNonQuery(); OleDbConnection.Close(); OleDbCommand.Dispose();
// if (n > 0) {MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green
}, "DATABASE IS BEING UPDATED SUCCESSFULLY "); }}},() =>{
try
{ OleDbCommand OleDbCommand = new OleDbCommand();
OleDbCommand.Connection = OleDbConnection;
OleDbCommand update = new OleDbCommand("INSERT INTO PupilDetails(ID, Exam_Number,
[Names], Sex, [Date Of Birth], [Guardian Names], [Guardian Contacts], [Former School],
Class_Allocated, [Date Enrolled], [Physical Address]) VALUES(" + idTextBox.Text + ", " +
exam_NumberTextBox.Text + ", " + namesTextBox.Text + ", " + SEXCb + ", " +
date_Of_BirthDateTimePicker.Text + ", " + guardian_NamesTextBox.Text + ", " +
guardian_ContactsTextBox.Text + ", " + former_SchoolTextBox.Text + ", " + CLASSALLO + ", " +
date_EnrolledDateTimePicker.Text + ", " + txtPhysicalAddress.Text + ")", OleDbConnection);
OleDbConnection.Open(); int n = update.ExecuteNonQuery(); OleDbConnection.Close(); if (n > 0)
```

```
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA IS
SUCCESSFULLY SAVED"); } }
catch (System.Exception)
{ OleDbCommand OleDbCommand = new OleDbCommand();
  OleDbCommand.Connection = OleDbConnection;
  OleDbCommand update = new OleDbCommand("UPDATE PupilDetails SET Exam_Number=" +
exam_NumberTextBox.Text + ", [Names]=" + namesTextBox.Text + ", Sex=" + SEXCBCB + ", [Date Of
Birth]=" + date_Of_BirthDateTimePicker.Text + ", [Guardian Names]=" +
guardian_NamesTextBox.Text + ", [Guardian Contacts]=" + guardian_ContactsTextBox.Text + ",
[Former School]=" + former_SchoolTextBox.Text + ", Class_Allocated=" + CLASSALLO + ", [Date
Enrolled]=" + date_EnrolledDateTimePicker.Text + ", [Physical Address]=" + txtPhysicalAddress.Text
+ " WHERE ID =" + iDTextBox.Text + "", OleDbConnection); OleDbConnection.Open(); int n =
update.ExecuteNonQuery(); OleDbConnection.Close(); OleDbCommand.Dispose();
  if (n > 0)
  { MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "THE DATABASE
HAS BEING UPDATED"); } }, () => { try { OleDbCommand OleDbCommand = new
OleDbCommand(); OleDbCommand.Connection = OleDbConnection;
  OleDbCommand update = new OleDbCommand("INSERT INTO PupilDetails(ID, Exam_Number,
[Names], Sex, [Date Of Birth], [Guardian Names], [Guardian Contacts], [Former School],
Class_Allocated, [Date Enrolled], [Physical Address]) VALUES(" + iDTextBox.Text + ", " +
exam_NumberTextBox.Text + ", " + namesTextBox.Text + ", " + SEXCBCB + ", " +
date_Of_BirthDateTimePicker.Text + ", " + guardian_NamesTextBox.Text + ", " +
guardian_ContactsTextBox.Text + ", " + former_SchoolTextBox.Text + ", " + CLASSALLO + ", " +
date_EnrolledDateTimePicker.Text + ", " + txtPhysicalAddress.Text + ")", OleDbConnection);
  OleDbConnection.Open(); int n = update.ExecuteNonQuery(); OleDbConnection.Close();
OleDbCommand.Dispose(); // if (n > 0)
  { // MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA IS
SUCCESSFULLY SAVED");
  } } catch (System.Exception) { OleDbCommand OleDbCommand = new OleDbCommand();
  OleDbCommand.Connection = OleDbConnection;
  OleDbCommand update = new OleDbCommand("UPDATE PupilDetails SET Exam_Number=" +
exam_NumberTextBox.Text + ", [Names]=" + namesTextBox.Text + ", Sex=" + SEXCBCB + ", [Date Of
Birth]=" + date_Of_BirthDateTimePicker.Text + ", [Guardian Names]=" +
guardian_NamesTextBox.Text + ", [Guardian Contacts]=" + guardian_ContactsTextBox.Text + ",
[Former School]=" + former_SchoolTextBox.Text + ", Class_Allocated=" + CLASSALLO + ", [Date
Enrolled]=" + date_EnrolledDateTimePicker.Text + ", [Physical Address]=" + txtPhysicalAddress.Text
+ " WHERE ID =" + iDTextBox.Text + "", OleDbConnection); OleDbConnection.Open();
  int n = update.ExecuteNonQuery(); OleDbConnection.Close(); OleDbCommand.Dispose();
  // if (n > 0) {
// MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "THE DATABASE HAS
BEING UPDATED");
  } }, () => { try { OleDbCommand OleDbCommand = new OleDbCommand();
OleDbCommand.Connection = OleDbConnection;
OleDbCommand update = new OleDbCommand("INSERT INTO PupilEndOfTermResults(ID, [Exam
Number], [Names], [Class Allocated]) VALUES (" + iDTextBox.Text + ", " +
exam_NumberTextBox.Text + ", " + namesTextBox.Text + ", " + CLASSALLO + ")",
```

```
OleDbConnection); OleDbConnection.Open(); int n =
update.ExecuteNonQuery();OleDbConnection.Close(); OleDbCommand.Dispose();
if (n == 0)
{MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA SAVED NOT
SAVED IN THE TEST DATABASE"); } } catch (System.Exception) {
OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
OleDbConnection; OleDbCommand update = new OleDbCommand("UPDATE PupilEndOfTermResults
SET [Exam Number]=" + exam_NumberTextBox.Text + ", [Names]=" + namesTextBox.Text + ", [Class
Allocated]=" + CLASSALLO + " WHERE ID = " + iDTextBox.Text + "", OleDbConnection);
OleDbConnection.Open(); int n = update.ExecuteNonQuery(); OleDbConnection.Close();
OleDbCommand.Dispose();
if (n == 0) {
MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA NOT UPDATED IN
THE TEST DATABASE");
}}, () =>{
try { OleDbCommand OleDbCommand = new OleDbCommand();
OleDbCommand.Connection = OleDbConnection;
OleDbCommand update = new OleDbCommand("INSERT INTO PupilEndOfTermResultsT2(ID,
[Exam Number], [Names], [Class Allocated]) VALUES (" + iDTextBox.Text + ", " +
exam_NumberTextBox.Text + ", " + namesTextBox.Text + ", " + CLASSALLO + ")",
OleDbConnection); OleDbConnection.Open(); int n = update.ExecuteNonQuery();
OleDbConnection.Close(); OleDbCommand.Dispose(); if (n == 0)
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA SAVED NOT
SAVED IN THE TEST DATABASE");
} } catch (System.Exception) { OleDbCommand OleDbCommand = new OleDbCommand();
OleDbCommand.Connection = OleDbConnection;
OleDbCommand update = new OleDbCommand("UPDATE PupilEndOfTermResultsT2 SET [Exam
Number]=" + exam_NumberTextBox.Text + ", [Names]=" + namesTextBox.Text + ", [Class
Allocated]=" + CLASSALLO + " WHERE ID = " + iDTextBox.Text + "", OleDbConnection);
OleDbConnection.Open(); int n = update.ExecuteNonQuery(); OleDbConnection.Close();
OleDbCommand.Dispose();
if (n == 0)
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA NOT
UPDATED IN THE TEST DATABASE");
}}, () =>{
try
{ OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
OleDbConnection; OleDbCommand update = new OleDbCommand("INSERT INTO
PupilEndOfTermResultsT3 (ID, [Exam Number], [Names], [Class Allocated]) VALUES (" +
iDTextBox.Text + ", " + exam_NumberTextBox.Text + ", " + namesTextBox.Text + ", " +
CLASSALLO + ")", OleDbConnection); OleDbConnection.Open(); int n = update.ExecuteNonQuery();
OleDbConnection.Close(); OleDbCommand.Dispose();
if (n == 0) {
MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA SAVED NOT
SAVED IN THE TEST DATABASE");
} } catch (System.Exception)
```

```
{ OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
OleDbConnection; OleDbCommand update = new OleDbCommand("UPDATE
PupilEndOfTermResultsT3 SET [Exam Number]=" + exam_NumberTextBox.Text + ", [Names]=" +
namesTextBox.Text + ", [Class Allocated]=" + CLASSALLO + " WHERE ID =" + iDTextBox.Text +
"", OleDbConnection); OleDbConnection.Open(); int n = update.ExecuteNonQuery();
OleDbConnection.Close(); OleDbCommand.Dispose();
if (n == 0)
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA NOT
UPDATED IN THE TEST DATABASE");
}}, () => {try
{ OleDbCommand OleDbCommand = new OleDbCommand();
OleDbCommand.Connection = OleDbConnection;
OleDbCommand update = new OleDbCommand("INSERT INTO TestOneResults (ID, [Exam Number],
[Names], [Class Allocated]) VALUES (" + iDTextBox.Text + ", " + exam_NumberTextBox.Text + ", " +
namesTextBox.Text + ", " + CLASSALLO + ")", OleDbConnection);
OleDbConnection.Open(); int n = update.ExecuteNonQuery(); OleDbConnection.Close();
OleDbCommand.Dispose(); if (n == 0)
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA SAVED NOT
SAVED IN THE TEST DATABASE");
}}
catch (System.Exception)
{ OleDbCommand OleDbCommand = new OleDbCommand();
OleDbCommand.Connection = OleDbConnection;
OleDbCommand update = new OleDbCommand("UPDATE TestOneResults SET [Exam Number]=" +
exam_NumberTextBox.Text + ", [Names]=" + namesTextBox.Text + ", [Class Allocated]=" +
CLASSALLO + " WHERE ID =" + iDTextBox.Text + "", OleDbConnection);
OleDbConnection.Open(); int n = update.ExecuteNonQuery(); OleDbConnection.Close();
OleDbCommand.Dispose();
if (n == 0)
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA NOT
UPDATED IN THE TEST DATABASE");
}}, () =>{
try
{ OleDbCommand OleDbCommand = new OleDbCommand();
OleDbCommand.Connection = OleDbConnection;
OleDbCommand update = new OleDbCommand("INSERT INTO TestOneResultsT2 (ID, [Exam
Number], [Names], [Class Allocated]) VALUES (" + iDTextBox.Text + ", " +
exam_NumberTextBox.Text + ", " + namesTextBox.Text + ", " + CLASSALLO + ")",
OleDbConnection); OleDbConnection.Open(); int n = update.ExecuteNonQuery();
OleDbConnection.Close(); OleDbCommand.Dispose();
if (n == 0)
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA SAVED NOT
SAVED IN THE TEST DATABASE");
}} catch (System.Exception)
{ OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
OleDbConnection; OleDbCommand update = new OleDbCommand("UPDATE TestOneResultsT2 SET
```

```
[Exam Number]=" + exam_NumberTextBox.Text + ", [Names]=" + namesTextBox.Text + ", [Class
Allocated]=" + CLASSALLO + " WHERE ID =" + iDTextBox.Text + "", OleDbConnection);
OleDbConnection.Open(); int n = update.ExecuteNonQuery(); OleDbConnection.Close();
OleDbCommand.Dispose();
if (n == 0)
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA NOT
UPDATED IN THE TEST DATABASE");
}}, () =>{
try
{ OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
OleDbConnection; OleDbCommand update = new OleDbCommand("INSERT INTO TestOneResultsT3
(ID, [Exam Number], [Names], [Class Allocated]) VALUES (" + iDTextBox.Text + ", " +
exam_NumberTextBox.Text + ", " + namesTextBox.Text + ", " + CLASSALLO + ")");
OleDbConnection.Open(); int n = update.ExecuteNonQuery();
OleDbConnection.Close(); OleDbCommand.Dispose();
if (n == 0)
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA SAVED NOT
SAVED IN THE TEST DATABASE");
}} catch (System.Exception) {
OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
OleDbConnection; OleDbCommand update = new OleDbCommand("UPDATE TestOneResultsT3 SET
[Exam Number]=" + exam_NumberTextBox.Text + ", [Names]=" + namesTextBox.Text + ", [Class
Allocated]=" + CLASSALLO + " WHERE ID =" + iDTextBox.Text + "", OleDbConnection);
OleDbConnection.Open(); int n = update.ExecuteNonQuery(); OleDbConnection.Close();
OleDbCommand.Dispose();
if (n == 0)
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA NOT
UPDATED IN THE TEST DATABASE");
}}, () =>{
try {string a;
a = DateTime.Now.ToString("ddd, dd-MMM-yyyy, HH:mm:ss"); OleDbCommand OleDbCommand =
new OleDbCommand(); OleDbCommand.Connection = OleDbConnection; OleDbCommand update =
new OleDbCommand("UPDATE SchoolName SET DateModified=" + a + " WHERE ID =1",
OleDbConnection); OleDbConnection.Open(); update.ExecuteNonQuery(); OleDbConnection.Close();
OleDbCommand.Dispose();
}catch (System.Exception) { // }} );
}else
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "YOU ARE NOT
CONNECTED TO THE SCHOOL SERVER, PLEASE CONNECT!");
}}
else if (namesRow.HasRows == true){ da.Fill(dt); pupilDetailsBindingSource.DataSource = dt;
if (File.Exists(@"\SCHOOLSERVER\SchoolDatabase\SCHOOLMANAGEMENT.mdb"))
{ if (pupilDetailsDataGridView.Enabled == true)
{
// DialogResult dr =MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "THE
PUPIL DETAILS WILL BE MODIFIED, DO YOU WANT TO PROCEED?", "Message",
MessageBoxButtons.YesNo, MessageBoxIcon.Information);
```

```
// if (dr == DialogResult.Yes)
{ Parallel.Invoke() =>{
try{ OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
OleDbConnection; OleDbCommand update = new OleDbCommand("INSERT INTO PupilDetails(ID,
Exam_Number, [Names], Sex, [Guardian Contacts], [Class Allocated], [Date Enrolled], [Date Of Birth],
[Physical Address]) VALUES(" + iDTextBox.Text + ", " + exam_NumberTextBox.Text + ", " +
namesTextBox.Text + ", " + SEXCb + ", " + guardian_ContactsTextBox.Text + ", " + CLASSALLO +
", " + date_EnrolledDateTimePicker.Text + ", " + date_Of_BirthDateTimePicker.Text + ", " +
txtPhysicalAddress.Text + ")", OleDbConnection); OleDbConnection.Open(); int n =
update.ExecuteNonQuery(); OleDbConnection.Close(); OleDbCommand.Dispose();
// if (n < 1) {MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA NOT
INSERTED IN THE DATABASE"); }
}
catch (System.Exception)
{
OleDbCommand OleDbCommand = new OleDbCommand();
OleDbCommand.Connection = OleDbConnection;
OleDbCommand update = new OleDbCommand("UPDATE PupilDetails SET Exam_Number=" +
exam_NumberTextBox.Text + ", [Names]=" + namesTextBox.Text + ", Sex=" + SEXCb + ",
[Guardian Contacts]=" + guardian_ContactsTextBox.Text + ", [Class Allocated]=" + CLASSALLO + ",
[Date Enrolled]=" + date_EnrolledDateTimePicker.Text + ", [Date Of Birth]=" +
date_Of_BirthDateTimePicker.Text + ", [Physical Address]=" + txtPhysicalAddress.Text + " WHERE
ID = " + iDTextBox.Text + "", OleDbConnection); OleDbConnection.Open(); int n =
update.ExecuteNonQuery(); OleDbConnection.Close(); OleDbCommand.Dispose();
// if (n > 0) {MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATABASE
IS BEING UPDATED SUCCESSFULLY "); }
}},() => {
try{ OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
OleDbConnection; OleDbCommand update = new OleDbCommand("INSERT INTO PupilDetails(ID,
Exam_Number, [Names], Sex, [Date Of Birth], [Guardian Names], [Guardian Contacts], [Former
School], Class_Allocated, [Date Enrolled], [Physical Address]) VALUES(" + iDTextBox.Text + ", " +
exam_NumberTextBox.Text + ", " + namesTextBox.Text + ", " + SEXCb + ", " +
date_Of_BirthDateTimePicker.Text + ", " + guardian_NamesTextBox.Text + ", " +
guardian_ContactsTextBox.Text + ", " + former_SchoolTextBox.Text + ", " + CLASSALLO + ", " +
date_EnrolledDateTimePicker.Text + ", " + txtPhysicalAddress.Text + ")", OleDbConnection);
OleDbConnection.Open(); int n = update.ExecuteNonQuery(); OleDbConnection.Close();
OleDbCommand.Dispose();
if (n > 0)
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA IS
SUCCESSFULLY SAVED");
} } catch (System.Exception)
{ OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
OleDbConnection; OleDbCommand update = new OleDbCommand("UPDATE PupilDetails SET
Exam_Number=" + exam_NumberTextBox.Text + ", [Names]=" + namesTextBox.Text + ", Sex=" +
SEXCb + ", [Date Of Birth]=" + date_Of_BirthDateTimePicker.Text + ", [Guardian Names]=" +
guardian_NamesTextBox.Text + ", [Guardian Contacts]=" + guardian_ContactsTextBox.Text + ",
[Former School]=" + former_SchoolTextBox.Text + ", Class_Allocated=" + CLASSALLO + ", [Date
```

```
Enrolled]=" + date_EnrolledDateTimePicker.Text + ", [Physical Address]=" + txtPhysicalAddress.Text
+ " WHERE ID =" + iDTextBox.Text + "", OleDbConnection); OleDbConnection.Open(); int n =
update.ExecuteNonQuery(); OleDbConnection.Close(); OleDbCommand.Dispose();
if (n > 0)
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "THE DATABASE HAS
BEING UPDATED"); }}, () =>
{ try
{ OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
OleDbConnection; OleDbCommand update = new OleDbCommand("INSERT INTO PupilDetails(ID,
Exam_Number, [Names], Sex, [Date Of Birth], [Guardian Names], [Guardian Contacts], [Former
School], Class_Allocated, [Date Enrolled], [Physical Address]) VALUES(" + iDTextBox.Text + ", " +
exam_NumberTextBox.Text + ", " + namesTextBox.Text + ", " + SEXCb + ", " +
date_Of_BirthDateTimePicker.Text + ", " + guardian_NamesTextBox.Text + ", " +
guardian_ContactsTextBox.Text + ", " + former_SchoolTextBox.Text + ", " + CLASSALLO + ", " +
date_EnrolledDateTimePicker.Text + ", " + txtPhysicalAddress.Text + ")", OleDbConnection);
OleDbConnection.Open(); int n = update.ExecuteNonQuery(); OleDbConnection.Close();
OleDbCommand.Dispose(); // if (n > 0)
{// MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA IS
SUCCESSFULLY SAVED"); }}
catch (System.Exception)
{ OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
OleDbConnection; OleDbCommand update = new OleDbCommand("UPDATE PupilDetails SET
Exam_Number=" + exam_NumberTextBox.Text + ", [Names]=" + namesTextBox.Text + ", Sex=" +
SEXCb + ", [Date Of Birth]=" + date_Of_BirthDateTimePicker.Text + ", [Guardian Names]=" +
guardian_NamesTextBox.Text + ", [Guardian Contacts]=" + guardian_ContactsTextBox.Text + ",
[Former School]=" + former_SchoolTextBox.Text + ", Class_Allocated=" + CLASSALLO + ", [Date
Enrolled]=" + date_EnrolledDateTimePicker.Text + ", [Physical Address]=" + txtPhysicalAddress.Text
+ " WHERE ID =" + iDTextBox.Text + "", OleDbConnection); OleDbConnection.Open(); int n =
update.ExecuteNonQuery(); OleDbConnection.Close(); OleDbCommand.Dispose();
// if (n > 0) {
// MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "THE DATABASE HAS
BEING UPDATED"); }}, () =>{
try
{ OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
OleDbConnection; OleDbCommand update = new OleDbCommand("INSERT INTO
PupilEndOfTermResults(ID, [Exam Number], [Names], [Class Allocated]) VALUES (" +
iDTextBox.Text + ", " + exam_NumberTextBox.Text + ", " + namesTextBox.Text + ", " +
CLASSALLO + ")", OleDbConnection); OleDbConnection.Open(); int n = update.ExecuteNonQuery();
OleDbConnection.Close(); OleDbCommand.Dispose();
if (n == 0)
{MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA SAVED NOT
SAVED IN THE TEST DATABASE");
}} catch (System.Exception)
{ OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
OleDbConnection; OleDbCommand update = new OleDbCommand("UPDATE PupilEndOfTermResults
SET [Exam Number]=" + exam_NumberTextBox.Text + ", [Names]=" + namesTextBox.Text + ", [Class
Allocated]=" + CLASSALLO + " WHERE ID =" + iDTextBox.Text + "", OleDbConnection);
```

```
OleDbConnection.Open(); int n = update.ExecuteNonQuery(); OleDbConnection.Close();
OleDbCommand.Dispose();
if (n == 0)
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA NOT UPDATED
IN THE TEST DATABASE");
}}, () => {
try
{ OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
OleDbConnection; OleDbCommand update = new OleDbCommand("INSERT INTO
PupilEndOfTermResultsT2(ID, [Exam Number], [Names], [Class Allocated]) VALUES (" +
iDTextBox.Text + ", " + exam_NumberTextBox.Text + ", " + namesTextBox.Text + ", " +
CLASSALLO + ")", OleDbConnection); OleDbConnection.Open(); int n = update.ExecuteNonQuery();
OleDbConnection.Close(); OleDbCommand.Dispose();
if (n == 0)
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA SAVED NOT
SAVED IN THE TEST DATABASE");
}} catch (System.Exception)
{ OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
OleDbConnection; OleDbCommand update = new OleDbCommand("UPDATE
PupilEndOfTermResultsT2 SET [Exam Number]=" + exam_NumberTextBox.Text + ", [Names]=" +
namesTextBox.Text + ", [Class Allocated]=" + CLASSALLO + " WHERE ID = " + iDTextBox.Text +
"", OleDbConnection); OleDbConnection.Open(); int n = update.ExecuteNonQuery();
OleDbConnection.Close(); OleDbCommand.Dispose();
if (n == 0)
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA NOT
UPDATED IN THE TEST DATABASE");
}}, () =>
{ try
{ OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
OleDbConnection; OleDbCommand update = new OleDbCommand("INSERT INTO
PupilEndOfTermResultsT3 (ID, [Exam Number], [Names], [Class Allocated]) VALUES (" +
iDTextBox.Text + ", " + exam_NumberTextBox.Text + ", " + namesTextBox.Text + ", " +
CLASSALLO + ")", OleDbConnection); OleDbConnection.Open(); int n = update.ExecuteNonQuery();
OleDbConnection.Close(); OleDbCommand.Dispose();
if (n == 0)
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA SAVED NOT
SAVED IN THE TEST DATABASE");
}} catch (System.Exception)
{ OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
OleDbConnection; OleDbCommand update = new OleDbCommand("UPDATE
PupilEndOfTermResultsT3 SET [Exam Number]=" + exam_NumberTextBox.Text + ", [Names]=" +
namesTextBox.Text + ", [Class Allocated]=" + CLASSALLO + " WHERE ID = " + iDTextBox.Text +
"", OleDbConnection); OleDbConnection.Open(); int n = update.ExecuteNonQuery();
OleDbConnection.Close(); OleDbCommand.Dispose();
if (n == 0)
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA NOT
UPDATED IN THE TEST DATABASE");
```

```
    }}, () =>{
try{ OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
    OleDbConnection; OleDbCommand update = new OleDbCommand("INSERT INTO TestOneResults
    (ID, [Exam Number], [Names], [Class Allocated]) VALUES (" + iDTextBox.Text + ", " +
    exam_NumberTextBox.Text + ", " + namesTextBox.Text + ", " + CLASSALLO + ")",
    OleDbConnection); OleDbConnection.Open(); int n = update.ExecuteNonQuery();
    OleDbConnection.Close(); OleDbCommand.Dispose();
if (n == 0)
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA SAVED NOT
    SAVED IN THE TEST DATABASE");
} } catch (System.Exception)
{ OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
    OleDbConnection; OleDbCommand update = new OleDbCommand("UPDATE TestOneResults SET
    [Exam Number]=" + exam_NumberTextBox.Text + ", [Names]=" + namesTextBox.Text + ", [Class
    Allocated]=" + CLASSALLO + " WHERE ID = " + iDTextBox.Text + "", OleDbConnection);
    OleDbConnection.Open(); int n = update.ExecuteNonQuery(); OleDbConnection.Close();
    OleDbCommand.Dispose();
if (n == 0)
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA NOT UPDATED
    IN THE TEST DATABASE");
} }}, () =>
{ try
{ OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
    OleDbConnection;
    OleDbCommand update = new OleDbCommand("INSERT INTO TestOneResultsT2 (ID, [Exam
    Number], [Names], [Class Allocated]) VALUES (" + iDTextBox.Text + ", " +
    exam_NumberTextBox.Text + ", " + namesTextBox.Text + ", " + CLASSALLO + ")",
    OleDbConnection); OleDbConnection.Open(); int n = update.ExecuteNonQuery();
    OleDbConnection.Close(); OleDbCommand.Dispose();
    if (n == 0)
    { MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA SAVED NOT
    SAVED IN THE TEST DATABASE");
    } } catch (System.Exception)
{ OleDbCommand OleDbCommand = new OleDbCommand();
    OleDbCommand.Connection = OleDbConnection;
    OleDbCommand update = new OleDbCommand("UPDATE TestOneResultsT2 SET [Exam Number]="
    + exam_NumberTextBox.Text + ", [Names]=" + namesTextBox.Text + ", [Class Allocated]=" +
    CLASSALLO + " WHERE ID = " + iDTextBox.Text + "", OleDbConnection);
    OleDbConnection.Open(); int n = update.ExecuteNonQuery(); OleDbConnection.Close();
    OleDbCommand.Dispose();
    if (n == 0)
    { MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA NOT
    UPDATED IN THE TEST DATABASE");
    } }}, () => { try
{ OleDbCommand OleDbCommand = new OleDbCommand();
    OleDbCommand.Connection = OleDbConnection;
```

