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*SCHOOL OF COMPUTING AND INFORMATICS*

DATA SHARING AMONG SELECTED GOVERNMENT INSTITUTIONS IN KENYA

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A research project submitted in partial fulfilment of the requirements of Masters of Science in  
Information Systems of the University of Nairobi

## **Declaration**

I do hereby declare that this research project is my original work and to the best of my knowledge has not been presented for an award a degree in any institution of higher education.

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

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## **Dedication**

This research study is dedicated to my family Caroline, Joel, Ben, Julius, and Sam. Not to forget my sisters' Linah, Sarah, Salina, Jepkoech, Jesang, and friends for their kind love and moral support and encouragement.

## **Acknowledgement**

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## **Abstract**

This research study aims at assessing the strategies put in place to encourage or enable data sharing among government institutions in Kenya a; establish the existence of data and information sharing and the factors affecting data/ information sharing among government institutions. Due to the emergence of new technologies and need for shared knowledge and information, this study is important to stimulate and improve data sharing among public institutions.

This is a survey study conducted on a target population of 50 selected government institutions in Kenya with offices in Nairobi City County. Hard copy and online survey questionnaire was administered to the selected institutions, out of which 29 responses were received. Data collected include, general information (demographics), frequency of data/information sharing and the factors affecting data sharing among public government institutions in Kenya. Data analysis was done using descriptive statistics using SPSS analytical software. The study determined that majority of the institutions do have data/information governance policy and guidelines and that most them have a defined data or information sharing strategy, with majority of them frequently use electronic mail, website / online portal, media and meetings as ways of data sharing. The study also determined that the most institutions frequently used tables(spreadsheets);text format (doc, pdf) and that they have infrastructure/ICT tools to manage data sharing; with most of the primary data sources being field data collection and regular updates from collaborating partner institutions. The major challenges to most institutions are due to lack of clear policy, standards, communication protocol, incompatibility (interoperability issues) and data security. Data Sharing occurs more frequently on request and obligation. It is recommended that public institutions should ensure that appropriate data/information governance, policy and guidelines are developed to provide a common framework for best practice in data sharing. Institutions are also recommended to cooperate and partner with one another to stimulate data sharing and that there is need to make sure that data in their possession is easily available to other public/government institutions by improving infrastructure and embrace new technologies such as e-government, KNSDI, and e-repositories. Moreover, capacity development is required to improve IT maturity levels for data and information sharing among government institutions.

# Table of contents

Declaration .....	i
Dedication .....	ii
Acknowledgement .....	iii
Abstract .....	iv
Table of contents .....	v
Abbreviations .....	viii
List of tables .....	ix
List of figures .....	x
CHAPTER ONE: INTRODUCTION .....	1
1.1 Background to the study.....	1
1.1.1 Benefits of Data Sharing:.....	2
1.1.2 Data sharing challenges .....	3
1.2 The Problem Statement.....	4
1.3 Research Questions .....	4
1.4 The objectives of the study .....	5
1.5 Significance of the study.....	5
CHAPTER TWO: LITERATURE REVIEW .....	6
2.1 Introduction.....	6
2.2 Data and information sharing theories .....	6
2.2.1 Theory of Information sharing .....	6
2.2.2 Interdependence theory .....	7
2.2.3 Information sharing framework model review .....	7
2.3 Legal Framework .....	8
2.4 Review of empirical studies related to data/information sharing .....	9
2.4.1 Information sharing among humanitarian organizations in Kenya .....	9
2.4.2 Credit sharing and Loan performance in commercial banks in Kenya .....	10
2.4.3 An evaluation of the role and contribution of Information Communication Technology (ICT) in Knowledge communication and sharing processes .....	11
2.4.4. Towards a conceptual health data model in support of Kenya's National Spatial Data Infrastructure (KNSDI) .....	12
2.5 Proposed Data Sharing Conceptual framework .....	13
2.6 Literature Review summary .....	14

CHAPTER THREE: RESEARCH METHODOLOGY .....	15
3.1: Introduction.....	15
3.2: Research Design and Locale .....	15
3.3: Data sources .....	15
3.4: Population of Study .....	15
3.5: Sampling and Sampling Technique .....	16
3.5.1 Piloting of the instruments .....	16
3.6: Data Collection Instruments and Method .....	18
CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION.....	19
4.1 Introduction.....	19
4.2 Data Processing and analysis .....	19
4.3 Coding of the Data .....	19
4.4 Respondents of the Survey study (Demographics) .....	20
4.4.1 Type of Government Institution.....	20
4.4.2: Age of Respondents .....	20
4.4.3: Experience of Respondents.....	21
4.4.4: Level of education.....	21
4.5 Hypotheses for testing.....	22
4.6 Data Sharing Strategies/Initiatives.....	23
4.6.1 Governance, Policy and Guidance, Cooperation and Partnerships.....	23
4.6.2 Data sharing support Infrastructure availability.....	23
4.7 Data Sources .....	24
4.8 Data sharing methods.....	24
4.9 Data storage and management strategies .....	25
4.10 Extent of Data sharing .....	26
4.10.1 Extent Data sharing methods .....	26
4.10.2 Extent of Data sharing in different formats .....	27
4.10.3 Extent of Data sharing with other types of institutions.....	28
4.11 Factors affecting Data sharing among Government institutions.....	29
4.11.1 Organizational leadership, governance and policies.....	29
4.11.2 Security and other related factors affecting data sharing among institutions.....	29
4.11.3 Data standards and Formats Challenges .....	30
4.12 Refined Data Sharing Conceptual Framework .....	32

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS .....	33
5.1 Introduction .....	33
5.2 Achievements.....	33
5.2.1 Existing plans and strategies (standards and policies) for sharing data by government institutions.....	33
5.2.2 Extent of data sharing among government institutions.....	33
5.2.3 Development of a framework for enabling data sharing among government institutions .....	34
5.3 Conclusion .....	34
5.4 Recommendation .....	35
5.5 Limitations of Study.....	35
5.6 Suggestions for further study .....	36
References .....	37
Appendix1. Questionnaire .....	39



## Abbreviations

KNBS	Kenya national Bureau of Statistics
NSDI	National Spatial Data Infrastructure
PSI	Public Sector Information
UN	United Nations
NGOs	Non-Governmental Organizations
KNSDI	Kenya National Spatial Data Infrastructure
ICT	Information Communication Technology
CRB	Credit reference bureaus
SPSS	Statistical Package for Social Sciences
PSI	Public Sector Information
IS	Information Sharing
UoN	University of Nairobi

## List of tables

Table3. 1: Sampling technique.....	16
Table3. 2: Questionnaire rating.....	17
Table4.1: Type of institution.....	20
Table4.2: Age group.....	20
Table4.3: Level of experience.....	21
Table4.4: Education level.....	21
Table4.5: Computation of $\chi^2$ .....	22
Table4.6: Governance, policy and guidance, cooperation and partnerships .....	23
Table4.7: Support Infrastructure Availability .....	23
Table4.8: Data Sources .....	24
Table4.9: Data sharing methods.....	24
Table4.10: Data storage and management initiatives.....	25
Table4.11: Mean values for the different initiatives used.....	25
Table4.12: Mean values for extent of data sharing methods used .....	26
Table4.13: Frequencies of sharing methods.....	26
Table4.14: Frequency of using different data formats .....	27
Table4.15: Frequency of data sharing among different types of institutions .....	28
Table4.16: Frequency of data sharing across types of institutions.....	28
Table4.17: Organizational leadership, governance and policy factors.....	29
Table4.18: Analysis of Security issues affecting data sharing .....	29
Table4.19: Challenges in terms of data standards and formats.....	30

## List of figures

Figure 1: Information sharing framework model review .....	8
Figure 2: Proposed Data sharing model .....	13
Figure 3: Bar chart showing frequencies of the use of different data formats .....	27
Figure 4: Bar chart showing security factors analysis.....	30
Figure 5: An analysis of challenges in terms of data standards and formats .....	31
Figure 6: Refined proposed conceptual framework for data sharing .....	32

# CHAPTER ONE: INTRODUCTION

## 1.1 Background to the study

Information sharing describes the exchange of data between various organizations, people and technologies. But according to Harlan Cleveland (1985) who described information as “sharable”, “Things” are exchanged, even after you give it away or sell it, you still possess it”. There are several types of data sharing: Data shared by individuals, data shared by institutions, Information shared between firmware/software (Such as the Internet Protocol (IP) addresses of available network nodes or the availability of disk space for the modern technologies such as cloud computing). The emergence of wide distributed networks, intranets, cross-platform interoperability, E-Government online services, and standardization of IP protocols has all facilitated the data and information sharing.

A Government Institution is an established organization or foundation, especially one dedicated to education, public service, or culture run by government. Government Institutions such as Commissions, Autonomous Bodies, Cultural Institutions, Welfare Fund Boards, Development Authorities, and Universities etc. are funded by the government of Kenya and share most of the public resources.

