CHALLENGES OF DIGITIZING AND SECURING COUNTY GOVERNMENTS RECORDS: A CASE STUDY OF KISUMU COUNTY.

GEOFREY OGELO
ICT-G-4-0472-17

A RESEARCH PROJECT SUBMITTED TO THE SCHOOL OF COMPUTING AND INFORMATICS AND INFORMATICS IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE OF GRETSA UNIVERSITY

DECEMBER 2021

DECLARATION

This research is my original work and has not been presented for award of a degree or for any similar purpose in any other institution

Signature: _____ Date: 29/11/2021

GEOFREY OGELO

ICT-G-4-0472-17

Supervisor

This Research has been submitted with my approval as University

Signature: _____ Date: 29/11/24

Mr. Phillip Bittok

School of computing and informatics

Gretsa University-Thika

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

OPERATIONAL DEFINITIONNOF TERMS

Digest – A cryptographic hash function containing an alphanumeric string created by one way hashing formula

Electronic Record –Any information recorded in a format that a computer can process.

Internet – A global system of interconnected computer network that use the standard internet protocol suite.

Metadata – Data containing descriptive information about other data.

Records – All books, research, maps, photographs, or any other documentary materials mad to keep information about the county government.

ABSTRACT

This research investigates the underlying challenge in the process of digitizing Kisumu County Government records as well as the emanating security concern following the digitization process. It considered storing of data on a web server owned by the county government. Storing data on a web server was more secure and guaranteed accessibility unlike storage of data on local computers. A particular emphasis was put on the use of web server technologies to secure data. These technologies included the use of an SQL database, encryption and password hashing as a means of securing data security. For organization of data, the research stored the list of records in a database in a chronological fashion; organized from past years to more current years. Further, this research looked into the benefits of storing data in a digital fashion as compared to the manual and current way used for the storage of records. The research used a cross sectional survey research design as well as purposive sampling technique as the sampling technique.

CHAPTER ONE: INTRODUCTION

1.1 Introduction

In this chapter the background information on Kisumu County Government, digitization of records, their storage and security was comprehensively outlined. In addition to the aforementioned concepts, this chapter also covered the problem statement, purpose of the study and the significant of the study.

1.2 Background of the study

Over the years, technological changes had always led to evolution in the way governments as well as organizations managed their data. This evolution had been aggravated further by the need for universal accessibility and security of such data. Data processed into information had been considered for years as a fifth factor of production by most organizations worldwide. County Governments in Kenya had not been left behind. This had been as a result of the realized benefits of digital records in efficient service delivery and accessibility as opposed to manual records.

Processed data referred to as information played a vital role in functions of organizations, including their establishment and continuity. (Garmin 2006). Information was the foundation upon which fundamental government decisions were made, their evaluation and future implementation.

Digitization was the process of converting information into digital format (Nur Atiqah er. Al 2018). Data digitization was categorized into records and archives. Archives were elaborated as documents that contained historical background of a government or organization and normally this historical background was obtained from primary sources. Records on the other hand were observed to be information that was generated, received, and maintained by a government or organization. This digitization or electronization of data had resulted in an enormous increase and expansion in the creation and processing of manual records into digital records.

(Wangui, 2011) noted that knowledge that was maintained in hard copy, or research format and other materials apart from electronic files was faced by some limitations that reduced the efficiency of governments. These limitations included but were not limited to rigidity in the essence of sharing and remote access. Further, information access was limited by bureaucracy

and centralization. In the recent past, governments had then shown commitment in good governance and accountability through digitization thereby increasing efficiency and effectiveness. Digitization of data was indeed a combination of various factors that lead to its complexity. These factors included integration, access authorization, security, and organization, this was not all; governments had to look into the issues of copyright when storing and giving access to such data to avoid legal obstacles. This was even more so emphasized where the data was expected to be accessed through public domain on the internet (Harper, 2008).

Control of access to information was fundamental in governments to prohibit viewership and modification of data by unauthorized personnel. To achieve this, passwords were used as the only way to access data without which data could be accessed. Passwords required to be stored in a database for reference each time a user logged into a system. For security purpose, passwords were not normally stored in plain text, rather they were hashed. To achieve hashing, cryptographic hash functions were used.

(Wikipedia) defined hash functions as function that took input (or "message") and returned a fixed sized alphanumeric string. This then meant that even with access to the database storing the passwords, a malicious person could understand the stored passwords. In the scope of storing data on a web server, the most popular way of implementing this was the use of SQL databases and PHP programming language to access and manipulate data. One of the popular hashes that was used with PHP was Bcrypt.

The County government of Kisumu known to have a website, https://www.kisumu.go.ke/ hosted on a web server that the County Government had complete control. The server contained information relevant to the county government, but it covered a very small fraction of the data of the county government documents. When need arose, county government employees accessed data through manual records and processes it as required. This had been the norm over the years whilst the county government was authorized to adopt systems and new strategies aimed at enhancing the county government operations.

