FACTORS AFFECTING IMPLEMENTATION OF INFORMATION AND COMMUNICATION TECHNOLOGY IN KENYA'S RURAL SECONDARY SCHOOLS: THE CASE OF IGEMBE DISTRICT

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DECLARATION

This management research project is my original work and has not been presented for a degree award in any other university.

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This management research project has been submitted with my approval as a university supervisor.

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DEDICATION

I dedicate this project to my parents, brothers, and sisters. Graciously, I recognize their support and encouragement. Above all, I would like to specifically say, for a **mum** who knew that I needed to be educated to be a better person in life, this is a special dedication to her.

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List of Abbreviations

BECTA	-	British Educational Communication Technology Agency
CFSK	-	Computer for Schools Kenya
CMS	-	Course management system
COP	-	Communities of practice
CPD	-	Continuous professional development
CSCL	-	Computer supported collaborative learning
CSK	-	Computer Society of Kenya
ICT	-	Information and Communication Technologies
IS	-	Information systems
KTTC	-	Kenya Technical Teachers College
LeTTOL	-	Learning To Teach Online
MEEL	-	Modeling Effective E-Learning
NFER	-	National Foundation for Educational Research
NFER	-	National Foundation for Educational Research
DFES	-	Department for Education and Skills
NTA	-	National Training Awards
QAA	-	Quality Assurance Agency
SYFEC	-	South Yorkshire Further Education Consortium
TTA	-	Teacher Training Agency
UNESCO	-	United Nations Educational, Scientific & Cultural Organization
VLE	-	Virtual Learning Environment

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ABSTRACT

Information and Communications Technologies (ICTs) entail the convergence of computers, telecommunication and audio-visual systems. In this study, the term ICTs was used to mean the use of computer hardware, software, networking and the Internet, and other media of communication such as television, radio, newspapers and cell phones. The objectives of this study were to establish the extent of implementation of ICTs in rural secondary schools in Igembe and to identify the factors which are affecting implementation of the ICTs in Igembe secondary schools.

A census study was conducted at the 38 schools out of 40 secondary schools in Igembe district. To collect data the researcher used a structured questionnaire that was personally administered to the respondents. The respondents were the school principals, computer course teachers or any other knowledgeable teacher in the respective secondary schools. These individuals were chosen as they are expected to be more knowledgeable and therefore in a position to provide the knowledge being sought. In this study, data was analyzed using frequencies, mean scores, standard deviations, percentages, Friedman's test and Factor analysis techniques.

The researcher found out that over 50% of the Igembe secondary schools had not yet acquired computers and none had the Internet connection. The study indicated that cost of connection, lack of; computers, technical support, electricity and telecommunication links contribute to the lack of Internet connection. ICTs were mainly used for; mailing and chatting with peers, leisure and entertainment, office work, and students' information search. The factors that affect ICT implementation were categorized as; inadequate funding, unconducive ICT environment, improper ICT strategies and supportive resource.

The 52.6% of the schools in Igembe district are five years and younger, this connotes that the school resources are being used in development of the physical infrastructure such as buildings, hence, 60.5% of the schools in the district have not yet acquired any computer. The extent of implementation and ICT usage in Igembe district was limited to the traditional ICTs such as radios, television sets, news papers and just a few computers. The researcher identified one of the major factors hindering implementation of ICTs as lack of funding, thus the government and NGOs should come up with an affirmative action geared towards automation and revolutionizing education systems using ICT by providing finances and expertise to the schools.

CHAPTER ONE: INTRODUCTION

1.1   Background

Information and Communications Technologies (ICTs) entail the convergence of computers, telecommunication and audio-visual systems, that enable the collection, processing, transportation and delivery of information and communication services to users. The need for schools to invest in ICT in Kenya has been emphasized by the Kenya Government through the Ministry of Information. The Government of Kenya recognizes the role of ICTs in the social and economic development of the nation and has promulgated a national ICTs Policy based on the Economic Recovery Strategy for Wealth and Employment Creation (2003-2007) (http://www.information.go.ke).

The rationale and implications of the ICT policies in schools can lead to different emphases in the way that ICTs are introduced and used in education, in particular at the secondary school level. ICT is used to refer to the use of computer hardware, software and networking, and other media of communication such as television, radio, and other modes of telecommunications such as mobile phone usage. In this study, the research mainly focuses on the use of computers and the Internet for learning. In any case digital convergence is bringing all the technologies together through the Internet (Omolo, 2003).

According to Reidlinger and Weir (1995), ICTs can support learning in a number of ways. It can facilitate communication, increase access to information, provide greater learning easiness to students with special education needs, and motivate students because of their enhanced problem solving capabilities and deeper understanding of the courses being offered.

Successful implementation of ICTs in secondary schools can be achieved through: engaging skilled teachers; employing supportive ICT infrastructure; having access to, and the development and application of, online resources and services; instituting enabling policies and strategies that facilitate the uptake and usage of ICT within schools; facilitating Public - Private Partnerships to mobilize resources; promote the development of integrated e-learning curriculum to support ICT in education; promoting distance education and virtual institutions; facilitating sharing of e-learning resources between institutions; and integrating e-learning resources with other existing resources (Reidlinger and Weir, 1995).

According to Ndungu (2005) ICT implementation in high schools is highly influenced by school culture; whole school attitude to ICT; individual attitudes; individual believes; ICT

implementation process; access and availability of resources and ICT training and support infrastructure.

According to Omolo (2003) some of the factors that strongly influence ICT implementation in schools are; availability of funds, electricity, telecommunication, classroom space, adequate computers, training ICT teachers, security, clear government policy, software, Internet service providers and collaborative support of various stakeholders.

1.1.1 Implementation of ICTs in Schools

Tornatzky (1982) defines implementation as all the organizational activities working toward the management and routinisation of an innovation. Before implementation ICTs are adopted. ICTs adoption involves the investment of funds into the idea, product or technology that facilitates the conduct of business electronically (Vasudevan, 2001). In schools, ICT can be adopted in curriculum and materials development. Materials may include schemes of work, lesson plans, along with teaching and learning manuals (Obura et al, 2003). Implementation of ICTs in schools has several requirements:

Firstly, ICT infrastructure is need and as identified by UNESCO, this involves educational hardware, distributional networks of teaching and learning materials and collaborative environments (UNESCO, 2001). To acquire hardware and software, CFCK sources and refurbishes computers donated by public and private organizations and distribute these computers to public secondary and primary schools (Obura et al., 2003). Secondly, ICT implementation requires ICT media such as the Internet (http://www.cecnsw.catholic.edu.au/default3.asp?ID=59), and student interest and motivation towards ICTs implementation (http://www.curriculum.edu.au/mceetya/taskfrce/task224.htm).

Thirdly, competent ICT Teachers are needed for successful development, implementation and support of ICT systems (Information Communication Technology sector, 2006). Fourthly, there is need for financial readiness. Financial readiness is key since it focuses on e-learning budget for funding training, installation, and maintenance costs (Watkins, Leigh, and Triner, 2003). Lastly, there is need for regulatory framework because it seeks to stimulate investment and innovation in ICT and achieve universal access (http://www.information.go.ke, 2006).

1.1.2 Overview of ICT Situation in Igembe District and in Schools

Igembe district is in Eastern Province. It is located 54 kilometres away from Meru town and 300 Kilometres from Nairobi city. According to Meru North Development Plan (2002), the development of the ICT sector has been lagging behind in Meru North District (today's

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Igembe and Tigania Districts) owing to ignorance, high illiteracy levels and lack of resources. However, the ministry promised to strengthen the ICT sector so as to ensure that the district is not left behind in global trends. The ministry predicted that once the sector was improved, the learning institutions would have a good source of information exchange.

According to Meru North Development Plan (2002), the government would facilitate the creation of the necessary infrastructure and provide resources in form of finances and equipment for the development of ICT sector, the ministry of finance and planning would establish the District Information and Documentation Centre (DIDC) while the ministry of transport and communication and information and tourism would provide the regulatory framework for the operation of ICT.

The ICT sector would consequently encourage the media houses to continue to provide high quality newspaper while radio and television stations broadcast beneficial programmes. The Kenya Broadcasting Corporation was the main radio and television broadcaster in this region. Some of the Nation dailies read locally were Daily Nation, East African Standard, the people and Kenya Times. The Internet access was low with only one Cybercafé at Maua Town at the start of the planning period (Meru North Development Plan, 2002).

Meru North Development Plan (2002) suggested that the three important factors that would help achieve the above plans are; (a) *physical infrastructure* which includes good telecommunication networks, latest electronic machines and buildings; (b) *Public administration* that ensures safety, law and order, peace and stability; (c) *Human resources development* that would ensure people's education and innovativeness and keep the people healthy.

According to the Ministry of Education (2006), ICT department review data of 2006, there were 35 secondary schools in Meru North District. 17 public secondary schools were connected to electricity power from Kenya Power and Lighting Company and had also acquired power generators as the standby power source. Ministry's ICT department also shows that 13 secondary schools had established computer labs.

Several studies have been done on ICT implementation. These did not address the factors that affect implementation of ICTs in rural secondary schools. For instance, Muganda (2006) focused only on e-learning implementation in the University of Nairobi, while Ndungu (2005) focused on the factors that influence the sustainability of ICT in high schools that are registered for computer courses examination in Kenya Certificate Secondary Education.

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These studies did not consider factors hindering ICT implementation in rural schools. Ndungu (2005) focused only on sustainability of computers in high schools and not any other ICT. Omolo (2003) concentrated on ICT implementation in Secondary schools in Nairobi.