Data sharing is considered an important approach to increasing institutional efficiency and performance. With advances in information and communication technology, sharing information across government institutions has become more feasible. These coordination mechanisms usually enhance information exchange; they help avoid widespread duplication of efforts and ensure resources are used in the most efficient manner in institutions’ operations (Paul et al, 2012).

“In the public sector, government agencies are also aware of the importance of information sharing for addressing policy issues such as security issues (such as privacy and anti-terrorism), infrastructure data (such as utility data for planning purposes), demographic (population census data) and public health data. However, information sharing can be a complex task. Identifying factors that influence information sharing is critical (Tung-Mou, 2011).

Government institutions in Kenya have enormous and varied data and information pertaining to their functions and services they deliver. The institutions collect and store data/information for their independent use within each organization. The data and information possessed by these institutions are required by the public and thus need to share among each other and the Government. For example, the Kenya national Bureau of Statistics (KNBS) do collect crucial

census data every 10 years which is being utilized by several public institutions and other non-governmental organizations for planning in various sectors such as elections preparation by Electoral and Boundaries Commission (IEBC), humanitarian organizations, Ministry of Planning and development among others.

Strategies must be put in place to encourage and enable effective and secure sharing of information for planning and development across all public sectors in the country as they collaborate and partner together.

### **1.1.1 Benefits of Data Sharing:**

Sharing of data/information has a lot of benefits. Sharing of can be done in several ways such as depositing in a data repository/archive, submitting to a journal (Publishing), deposit in an institutional repository (such as the UoN repository), online via a project or institutional website or informally on a peer-to-peer basis.

There are various benefits to diverse groups of users which include the following:-

#### **To public and funders**

1. Production of high quality research with social value
2. Always balanced against risks to participants
3. Compliance with laws and regulations
4. Adoption of emerging norms – “open access” publishing
5. To be, and appear to be, open and accountable Funders
6. Make optimal use of publicly funded research
7. Avoid duplication of data collection

#### **To scholarly community**

1. Maintain professional standards of open inquiry
2. Maximize transparency where appropriate
3. Quality improvement from verification, replication and trustworthiness
4. Valuable resource in teaching, e.g., methodology
5. Promote innovation – unintended, new uses of data

### **To research participants**

1. Allow maximum use of their contributed data / information
2. Minimize data collection on the hard-to-reach
3. Enable participants' experiences to be understood as widely as ethically possible
4. Archiving provides long-term safe storage for data
5. Assists in implementing publishers' data retention policies
6. Increases visibility of scholarly work (e.g., data catalogue)
7. Open access journal articles cited 2-3 times more
8. Enable collaborations on closely related themes, and new topics
9. Establish links to next generation of researchers

#### **1.1.2 Data sharing challenges**

Data sharing has got challenges such as privacy violations, lack of cooperation among institutions, lack of quality control, limited data/information sharing infrastructure and lack of governance, guidance and policies which enable or encourage data/information sharing.

## **1.2 The Problem Statement**

Data sharing is considered an important approach to increasing organizational efficiency and performance. Identifying factors that influence information sharing is crucial. Currently there is a multiplicity of open data policies at various levels of government, whereas very little systematic and structured research has been done on the issues that are covered by data sharing strategies and their impact. With advances in information and communication technology, sharing data across institutions has become more feasible. In the public sector, government agencies are also aware of the importance of information sharing for addressing issues such as anti-terrorism, rising cost due to duplication of effort and public health. However, data sharing can be a complex task. Identifying factors that influence information sharing is critical (Tung-Mou, 2011). There is lack of adequate studies on data sharing strategies in Government.

Data sharing strategies are initiatives or plans which are put in place that enable or lead to ability to share data among government institutions. Some of the factors that encourage data and information include e-government strategy, KNSDI, digital villages' initiative, Network infrastructure, data centers and ICT policies and regulations among others.

## **1.3 Research Questions**

- i. What strategies and initiatives have been put in place by Government to stimulate or enable data sharing among government institutions such as policies, infrastructure among others?
- ii. Do the government institutions share data or information amongst themselves?
- iii. What are the factors that affect data sharing?

## **1.4 The objectives of the study**

The general aim of this study was to survey the existing strategies put in place to enable sharing of data and information among Government institutions.

**The specific objectives were:-**

- 1) To assess the existing plans and strategies (standards and policies) for sharing data by government institutions;
- 2) To investigate extent of data sharing among government institutions through various initiatives such as e-government and open source portals;
- 3) To make recommendations on the best practice and sharing framework needed for data and information sharing with security measures put in place.

## **1.5 Significance of the study**

The significance of this research shall contribute to knowledge base of the existing strategies in public institutions for data and information sharing which will aid the government and other development partners in planning for improvement and development of systems which stimulate and encourage data sharing among public institutions for efficiency, transparency, accountability and proper government resources utilization by reducing cost of production.

The findings and analysis of research results will assist in developing of policies, guidelines and to identify opportunities for data sharing. Furthermore, it will ensure best practices are followed in sharing data.



## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

In developing open data strategies and policies, government aim to encourage and guide the dissemination of government data and to benefit from its use. Currently there is a multiplicity of open data policies at various levels of government, whereas very little systematic and structured research has been done on the issues that are covered by open data policies, their intent and actual impact (Anneke et al, 2014).

Government institutions are mandated to provide services required by the government and the citizens. The institutions collect various types of data which is then processed or analyzed to get certain information needed by each institution. This information is then stored in private databases or published in the government gazette to be accessed by the public or other intended users. Whenever an institution requires certain data/information, it may go and carry out field data collection directly without checking other sources for existing data thus duplicating the effort and costly use of resources. This calls on the government to put strategies to encourage data sharing among its institutions to avoid misuse of public funds, lack of transparency and inefficiency in the public sector.

### **2.2 Data and information sharing theories**

#### **2.2.1 Theory of Information sharing**

Constant et al (1994) came up with a “theory of information sharing” which is based on social exchange theory by Kelley et al (1978). The aim of the Constant et al. information sharing theory is to comprehend the factors that enable or hinder information sharing in technologically advanced organizations. Information sharing is affected by rational self-interest as well as the social and organizational context (Jarvenpaa et al, 2000).

The “information sharing theory” supports the assessment of the factors that stimulate or encourage data sharing which can be applied to government institutions in Kenya.

While the reuse of Public Sector Information (PSI) can generate important economic and social value, a series of ethical issues are emerging (Wang, 2013). This implies that information sharing

has benefits and disadvantages, for instance while sharing contribute in reducing cost by reusing available data/information, some issues emerge in terms of data security, privacy infringement and other ethical issues. Nevertheless, benefits of data/information sharing outweigh the negative impacts thus it should be encouraged among government institutions in Kenya.

### **2.2.2 Interdependence theory**

The interdependence theory is part of a larger scale of social exchange theories which looks at how people exchange rewards and costs in a relationship. Interdependence theory takes it another step further and demonstrates how these rewards and costs collaborate with peoples' expectations of interpersonal relationship. This theory comes from the idea that closeness is the key to all relationships; that people communicate to become closer to one another. This theory states that there are rewards and costs to any relationship and that people try to maximize the rewards while minimizing the costs. This therefore is crucial in data sharing which results in interdependence between institutions and brings about benefits (rewards) while reducing cost (Harold Kelley and John Thibaut, 1978).

### **2.2.3 Information sharing framework model review**

According to Macao 2012, Center for Electronic Governance developed a concept for data sharing with the following dimensions:-

Vertical - areas	horizontal – Maturity stages
1. Technological	1. Experience-sharing
2. Organizational	2. Infrastructure support
3. Inter-organizational	3. Information strategies
4. Environmental	

At the intersection of both perspectives (areas and stages), we have the relevant information sharing concepts (Macao, 2012) as shown in figure 1.

HORIZONTAL DIMENSION – MATURITY STAGES				
SHARING EXPERIENCE	the concepts that should be considered in early stages of government IS, serving to lay the foundations for government IS			
INFRASTRUCTURE SUPPORT	concepts referring to the shared components accessible to the whole public administration, like infrastructure components, IS facilitation and promotion, etc.			
INFORMATION STRATEGY	concepts defining the information sharing environment			
	concepts	MATURITY STAGES		
		1 - Experience Sharing	2 - Infrastructure Support	3 - Information Strategy
DIMENSIONS	Environmental	benefits risks	laws regulations	strategy engagement
	Inter-Organizational	scope	partnerships trust	governance community
	Organizational	roles	processes people	capacity-building function
	Technological	unit data component	standards attributes	repositories ontologies

Figure 1: Information sharing framework model review

### 2.3 Legal Framework

The constitution of Kenya also spells out the right to access to information thus enable data/information sharing among Government institutions

There are laws and regulations in Kenya’s constitution which govern sharing of data and/or information especially those that are government and public owned. “Chapter 4 article 35.