These operations needed to be in tandem with the various county government departments to allow ease in the flow of information and service delivery. Further, the available manual information had not been made available to the general public for access on a need basis. This

had over time reduced service delivery efficiency and increased the strain on the general public having them travel to various offices to have their needs accomplished.

1.3 Statement of the research problem

The county government of Kisumu stored most of its record in a hard-copy format and did not have a comprehensive, secure database of these very records. This presented issues with efficient and effective on-demand access of data.

Transferring these manual records into digital records could be a daunting task and required a great deal of computer literate human labor. A more sophisticated problem adding to the already existent task was the organization and access control that have to be implemented in a fashion that does not compromise the effective and efficient access and manipulation of information stored digitally.

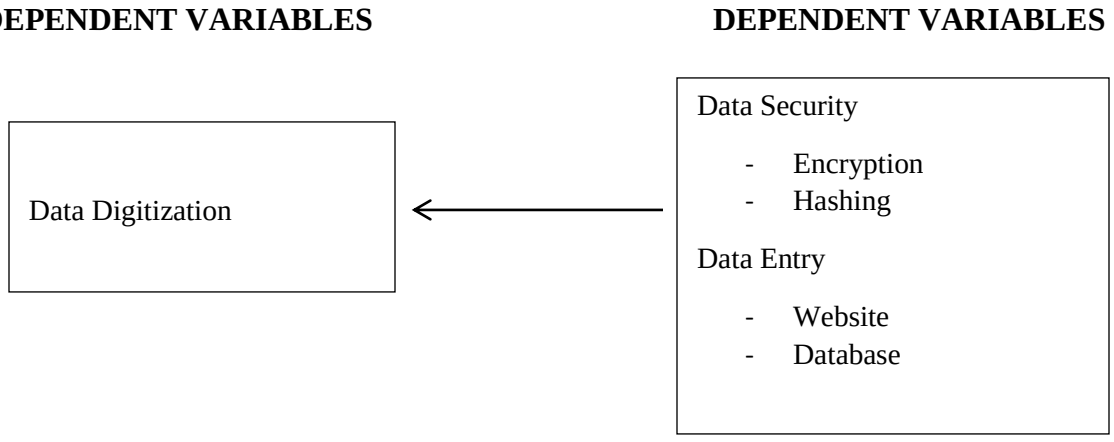
Furthermore, security of this very information had to be ensured professionally by computer security and programming personnel who are expensive to acquire and take time to implement the security measures required.

1.4 Purpose of the study

This study investigated the challenges that emanated from the process of digitizing manual records and archives including personnel requirements, economic issues, electronic data security, electronic data storage techniques and favorable mechanisms that could be used to accomplish these tasks including; programming languages and database type.

1.5 Conceptual Framework

Figure 1: Conceptual Framework



1.6 Objectives of the study

1.6.1 General Objective

To establish the security, logistic, economic, and human resource challenges emanating from digitization of Kisumu County Government records and archives.

1.6.2 Specific Objectives

i. To determine the activities used for successful digitization of records and archives.
ii. To investigate security concerns emanating from digitization of data.
iii. To investigate the proper procedure needed for successful digitization of manual records and archives.

1.7 Research Questions

i. What were the activities involved in the digitization of Kisumu County Government records and archives?
ii. What were the security concerns emanating from the digitization and storage of Kisumu County Government records and archives?
iii. What was the preferred criteria for organization of digital records and archives for the County Government of Kisumu?

1.8 Significance of the study

This research was designed to bring an understanding to the County Government of Kisumu executive, legislature, employee of the County Government, the general public of Kisumu County and other interested parties with regards to data digitization.

Not only had it elaborated the economic and human resource perspective, but this research dove also deeper into the technological aspect of data digitization elaborating on the computer technologies mechanisms that had been used in the implementation of digitizing loads of data. As a result, the County Government and other interested parties could borrow from this research and implement the task of data digitization without conducting in depth, future research.

1.9 Scope of the study

This research was conducted with respect to the County Government of Kisumu, In addition, the study covers the implementation of computer databases using SQL and data access and control using PHP. To look into the security aspect, this research had elaborated on Bcrypt hashing algorithm for the purpose of password hashing.

1.10 Limitations of the Study

The following limitations were experienced during the process of research:

i. The respondents were not entirely genuine whilst giving information with regard to the county government since it was their employer.

ii. The respondents were busy to answer the questions effectively since they could only be acquired during working hour in their offices.

iii. Data required for the research was not easily accessible because most of the records and archives are stored in a hard copy fashion.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter examined past studies that covered the subject of data digitization, digital databases, and their implementation, hashing function and the county government of Kisumu. This chapter was composed of six sections each with a subject matter and broadly categorized into; review of literature, review of themes, theoretical framework, and summary of identified gaps in literature.

2.2 Review of the literature.

Digitization of data had been a topic of discussion and evaluation over a long period of time. What had taken time to do was the implementation of digitization procedures especially in third world countries. With devolution being the recent phenomenon in Kenya, the digitization of county government's records and archives had become a function that was not of utmost priority. Researchers had been submitted covering both general and specific areas of data digitization. This section of literature review distinguished the various concepts that the whole of this research covered. In the section that follow, 2.2.1 to 2.2.2 the researcher covered literature on specific section of this research. These included; Data digitization, password hashing and database access and manipulation.