```
OleDbCommand update = new OleDbCommand("INSERT INTO TestOneResultsT3 (ID, [Exam  
Number], [Names], [Class Allocated]) VALUES (" + iDTextBox.Text + ", " +  
exam_NumberTextBox.Text + ", " + namesTextBox.Text + ", " + CLASSALLO + ")",  
OleDbConnection); OleDbConnection.Open(); int n = update.ExecuteNonQuery();  
OleDbConnection.Close(); OleDbCommand.Dispose();  
if (n == 0)  
{ MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA SAVED NOT  
SAVED IN THE TEST DATABASE");  
} } catch (System.Exception) { OleDbCommand OleDbCommand = new OleDbCommand();  
OleDbCommand.Connection = OleDbConnection;  
OleDbCommand update = new OleDbCommand("UPDATE TestOneResultsT3 SET [Exam Number]="  
+ exam_NumberTextBox.Text + ", [Names]=" + namesTextBox.Text + ", [Class Allocated]=" +  
CLASSALLO + " WHERE ID = " + iDTextBox.Text + "", OleDbConnection);  
OleDbConnection.Open(); int n = update.ExecuteNonQuery(); OleDbConnection.Close();  
OleDbCommand.Dispose();  
if (n == 0) {  
MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "DATA NOT UPDATED IN  
THE TEST DATABASE"); }}, () => { try {  
string a;  
a = DateTime.Now.ToString("ddd, dd-MMM-yyyy, HH:mm:ss");  
OleDbCommand OleDbCommand = new OleDbCommand();  
OleDbCommand.Connection = OleDbConnection;  
OleDbCommand update = new OleDbCommand("UPDATE SchoolName SET DateModified=" + a + "  
WHERE ID =1", OleDbConnection); OleDbConnection.Open(); update.ExecuteNonQuery();  
OleDbConnection.Close(); OleDbCommand.Dispose(); } catch (System.Exception) { } } } else {  
btnSAVEUPDATE.Enabled = false; panel2.Enabled = false; MessageBox.Show(new Form() { TopMost =  
true, BackColor = Color.Green }, "USE THE SEARCH FUNCTION, EDIT THE PUPIL DETAILS AND  
UPDATE THE DETAILS"); } } else {  
MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Green }, "YOU ARE NOT  
CONNECTED TO THE SCHOOL SERVER, PLEASE CONNECT!"); } } connection2.Close();  
}} this.TopMost = true; }
```

## **Function**

This component should enable the user to register and capture pupils' details. This component automatically records pupils' relevant details in all the respective databases and the tables. Because the component employs parallel computing, data is sent at once as a bunch to the server. To avoid duplication of pupil records in the database, the system application component checks the main database table if the entry exists before saving it. Should a name with the equivalent details exist, the system will not save the record, but should prompt the user to edit the details or not.

### **10.2.8.1.5.6. Picture Insert and Update Component**

```
{Linear barcode = new Linear(); barcode.Type = BarcodeType.CODE128; barcode.Data =  
txtEMISIDNumber.Text; System.Drawing.Graphics g = this.picBarcode.CreateGraphics();
```

```
barcode.drawBarcode(); g.FillRectangle(new
    System.Drawing.SolidBrush(System.Drawing.SystemColors.Control),
new Rectangle(64, 2, picBarcode.Width, picBarcode.Height)); System.Drawing.Bitmap xbmc =
    barcode.drawBarcode(); this.picBarcode.Image = xbmc;
try
    {MemoryStream ms = new MemoryStream(); picBarcode.Image.Save(ms,
        System.Drawing.Imaging.ImageFormat.Jpeg); byte[] BarCodePic = ms.GetBuffer();
MemoryStream ms0 = new MemoryStream(); photo_IDPictureBox.Image.Save(ms0,
        System.Drawing.Imaging.ImageFormat.Jpeg); byte[] imageBytes = ms0.GetBuffer();
OleDbCommand OleDbCommand = new OleDbCommand(); OleDbCommand.Connection =
    OleDbConnection; OleDbCommand update = new OleDbCommand("UPDATE PupilDetails SET
    Exam_Number=" + exam_NumberTextBox.Text + ", [Names]=" + namesTextBox.Text + ", Sex=" +
    sexComboBox.Text + ", [Guardian Contacts]=" + guardian_ContactsTextBox.Text + ", [Class
    Allocated]=" + class_AllocatedComboBox.Text + ", [Date Enrolled]=" +
    date_EnrolledDateTimePicker.Text + ", [Date Of Birth]=" + date_Of_BirthDateTimePicker.Text + ",
    [Physical Address]=" + txtPhysicalAddress.Text + ", [EMIS-ID Number]=" + txtEMISIDNumber.Text
    + " WHERE ID =" + iDTextBox.Text + "", OleDbConnection);
OleDbConnection.Open(); int n = update.ExecuteNonQuery(); OleDbConnection.Close();
if (n < 1)
{ MessageBox.Show("DATA NOT UPDATED");} catch (System.Exception ex)
    {System.Windows.Forms.MessageBox.Show(ex.Message);}
try
{MemoryStream ms = new MemoryStream(); picBarcode.Image.Save(ms,
    System.Drawing.Imaging.ImageFormat.Jpeg); byte[] BarCodePic = ms.GetBuffer();
MemoryStream ms0 = new MemoryStream();
photo_IDPictureBox.Image.Save(ms0, System.Drawing.Imaging.ImageFormat.Jpeg);
byte[] imageBytes = ms0.GetBuffer();
//byte[] imageBytes = File.ReadAllBytes(photo_IDPictureBox.ImageLocation);
{
using (var cmd = new OleDbCommand("UPDATE PupilDetails SET [Photo ID]=(@1), Barcode = (@2)
    WHERE ID =" + iDTextBox.Text + "", conn))
{ conn.Open(); cmd.Parameters.AddWithValue("@1", imageBytes);
    cmd.Parameters.AddWithValue("@2", BarCodePic); int n=cmd.ExecuteNonQuery(); conn.Close();
    if (n < 1)
        { MessageBox.Show("EITHER PHOTO ID OR BAR CODE DETAILS NOT UPDATED TO THE
        SERVER"); }}}}
} catch (System.Exception ex)
{System.Windows.Forms.MessageBox.Show(ex.Message);}
```

## **Function**

This component of the system allows the user to be able to capture photo IDs of pupils. The component also generates barcodes for use on ID cards. Once the photo ID is capture and the barcode is generated automatically by the system's application, the use should be able to insert the photo ID image and the barcode simultaneously with the pupil's details during pupil details edit and check exercise.

### **10.2.8.1.5.7. Pupils Test Results Entry Form Component Query Function**

```
private void btnSUBJECT_Click(object sender, EventArgs e)
{ //progressBar1.Value = 0;
  if (class_AllocatedToolStripTextBox4.Text.Length == 0)
  { MessageBox.Show("PLEASE ENTER THE DESIRED CLASS IN THE WHITE TEXT BOX");
  } else { tcDEPARTMENT.SelectTab("tpDATAPOINT"); lblSUBJECT.Text = SUBJECT;
    this.lblSUBJECT.TextAlign = ContentAlignment.TopCenter;
    { if (termTextBox.Text == "ONE")
    { dt = new DataTable(); string sql = "Select * from PupilEndOfTermResults WHERE [Class Allocated]
      LIKE '%" + class_AllocatedToolStripTextBox4.Text + "%'"; OleDbDataAdapter da = new
      OleDbDataAdapter(sql, conn); da.Fill(dt); dataGridView.DataSource = dt;
    if (dataGridView.Rows.Count < 1)
    { MessageBox.Show("THEY IS NO DATA FOR THE REQUESTED CLASS");
    } else { dataGridView.Columns[4].DataPropertyName = "SUBJECT";}
    { this.label17.Text = (dataGridView.Rows.Count).ToString();this.dataGridView.Sort(dataGridView.Columns[2],
      ListSortDirection.Ascending);
    this.pupilEndOfTermResultsTableAdapter.Connection.Close(); btnSAVEUPDATEDATA.Enabled =true;
    } } if (termTextBox.Text == "TWO")
    { dt = new DataTable(); string sql = "Select * from PupilEndOfTermResultsT2 WHERE [Class Allocated]
      LIKE '%" + class_AllocatedToolStripTextBox4.Text + "%'"; OleDbDataAdapter da = new
      OleDbDataAdapter(sql, conn); da.Fill(dt); dataGridView.DataSource = dt; if
      (dataGridView.Rows.Count < 1)
    { MessageBox.Show("THEY IS NO DATA FOR THE REQUESTED CLASS");
    } else { dataGridView.Columns[4].DataPropertyName = "Commerce";}
    { this.label17.Text = (dataGridView.Rows.Count).ToString();
    this.dataGridView.Sort(dataGridView.Columns[2], ListSortDirection.Ascending);
    this.pupilEndOfTermResultsTableAdapter.Connection.Close(); btnSAVEUPDATEDATA.Enabled =true;
    } }if (termTextBox.Text == "THREE") { dt = new DataTable();
string sql = "Select * from PupilEndOfTermResultsT3 WHERE [Class Allocated] LIKE '%" +
class_AllocatedToolStripTextBox4.Text + "%'"; OleDbDataAdapter da=new OleDbDataAdapter(sql,conn);
da.Fill(dt); dataGridView.DataSource = dt; if (dataGridView.Rows.Count < 1)
{ MessageBox.Show("THEY IS NO DATA FOR THE REQUESTED CLASS");}
else { dataGridView.Columns[4].DataPropertyName = "Commerce";}{
this.label17.Text = (dataGridView.Rows.Count).ToString();
this.dataGridView.Sort(dataGridView.Columns[2], ListSortDirection.Ascending);
this.pupilEndOfTermResultsTableAdapter.Connection.Close(); btnSAVEUPDATEDATA.Enabled =
true;}}}}}
```

## **Function**

This system's application component should be able to query and load data for a specific class from the server main database. The system's GUI should employ this code behind the button functions, of which each subject should have its own button, to allow easy accessibility and readability by the users. The rest of the details concerning the term and year of the data to load, the system should automatically be able to cypher that.

## 10.2.8.1.5.8. Pupils Test Results Data Update Function Component

```
if (TOTALMARKS.Text.Length != 0)
    { Int32 INITIALMARKS; Int32 TM = Convert.ToInt32(TOTALMARKS.Text); Int32 PC = 100;
for (int i = 0; i < dataGridView.Rows.Count; i++) { try
    { if (Int32.TryParse(dataGridView.Rows[i].Cells[3].Value.ToString(), out INITIALMARKS))
{ Int32 price = INITIALMARKS * PC / TM; dataGridView.Rows[i].Cells[4].Value = price.ToString();
}} catch (Exception){ }} else if (TOTALMARKS.Text.Length == 0)
    { Int32 INITIALMARKS; Int32 TM = 100; Int32 PC = 100; for (int i = 0; i < dataGridView.Rows.Count;
    i++)
{ try { if (Int32.TryParse(dataGridView.Rows[i].Cells[3].Value.ToString(), out INITIALMARKS))
{Int32 price = INITIALMARKS * PC / TM; dataGridView.Rows[i].Cells[4].Value = price.ToString();
}} catch (Exception) { }} { btnEXIT.Enabled = true; if (lblSUBJECT.Text == COMMERCE)
{ { this.TopMost = false; if (termTextBox.Text == "ONE") {
    Parallel.Invoke() =>
{ OleDbCommand OleDbCommand=new OleDbCommand(); OleDbCommand.Connection=OleDbConnection;
    OleDbConnection.Open(); for (int i = 0; i < dataGridView.Rows.Count; i++)
    { try { OleDbCommand update = new OleDbCommand("UPDATE PupilEndOfTermResults SET
    SUBJECT=" + (dataGridView.Rows[i].Cells[4].FormattedValue) + " WHERE ID =" +
    (dataGridView.Rows[i].Cells[0].FormattedValue) + """, OleDbConnection);
    { update.ExecuteNonQuery(); progressBar1.Minimum = 0; progressBar1.Maximum =
    dataGridView.Rows.Count; progressBar1.Increment(+1); //OleDbConnection.Close(); }
} catch (Exception ex) { //MessageBox.Show(ex.Message); } OleDbConnection.Close();
    { MessageBox.Show(new Form() { TopMost = true }, "DATA UPDATED SUCCESSFULLY TO THE
    SERVER");
    }else { //MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Red }, "YOUR
    COMPUTER IS OFFLINE, DATA WILL BE SAVED TO THE LOCAL MACHINE. RESAVE THE
    DATA AS SOON AS YOU CONNECT TO THE SCHOOL NETWORK"); } } },
() =>{ OleDbCommand OleDbCommand=new
OleDbCommand();OleDbCommand.Connection=OleDbConnection;OleDbConnection.Open();
    for (int i = 0; i < dataGridView.Rows.Count; i++){
try{OleDbCommand update = new OleDbCommand("UPDATE PupilEndOfTermResults SET SUBJECT="
    + (dataGridView.Rows[i].Cells[4].FormattedValue) + " WHERE ID =" +
    (dataGridView.Rows[i].Cells[0].FormattedValue) + """, OleDbConnection);
    { update.ExecuteNonQuery(); progressBar1.Minimum = 0; progressBar1.Maximum =
    dataGridView.Rows.Count; progressBar1.Increment(+1); //OleDbConnection.Close(); } } catch
    (Exception)
    { // MessageBox.Show(ex.Message); } OleDbConnection.Close();
    { MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Red }, "YOUR COMPUTER IS
    OFFLINE, DATA SAVED TO THE LOCAL MACHINE. RESAVE THE DATA AS SOON AS YOU
    CONNECT TO THE SCHOOL NETWORK"); } });
    } if (termTextBox.Text == "TWO") {Parallel.Invoke() =>{
{ OleDbCommand OleDbCommand=new OleDbCommand(); OleDbCommand.Connection=OleDbConnection;
    OleDbConnection.Open(); for (int i = 0; i < dataGridView.Rows.Count; i++)
    { try { OleDbCommand update = new OleDbCommand("UPDATE PupilEndOfTermResultsT2 SET
    SUBJECT=" + (dataGridView.Rows[i].Cells[4].FormattedValue) + " WHERE ID =" +
    (dataGridView.Rows[i].Cells[0].FormattedValue) + """, OleDbConnection);
```

```
{ update.ExecuteNonQuery(); progressBar1.Minimum = 0; progressBar1.Maximum =
    dataGridView.Rows.Count; progressBar1.Increment(+1); //OleDbConnection.Close();}
} catch (Exception) { // MessageBox.Show(ex.Message);}
} OleDbConnection.Close(); {
    MessageBox.Show(new Form() { TopMost = true }, "DATA UPDATED SUCCESSFULLY TO THE
    SERVER");
} else { //MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Red }, "YOUR COMPUTER
    IS OFFLINE, DATA WILL BE SAVED TO THE LOCAL MACHINE. RESAVE THE DATA AS
    SOON AS YOU CONNECT TO THE SCHOOL NETWORK");}}, () =>
{ OleDbCommand OleDbCommand=new OleDbCommand();OleDbCommand.Connection=OleDbConnection;
    OleDbConnection.Open(); for (int i = 0; i < dataGridView.Rows.Count; i++)
    { try {OleDbCommand update = new OleDbCommand("UPDATE PupilEndOfTermResultsT2 SET
        SUBJECT=" + (dataGridView.Rows[i].Cells[4].FormattedValue) + " WHERE ID =" +
        (dataGridView.Rows[i].Cells[0].FormattedValue) + """, OleDbConnection);
        { update.ExecuteNonQuery(); progressBar1.Minimum = 0; progressBar1.Maximum =
            dataGridView.Rows.Count; progressBar1.Increment(+1); //OleDbConnection.Close(); }
        } catch (Exception) { // MessageBox.Show(ex.Message); }}OleDbConnection.Close();
        { MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Red }, "YOUR COMPUTER IS
            OFFLINE, DATA SAVED TO THE LOCAL MACHINE. RESAVE THE DATA AS SOON AS YOU
            CONNECT TO THE SCHOOL NETWORK"); }});
    } if (termTextBox.Text == "THREE"){Parallel.Invoke(() =>{
{ OleDbCommand OleDbCommand=new OleDbCommand(); OleDbCommand.Connection=OleDbConnection;
    OleDbConnection.Open(); for (int i = 0; i < dataGridView.Rows.Count; i++)
    { try {OleDbCommand update = new OleDbCommand("UPDATE PupilEndOfTermResultsT3 SET
        SUBJECT=" + (dataGridView.Rows[i].Cells[4].FormattedValue) + " WHERE ID =" +
        (dataGridView.Rows[i].Cells[0].FormattedValue) + """, OleDbConnection);
        { update.ExecuteNonQuery(); progressBar1.Minimum = 0; progressBar1.Maximum =
            dataGridView.Rows.Count; progressBar1.Increment(+1); //OleDbConnection.Close(); }
        } catch (Exception) { // MessageBox.Show(ex.Message); }} OleDbConnection.Close();
        { MessageBox.Show(new Form() { TopMost = true }, "DATA UPDATED SUCCESSFULLY TO THE
            SERVER"); }else
            { //MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Red }, "YOUR COMPUTER IS
                OFFLINE, DATA WILL BE SAVED TO THE LOCAL MACHINE. RESAVE THE DATA AS SOON
                AS YOU CONNECT TO THE SCHOOL NETWORK");}}, () =>
{ OleDbCommand OleDbCommand=new OleDbCommand();OleDbCommand.Connection=OleDbConnection;
    OleDbConnection.Open(); for (int i = 0; i < dataGridView.Rows.Count; i++)
    {try
        { OleDbCommand update = new OleDbCommand("UPDATE PupilEndOfTermResultsT3 SET
            SUBJECT=" + (dataGridView.Rows[i].Cells[4].FormattedValue) + " WHERE ID =" +
            (dataGridView.Rows[i].Cells[0].FormattedValue) + """, OleDbConnection);
            {update.ExecuteNonQuery(); progressBar1.Minimum = 0; progressBar1.Maximum = dataGridView.Rows.Count;
            progressBar1.Increment(+1); //OleDbConnection.Close(); }
        } catch (Exception) { // MessageBox.Show(ex.Message);}
        }OleDbConnection.Close(); {
            MessageBox.Show(new Form() { TopMost = true, BackColor = Color.Red }, "YOUR COMPUTER IS
            OFFLINE, DATA SAVED TO THE LOCAL MACHINE. RESAVE THE DATA AS SOON AS YOU
            CONNECT TO THE SCHOOL NETWORK"); }});}}
```

## **Function**

Once a teacher of the subject has finished entering the marks scored by the pupils of a class in the data grid view subject column, the total marks for the subject in the text box for the total marks, the user should be able to save and/or update the server main database records concerning the results for the term. During the update process, the system instantaneously calculates the percentage scores and save the percentage scores to the central database. Should the server be offline for any reason, or the connectivity be absent to the school network, the client computer should be able to save the data offline, of which the user should be able to sync the data to the server once connectivity to the server is established.

### **10.2.8.1.5.9. Pupils Test Results Summary Grading and Comment Function**

```
private void btnTABULATIONS_Click(object sender, EventArgs e)
{
    string NS = "NATURAL SCIENCES"; string NaT = "NATURAL";
    if (lblPATHWAY.Text == NS || lblPATHWAY.Text.ToString().Contains(NaT) ||
        lblPATHWAY.Text.ToString() == NS)
    {
        // pupilEndOfTermResultsDataGridView.Columns.AddRange(new DataGridViewTextBoxColumn[] {
        englishDataGridViewTextBoxColumn, literatureEnglishDataGridViewTextBoxColumn,
        civicEducationDataGridViewTextBoxColumn, religiousEducationDataGridViewTextBoxColumn,
        historyDataGridViewTextBoxColumn, geographyDataGridViewTextBoxColumn,
        frenchDataGridViewTextBoxColumn, bembaDataGridViewTextBoxColumn,
        mathematicsDataGridViewTextBoxColumn, addMathematicsDataGridViewTextBoxColumn,
        agriculturalScienceDataGridViewTextBoxColumn, physicsDataGridViewTextBoxColumn,
        chemistryDataGridViewTextBoxColumn, biologyDataGridViewTextBoxColumn,
        scienceDataGridViewTextBoxColumn, artDataGridViewTextBoxColumn,
        musicDataGridViewTextBoxColumn, woodWorkDataGridViewTextBoxColumn,
        metalWorkDataGridViewTextBoxColumn, homeEconomicsDataGridViewTextBoxColumn,
        foodNutritionDataGridViewTextBoxColumn, homeManagementDataGridViewTextBoxColumn,
        geoMechDrawingDataGridViewTextBoxColumn, commerceDataGridViewTextBoxColumn,
        computerStudiesDataGridViewTextBoxColumn, technicalDrawingDataGridViewTextBoxColumn,
        businessStudiesDataGridViewTextBoxColumn, principalsOfAccountsDataGridViewTextBoxColumn,
        socialStudiesDataGridViewTextBoxColumn, dataGridViewTextBoxColumn1 });
        for (int i = 0; i < pupilEndOfTermResultsDataGridView.RowCount; i++)
        {
            String ENG; String LitENG; String CE; String RE; String HIS; String GEO; String FRE; String BEM;
            String MATHS; String ADDMA; String ARGIC; String BIO; String SCIE; String ART; String MUSIC;
            String WW; String MW; String HE; String FN; String HM; String GMD; String COMM; String CS;
            String TD; String BS; String PA; String SS; String DT; String PE; String FF; String CHEM; String PHY;
            try {
                CHEM=pupilEndOfTermResultsDataGridView.Rows[i].Cells["physicsDataGridViewTextBoxColumn"].Value.ToString();
                PHY=pupilEndOfTermResultsDataGridView.Rows[i].Cells["chemistryDataGridViewTextBoxColumn"].Value.ToString();
                PE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["pedataGridViewTextBoxColumn"].Value.ToString();
                FF=pupilEndOfTermResultsDataGridView.Rows[i].Cells["ffdataGridViewTextBoxColumn"].Value.ToString();
                ENG=pupilEndOfTermResultsDataGridView.Rows[i].Cells["englishDataGridViewTextBoxColumn"].Value.ToString();
            }
        }
    }
}
```

---

```
LitENG=pupilEndOfTermResultsDataGridView.Rows[i].Cells["literatureEnglishDataGridViewTextBoxColumn"].Value.ToString();
CE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["civicEducationDataGridViewTextBoxColumn"].Value.ToString();
RE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["religiousEducationDataGridViewTextBoxColumn"].Value.ToString();
HIS=pupilEndOfTermResultsDataGridView.Rows[i].Cells["historyDataGridViewTextBoxColumn"].Value.ToString();
GEO=pupilEndOfTermResultsDataGridView.Rows[i].Cells["geographyDataGridViewTextBoxColumn"].Value.ToString();
FRE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["frenchDataGridViewTextBoxColumn"].Value.ToString();
BEM=pupilEndOfTermResultsDataGridView.Rows[i].Cells["bembaDataGridViewTextBoxColumn"].Value.ToString();
MATHS=pupilEndOfTermResultsDataGridView.Rows[i].Cells["mathematicsDataGridViewTextBoxColumn"].Value.ToString();
ADDMA=pupilEndOfTermResultsDataGridView.Rows[i].Cells["addMathematicsDataGridViewTextBoxColumn"].Value.ToString();
ARGIC=pupilEndOfTermResultsDataGridView.Rows[i].Cells["agriculturalScienceDataGridViewTextBoxColumn"].Value.ToString();
BIO=pupilEndOfTermResultsDataGridView.Rows[i].Cells["biologyDataGridViewTextBoxColumn"].Value.ToString();
SCIE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["scienceDataGridViewTextBoxColumn"].Value.ToString();
ART=pupilEndOfTermResultsDataGridView.Rows[i].Cells["artDataGridViewTextBoxColumn"].Value.ToString();
MUSIC=pupilEndOfTermResultsDataGridView.Rows[i].Cells["musicDataGridViewTextBoxColumn"].Value.ToString();
WW=pupilEndOfTermResultsDataGridView.Rows[i].Cells["woodWorkDataGridViewTextBoxColumn"].Value.ToString();
MW=pupilEndOfTermResultsDataGridView.Rows[i].Cells["metalWorkDataGridViewTextBoxColumn"].Value.ToString();
HE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["homeEconomicsDataGridViewTextBoxColumn"].Value.ToString();
FN=pupilEndOfTermResultsDataGridView.Rows[i].Cells["foodNutritionDataGridViewTextBoxColumn"].Value.ToString();
HM=pupilEndOfTermResultsDataGridView.Rows[i].Cells["homeManagementDataGridViewTextBoxColumn"].Value.ToString();
GMD=pupilEndOfTermResultsDataGridView.Rows[i].Cells["geoMechDrawingDataGridViewTextBoxColumn"].Value.ToString();
COMM=pupilEndOfTermResultsDataGridView.Rows[i].Cells["commerceDataGridViewTextBoxColumn"].Value.ToString();
CS=pupilEndOfTermResultsDataGridView.Rows[i].Cells["computerStudiesDataGridViewTextBoxColumn"].Value.ToString();
TD=pupilEndOfTermResultsDataGridView.Rows[i].Cells["technicalDrawingDataGridViewTextBoxColumn"].Value.ToString();
BS=pupilEndOfTermResultsDataGridView.Rows[i].Cells["businessStudiesDataGridViewTextBoxColumn"].Value.ToString();
```