(1) Every citizen has the right of access to—

(a) Information held by the State; and

(b) Information held by another person and required for the exercise or protection of any right or fundamental freedom.

(2) Every person has the right to the correction or deletion of untrue or misleading information that affects the person.

(3) The State shall publish and publicize any important information affecting the nation.” (The Constitution of Kenya, 2010). This enable sharing of data/information in a regulated manner.

## **2.4 Review of empirical studies related to data/information sharing**

### **2.4.1 Information sharing among humanitarian organizations in Kenya**

According to a study done by M'muthuiba (2013) on information sharing among humanitarian organizations in Kenya, the study examined the extent of information sharing and establishing factors affecting information sharing among humanitarian organizations in Kenya. A factor analysis was applied to determine the relative importance of each of the factor with respect to information sharing. The study determined that majority of the organizations do have an information governance policy and guidelines in place and that most organizations have a defined data or information sharing strategy, with majority of them often or always using electronic mail, website / online portal and meetings as a means of information dissemination. Sharing of information to a greater extent occurs mostly upon request. The study determined that factors affecting information sharing among humanitarian organizations in Kenya can be grouped into 5 factors;

- i. Information governance, policy and guidance factors and collaboration and partnerships factors;
- ii. Information sharing systems factors and data standards & format factors;
- iii. Communication and dissemination factors;
- iv. Information security and sensitivity factors;
- v. Cultural factors.

The researcher recommended that organizations should ensure that appropriate information governance, policy and guidelines are developed to provide a framework to bring together all of the requirements, standards and best practice that apply to the handling of information. Organizations are also recommended to collaborate and partner with established networks or groups to promote organizational information sharing and that there is need for organizations to ensure that Information and data accessible to them is easily available to other humanitarian actors through establishing well-defined communication strategy and dissemination methods and data or information sharing strategies. This study centered on non-governmental organizations only and does not show what is happening in the government institutions thus need to assess the strategies put in place to encourage data sharing among public institutions in Kenya.

#### **2.4.2 Credit sharing and Loan performance in commercial banks in Kenya**

According to a study by Jeremiah, (2012) on relationship between credit sharing and loan performance in commercial banks in Kenya, banks work in collaboration with regulatory and other stake holders to increase access to credit through formal banking services in Kenya. The ideal underlying credit information sharing lies in “The best future predictor of behavior is the past behavior” (Miller, 2003).

According to this study, the researcher defined credit information sharing as a process where banks and other credit providers submit information about their borrowers to Credit Reference Bureau so that it can be shared with other credit borrowers. Credit reference bureaus are information brokers operating on the principle of reciprocity, collecting, filling and distributing information supplied voluntarily by its members (Jeremiah, 2012). His findings showed that credit information sharing among commercial banks is of great significance positively in loan performance. The government objective of launching credit referencing in Kenya commercial banks is one of the strategies put in place to stimulate data/information sharing thus the proposed research on other strategies which encourage data sharing among government institutions is inevitable.

### **2.4.3 An evaluation of the role and contribution of Information Communication Technology (ICT) in Knowledge communication and sharing processes**

According to a study undertaken by Ambia in 2012, the findings indicate that for information sharing to take place, there are factors which stimulate it. She concluded that ICT plays a major role among other social-economic and human factors.

The specific objectives were;

- 1) To establish the kind of information communication technology infrastructural tools available in selected organizations;
- 2) To establish the level of training, acceptance and use of information communication technology in these organizations; and,
- 3) To assess how the information communication technology infrastructural tools combine with the training, acceptance and use of information communication technology to affect knowledge communication and sharing in these organizations.

In general objective the study established that ICT plays a central role in knowledge communication and sharing in the selected organizations. For objective one, the findings show that the selected organizations have well established ICT infrastructural tools for knowledge sharing purposes. In relation to objective two, the findings indicate that majority of the workers are highly trained in different areas of ICT use and that their level of acceptance in ICT use was high. Findings on objective three indicate that the ICT infrastructural tools work in combination with training, acceptance and use of ICT to positively affect knowledge communication and sharing in the selected organizations. In objective four, the study established that the organizational structures in the selected organizations were formal top-down structures that did not encourage an open culture of knowledge communication and sharing.

The general conclusion of the study is that ICT have a positive role and contribution to knowledge communication and sharing in the selected Kenyan organizations. However, the study also established that social and human factors were intertwined with ICT factors in knowledge sharing processes and that these social and human factors were contributing to the knowledge communication and sharing processes as much as the ICT factors.” (Ambia, 2012).

#### **2.4.4. Towards a conceptual health data model in support of Kenya's National Spatial Data Infrastructure (KNSDI)**

According to research done by Maagi,(2012),Recent developments in interoperable systems and the need for harmonizing standards for data capture and exchange, as evident in Kenya's National Spatial Data Infrastructure (KNSDI)'s goal of promoting information sharing, offers opportunities for redeveloping data collection and storage systems. Key among these is the health data management systems. While other developed countries like South Africa are focusing on development of health data models to support seamless health data exchange and development of computerized information systems, Kenya is yet to develop one.

The ultimate goal is to illuminate the road towards implementing a comprehensive national spatio-temporal health information database functioning proactively in real time and capable of being integrated with other multi-agency datasets (Okiomeri, 2012).

This is one of the strategies the government put in place through KNSDI to enable standardization and sharing of geospatial data in Kenya but as per the results of his study, nothing much has been done to implement the initiative.

Recommendations on the development of the National Spatial Data Infrastructure (NSDI) in Nigeria and Kenya invite public organizations to harmonize spatial data sharing policies for the spatial data plays crucial role in national development. This provides justification for governments to investment and prioritizes the development of the infrastructure. However, the significance of the infrastructure can be realized through regular update of the geospatial data and availing the same to consumers through the decentralization of the services to ensure that the technology penetrates every aspect of society.

In this regard, the researcher analyzed the achievements made so far in the development and utility of NSDI in Nigeria and Kenya. This is based on the realization that in most of the African nations, the NSDI has been well conceived with national and various sub-committees inaugurated with donor support yet the incorporation of the infrastructure in the national strategic development policies is minimal (Oyugi et al, 2013). They raised the question of what ideally should constitute NSDI as the main objective as well as finding out to what extent the components of the NSDI has been implemented in Nigeria and Kenya. This study is relevant in bringing the factor of strategic policies in place which enable data and information sharing in general.

## 2.5 Proposed Data Sharing Conceptual framework

Based on the information sharing framework theory by Macao (2012), data sharing involves a critical analysis of data available and their sources together with the strategies and initiatives which enable data sharing such as infrastructure, policies and regulations and coming up with a common framework for data/information sharing which can be applied in Kenya government institutions.

The data sources are important for the availability of data/information for sharing. It's also crucial to have strategies that enable and encourage sharing of these data from different institutions. This will go a long way in enabling coordinated and systematic acquisition/collection, access, storage, use, management, and sharing of data and information among government institutions. Based on the empirical studies discussed on the review of theories and the Center for Electronic Governance information sharing framework<sup>1</sup>, this concept can be used as the basis for developing a framework for data sharing among public institutions in Kenya. This involves an assessment of strategies and data sources and analysis performed to develop a common framework for data sharing among government institutions in Kenya as we have proposed in the figure below.