2.2.1 Data Digitization

Since the early 2000's, organizations had been taking to digitize data and store for later access and use. The digitization of data had been seen as a more efficient way of dealing with process transformation. The data digitization process was observed to be a complex combination of multi-channel process of thinking, cross-enterprise integration, and business technology. This then shaped the applications and innovations that are intended for data digitization (Morris, 2003).

(Saiful Farick Mat Yatin et Al. 2018) noted that records were vital sources that an organization needed in order to conduct their operation efficiently and effectively. This also applied to government, including county governments. Records resulted to proof in the activities of any government or organization and had vital functions. These functions that necessitated for organizations to have records included; provision of corporate memory , policy formulation, decision making, achievement of greater efficiency, productivity and consistency, meeting of statutory and regulatory requirements, protections of interests and archiving activities.

The aforementioned factors were an importance of both manual and digital records. (Levent et. Al. 2017) explained that there were several reasons that lead to the importance of digitization. These reasons included but were not limited to; simultaneous usage of records by many persons, remote accessibility, better integration with business information systems, ease in sharing data and information, ease in backup, security, space having, and increased productivity in any organization.

2.2.2 Password Hashing

In computing, a hash function was a function that took an input and returned a fixed size alphanumeric string (Wikipedia). (Stevens, 2012) stated the importance of one-way function with regards to security. In his definition (Stevens, 2012) explained that one-way function a function that mapped a huge (possibly infinite) domain to one of all possible string of a specific length. He further noted that it was very easy to computer search a string but infeasible to invert it but theoretically possible to test every single input with unlimited computing power, taking hundreds to thousands of years.

In their study, implementation, and performance analysis of PBKDF2, Bcrypt, Scrypt Algorithm, (Levent et. Al., 2017) noted that there was a continued increase in security breaches as a result of an increase in the number of wireless technologies. This then meant there was a need to safeguard a private and confidential data using a strong password to be used to log in through the web portals. With the requirement that almost every website required that you login, there was a continued temptation to use the same password and username for all those websites.

Hash functions have the feature of determining resulting in the same digest or hash for each unique input. (Levent et. Al., 2017) outlined the properties of one-way function as; computing a hash was fast, it was not possible to regenerate original value from its hash, it was not possible to change the input without altering the digest and no two messages had the same digest.

To secure user accounts and data access, passwords stored in databases were hashed. During login, the user input was acquired, hashed, and stored in a temporary variable. The hash corresponding to the user trying to login was retrieved as was and stored in a temporary variable. From there, the user input and the database hash were compared, if they matched the user was logged in, else the user was prompted to enter the right password.

2.3 1st Theme: Establishing activities required during data digitization.

(Linden, 2008) added to this by noting that the reasons for digitizing data overlapped and varied depending on the organization or government. Generally, the reasons centered around access, security, and efficiency. More so, governments and organizations could secure financial funding to implement digitizing programs. There was a diverse array of activities that was encompassed in the process of creating digital records. These activities were noted as follows;

a) Selection of material to digitize depending on research, learning, needs and copyrights.
b) Preparation by conservation, disbanding and tagging of physical volumes of records by content or format type.
c) Digitization through image processing, creating of archival and derivative files plus structuring.
d) Quality control by developing of a QC strategy, selection of QC tools, development of assessment workflow and planning the process of correcting errors.
e) Metadata description, selection and implementation of standards, and file naming conventions.
f) Technical development of the repository and storage plan, digital content delivery platform, discovery and navigation tools, web services, web design and development.
g) Project Management on matters workflow coordination, financial management, promotion, and user support.
h) Life cycle management of the digitized data by developing preservation strategies and procedures and ongoing content, metadata, application revision, additions among other.

2.4 2nd Theme: Security concerns emanating from the Digitization of Data

(Nur Atiqah el. Al. 2018) noted that there were a number of risks associated with the implementation of a digitization process. These risks were categorized into financial, security human resource and technical issues. The concerns were seen to be valid and could cause the digitization process to fail. Among the noted risks included:

a) Financial: The short-term, recurrent storage and migration costs. This was in comparison with the long-term costs of storing physical, non-digital data.
b) Technical: Hardware and software obsoleteness was an impending problem with the continual change in technological advancements. The life-expectancy of software and

hardware support systems was considerably shorter than the required time to retain the records in question. This issue then contributed to the overall financial constraints.

c) Security: Once records were digitized and made accessible over the internet, the risk of breach and cyber theft was exponentially increased. The government had to implement strict cyber security mechanisms that may not always guarantee 100% security.
d) Human Resource: The human resource required to digitize the record and maintain as well as update the data was expensive to acquire, especially if outsourcing.

2.5 3rd Theme: Criteria of the organization of the digital records.