```
PA=pupilEndOfTermResultsDataGridView.Rows[i].Cells["principalsOfAccountsDataGridViewTextBoxColumn"].Value.ToString();
SS=pupilEndOfTermResultsDataGridView.Rows[i].Cells["socialStudiesDataGridViewTextBoxColumn"].Value.ToString();
DT=pupilEndOfTermResultsDataGridView.Rows[i].Cells["dataGridViewTextBoxColumn1"].Value.ToString();
//pedataGridViewTextBoxColumn
string[] SUBSat=new string[] { ENG, LitENG, CE, RE, HIS, GEO, FRE, BEM, MATHS, ADDMA, ARGIC, PHY, CHEM, BIO, ART, MUSIC, WW, MW, HE, FN, HM, GMD, COMM, CS, TD, BS, PA, SS, DT, FF, PE };
int Sat=SUBSat.Count(x => !string.IsNullOrEmpty(x));
pupilEndOfTermResultsDataGridView.Rows[i].Cells[3].Value=Sat.ToString();
if (Sat == 0) { pupilEndOfTermResultsDataGridView.Rows[i].Cells[5].Value="ABSENT";
} } catch (Exception ex) { } try{ var list=new List<int>();
ENG=pupilEndOfTermResultsDataGridView.Rows[i].Cells["englishDataGridViewTextBoxColumn"].Value.ToString(); if (ENG.Length != 0) { int InENG=Convert.ToInt32(ENG); list.Add(InENG); }
LitENG=pupilEndOfTermResultsDataGridView.Rows[i].Cells["literatureEnglishDataGridViewTextBoxColumn"].Value.ToString(); if (LitENG.Length != 0) { int InLitENG=Convert.ToInt32(LitENG); list.Add(InLitENG); }
CE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["civicEducationDataGridViewTextBoxColumn"].Value.ToString(); if (CE.Length != 0) { int InCE=Convert.ToInt32(CE); list.Add(InCE); }
RE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["religiousEducationDataGridViewTextBoxColumn"].Value.ToString(); if (RE.Length != 0) { int InRE=Convert.ToInt32(RE); list.Add(InRE); }
HIS=pupilEndOfTermResultsDataGridView.Rows[i].Cells["historyDataGridViewTextBoxColumn"].Value.ToString(); if (HIS.Length != 0) { int InHIS=Convert.ToInt32(HIS); list.Add(InHIS); }
GEO=pupilEndOfTermResultsDataGridView.Rows[i].Cells["geographyDataGridViewTextBoxColumn"].Value.ToString(); if (GEO.Length != 0) { int InGEO=Convert.ToInt32(GEO); list.Add(InGEO); }
FRE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["frenchDataGridViewTextBoxColumn"].Value.ToString(); if (FRE.Length != 0) { int InFRE=Convert.ToInt32(FRE); list.Add(InFRE); }
BEM=pupilEndOfTermResultsDataGridView.Rows[i].Cells["bembaDataGridViewTextBoxColumn"].Value.ToString(); if (BEM.Length != 0) { int InBEM=Convert.ToInt32(BEM); list.Add(InBEM); }
MATHS=pupilEndOfTermResultsDataGridView.Rows[i].Cells["mathematicsDataGridViewTextBoxColumn"].Value.ToString(); if (MATHS.Length != 0) { int InMATHS=Convert.ToInt32(MATHS); list.Add(InMATHS); }
ADDMA=pupilEndOfTermResultsDataGridView.Rows[i].Cells["addMathematicsDataGridViewTextBoxColumn"].Value.ToString(); if (ADDMA.Length != 0) { int InADDMA=Convert.ToInt32(ADDMA); list.Add(InADDMA); }
ARGIC=pupilEndOfTermResultsDataGridView.Rows[i].Cells["agriculturalScienceDataGridViewTextBoxColumn"].Value.ToString(); if (ARGIC.Length != 0) { int InARGIC=Convert.ToInt32(ARGIC); list.Add(InARGIC); }
PHY=pupilEndOfTermResultsDataGridView.Rows[i].Cells["physicsDataGridViewTextBoxColumn"].Value.ToString(); if (PHY.Length != 0) { int InPHY=Convert.ToInt32(PHY); list.Add(InPHY); }
CHEM=pupilEndOfTermResultsDataGridView.Rows[i].Cells["chemistryDataGridViewTextBoxColumn"].Value.ToString(); if (CHEM.Length != 0) { int InCHEM=Convert.ToInt32(CHEM); list.Add(InCHEM); }
BIO=pupilEndOfTermResultsDataGridView.Rows[i].Cells["biologyDataGridViewTextBoxColumn"].Value.ToString(); if (BIO.Length != 0) { int InBIO=Convert.ToInt32(BIO); list.Add(InBIO); }
ART=pupilEndOfTermResultsDataGridView.Rows[i].Cells["artDataGridViewTextBoxColumn"].Value.ToString(); if (ART.Length != 0) { int InART=Convert.ToInt32(ART); list.Add(InART); }
```

```
MUSIC=pupilEndOfTermResultsDataGridView.Rows[i].Cells["musicDataGridViewTextBoxColumn"].Value.ToString(); if (MUSIC.Length != 0) { int InMUSIC=Convert.ToInt32(MUSIC); list.Add(InMUSIC); }
WW=pupilEndOfTermResultsDataGridView.Rows[i].Cells["woodWorkDataGridViewTextBoxColumn"].Value.ToString(); if (WW.Length != 0) { int InWW=Convert.ToInt32(WW); list.Add(InWW); }
MW=pupilEndOfTermResultsDataGridView.Rows[i].Cells["metalWorkDataGridViewTextBoxColumn"].Value.ToString(); if (MW.Length != 0) { int InMW=Convert.ToInt32(MW); list.Add(InMW); }
HE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["homeEconomicsDataGridViewTextBoxColumn"].Value.ToString(); if (HE.Length != 0) { int InHE=Convert.ToInt32(HE); list.Add(InHE); }
FN=pupilEndOfTermResultsDataGridView.Rows[i].Cells["foodNutritionDataGridViewTextBoxColumn"].Value.ToString(); if (FN.Length != 0) { int InFN=Convert.ToInt32(FN); list.Add(InFN); }
HM=pupilEndOfTermResultsDataGridView.Rows[i].Cells["homeManagementDataGridViewTextBoxColumn"].Value.ToString(); if (HM.Length != 0) { int InHM=Convert.ToInt32(HM); list.Add(InHM); }
GMD=pupilEndOfTermResultsDataGridView.Rows[i].Cells["geoMechDrawingDataGridViewTextBoxColumn"].Value.ToString(); if (GMD.Length != 0) { int InGMD=Convert.ToInt32(GMD); list.Add(InGMD); }
}
COMM=pupilEndOfTermResultsDataGridView.Rows[i].Cells["commerceDataGridViewTextBoxColumn"].Value.ToString(); if (COMM.Length != 0) { int InCOMM=Convert.ToInt32(COMM); list.Add(InCOMM); }
CS=pupilEndOfTermResultsDataGridView.Rows[i].Cells["computerStudiesDataGridViewTextBoxColumn"].Value.ToString(); if (CS.Length != 0) { int InCS=Convert.ToInt32(CS); list.Add(InCS); }
TD=pupilEndOfTermResultsDataGridView.Rows[i].Cells["technicalDrawingDataGridViewTextBoxColumn"].Value.ToString(); if (TD.Length != 0) { int InTD = Convert.ToInt32(TD); list.Add(InTD); }
BS=pupilEndOfTermResultsDataGridView.Rows[i].Cells["businessStudiesDataGridViewTextBoxColumn"].Value.ToString(); if (BS.Length != 0) { int InBS=Convert.ToInt32(BS); list.Add(InBS); }
PA=pupilEndOfTermResultsDataGridView.Rows[i].Cells["principalsOfAccountsDataGridViewTextBoxColumn"].Value.ToString(); if (PA.Length != 0) { int InPA=Convert.ToInt32(PA); list.Add(InPA); }
SS=pupilEndOfTermResultsDataGridView.Rows[i].Cells["socialStudiesDataGridViewTextBoxColumn"].Value.ToString(); if (SS.Length != 0) { int InSS=Convert.ToInt32(SS); list.Add(InSS); }
DT=pupilEndOfTermResultsDataGridView.Rows[i].Cells["dataGridViewTextBoxColumn1"].Value.ToString(); if (DT.Length != 0) { int InDT=Convert.ToInt32(DT); list.Add(InDT); }
PE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["pedataGridViewTextBoxColumn"].Value.ToString(); if (PE.Length != 0) { int InPE=Convert.ToInt32(PE); list.Add(InPE); }
FF=pupilEndOfTermResultsDataGridView.Rows[i].Cells["ffdataGridViewTextBoxColumn"].Value.ToString(); if (FF.Length != 0) { int InFF=Convert.ToInt32(FF); list.Add(InFF); }
var Passed=list.Count(j => j > 34); var PassedJ=list.Count(j => j > 39);
string JUNIOR1="8"; string JUNIOR2="9"; string SENIOR1="10"; string SENIOR2="11"; string SENIOR3="12";
{ if (class_AllocatedToolStripTextBox4.Text.ToString().Contains(SENIOR1) || class_AllocatedToolStripTextBox4.Text.ToString().Contains(SENIOR2) || class_AllocatedToolStripTextBox4.Text.ToString().Contains(SENIOR3)) {pupilEndOfTermResultsDataGridView.Rows[i].Cells[4].Value=Passed.ToString();
}if (ENG.Length != 0) {int InENG=Convert.ToInt32(ENG); if (InENG >= 35 && Passed > 5) {pupilEndOfTermResultsDataGridView.Rows[i].Cells[5].Value="FULL CERTIFICATE";
} var POINTS=new List<int>();
// if (class_AllocatedToolStripTextBox4.Text.ToString().Contains(SENIOR1) || class_AllocatedToolStripTextBox4.Text.ToString().Contains(SENIOR2) || class_AllocatedToolStripTextBox4.Text.ToString().Contains(SENIOR3))
```

```
{ var Best6=list.OrderByDescending(r => r).Take(6);
var G1=Best6.Count(r => r >= 75 && r <= 100); if (G1.ToString().Length != 0) { int InG1 = 1 * G1;
POINTS.Add(InG1); }
var G2=Best6.Count(r => r >= 65 && r < 75); if (G2.ToString().Length != 0) { int InG2=2 * G2;
POINTS.Add(InG2); }
var G3=Best6.Count(r => r >= 60 && r < 65); if (G3.ToString().Length != 0) { int InG3=3 * G3;
POINTS.Add(InG3); }
var G4=Best6.Count(r => r >= 55 && r < 60); if (G4.ToString().Length != 0) { int InG4=4 * G4;
POINTS.Add(InG4); }
var G5=Best6.Count(r => r >= 50 && r < 55); if (G5.ToString().Length != 0) { int InG5=5 * G5;
POINTS.Add(InG5); }
var G6=Best6.Count(r => r >= 45 && r < 50); if (G6.ToString().Length != 0) { int InG6=6 * G6;
POINTS.Add(InG6); }
var G7=Best6.Count(r => r >= 40 && r < 45); if (G7.ToString().Length != 0) { int InG7=7 * G7;
POINTS.Add(InG7); }
var G8=Best6.Count(r => r >= 34 && r < 40); if (G8.ToString().Length != 0) { int InG8=8 * G8;
POINTS.Add(InG8); } var POINTSBEST=POINTS.Sum();
pupilEndOfTermResultsDataGridView.Rows[i].Cells[6].Value=POINTSBEST.ToString();
}} else if (InENG <= 34 && Passed < 6)
{ pupilEndOfTermResultsDataGridView.Rows[i].Cells[5].Value="GCE"; }
else { pupilEndOfTermResultsDataGridView.Rows[i].Cells[5].Value="GCE"; }
} else if (class_AllocatedToolStripTextBox4.Text.ToString().Contains(JUNIOR1) ||
class_AllocatedToolStripTextBox4.Text.ToString().Contains(JUNIOR2))
{ pupilEndOfTermResultsDataGridView.Rows[i].Cells[4].Value=PassedJ.ToString();
{ if (ENG.Length != 0) { int InENG=Convert.ToInt32(ENG); { if (InENG >= 40 && Passed > 5)
{ pupilEndOfTermResultsDataGridView.Rows[i].Cells[5].Value="FULL CERTIFICATE";
{ var POINTS=new List<int>();
// if (class_AllocatedToolStripTextBox4.Text.ToString().Contains(SENIOR1) ||
class_AllocatedToolStripTextBox4.Text.ToString().Contains(SENIOR2) ||
class_AllocatedToolStripTextBox4.Text.ToString().Contains(SENIOR3))
{ var BEST6G9=list.OrderByDescending(r => r >= 40).Take(6);
var G1=BEST6G9.Count(r => r >= 75 && r <= 100); if (G1.ToString().Length != 0) { int InG1=1 * G1;
POINTS.Add(InG1); }
var G2=BEST6G9.Count(r => r >= 60 && r < 75); if (G2.ToString().Length != 0) { int InG2=2 * G2;
POINTS.Add(InG2); }
var G3=BEST6G9.Count(r => r >= 50 && r < 60); if (G3.ToString().Length != 0) { int InG3=3 * G3;
POINTS.Add(InG3); }
var G4=BEST6G9.Count(r => r >= 39 && r < 50); if (G4.ToString().Length != 0) { int InG4=4 * G4;
POINTS.Add(InG4); }
var POINTBESTG9=BEST6G9.Sum();
pupilEndOfTermResultsDataGridView.Rows[i].Cells[6].Value=POINTBESTG9.ToString();
}} else if (InENG <= 39 && Passed < 6)
{ pupilEndOfTermResultsDataGridView.Rows[i].Cells[5].Value="GCE"; }
else { pupilEndOfTermResultsDataGridView.Rows[i].Cells[5].Value="GCE"; }
}}}} else if (Passed != 0) { pupilEndOfTermResultsDataGridView.Rows[i].Cells[5].Value="GCE"; }
}}}} catch (Exception ex) { } }
```

```
else if (!lblPATHWAY.Text != NS || !lblPATHWAY.Text.ToString().Contains(NaT) ||
    lblPATHWAY.Text.ToString() != NS)
{ try { Int32 PHYSICS; Int32 CHEMISTRY; for (int jk=0; jk <
    pupilEndOfTermResultsDataGridView.RowCount; jk++)
{ if
(Int32.TryParse(pupilEndOfTermResultsDataGridView.Rows[jk].Cells["physicsDataGridViewTextBoxC
olumn"].Value.ToString(), out PHYSICS) &
Int32.TryParse(pupilEndOfTermResultsDataGridView.Rows[jk].Cells["chemistryDataGridViewTextB
oxColumn"].Value.ToString(), out CHEMISTRY))
{ Int32 COMBINEDSCIENCE=(PHYSICS + CHEMISTRY) / 2;
pupilEndOfTermResultsDataGridView.Rows[jk].Cells["scienceDataGridViewTextBoxColumn"].Value=
    COMBINEDSCIENCE.ToString();
}}catch (Exception EX) { }
// pupilEndOfTermResultsDataGridView.Columns.AddRange(new DataGridViewTextBoxColumn[] {
    englishDataGridViewTextBoxColumn, literatureEnglishDataGridViewTextBoxColumn,
    civicEducationDataGridViewTextBoxColumn, religiousEducationDataGridViewTextBoxColumn,
    historyDataGridViewTextBoxColumn, geographyDataGridViewTextBoxColumn,
    frenchDataGridViewTextBoxColumn, bambaDataGridViewTextBoxColumn,
    mathematicsDataGridViewTextBoxColumn, addMathematicsDataGridViewTextBoxColumn,
    agriculturalScienceDataGridViewTextBoxColumn, physicsDataGridViewTextBoxColumn,
    chemistryDataGridViewTextBoxColumn, biologyDataGridViewTextBoxColumn,
    scienceDataGridViewTextBoxColumn, artDataGridViewTextBoxColumn,
    musicDataGridViewTextBoxColumn, woodWorkDataGridViewTextBoxColumn,
    metalWorkDataGridViewTextBoxColumn, homeEconomicsDataGridViewTextBoxColumn,
    foodNutritionDataGridViewTextBoxColumn, homeManagementDataGridViewTextBoxColumn,
    geoMechDrawingDataGridViewTextBoxColumn, commerceDataGridViewTextBoxColumn,
    computerStudiesDataGridViewTextBoxColumn, technicalDrawingDataGridViewTextBoxColumn,
    businessStudiesDataGridViewTextBoxColumn, principalsOfAccountsDataGridViewTextBoxColumn,
    socialStudiesDataGridViewTextBoxColumn, dataGridViewTextBoxColumn1 });
for (int i=0; i < pupilEndOfTermResultsDataGridView.RowCount; i++)
{ String ENG; String LitENG; String CE; String RE; String HIS; String GEO; String FRE; String BEM;
    String MATHS; String ADDMA; String ARGIC; String BIO; String SCIE; String ART; String MUSIC;
    String WW; String MW; String HE; String FN; String HM; String GMD; String COMM; String CS;
    String TD; String BS; String PA; String SS; String DT; String PE; String FF;
    try
{ PE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["pedataGridViewTextBoxColumn"].Value.ToString();
    FF=pupilEndOfTermResultsDataGridView.Rows[i].Cells["ffdataGridViewTextBoxColumn"].Value.ToString();
    ENG=pupilEndOfTermResultsDataGridView.Rows[i].Cells["englishDataGridViewTextBoxColumn"].Value.To
        String();
    LitENG=pupilEndOfTermResultsDataGridView.Rows[i].Cells["literatureEnglishDataGridViewTextB
        oxColumn"].Value.ToString();
    CE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["civicEducationDataGridViewTextB
        oxColumn"].Value.ToString();
    RE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["religiousEducationDataGridViewTextB
        oxColumn"].Value.ToString();
    HIS=pupilEndOfTermResultsDataGridView.Rows[i].Cells["historyDataGridViewTextB
        oxColumn"].Value.ToSt
        ring();
```

```
GEO=pupilEndOfTermResultsDataGridView.Rows[i].Cells["geographyDataGridViewTextBoxColumn"].Value.ToString();
FRE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["frenchDataGridViewTextBoxColumn"].Value.ToString();
BEM=pupilEndOfTermResultsDataGridView.Rows[i].Cells["bembaDataGridViewTextBoxColumn"].Value.ToString();
MATHS=pupilEndOfTermResultsDataGridView.Rows[i].Cells["mathematicsDataGridViewTextBoxColumn"].Value.ToString();
ADDMA=pupilEndOfTermResultsDataGridView.Rows[i].Cells["addMathematicsDataGridViewTextBoxColumn"].Value.ToString();
ARGIC=pupilEndOfTermResultsDataGridView.Rows[i].Cells["agriculturalScienceDataGridViewTextBoxColumn"].Value.ToString();
BIO=pupilEndOfTermResultsDataGridView.Rows[i].Cells["biologyDataGridViewTextBoxColumn"].Value.ToString();
SCIE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["scienceDataGridViewTextBoxColumn"].Value.ToString();
ART=pupilEndOfTermResultsDataGridView.Rows[i].Cells["artDataGridViewTextBoxColumn"].Value.ToString();
MUSIC=pupilEndOfTermResultsDataGridView.Rows[i].Cells["musicDataGridViewTextBoxColumn"].Value.ToString();
WW=pupilEndOfTermResultsDataGridView.Rows[i].Cells["woodWorkDataGridViewTextBoxColumn"].Value.ToString();
MW=pupilEndOfTermResultsDataGridView.Rows[i].Cells["metalWorkDataGridViewTextBoxColumn"].Value.ToString();
HE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["homeEconomicsDataGridViewTextBoxColumn"].Value.ToString();
FN=pupilEndOfTermResultsDataGridView.Rows[i].Cells["foodNutritionDataGridViewTextBoxColumn"].Value.ToString();
HM=pupilEndOfTermResultsDataGridView.Rows[i].Cells["homeManagementDataGridViewTextBoxColumn"].Value.ToString();
GMD=pupilEndOfTermResultsDataGridView.Rows[i].Cells["geoMechDrawingDataGridViewTextBoxColumn"].Value.ToString();
COMM=pupilEndOfTermResultsDataGridView.Rows[i].Cells["commerceDataGridViewTextBoxColumn"].Value.ToString();
CS=pupilEndOfTermResultsDataGridView.Rows[i].Cells["computerStudiesDataGridViewTextBoxColumn"].Value.ToString();
TD=pupilEndOfTermResultsDataGridView.Rows[i].Cells["technicalDrawingDataGridViewTextBoxColumn"].Value.ToString();
BS=pupilEndOfTermResultsDataGridView.Rows[i].Cells["businessStudiesDataGridViewTextBoxColumn"].Value.ToString();
PA=pupilEndOfTermResultsDataGridView.Rows[i].Cells["principalsOfAccountsDataGridViewTextBoxColumn"].Value.ToString();
SS=pupilEndOfTermResultsDataGridView.Rows[i].Cells["socialStudiesDataGridViewTextBoxColumn"].Value.ToString();
DT=pupilEndOfTermResultsDataGridView.Rows[i].Cells["dataGridViewTextBoxColumn1"].Value.ToString();
string[] SUBSat=new string[] { ENG, LitENG, CE, RE, HIS, GEO, FRE, BEM, MATHS, ADDMA, ARGIC, BIO, SCIE, ART, MUSIC, WW, MW, HE, FN, HM, GMD, COMM, CS, TD, BS, PA, SS, DT, PE, FF };
```

```
int Sat=SUBSat.Count(x => !string.IsNullOrEmpty(x));
pupilEndOfTermResultsDataGridView.Rows[i].Cells[3].Value=Sat.ToString();
if (Sat == 0)
{ pupilEndOfTermResultsDataGridView.Rows[i].Cells[5].Value="ABSENT"; }
} catch (Exception ex) { } try
{ var list=new List<int>();
ENG=pupilEndOfTermResultsDataGridView.Rows[i].Cells["englishDataGridViewTextBoxColumn"].Value
.ToString(); if (ENG.Length != 0) { int InENG=Convert.ToInt32(ENG); list.Add(InENG); }
LitENG=pupilEndOfTermResultsDataGridView.Rows[i].Cells["literatureEnglishDataGridViewTextBoxColumn"].Value.ToString(); if (LitENG.Length != 0) { int InLitENG=Convert.ToInt32(LitENG);
list.Add(InLitENG); }
CE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["civicEducationDataGridViewTextBoxColumn"].Value.ToString(); if (CE.Length != 0) { int InCE=Convert.ToInt32(CE); list.Add(InCE); }
RE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["religiousEducationDataGridViewTextBoxColumn"].Value.ToString(); if (RE.Length != 0) { int InRE=Convert.ToInt32(RE); list.Add(InRE); }
HIS=pupilEndOfTermResultsDataGridView.Rows[i].Cells["historyDataGridViewTextBoxColumn"].Value.ToString(); if (HIS.Length != 0) { int InHIS=Convert.ToInt32(HIS); list.Add(InHIS); }
GEO=pupilEndOfTermResultsDataGridView.Rows[i].Cells["geographyDataGridViewTextBoxColumn"].Value.ToString(); if (GEO.Length != 0) { int InGEO=Convert.ToInt32(GEO); list.Add(InGEO); }
FRE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["frenchDataGridViewTextBoxColumn"].Value.ToString(); if (FRE.Length != 0) { int InFRE=Convert.ToInt32(FRE); list.Add(InFRE); }
BEM=pupilEndOfTermResultsDataGridView.Rows[i].Cells["bembaDataGridViewTextBoxColumn"].Value.ToString(); if (BEM.Length != 0) { int InBEM=Convert.ToInt32(BEM); list.Add(InBEM); }
MATHS=pupilEndOfTermResultsDataGridView.Rows[i].Cells["mathematicsDataGridViewTextBoxColumn"].Value.ToString(); if (MATHS.Length != 0) { int InMATHS=Convert.ToInt32(MATHS);
list.Add(InMATHS); }
ADDMA=pupilEndOfTermResultsDataGridView.Rows[i].Cells["addMathematicsDataGridViewTextBoxColumn"].Value.ToString(); if (ADDMA.Length != 0) { int InADDMA=Convert.ToInt32(ADDMA);
list.Add(InADDMA); }
ARGIC=pupilEndOfTermResultsDataGridView.Rows[i].Cells["agriculturalScienceDataGridViewTextBoxColumn"].Value.ToString(); if (ARGIC.Length != 0) { int InARGIC=Convert.ToInt32(ARGIC);
list.Add(InARGIC); }
BIO=pupilEndOfTermResultsDataGridView.Rows[i].Cells["biologyDataGridViewTextBoxColumn"].Value.ToString(); if (BIO.Length != 0) { int InBIO=Convert.ToInt32(BIO); list.Add(InBIO); }
SCIE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["scienceDataGridViewTextBoxColumn"].Value.ToString(); if (SCIE.Length != 0) { int InSCIE=Convert.ToInt32(SCIE); list.Add(InSCIE); }
ART=pupilEndOfTermResultsDataGridView.Rows[i].Cells["artDataGridViewTextBoxColumn"].Value.ToString(); if (ART.Length != 0) { int InART=Convert.ToInt32(ART); list.Add(InART); }
MUSIC=pupilEndOfTermResultsDataGridView.Rows[i].Cells["musicDataGridViewTextBoxColumn"].Value.ToString(); if (MUSIC.Length != 0) { int InMUSIC=Convert.ToInt32(MUSIC); list.Add(InMUSIC); }
WW=pupilEndOfTermResultsDataGridView.Rows[i].Cells["woodWorkDataGridViewTextBoxColumn"].Value.ToString(); if (WW.Length != 0) { int InWW=Convert.ToInt32(WW); list.Add(InWW); }
MW=pupilEndOfTermResultsDataGridView.Rows[i].Cells["metalWorkDataGridViewTextBoxColumn"].Value.ToString(); if (MW.Length != 0) { int InMW=Convert.ToInt32(MW); list.Add(InMW); }
HE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["homeEconomicsDataGridViewTextBoxColumn"].Value.ToString(); if (HE.Length != 0) { int InHE=Convert.ToInt32(HE); list.Add(InHE); }
```