1.2   Statement of the problem

The ICTs application in schools accrues indispensable benefits. They enhance universal accessibility of education and training; cheapness of education to wider population; empowerment of learners; quality of teaching and the speed in data processing and; communication due to insurmountable network capabilities. Consequently, increased implementation of ICTs in schools in Kenya is naturally expected and is ongoing. However, the state of implementation is not known.

Studies undertaken relating to ICT implementation in schools left out ICT implementation in rural schools. Such studies include for instance those by Muganda (2006), Ndungu (2005) and Omolo (2003). Muganda (2006) focused only on e-learning implementation in the University of Nairobi. Ndungu (2005) study on "A framework for implementation of ICT in Kenya high schools focusing on sustainability", focused only on the high schools that have registered for Kenya National Examination Council (KNEC) computer course examinations. Omolo (2003), in his research "the factors affecting ICT implementation in secondary schools in Nairobi (Urban)", suggested further study to be carried out on rural schools, The need for this study is therefore evident.

ICT can lead to several benefits if implemented to a great extent. This requires resources. Thus there is need to know the extent to which ICTs have been implemented in schools so that the schools administration, the ministry of education, the school sponsors like the parents and NGOs, and the public could be appropriately advised about the extra effort and resources required so as to achieve the set goals relating to the ICTs implementation.

Implementation requires certain factors which Education Commission identified as up-to-date hardware, technical infrastructure, connection to the Internet, proper curriculum, the online learning and virtual schooling as factors that constitute sound ICT strategy (http://www.edna.edu.au/preview/schools/reports/learningonline.pdf).Nevertheless, sufficient funding, participatory planning and decision making, security and safety, road network, availability of the relevant ICT media and the literacy of the society benefiting from the implementation are factors worthy consideration. The extent of ICT implementation therefore

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is expected to be more if the occurrence of those factors is great and less if there presence is diminutive.

Consequently this study is on the state of implementation of ICT in rural secondary schools in Igembe district. The study addressed the following research questions; to what extent have ICTs been implemented in secondary schools in Igembe district? And what are the factors that affect implementation of the ICTs in Igembe district secondary schools?

1.3   Objectives of the Study

General objective of the study

The general objective of this study is to investigate ICTs implementation in secondary schools in Igembe district.

The Specific objectives of this study are;

a) To establish the extent of implementation of ICTs in rural secondary schools in Igembe

b) To identify the factors which are affecting implementation of the ICTs in Igembe Secondary Schools

1.4   Importance of the study

The secondary school administration and the ministry of education may require the predictive information from this study to develop better strategies for successful and effective implementation of ICTs in the schools. The ICT students and researchers will use the findings of this study in their endeavours of carrying out further related researches, as the suggestions from this study would point out the gaps in knowledge. ICT consultants will be informed about the status of ICT implementation in the rural secondary schools and thus they will be able to offer informed guidance. The parents and the other publics will be enlightened by the findings of the study, that is, they will be able to ascertain the progress being made in the schools and whether their children are getting the value for the fees paid.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The use of ICT is regarded as a necessary element of success of a learning institution (Clemon and Row, 1991). Clemon and Row (1991) argue that ICT is revolutionizing the traditional procedures involved in education delivery and many schools are enthusiastic about adopting it due to the speed and efficiency in content delivery in schools. According to Webster (2001), e-learning students have 60 percent faster learning curves compared to classroom counterparts.

Application of ICT enhances online Learning that enables the student information search through the Internet and E-mails. ICTs enable online teaching that facilitates teachers to work remotely from their students and can even administer examinations on-line. For these, education networking ensures that the education stakeholders are networked through computers and the Internet (Reidlinger and Weir, 1995). ICTs are useful for leisure, entertainment and office work.

ICT can enhance all forms of learning (Crook, 1996). Crook explores a number of orientations to the technology applied in teaching. Those orientations include: (a) Computer as Tutor- use of a software that coaches students in basic skills, assesses them and takes them to a higher level if they are succeeding or to more reinforcement if not; (b) Computer as pupil- regards the computer as a tool which the learner may come to control or 'teach' to do things; (c) Computer as resource- computers can present information in multimedia formats, in text, graphics, sounds, or Video; also making use of hyperlinks to link concepts together.

ICT has become an invaluable tool for children with special education needs (BECTA, 2000). BECTA has an inclusion website which provides information about how ICT can support pupils with a range of special education problems.

2.1.1 Advantages and Limitations of ICT use in Schools

Advantages

The use of ICT in schools can lead to several advantages. Firstly, it enhances universal accessibility by improving access to education and training. E-learning infrastructure grants access to education anywhere, anytime, three hundred and sixty days a year, twenty-four hours a day and seven days a week (Survillian, 2002). Secondly, e-learning reduces the cost of education through economies of scale. Accommodation and travelling costs are cut down

because the instructors and learners are connected in their residential areas (Survillian, 2002). Thirdly, with e-learning, the learner determines the pace of learning, what to learn and when to learn. In so doing, he is able to remain in employment while learning (Clemons and Row, 1991).

Fourthly, e-learning improves the quality of teaching since it uses both audio and visual senses in the acquisition of knowledge. Studies have shown that a person acquires only 15-20% of information through the auditory sense and 60-80% through visual sense. In a case where both audio and visual senses are used, retention becomes very high (Kitahara, 1983). Fifth, Jones, Scanlon, and O'shea, (1987) observed that e-learning smoothes status and flattens hierarchies. It reduces discriminatory communication patterns based on physical and social cues such as gender, race, socio-economic status, and physical features, hence it equalizes people.

Sixth, e-learning enhances speed because computers are fast in processing data and communication along networks is fast. Thus instructors can provide feedback to students promptly and over a wide geographical area at an instant (Jones, Scanlon, and O'shea, 1987).

Limitations

The factors limiting ICTs Implementation include: computer and Internet skills, the accessibility to computers and the Internet; an e-learning culture and motivation; attitude of the people towards e-learning; learning mechanisms; management and technical support (Watkins, Leigh, and Triner, 2003). Limiting factors can be categorized into organizational and environmental factors. These are the influences such as the degree of competition, and the uncertainty of the environment (Grover and Goslar, 1993). Internal environmental factors, these are the organizational or structural factors such as technological, expertise or information system (IS) factors.

The importance of environmental, organizational and IS factors are: organizational size that connotes that large firms have the resources to implement radical technological innovations (Schumpeters, 1939). Organizational decision making processes, in a centralized organization decisions are made at the top levels of the organization, while as lower formalization and higher decentralization grant lower level individuals greater participation in making decisions (Moch and Morse, 1977). IS factors involve the diversity of specialists within the Information Technology department and their technical expertise and experience (Lederer and Mendelo, 1986).

2.1.2 How ICT can be applied in Schools

Technology-assisted learning provides a conveniently accessible and easy-to-use global platform that supports a wide array of learning and knowledge dissemination activities (Allen & Seaman 2006). Zhang (2004) suggest that instructors can deliver course materials through designated Web sites, from which students access those materials and interact with the instructor and their peers remotely.

Technology-assisted learning improves the ability of students to acquire knowledge. It demands abstract conceptualization and reflective observation of the subjects being studied. Technology-assisted learning styles do not support subjects that require concrete experience and experimentation, since they better support vocabulary learning than face-to-face learning. It is comparatively less effective in developing listening comprehension skills (Hui et al., 2008).

According to Masie (2002), technology-assisted learning should be used only to complement rather than replacing face-to-face learning. Therefore, technology-assisted learning should be used to support students' accumulation of explicit knowledge rather than tacit knowledge (Rosenberg, 2001).

Johnson (2000) showed that students in the technology-assisted group perceive the instructor more positively and rate the overall course quality higher than their counterparts in the face-to-face group. Abraham (2002) found that technology-assisted learning improves learning feedback to students, but the learning effectiveness is not significantly better than that observed in a classroom-based learning. Hui (2008) suggest that educators and Web-based course designers should make learning materials easy to comprehend when designing or delivering courses via technology-assisted learning.

Online lecture resources such as a typical course management system (CMS) offer instructors a suite of flexible tools (Grabe and Christopherson, 2008). Morgan's (2003) study of more than 700 university faculty members who used a CMS determined that nearly 70% used the CMS to supplement lectures. Morgan described it as an alternative representation of lecture content such as lecture outlines, lecture summaries and recorded lectures, in ways that may meet a wide range of student needs.

The end of handwriting in students' evaluation, for instance, in a group of American school children, a student typing an examination could expect to perform slightly better than student handwriting the exam (Russell and Haney, 1997).

Duggleby (2004) addressed three separate initiatives in the usage of ICT in Education, these are South Yorkshire Further Education Consortium (SYFEC), e-skills4industry, and Cascade and information and communication technology (ICT) training for schools. The initiatives, however, share two important characteristics. First, they have been recognized within the National Training Awards (NTA) programme organised by UK Skills and supported by the UK Government's Department for Education and Skills (DfES). Second, each of the initiatives looks at the utilization of ICT in different aspects of education and training (DfES, 2003).

Freitas (2008) addressed the British Educational Communication Technology Agency (BECTA), which is responsible for technology-enhanced learning and supports standards and promotes greater integration within and between learning organizations. BECTA developed a Modelling Effective E-Learning (MEEL) pedagogic model that act as a planning tool and support practitioners in schools. The model is process-orientated with three dimensions, the context dimension that considers constraints or opportunities, the approaches dimension that includes techniques, assessment and differentiation, and the outcomes dimension that contains dispositions such as autonomy and creativity (Freitas, et al. 2008).