The criteria for digitizing records varied from government to organization. Ideally, the process follows the array of activities that are discussed in section 2.3 International Standard ISO 15489:2001 gives a definition of records management as; the act of management responsible for the efficient and systematic control of the creation, receipt, maintenance, use, retention and disposal of records including the processes of capturing and maintaining evidence of and information about business activities and transaction in form of records.

Further, the criteria of the organization of digital records must follow the principles of records management (Githaka 2006). If the aforementioned criteria are not followed, then this record may not be considered to be records. It was imperative to understand the whole process of record management to avoid the pitfall.

University College Cork, 2017 gives the categories for data classification based on the scope of access by various personnel. This can be noted as roles and responsibility depending on the owner of the data.

ISO 27002 expressly notes that the purpose of information classification was to endure that information receives an appropriate level of protection. University of Cork classifies its data depending on the group of people expected to access it. These criteria can be adopted by the county government of Kisumu for ease in organization of data. The categories are listed as:

Table 1: Data categories.

RISK	**LEGAL, REPUTATIONAL, FINANCIAL AND OPERATIONAL IMPACT OF DATA ACCESS.**		
Inappropriate access causing breach of confidentiality/data protection rules	Minor	Moderate	Serious
Inappropriate access resulting in unauthorized amendments	Minor	Moderate	Serious
Data loss	Minor	Moderate	Serious
Unauthorized Disclosure	Minor	Moderate	Serious
	↓	↓	↓
CLASSIFICATION	Public	Internal use only	Confidential
	↓	↓	↓
EXAMPLES	Public websites Campus Maps Staff Directory	Intranet Data Internal Telephone Financial budgets	Financial Data HR Data Human Subject Data

University of Cork – Ireland; 2017

2.6 Theoretical Framework

2.6.1 Digital Transformation Framework

(Corver and Elkhuizen, 2014) proposed a theoretical framework developed a Digital Business Transformation framework building it on four key items: the customer, the product or the service, the organization, and the process plus system. In respect to the county government of Kisumu, this would encompass the resident of Kisumu County, the county government services, the county government itself and the process and system consecutively.

They used the argument that digital transformation often began with the customer as the premise for the framework. Hence, it believes that the process should the logical order of getting to know the customers better, then improvements to the service level, followed by digitization of customer experience before digital transformation can't then be the other three areas which are digitizing operations, products, and services.

They are of the view that the proposed framework could be useful to organizations in their quest to develop in a digital vision and build new business models that are based on digital opportunities. This process had to start with the digitization of records and archive.

2.7 Summary of identified gaps in literature.

The digitization of records, the security concern and implementation cots had been covered in my research and elaborated further in journals and other book. During this literature review, the researcher discovered that the digitizing of records with regards to county governments in Kenya did not have enough literature of the covered areas included government departments and non-governmental institutions. The research then sought to cover the digitization from the perspective of a marginalized county in Kenya so as to understand the challenges they faced and how best to overcome them.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

In this chapter, the methodology of this research was discussed in detail to elaborate how data was collected and analyzed. Also, this chapter covered the reliability of data, its validity, the study area, sample size, measurement of instruments and location of study.

3.2 Research Design

To collect data, this study used a cross sectional survey approach of research. This approach was used as the principal rationale of the study to figure out the challenges of digitizing records of the county government of Kisumu including security concerns, economic and other form of challenge. This research design was chosen because the data to be collected was primary and was not experimental.

3.3 Study Area

The study area of this research was confined within the offices of Kisumu County, located in Kisumu town.

3.4 Target population

This research targeted the workforce of Kisumu County Government especially employees who dealt with data collection, storage, and analysis within the county government. This population was used to collect views on security concerns, economic, logistic among other issues associated with digitizing data. This population was selected because it had the fundamental knowledge in knowing what needed to be done and what transpired in the day-to-day collection, analysis and sending of information relevant to the county government. The research included 20 county government employees.

3.5 Sampling Techniques and Sample Size.

To select the population, purposive sampling technique was used. The reason for this sampling technique was the need to have respondents familiar with the research issues in question. Both the male and female genders were included in the study.

3.6 Research Instruments.

The researcher used a questionnaire too as the primary research instrument in the study. These questionnaires contained closed ended as well as open ended questions for the respondent to answer.

3.7 Reliability of Measurements

Questionnaires are a reliable source as they were given to employees with wide know how of the operations of the county government of Kisumu.

3.8Data Collection Techniques

The data in this research was collected through questionnaires. The questionnaires constituted of both open ended and closed ended questions in relation to digitization of data. Questionnaires were the preferred method of data collection because the target audience was literate and was able to read and write. The questionnaires took between 10 to 15 minutes to answer.

3.9 Data Analysis

Descriptive statistic was used to analyze data. Frequencies and percentages were used in analyzing data obtained. The data was then presented using tables and graph to summarize and enable ease in understanding.

3.1.0 Logistical and Ethical Considerations

The researcher ensured only willing person participated in the study and introduced this person to ensure they understood the scope of the questions. The researcher also ensured that the respondents are aware of the confidentiality of the data they provide in the questionnaires.