```
FN=pupilEndOfTermResultsDataGridView.Rows[i].Cells["foodNutritionDataGridViewTextBoxColumn"].Value.ToString(); if (FN.Length != 0) { int InFN=Convert.ToInt32(FN); list.Add(InFN); }
HM=pupilEndOfTermResultsDataGridView.Rows[i].Cells["homeManagementDataGridViewTextBoxColumn"].Value.ToString(); if (HM.Length != 0) { int InHM=Convert.ToInt32(HM); list.Add(InHM); }
GMD=pupilEndOfTermResultsDataGridView.Rows[i].Cells["geoMechDrawingDataGridViewTextBoxColumn"].Value.ToString(); if (GMD.Length != 0) { int InGMD=Convert.ToInt32(GMD); list.Add(InGMD); }
COMM=pupilEndOfTermResultsDataGridView.Rows[i].Cells["commerceDataGridViewTextBoxColumn"].Value.ToString(); if (COMM.Length != 0) { int InCOMM=Convert.ToInt32(COMM); list.Add(InCOMM); }
CS=pupilEndOfTermResultsDataGridView.Rows[i].Cells["computerStudiesDataGridViewTextBoxColumn"].Value.ToString(); if (CS.Length != 0) { int InCS=Convert.ToInt32(CS); list.Add(InCS); }
TD=pupilEndOfTermResultsDataGridView.Rows[i].Cells["technicalDrawingDataGridViewTextBoxColumn"].Value.ToString(); if (TD.Length != 0) { int InTD=Convert.ToInt32(TD); list.Add(InTD); }
BS=pupilEndOfTermResultsDataGridView.Rows[i].Cells["businessStudiesDataGridViewTextBoxColumn"].Value.ToString(); if (BS.Length != 0) { int InBS=Convert.ToInt32(BS); list.Add(InBS); }
PA=pupilEndOfTermResultsDataGridView.Rows[i].Cells["principalsOfAccountsDataGridViewTextBoxColumn"].Value.ToString(); if (PA.Length != 0) { int InPA=Convert.ToInt32(PA); list.Add(InPA); }
SS=pupilEndOfTermResultsDataGridView.Rows[i].Cells["socialStudiesDataGridViewTextBoxColumn"].Value.ToString(); if (SS.Length != 0) { int InSS=Convert.ToInt32(SS); list.Add(InSS); }
DT=pupilEndOfTermResultsDataGridView.Rows[i].Cells["dataGridViewTextBoxColumn1"].Value.ToString(); if (DT.Length != 0) { int InDT=Convert.ToInt32(DT); list.Add(InDT); }
PE=pupilEndOfTermResultsDataGridView.Rows[i].Cells["pedataGridViewTextBoxColumn"].Value.ToString(); if (PE.Length != 0) { int InPE=Convert.ToInt32(PE); list.Add(InPE); }
FF=pupilEndOfTermResultsDataGridView.Rows[i].Cells["ffdataGridViewTextBoxColumn"].Value.ToString(); if (FF.Length != 0) { int InFF=Convert.ToInt32(FF); list.Add(InFF); }
var Passed=list.Count(j => j > 34); var PassedJ=list.Count(j => j > 39);
string JUNIOR1="8"; string JUNIOR2="9"; string SENIOR1="10"; string SENIOR2="11"; string SENIOR3="12";
//pupilEndOfTermResultsDataGridView.Rows[i].Cells[4].Value=Passed.ToString();
{ if (class_AllocatedToolStripTextBox4.Text.ToString().Contains(SENIOR1) || class_AllocatedToolStripTextBox4.Text.ToString().Contains(SENIOR2) || class_AllocatedToolStripTextBox4.Text.ToString().Contains(SENIOR3)) { pupilEndOfTermResultsDataGridView.Rows[i].Cells[4].Value=Passed.ToString(); }
{ if (ENG.Length != 0) { int InENG=Convert.ToInt32(ENG); }
{ if (InENG >= 35 && Passed > 5) { pupilEndOfTermResultsDataGridView.Rows[i].Cells[5].Value="FULL CERTIFICATE"; }
{ var POINTS=new List<int>();
// if (class_AllocatedToolStripTextBox4.Text.ToString().Contains(SENIOR1) || class_AllocatedToolStripTextBox4.Text.ToString().Contains(SENIOR2) || class_AllocatedToolStripTextBox4.Text.ToString().Contains(SENIOR3)) { var Best6=list.OrderByDescending(r => r).Take(6);
var G1=Best6.Count(r => r >= 75 && r <= 100); if (G1.ToString().Length != 0) { int InG1=1 * G1; POINTS.Add(InG1); }
var G2=Best6.Count(r => r >= 65 && r < 75); if (G2.ToString().Length != 0) { int InG2=2 * G2; POINTS.Add(InG2); }
```