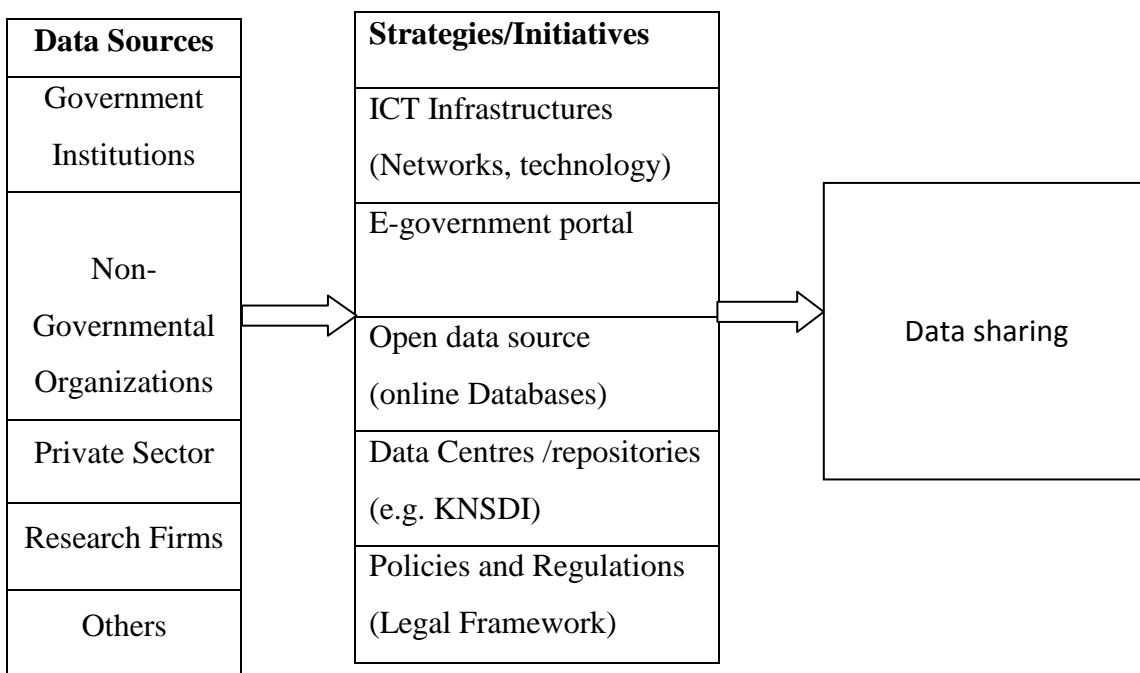


Figure 2: Proposed Data sharing model



## **2.6 Literature Review summary**

From the foregoing, it can be seen that there is need to fill the gap in knowledge through extending research to assess data/information sharing among government institutions and come up with a common strategy framework for successful, effective and secure information sharing. In the case of information sharing between humanitarian organizations, the gap is in the link with the government institutions and how they share data. As for the banks credit scenario, it shows that there is need to encourage data/information sharing among other government institutions due to the security, performance and mutual benefits resulting from sharing of data and information. For instance, the telecommunication companies and commercial banks can share crucial data with the government security agents so as to curb corruption and security issues such as crime and terrorism. Also the format and accuracy of data is crucial in sharing information among public institutions.

## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **3.1: Introduction**

This section presents information concerning research methodology which was adopted in the study for collecting data on strategies put in place to encourage information sharing among Government public institutions in Kenya. It consists of the research design, target population, sampling technique, data collection methods/instruments and data analysis methods to be carried out.

### **3.2: Research Design and Locale**

“A research design is thus the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure” (Kothari, 2004). This research study used descriptive survey design. According to Mugenda and Mugenda (2008) descriptive survey is most applicable for analyzing investigative scenario as it seeks to provide answers to the current subject being studied, by determining and reporting the way things are. The locality of the research was in Kenya’s government institutions most of which have their head offices in Nairobi City County.

### **3.3: Data sources**

The primary source of data was from a survey questionnaires administered online through and others by printed hardcopies delivered directly to the target audience. Other sources for this study were from documentary collections of information about the government institutions available in their websites and the government open data website, conference proceedings, and Reports.

### **3.4: Population of Study**

The population studied included selected government institutions providing public services in Kenya. These include all the 18 Government Ministries (and departments); 12 Independent Constitutional Commissions; and other government Parastatals/corporations providing related services as of 2014. Most of these institutions are based in Nairobi. The target audiences were the Public Relations/Communications personnel, Policy level management, information officers, technical personnel and other data users in the various government institutions.

### 3.5: Sampling and Sampling Technique

A selected population of the government institutions with related or complementary functions and have their head offices located in Nairobi was sampled. All the selected 50 government institutions was studied, this was to improve the degree of accuracy although the target population of study is large but according to Mugenda and Mugenda (2008), 30% of the target population could still be representative.

The researcher used stratified sampling method. The categories were;

1. Ministry
2. Commission
3. Parastatals/Corporation
4. Other agencies

The random samples selected from each category are as follows:

**Table3. 1: Sampling technique**

Category	Total number	Number randomly sampled
Ministry	18	12
Parastatal	20	11
Commission	12	3
Other agency	10	3
Total	50	29

#### 3.5.1 Piloting of the instruments

After obtaining an introductory letter from the university, the researcher conducted a pilot testing of the questionnaire in two selected government institution. These institutions were not included in the main study. The reason for piloting was to ensure that measurements are of acceptable reliability and validity.

**Reliability**-of measurements concerns the degree to which a particular measuring procedure gives equivalent results over a number of repeated trials. Orodho, 2009; 182).A pilot test was conducted after establishing the validity. Twenty respondents from two government institution were used in

the pilot testing to answer the questionnaires. Their responses were subjected to a Cronbach's Alpha Coefficient reliability test using the following formula:

$$\alpha = \frac{K}{K-1} \left( 1 - \frac{\sum SDt^2(1)}{SDt^2} \right)$$

Where  $\alpha$  = Reliability

$$\sum SDt^2 = \text{Sum of the variance of individual item in the questionnaire}$$

$SDt^2$  = Variance of the entire questionnaire

K = Number of the items in the questionnaire

The value of reliability  $\alpha$  was equal to 0.78 which indicated that the questionnaire was reliable.

**Validity-** The degree to which test measures what it purports to be measuring. Orodho, (2009; 187).

The procedure used to measure reliability by the researcher was the revision of the questionnaires. To establish the validity, the instruments (Appendix 1) were subjected to the scrutiny of three people who evaluated the relevance of each item in the instruments to the objectives. The experts rated each item on a scale. Their recommendations were used to finally modify questions. Once the questionnaires were designed and rated, the content validity index (CVI) was then computed as follows:-

$$CVI = \frac{\text{Agreed items by both judges as suitable}}{\text{Total number of items being judged}}$$

**Table3. 2: Questionnaire rating**

	Relevant items	Not relevant items	Total
First rater	69	11	80
Second rater	72	8	80
Third rater	70	10	80
	211	29	240

$$CVI = \frac{211}{240} = 0.879$$

The CVI value obtained of 0.879 showed that the questionnaires were valid.

### **3.6: Data Collection Instruments and Method**

The Primary data collection method was carried out using a survey questionnaire administered directly and also via electronic mail. The questionnaire was divided into three sections. Section 1 captured demographics; second Section captured the strategies in place for data sharing among the government institutions in Kenya while the last Section covered the factors affecting data sharing in terms of the data formats and security measures for data sharing among government institutions in Kenya. The other method was through internet search for information about the core functions of each institution from their websites and also government documentaries. The questionnaire was administered through both online survey questionnaire created using online surveymonkey questionnaire design application and also through direct delivery mode to individual respondent. The targeted respondents were the heads of department/directorates, Information Technology Management / ICT managers in all the selected government institutions.

## **CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION**

### **4.1 Introduction**

This research project data was acquired through a survey questionnaire designed using online tools at surveymonkey.com and administered to the target audience through email and also printed forms given directly to the respondents which included heads of institutions, directors, managers and public relations officers in the various government institutions among others.

This findings section begins by providing an overview of respondent characteristics. It then provides a detailed look at various data practice concepts addressed in the study – data sources, data practices, data management governance, guidance and policies, data sharing extent and, most importantly, data sharing by different government institutions.

### **4.2 Data Processing and analysis**

The research data was collected, cleaned, sorted and analyzed by the researcher. The various analyses which were done on the data collected included calculation of means, frequencies, standard deviation and percentages. The researcher scrutinized the questionnaires from the respondents and the field notes to check their completeness, accuracy and uniformity in the interpretation of the questions. To aid and speed up data analysis process, Statistical Package for the Social Sciences (SPSS version 20) was used to generate the main statistics including mean and standard deviations with aid interpretation analysis.

### **4.3 Coding of the Data**

The data collected and captured in the Microsoft excel worksheet was first of all imported to SPSS package. Each question was assigned a number that made a distinction of which section of the questionnaire it came from and answers were coded using numeric values; Yes was assigned value of 1 and No a value of 2. The questionnaire in this case had different sections covering different aspects that were being investigated in relation to the research objectives.

#### 4.4 Respondents of the Survey study (Demographics)

This section is where the institution's general information responses are analyzed.

This includes type of government institution, gender of respondents', age, academic profile, experience, and number of employees in the institution.

##### 4.4.1 Type of Government Institution

Table 4.4.1 below shows the various respondents. Those from the ministries and Parastatals were the majority representing 41.4% and 37.9%, commissions and other agencies represented 10.3% each.

**Table4.1: Type of institution**

	Frequency	Percent
Ministry	12	41.4%
Parastatal	11	37.9%
Commission	3	10.3%
Other agency	3	10.3%

##### 4.4.2: Age of Respondents

Table 4.2.2 shows the age group distribution of study respondents. As seen, majority of respondents (62.1%) are aged between 31-40 years while 10.3% are between 20- 30 years of age and 27.6% are between 41-50 years. The age group of 31-40 years is assumed to be the most productive periods for most employees as this is the time they are in higher ranks due to their high level of experience and knowledge in their respective career fields.