CHAPTER FOUR: FINDINGS AND DISCUSSION

4.1 Introduction

This chapter covered the findings that were collected from the survey process. The data was analyzed and organized into tables and charts. Further, discussions were done to illuminate the finding. This chapter was divided into overview findings, discussion of findings, and critique of other studies inferences of the study organized from section 4.2 to 4.5 respectively.

4.2 Overview of Findings

During the study process, the researcher interacted with 20 Kisumu County Government employees. These personnel were given the questionnaire prepared for them. Of the 20 questionnaires only 17 were returned usable. This represented 85% of return rate for all the questionnaires. This information was represented in the table below.

Table 2: Questionnaire Return Rate

Questionnaire Query	**Represented**
Returned	85%
Spoilt	15%
Total	100%

The study also observed that most of the respondents were male with at least 2 years working experience. This showed that most of the respondents were experienced in their work categories. Further, the study showed that all respondents were computer literate. This would come in handy during the process of digitization of records for the county government.

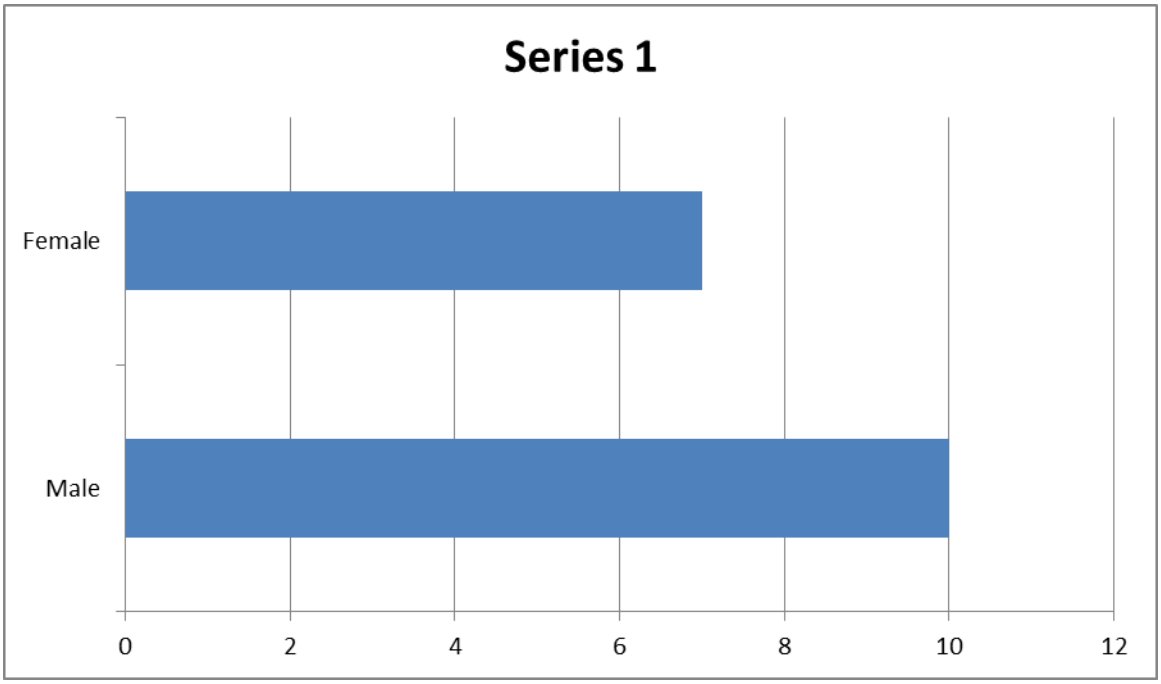
Another observation that was made was the almost equal number of employees who were comfortable working with digital records. This reflected in the difficulties with working with both manual and digital records. This reflected in the difficulties with working with both manual and digital records including organizing them, locating them, and recording them.

Respondents who participated in the study sited that there were laws in place that restricted them from some dealings with digital records. This however did not protect the records from being compromised security-wise and observed in their responses. Most of the employees had experienced some kind of security compromise. The study generalized them into; social engineered attacks, technical hack, and unauthorized access.

Also observed in the study was the acknowledgement that indeed dealing with digital records was expensive. This was observed in both categories of internal resource management and third-party external management. This was further complicated by lack of enough resource from the budget for the dealings in digital data.