```
var G3=Best6.Count(r => r >= 60 && r < 65); if (G3.ToString().Length != 0) { int InG3=3 * G3;
    POINTS.Add(InG3); }
var G4=Best6.Count(r => r >= 55 && r < 60); if (G4.ToString().Length != 0) { int InG4=4 * G4;
    POINTS.Add(InG4); }
var G5=Best6.Count(r => r >= 50 && r < 55); if (G5.ToString().Length != 0) { int InG5=5 * G5;
    POINTS.Add(InG5); }
var G6=Best6.Count(r => r >= 45 && r < 50); if (G6.ToString().Length != 0) { int InG6=6 * G6;
    POINTS.Add(InG6); }
var G7=Best6.Count(r => r >= 40 && r < 45); if (G7.ToString().Length != 0) { int InG7=7 * G7;
    POINTS.Add(InG7); }
var G8=Best6.Count(r => r >= 34 && r < 40); if (G8.ToString().Length != 0) { int InG8=8 * G8;
    POINTS.Add(InG8); } var POINTSBEST=POINTS.Sum();
pupilEndOfTermResultsDataGridView.Rows[i].Cells[6].Value=POINTSBEST.ToString();
    } } }
    else if (InENG <= 34 && Passed < 6)
    { pupilEndOfTermResultsDataGridView.Rows[i].Cells[5].Value="GCE"; }
    else
    { pupilEndOfTermResultsDataGridView.Rows[i].Cells[5].Value="GCE"; }
} } } }
    else if (class_AllocatedToolStripTextBox4.Text.ToString().Contains(JUNIOR1) ||
    class_AllocatedToolStripTextBox4.Text.ToString().Contains(JUNIOR2))
    { pupilEndOfTermResultsDataGridView.Rows[i].Cells[4].Value=PassedJ.ToString();
{ int InENG=Convert.ToInt32(ENG);
    { if (InENG >= 40 && Passed > 5)
{ pupilEndOfTermResultsDataGridView.Rows[i].Cells[5].Value="FULL CERTIFICATE";
    { var POINTS=new List<int>();
// if (class_AllocatedToolStripTextBox4.Text.ToString().Contains(SENIOR1) ||
    class_AllocatedToolStripTextBox4.Text.ToString().Contains(SENIOR2) ||
    class_AllocatedToolStripTextBox4.Text.ToString().Contains(SENIOR3))
{ var BEST6G9=list.OrderByDescending(r => r >= 40).Take(6);
var G1=BEST6G9.Count(r => r >= 75 && r <= 100); if (G1.ToString().Length != 0) { int InG1=1 * G1;
    POINTS.Add(InG1); }
var G2=BEST6G9.Count(r => r >= 60 && r < 75); if (G2.ToString().Length != 0) { int InG2=2 * G2;
    POINTS.Add(InG2); }
var G3=BEST6G9.Count(r => r >= 50 && r < 60); if (G3.ToString().Length != 0) { int InG3=3 * G3;
    POINTS.Add(InG3); }
var G4=BEST6G9.Count(r => r >= 39 && r < 50); if (G4.ToString().Length != 0) { int InG4=4 * G4;
    POINTS.Add(InG4); }
var POINTBESTG9=BEST6G9.Sum();
    pupilEndOfTermResultsDataGridView.Rows[i].Cells[6].Value=POINTBESTG9.ToString();
} } } else if (InENG <= 39 && Passed < 6)
{ pupilEndOfTermResultsDataGridView.Rows[i].Cells[5].Value="GCE"; }
else
{ pupilEndOfTermResultsDataGridView.Rows[i].Cells[5].Value="GCE"; } } }
    } else if (Passed != 0) { pupilEndOfTermResultsDataGridView.Rows[i].Cells[5].Value="GCE"; }
} } catch (Exception ex) { } }
}
```

## **Function**

This is the most crucial component of the system. This component should allow a user to bunch comment, grade, evaluate the subjects sat for, the subjects passed, and the certificate obtained by the pupils of a class in a button click. The system should automatically be able to perform all the computation in a second split, making all the decisions logically without any user further actions, but only the data from the server main database.

## **10.2.9. Acronyms and Abbreviations**

C#	C Sharp
COM Port	Communication Ports
CPU	Central Processing Unit
ESMS	Electronic School Management System
GUI	Graphical User Interface
OLEDB	Object Linking and Embedding Database
RAM	Random Access Memory
SMS	Short Messages System
VAR	Variable
INT	Integer

## 10.3. RESEARCH DESIGN

The researcher used a descriptive method, qualitative and the quantitative approaches in order to gather data for the subject in question. The descriptive method of research was used to gather information about present existing condition as respondents saw them, where as the qualitative approach aimed at obtaining none numerical findings from the survey while the quantitative approach focused on obtaining numerical findings from the survey that was employed.

### 10.3.1. Target Population

The population for the study comprised of 320 teachers. The population consisted of 78 teachers at Chikola Secondary, 73 at Kabundi Secondary, 54 at Maiteneke Secondary, 47 at Sacred Heart Convert and 68 at Sekela Secondary School giving a total population of about 330 all together.

### 10.3.2. Sample and Sampling Technique

The research had employed a target sample of purposively selected 215 teachers and 3 head teachers from the schools, which tested the fully intelligent electronic data and records management system, and those who had never used the e-system. However, 221 respondents (teachers) participated from schools with the e-system (Chikola, Kabundi and Sekela Secondary schools) and two headteachers. The research had set a target of 40 teachers and 1 headteacher from a school using the paper-file system (Maiteneke Secondary School) and 40 from a school using a no-automated e-system (Sacred Heart Convert School). Only 39 respondent (teachers from the schools without an electronic school management system) participated in the research and a headteacher. Thus, 263 respondents participated, instead of the anticipated 218, for the qualitative, quantitative and interview, data collection exercise, which employed questionnaires and interview respectively. The research data collection method had employed a larger sample because a small sample size has its own limitations as indicated by Coldwell and Herbst (2004), due to number of limitations which include educational, exposure to current technological advances, maturity, ethical, financial and geographical factors, to mention but a few. Selection of respondents was through convenient sampling and systematic sampling technique. The quantitative approach was the most method for the larger sample size ie the teachers because it is fast, inexpensive, easy, and the subjects were taken from a group that was easily accessible to the researcher.

### 10.3.3. Instruments for Data Collection

Data was collected using two different structured questionnaires that were given out to the candidates of the sampled population. The questionnaires consisted of close-ended matrix questions, close-ended matrix questions with a Likert scale of various responses and open-ended questions where the respondent gave responses in their own words, from their own opinion. A Likert scale is a rating that requires the subject to indicate the degree of agreement or disagreement to a statement. In the questionnaire where questions or statements had a Likert scale, the respondents had about two to five choices. The options served as the quantification of

the participants' agreement or disagreement on each statement or question. The degree of agreement or disagreement was used to measure the strength of a response. Below are examples of the designated Likert scale quantifications that was used in the questionnaire, where participants were required to tick in the left box, their choice.

a)	<input type="checkbox"/>	Agree	b)	<input type="checkbox"/>	Agree	b)	<input type="checkbox"/>	Strongly agree
	<input type="checkbox"/>	Disagree		<input type="checkbox"/>	Neither agree nor disagree		<input type="checkbox"/>	Agree
				<input type="checkbox"/>	Disagree		<input type="checkbox"/>	Neither agree nor disagree
							<input type="checkbox"/>	Disagree
							<input type="checkbox"/>	Strongly disagree

Table 13 Likert scale response quantifications examples, in a) they are 2 choices, b) 3 choices and c) 5 choices

### 10.3.4. Procedure for Data Collection

The research sought permission to conduct research from the institution headteacher, of which the results were used in this subject in question. The researcher distributed the questionnaires personally to the respondents, and collected them immediately and after a day or two days were respondents were busy. The researcher conducted the interviews within a week with all the respective Headteacher and notes were collected during interviews

### 10.3.5. Data Analysis Techniques

Two similar but different questionnaires were used for two types of schools, one without an electronic data and records management systems and the others with an electronic data and records management systems. This saved as a comparative study, which assessed whether an e-system could bring about any efficiency and effectiveness in the human-time resource management.

The quantitative data from both questionnaires was analysed using a software, called Statistical Package for Social Sciences (SPSS version 24) and by empirically comparing means of data of responses from the two sets. SPSS is one of the most widely availablely used statistical package tool that covers a broad range of statistical procedures, which allowed the researcher to summarize data and the quantitative response scores graphically and numerically. SPSS was used to calculate various statistics such as mean, mode and standard deviation. To determine whether there was significant differences between the means of groups of responses for our hypothesis questions, tests such as analysis of variance, ANOVA and Chi-square were used examine relationships among the variables.

### 10.3.6. Triangulation

The data, which was collected with the qualitative approach, was married with the data collected with quantitative approaches to yield data validation and rich results. This process is a powerful technique, which facilitates validation of data through cross verification from two or more

sources. The qualitative data was collected from the head teachers and teachers using an interview and qualitative method, over the effects of an electronic data capture and records management system on a school administration and management system **is** functioning, while the quantitative data was collected from the teacher populace from the five schools using the closed end questionnaires. The researcher after analysing the quantitative data and analysing the qualitative data had to check for consistency in the data results, by comparing and contrasting the results from the two methods so as to yield a robust conclusion and analysis of the study.

## **10.4. SCOPE OF THE STUDY**

The study focused on examining the effect of an electronic data capture and records management system on a school administration and management system functioning, with a special focus on Chikola Secondary, Kabundi Secondary, Maiteneke Secondary, Sacred Heart Convert and Sekela Secondary Schools of Chingola, Zambia as the case studies. The study was limited in the representatives since it focused on only a few units, which originate from one town, as such limited valid generalizations was made to the population from which the units were drawn from. The research was conducted in Chingola District of Zambia because there is a diverse group of players and stakeholders (the teachers) who are key players in the educational sector of the Zambia. The location chosen also fostered the proximity to the researcher and the management of the study since the researcher is a resident of Chingola.

### **10.4.1. Delimitations of the Study**

The study focused on head teachers and the teachers thus forming the representative sample for data collection.

- Teachers: These were vital in the research as they formed the basis of our education backbone. They are the people who provide the knowledge and skills that we hold ‘up-high’.
- Head teachers: They control the flow of human and financial resources in a school. In addition, they hold a general over view on how a school is functioning, and how anything new is affecting how the administrative and management functions are executed. This group of participates form a cardinal group whose sole purpose is to analyse, form plans and policies to improve the school educational performance.

The above-mentioned groups were chosen, specifically as they eventually interact and relate since they are interdependent in balancing up the running of the Zambia’s educational secondary school system.

### **10.4.2. Limitations of the Study**

Time and finances were not the only limiting factors for the research seeing that the researcher is both a teacher who had classes to teach and a student who had some assignments to accomplish during the research period. Furthermore, seeing that the research was for academic purposes, any institution hence did not sponsor it the researcher had financial limitations to cover a wider spectrum of respondents.

Additionally, some of the targeted respondents had no idea of what was happening around them due to lack of exposure, lack of interest in the current affairs and lack of interest and appreciation of technology. Thus, this resulted into a low positive response rate especially among the respondent of the schools without the electronic school management system.

### **10.4.3. Ethical Consideration**

The research was conducted with complete confidentiality, no teacher was asked to indicate his or her identification of any sort anywhere in the question, without his or her prior consent. Furthermore, they are no mention of any name of any respondent in the research paper. The interviews with the head teacher were conducted with prior consent from them. To avoid biases or ill feelings resulting from segmentation of the questionnaires from the various schools, the questionnaires of any of the two sets were mixed together following data capture. Any names used in this report were used specially for academic purposes, and the owners gave consent, the respective information of any institution was legally acquire with consent from the head of the institutions. In cases were institutions wanted to remain anonymize, the names and details were deducted.

### **10.4.4. Justification for Deviations from the Methodology in the Proposal**

The research was conducted as strictly as possible as stipulated in the proposal. Hence, there barely any deviation from the proposed methods in the proposal, apart from the increase in the sample size.

## 3 CHAPTER FOUR

### 11. PRESENTATION OF FINDINGS

The study aimed at assessing the effect of an electronic data capture and records management system on a school's administration and management in Chingola, Zambia. To facilitate the study, it focus on the schools which currently an 'electronic data capture and records management system (Jephkapi ESMS)': Chikola Secondary, Kabundi Secondary and Sekela Secondary Schools. The study also looked at the schools not using the any electronic data capture system: Maiteneke Secondary, Sacred Heart Convert, for comparative purposes. The focus was on a number of independent variables, namely: workflow automation, efficient communications management, management of records in effective manner, quality assurance, better productivity management, better performance management, better cost-effectiveness, ease in accessibility, accountability with better audit trails and more integration of various departments. In order to accomplish the above, nine null hypotheses were formulated, as shown below:

1. An electronic data capture and records management system does not change a school administration and management core functioning over time.
2. They are no potential benefits of an electronic data capture and records management system to an institution or organization.
3. They are more drawbacks of an electronic data capture and records management system in schools than the old paper-file system.
4. Most school staff do not support an electronic data capture and records management system because it is alien to them.
5. The introduction of an electronic data capture and records management system cannot bring about workflow automation.
6. There is better management of records with effectivity with the paper-file system than with the electronic data capture and records management system.
7. The old method of handling data, records and information using paper and files has more quality assurance than with the modern methods of using computers.
8. It is not easy to track productivity and performance of a pupil with an electronic data capture and records management system than with the old methods.
9. An electronic data capture and records management system is not cost-effective and not ease in accessibility than the old system of using papers and files.

The results of the research study are presented in this chapter. The chapter is divided into three sections, namely: section one deals with the demographic characteristics of respondents, section two presents the descriptive statistics of the items relating to particular objectives and section three presents the study's findings according to the hypotheses cited in chapter two.

In the study, a total number of 260 teachers were sampled which gave 260 questionnaires that were collected after distribution.

The information obtained was analyzed in terms of tables of frequencies, percentages and graphs. Responses from discussions with the three headteachers were used to supplement responses from the closed and open-ended questionnaires. The response rate was considered reasonable because at least more than 100% of the targeted sample size of respondents participated in the study. The researcher felt that the views expressed in the report is therefore representative of the target population.

## 11.1. Section One: Background information of respondents

### 11.1.1. Demographic Characteristics

Below are the demographic characteristics, which show the distribution of respondents' categories in terms of age, gender, and years of service in the Ministry of Education, as described in the tables.

#### 11.1.1.1. Gender

Table 14: Gender of respondents from the schools with an electronic school management system

		Gender			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	96	43.4	43.4	43.4
	Male	125	56.6	56.6	100.0
	Total	221	100.0	100.0	

Table 15: Gender of respondents from the schools without an electronic school management system

		Gender			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	17	43.6	43.6	43.6
	Male	22	56.4	56.4	100.0
	Total	39	100.0	100.0	

The results in table 14 show that most of the respondents 56.6% were males while only 43.4% were females from the schools with the electronic school data and records management. From table 15, the results show that 56.4% were males and 43.6% were females of respondents from the schools without an electronic school data and records management system. Thus, from both samples, there was a distribution of more males than females with a smaller margin of 12% less.

#### 11.1.1.2. Age Groups

Table 16: Age of respondents from the schools with an electronic school management system

Age	
-----	--

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	21yrs minus	61	27.6	27.9	27.9
	21yrs-28yrs	28	12.7	12.8	40.6
	28yrs-34yrs	31	14.0	14.2	54.8
	34yrs-40yrs	47	21.3	21.5	76.3
	40yrs-50yrs	39	17.6	17.8	94.1
	50yrs plus	13	5.9	5.9	100.0
	Total	219	99.1	100.0	
Missing	System	2	.9		
Total		221	100.0		

Table 17: Age of respondents from the schools without an electronic school management system

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	21yrs - 28yrs	8	20.5	20.5	20.5
	28yrs - 34yrs	6	15.4	15.4	35.9
	34yrs - 40yrs	15	38.5	38.5	74.4
	40yrs - 50yrs	4	10.3	10.3	84.6
	50yrs plus	6	15.4	15.4	100.0
	Total	39	100.0	100.0	

From table 16, it is evident that the majority of the respondents (27.6%) were aged less than 21 years followed by (21.3%) between ages 34 years to 40 years of age from the schools with the electronic school data and records management. From the schools without the electronic school data and records management, the majority (38.5%) were aged between 34 years to 40 years followed by the age group (20.5%) 21 years to 28 years of age as shown in table 17.

### 11.1.1.3. Years in service

As seen in table 18 below, most respondents (30.3%) from the schools with the electronic school data and records management have serviced for more than 10 years, followed by the next majority (26.7%) with 1 year to 2 years in services. From the schools without the electronic school data and records management, most respondents (33.3%) have services for 2 years to 5 years, followed by the next majority group (30.8%) with 10 years of services or more as shown in table 19.

Table 18: Year in service of respondents from the schools with an electronic school management system

Years_In_Service					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1yrs-2yrs	59	26.7	27.1	27.1

	2yrs-5yrs	42	19.0	19.3	46.3
	5yrs-10yrs	50	22.6	22.9	69.3
	10yrs plus	67	30.3	30.7	100.0
	Total	218	98.6	100.0	
Missing	System	3	1.4		
Total		221	100.0		

Table 19: Year in service of respondents from the schools without an electronic school management system

		Years_In_Service			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1yrs - 2yrs	8	20.5	20.5	20.5
	2yrs - 5yrs	6	15.4	15.4	35.9
	5yrs - 10yrs	13	33.3	33.3	69.2
	10yrs plus	12	30.8	30.8	100.0
	Total	39	100.0	100.0	

The researcher acquired the gender, age groups and duration of service of the respondents in the schools to ascertain the respondents' level of responsibilities, work environment experiences and maturity in the decision- making processes.

## 11.2. Section Two: Description of respondents' opinions in relation to the independent variable

In this section, the descriptions of respondents' preferences to the options for the answers to questions according to the items of the questionnaire relating to the objectives of the study-is presented. Respondents were asked to react to the items in the questionnaire by ticking the option that best described their opinions on a Likert scale ranging from strongly disagree to strongly agree, level of available to none availability, yes or no, etc. Several items in the questionnaire were presented to the respondents to rate their availability and the findings as show in the subsections below:

### 11.2.1. Respondents' views on whether Zambian schools are doing enough to enhance the way in which they handle data

Table 20: Respondents' views on whether Zambian schools are doing enough to enhance the way in which they handle data for the school with an electronic school management system

		Schools_Data_Handling_Methods_with_ESMS		
		Frequency	Percent	Cumulative Percent
Valid	1. They are in-line with global standards	20	9.0	9.1
	2. There are making progress	139	62.9	72.3

	3. They could be doing more	31	14.0	86.4
	4. They are falling significantly behind global standards	30	13.6	100.0
	Total	220	99.5	
Missing	System	1	.5	
Total		221	100.0	

As evident from table 20, 139 respondents (62.9%) answered that Zambian schools are making progress to enhance the way in which they handle data for the school with an electronic, while 31% (14 respondents) feel that the schools need to put in more effort. To illustrate this, below is figure 26, showing most respondents selecting “they are making progress”, the schools in handling data. However, 30% of the respondents’ feel that schools are falling significantly behind global standards.

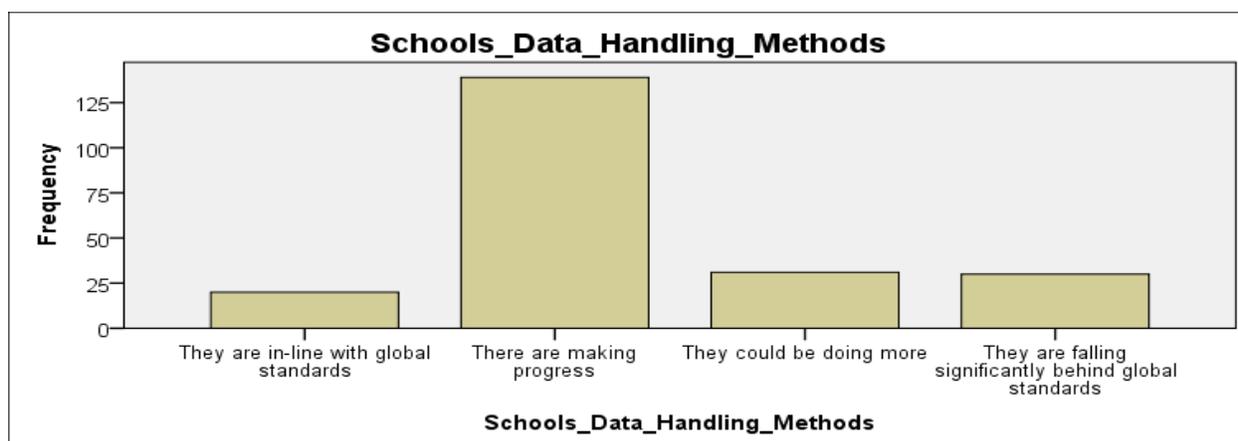


Figure 26: Respondents’ views on whether Zambian schools are doing enough to enhance the way in which they handle data for the school with an electronic school management system

The statistics were not different for the schools without an electronic school management system, as seen from the table below, 59.0% respondents think that schools are making progress to enhance the way in which they handle data for the school with an electronic. 23.1% feel the schools can do better in the way they handle data, 10.3% feel that the schools are falling significantly in the way they handle data, while 7.7% feel the schools are in line with global standards.

Table 21: Respondents’ views on whether Zambian schools are doing enough to enhance the way in which they handle data for the school without an electronic school management system

Schools_Data_Handling_Methods_without_ESMS						
	Frequency	Percent	Cumulative Percent	Statistics		
				Schools_Data_Handling_Methods		
1.They are in-line with global standards	3	7.7	7.7	N	Valid	39
2. There are making progress	23	59.0	66.7		Missing	0
3. They could be doing more	9	23.1	89.7			

4. They are falling significantly behind global standards	4	10.3	100.0	Mean	2.36
				Median	2.00
Total	39	100.0		Mode	2
				Std. Deviation	.778
				Variance	.605

### 11.2.2. Respondents' views on whether the electronic school management system (ESMS) employed by their schools has made data capture for the end of term pupils results and details more or less efficient than the years past

After capturing and analysing the respondents views on whether the electronic school management system (ESMS) which is employed by their schools, has made data capture for the end of term pupils results and details more or less efficient than the years past, the results are in table 22 and figure 27.

Table 22: ESMS Brought data efficiency in school

ESMS_Brought_Data_Efficiency			
		Frequency	Percent
Valid	More	154	69.7
	The same	44	19.9
	Less	23	10.4
	Total	221	100.0

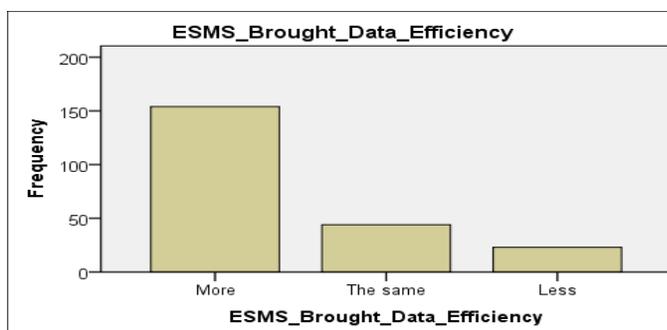


Figure 27: ESMS Brought data efficiency in school

As evident from the above (table 22 and figure 27), the majority, 69.7% (154 respondents) responded that the new electronic system brought about data capture and handling efficiency than in the past when they never had the system. While 19.9% (44 respondents) felt that, the data capture is the same as previously before the system was introduced. In addition, 10% (23 respondents) feel the system has made data capture worse.

### 11.2.3. Respondents' views on whether the paper-file system employed by the school has made data capture for the end of term pupils results and details more or less efficient and effective

When it came to the system with the old system in place, the paper-file system that their school has been using for data capture for the end of term pupils results and details and the researcher checked from the respondents whether **it is** more or less efficient and effective. The results were records, and shown in table 23, and figure 28. The majority, 51.2 % (20 respondents) said **it is** not efficient, 28.2% said it is the same as an electronic system while 17.9% said it is efficient.

Table 23: Is the Paper-Filling Method Effective is than ESMS

Paper Manual Effective is than ESMS		Frequency	Percent
Valid	More	7	17.9
	The same	11	28.2
	Less	20	51.3
	Total	38	97.4
Missing	System	1	2.6
Total		39	100.0

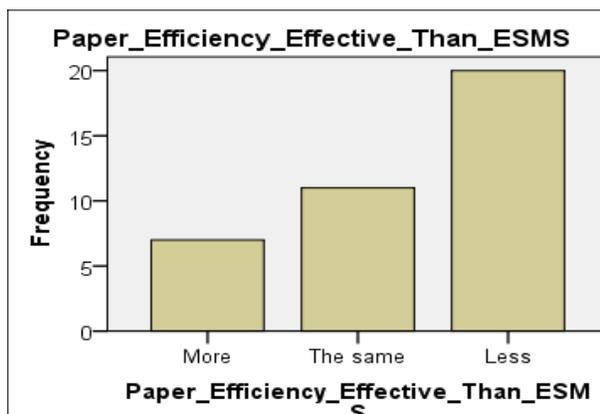


Figure 28: paper manual system is more efficiency in school

### 11.2.4. Respondents' views on whether the electronic data record management system can change a new upcoming school's administrative and management practices and systems

From the table 24 and figure 29, the results for whether the electronic data record management system can change a new upcoming school's administrative and management practices and systems, are displayed. These participants were from the schools with an electronic school management system. And as seen, 81.4% feel it can make a great deal of positive change, while only 4.5% think it can have no impact.

Table 24: ESMS Capability Change New Schools

ESMS_Capability_Change_New_Schools		Frequency	Percent
Valid	Very likely	180	81.4
	Unlikely	27	12.2
	Not at all	10	4.5
	Total	217	98.2
Missing	System	4	1.8
Total		221	100.0

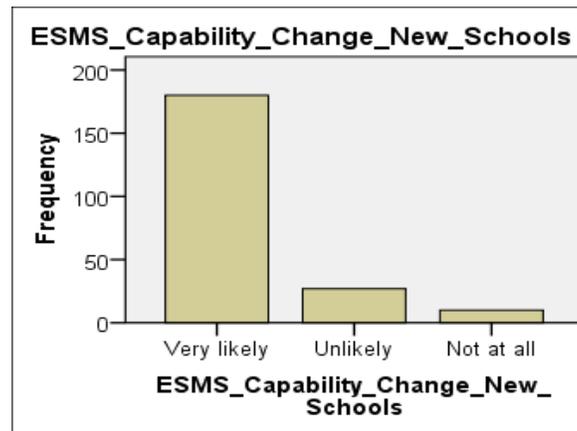


Figure 29: ESMS Capability Change New Schools

Below are the qualitative findings from the two categories of schools (the schools with and those without the electronic school management collectively), for how the electronic data record management system changes new upcoming schools' administrative and management practices and systems. The respondents said the system:

- is very convenient and the users are less likely to make the common error
- will compile the schools to provide more computers in schools to the teaching staff
- will improve easiness, efficiency, effectiveness and reliability of data and records
- will help save costs seeing there will be less paper work
- is manageable and will make the work easy
- will ensure data is be kept for a longtime and updates will easily be made
- will maintain proper data storage data and security thus reduce the records going missing like in the case of papers and files
- will help users save time during data capture and entry, and keeping of pupils records will greatly improve
- will ensure more improve data access and reduce retrieval time of records and data than when its held on hard copies in files and folders
- will ensure more data is be readily available for decision making
- will improve and increase the amount of data and record keeping capacity
- will help to make the programs for the school to run at the fastest rate
- will ensure there is no procrastination in compiling and processing data will be reduced
- will help to capture data and maintain good results in school
- will help the school management and administration not to be wasting time looking for pupils data or records, like in a case when a teacher goes with a file at home,

because data will readily be available in fraction of second from the school new e-system

- will help to track the of performance records of pupils and teacher for referencing
- may pose challenges as most upcoming schools do not have computers and the teachers are computer illiterate.

### 11.2.5. Respondents' frequency on the usage of the electronic data record management system per year

On the frequency of use of the same electronic school management system, 15.8% use it more than 5 plus in a year, 71.5% use it at least more than once a year and 11.8% have never used it before, as seen in table 25.

Table 25: frequency on the usage of the ESMS per year

		Usage_Annual_Frequency		
		Frequency	Percent	Cumulative Percent
Valid	None	26	11.8	11.9
	1 - 5	158	71.5	84.0
	5 plus	35	15.8	100.0
	Total	219	99.1	
Missing	System	2	0.9	
Total		221	100.0	

### 11.2.6. Respondents' opinion on whether there is enough legislation in place across Zambia to support schools in improving pupil records data capture, protection and storage systems

To answer the question of whether the respondents think there is enough legislation in place across Zambia to support schools in improving pupil records data capture, protection and storage systems, the results were records in table 26 and visually displayed in figure 30. 119 respondents whom are 53.8% of the sampled population feel the government should introduce more measures to support the same. While 26.3% (58 respondents) are not familiar with existing legislation to support electronic systems for data management in schools, while 14.5% (32 respondents) feel the country's legislation are in-line with globally standards for supporting the same in schools.

Table 26: Enough legislation in place across Zambia to support schools in improving pupil records data capture, protection and storage systems

Enough Legislation Supporting ESMS in Schools				
	With ESMS		Without ESMS	
	Frequency	Percent	Frequency	Percent
The country is in-line with legislation globally	32	14.5	5	12.8
I am unfamiliar with existing legislation	58	26.2	13	33.3
More measures could be introduced by the government	119	53.8	19	48.7
The country is falling significantly behind	12	5.4	2	5.1
Total	221	100.0	39	100.0

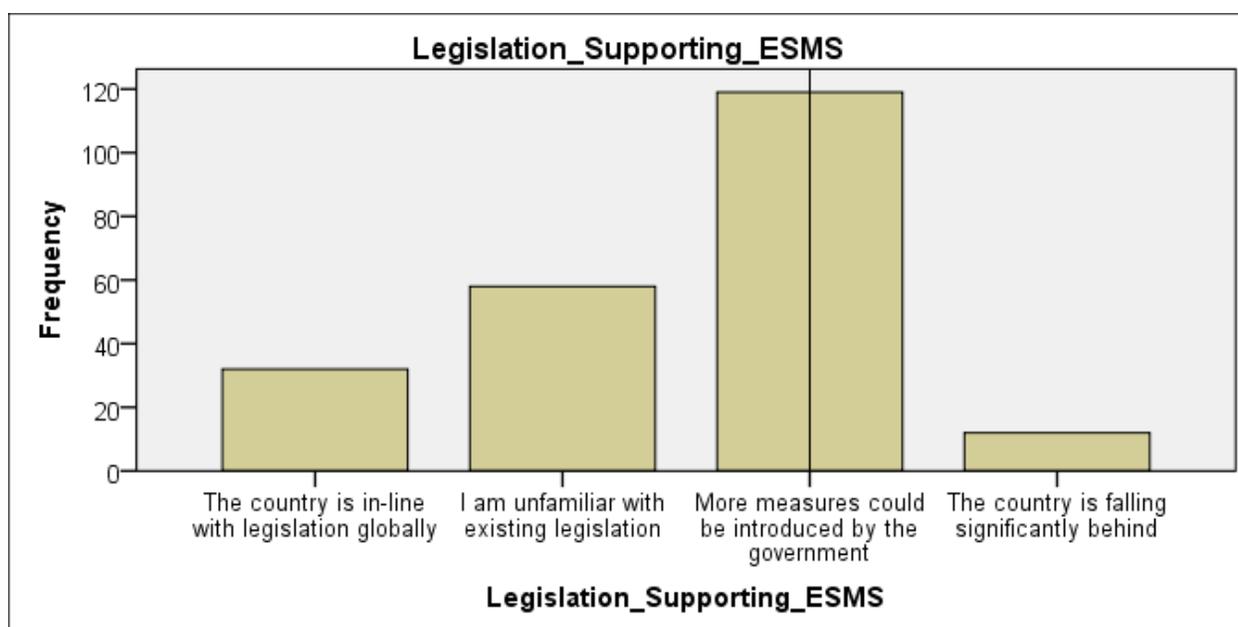


Figure 30: Enough legislation in place across Zambia to support schools in improving pupil records data capture, protection and storage systems (responses from schools with ESMS)

### 11.2.7. Respondents' opinion on whether there are enough skills and expertise in the area of electronic data management systems across Zambia

After having checked for registration and governmental support, the research had to establish whether there are enough skills and expertise in the area of electronic data management systems across Zambia. As seen from table 27 and figure 31, most (65.6%) respondents responded that more training is needed, while 24% were concerned by the lack of computer literacy among the teaching staff.

Table 27: Enough skills and expertise in the area of electronic data management systems across Zambia

Enough skills and expertise in the area of electronic data management systems across Zambia					
		With ESMS		Without ESMS	
		Frequency	Percent	Frequency	Percent
Valid	The country is in-line with best practices globally	22	10.0	4	10.3
	More training and qualification is required	145	65.6	29	74.4
	I am concerned by the lack of computer literacy	53	24.0	6	15.4
	Total	220	99.5	39	100.0
Missing	System	1	.5		
Total		221	100.0	39	100.0

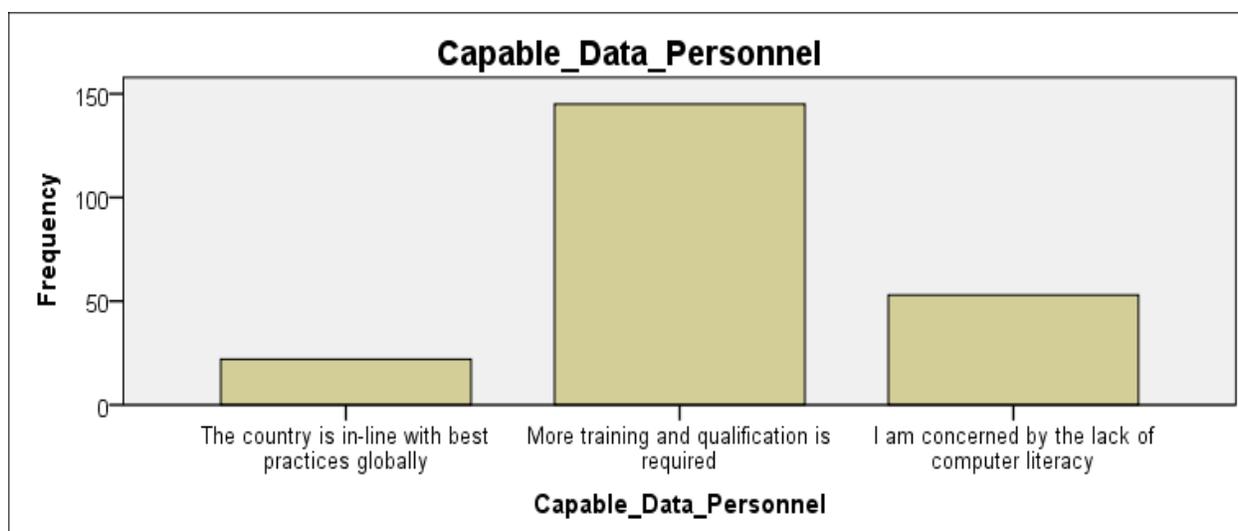


Figure 31: Enough skills and expertise in the area of electronic data management systems across Zambia responses from schools with ESMS

### 11.2.8. Respondents' opinion on which types of sectors do they think are the most in need of the electronic data record management system in Zambia

When the respondents were asked, which types of sectors they think are the most in need of the electronic data record management system in Zambia, 51.6% feel the whole government should use an electronic data manager system as shown in table 28. While 37.1% said secondary schools and tertiary schools.

Table 28: Sectors in need of the data electronic management system

Sectors_Needing_EDMS					
		With ESMS		Without ESMS	
		Frequency	Percent	Frequency	Percent
Valid	Government as a whole	114	51.6	27	69.2
	Secondary and tertiary schools	82	37.1	5	12.8
	Financial services institutions	12	5.4	3	7.7
	Healthcare organizations	5	2.3	4	10.3
	All	8	3.6		
	Total	221	100.0	39	100.0

### 11.2.9. Respondents' opinion on how significantly do they think an electronic data record management system impacts an institution's reputation

From table 29 and figure 32 below, it is evident that an electronic system of data and record management significantly affects an institution's reputation, by the fact that 46.2% responded so. While 40.7% are usually unaware if an institution is using one or not. Additionally, 10.0% feel it does not influence their decision to use the institutions services or products.