Virtual learning environment (VLE) is remote delivery of courses via the World Wide Web that has made online education viable to vast numbers of students (Chen & Dwyer, 2003). VLEs process, store and disseminate educational material and support students in their learning, and instructors in their teaching (Goodhue & Thompson, 1995)

2.2 Factors to Considered When Implementing ICTs

When implementing ICTs in schools several factors should be considered. Such factors may include: financial capability, ICT infrastructure, user's motivation, social and moral effects.

Students and teachers who spend most of their time with computers may become so individualistic and get problems relating to others in a social context. They may become aggressive, and impatient to others (O'Brien, 2002). In addition, the leisure time will be used for learning or teaching. Thus, work without rest may result into health problems such as stress, and eventually poor teaching and low retention for learners. Other healthy problems would be carpal turnel syndrome (CTS), which causes numbness and pain in the wrist because of repeated striking of the computer keyboard. Defects in Vision can also be caused due to exposure to light rays emitted by the monitor (Laudon, 1996).

The use of the Internet for e-learning exposes people to information that could be regarded as immoral, implementers of e-learning should therefore find ways of preventing access to what would be regarded as immoral. Notwithstanding the challenges of e-learning, institutions of learning, try very hard to implement e-learning.

Some efforts are being made to avail computer hardware and software to schools. For instance, Computers for Schools Kenya (CFSK) sources and refurbishes computers donated by public and private organizations and distribute these computers to public secondary and primary schools (Obura et al., 2003). Muhunyo (2008) describes how a St Mark's Teachers Training college in Embu district is sourcing for branded computers from UK. These projects have demonstrated how communities can work together and achieve the goals of increasing access to technology (Muhunyo, 2008).

ICTs diffusion processes for an ICT innovation requires certain channels and ample time among members of a social system (Rogers, 1983). Cooper and Zmud (1990) define an innovation as an idea, a product, a technology or a program that is new to the adopting unit. In the DOI theory, Rogers (1983) views the mechanism of diffusion as a process consisting of initiation, adoption and implementation.

Initiation is the generation of innovative ideas from experiences, experimentation or imagination, circulation of the same to the members of the organization, and the development of the specific ICT proposals (Vasudevan, 2001). Adoption is the decision to make full use of an innovation (Rogers, 1983), this involves investment of funds into the idea, product or technology that facilitates the conduct of business electronically (Vasudevan, 2001). Implementation involves the management and routinization of an innovation, the adopter goes through the process of systems development and installation aiming at achieving expected benefits are realized (Tornatzky, 1982).

Cooper and Zmud (1990) have integrated the stage model of diffusion with theories from organizational change, innovation, and technology diffusion. The stage model includes not only the initiation and adoption process, but also adaptation, acceptance, routinization, and infusion. Cooper and Zmud note that diffusion of an innovation starts from adapting to the new product or procedures initiated by the innovation, to the final diffusion stage, where the concern shifts to using the innovation for improving organizational effectiveness and measuring it's impacts on the firm.

The stage model essentially captures the organizational learning process. During this process the adopter goes over the learning curve, understanding the potential of the innovation, identifying and developing the sophisticated uses for the innovation, modifying their work practices to suit the innovation. Finally the adopter identifies and develops suitable organizational control procedures to manage the innovation and the new work environment. These changes take time and organizations have greater success with the gradual progression from one stage to another. The innovation's attributes are; relative advantage, compatibility, complexity, innovation's trialability, and the observability (Rogers and Shoemaker, 1971).

To cope with change in ICT-based learning environments, teachers in modern societies need to be change agents, and thus they should be able to create conditions that allow students to make sense of the world and be successful through the interplay between humans and machines (Mukama and Andersson, 2008). Mukama and Andersson (2008) also posit that the way of coping with change in schools is to build efforts on positive values existing in schools. If teachers, for instance, are creative or learn together through peer teaching, appropriate conditions can be strengthened through opportunities to demonstrate the outcomes of their creativity and their peer teaching during joint reflections and problem solving.

Legrand's (1993) asserts that unconditional support of the school administrators is a necessary condition for effective integration and implementation of ICT in schools. Some school directors who centralize to some extent the use of computers tend to limit teachers access and therefore the latter become frustrated. This impedes teachers' commitment, motivation and creativity in terms of ICT implementation in a classroom practice. The success in implementing ICTs in schools depends on teachers' competence, hence the need to solicit for the teachers' effort and support through out the implementation process.

Summary

ICTs are seen not as ends in themselves but as tools for improving student outcomes across all curriculum areas and as tools to drive organisational change. ICTs enhance e-learning, they are used in office work, used for recreational purposes in schools, and to enhance communication between teachers and students and with their peers. Factors affecting ICTs implementation are the hardware availability, sufficiency of the technical infrastructure and the connection of schools to the Internet. These factors enable online learning within an overall ICT strategy. (http://www.edna.edu.au/preview/schools/reports/learningonline.pdf)

According to Omolo (2003) the major constraint in ICT implementation was lack of funds. Omolo (2003) concluded that ICT implementation in schools will differ across schools, and mainly will depend on whether a school has adequate infrastructure or not. Hence implementation will involve use of networks, Internet access and usage, ICT planning, funding in schools, professional development of teachers and formal ICT policies in schools. Ndungu (2005) posits that a framework for implementation of ICT is needed to ensure ICT sustainability. Ndungu (2005) indicated that to sustain ICTs there is need for financial, technical and institutional support.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Research Design

The survey research design was used for this study. Mugenda and Mugenda (1999) notes that a survey research attempts to collect data from members of a population and describes existing phenomena by asking individuals about their opinion, attitudes, behavior or values.

This design was suitable for this kind of study because the researcher intended to collect data meant to ascertain facts about ICT implementation in secondary schools. This kind of research methodology makes use of surveys to solicit management and practitioner informed opinion. It is often used to study the general condition of people and organizations as it investigates the behavior and opinion of people usually through questioning them (Cooper and Schindler, 2003).

3.2 Population of Study

The target population for this study was all the secondary schools in Igembe district (See Appendix III for the list of schools). According to Mugenda and Mugenda (2003), when target population is small a census study is preferred to sampling. Thus this research is a census study.

The respondents were the school principals, computer course teachers or any other knowledgeable teacher in the respective secondary schools. These individuals were chosen as they are expected to be more knowledgeable and therefore in a position to provide the knowledge being sought.

3.3 Data Collection

The researcher used a structured questionnaire (Appendix II). The questionnaires were personally administered to the respondents. This method was appropriate since it encouraged prompt responses from the respondents.

The questionnaire was structured into three sections; Section I sought to capture the general data (Bio-Data) about the secondary schools. This data enabled the researcher to get the schools' outlook so as to be able to categorize the school and also to gain a preview of the schools' status in light of the ICTs. Section II of the questionnaire sought data on the extent to which secondary schools in Igembe district have adopted and implemented ICTs. This section was concerned with ICT infrastructure, equipment and the level of their utilization.

Section III was concerned with the data on factors that affect ICT implementation in Igembe Secondary schools.

3.4   Data Analysis

Package for Social Sciences (SPSS) and MS-Excel were used to analyze the data, this enabled data interpretation and making of statistical inferences. The collected data was coded and tabulated. The data were analyzed using descriptive statistics, Friedman's test and Factor analysis techniques.

In particular, for data relating to Section I, the researcher used means, standard deviations and percentages in respect of different attributes of the respondents and the schools being studied. Data captured in respect to Section II were analyzed using means, proportions, percentages and frequencies. Friedman's test was also done to help evaluate the relative importance of components and to enable the researcher gauge the extent of ICT implementation in the Igembe secondary schools. Data relating to Section III required both the factor analysis and Friedman's test techniques. These techniques were used to determine the factors that affect ICT implementation and the relative importance of those factors.

Factor analysis is a systemic, statistical procedure used to uncover relationships amongst several variables and also reduces the responses to manageable factors. Factor analysis enables the data to be summarized and organized in an effectively meaningful way as it provides tools for reducing information into understandable form.

CHAPTER FOUR: DATA ANALYSIS AND FINDINGS

4.1   Introduction:

This chapter deals with data analysis and interpretation of the research findings. The data in this study was summarized and presented in the form of tables, frequencies, percentages, means score, standard deviation and rank ordering. The chapter documents the extent of ICTs implementation and the factors that affect the implementation of ICTs in Igembe secondary schools. Out of the forty secondary schools targeted, only two schools were not reached to provide response. All the schools researched provided responses and therefore giving a response rate of 95%. The questionnaires were personally administered by the researcher.

The chapter is divided into three sections. Section I concerns the respondents' demographic data, Section II concerns the extent to which ICTs have been implemented, and Section III concerns the factors that affect ICTs implementation in Igembe Secondary schools.

4.2 Demographics Factors

Demographic factors considered in the study included the number of years of the secondary schools in Igembe district, the schools administrative categorization, the number of students, the number of streams in the schools, the number of computer teachers and their qualification, the number of computers, and whether the schools have explicit plans to acquire computers.

4.2.1 The Age of the Secondary School

Table 4.1: Age of Schools

Years	Frequency	Percent
Not more than 5	20	52.6
06-10	1	2.6
11-15	4	10.5
16-20	5	13.2
21-25	2	5.3
Over 25	6	15.8
Total	38	100.0

As Table 4.1 shows, 38 out of 40 schools participated in the study. The researcher found out that 52.6% of the schools were not more than five years old, 2.6% were between 6 and 10

years, 10.5% were between 11 and 15 years, 13.2% were between 16 and 20 years, 5.3% were between 21 and 25 years and 15.8% of the schools were above 25 years of age. This analysis reveals that over 50% of the schools are not more than 5 years old. Thus more than half of the schools are still under development and as expected are with big percentages of their resources being channelled towards physical infrastructure such as buildings.