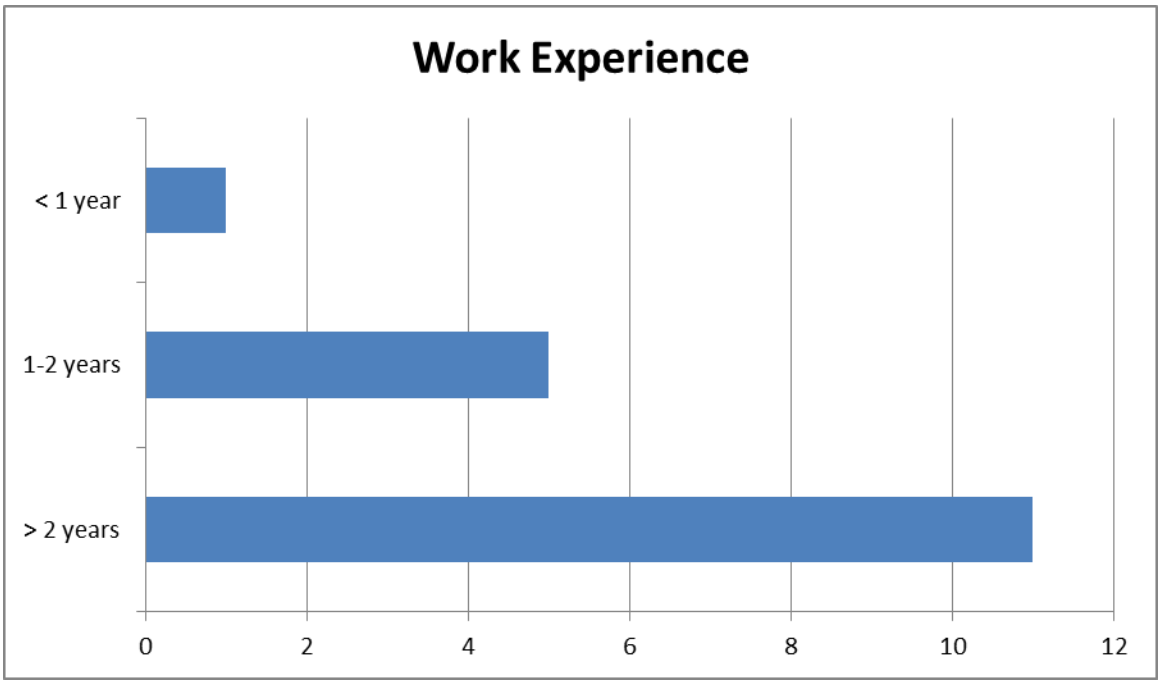
4.3 Discussion of Findings

Figure 3: Gender Distribution of Respondents



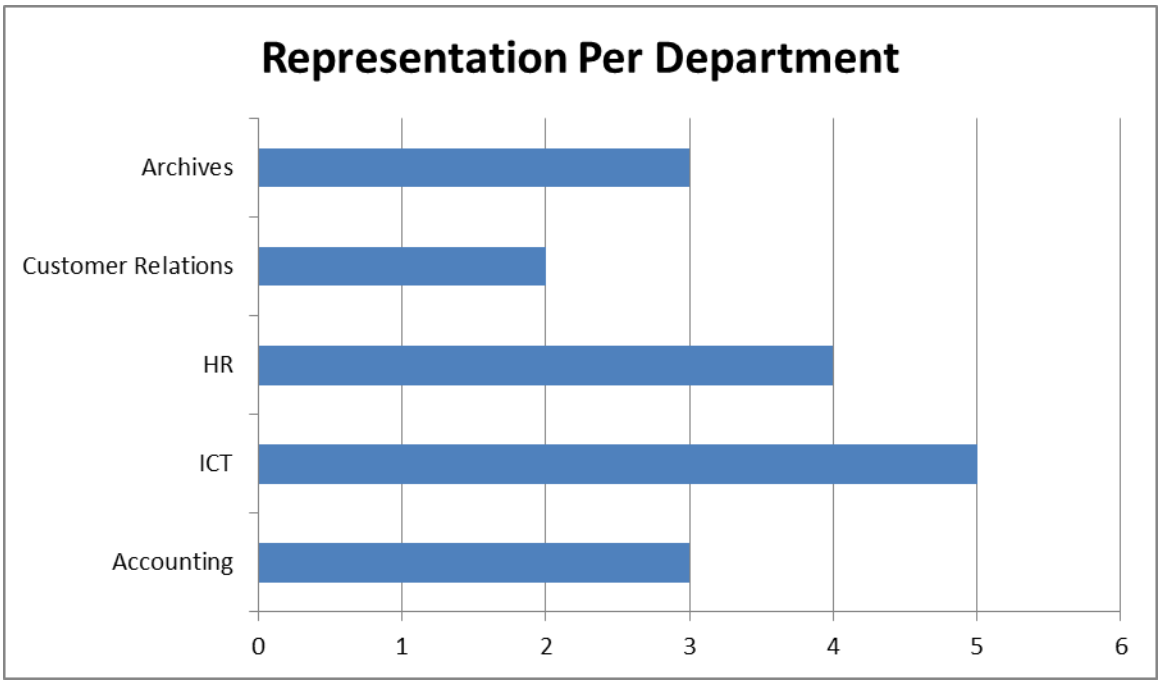
From the study, the researcher found that most of the respondents were male with a representation of 59% or 10 out of 17 respondents. 41% of the respondents were female with a representation of 41% or 7 out of 17. These respondents had been working for a period of 2-5 years for the county government on average with a representation of 64% having worked for the duration aforementioned. 29.4% of the respondents had worked for a period of between 1 and 2 year and the remaining 5.9% being composed of relatively new employee who had worked for less than one year. This information was represented in the figure below.