Table 29: Significantly of an electronic data record management system impacts an institution's reputation

EDMS_Reputation_Impacts					
		With ESMS		Without ESMS	
		Frequency	Percent	Frequency	Percent
Valid	It significantly impacts my decision to use that institution's services or products	102	46.2	25	64.1
	I am often unaware if a institution uses such a system or not	90	40.7	9	23.1
	It does not influence my decision to use that institution's services or products	22	10.0	1	2.6
	Total	214	96.8	35	89.7
Missing	System	7	3.2	4	10.3
Total		221	100.0	39	39

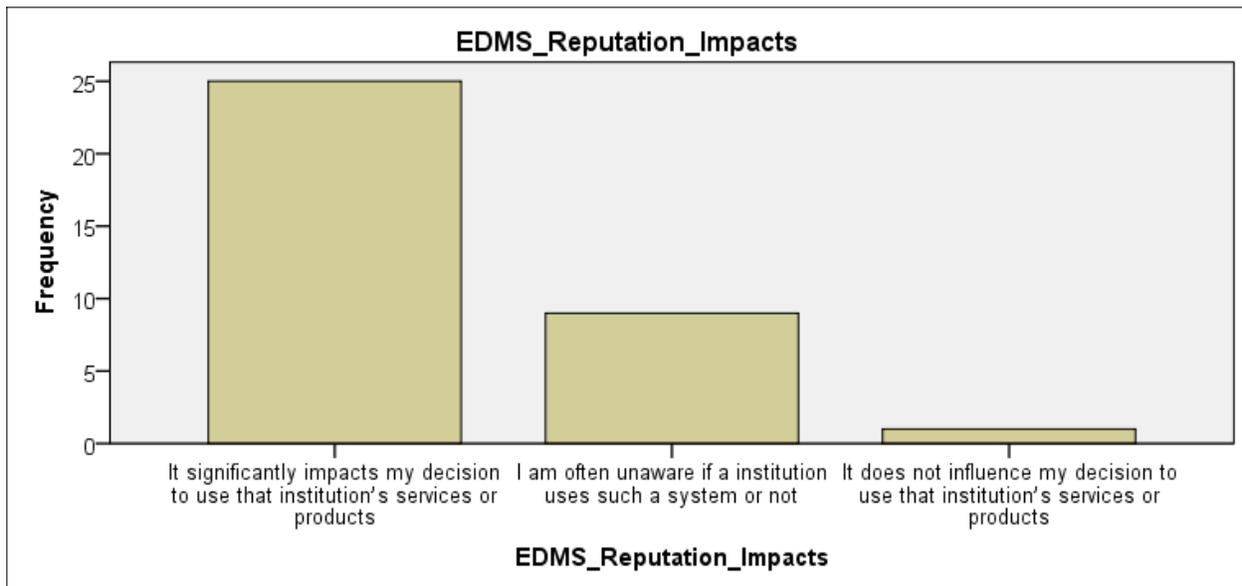


Figure 32: Significantly of an electronic data record management system impacts an institution's reputation

### 11.2.10. Respondents' view on whether the electronic data record management system, concerning what may have being the price for the electronic data and record management system costed your school, was of worthy it.

From table 30, 45.5% of the respondents responded that the electronic data record management system was of good value which their schools acquired. 40.5% are unsure whether the electronic data record management system was worthy it or not. 7.3% of the respondents feel that the electronic data and record management system is of great value. But 6.8% of the respondents think the electronic data and record management system is of poor value.

Table 30: In regards to what may have being the price for the electronic data record management system costed your school, would you say the value was of worthy it?

		ESMS_Cost_Worthy			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poor value	15	6.8	6.8	6.8
	Unsure	89	40.3	40.5	47.3
	Good value	100	45.2	45.5	92.7
	High value	16	7.2	7.3	100.0
	Total	220	99.5	100.0	
Missin g	System	1	0.5		
Total		221	100.0		

Value Category	Frequency
Poor value	15
Unsure	89
Good value	100
High value	16

### 11.2.11. Respondents' view on whether the electronic data record management system provides more availability to pupil's end of term records and pupils data and details as compared to the old paper-file system whenever records

From table 31, 74.8% respondents responded that an electronic data record management system provide more availability to pupil's end of term records and pupils data and details as compared to the old paper-file system whenever records are needed. While 25.2% respondents feel that an electronic data record management system provide less availability to pupil's end of term records and pupils data and details as compared to the old paper-file system whenever records are needed.

Table 31: electronic data record management system provide more availability to pupil's end of term records and pupils data and details as compared to the old paper-file system whenever records are needed

Is Data Availability Better than with the Paper-File Old System					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	151	68.3	74.8	74.8
	No	51	23.1	25.2	100.0
	Total	202	91.4	100.0	
Missing	System	19	8.6		
Total		221	100.0		

### 11.2.12. Respondents' reasons for using the electronic data record management system

The reasons why the respondents used the electronic system of data and record management in the schools varied, as shown in table 32 and figure 33. Most of the respondents about 44.5% used it to save time, 35.9% used it because of its convenience, 7.7% used it because it allowed them to work 24/7, and 11.4% used it because of its convenience, allowed them to save time, and because it gave them 24 hour access to the data and records.

Table 32: Reasons for using the electronic data record management system

Reasons_For_Using_ESMS					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Convenience	79	35.7	35.9	35.9
	To save time	98	44.3	44.5	80.5
	24-hour access to data	17	7.7	7.7	88.2
	All	25	11.3	11.4	99.5
	Others	1	.5	.5	100.0
	Total	220	99.5	100.0	
Missing	System	1	.5		

Total	221	100.0		
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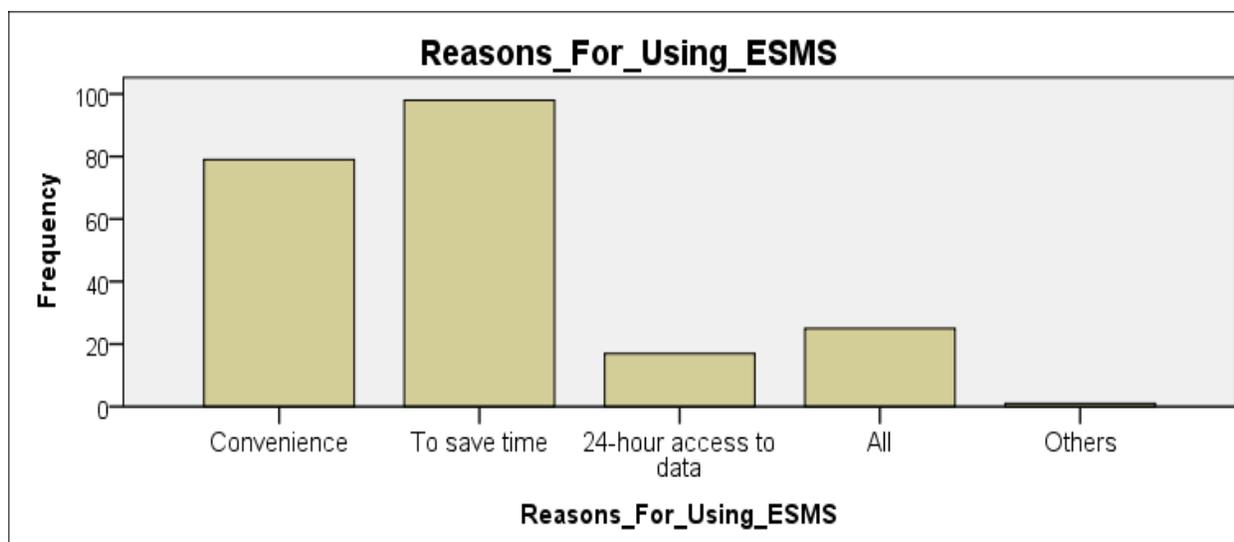


Figure 33: Reasons for using the electronic data record management system (schools with ESMS)

### 11.2.13. Respondents' likelihood to recommend an electronic data record management system to other schools

Most respondents from schools with and those without the electronic data management system, about 46.6% and 42.0% respectively are likely to recommend an electronic data record management system to other schools. While 35.7% from the schools with the electronic data management system and 56.4% from the schools without the electronic data management system strongly feel, they are likely to recommend an electronic data record management system to other schools. While 17.7% from the schools with the electronic data management system and 2.6% from the schools without the electronic data management system are unlikely and very unlikely to recommend the system to any school, as seen in table 33 and figure 35.

Table 33: Likelihood to recommend an electronic data record management system to other school

		Can_U_Recommend_ESMS			
		With ESMS		Without ESMS	
		Frequency	Percent	Frequency	Percent
Valid	Very unlikely	24	10.9	1	2.6
	Unlikely	15	6.8	0	0
	Likely	103	46.6	16	41.0
	Very likely	79	35.7	22	56.4
	Total	221	100.0	39	100.0

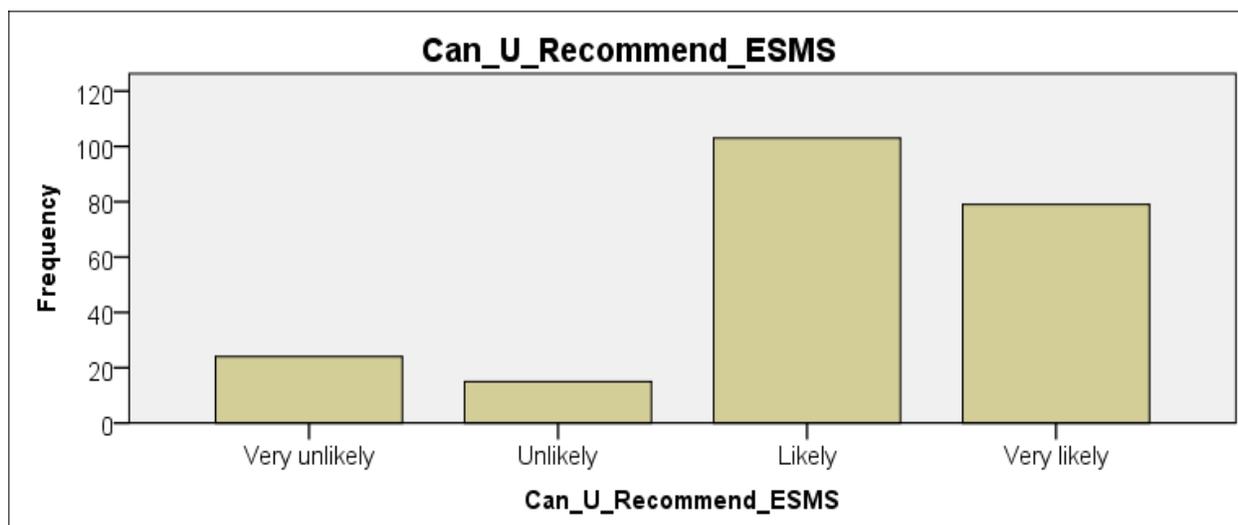


Figure 34: Likelihood to recommend an electronic data record management system to other school (schools with ESMS)

#### 11.2.14. Respondents' estimated time they take to complete the entering the results, grades for results and comments for the results for the end of term in the system, on the report form and the master mark sheet.

As seen from table 34 and figure 36, most respondents from the schools with an electronic data management system, 88.2% of them used less than 120 minutes estimated time to complete the entering the results, grades for results and comments for the results for the end of term in the system, on the report form and the master mark sheet. Of the 88.2%, 38.2% used less than 30 minutes to complete their tasks. Moreover, an accumulative of 61.8% used less than an hour to complete their tasks.

Table 34: Average Time Enter Results in the Electronic School System

Average_Time_Enter_Results in the Electronic School System		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	min<30min	26	11.8	38.2	38.2
	29min-45min	9	4.1	13.2	51.5
	44min-60min	7	3.2	10.3	61.8
	59min-90min	11	5.0	16.2	77.9
	90min-120min	7	3.2	10.3	88.2
	min>120min	8	3.6	11.8	100.0
	Total	68	30.8	100.0	
Missing	System	153	69.2		
Total		221	100.0		

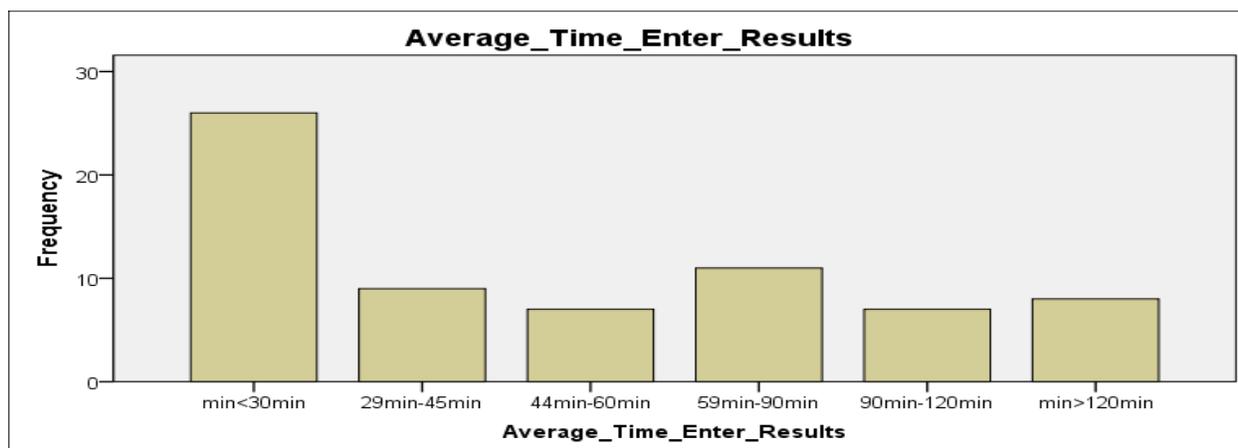


Figure 35: Average Time Enter Results in the Electronic School System

However, from table 35 and figure 37. Most respondents from the schools without an electronic data management system, 61.1% of them used less than 480 minutes (which is the whole day) of estimated time to complete the entering the results, grades for results and comments for the results for the end of term in the system, on the report form and the master mark sheet. And 38.9% (who were the majority statistic) needed more than a day's working hours to complete the task. Of the 61.1%, only 5.6% used less than 60 minutes to complete their tasks. 30.6% needed between 60 minutes to 120 minutes, and so forth.

Table 35: Average Time Enter Results on the Files and papers

Average_Time_Enter_Results on Papers and Files		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	min<60	2	5.1	5.6	5.6
	min<120	11	28.2	30.6	36.1
	min<240	6	15.4	16.7	52.8
	min<480	3	7.7	8.3	61.1
	min>479	14	35.9	38.9	100.0
	Total	36	92.3	100.0	
Missing	System	3	7.7		
Total		39	100.0		

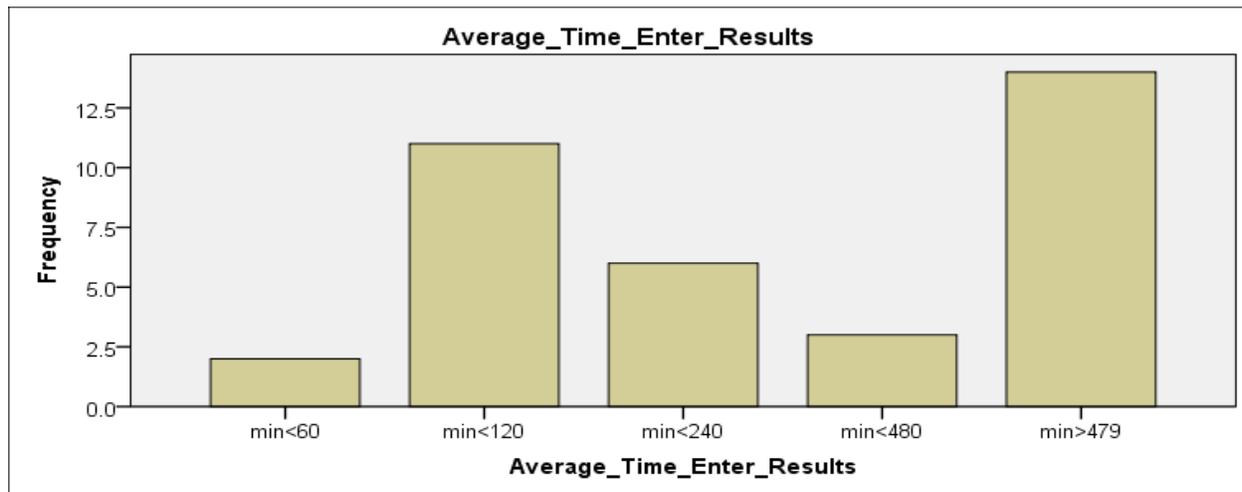


Figure 36: Average Time Enter Results on the Files and papers

Below are the collective descriptive and qualitative findings from the interviews and questionnaires last section (C) for the research study from both the schools with and the ones without the electronic school data and records management system:

Was the time that you needed to do your work during end of term test results data entry using the electronic data and record management system more efficient and effective than the old paper-file system and if you were? Give reasons to your answer.

- Can save and saved time to enter than was with the paper-file system
- There can be and there is more easiness, efficiency and effectiveness during data entry. More over, there is more effectiveness and reliability of data and records as the system did 75% plus of the work, like calculating percentage, grades, commenting, finding averages, maximum scores, positions in classes and grades, etc
- There can be and there was less paper work, thus can and saved costs on paper
- Data will be kept for a longtime and updates are made easily
- There will be proper data storage data and security thus reduce the records going missing like in the case of papers
- The keeping of pupils records will greatly improve and has improved
- They will improve data access and retrieval time than when its held on hard copies
- More data will be and is readily available for decision making
- Programs for the school will run at the fastest rate as teacher will have more extra time
- Procrastination in compiling and processing data will be reduced and can reduce
- It will help to capture data and maintain good results in school
- The school management and administration will not be wasting time looking for pupils data or records, like in a case when a teacher goes with a file at home, because data will readily be available in fraction of second from the school

- It will help to track the performance records and for references
13. with reference to the electronic data record management system:
- b) In your opinion, what specific benefits do you think an electronic data capture system would bring or brings about?
    - Accuracy
    - Conveniency in terms of usage
    - Effeiciency in working
    - Time saving and space
    - Less paper work
    - Good record keeping
    - Data is readily available and retrieved
    - more easiness, efficiency, effectiveness and reliability of data and records as the system does most work (75% plus) like calculating percentage, grades, commenting, finding averages, maximum scores, positions in classes and grades, etc
  - c) In your opinion, what problems do you think motivated or would motivate your school management to introduce an electronic data capture system for pupils' results in your school?
    - There was no easiness and efficient access to data and records
    - Loss of data in the old filing system due to papers going missing
    - Time wasting when teacher could que up for a file waiting for others to finish entering
    - Too much paper work and paper waste seeing corrections on paper were difficult
    - Delays and lapses in the old system
    - Lack of time management
    - Teachers would enter false marks on the report cards
    - Teachers were hiding files during data enterly before open day
  - d) In your opinion, what needs are you or would you be trying to meet with the an electronic data capture system for pupils results in your school, as compared to the system that was or is in place (the paper-file system) for handling the data and records of pupils?
    - To capture pupils data and update results easily
    - To be able to work withing a reasonable time and save information and access data easily
    - Implementing e-governance and management
    - more easiness, efficiency, effectiveness and reliability of data and records

- track pupils performance with the term and the year
- e) How do you hope this system will make your life better?
  - It will make my work flow more effectively and up to global standards
  - Keeping upto date with technology innovations
  - Time will be served
  - Compile to learn computers
  - Conveniency when working as can work from home at my own pace
  - Work with less errors and less paper work

### 11.3. Section Three: Verification of the Hypotheses

After having a look at the statistics of the respondents views and responses to the questions, that alone cannot give us a picture for which to base our arguments. Thus, the hypotheses, to test the hypotheses, composite indices for the independent variables were computed by summing up all valid responses intended to obtain respondents responses and views per each of the variable and research question. The reason for aggregating these responses was necessitated, because the data is continuous. In verifying the hypotheses, the researcher used categories of data, which were and transformed into, quantitative forms. In view of this, extreme positive responses (i.e. strongly agree or very good) were assigned the value of 5, and the extreme negative responses (i.e. strongly disagree or very poor) were assigned the value of 1, and where responses only had a yes or no, they were assigned a 1 and a 2 respectively, etc. Composite scores were computed, for the independent variable for statements of the questionnaire dealing with each of the independent variables. Consequently, the analysis entailed the verification of the null hypotheses at 0.05 level of significance or less, and below are the null hypothesises which were checked:

1. An electronic data capture and records management system does not change a school administration and management core functioning over time.
2. They are no potential benefits of an electronic data capture and records management system to an institution or organization.
3. They are more drawbacks of an electronic data capture and records management system in schools than the old paper-file system.
4. Most school staff do not support an electronic data capture and records management system because it is alien to them.
5. The introduction of an electronic data capture and records management system cannot bring about workflow automation.
6. There is better management of records with effectivity with the paper-file system than with the electronic data capture and records management system.

7. The old method of handling data, records and information using paper and files has more quality assurance than with the modern methods of using computers.
8. It is not easy to track productivity and performance of a pupil with an electronic data capture and records management system than with the old methods.
9. An electronic data capture and records management system is not cost-effective and not ease in accessibility than the old system of using papers and files.

The results of the hypotheses' are in the table below, from table 36 to table 41 for the schools with and those without an electronic school management system.

Table 36, shows a 'One-Sample T-Test Statistics' of responses for schools with an electronic school management system, while table 36 shows a 'One-Sample T-Tests' of responses for schools with an with an electronic school management system. In addition, in table 38, see 'Nonparametric Tests: One Sample Hypothesis Test Summary' for schools with an electronic school management system.

The table 39, we find a 'One-Sample T-Test Statistics' of responses from respondents from schools without an electronic school management system, while table 40 shows a 'One-Sample T-Tests' of responses for schools without an with an electronic school management system. In table 41, see 'Nonparametric Tests: One Sample Hypothesis Test Summary' for schools without an electronic school management system.

To draw up the hypothesis from the responses from the respondents, a number of questions were asked, thus:

- To test null hypothesis, that an electronic data capture and records management system doesn't change a school administration and management core functioning over time. The question which was asked was: Do you think the electronic data record management system employed by your school has made data capture for the end of term pupils results and details more or less efficient than years ago?
- To test null hypothesis, that they are no potential benefits of an electronic data capture and records management system to an institution or organization. the approximated time you took to complete the entering the results, grades for results and comments for the results for the end of term in the system or on the report form and the master mark sheet.
- To test null hypothesis, that they are more drawbacks of an electronic data capture and records management system in schools than the old paper-file system. The question that was asked was, How likely are you to recommend an electronic data record management system to others?
- To test null hypothesis, that most school staff do not support an electronic data capture and records management system because it is alien to them. The question that was used was: How likely would the electronic data record management system change new upcoming school's administrative and management practices and systems? In addition: How likely are you to recommend an electronic data record management system to others?

- To test null hypothesis, that the introduction of an electronic data capture and records management system cannot bring about workflow automation. The question that was used was: What were your reasons for choosing the electronic data record management system in your opinion? And the approximated time you took to complete the entering the results, grades for results and comments for the results for the end of term in the system or on the report form and the master mark sheet.
- To test null hypothesis, that there is better management of records with effectivity with the paper-file system than with the electronic data capture and records management system. The question which was asked was: The approximated time you took to complete the entering the results, grades for results and comments for the results for the end of term in the system or on the report form and the master mark sheet; how significantly do you think an electronic data record management system impacts an institution's reputation? And also, does the electronic data record management system provide more availability to pupil's end of term records and pupils' data and details as compared to the old paper-file system whenever records are needed?
- To test null hypothesis, that the old method of handling data, records and information using paper and files has more quality assurance than with the modern methods of using computers. The question, which was asked was: Does the electronic data record management system provide more availability to pupil's end of term records and pupils data and details as compared to the old paper-file system whenever records are needed?
- To test null hypothesis, that it is not easy to track productivity and performance of a pupil with an electronic data capture and records management system than with the old methods. The question, which was asked was: Does the electronic data record management system provide more availability to pupil's end of term records and pupils data and details as compared to the old paper-file system whenever records are needed?
- To test null hypothesis, that an electronic data capture and records management system is not cost-effective and not ease in accessibility than the old system of using papers and files. The question, which was asked, was: In regards to what may have being the price for the electronic data record management system costed your school, would you say the value was of worthy it?

Some of the questions were intended to verify the independent variables. The variables included: the electronic data management system been able to bring about workflow automation, better knowledge management in schools of the pupils data and records, efficient communications of details and records to management of the pupil performance, management of records in effective manner, quality assurance, better time productivity management, better performance management, system's ase in accessibility, with accountability with better audit trails and more data and records integration of various departments.

However, seeing that some research questions were not included for the hypotheses testing like: What percentage of a school staff population supports an electronic data capture and records

management system? What is the blocking of an electronic data capture and records management system in schools as an alternative to the traditional methods of data capture and storage?

Questions, which Included how often do you use the electronic data and record management system per year. Do you think there is enough legislation in place across Zambia to support schools in improving pupil records data capture, protection, and storage systems? Do you think there are enough skills and expertise in the area of electronic data management systems across Zambia? Which types of sectors do you think are the most in need of the electronic data and record management system in Zambia were asked to the respondents?.

In addition, the results for all the questions asked to the respondents were tested for verification to conformity with the statistics observed, using a one-sample t-test as show from table 36 to table

*Table 36: One-Sample T-Test Statistics for schools with an ESMS*

<b>One-Sample T-Test Statistics</b>				
	Valid Responses	Mean	Std. Deviation	Std. Error Mean
Do you think Zambian schools are doing enough to enhance the way they handle data in school?	220	2.32	.822	.055
Do you think the electronic data record management system employed by your school has made data capture for the end of term pupils results and details more or less efficient than years ago?	221	1.41	.672	.045
How likely would the electronic data record management system change new upcoming school's administrative and management practices and systems?	217	1.22	.513	.035
How often do you use the electronic data record management system per year?	219	2.04	.527	.036
Do you think there is enough legislation in place across Zambia to support schools in improving pupil records data capture, protection and storage systems?	221	2.50	.807	.054
Do you think there are enough skills and expertise in the area of electronic data management systems across Zambia?	220	2.14	.568	.038
Which types of sectors do you think are the most in need of the electronic data record management system in Zambia?	221	1.69	.946	.064
How significantly do you think an electronic data record management system impacts an institution's reputation?	214	1.63	.665	.045
In regards to what may have being the price for the electronic data record management system costed your school, would you say the value was of worthy it?	220	2.53	.730	.049
Does the electronic data record management system provide more availability to pupil's end of term records and <b>pupils'</b> data and details as compared to the old paper-file system whenever records are needed?	202	1.25	.436	.031
What were your reasons for choosing the electronic data record management system in your opinion? Please select all that apply.	220	1.96	.967	.065
How likely are you to recommend an electronic data record management system to others?	221	3.07	.926	.062
the approximated time you took to complete the entering the results, grades for results and comments for the results for the end of term in the system or on the report form and the master mark sheet.	68	2.8235	1.81980	.22068

*Table 37: One-Sample T-Tests of Responses for schools with an ESMS*

One-Sample T-Test						
	Test Value=0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Do you think Zambian schools are doing enough to enhance the way they handle data in school?	41.90	219	.000	2.32	2.21	2.43
Do you think the electronic data record management system employed by your school has made data capture for the end of term pupils results and details more or less efficient than years ago?	31.13	220	.000	1.41	1.32	1.50
How likely would the electronic data record management system change new upcoming school's administrative and management practices and systems?	34.94	216	.000	1.22	1.15	1.29
How often do you use the electronic data record management system per year?	57.28	218	.000	2.04	1.97	2.11
Do you think there is enough legislation in place across Zambia to support schools in improving pupil records data capture, protection and storage systems?	46.10	220	.000	2.50	2.40	2.61
Do you think there are enough skills and expertise in the area of electronic data management systems across Zambia?	55.92	219	.000	2.14	2.07	2.22
Which types of sectors do you think are the most in need of the electronic data record management system in Zambia?	26.58	220	.000	1.69	1.57	1.82
How significantly do you think an electronic data record management system impacts an institution's reputation?	35.79	213	.000	1.63	1.54	1.72
In regards to what may have being the price for the electronic data record management system costed your school, would you say the value was of worthy it?	51.43	219	.000	2.53	2.43	2.63
Does the electronic data record management system provide more availability to pupil's end of term records and <b>pupils'</b> data and details as compared to the old paper-file system whenever records are needed?	40.87	201	.000	1.25	1.19	1.31

What were your reasons for choosing the electronic data record management system in your opinion? Please select all that apply.	30.06	219	.000	1.96	1.83	2.09
How likely are you to recommend an electronic data record management system to others?	49.30	220	.000	3.07	2.95	3.20
<b>The</b> approximated time you took to complete the entering the results, grades for results and comments for the results for the end of term in the system or on the report form and the master mark sheet.	12.79	67	.000	2.82	2.3830	3.264 0

*Table 38: Hypothesis Test Summary schools with an ESMS , Nonparametric Tests: One Sample*

<b>Null Hypothesis</b>	<b>Test (significance level = 0.05)</b>	<b>Test Statistic</b>	<b>DF</b>	<b>Sig. (2-tailed)</b>	<b>Decision</b>
The categories of responses of Zambian schools doing enough to enhance the way they handle data in school, occur with equal probabilities	One-Sample Chi-Square Test	172.4	3	.000	Reject the null hypothesis.
The categories of responses of the electronic data record management system employed by the schools having made data capture for the end of term pupils results and details more or less efficient than years ago, occur with equal probabilities	One-Sample Chi-Square Test	134.398	2	.000	Reject the null hypothesis.
The categories of responses of likelihood of the electronic data record management system being able change new upcoming school's administrative and management practices and systems, occur with equal probabilities	One-Sample Chi-Square Test	242.387	2	.000	Reject the null hypothesis.
The categories of responses of frequencies of the electronic data record management system usage per year, occur with equal probabilities	One-Sample Chi-Square Test	149.014	2	.000	Reject the null hypothesis.
The categories of responses of having enough legislation in place across Zambia to support schools in improving pupil records data capture, protection and storage systems, occur with equal probabilities	One-Sample Chi-Square Test	117.335	3	.000	Reject the null hypothesis.
The categories of responses of having enough skills and expertise in the area of electronic data management systems across Zambia, occur with equal probabilities	One-Sample Chi-Square Test	111.609	2	.000	Reject the null hypothesis.
The categories of responses of which types of sectors which are most in need of the electronic data record management system in Zambia, occur with equal probabilities	One-Sample Chi-Square Test	230.425	4	.000	Reject the null hypothesis.

# The International Journal of Multi-Disciplinary Research

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The categories of responses of the significancies an electronic data record management system impacts on an institution's reputation, occur with equal probabilities	One-Sample Chi-Square Test	52.187	2	.000	Reject the null hypothesis.
The categories of responses of worthiness of the price for the electronic data record management system cost to the school, occur with equal probabilities	One-Sample Chi-Square Test	114.582	3	.000	Reject the null hypothesis.
The categories of responses of the electronic data record management system providing more availability to pupil's end of term records and pupils data and details as compared to the old paper-file system whenever records are needed, occur with equal probabilities	One-Sample Binomial Test (SE 7.106, STS:6.966)	151		.000	Reject the null hypothesis.
The categories of responses of the reasons for choosing the electronic data record management system, occur with equal probabilities	One-Sample Chi-Square Test	160.909	4	.000	Reject the null hypothesis.
The categories of responses of likeliness of the respondents to recommend an electronic data record management system to others, occur with equal probabilities	One-Sample Chi-Square Test	98.475	3	.000	Reject the null hypothesis.
The categories of responses of the approximated time one takes to complete the entering the results, grades for results and comments for the results for the end of term in the system, occur with equal probabilities	One-Sample Chi-Square Test	23.765	5	.000	Reject the null hvoothesis.

*Table 39: One-Sample T-Test Statistics for schools without an ESMS*

<b>One-Sample Statistics</b>				
	Number of variables	Mean	Std. Deviation	Std. Error Mean
Do you think Zambian schools are doing enough to enhance the way they handle data in school?	39	2.36	.778	.125
Do you think the paper-file system employed by your school has made data capture for the end of term pupils results and details more or less efficient and effective given technology nowadays?	38	2.34	.781	.127
Do you think there are enough skills and expertise in the area of electronic data management systems across Zambia?	39	2.05	.510	.082
Do you think there is enough legislation in place across Zambia to support schools in improving pupil records data capture, protection and storage systems?	39	2.46	.790	.126
Which types of sectors do you think are the most in need of the electronic data record management system in Zambia?	39	1.77	1.385	.222
How significantly do you think an electronic data record management system may impact an institution's reputation?	35	1.31	.530	.090
How likely are you to recommend an electronic data record management system to others?	39	3.51	.644	.103
The approximated time you took to complete the entering the results, grades for results and comments for the results for the end of term on the report form and the master mark sheet altogether	37	3.9189	1.87644	.30848

Table 40: One-Sample T-Tests of Responses for schools without an ESMS

One-Sample Test						
	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Do you think Zambian schools are doing enough to enhance the way they handle data in school?	18.946	38	.000	2.359	2.11	2.61
Do you think the paper-file system employed by your school has made data capture for the end of term pupils results and details more or less efficient and effective given technology nowadays?	18.493	37	.000	2.342	2.09	2.60
Do you think there are enough skills and expertise in the area of electronic data management systems across Zambia?	25.101	38	.000	2.051	1.89	2.22
Do you think there is enough legislation in place across Zambia to support schools in improving pupil records data capture, protection and storage systems?	19.468	38	.000	2.462	2.21	2.72
Which types of sectors do you think are the most in need of the electronic data record management system in Zambia?	7.976	38	.000	1.769	1.32	2.22
How significantly do you think an electronic data record management system may impact an institution's reputation?	14.677	34	.000	1.314	1.13	1.50
How likely are you to recommend an electronic data record management system to others?	34.082	38	.000	3.513	3.30	3.72
The approximated time you took to complete the entering the results, grades for results and comments for the results for the end of term on the report form and the master mark sheet altogether	12.704	36	.000	3.91892	3.2933	4.5446

*Table 41: Hypothesis Test Summary for schools without an ESMS, Nonparametric Tests: One Sample*

<b>Null Hypothesis (for schools without an ESMS)</b>	<b>Test (significance level = 0.05)</b>	<b>Test Statistic</b>	<b>DF</b>	<b>Sig.</b>	<b>Decision</b>
The categories of responses of <i>Zambian schools doing enough to enhance the way they handle data in school, occur with equal probabilities</i>	One-Sample Chi-Square Test	26.128	3	0	Reject the null hypothesis.
The categories of responses of <i>the paper-file system employed by the school for data capture for the end of term pupils results and details, is more or less efficient and effective than technology, occur with equal probabilities</i>	One-Sample Chi-Square Test	7	2	0.03	Reject the null hypothesis.
The categories of responses of <i>having enough skills and expertise in the area of electronic data management systems across Zambia, occur with equal probabilities</i>	One-Sample Chi-Square Test	29.692	2	0	Reject the null hypothesis.
The categories of responses of <i>having enough legislation in place across Zambia to support schools in improving pupil records data capture, protection and storage systems, occur with equal probabilities</i>	One-Sample Chi-Square Test	18.333	3	0	Reject the null hypothesis.
The categories of responses of <i>the types of sectors which are the most in need of the electronic data record management system in Zambia, occur with equal probabilities</i>	One-Sample Chi-Square Test	40.897	3	0	Reject the null hypothesis.
The categories of responses of <i>how significantly an electronic data record management system may impact an institution's reputation, occur with equal probabilities</i>	One-Sample Chi-Square Test	25.6	2	0	Reject the null hypothesis.