**Table4.2: Age group**

	Frequency	Percent
20-30 years	3	10.3%
31-40 years	18	62.1%
41-50 years	8	27.6%

#### 4.4.3: Experience of Respondents

Table 4.2.3 shows the level work experience of study. It shows that majority of respondents (48.3%) have between 5-10 years of work experience while 34.5% have over 10 years and 17.2% have between 1-5 years. This indicates that majority of data respondents in the studied institutions had good work experience, a confirmation that they are well informed about their institutions and have good understanding of the institutions data sharing strategies.

**Table4.3: Level of experience**

Age Group	Frequency	Percent
1-5 years	5	17.2%
5-10 years	14	48.3%
>10 years	10	34.5%

#### 4.4.4: Level of education

Table 4.2.4 below shows the academic profiles of study respondents. As seen, majority of respondents (62.1%) are graduates while post graduates are represented by 34.5% and only 3.4% hold Diploma certificates. Majority of data/information managers in government institutions that have responded in data sharing study have attained a university level of education. For this study, a graduate-level and above implies that the respondents are experts and have a good knowledge of data sharing.

**Table4.4: Education level**

Level of education	Frequency	Percent
Diploma	1	3.4%
Graduate	18	62.1%
Post graduate	10	34.5%



#### 4.5 Hypotheses for testing

The null hypothesis was stated as: “There is less or lack of adequate strategies put in place by government that encourages data sharing.” CHI square test was used to test this hypothesis and the results are as summarized below.

**Table4.5: Computation of  $\chi^2$**

$f_o$	$f_e$	$f_o - f_e$	$(f_o - f_e)^2$	$\frac{(f_o - f_e)^2}{f_e}$
25	21.9	3.1	9.61	0.439
29	28.1	0.9	0.81	0.029
10	8.4	0.6	0.36	0.038
25	25.0	0	0	0.000
10	15.6	-5.6	31.36	2.010
10	13.1	-3.1	9.61	0.733
15	16.9	-1.9	3.61	0.214
5	5.6	-0.6	0.36	0.064
15	15.0	0	0	0.000
15	9.4	5.6	31.36	3.336
Total	160			$\chi^2 = 5.863$

No of degrees of freedom= (r-1) (c-1) = (4-1) (2-1) =9

From the table of  $\chi^2$  distribution, critical values of  $\chi^2 = 9.488$  at 5% significance and critical value of  $\chi^2 = 13.277$  at 1% level of significance.

The computed value of  $\chi^2$  is less than the critical values of  $\chi^2$  at 5% and 1% levels of significance hence it is non-significant. The Null hypothesis cannot be rejected.

## 4.6 Data Sharing Strategies/Initiatives

### 4.6.1 Governance, Policy and Guidance, Cooperation and Partnerships

As presented on table 4.5.1.1 below, it indicated that the majority respondents showed that there is an information policy in place (96.6%). According to the responses received, 75.9% of the respondents acknowledge that their institutions do have agreements with other government institutions or partners to enable sharing of data/information.

**Table4.6: Governance, policy and guidance, cooperation and partnerships**

		Information policy existence (%)	Sharing agreement (%)	Sharing regulation in place (%)
	Yes	96.6	75.9	96.6
	No	3.4	24.1	3.4

### 4.6.2 Data sharing support Infrastructure availability

The researcher sort to assess the existence of data sharing support infrastructure in the government institutions studied. The findings indicated that about 100% of the institutions have computers and use corporate electronic mail.96.6% of the respondents have internet connection in place for communication and 93.1% have ICT data sharing tools such as servers as shown in the table 4.6 .2 below.

**Table4.7: Support Infrastructure Availability**

Support Infrastructure	Yes (%)	No (%)
computer's existence	100	0
Corporate e-mail	100	0
Internet connection	96.6	3.4
ICT data sharing Tools	93.1	6.9

#### 4.7 Data Sources

The sources of data identified showed that majority of the government institutions acquire data through field collection representing 89.7%, followed by direct request from other institutions and from E-government portals each representing 65.5% and the 34.5% use open data source.

This indicates that the institutions mostly acquire data from different sources depending on the need and availability.

**Table4.8: Data Sources**

		Field data source	Open data web source	E-government Portal source	Direct acquisition from institutions
	Yes (%)	89.7	34.5	65.5	65.5
	No (%)	10.3	65.5	34.5	34.5

#### 4.8 Data sharing methods

There are various methods of sharing data and information among government institutions. As indicated in the table below, most institutions have website which they use to share data (100%), followed by exchange through electronic mail (96.6%); media at 72.4% and less institutions use database servers (27.6%)

**Table4.9: Data sharing methods**

<b>Data sharing methods statistics</b>					
Data sharing methods		sharing through email	Sharing via media	Sharing through database servers	website sharing
	Yes (%)	96.6	72.4	27.6	100
	No (%)	3.4	27.6	72.4	0

#### 4.9 Data storage and management strategies

The respondents were asked to give their views on the initiatives started by the government if they are useful strategies in stimulating the sharing of data and information among government institutions. Majority of the respondents agreed with E-government initiative with a mean of 1.07 (93.1% saying yes); building of national data centers coming second with 86.2 % ;Open data and KNSDI initiatives followed at 65.5% each and others as indicated in the table 4.5.5.1 below.

**Table4.10: Data storage and management initiatives**

Existing Initiatives	Building of national data centers	KNSD initiative	E-government services	Compulsory SIM card registration	Open data initiative	Banks Credit info sharing
Yes (%)	86.2	65.5	93.1	55.2	65.5	31.0
No (%)	13.8	34.5	6.9	44.8	34.5	69.0

**Table4.11: Mean values for the different initiatives used**

	N	Minimum	Maximum	Mean	Std. Deviation
E-government services	29	1	2	1.07	.258
Building of national data centres	29	1	2	1.14	.351
KNSD initiative	29	1	2	1.34	.484
Open data websites	29	1	2	1.34	.484
Compulsory SIM registration	29	1	2	1.45	.506
Banks credit info sharing	29	1	2	1.69	.471

#### 4.10 Extent of Data sharing

##### 4.10.1 Extent Data sharing methods

There are various methods for sharing data/information with other institutions of which majority uses website platform (100%) followed by use electronic mail of (96.6%), media at 72.2% and the least being through conference and meetings as indicated in the table 4.6.1.2 below.

**Table4.12: Mean values for extent of data sharing methods used**

	N	Minimum	Maximum	Mean	Std. Deviation
Frequency via email	29	1	5	1.17	.759
Frequency via website	29	1	5	1.59	1.053
Frequency via print media	29	1	5	2.17	1.071
Frequency via social media	29	1	5	2.83	1.910
Frequency via conferences/meetings	29	1	5	2.97	.823

**Table4.13: Frequencies of sharing methods**

Sharing Method	Sharing Status	Frequency	Percent
Electronic mail	Yes	28	96.6%
	No	1	3.4%
Media	Yes	21	72.4%
	No	8	27.6%
Database Servers	Yes	8	27.6%
	No	21	72.4%
Website	Yes	29	100%
	No	0	0

#### 4.10.2 Extent of Data sharing in different formats

The study sort to assess the extent of using different data formats to share data. The findings were as indicated in the table 4.6.2.1 below. Majority of the respondents use excel, word and pdf formats on daily basis and update on web service daily and others monthly.

**Table4.14: Frequency of using different data formats**

	Frequency via table format		Frequency via database format		Frequency via text format		Frequency via web service		Frequency via GIS formats	
	Number	(%)	Number	(%)	Number	(%)	Number	(%)	Number	(%)
Daily	21	72.4	11	37.9	19	65.5	12	41.4	9	31.0
Weekly	3	10.3	4	13.8	4	13.8	1	3.4	1	3.4
Monthly	3	10.3	5	17.2	4	13.8	10	34.5	2	6.9
Yearly	2	6.9	4	13.8	1	3.4	3	10.3	2	6.9
Never	0	0.0	5	17.2	1	3.4	3	10.3	15	51.7