4.2.2 Number of Students and Computers

Table 4.2 (a): Classification of Schools using their Administrative categories.

	Number of students	Number of computers	
School Category	Mean	sum	Mean
District	199	61	10
Provincial	415	144	16

Table 4.2 (b): Classification of Schools using their Nature of Operation.

	Number of students	Number of computers	
School Category	Mean	sum	Mean
Boarding	346	204	15
Day	154	1	1

Table 4.2 (c): Classification of Schools by their nature of ownership.

	Number of students	Number of computers	
School Category	Mean	sum	Mean
Public	251	193	14
Private	238	12	12

Table 4.2 (d): Classification of Schools by gender.

	Number of students	Number of computers	
School Category	Mean	sum	Mean
Girls	439	38	13
Boys	395	134	19
Mixed	183	33	7

Number of Students

Table 4.2 (a) shows that provincial schools enrol more students than the district schools. Provincial schools have a mean score of 415 which is much higher than 199 of the district schools. Table 4.2 (b) indicates that boarding schools have a higher student enrolment of 346 against the 134 for the day schools. Table 4.2 (c) indicates that public schools recorded a higher student number with a mean score of 251 when compared to the 238 for the private schools. Table 4.2 (d) presents class of schools by gender. As the table shows, the girls' schools recorded a higher number of students with a mean score of 439, the boys' schools 395, while the mixed schools had the least number of students with a mean score of 183.

Number of Computers

Table 4.2 (a) shows that the provincial schools have a higher number of computers with a mean score of 16 than the district schools which have 10 Table 4.2 (b) indicates that boarding schools have more computers with a mean score of 15, whilst there is a day school that had only one computer. Table 4.2 (c) indicates that public schools have a high number of computers with a mean score of 14 while as there was a private school that had twelve computers. Table 4.2 (d), in comparing the Girls', Boys' and the mixed schools, Boys' schools recorded the highest number of computers with a mean score of 19, followed by the girls' schools with 13 and then the mixed schools with a mean score of 7.

In total, there were 205 computers in all the District secondary schools. Given the enormous number of students in the district, this number of computers is low and thus there is need to plan to acquire more computers for use in schools.

4.2.3 Number of Streams for each Class

Table 4.3: Number of Streams for each Class

Class	Percentage Distribution		
	1	2	3
Form 1	42.1	44.7	13.2
Form 2	64.9	24.3	10.8
Form 3	54.5	15.2	30.3
Form 4	44.0	16.0	40.0

Table 4.3 indicates that the highest percentage of form 1s in schools in Igembe district have two streams. The schools with one stream of Form 1 followed closely with 42.1%. The

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highest percentage of form 2s in schools had one stream. Most Schools in the district had one stream of the form 3s. The 44% of schools had one stream of form 4s.

4.2.4. Qualification of Computer Teachers in Secondary Schools

Table 4.4: Qualification of Computer Teachers in Secondary Schools

Qualification	Frequency	Percent
Diploma	9	69.2
Degree	4	30.8
Total	13	100.0

Table 4.4 indicates the qualifications and competence of computer teachers in the schools in Igembe district. The table shows that diploma teachers are more with 69.2% as compared to 30.8% of teachers that have attained degree level of qualification. These statistics show that the computer teaching staff are appropriately trained and are therefore competent in computer teaching.

4.2.5 Number of Schools with computers

Table 4.5: Number of Schools with computers

Number of computers	Frequency (schools)	Total number of Computers	Percent
1	3	3	7.9
4	1	4	2.6
10	2	20	5.3
12	2	24	5.3
20	4	80	10.5
24	1	24	2.6
25	2	50	5.3
Total	15	205	39.5
Schools without computer	23		60.5
Total	38		100.0

Table 4.5 shows that 15 schools out of the 38 schools that participated in the study had acquired computers for their schools. 7.9% of the schools had only one computer in their schools, 10.5% had acquired twenty computers, and 5.3% had acquired twenty five

computers. In total there are only 205 computers in the fifteen schools of Igembe district, which constitutes the 39.5% of all schools. Also the table shows that 60.5% of the schools in the district have not yet acquired any computer.

4.2.6   Adequacy of computers in Schools

Table 4.6: Adequacy of computers in Schools

Computers	Frequency	Percent
Adequate	5	13.2
Not Adequate	33	86.8
Total	38	100.0

Table 4.6 shows that only a small percentage of Secondary schools, constituting 5%, are satisfied with the level of computers available in their schools for teaching. The other 86.2% said that the number of computers available for teaching was inadequate.

Table 4.7: Schools planning to buy computers for teaching

Schools	Frequency	Percent
Planning	26	68.4
Not planning	12	31.6
Total	38	100.0

Table 4.7 shows that despite the fact that very many schools are not satisfied with the amount of computers in their schools, just a few of them have a plan to acquire computers. The percentage number of schools planning to acquire computers constitutes 68.4%, while 31.6% of the schools did not have any explicit plan to acquire computers.

4.3 The Extent of ICTs implementation

To establish the extent to which ICTs have been implemented in Igembe secondary schools, specific questions were posed to the respondents. The extent of implementation was inferred from the applications that the various ICTs are being put into. Nevertheless, the kinds of ICTs available in the schools are also good pointers of the extent of implementation of ICTs in schools.

4.3.1 Number of Schools offering computer courses

Table 4.8: Are there Students taking computer courses in the schools

Students	Frequency	Percent
Taking	10	26.3
Not taking	28	73.7
Total	38	100.0

Table 4.8 indicates that only 26.3% of schools out of the thirty eight that participated in this study had introduced computer courses in their schools. 73.7% of the schools had not.

Table 4.9: How the computer course is executed

Valid	Frequency	Percent
Compulsory for all students	6	15.8
Optional	3	7.9
Total	9	23.7
Missing	29	76.3
Total	38	100.0

Table 4.9 indicates that out of the ten schools that had introduced computer courses in their schools, 9 have responded to this portion of the questionnaire. 66.7% of the schools that responded stated that the course was compulsory for all the students while 33.3% of the schools said that the course was optional. Generally, in Igembe district the computer course is compulsory for students in Form 1 and 2 and it was made optional for the students in Form 3 and Form 4 who intend to sit for Kenya Certificate of Secondary Education (KCSE) examination in the computer course.

4.3.2. Internet connectivity

The researcher found out that there was no Internet connection in schools in Igembe District.

Table 4.10: Reasons contributing to the lack of Internet connectivity in the schools

Reason	Mean	Std. Deviation	Factors
Cost of connection	4.03	1.2625	1
Adequate Computers	3.63	1.7618	2
Technical Support	3.32	1.3970	3
Electricity	3.00	1.9728	4
Telecom Lines	3.16	1.6362	5
Clear ICT policy	3.11	1.5385	6
ICT Software Vendors	2.87	1.4918	7
ICT Equipment Vendors	2.82	1.4114	8
Internet know-how	2.95	1.6266	9

Table 4.10 is based on Friedman rank test which assigns weight based on the degree of importance of factors (i.e. most important to least important). Table 4.10 shows the reasons that contribute to lack of Internet connection in secondary schools. Using the mean scores the table indicates factors 1 to 4 as the most important, factors 5 and 6 as the averagely important and factors 7 to 9 as the least important. Thus factors 1 to 4 emerge as the crucial factors to be considered in ensuring Internet connection in Igembe secondary schools.

4.3.3 ICT Media other than computers and Internet

Table 4.11: ICT Media other than computers and Internet used in schools

ICT Media	Frequency (Amount)	Percentage
Radio	29	28.7
TV	20	19.8
Video	20	19.8
Newspapers	32	31.7
Total responses	**101**	**100.0**

Other ICT Media as specified by the users

The study specified the most common ICTs that are used in schools as shown in table 4.11. But some schools had other ICTs that the respondents felt needed to be included in the list these are:

a) Mobile phones
b) Scanners
c) Home theatres
d) Printers
e) Type writers and duplicating machine

Table 4.11 shows the ICT media used in Igembe Secondary schools other than the computers and the Internet connection services. The table shows total number of ICT media available in schools in Igembe district. Newspapers have high level of usage with 31.7%, radios follow with 28.7%, and the least used media are television sets and videos that have 19.8% of usage, each. Table 4.11 also shows other ICT media that individual respondents considered important for their school, these are, cell phones, scanners, printers, type writers, home theatres and duplicating machines.

4.3.4 The extent of ICTs implementation in Secondary Schools

Table 4.12: The Extent of ICTs Implementation

ICT Application	Mean	Std. Deviation	Application
Mailing and chatting with Peers & friends	2.89	1.3313	1
Leisure and/or Entertainment	2.84	1.2846	2
Office Work	2.50	1.0843	3
Students' Information Search	1.97	0.7880	4
Staff Records and Pay Roll management	1.74	1.1551	5
Teachers Research and study	1.53	0.9792	6
E-Learning (For Teaching)	1.37	0.7136	7
Website to sell the school to the Public	1.29	0.8353	8
Administration of On-Line Examinations	1.13	0.4748	9

Table 4.12 indicates the levels of usage or applications of the ICT media in secondary schools in Igembe district. Table 4.12 is based on Friedman rank test, which assigns weights based on the degree of importance of the factors (i.e. most important to least important), the most important factor being ranked the first.

Using the mean scores the table ranked applications 1 to 4 as the most common and thus important, application 5 to 7 as the averagely important, while applications 8 and 9 were not achievable by schools because they could not be appropriately supported by the ICTs available. Applications 8 and 9 required hefty investments in ICT equipment and Internet services which is not plausible for most of the schools currently. The researcher found out that ICTs implementation in Igembe secondary schools is still at a very low extent with low level ICT infrastructure and applications.