The categories of responses of <i>how likely are the respondents to recommend an electronic data record management system to others, occur with equal probabilities</i>	One-Sample Chi-Square Test	18	2	0	Reject the null hypothesis.
The categories of responses of <i>the approximated time they take to complete the entering the results, grades for results and comments for the results for the end of term on the report form and the master mark sheet altogether, occur with equal probabilities</i>	One-Sample Chi-Square Test	22.514	5	0	Reject the null hypothesis.

As evident from the tables above:

1. The first null hypothesis, that an electronic data capture and records management system does not change a school administration and management core functioning over time, is rejected. Seeing that the level of significance is below 0.05 as seen in tables 37, 38, 40 and 41, and we accept the alternative hypothesis, that that an electronic data capture and records management system does change a school administration and management core functioning over time.
2. The second null hypothesis, that they are no potential benefits of an electronic data capture and records management system to an institution or organization is rejected. Seeing that the level of significance is below 0.05 as seen in tables 37, 38, 40 and 41, and we accept the alternative hypothesis, that there are potential benefits of an electronic data capture and records management system to an institution or organization.
3. The third null hypothesis that, they are more drawbacks of an electronic data capture and records management system in schools than the old paper-file system is rejected. Seeing that the level of significance is below 0.05 as seen in tables 37, 38, 40 and 41, and we accept the alternative hypothesis, that they are less drawbacks of an electronic data capture and records management system in schools than the old paper-file system.
4. The fourth null hypothesis that, most school staff do not support an electronic data capture and records management system because it is alien to them is rejected. Seeing that the level of significance is below 0.05 as seen in tables 37, 38, 40 and 41, and we accept the alternative hypothesis, that most school staff do support an electronic data capture and records management system.
5. The fifth null hypothesis that, the introduction of an electronic data capture and records management system cannot bring about workflow automation is rejected. Seeing that the level of significance is below 0.05 as seen in tables 37, 38, 40 and 41, and we accept the alternative hypothesis, that the introduction of an electronic data capture and records management system can bring about workflow automation.
6. The sixth null hypothesis that, there is better management of records and effectivity with the paper-file system than with the electronic data capture and records management system is rejected. Seeing that the level of significance is below 0.05 as seen in tables 37, 38, 40 and 41, and we accept the alternative hypothesis, that there is better management of records and effectivity with the electronic data capture and records management system than with the paper-file system.

7. The seventh null hypothesis that, the old method of handling data, records and information using paper and files has more quality assurance than with the modern methods of using computers is rejected. Seeing that the level of significance is below 0.05 as seen in tables 37, 38, 40 and 41, and we accept the alternative hypothesis, that the old method of handling data, records and information using paper and files has less quality assurance than with the modern methods of using computers and technology.
8. The eighth null hypothesis that, it is not easy to track work productivity and performance of a pupil with an electronic data capture and records management system than with the old methods is rejected. Seeing that the level of significance is below 0.05 as seen in tables 37, 38, 40 and 41, and we accept the alternative hypothesis, that it is easy to track work productivity and performance of a pupil with an electronic data capture and records management system than with the old methods.
9. The last null hypothesis that, an electronic data capture and records management system is not cost-effective and not ease in accessibility than the old system of using papers and files is rejected. Seeing that the level of significance is below 0.05 as seen in tables 37, 38, 40 and 41, and we accept the alternative hypothesis, that an electronic data capture and records management system is cost-effective and ease in data accessibility than the old system of using papers and files.

## 12. DISCUSSION AND INTERPRETATION OF FINDINGS

The study aimed at assessing the effect of an electronic data capture and records management system on a school's administration and management in Chingola, Zambia. To facilitate this, the study focused on the schools which are currently having an 'electronic data capture and records management system (Jephkapi ESMS) in use: Chikola Secondary, Kabundi Secondary and Sekela Secondary Schools. The schools not using the any electronic data capture system: Maiteneke Secondary, Sacred Heart Convert, were for comparative purpose. The findings were discussed, and interpreted according to the research objectives and questions. The main objectives of the experiement and research were to determine which system is more cost efficient, useably efficient and effective between the paper-file system and the e-system for pupil data and record management in schools. To achieve the main objective, a number of secondary objectives were generated to help us understand the problem and get a better solution, to begin with, the study sought to:

- Highlight the importance of introducing an electronic data capture and records' management system in schools.
- Compare and contrast which system between the old paper-based and the new electronic data capture and records system has easy and quick access to add, update and view the records stored by a school.
- Make recommendations from the findings, on which systems has an increased the number of people accessing the data simultaneously in a faster manner.
- To help schools have a centralized data centre, where data can be accessible by multiple authorized users at any time independently of anyone who may be working on the same record.
- To automate the current school system processes and functions and save 75% of the teacher's work time concerning the pupil data and record process management.

### 12.1. Section One: Background information of respondents

The researcher acquired the gender, age groups and duration of service of the respondents in the respective schools to ascertain the respondents' level of responsibilities, work environment experiences and maturity in the decision- making processes. To begin with, the participants for the findings where represented by various age groups, all genders, and various years of service in the Mnistry of Education. The respondents consisted of 56.6% males and 43.4% females from the schools with the electronic school data and records management. 56.4% were males and 43.6% were females of respondents from the schools without an electronic school data and records management system. Thus, from both sampled populations who participated in this experiment and study, there was a distribution of more males than females with a smaller margin of 12% less across. The majority of the respondents, from the schools with the electronic school data and records management were distributed as: 27.9% were aged less than 21 years followed

by 21.5% of between the ages of 34 years to 40 years of age, 17.8% were aged between 40 years to 50 years, 12.8% were aged 21 years to 28 years and only 5.9% were aged 50 years plus. From the schools without the electronic school data and records management, the majority 38.5% were aged between 34 years to 40 years followed by the age group 21 years to 28 years of ages which accounted for 20.5%, 15.4% accounted for the age groups 28 years to 34 years and 50 years respectively, while the age group 40 years to 50 years accounted for 10.3%. The participants in the study, from the schools with the electronic school data and records management, 30.7% had serviced for more than 10 years, 27.1% had 1 year to 2 years in services, 22.9% had served for 5 years to 10 years and 19.3% had served for 2 years to 5 years. From the schools without the electronic school data and records management, 33.3% of the respondents had served for 2 years to 5 years, 30.8% had 10 years plus of service, 20.5% had serviced for 1 year to 2 years and only 15.4% had serviced for 2 years to 5 years. As such, the demographic information above, establishes that the participants were well invested in their responses due to the fact that they have been working in their current positions for longer than a year, and thus they are mature, and they are responsible persons in their work places.

## 12.2. Description of respondents' opinions in relation to the study objectives, research questions and variables

The study had a number of independent variables, namely: workflow automation, efficient communications management, management of records in effective manner, quality assurance, better productivity management, better performance management, better cost-effectiveness, ease in accessibility, accountability with better audit trails and more integration of various departments, which were used to understand the experiment and the study as a whole. The whole study rested to know and understand the impacts of an electronic data capture and records management system on a school administration and management. As such, this study has established that there are barely any drawbacks of an electronic data capture and records management system in schools as compared to the old paper-file system. Seeing that the null hypothesis, that there are more drawbacks of an electronic data capture and records management system in schools than the old paper-file system was rejected. The alternative hypothesis, that the old method of handling data, records and information using paper and files has less quality assurance than with the modern methods of using computers and technology was also accepted. The other accepted alternative hypothesis, that it is easy to track work productivity and performance of a pupil with an electronic data capture and records management system than with the old methods was accepted. The electronic data-capture system is an intriguing alternative for the paper-based system in the educational sector for most schools. Because of its major advantages which included the ability to enter, review, analyse data in real-time and to implement online data validation checks to assure data quality more effectively at the point of

entry, the electronic data capture system is anticipated to soon replace the paper based data capture systems in place. (Walther, et al., 2011)

## **12.2.1. To compare and contrast which system between the old paper-based and the new electronic data capture and records system has easy and quick access to add, update, and view the records stored by a school.**

The study conducted has founded that most schools in Chingola-Zambia, are making progress to enhance the way in which they handle data for the pupils. As from the findings, the respondents from the schools with an electronic school management system, 62.9% feel that Zambian schools are making progress to enhance the way in which they handle data with an electronic system, 14.0% feel that the schools are making progress in handling pupils' data, 13.6% feel that schools are falling significantly behind global standards, and 9.0% feel that the schools are in line with global standards. With the schools without an electronic school management system, 59.0% respondents feel that schools are making progress to enhance the way in which they handle data for the pupils, 23.1% feel the schools can do better in the way they handle data, 10.3% feel that the schools are falling significantly in the way they handle data, while 7.7% feel the schools are in line with global standards.

This research has also established that an electronic school management system made the data capture, access, and management for the pupils more efficient than the years past. This was arrived at when the alternative hypothesis, that an electronic data capture and records management system does change a school administration and management core functioning over time was accepted, and the other alternative hypothesis, that there are potential benefits of an electronic data capture and records management system to an institution or organization, was accepted as well. After analysing the responses from the e-system users (the respondents with an e-sye in their schools), it was established that 69.7% respondents felt that the new electronic system brought about data capture and handling efficiency than in the past when they never had the e-system. While 19.9% felt that, the data capture for the pupils details and data was the same as previously years before the system was introduced. However, 10.4% respondents felt the new e-system has made the pupils details and data capture worse, than the time they never had not the e-system. The respondents from the school not using any electronic school management system for pupils' data management, had a similar perspective in relation to the paper-file system that their school has been using for data capture for the end of term pupils results and details. Of the respondents, 51.2 % felt the paper-filling old system is not efficient if given an electronic system, 28.2% felt it is the same as an electronic system while 17.9% felt the paper-filling old system is more efficient than if given an electronic system. As such, from the two different category of schools using two different (old-paper-filling system and an electronic data management system), it is established that technology has a big impact on how data and records are managed,

unlike the old conventional methods. The benefits of the electronic data capture system are so overwhelming to ignore nonetheless, as they include improving the staff computer basic knowledge sets and an institution's productivity, increased operational effectiveness and IT efficiency. (Anon., 2010)

Now that most teachers feel that an electronic system in a school brings about more positive benefits than the old paper-filling system as established, the research had to determine if there are enough financial infrastructure and legislation in place across Zambia to support schools in improving pupil records data capture, protection, and storage systems. The study has established that Zambia needs to work extra hard in order to improve the existing legislation to foster an increase of ICTs usage in schools among teachers. According to the study, 53.8% and 48.7% of the respondents from the schools with and those without the electronic school management system respectively, of the sampled population felt the government should introduce more measures to support schools in improving pupil records data capture, protection, and storage systems. For which such support may include introducing e-systems in school for the same purpose. 26.2% and 33.3% of the respondents from the schools with and those without the electronic school management system respectively, of the sampled population are not familiar with any such existing legislation to support electronic systems for data management in schools. While 14.5% and 12.8% of the respondents from the schools with and those without the electronic school management system of the sampled population felt the country's legislation and policies are in-line with global standards for supporting the same e-systems in schools. However, 5.4% and 5.1% of the respondents from the schools with and those without the electronic school management system respectively, of the sampled population felt that the country is falling significantly behind global standards. Phiri (2016), supports the findings of the study, the government need to spend their priorities on providing networking access points and introducing databases in government ministries and departments, training persons with computer and ICT basic skills, supporting new legislation and property rights options for software choices supporting tele-working modalities or digital tools to mention but a few. The Zambian ICT policy "is designed to guide and mainstream the use of ICTs in all sectors of the economy. The policy is an ICT development policy designed to fit within the socio-economic development agenda of the country rather than a standalone technology framework" according to the Zambia National ICT Policy (2006). "Therefore, if a policy is well developed and implemented, communities will be computer literate and all communities will appreciate modern technologies. People will be connected to the global village and be able to compete and learn on a global perspective. The internet can be a global market for the farmers. It would even be cheaper for farmers to buy farming equipment online other than through intermediaries who charge exorbitant prices. Policy would enable the residents to be more computer literate due to regular use of ICTs. There has to be a deliberate policy to include ICT in most study programmes even

for adult learners. Poverty is seen as the opposite of well-being. People need to be educated on the use and benefits of the internet” Phiri (2016).

The above findings that Zambia needs to beef-up its support for ICTs in Zambia, is also supported by the fact that they is not enough skills and expertise in the area of electronic data management systems across Zambia among teachers. 65.6% and 74.4% of respondents from the schools with and those without the electronic school management system respectively, of the sampled population felt more training and qualification is needed to support persons acquire the necessary skills and expertise in the area of electronic data management systems across Zambia. While 24% and 15.4% of respondents from the schools with and those without the electronic school management system respectively, of the sampled population felt that lack of computer literacy among the teaching staff in Zambia is concerning and needs urgent attention. However, only 10.0% and 10.3% of respondents from the schools with and those without the electronic school management system respectively, of the sampled population felt that the country is in line with the best practices globally. These finding also line with Nguvu (2016) finding. He said there are plenty colleges that offer ICT courses here and there, but the majority of Zambian students are only exposed to outdated learning materials or cannot afford to enroll in a world-class programme for proper computer science or studies. And because colleges can not produce will qualified ICT knowlegable teachers, this gives rise to the computer literacy among teachers. (Nguvu, 2016)

Its not only the educational sector that which the respondents were concerned of, 51.6% and 69.2% of respondents from the schools with and those without the electronic school management system respectively, of the sampled population felt the whole government should use an electronic data manager system in their respective departments. 37.1% and 12.8% of respondents from the schools with and those without the electronic school management system respectively, of the sampled population felt that such e-systems are suitable for secondary and tertially schools. 5.4% and 7.7% of respondents from the schools with and those without the electronic school management system respectively, of the sampled population felt that the financial service institutions need the e-systems the most. However, only 2.3% and 10.3% of respondents from the schools with and those without the electronic school management system respectively, of the sampled population felt the e-systems are needed in the healthcare organisations mostly.

From the schools with the electronic school management system respectively, of the sampled population, 45.2% felt the electronic data and record management system used in their schools was of good value for whatever the cost it costed their respective schools. While 7.2% felt the electronic data and record management, system used in their schools was of high value for whatever the cost it costed their schools. Nevertheless, 40.3% were not aware of the worthy of the electronic data and record management system used in their schools for whatever the cost it

costed their schools. However, 6.8% felt the electronic data and record management system used in their schools was of poor value for whatever the cost it costed their schools.

**12.2.2. To help schools have a centralized data centre, where data can be accessible by multiple authorized users at any time independently of anyone who may be working on the same record, and to recommendations the systems has which has an increased the number of user access to the data in a faster manner.**

Among the other objectives of the study was to develop a system that will allow multi users with a centralised access. This experiment and research study had the objective was achieved. The school used for this study usually have 3 open days in a year, the time when they present the end of term performance results to the parents of the pupils. As such, the majority of the users with the electronic school management system are subject teacher who usually use the system for entering the end of term results. From the findings, it is established as 15.8% of the respondents (teachers) use the system more than 5 plus in a year, 71.5% use it at least more than once a year and only 11.8% said they have never used it before. To further understand the the system's accessibility, the respondents gave their view on whether the electronic data record management system provides more availability to pupil's end of term records and pupils data and details as compared to the old paper-file system whenever records are needed. It was established that the system does posses more accessibility after seeing the findings: 74.8% of the respondents said that the electronic data record management system provides and provided more availability to pupil's end of term records, pupil's data and details as compared to the old paper-file system whenever the records were needed and are needed. While 25.2% of the respondents, felt that an electronic data record management system provide less availability to pupil's end of term records and pupils data and details as compared to the old paper-file system whenever records are needed. From the same vain, the respondents had multi-varied reasons as to why they use the electronic system. The majority of the respondents, 44.5% used it to save time seeing that it allowed a limiteless number of users to access data at any point in time and from anywhere. 35.9% used the electronic system because of its convenience, seeing that the system allowed the users to work from their homes, at their own pace. 7.7% used it because it allowed them to work 24/7 from any where at any time. While 11.4% of the respondents, said they used the system because of its convenience, it allowed them to save time, and because it gave them 24 hour access to the data and records. As such, the electronic school management system, unlike paper-filling system, allows a limiteless number of people accessing the data simultaneously in a faster manner.

### **12.2.3. Automate the current school system processes and functions and save 75% of the teacher's work time concerning the pupil data and record process management and to**

This research study has also established the an electronic school management system automates the current school processes and functions and save 75% of the teachers' work time during the pupils' data and records management activities. Moreover, the alternative hypothesis, that the introduction of an electronic data capture and records management system can bring about workflow automation was accepted, and the other alternative hypothesis that there is better management of records and effectivity with the electronic data capture and records management system than with the paper-file system was also accepted. In addition, after comparing the average working time on the pupils end of term records from the using an electronic school management and the schools not using the electronic school management system, it was noted that the electronic management system didn't 75% plus of the work for the teachers, thus saving time for them. From the study, 88.2% of the respondents from the schools with an electronic data management system used less than 120 minutes average estimated time to complete entering the results for their respective classes, from which the system automatically generated the grades and comments for the results for the end of term for them on the report cards and the master mark sheet. Of the users, 38.2% used less than 30 minutes to complete their tasks. Of all the users (respondents), 61.8% used less than an hour to complete their tasks, while only 11.8% of the users used more than 120 minutes to complete their tasks. However, 5.6% of the respondents from the schools without an electronic data management system used less than 60 minutes to complete their tasks. 30.6% of them needed between 60 minutes to 120 minutes to do the work. In short, 61.1% of respondents from the school with an electronic system management system used less than 480 minutes (which is the whole day) of estimated time to complete the entering the results, grades for results and comments for the results for the end of term in the system, on the report form and the master mark sheet. And a total of 38.9%, who were the majority on the statistics (mode) needed more than a day's office working hours (more than 479 minutes) to complete working on the report cards for their respective classes. Putting the two statistics from the respective two categories of samples (schools with and without the electronic school management system), this research has established that while the 88.2% of the teachers from school with the e-system used less than 120 to complete their tasks, it took only a total of 61.1% (cumulative) teachers from the school without any e-system 480 minutes to complete their tasks, and only 11.8% of the teachers from the same completed their tasks in less than 120 minutes, and none was able to complete any of their tasks in less than 30 minutes, while it took 38.2% of the teachers with an e-system. As such, most respondents from the school with an electronic data record management system in the schools varied, as shown in table 32 and figure 33. These statistics proved they reason as to why the respondents used the e-system, seeing that

44.5% used it to save time. While the 35.9% used it because of its convenience, 7.7% used it because it allowed them to work 24/7, and 11.4% used it because of its convenience, and because it gave them 24 hour access to the data and records.

#### **12.2.4. Technology Acceptance and highlight the importance of introducing an electronic data capture and records' management system in schools.**

It is also established from the study that most schools' personnel have accepted the onset technology in our society, seeing that the alternative hypothesis was acceptance, that most school staff do support an electronic data capture and records management. The other alternative hypothesis, that an electronic data capture and records management system is cost-effective and ease in data accessibility than the old system of using papers and files was also accepted. In fact, most respondents are more likely to recommend the e-system to other schools seeing that they have noticed a great change and much more it can bring about to an institution. This was evident when most respondents from the school with an electronic school management system, when asked if the electronic data record management system can change a new upcoming school's administrative and management practices and systems, 81.4% felt the system can make a great deal of positive change, while 12.2% felt the new system will not likely change anything, while only 4.5% think it can have no impact at all.

Having discussed the various findings answering and fulfilling the research work objectives, the technology acceptance model helped us to understand where the gap is in Zambia, which is causing the Chingola households and SMEs not to fully utilize and reap the benefits of the internet, computers, and smartphones. The theoretical framework, the Technology Acceptance Model (TAM) employed in this research study stated that the actual behavior is influenced by the person's intention to perform such behavior with this intention influenced by one's attitudes and subjective norms. The TAM asserted that there are two determinants for the consumer's attitudes towards usage intention. The first being the degree to which a person believes that using a particular technology would enhance someone's job performance (the perceived usefulness (U)) and the second being the degree to which a person believes that using a particular ICT tool or technology would be free of effort (the perceived ease of use (E)). (Davis, 1989)

As such, most respondents have accepted ICTs for use in their daily school activities, and that the technology is easy to use and it has helped them to do their work effectively and efficiently. Thus to measure the likelihood that a person will employ and use a new system's application, the TAM employs a variable called a Behavioral intention (BI), which is given by the formula  $BI = U + E$  (Davis F, 1985 and Fred D. Davis, Richard P. Bagozzi, & Paul R. Wars, 1989). However, we have other variables which affect the TAM, which are political and economic as in relation to this study. And the study has established that policies need to focus on ICT being made accessible and more affordable, so that people can fully realize the benefits of ICTs

Moreover, the respondents from two categories of schools, those with and the ones without the electronic data management system, 46.6% and 41.0% respectively are likelyhood to recommend an electronic data record management system to other schools. 35.7% of the respondents from the schools with the electronic data management system and 56.4% from the schools without the electronic data management system strongly felt they are more likely to recommend an electronic data record management system to other schools. While 10.9% felt they are very unlikely and 6.8% are unlikely to recommend, from the schools with the electronic data management system. In addition, 2.6% from the schools without the electronic data management system are very unlikely to recommend the system to any school.

According to the evidence, most respndents feel that an electronic data record management system significantly impacts an institution's reputation. This was observed when 46.2%, the majority, from the schools with an electronic system managenet said that an electronic data and records management system significantly influences their decision to use that institution's services or products. While from the schools without the electronic school management schools 64.1% felt their decision to use an institutions products and services it likewise significantly influenced by them having electronic systems in place. 40.7% and 23.1% from the schools with and the ones without the electronic school management system respectively, are usually unconcerned whether an institution is using any electronic system or not. However, 10.0% and 2.6% from the schools with and the ones without the electronic school management system respectively felt that, the presence of technology in an institution does not influence their decision to use that institution's services or products.

## 13. CONCLUSIONS

### 13.1. Conclusion

From the discussions, the electronic data capture and records management system is a transformative innovation for the schools still using the old methods of data and record keeping paper. This system to begin with, provides a school with a centralized data centre, where data can be accessible by an unlimiteless number of authorized users at any time irrespective of anyone who may be working on the same record. The main objectives of this research work was attained as the system which is more cost efficient, useably efficient and effective between the paper-file system and the e-system for pupil data and record management in school was determined. This e-system brings with it the effectiveness, efficiency, and easy accessibility of data, records and information in schools. With the surplus of details and records of pupils of ever-increasing populations nowadays in schools, it can get more and easier to find the information or documents one wants.

The electronic school management system plays a very important role for data capture and records' management system in schools. Because it provides a user with conveniency, it