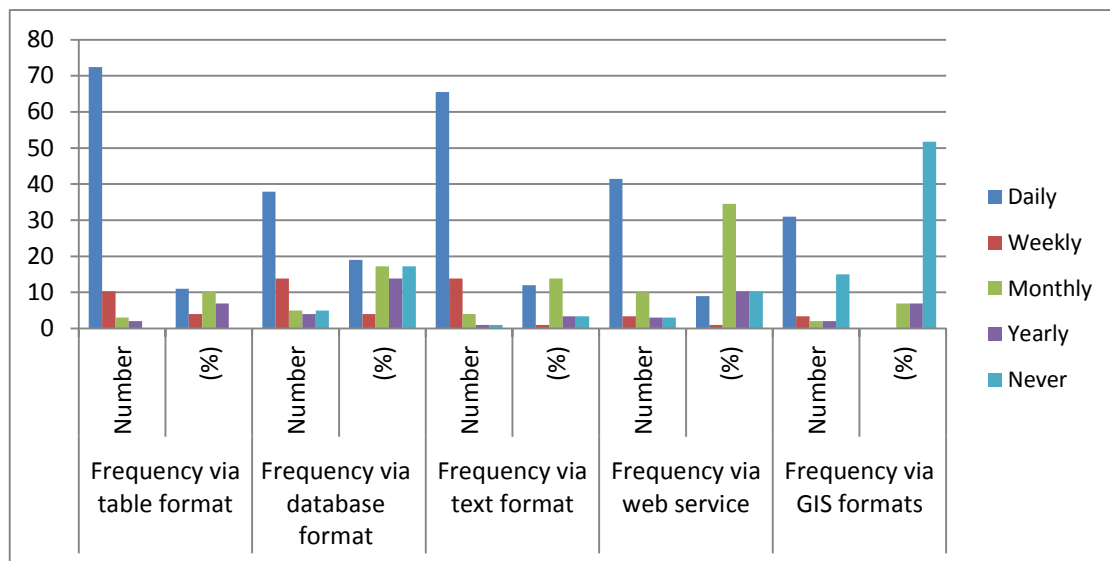


Figure 3: Bar Chart showing frequencies of the use of different data formats

#### 4.10.3 Extent of Data sharing with other types of institutions

The researcher asked respondents how frequently they share data and information with other types of institutions. The findings showed that majority share data with their parent ministries with a mean of 65.5%; followed by Parastatals/agencies at 48.3%; with media at 41.4%; commissions at 31% on a daily basis as indicated in the table 4.6.3 below where N represents the number of institutions.

**Table4.15: Frequency of data sharing among different types of institutions**

Extent	frequency with ministries		frequency with commissions		frequency with Parastatals/agencies		frequency with Public schools/universities		frequency with media	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
Daily	19	65.5	9	31.0	14	48.3	4	13.8	12	41.4
Weekly	6	20.7	1	3.4	11	37.9	0	0	1	3.4
Monthly	3	10.3	9	31.0	2	6.9	7	24.1	11	37.9
Yearly	1	10.3	6	20.7	2	6.9	10	34.5	2	6.9
Never	0	3.4	4	13.8	0	0	8	27.6	3	10.3
Total N	29	100	29	100	29	100	29	100	29	100

**Table4.16: Frequency of data sharing across types of institutions**

	ministry	%	Parastatals	%	Commissions	%	Other Agencies	%
ministry	11	91.7	10	83.3	10	83.3	10	83.3
Parastatals	11	100	11	100	8	72.7	6	54.5
Commissions	3	100	3	100	2	66.7	3	100
Other Agencies	3	100	3	100	1	33.3	3	100

The table above show the inter-relationship between different types of institutions as categorized in the table 4.6.3. 2. The frequency of sharing data/information among institution of same category is high. For instance, sharing between ministries is 91.7%, among Parastatals is 100% and among Commissions is 66.7%.This implies the institutions at same level or category depend on one another. Also it can be seen almost all other institutions do share data/information with ministries.

## 4.11 Factors affecting Data sharing among Government institutions

### 4.11.1 Organizational leadership, governance and policies

From the table 4.7.1.1 below most institutions' ability to share data/information with other government institutions are affected by communication protocols representing 82.8%, followed by established practices and procedures at 72.4%; leadership and management factors account for 41.5% whereas 34.5% thought that employees attitude might affect sharing of data. Other institutions had other factors which may affect data sharing such as lack of IT maturity in other institutions.

**Table4.17: Organizational leadership, governance and policy factors**

Response	Organizational leadership/ management factors		Employees attitude factor		Established practices and procedures		Communication protocol factor		Other factor	
	Number	(%)	Number	(%)	Number	(%)	Number	(%)	Number	(%)
Yes	12	41.5	10	34.5	21	72.4	24	82.8	3	10.3
No	17	58.6	19	65.5	8	27.6	5	17.2	26	89.7
Total	29	100	29	100	29	100	29	100	29	100

### 4.11.2 Security and other related factors affecting data sharing among institutions

As indicated in the table 4.7.2.1 below, 96.6% of the respondents agreed that confidentiality/sensitivity of data affect the sharing of data/information with 69% agreeing on information content. The relevance of data also affects sharing of data representing 58.6% while 44.8% agreed that data source do affect data sharing. However, majority of the government institutions (89.7%) responded that competition does not affect data sharing since most of their functions /services are unique.

**Table4.18: Analysis of Security issues affecting data sharing**

Response	Confidentiality /sensitivity		Information content		Data source factor		Competition		Relevance of data	
	Number	(%)	Number	(%)	Number	(%)	Number	(%)	Number	(%)
Yes	28	96.6	20	69.0	13	44.8	3	10.3	17	58.6
No	1	3.4	9	31.0	16	55.2	26	89.7	12	41.4
Total	29	100	29	100	29	100	29	100	29	100



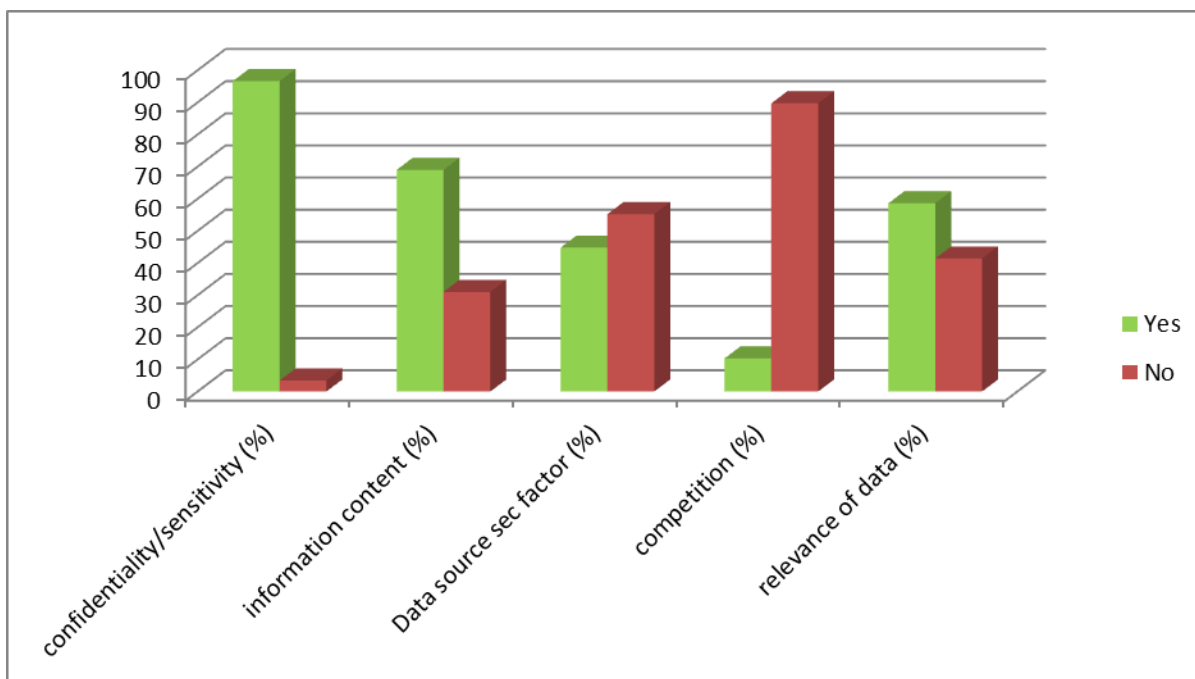


Figure 4: Bar chart showing security factors analysis

#### 4.11.3 Data standards and Formats Challenges

There are various challenges which affect data sharing in terms of data standards and formats. 65.5% of the respondents studied indicated that lack of common data standards is a challenge followed by incompatible formats (interoperability issue) representing 48.3%. Also lack of policy on standards/formats contribute to the challenges of sharing data of which 41.4% of the respondents agreed as shown in the table 4.7.3.1 and visualized in figure 10 below.