4.4   The factors Affecting ICT implementation in Secondary Schools.

4.4.1   Factor Analysis: Factors Summaries and Component Grouping

Factor analysis was performed on the results of the importance attached to each of the factors affecting the implementation of ICTs in Igembe Secondary schools. Initially, correlation analysis was run to check for interdependence among the factors after which Principal Component Analysis (PCA) was run. From the correlation matrix in Appendix V, the correlation coefficients are more close to one meaning that there is a relationship between the variables. The purpose of performing PCA was to transform a set of interrelated variables into a set of unrelated linear combinations of these variables into a set of uncorrelated linear combinations. Varimax rotation together with Kaiser Criterion was used to classify and reduce the factors to interpretable components.

Table 4.13 represents the communalities for factors that affect the ICTs implementation in secondary schools. The communality is the squared multiple correlation coefficient for variables using the factors as predictors. The communality measures the percentage of variance in a given variable explained by all the factors jointly and can be interpreted as the reliability of the indicator. It is the proportion of variance that each item or variable has in common with other items. For instance, 92.3% of is the highest variability in the factor "Readily available Internet Service Providers"', while as the lowest variability was captured for the factor "Staff participation in Planning and implementation" with a communality of 67.5% .

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Table 4.13: Rescaled Communality

Factors	Initial	Extraction
Reliable Telecommunication links or Telephone lines	1.000	.700
Acquisition of Computer Hardware	1.000	.881
Acquisition of Computer Software	1.000	.910
Subscription to relevant sites	1.000	.768
Availability of appropriate ICT Media (e.g. Internet, Mobile phones)	1.000	.706
Availability of an elaborate ICT Curriculum	1.000	.778
Formulation of Appropriate ICT Policy	1.000	.797
Availability of adequate Class room space	1.000	.826
Government Funding to acquire ICT Equipment	1.000	.802
Involvement of NGOs in ICT implementation	1.000	.738
Staff participation in Planning and implementation	1.000	.675
ICT Equipment Vendors' and Consultants' advice and their availability	1.000	.780
Security and Safety around and within the School	1.000	.730
Competent ICT Staff (e.g. Teachers, Support staff)	1.000	.845
Funds availability for ICTs implementation	1.000	.737
Availability of Uninterrupted Electricity supply	1.000	.698
Alternative Power supply (e.g. Generators)	1.000	.850
The Ministry of Education's Support	1.000	.868
The School Administration's Support	1.000	.839
Students' interest and Motivation	1.000	.906
Teachers' Motivation and regular training	1.000	.799
Readily available Internet Service Providers'	1.000	.923
Sufficient Bandwidth for Adequate Internet services	1.000	.894
Proper Road Networks to the School	1.000	.783
Sieving strategies against insecure sites and immoral materials on the Internet	1.000	.824
Proper policies to protect Intellectual Rights	1.000	.742
Literacy of the neighbouring community	1.000	.819
Relative wealth of the neighbouring community	1.000	.882

Table 4.14 indicates the total variance explained by each component (factor). A total of 9 components were extracted from the factors. The components are orthogonal to one another, meaning they are uncorrelated. For a component to account for at least one variable, it should have an Eigen value (the sum of squares of its factor loadings) of at least one. This is the cut off point for determining the number of components to be extracted with maximum or near maximum loadings. Component 1 explains the highest observed variance followed by component 2 and so on. From the table, component 1 accounts for 25.685% of the total observed variability while component 2 explains 11.453%, component three 9.4%, component four 8.161%, component five 6.31%, component six 5.412%, component seven 5.366%, component eight 4.542%, and component nine 4.037%. The nine extracted components explain 80.366% of the total variability for all the 28 variables.

Table 4.14: Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.192	25.685	25.685	7.192	25.685	25.685	3.938	14.064	14.064
2	3.207	11.453	37.138	3.207	11.453	37.138	3.405	12.162	26.226
3	2.632	9.400	46.538	2.632	9.400	46.538	2.562	9.149	35.375
4	2.285	8.161	54.698	2.285	8.161	54.698	2.477	8.847	44.222
5	1.767	6.310	61.008	1.767	6.310	61.008	2.254	8.050	52.273
6	1.515	5.412	66.421	1.515	5.412	66.421	2.240	8.000	60.273
7	1.502	5.366	71.787	1.502	5.366	71.787	2.029	7.246	67.518
8	1.272	4.542	76.329	1.272	4.542	76.329	1.864	6.657	74.175
9	1.130	4.037	80.366	1.130	4.037	80.366	1.733	6.191	80.366
10	.824	2.944	83.310						
11	.781	2.789	86.099						
12	.665	2.376	88.475						
13	.537	1.917	90.392						
14	.463	1.653	92.045						
15	.389	1.390	93.435						
16	.371	1.327	94.762						

	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
17	.306	1.093	95.855						
18	.275	.982	96.837						
19	.214	.765	97.602						
20	.165	.590	98.192						
21	.145	.519	98.711						
22	.127	.454	99.165						
23	.087	.310	99.475						
24	.066	.235	99.710						
25	.033	.117	99.827						
26	.021	.073	99.901						
27	.017	.059	99.960						
28	.011	.040	100.000						

Table 4.15 presents the rotated component matrix that was used to extract independent variables highly related to particular components. Orthogonal Varimax rotation together with the Kaiser Normalization was used to force the entries in the initial factor to be near 0 or 1. Such loadings show more clearly which variables go together and thus easily interpretable. The final matrix represents both a pattern and a structure matrix. The coefficients in the rotated matrix indicate both the correlation coefficient and the regression weights.

Table 4.15: Rotated Component Matrix (a)

Factors	Component								
	1	2	3	4	5	6	7	8	9
Reliable Telecommunication links	-.090	-.183	-.012	.126	-.106	.108	-.316	.661	.286
Acquisition of Computer Hardware	.892	.143	-.013	.184	.126	.032	.075	-.016	-.091
Acquisition of Computer Software	.896	.052	-.050	.115	.107	.120	.045	.071	-.234
Subscription to relevant sites	-.014	.624	-.215	.528	-.115	.147	.059	.091	-.085
Availability of appropriate ICT Media	-.123	.032	-.014	.113	.176	-.036	-.090	.043	.797

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Factors	Component								
	1	2	3	4	5	6	7	8	9
Availability of an elaborate ICT Curriculum	.425	.189	.130	.591	-.131	.371	.079	-.149	.112
Formulation of Appropriate ICT Policy	.615	.118	.321	-.030	-.447	.180	.126	.058	.222
Availability of adequate Class room space	.375	.271	.153	.123	-.083	-.015	.053	.668	-.344
Government Funding to acquire ICT Equipment	.152	.116	.027	.098	-.057	.852	.017	.135	.091
Involvement of NGOs in ICT implementation	.268	.053	.394	.703	.064	.082	.031	-.047	.012
Staff participation in Planning and implementation	-.039	.204	.099	.605	-.047	.083	.178	.240	.398
ICT Equipment Vendors' and Consultants' availability	-.021	.332	-.004	.145	-.066	.260	.758	.008	-.035
Security and Safety around and within the School	.204	.085	.275	.142	.203	-.063	.657	-.084	-.320
Competent ICT Staff	.427	-.127	-.179	.463	-.261	.429	.264	.248	-.130
Funds availability for ICTs implementation	.713	-.089	.300	.028	-.009	.198	.020	.286	.090
Availability of Uninterrupted Electricity supply	.521	.126	.391	.173	-.142	-.102	.311	.089	-.304
Alternative Power supply	.282	.168	.037	-.255	.189	.405	.192	.644	.158
The Ministry of Education's Support	.199	.090	.400	.305	.131	.699	-.047	.095	-.224
The School Administration's Support	.090	-.062	.833	.270	.103	.097	.017	.098	-.174
Students' interest and Motivation	.086	-.022	.916	-.030	.070	.053	.174	.010	.143
Teachers' Motivation and regular training	.143	.334	.145	.419	.196	.092	.334	.449	-.331
Readily available Internet Service Providers'	.164	.884	-.019	.059	-.141	.217	.192	.002	-.080
Sufficient Bandwidth for Adequate Internet services	.469	.671	.287	-.261	-.104	.036	.196	-.150	-.035
Proper Road Networks to the School	.230	-.202	.145	-.039	.166	-.427	.626	.005	.255
Sieving against insecure sites and immoral materials on the Internet	-.054	.852	-.077	.195	-.077	.042	-.051	.155	.129
Proper policies to protect Intellectual Rights	.023	.597	.101	.022	.579	-.173	.085	-.044	.014
Literacy of the neighbouring community	-.157	-.326	.102	-.268	.747	.182	-.013	.122	-.003
Relative wealth of the neighbouring community	.180	-.077	.084	.102	.860	-.076	.144	-.076	.231

Factor selection

Table 4.15 shows the rotated component matrix of all the factors that affect ICTs implementation in Igembe District secondary schools. The rotated matrix indicates both the correlation coefficient and the regression weights. Components 1 to 9 in Table 4.15 respectively represent the factors that affect implementation of ICTs in secondary schools. The variables extracted under the nine factors are as follows:

Component 1(Acquisition of ICT resources and their support) consists of acquisition of computer hardware and software, funds availability for ICTs implementation, availability of uninterrupted electricity supply, and formulation of appropriate ICT policy

Component 2 (Internet services accessibility and strategies) consists of subscription to the relevant sites, readily available Internet service providers, sieving strategies against insecure sites and immoral materials on the Internet, sufficient bandwidth for adequate Internet services, and proper policies to protect Intellectual rights. Component 3 (Human attitude and social forces) consists of the school administration's support, and students' interest and motivation.