Figure 4: Work Experience of Respondents



The study also revealed that most of the respondents who took part in the survey were from ICT department with 29.4% of all respondents. This was convenience since they were directly involved in the maintenance of digital asset of the county government. The HR department followed with 4 personnel. The least involved with regards to the available respondents for the survey was the customer service department which had 11.8% of the respondent. The accounting, human resource and archived departments had 17.6%, 23.5%, and 17.6% of all respondents respectively. This enabled the researcher to collect data that was diverse and thereby gave a comprehensive picture of the county government. This information was represented comprehensively in the following figure.

Figure 5: Representation of Departments in the Survey



Of the respondents who participated in the study, all of them were computer proficient representing 100% of the respondents. This served as an important skill in today's era, without which the employee would be disadvantaged. The availability of computer proficient respondents made the study more successful since it meant the responses would be more accurate. The following represents this information.

Table 3: Computer Proficiency of Respondents

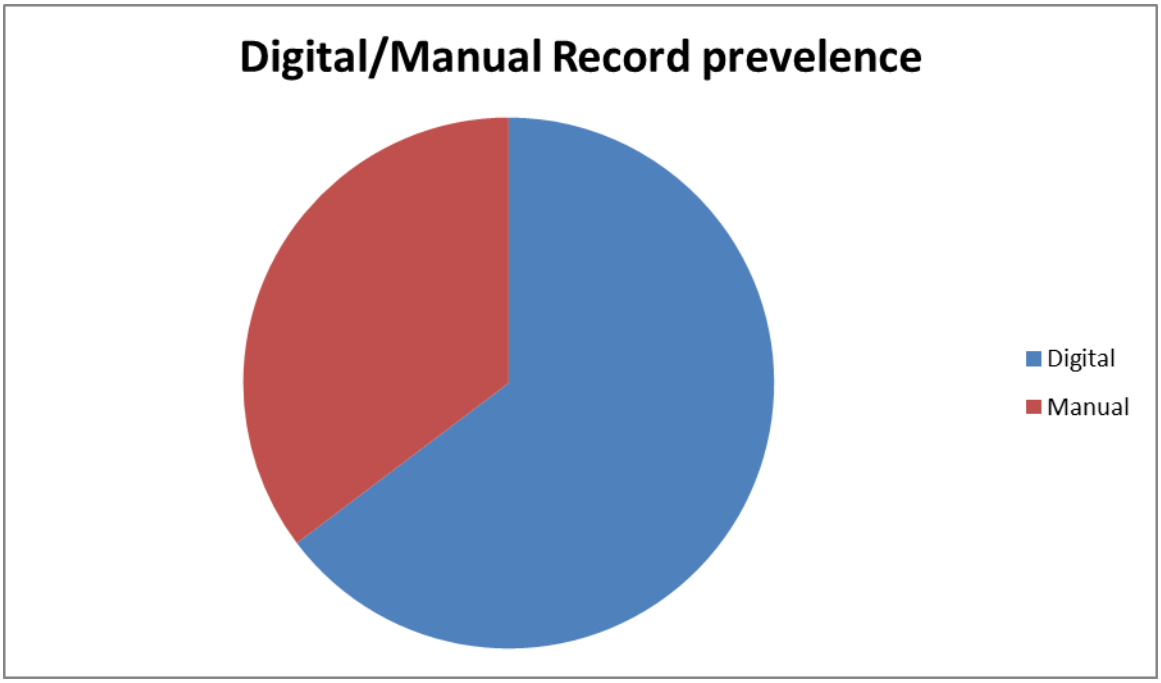
Query	Yes	No
Are you computer proficient?	100%	0%