**Table 4.19: Challenges in terms of data standards and formats**

Response	Lack of standardized ICT tools		Lack of policy on standards/formats		Lack of common data standards		Incompatible formats	
	Number	(%)	Number	(%)	Number	(%)	Number	(%)
Yes	13	44.8	12	41.4	19	65.5	14	48.3
No	16	55.2	17	58.6	10	34.5	15	51.7

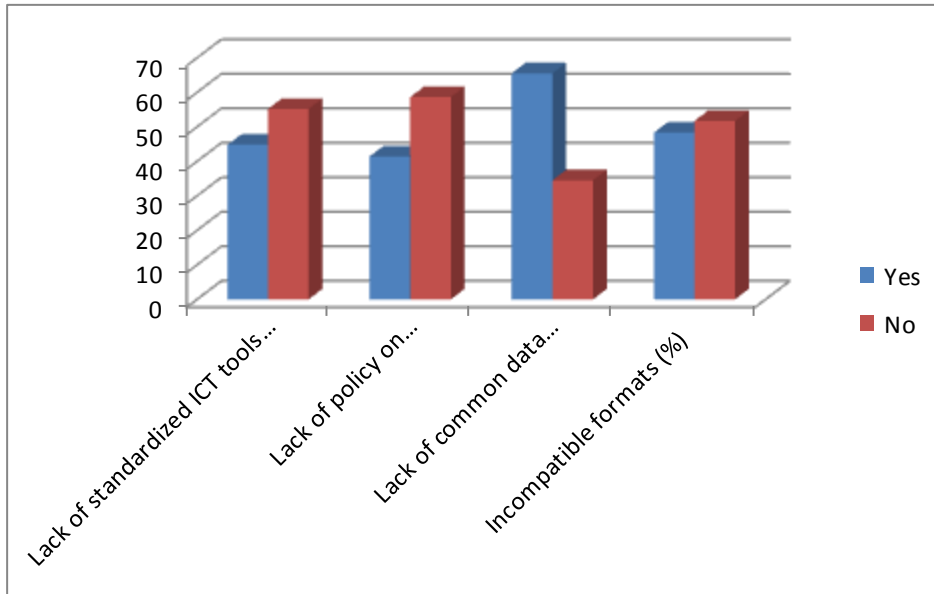


Figure 5: An analysis of challenges in terms of data standards and formats

#### 4.12 Refined Data Sharing Conceptual Framework

Based on the information sharing concept by Macao (2012), we came up with the following proposed framework for data sharing in Kenya.

The need for a framework for data sharing is to enable coordinated and systematic acquisition/collection, access, storage, use, management, and sharing of data and information among government institutions.

Research findings shows that almost all the other factors affecting data sharing should have legal basis to combat the challenges of data sharing such as quality control, privacy, copyright and other data security issues. Majority of the respondents single out the limitation of sharing due to lack of common data standards thus need to have quality control concept before data/information sharing takes place or deposition of data in a repository. From the analysis of the research findings, we came up with a refined proposed conceptual framework for sharing data which can be applied in Kenya as shown in figure 6 below.

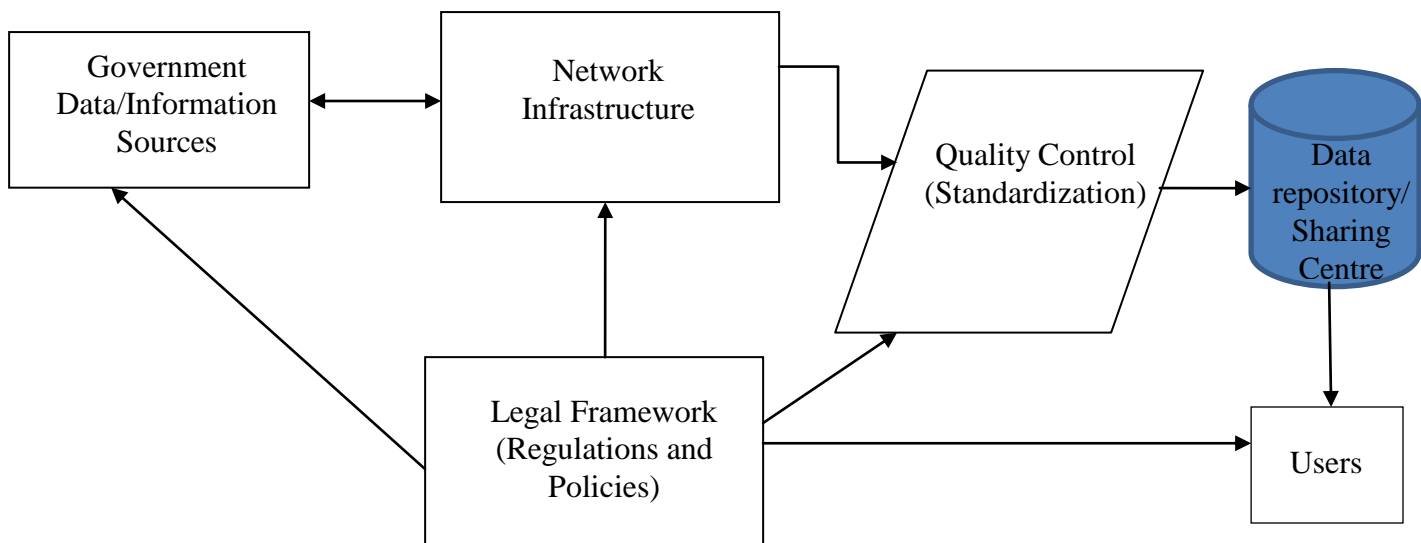


Figure 6: Refined proposed conceptual framework for Data sharing

# **CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS**

## **5.1 Introduction**

The research objectives that were earlier given in chapter one are discussed in relation to the findings.

## **5.2 Achievements**

The following are the discussion of the research objectives and achievements:

### **5.2.1 Existing plans and strategies (standards and policies) for sharing data by government institutions**

Data sharing is an important aspect in life as it creates a knowledge transfer from one individual to another as part of capacity building. According to M’Muthuiba (2013), information sharing is a central process through which team members collectively utilize their available informational resources. With the emerging of new technologies, data exchange will improve with increased efficacy and informed decision making in service delivery.

In this study, we sought to survey the initiatives which enable data sharing among government institutions aimed at improving efficiency in service provision, reduce production cost and better decision making process. We were able to achieve that indeed there are various initiatives by the government for data sharing. Some of the strategies that encourage data and information include e-government strategy, KNSDI, Network infrastructure, data centers (repositories) and ICT policies and regulations among others.

### **5.2.2 Extent of data sharing among government institutions**

The findings showed that there is data sharing taking place and the frequency of sharing data/information among institution of same category is high. For instance, sharing between ministries is 91.7%, among Parastatals is 100% and among Commissions is 66.7%. This implies the institutions at same level or category depend on one another. Also it can be seen almost all other institutions do share data/information with their parent ministries. However, whereas data sharing takes place, challenges do exist such as security issues, majority of the institutions studied showed that confidentiality/sensitivity of data is a major issue while completion in government is less significant presumably due to unique functions’ of each institution

### **5.2.3 Development of a framework for enabling data sharing among government institutions**

A review of other frameworks was done and a framework was developed that gives guidance/ criteria for sharing information/data. The elements of the framework were legal framework (Policies and regulations) which forms the basis of the proposed conceptual framework, availability Strategies/Initiatives (such as infrastructure), data collection/sources and data repository Centre with quality control unit.

### **5.3 Conclusion**

The aim of this study was to survey the existing data sharing strategies/initiatives, the extent and propose a conceptual framework to enable data sharing among government institutions in Kenya. The current situation towards partnership working in Public institutions is due to statutory obligations as the reason to share data or information but they are not always sure what information they require access to complete their duties. This leads to a need to improve Public institutions' ability to cooperate; working together requires the sharing of data and information. The results from the study indicate that most of the institutions do share data or information with other public institutions and are aware of the importance and benefits of data sharing among each other. Majority of the institutions have defined information governance policy and guidelines, and communication and dissemination methods, developed collaboration and partnerships with each other and frequently use Information sharing systems to enable data or information sharing. Nevertheless, there are challenges in sharing of data/information such as lack of policies and clear guidelines, incompatibility of data formats, data security and availability of data sharing systems/initiatives which stimulate data sharing. However, completion in government is less significant presumably due to unique functions' of each institution.

Development of a common data sharing framework with well-defined policies and regulations is recommended for best practice in data sharing.

#### **5.4 Recommendation**

It is recommended that public institutions should ensure that appropriate information governance, policy and guidelines are developed to provide a framework to bring together all of the requirements, standards and best practice in data sharing.

Institutions are also recommended to cooperate and partner with one another to stimulate data/information sharing and that there is need to make that data/Information in their possession is easily available to other public/government institutions by developing well-defined communication strategy and dissemination methods for data or information sharing.

Furthermore, open data access is recommended as it allows for transparency and accountability through initiatives such as E-government portal and other open source websites.

It is also recommended that Capacity building in data storage and management be done in all the government institutions to improve level of data sharing amongst them. There must be also a desire from the institutions to work together to meet their goals and objectives in service delivery.

#### **5.5 Limitations of Study**

The scope of the study was limited to selected government institutions due to the large number of public institution. There was Unwillingness by respondents to fill the questionnaires promptly and existence of long protocol procedures. The research time duration was short hence low rate of return of questionnaires. The target audience in the level of policy makers was hard to reach thus bias towards data and information managers. Moreover, there are other challenges of IT maturity levels of respondents such as lack of awareness/knowledge in data sharing initiatives available thus need for capacity building.