Components 4 (Collective participation) consists of involvement of NGOs, and staff participation in planning and implementation. Component 5 (The schools' external environment) consists of literacy of the neighbouring community, and relative wealth of the neighbouring community. Component 6 (The government's support) consists of government funding to acquire ICT equipment, and the ministry of education's support.

Component 7 (Supportive services) involves the ICT equipment vendors and consultants availability, security and safety around and within the school, and proper road networks to the school. Component 8 (ICT infrastructure) consists of reliable telecommunication links, availability of adequate class room space; and alternative power supply. Component 9 (ICT Media availability) involves the availability of the appropriate ICT media.

Table 4.16 shows a summary of the factor loading heavily to a particular. The factor loading heavily on a particular component should have the greatest corresponding value entry across all the nine components in the rotated component matrix. The first two components clearly indicate that the most important factors that affect the ICT implementation in secondary schools relate to acquisition of ICT resources and their support and Internet services accessibility and strategies.

Table 4.16: Summary of heavy loading components

Component	Initial Eigen values		
	Total	% of Variance	Cumulative %
1	7.192	25.685	25.685
2	3.207	11.453	37.138
3	2.632	9.400	46.538
4	2.285	8.161	54.698
5	1.767	6.310	61.008
6	1.515	5.412	66.421
7	1.502	5.366	71.787
8	1.272	4.542	76.329
9	1.130	4.037	80.366

4.4.2 The factors Affecting ICT implementation in Igembe Secondary schools.

Table 4.17: The Friedman's Factor Ranking.

Factors	Mean	Std. Dev.	Rank
1. Students' interest and Motivation	3.37	1.4411	1
2. Proper Road Networks to the School	3.50	1.4285	2
3. Reliable Telecommunication links	3.39	1.4054	3
4. Security and Safety around and within the School	3.16	1.1974	4
5. Relative wealth of the neighbouring community	3.08	0.9118	5
6. The School Administration's Support	3.00	1.3755	6
7. Literacy of the neighbouring community	3.00	1.0134	7
8. Availability of appropriate ICT Media	2.87	1.2980	8
9. Availability of adequate Class room space	2.58	1.3483	9
10. Staff participation in Planning and implementation	2.47	1.2463	10
11. Funds availability for ICTs implementation	2.45	1.4832	11
12. ICT Equipment Vendors' &Consultants' availability	2.32	1.2543	12
13. Availability of Uninterrupted Electricity supply	2.45	1.6878	13

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Factors	Mean	Std. Dev.	Rank
14. Involvement of NGOs in ICT implementation	2.37	1.5143	14
15. The Ministry of Education's Support	2.26	1.3087	15
16. Competent ICT Staff	2.18	1.4305	16
17. Alternative Power supply	2.34	1.6970	17
18. Teachers' Motivation and regular training	2.13	1.3788	18
19. Availability of an elaborate ICT Curriculum	2.11	1.3109	19
20. Government Funding to acquire ICT Equipment	2.00	1.2734	20
21. Formulation of Appropriate ICT Policy	2.05	1.2509	21
22. Acquisition of Computer Hardware	1.82	1.2489	22
23. Acquisition of Computer Software	1.76	1.1954	23
24. Sieving against insecure sites and immoral materials on the Internet	1.50	0.9515	24
25. Proper policies to protect Intellectual Rights	1.42	1.0301	25
26. Subscription to relevant sites	1.29	0.7679	26
27. Readily available Internet Service Providers'	1.24	0.5897	27
28. Sufficient Bandwidth for Adequate Internet services	1.13	0.4140	28

Table 4.17 is based on Friedman rank test which assigns weights based on the degree of importance of factors (i.e. most important to least important). Table 4.17 indicates the factors that influence and thus affect ICT implementation in secondary schools. In Igembe District, the several factors were given the greatest consideration when implementing ICTs in secondary schools. The factors that were identified and ranked as were, factors 1 to 15 as the most important factors that affect ICT implementation, factors 16 to 23 as averagely important, while factors 24 to 28 as of no consequence to secondary schools in Igembe district. Factors 24 to 28 reflected very low averages showing that they had no influence on the ICT implementation. This was because of the lack of Internet connection in the schools in Igembe District.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS.

5.1   Introduction

The objectives of this study were to: establish the extent of ICTs' Implementation, and to identify the factors that have greatly affected the implementation of the ICTs in Igembe district secondary schools. This chapter presents the summary, discussions and conclusions from the research findings as per the objectives of the study. Based on the findings of this study, recommendations have been given on the extent of ICTs' implementation and the factors that have affected the implementation of the ICTs in Igembe District secondary schools. The limitations of the study as well as suggestions for further research have also been discussed.

5.2   Summary, Discussions and Conclusions

Over half of the schools involved in the research in Igembe district were less than five years old. Provincial schools have higher enrolment of students as compared to the district schools and they also have more computers. Boarding schools have a higher enrolment than the day schools and thus they could afford more computers. Private schools did not have any computers as opposed to public schools which had a high number of computers. The boys' schools recorded higher numbers of computers than the girls' schools.

Diploma computer teachers in number are double the teachers with degree qualifications in Igembe secondary schools. Very negligible percentage of secondary schools was satisfied with the level of computers available in their schools. Few schools had an explicit plan to acquire computers in the near future.

The first objective sought to establish the extent of implementation of ICTs in Igembe district secondary schools. The study revealed that there are 205 computers in only fifteen schools in Igembe district, with over half of the schools not having any computer. Most of the schools in Igembe district had made computer studies compulsory especially at form one and two, and it was optional for upper classes. The study showed that there were no schools with internet connection because the cost of connection was high, and that computers, technical support, and electricity connection were lacking in most of the schools.

Computers, newspapers, radios, televisions and videos were the ICT media available in secondary schools in the district. The other ICT media being used in schools were cell phones, scanners, printers, type writers, home theatres and duplicating machines. The study

revealed that ICT media were applied majorly in mailing and chatting with peers, leisure and entertainment, office work, and students' information search.

The second objective was to identify the factors that affect implementation of the ICTs in Igembe district secondary schools. Results of factor analysis revealed that the most important factors were: acquisition of ICT resources and their support; Internet services accessibility and strategies; the human attitudes and social forces; schools' external environment; government's support; supportive services; ICT infrastructure; and; lastly the ICT media availability.

Friedman's ranking was used to identify the most important individual factors that influence and affect the ICT implementation in secondary schools in Igembe district. The factors were security and safety in the schools, relative wealth of the neighbouring community, the school administration support, literacy of the neighbouring community, availability of appropriate ICT media, availability of class room space, staff participation in planning and implementation, ministry of education support, ICT equipment vendors and consultants advice and availability, availability of uninterrupted electricity supply, involvement of NGOs in ICT implementation, and schools capability to fund ICT implementation.

In conclusion, the extent of ICT implementation in secondary schools in Igembe district is quite low, most of the ICTs being used in the district are the traditional communication media such as televisions, radios, and newspapers. These media were used for leisure and entertainment and in a very small way for information search. However, the cell phones were in great use by teachers and school administration for communication. Over 50% of the secondary schools in Igembe district had not yet acquired computers, thus there was no computer course offered in such schools.

Nevertheless, none of the schools in the district had internet connection. The schools require up-to-date technologies such as computers and Internet connection so as to fully exploit the benefits of e-learning. Also the government should improve the physical infrastructure such as road network, security and school buildings. This will enhance speedy ICT implementation in schools.

The factors affecting ICT implementation relates to financial, organizational, technical and social factors. For successful implementation of ICTs in schools funding was key, this calls for schools to collaborate with different financiers such as the parents, NGOs, and the government to obtain the funding needed to achieve acceptable levels of ICT implementation.

5.3   Recommendations

This study has revealed the extent of the ICTs implementation and the factors that affect ICTs implementation in Igembe district secondary schools. The extent of ICT usage in Igembe district was limited to the traditional ICTs such as radios, television sets, news papers and just a few computers. The researcher recommends that the schools invest in acquiring computers, networking those computers and obtain Internet connection so as to enable the schools benefit from the on-line facilities and resources.

Nevertheless, the study identified one of the major factors hindering implementation of ICTs in secondary schools to be lack of funds. The researcher recommends that the government and NGOs should develop an affirmative action geared towards automation and revolutionizing education systems by providing finances and other resources such as expertise to the schools.

5.4   Limitations of the Study

The study suffered from a few limitations, among these, the researcher spent a lot of time administering the questionnaires, because the concept being tested had to be explained fully to most of the respondents. Most of the secondary schools were remotely and sparsely located and thus required that the researcher travel for long distances. Some of those places did not have means of transport hence had to walk through hilly and rocky roads to the schools. Majority of the school principals were ignorant and naïve about the concepts being tested and thus insisted on remaining with the questionnaire forcing the researcher to make several trips to the schools. This made the study very costly in terms of time, effort and money.

5.5   Suggestions for Further Research

This study was conducted on rural secondary schools in Igembe District. As the study showed, over 50% of the schools were still in their initial development stages, huge chunks of their expenditures going to structural improvements, such as buildings and basic teaching materials. However, given some more few years these schools will have stabilized and will then be able to invest in technologies such as computers and internet, hence there is need for subsequent longitudinal researches to study the trends in ICTs implementation in secondary schools in the district.

Furthermore, ICT field is dynamic and therefore a research on the same area could be repeated after a period of say 5 years from now to benchmark the results. The study was

restricted to only one district and the population was relatively small, thus the study on ICT implementation in rural secondary schools can be repeated in other districts to enable proper generalization of the findings.