improves easiness, efficiency, effectiveness, and reliability of data and records in schools, reduces a school stationary running costs by large margins, it keeps data a long periods and allows updates to be made to the records easily. The occurrence of the pupil's records going missing like in the case of papers becomes a story of the past. Seeing that users do 75% less work (as the system does the surplus work, like calculating percentage, grades, commenting, finding averages, maximum scores, positions in classes and grades, etc ), than in the case of the paper-file system time during data capture and entry, users can use the surplus time for their other extra curricula activities. The e-system allows users to: keep upto date with technology innovations, save time, be compiled to learn basic computers usage, to work from home at my own pace, work with less errors and less paper work, to mention but a few. By the fact that it provides an improved data access and far-more retrieval time, than when records are held on hard copies, more data becomes readily available for decision making faster.

An electronic data capture and records management system in schools establishes workflow automation, efficient communications management, management of records in effective manner, quality assurance, better productivity management, better performance management, better cost-effectiveness, ease in accessibility, accountability with better audit trails and more integration of various departments, which were used to understand the experiment and the study as a whole.

The electronic data capture and records management system has very few drawbacks as compared to the old paper-file system. Zambias have being making progress to enhance the way in which they handle data for the pupils. However, some schools need to do better in the way they handle data, as they are falling significantly behind with global standards. They is also need to provide enough financial infrastructure and legislation across Zambia to support schools in improving pupil records data capture, protection, and storage systems, foster an increase of ICTs usage in schools among teachers. Among such support should include more training and qualification support persons acquire the necessary skills and expertise in the area of electronic data management systems across Zambia and to increase computer literacy among the teaching in Zambia. In this era, from the schools with an electronic system managenet said that an electronic data and records management system significantly influences their decision to use that institution's services or products. While from the schools without the electronic school management schools, 64.1% felt their decision to use an institutions product and services it likewise significantly influenced by them having electronic systems in place. 40.7% and 23.1% from the schools with and the ones without the electronic school management system respectively, are usually unconcerned whether an institution is using any electronic system or not. However, 10.0% and 2.6% from the schools with and the ones without the electronic school management system respectively felt that, the presence of technology in an institution does not influence their decision to use that institution's services or products.

## 13.2. Implications and the Significance of the Study

As the developed countries are becoming more efficient and effective in their daily work activities and work flow due to the optimal use of information technologies. The results of the report of the thesis saved to bring to light how we can bring accuracy, efficiency, effectivity and sustainable use of the limited resources in the daily institutional work activities and work flow by bringing accuracy and efficiency to data records capture and retrieval methods. Information is power, and if information can be recorded and accessed easily and faster, then one can save on the resource use and use the resources that include time, people and money for other activities and projects.

An electronic school management system helps in storing information about the whole child, including academic records, physical and mental health data, disciplinary procedures, payment records and much more. Papers lying on desks can result in unwanted materials, and files that have been misplaced may cause frustration when been sought for if there is an immediate decision that has to be made. The administrative workers from a district office or other school may have to wait for requested files to be retrieved that is kept at a specific building, coupled with the time wasted on the extra paper copies that need to be made from the original copies later. An electronic based record management system ensures that only authorized persons can access information faster than ever before. Sensitive materials (such as the school pupil payments records) can be pre-set to allow very limited access and prohibit the forwarding of information to persons unauthorized to view it.

An electronic records management system's flexibility, ease of use, with a customizable reporting output system and unsurpassed features may makes it ideal for public and private schools of all sizes. Whether the school needs to collect and manage pupil and staff information, analyse the school pupil data, produce reports, or quickly generate correspondence and labels.

There are many benefits of this study of the effects of an electronic data capture and records management system on a school administration and management system's functioning, apart from simply studying on how having less paper to deal with may affect a school. It is unlikely that an office can be completely paper-free, electronic data capture, communication and other systems can eliminate much of paper, reduce costs and allow quicker access to records and information in schools among teachers and managers. Because teachers can access electronic records and information more quickly than on paper, they can almost instantly respond to parent queries over the pupil's performance, thus allocate more time to teaching and assessing pupils, accountants can instantly respond faster to the head teacher's enquiry, view every transaction instantly including every pupil tuition payment records instantly.

Saving time on document handling in any paper-based institution is paramount, seeing that each paper-record for a pupil that comes across a teacher with the common system of paper-pen and files requires a manual process. When it comes to an end of term test results reporting, the teaching staff used to spend lots of time assembling and organizing report forms using paper and files, calculating percentages and grade scores one by one for each pupil. With technology, computers can do this faster in a fraction of a second, thus an electronic data capture and records management solution in turn saves an enormous amount of time by replacing each of those manual tasks with a few keystrokes or the clicks of a mouse. Technology reduces document storage and supply costs, seeing that all of the materials that go into a paper-file record keeping process cost money, including file cabinets, folders, paper, printer ink and copier ink. In addition, there is the cost of storage space for all of that paper. With a semi or a paperless office system, all of the materials and physical space are replaced with digital records at a fraction of the cost.

The study brings to light the benefits of instant document retrieval, the faster anyone can have access to the record or information, the quicker is their processing power, which in turn saves a lot of the time and money. With the electronic data and records management systems in schools, the staff can be able to find any information they need in seconds, without having to get up, go to a file cabinet and search through the folders. With an electronic data and records management system in place, a staff of an institution can access any document or record required without having to move from office to office, thus saving on time and energy.

This designed electronic data and records management systems provides a centralized database system where users can collaborate easily through granted access and controls. Nevertheless, users can also work in the comfort of their homes. However, given the centralized access and control, data handling becomes easy as the personnel can input and manipulate records and data of pupils from anywhere provided they be within the range of the school network or the network access parameters.

The importance of the study in summary is bring to light the importance of technology use in data and records management in schools, and to confirm whether the expected results should yield a magnitude of benefits as reflected by Ramesh C. Misra (Secretary AR&P), (p19, 2011), which include

- Workflow automation
- Knowledge management, including creation of institutional reminiscences
- Efficient communications management
- Management of records in effective manner
- Quality assurance
- Productivity Management (file tracking, dashboard view and performance management)

- Cost-effectiveness and ease in accessibility
- Accountability, including audit trails and transparency
- Horizontal and vertical integration of various departments

## **10.1. Future Studies and Recommendations**

Basing on the findings of this study, in order to improve on ICTs usage in school and and improve on learning, the following recommendations may be considered.

There is need for the most schools to invest more in computers and related technology as means of not only solving accessibility problem to data or for pupil learning, but improving on the presence of the facilities especially computers in the classroom and computer lab. More infrastructures: printers, computers, projectors should be put in place for more practice and utilization by teachers and pupils alike.

There is need to educate teachers on the importance of technologies to our every day lives. Much of these educations are usually only impacted on pupils forgetting the teacher. This may be due to lack of a time table to teach or sensitize teachers, but workshops can be planned and implemented at school levels targeted at teachers only.

Since ICT is relatively a new in the schools for teaching and learning purposes, a lot of research is needed to be carried out on how teachers are affected and effected by it. This study has exposed many things that could not all be covered. The researcher thus recommends that the link between technology and authentic learning in most institutions of learning must be emphasized across all fields. Another area needing research is on the hinderances of technology adaptation among teaching staff. As far as this study has tackled part of it, much indepth research is needed. Its only when a teacher is understood, that will become easy to implement ICT education in schools, seeing that most studies emphase on a pupil and ICTs, forgetting that the teachers are the ones who need to assist in impacting the idea in pupils.

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## 11.2. FIGURES

Figure 1: technology acceptance model (davis, 1985 & 1989)	8
figure 2: conceptual framework for the e-solution for school data and record management system	10
figure 3: current system of the pupil data and record file-paper flow from office to office	19
figure 4: the proposed school electronic data and record management system pseudo	20
figure 5: jephkapi esms system overview	22
figure 6: jephkapi esms basic operation subsystem architecture	25
figure 7: jephkapi esms login system	26
figure 8: jephkapi esms password recovery	26
figure 9: jephkapi esms system administration management gui	27
figure 10: jephkapi esms system database maintenance and management	28
figure 11: entering new school details and records	28
figure 12: jephkapi esms user details definition	29
figure 13: jephkapi esms pupil registration form	29
figure 14: jephkapi esms viewing and printing pupils details	30
figure 15: jephkapi esms school population and statistics	31
figure 16: jephkapi esms pupil details import	32
figure 17: multi sms for correspondences with parents	33
figure 18: jephkapi esms end of term test results capture-choosing department	33
figure 19: jephkapi esms end of term test results capture-entering of results	34
figure 20: jephkapi esms end of term test results capture-class master marks entry form	34
figure 21: jephkapi esms report form for a class	35
figure 22: pupils' payments capture and financial report form screen	35
figure 23: jephkapi esms pupil's payment capture form	36
figure 24: jephkapi esms pupil payment records reports	37
figure 25: system design overview and component function	45
figure 26: respondents' views on whether zambian schools are doing enough to enhance the way in which they handle data for the school with an electronic school management system	83
figure 27: esms brought data efficiency in school	84
figure 28: paper manual system is more efficiency in school	85
figure 29: esms capability change new schools	86
figure 30: enough legislation in place across zambia to support schools in improving pupil records data capture, protection and storage systems (responses from schools with esms)	88
figure 31: enough skills and expertise in the area of electronic data management systems across zambia responses from schools with esms	89
figure 32: significantly of an electronic data record management system impacts an institution's reputation	91
figure 34: reasons for using the electronic data record management system (schools with esms)	93
figure 35: likelihood to recommend an electronic data record management system to other school (schools with esms)	94

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figure 36: average time enter results in the electronic school system	95
figure 37: average time enter results on the files and papers	96
figure 38: the price of bond paper for 10 boxes, which is a unit price of k 65 per ream paper.	131
figure 39: chikola secondary school pupil class population statistics	132
figure 42: records of pupils in storage on a shelf	133
figure 41: records of pupils in storage wasting away	133
figure 40: records of pupils in storage cabinet	133

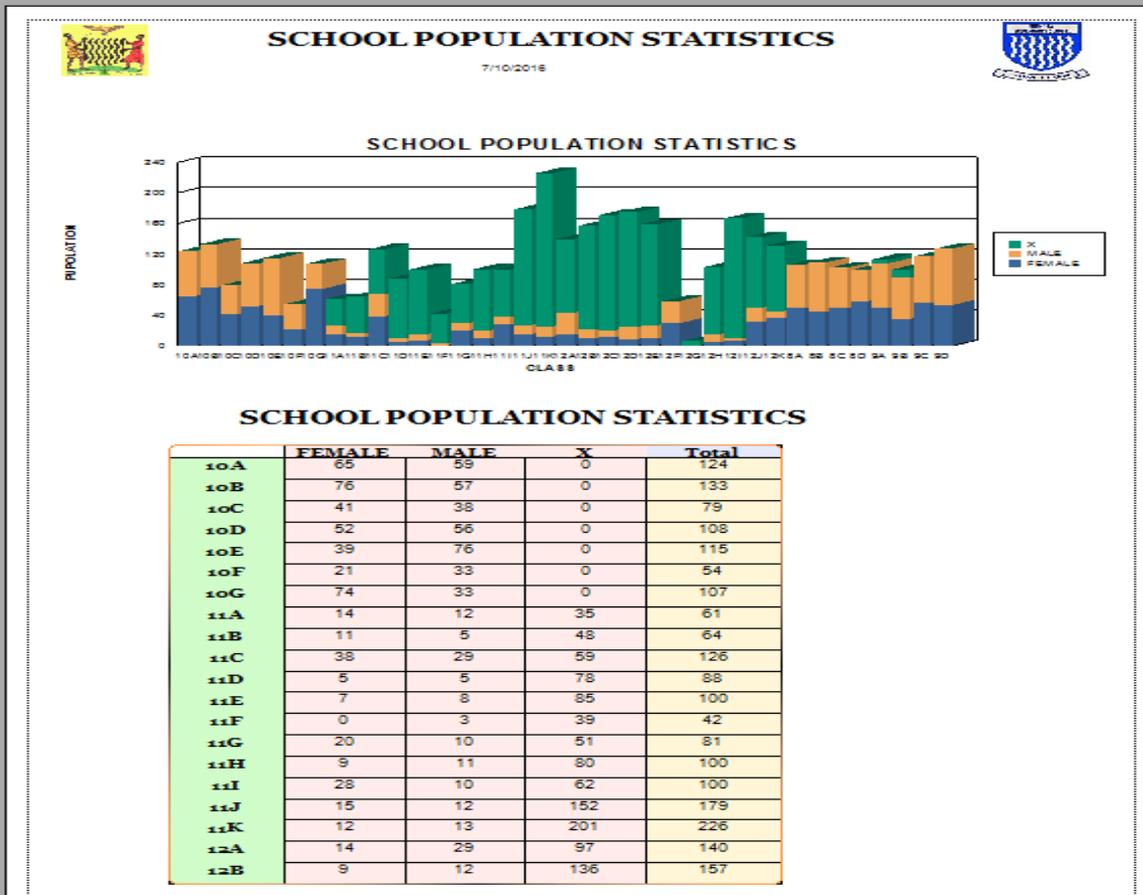
### 11.3. TABLES

Table 1: school details table	38
table 2: system users table	38
table 3: pupils' payments records table	38
table 4: pupils' vital statistics and details table	38
table 5: ovc details vital statistics table	39
table 6: career pathway table	40
table 7: test one results table	40
table 8: school details table	40
table 9: end of term test results table	41
table 10: test two results table	41
table 11: pupils details big data student ids database table	42
table 12: pupils' payments school pupil financial records database table	42
table 13 likert scale response quantifications examples, in a) they are 2 choices, b) 3 choices and c) 5 choices	76
table 14: gender of respondents from the schools with an electronic school management system	80
table 15: gender of respondents from the schools without an electronic school management system	80
table 16: age of respondents from the schools with an electronic school management system	80
table 17: age of respondents from the schools without an electronic school management system	81
table 18: year in service of respondents from the schools with an electronic school management system	81
table 19: year in service of respondents from the schools without an electronic school management system	82
table 20: respondents' views on whether zambian schools are doing enough to enhance the way in which they handle data for the school with an electronic school management system	82
table 21: respondents' views on whether zambian schools are doing enough to enhance the way in which they handle data for the school without an electronic school management system	83
table 22: esms brought data efficiency in school	84
<i>table 23: is the paper-filling method effective is than esms</i>	85
<i>table 24: esms capability change new schools</i>	85
table 25: frequency on the usage of the esms per year	87
<i>table 26: enough legislation in place across zambia to support schools in improving pupil records data capture, protection and storage systems</i>	88

<i>table 27: enough skills and expertise in the area of electronic data management systems across zambia</i>	89
<i>table 28: sectors in need of the data electronic management system</i>	90
<i>table 29: significantly of an electronic data record management system impacts an institution's reputation</i>	90
<i>table 30: in regards to what may have being the price for the electronic data record management system costed your school, would you say the value was of worthy it?</i>	91
<i>table 31: electronic data record management system provide more availability to pupil's end of term records and pupils data and details as compared to the old paper-file system whenever records are needed</i>	92
<i>table 32: reasons for using the electronic data record management system</i>	92
<i>table 33: likelihood to recommend an electronic data record management system to other school</i>	93
<i>table 34: average time enter results in the electronic school system</i>	94
<i>table 35: average time enter results on the files and papers</i>	95
<i>table 36: one-sample t-test statistics for schools with an esms</i>	102
<i>table 37: one-sample t-tests of responses for schools with an esms</i>	103
<i>table 38: hypothesis test summary schools with an esms , nonparametric tests: one sample</i>	104
<i>table 39: one-sample t-test statistics for schools without an esms</i>	106
<i>table 40: one-sample t-tests of responses for schools without an esms</i>	107
<i>table 41: hypothesis test summary for schools without an esms, nonparametric tests: one sample</i>	108



## 12.1.2. Appendix B- School class statistics



CLASS	FEMALE	MALE	X	Total
12C	11	9	151	171
12D	8	16	151	175
12E	9	18	132	159
12F	29	29	0	58
12G	0	0	6	6
12H	5	10	88	103
12I	6	3	158	167
12J	31	19	92	142
12K	36	9	86	131
8A	49	57	0	106
8B	44	65	0	109
8C	49	53	0	102
8D	58	41	0	99
9A	49	59	5	113
9B	35	54	11	100
9C	56	61	0	117
9D	53	74	0	127
<b>Total</b>	<b>1078</b>	<b>1088</b>	<b>2003</b>	<b>4169</b>

Figure 38: Chikola Secondary School Pupil Class Population Statistics

## 12.1.3. Appendix C - Old Records in Storage



Figure 40: Records of pupils in storage wasting away



Figure 41: Records of pupils in storage cabinet



Figure 39: Records of pupils in storage on a shelf

## 12.2. QUESTIONNAIRE

### 12.2.1. Research Instrument: Questionnaire One

FOR SCHOOLS WITH AN ELECTRONIC DATA AND RECORDS MANAGEMENT SYSTEMS



## INFORMATION AND COMMUNICATIONS UNIVERSITY

Dear Respondent,

My name is Jephther Kapika Pelekamoyo an MSc ICT student at Information and Communications University, Lusaka. I am conducting a research entitled: **The effect of an electronic data capture and records management system on a school administration and management: A case study of Chikola Secondary, Kabundi Secondary, Maiteneke Secondary, Sacred Heart Convert and Sekela Secondary Schools.**

This research is purely for academic purposes and will only be used solely and strictly for academic purposes. Please do not write your name or any personal details that may symbolize your identity on the questionnaire.

### SECTION A: DEMOGRAPHIC INFORMATION (Tick the box for your choice)

Tick in the box applicable to you

1. Gender:

<input type="checkbox"/>	Female
--------------------------	--------

<input type="checkbox"/>	Male
--------------------------	------

2. Age:

<input type="checkbox"/>	Below 21
<input type="checkbox"/>	21-28

<input type="checkbox"/>	28-34
<input type="checkbox"/>	34-40

<input type="checkbox"/>	40-50
<input type="checkbox"/>	50 plus

3. How long have you served on your current position?

<input type="checkbox"/>	1-2 years
<input type="checkbox"/>	2-5 years

<input type="checkbox"/>	5-10 years
<input type="checkbox"/>	over 10 years

4. Apart from your regular current job, do you have another job or a part time job?

<input type="checkbox"/>	No	<input type="checkbox"/>	Yes
--------------------------	----	--------------------------	-----

If yes mention:

5. Which type of secondary school did you attend?

	Mission school
	Private school

	Government school
--	-------------------

**SECTION B** (Tick the box for your choice)

1. Do you think Zambian schools are doing enough to enhance the way they handle data in school?

	They are in-line with global standards
	There are making progress
	They could be doing more
	They are falling significantly behind global standards

2. Do you think the electronic data record management system employed by your school has made data capture for the end of term pupils results and details more or less efficient than years ago?

More	The same	Less
------	----------	------

3. How likely would the electronic data record management system change new upcoming school's administrative and management practices and systems?

Very likely	Unlikely	Not at all
-------------	----------	------------

Give reason for your answer: .....

.....

4. How often do you use the electronic data record management system per year?

None	1 - 5	5 plus
------	-------	--------

5. Do you think there is enough legislation in place across Zambia to support schools in improving pupil records data capture, protection and storage systems?

	The country is in-line with legislation globally
	I am unfamiliar with existing legislation
	More measures could be introduced by the government
	The country is falling significantly behind

6. Do you think there are enough skills and expertise in the area of electronic data management systems across Zambia?

<input type="checkbox"/>	The country is in-line with best practices globally
<input type="checkbox"/>	More training and qualification is required
<input type="checkbox"/>	I am concerned by the lack of computer literacy

7. Which types of sectors do you think are the most in need of the electronic data record management system in Zambia?

<input type="checkbox"/>	Government as a whole
<input type="checkbox"/>	Secondary and tertiary schools
<input type="checkbox"/>	Financial services institutions
<input type="checkbox"/>	Healthcare organizations
<input type="checkbox"/>	Other like:

8. How significantly do you think an electronic data record management system impacts an institution's reputation?

<input type="checkbox"/>	It significantly impacts my decision to use that company's services or products
<input type="checkbox"/>	I am often unaware if a company uses such a system or not
<input type="checkbox"/>	It does not influence my decision to use that company's services or products

9. In regards to what may have being the price for the electronic data record management system costed your school, would you say the value was of worthy it?

<input type="checkbox"/>	Poor Value
<input type="checkbox"/>	Unsure

<input type="checkbox"/>	Good Value
<input type="checkbox"/>	High Value

10. Does the electronic data record management system provide more availability to pupil's end of term records and pupils' data and details as compared to the old paper-file system whenever records are needed?

<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
--------------------------	-----	--------------------------	----

11. What were your reasons for choosing the electronic data record management system in your opinion? Please select all that apply.

<input type="checkbox"/>	Convenience
<input type="checkbox"/>	To save time
<input type="checkbox"/>	24-hour access to data

<input type="checkbox"/>	Other (_____)
--------------------------	------------------

12. How likely are you to recommend an electronic data record management system to others?

<input type="checkbox"/>	Very Unlikely
--------------------------	---------------

<input type="checkbox"/>	Unlikely
--------------------------	----------

	Likely
--	--------

	Very Likely
--	-------------

**SECTION C** (In your own words, answer the questions below in the spaces provided)

13. Fill in the table below according to the answers you will provide:

List the class you teach, the subject that you teach in the class and the time you took to complete the entering the results, grades for results and comments for the results for the end of term in the system or on the report form and the master mark sheet.

SN	1	2	3	4	5	6	7
Class							
Time							

Was the time that you needed to do your work during end of term test results data entry using the electronic data and record management system more efficient and effective than the old paper-file system? Give reasons to your answer.

.....  
.....  
.....

14. with reference to the electronic data record management system:

a) What features do you think one would look for if they were to use the system?

.....  
.....  
.....

b) What specific benefits do you think the system will bring about?

.....  
.....  
.....

c) What problems do you think motivated your school management to introduce the system?

.....  
.....  
.....

d) In your opinion, what needs are you trying to meet with the new system as compared to the system that was in place to handle the data and records?

.....  
.....  
.....

e) How do you hope this system will make your life better?

.....  
.....  
.....

## 12.2.2. Research Instrument: Questionnaire Two FOR SCHOOLS WITHOUT AN ELECTRONIC DATA AND RECORDS MANAGEMENT SYSTEMS



### INFORMATION AND COMMUNICATIONS UNIVERSITY

Dear Respondent,

My name is Jephther Kapika Pelekamoyo an MSc ICT student at Information and Communications University, Lusaka. I am conducting a research entitled: **The effect of an electronic data capture and records management system on a school administration and management: A case study of Chikola Secondary, Kabundi Secondary, Maiteneke Secondary, Sacred Heart Convert and Sekela Secondary Schools.**

This research is purely for academic purposes and will only be used solely and strictly for academic purposes. Please do not write your name or any personal details that may symbolize your identity on the questionnaire.

#### SECTION A: DEMOGRAPHIC INFORMATION (Tick the box for your choice)

Tick in the box applicable to you

1. Gender:

<input type="checkbox"/>	Female
--------------------------	--------

<input type="checkbox"/>	Male
--------------------------	------

2. Age:

<input type="checkbox"/>	Below 21
<input type="checkbox"/>	21-28

<input type="checkbox"/>	28-34
<input type="checkbox"/>	34-40

<input type="checkbox"/>	40-50
<input type="checkbox"/>	50 plus

3. How long have you served on your current position?

<input type="checkbox"/>	1-2 years
<input type="checkbox"/>	2-5 years

<input type="checkbox"/>	5-10 years
<input type="checkbox"/>	over 10 years

4. Apart from your regular current job, do you have another job or a part time job?

No	Yes
If yes mention:	

5. Which type of secondary school did you attend?

Mission school	Government school
Private school	

**SECTION B** (Tick the box for your choice)

6. Do you think Zambian schools are doing enough to enhance the way they handle data in school?

<input type="checkbox"/>	They are in-line with global standards
<input type="checkbox"/>	There are making progress
<input type="checkbox"/>	They could be doing more
<input type="checkbox"/>	They are falling significantly behind global standards

7. Do you think the paper-file system employed by your school has made data capture for the end of term pupils results and details more or less efficient and effective given technology nowadays?

<input type="checkbox"/> More	<input type="checkbox"/> The same	<input type="checkbox"/> Less
-------------------------------	-----------------------------------	-------------------------------

8. Do you think there are enough skills and expertise in the area of electronic data management systems across Zambia?

<input type="checkbox"/>	The country is in-line with best practices globally
<input type="checkbox"/>	More training and qualification is required
<input type="checkbox"/>	I am concerned by the lack of computer literacy

9. Do you think there is enough legislation in place across Zambia to support schools in improving pupil records data capture, protection and storage systems?

<input type="checkbox"/>	The country is in-line with legislation globally
<input type="checkbox"/>	I am unfamiliar with existing legislation
<input type="checkbox"/>	More measures could be introduced by the government
<input type="checkbox"/>	The country is falling significantly behind

10. Which types of sectors do you think are the most in need of the electronic data record management system in Zambia?

<input type="checkbox"/>	Government as a whole
<input type="checkbox"/>	Secondary and tertiary schools
<input type="checkbox"/>	Financial services institutions
<input type="checkbox"/>	Healthcare organizations

---

	Other like:
--	-------------

11. How significantly do you think an electronic data record management system may impact an institution's reputation?

	It significantly impacts my decision to use that company's services or products
	I am often unaware if a company uses such a system or not
	It does not influence my decision to use that company's services or products

12. How likely are you to recommend an electronic data record management system to others?

	Very Unlikely
	Unlikely

	Likely
	Very Likely

**SECTION C** (In your own words, answer the questions below in the spaces provided)

13. Fill in the table below according to the answers you will provide:

List the class you teach, the subject that you teach in the class and the time you took to complete the entering the results, grades for results and comments for the results for the end of term in the system or on the report form and the master mark sheet.

SN	1	2	3	4	5	6	7
Class							
Time							

14. Was the time that you needed to do your work during end of term test results data entry efficient and effective? Give reasons to your answer.

.....  
.....  
.....  
.....

15. With reference to an electronic data record management system:

f) What features do you think one would look for if they were to use such an electronic system for pupils' results?

.....  
.....  
.....

g) What specific benefits do you think an electronic system for pupils' results would bring about to your school?

.....  
.....  
.....

h) What problems do you think would motivate your school management to introduce an electronic data capture system for pupils' results in your school?

.....  
.....  
.....

i) In your opinion, what needs would you be trying to meet with an electronic system as compared to the system that was in place to handle the data and records?

.....  
.....

## 12.3. INTERVIEW

### 12.3.1. RESEARCH INSTRUMENT: INTERVIEW



#### INFORMATION AND COMMUNICATIONS UNIVERSITY

Dear Respondent,

My name is Jephther Kapika Pelekamoyo an MSc ICT student at Information and Communications University, Lusaka. I am conducting a research entitled: **The effect of an electronic data capture and records management system on a school administration and management: A case study of Chikola Secondary, Kabundi Secondary, Maiteneke Secondary, Sacred Heart Convert and Sekela Secondary Schools.**

This research is purely for academic purposes and will only be used solely and strictly for academic purposes. Please do not write your name or any personal details that may symbolize your identity on the questionnaire.

#### SECTION A: DEMOGRAPHIC INFORMATION

(Tick the box for your choice)

Tick in the box applicable to you

1. Gender:

<input type="checkbox"/>	Female
--------------------------	--------

<input type="checkbox"/>	Male
--------------------------	------

2. Age:

<input type="checkbox"/>	Below 21
<input type="checkbox"/>	21-28

<input type="checkbox"/>	28-34
<input type="checkbox"/>	34-40

<input type="checkbox"/>	40-50
<input type="checkbox"/>	50 plus

3. How long have you served on your current position? .....

4. Apart from your regular current job, do you have another job or a part time job?

<input type="checkbox"/>	No	<input type="checkbox"/>	Yes
--------------------------	----	--------------------------	-----

If yes mention:

5. Which type of secondary school did you attend?

<input type="checkbox"/>	Mission school
--------------------------	----------------

<input type="checkbox"/>	Private school
--------------------------	----------------

<input type="checkbox"/>	Government school
--------------------------	-------------------

**SECTION B** (Data to be collected using a voice recorder for the questions below :)

1. What is an electronic data capture and records management system and why is it important to an institution like a school?  
.....
2. What are the existing data and records management systems in most institutions especially schools?  
.....
3. How has the electronic data capture and records management system changed how you do things in your school time?  
.....
4. What are the potential benefits of an electronic data and records management system to an institution or organization?  
.....
5. What are the negative effects of the change from paper-files to E-Systems on your school?  
.....
6. Is the paper-file system more viable to an electronic data capture and records management system?  
.....
7. What percentage of a school staff population supports an electronic data capture and records management system?  
.....
8. What is blocking an electronic data capture and records management system in schools as an alternative to the traditional methods of data capture and storage?  
.....
9. Do you think Zambian schools are doing enough to enhance the way they handle data in school?  
.....
10. What problems do you think motivated your school management to introduce the system?  
.....
11. In your opinion, what needs are you trying to meet with the new system as compared to the system that was in place to handle the data and records?  
.....
12. Do you think there are enough skills and expertise in the area of information and communication technology across Zambia?  
.....
13. Do you think it would be better for your school to use the conversional method of pen-paper and file system seeing that not everyone knows how to operate a computer? Give reason to your answer:  
.....  
.....  
.....
14. How you think an electronic data capture system can make the lives of your staff and pupils better?  
.....