## **5.6 Suggestions for further study**

Future research work could increase scope to include all networks sharing data or information across all private, public and intergovernmental organization. The data sharing initiatives can be studied further to assess their effectiveness, if successful or reason for failure in their implementation.

Moreover, there could be need for future study to expand on the data types being shared and categorized for ease of archiving and retrieval by users.

Since data sharing is very crucial in transfer of knowledge and information for planning and decision making; there is need to study the best ways of acquiring/capturing data, storing and management and enhance capacity building. The future study could also consider security issues arising due to the emergence of new and advanced technologies in integration of data sharing. Nevertheless, further research could be done to determine the best methods of collecting data and a common data formats and standards are developed for each category of institutions utilizing the acquired data and the government through the relevant ministry or communication authority should come up with a clear data sharing framework.

## References

1. Ambia, Marjory Wairimu."An evaluation of the role and contribution of Information Communication Technology (ICT) in Knowledge communication and sharing processes: a case study of selected organizations in Kenya".Diss. University of Nairobi, 2012.
2. Brey, Philip. "Global information ethics and the challenge of cultural relativism." (2011).
3. Chisenga, Justin. "Opening access to agricultural information in Ghana, Kenya and Zambia." (2012): 132-138.
4. Cook, Karen S., et al. *Social exchange theory*. Springer Netherlands, 2013.
5. Cragin, Melissa H., et al. "Data sharing, small science and institutional repositories." *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 368.1926 (2010): 4023-4038.
6. Jarvenpaa, Sirkka L., and D. Sandy Staples. "The use of collaborative electronic media for information sharing: an exploratory study of determinants." *The Journal of Strategic Information Systems* 9.2 (2000): 129-154.
7. Jeremiah, N. Nyangweso. *Relationship between credit Information sharing and loan performance-case of Commercial Banks in Kenya*. Diss. University of Nairobi, 2013.
8. M'muthuiba, Ayub Gitonga. *Information sharing among humanitarian organizations in Kenya*. Diss. University of Nairobi, 2013.
9. Miller, Margaret J.,2003.Credit reporting systems around the Globe: The state of the art in public credit registries and private credit reporting firms, *Credit Reporting system and International Economy*, Cambridge, MA:MIT press
10. Mugenda O.M. and Mugenda A.G., (2008). *Research Methods: Quantitative and Qualitative Approaches*
11. Munge, Evans, Daniel C. Rotich, and Justus Wamukoya. "A Situational Analysis of Information Management in Selected Government Ministries in the Context of Kenya Vision 2030." *Conference and Programme Chairs*. 2013.
12. Omran, El-Sayed Ewis. *Spatial data sharing: from theory to practice*. Publisher not identified 2007.
13. Oyugi & Adewale *IAfrica Habitat Review* 7 (2013) 537-550



14. Saif, Syed Mohsin, et al. "A Network engineering Solution for Data sharing across healthcare providers and protects patients health data privacy using EHR System." *Journal of Global Research in Computer Science* 2.8 (2011): 67-72.
15. Wang, Ying. "Information Ethics in Reuse of Public Sector Information in China." *Technology and Society Magazine, IEEE* 32.3 (2013): 73-79.
16. Yang, Tung-Mou, and Terrence A. Maxwell. "Information-sharing in public organizations: A literature review of interpersonal, intra-organizational and inter-organizational success factors." *Government Information Quarterly* 28.2 (2011): 164-175.
17. Veerle Van Den Eynden & Bethany Morgan Brett." Data management and documentation - social sciences." *UK Data Archive, University Of Essex* (2010.)

## Appendix1. Questionnaire

### PART A: GENERAL INFORMATION

1. What is the name of the institution you work for? .....
2. What is your current position/designation? .....
3. What type of institution is your employer?
  - Ministry
  - Government Parastatals/Agency
  - Commission
  - Other (specify) -----
4. Please specify your gender
  - Male
  - Female
5. What is your age group?
  - 20 - 30 years
  - 31 - 40 years
  - 41 - 50 years
  - Above 50 years
6. What is your level of work experience?
  - Less than 1 year
  - 1 - 5 years
  - 5-10 years
  - > 10 years

7. Which is your highest academic level?

- Primary certificate
- Secondary certificate
- Diploma
- Graduate
- Masters

8. How many employees does your organization have?

- 10 employees and below
- 11 to 50 employees
- > 50 employees

## **PART B: DATA SHARING STRATEGIES**

### **Information Governance, Policy and Guidance and Collaboration and Partnerships**

9. Does your institution have any data/information governance policy in place?

- Yes
- No

10. Does your institution have any agreements with other government institutions or partners to make available data or information that they may be in their possession?

- Yes
- No

11. Does your institution have any policies and regulations on data/information sharing?

- Yes
- No

**Data Sharing Initiatives /Infrastructure availability**

12. Does your organization have any Information Communication Technology (ICT) tools in place to manage data sharing?

- Yes
- No

13. Do you have computers in your institution?

- Yes
- No

14. Do you have internet connection?

- Yes
- No

15. Do you have an official corporate e-mail address?

- Yes
- No

**Data Sources and frequency of use**

16. What methods do you use to obtain data/information for your institution?

(Tick where applicable)

- Field data collection
- Open data source website
- E-Government Portal
- acquiring directly from other government institutions
- Other (specify) -----

17. In respect to data exchange/sharing, please indicate how frequently do your institution uses each of the following ways of sharing/exchanging data/information with other institutions?

	Daily	Weekly	Monthly	Yearly	Never
Electronic mail					
Website / Online portal					
Conferences/ Meetings					
Social Media (e.g. Twitter, Facebook etc.)					
Television and Radio					
Print Media (e.g. Gazette notices, memos etc.)					

**Data Standards and Format extent of use**

18. Please indicate how frequently do each of the following data formats your institution uses to make data available to other government institutions?

	Daily	Weekly	Monthly	Yearly	Never
Database (Geodatabase, Oracle, access, SQL etc.)					
Table (Excel, csv, dbf etc.)					
Text formats (doc, pdf, PPT etc.)					
Web service data (WMS, WFS, xml, etc.)					
Imagery (Photos, satellite images)					
Geospatial (SHP, dwg, GPS files etc.)					
Other (specify) -----					

**PART C: Data/Information Sharing Extent among Government institutions**

19. Does your institution make available information/data in its possession to assist incase of an emergency/crisis to other government institutions??

Yes

No

20. In evaluating your institution's data/information sources, please indicate how often do your institution/ministry uses the following sources of data for carrying out its activities?

Data Source	Daily	Weekly	Monthly	Yearly	Never
Field data collection					
Updates from collaborating Institutions o					
Information from conferences/meetings					
Subscribed mailing lists					
Media					
Online e-government portal					
Research findings					
Other (specify) -----					

21. To what extent does your institution/department/agency share information with any of the following Government institutions?

Government Institution/Agency	Daily	Weekly	Monthly	Yearly	Never
Government Ministries					
Commissions					
Parastatals					
Public Schools and Universities					
Media					
Other (Specify).....					

**PART D: FACTORS AFFECTING DATA/INFORMATION SHARING AMONG GOVERNMENT INSTITUTIONS**

22.

i. What factors affect your institution’s ability to share acquired data or information with other Government institutions Information governance, policy and guidance factors? (Please tick those applicable)

- Organizational leadership & Management
- Employees’ attitudes towards data and information sharing
- Established practice of data sharing within and among government institutions
- Formal communication protocols/procedures
- Other (specify) -----

ii. In terms of communication and dissemination of data, which of the following strategies affect data/information sharing in your institution?

- Access to mobile and online ICT tools
- Communication Policies
- Other (specify) -----

iii. Which of the following factors affect data/information sharing in terms of Collaboration and partnerships by your institution and other government institution? (Tick those applicable)

- Obligation and requests
- Inter-institutional relationships/related functions
- Cooperation
- Other (specify) -----

iv. In terms of Information/data Security, which of the following factors affect sharing of data with other institutions? (Tick where applicable)

- Confidentiality/sensitivity
- Information content
- Competitive advantage
- Data source
- Relevance of data
- Other (specify) -----

v. Which of the following challenges does your organization face in terms of data standards & format?

- Lack of Standardized ICT tools
- Lack of policy
- Lack of Common data standards
- Incompatible data formats (Interoperability issues)
- Other (specify) -----

vi. Which of the following Data Storage and management strategies/practices will assist in data sharing with other institutions?

- Building of National Data Centres
- Kenya National Spatial Data Infrastructure (KNSDI) Initiative
- E-government online-Portals (i-Tax system, IFMIS, GHRIS etc.)
- Compulsory SIM Cards Registration
- Open data Source website database
- Credit Information Sharing by banks
- Other (specify) -----