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APPENDICES

Appendix I: Letter of Introduction

University of Nairobi,
School of Business,
Department of Management Science,
P.O. Box 30197, Nairobi.

To Whom It May Concern:

Dear Respondent,

RE: Search for Research Data.

I am a postgraduate student undertaking a Master of Business Administration Degree at the School of Business, University of Nairobi. In partial fulfilment of the requirements for the award of the degree of Master of Business Administration, I am conducting a study on "The Factors Affecting The implementation of ICTs in Rural Secondary Schools. The Case of Igembe District". Your school has been selected to participate in this study.

For the purpose of completing my research, I have to collect data through the attached questionnaire. I shall be grateful if you kindly assist me by completing this questionnaire.

This information is purely for the purpose of my project and I pledge to you that it shall be treated with strict confidentiality. A copy of the final research report will be availed to you upon request.

Thank you for your cooperation.

Yours faithfully,

Mwenda Johnstone Gichuru
MBA Candidate

Appendix II: Questionnaire

General Information of the Secondary School

(Please provide appropriate responses in the spaces provided, either by **stating** or **ticking**)

1. Name of the School _____

2. How old is your school? Indicate your answer within the ranges provided.

< 05	[ ]
06-10	[ ]
11-15	[ ]
16-20	[ ]
21-25	[ ]
> 25	[ ]

3. Which of the following best describes your school (Please Tick)

    a) District   [ ]   Provincial   [ ]
    b) Public   [ ]   Private   [ ]
    c) Boarding   [ ]   Day   [ ]
    d) Girls   [ ]   Boys   [ ]   Mixed [ ]

4. What is the total number of students in your school? _____

5. Indicate the number of streams for each class (Tick one)

	None	1	2	3	Over 3
Form One	☐	☐	☐	☐	☐
Form Two	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
Form Three	☐	☐	☐	☐	☐

    Form Four

6. What is the Qualification and Number of your computer teacher(s)?

Qualification	How Many
Diploma [ ]	[ ]
Degree [ ]	[ ]

Others, Specify _____

7. Does your school have adequate computers for teaching?

Yes   [ ]   No   [ ]

Please give the number of computers _____

8. Is your school planning to buy computers for teaching purposes?

Yes   [ ]   No   [ ]

SECTION II

The Extent to which ICT has been implemented and thus capable of influencing the learning in the secondary school.

9. Are there students taking computer courses in your schools

Yes   [ ]   No   [ ]

10. How is the computer course executed, i.e. is it?

Compulsory for all students   [ ]

Optional   [ ]

If optional, how many students are currently taking the course? _____

11. Is the school connected to the Internet?   Yes   [ ]   No   [ ]

12. How reliable is your Internet service provider(s)?

Very reliable   [ ]

Reliable   [ ]

Uncertain   [ ]

Unreliable   [ ]

Very Unreliable   [ ]

13. If Yes to Q10, how frequent do your students or teachers use the internet?

        Never   [ ]

        Daily   [ ]

        Weekly   [ ]

        Monthly   [ ]

14. On a scale of 1 to 5, please rank the reasons indicated below, if they contribute to the lack of Internet connectivity in your school.

5 – A Very Good Reason,   **1 – Not a Reason at All**

Lack of	1	2	3	4	5
Adequate Computers	[ ]	[ ]	[ ]	[ ]	[ ]
Cost of connection	[ ]	[ ]	[ ]	[ ]	[ ]
Technical Support	[ ]	[ ]	[ ]	[ ]	[ ]
Telecom Lines	[ ]	[ ]	[ ]	[ ]	[ ]
Internet knowhow	[ ]	[ ]	[ ]	[ ]	[ ]
ICT Equipment Vendors	[ ]	[ ]	[ ]	[ ]	[ ]
ICT Software Vendors	[ ]	[ ]	[ ]	[ ]	[ ]
Clear ICT policy	[ ]	[ ]	[ ]	[ ]	[ ]
Electricity	[ ]	[ ]	[ ]	[ ]	[ ]

Other (Please specify)_____

_____

15. What other ICT media, other than computers and Internet does your school use?

	ICT Media	Number
Radio	[ ]	[ ]
TV	[ ]	[ ]
Video	[ ]	[ ]
Newspapers	[ ]	[ ]
Other	[ ]	[ ]

Other (Please Specify) _____

_____

16. Indicate how the activities listed below show the extent to which ICTs are being used in your school. On a scale of 1 to 5 where: 5 – Very Large Extent, 4 – Large Extent, 3 – Moderate Extent, 2 – Small Extent, 1 – No Extent at all

Activities Involving ICTs	1	2	3	4	5
Mailing and chatting with Peers and friends					
Administration of On-Line Exams and Assignments					
Leisure and/or Entertainment					
E-Learning (For Teaching)					
Students' Information Search					
Office Work (For Communication using VOIP, e-mails, Typing Memos)					
Teachers Research and study					
Staff Records and Pay Roll management					
Website to sell the school to the Public (Advertising)					
Others (Please Specify)_____					

The Factors Affecting ICT implementation in Secondary Schools

17. Indicate the extent to which factors listed below affect ICT implementation in your school. On a scale of 1 to 5 where: 5 – Very Large Extent,   4 – Large Extent,   3 – Moderate Extent,   2 – Small Extent,   1 – To No Extent

Factor(s) For ICT Implementation	1	2	3	4	5
Reliable Telecommunication links or Telephone lines					
Acquisition of Computer Hardware					
Acquisition of Computer Software					
Subscription to relevant sites					
Availability of appropriate ICT Media (e.g. Internet, Mobile phones)					
Availability of an elaborate ICT Curriculum					
Formulation of Appropriate ICT Policy					
Availability of adequate Class room space					
Government Funding to acquire ICT Equipment					
Involvement of NGOs in ICT implementation					
Staff participation in Planning and implementation					
ICT Equipment Vendors' and Consultants' advice and their availabilty					
Security and Safety around and within the School					
Competent ICT Staff (e.g. Teachers, Support staff)					
Funds availability for ICTs implementation					
Availability of Uninterrupted Electricity supply					

Alternative Power supply (e.g. Generators)					
The Ministry of Education's Support					
The School Admininistration's Support					
Students' interest and Motivation					
Teachers' Motivation and regular training					
Readily available Internet Service Providers'					
Sufficient Bandwidth for Adequate Internet services					
Proper Road Networks to the School					
Sieving strategies against insecure sites and immoral materials on the Internet					
Proper policies to protect Intellectual Rights					
Literacy of the neighbouring community					
Relative wealth of the neighbouring community					
If Others, Please specify_____					
_____					

Thank you very much for your cooperation.

God Bless you.

Appendix III: A List of Igembe District Secondary Schools

1. Maua Girls Secondary
2. Mutuati Secondary School
3. Thitha Secondary
4. Njia Boys Secondary
5. Kathanga Mixed Secondary
6. Nthare Secondary
7. Burieruri Boys Secondary
8. Igembe Boys Secondary
9. A/Kiongo Secondary school
10. Kangeta Girls Secondary
11. Karumaru Secondary
12. Kilimamungu Girls Secondary
13. St. Paul Secondary
14. Akirang'ondu Boys
15. Ntuene Secondary
16. Mariri Secondary
17. Ntunene Girls Secondary
18. St. Rita Amwamba Secondary
19. Antuambui Secondary
20. Kawiru Secondary
21. Thamare Mixed Secondary
22. K. K. Baithai Secondary
23. Auki Mixed Day Secondary
24. Kirindara Day Secondary
25. Nkanda Mixed Secondary
26. Naathu Secondary
27. Machungulu Secondary
28. Mfariji Secondary
29. Kathelwa Secondary
30. Kirindine Day Secondary
31. Nturuba Mixed Day
32. Kilalai Day Secondary
33. Gitura Day Secondary
34. Thimbili Day Secondary
35. Kaurine Day Secondary
36. Mwerongondu Day Secondary
37. Kangeta Mixed Secondary
38. Ambaru Mixed Secondary
39. Kiegoi Mixed Boarding Secondary
40. Athiru Gaiti Secondary

(Source: The Igembe District Education Office – August 2008.

Appendix IV: Correlation Matrix

1. Reliable Telecommunication links or Telephone lines   -   VAR01
2. Acquisition of Computer Hardware   -   VAR02
3. Acquisition of Computer Software   -   VAR03
4. Subscription to relevant sites   -   VAR04
5. Availability of appropriate ICT Media   -   VAR05
6. Availability of an elaborate ICT Curriculum   -   VAR06
7. Formulation of Appropriate ICT Policy   -   VAR07
8. Availability of adequate Class room space   -   VAR08
9. Government Funding to acquire ICT Equipment   -   VAR09
10. Involvement of NGOs in ICT implementation   -   VAR10
11. Staff participation in Planning and implementation   -   VAR11
12. ICT Equipment Vendors' and Consultants' availability   -   VAR12
13. Security and Safety around and within the School   -   VAR13
14. Competent ICT Staff   -   VAR14
15. Funds availability for ICTs implementation   -   VAR15
16. Availability of Uninterrupted Electricity supply   -   VAR16
17. Alternative Power supply (e.g. Generators)   -   VAR17
18. The Ministry of Education's Support   -   VAR18
19. The School Admininistration's Support   -   VAR19
20. Students' interest and Motivation   -   VAR20
21. Teachers' Motivation and regular training   -   VAR21
22. Readily available Internet Service Providers'   -   VAR22
23. Sufficient Bandwidth for Adequate Internet services   -   VAR23
24. Proper Road Networks to the School   -   VAR24
25. insecure sites and immoral materials on the Internet   -   VAR25
26. Proper policies to protect Intellectual Rights   -   VAR26

27. Literacy of the neighbouring community   -   VAR27

28. Relative wealth of the neighbouring community   -   VAR2

Correlation matrix

	VAR01	VAR02	VAR03	VAR04	VAR05	VAR06	VAR07	VAR08	VAR09
VAR01	1	-0.142	-0.12	0.042	0.281	0.036	0.065	0.176	0.181
VAR02	-0.142	1	0.929	0.226	-0.115	0.425	0.473	0.354	0.187
VAR03	-0.12	0.929	1	0.136	-0.264	0.413	0.424	0.473	0.249
VAR04	0.042	0.226	0.136	1	0.012	0.425	0.04	0.225	0.221
VAR05	0.281	-0.115	-0.264	0.012	1	0.008	-0.012	-0.28	0.016
VAR06	0.036	0.425	0.413	0.425	0.008	1	0.442	0.194	0.389
VAR07	0.065	0.473	0.424	0.04	-0.012	0.442	1	0.318	0.305
VAR08	0.176	0.354	0.473	0.225	-0.28	0.194	0.318	1	0.22
VAR09	0.181	0.187	0.249	0.221	0.016	0.389	0.305	0.22	1
VAR10	-0.019	0.308	0.318	0.278	0.012	0.62	0.303	0.25	0.168
VAR11	0.137	0.144	0.005	0.389	0.29	0.316	0.14	0.186	0.289
VAR12	-0.257	0.107	0.087	0.38	-0.123	0.324	0.179	0.129	0.169
VAR13	-0.311	0.381	0.329	0.096	-0.108	0.127	0.139	0.226	0.018
VAR15	0.138	0.428	0.485	0.295	-0.147	0.566	0.448	0.434	0.504
VAR16	0.095	0.586	0.61	-0.069	-0.067	0.378	0.526	0.408	0.243
VAR17	-0.065	0.463	0.456	0.189	-0.244	0.393	0.462	0.477	0.075
VAR18	0.259	0.247	0.321	0.109	0.095	0.081	0.271	0.443	0.4
VAR19	0.148	0.312	0.352	0.272	-0.138	0.519	0.255	0.294	0.649
VAR20	-0.028	0.205	0.164	-0.026	-0.061	0.24	0.22	0.291	0.123
VAR21	-0.034	0.099	0.068	-0.197	0.012	0.194	0.349	0.11	0.088
VAR22	0.042	0.344	0.331	0.423	-0.186	0.336	0.121	0.554	0.169
VAR23	-0.148	0.281	0.235	0.62	-0.099	0.421	0.276	0.367	0.324
VAR24	-0.324	0.466	0.392	0.217	-0.118	0.273	0.508	0.296	0.154
VAR25	-0.114	0.189	0.15	-0.209	0.036	0	0.106	0.028	-0.238
VAR26	0.01	0.08	0.059	0.61	0.098	0.282	0.091	0.337	0.223
VAR27	-0.211	0.146	0.017	0.252	0.103	-0.014	-0.06	0.092	-0.103
VAR28	0.095	-0.149	-0.067	-0.382	0.103	-0.285	-0.341	-0.119	0.021
VAR29	-0.109	0.203	0.142	-0.188	0.237	0.106	-0.193	-0.082	-0.047

	VAR10	VAR11	VAR12	VAR13	VAR14	VAR15	VAR16	VAR17	VAR18	VAR19
VAR01	-0.019	0.137	-0.257	-0.311	0.138	0.095	-0.065	0.259	0.148	-0.028
VAR02	0.308	0.144	0.107	0.381	0.428	0.586	0.463	0.247	0.312	0 205
VAR03	0.318	0 005	0.087	0.329	0.485	0.61	0 456	0.321	0.352	0.164
VAR04	0.278	0.389	0.38	0 096	0.295	-0.069	0.189	0.109	0.272	-0.026
VAR05	0.012	0.29	-0.123	-0.108	-0.147	-0.067	-0.244	0 095	-0.138	-0 061
VAR06	0.62	0.316	0.324	0.127	0.566	0.378	0.393	0 081	0.519	0.24
VAR07	0.303	0.14	0.179	0.139	0.448	0.526	0 462	0.271	0.255	0.22
VAR08	0.25	0.186	0.129	0.226	0.434	0.408	0.477	0.443	0.294	0.291
VAR09	0.168	0.289	0.169	0.018	0.504	0.243	0.075	0.4	0.649	0.123
VAR10	1	0.363	0.25	0.235	0.342	0.37	0.431	0.002	0.427	0.428
VAR11	0.363	1	0.23	0.075	0.344	0.175	-0.039	0.113	0.187	0.268
VAR12	0.25	0.23	1	0.398	0.298	0.169	0.263	0.291	0.179	0.047
VAR13	0.235	0.075	0.398	1	0.203	0.05	0.566	0.039	0.283	0.345
VAR15	0.342	0.344	0.298	0.203	1	0.355	0.368	0.263	0.421	0.137
VAR16	0.37	0.175	0.169	0.05	0.355	1	0.458	0.517	0.383	0.344
VAR17	0.431	-0.039	0.263	0.566	0.368	0.458	1	0 143	0.3	0.384
VAR18	0.002	0.113	0.291	0.039	0.263	0.517	0.143	1	0.323	0.081
VAR19	0.427	0.187	0.179	0.283	0.421	0.383	0.3	0.323	1	0.541
VAR20	0.428	0.268	0.047	0.345	0.137	0.344	0.384	0.081	0.541	1
VAR21	0.394	0.156	0.128	0.31	-0.139	0.351	0.342	0.179	0.363	0.723
VAR22	0.377	0.372	0 444	0.462	0.398	0.288	0.381	0.361	0.415	0.371
VAR23	0.112	0.248	0.481	0.252	0.171	0.061	0.298	0.214	0.267	-0.033
VAR24	0.05	0.033	0.282	0.339	0.049	0.298	0.455	0.203	0.184	0.19
VAR25	0.05	0.091	0.181	0.411	-0.033	0.083	0.252	0.028	-0.231	0.069
VAR26	0.206	0.319	0.294	-0.071	-0.01	-0.124	0.008	0.192	0.087	-0.124
VAR27	0.123	0.114	0.208	0.251	-0.182	-0.038	0.137	0.132	0.056	0.095
VAR28	-0.088	-0.235	-0.149	0.045	-0.224	-0.054	-0.237	0.22	0.061	0.097
VAR29	0.194	0.085	0.001	0.211	-0.156	0.153	0.029	0.139	0.095	0.129

	VAR20	VAR21	VAR22	VAR23	VAR24	VAR25	VAR26	VAR27	VAR28
VAR01	-0.034	0.042	-0.148	-0.324	-0.114	0.01	-0.211	0.095	-0.109
VAR02	0.099	0.344	0.281	0.466	0.189	0.08	0.146	-0.149	0.203
VAR03	0.068	0.331	0.235	0.392	0.15	0.059	0.017	-0.067	0.142
VAR04	-0.197	0.423	0.62	0.217	-0.209	0.61	0.252	-0.382	-0.188
VAR05	0.012	-0.186	-0.099	-0.118	0.036	0.098	0.103	0.103	0.237
VAR06	0.194	0.336	0.421	0.273	0	0.282	-0.014	-0.285	0.106
VAR07	0.349	0.121	0.276	0.508	0.106	0.091	-0.06	-0.341	-0.193
VAR08	0.11	0.554	0.367	0.296	0.028	0.337	0.092	-0.119	-0.082
VAR09	0.088	0.169	0.324	0.154	-0.238	0.223	-0.103	0 021	-0.047
VAR10	0.394	0.377	0.112	0.05	0.05	0.206	0.123	-0.088	0.194
VAR11	0.156	0.372	0.248	0.033	0.091	0.319	0.114	-0.235	0.085
VAR12	0.128	0.444	0.481	0.282	0.181	0.294	0.208	-0.149	0.001
VAR13	0.31	0.462	0.252	0.339	0.411	-0.071	0.251	0.045	0.211
VAR14	-0.139	0.398	0.171	0.049	-0.033	-0.01	-0.182	-0.224	-0.156
VAR15	0.351	0.288	0.061	0.298	0.083	-0.124	-0.038	-0.054	0.153
VAR16	0.342	0.381	0.298	0.455	0.252	0.008	0.137	-0.237	0.029
VAR17	0.179	0.361	0.214	0.203	0.028	0.192	0.132	0.22	0.139
VAR18	0.363	0.415	0.267	0.184	-0.231	0.087	0.056	0.061	0.095
VAR19	0.723	0.371	-0.033	0.19	0.069	-0.124	0.095	0.097	0.129
VAR20	1	0.152	-0.01	0.279	0.341	-0.02	0.075	0.185	0.183
VAR21	0.152	1	0.426	0.253	0.034	0.319	0.283	-0.039	0.163
VAR22	-0.01	0.426	1	0.754	-0.144	0.747	0.365	-0.362	-0 136
VAR23	0.279	0.253	0.754	1	0.114	0.377	0.374	-0.258	-0.028
VAR24	0.341	0.034	-0.144	0.114	1	-0.149	0.073	0.093	0.425
VAR25	-0.02	0.319	0.747	0.377	-0.149	1	0.358	-0.336	-0.109
VAR26	0.075	0.283	0.365	0.374	0.073	0.358	1	0.155	0.482
VAR27	0.185	-0.039	-0.362	-0.258	0.093	-0.336	0.155	1	0.556
VAR28	0.183	0.163	-0.136	-0.028	0.425	-0.109	0.482	0.556	1