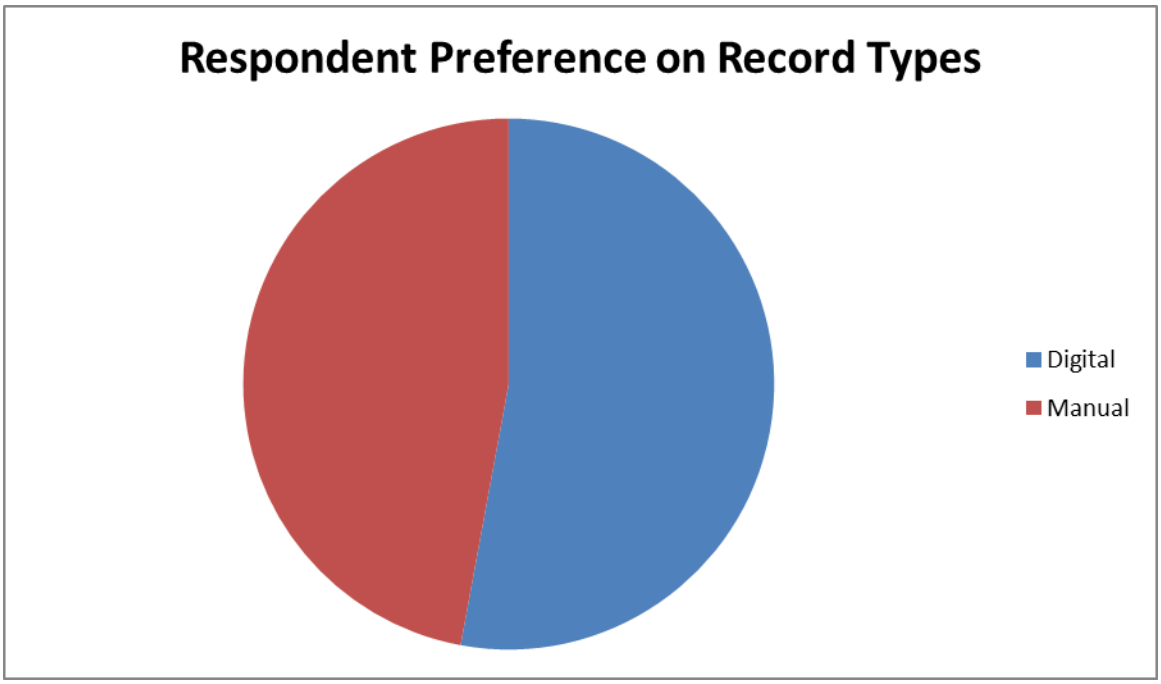
4.3.2 Dealing with manual and digital data.

When the respondents queried noted that they worked with both digital and manual records. However, the study found that most of the records used for the departments investigated. This included the use of computer to record and maintains data relevant to the county government. 64.7% of the respondents noted that digital records were prevalent in their department while 35.3% noted that they mostly use manual records.

On the preference of which record to use, most of the respondents were inclined to the use of manual records as opposed to digital records. This was attributed to being used to manual records and how manual systems worked. 52.9% of the respondent preferred the use of manual records while 47.1% preferred the use of digital records. This information was represented in the figures that follow.

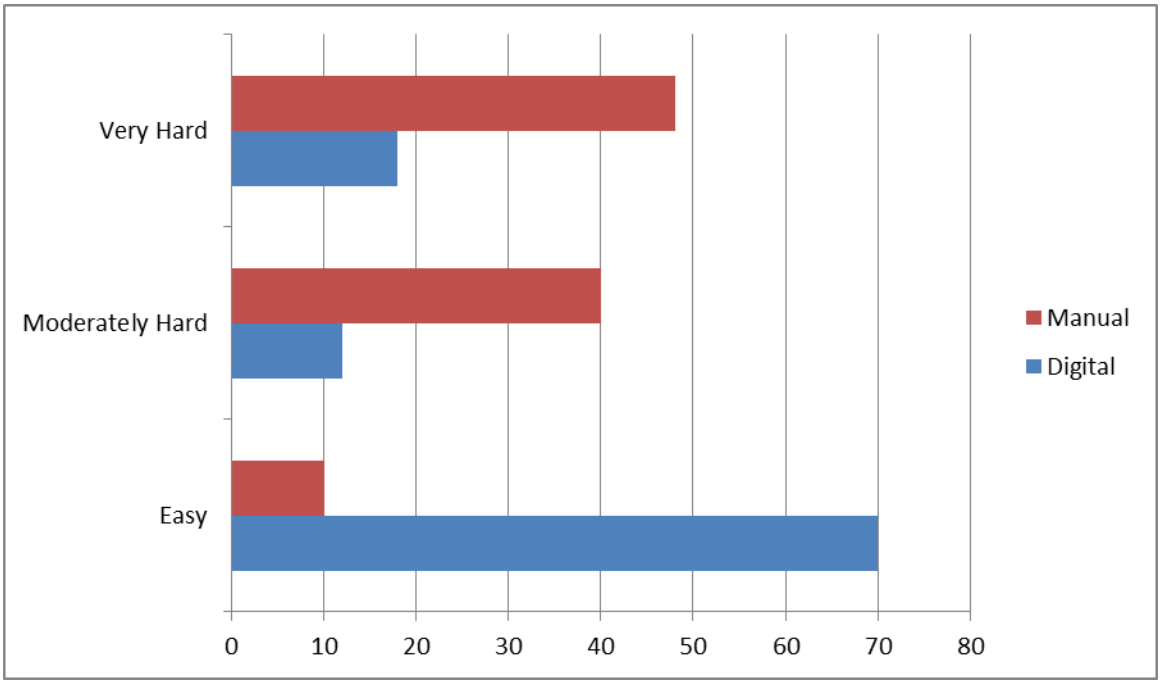
Figure 6: prevalence of Records Type





As opposed to manual records, digital records were considered to be easier to record, organize and locate by a majority of the respondents. This was observed as only 11.8% of the respondents flagged the aforementioned issues as easy on manual records while 70.5% flagged this very task is easy when it came to the use of digital records. 47.1% and 17.6% flagged the tasks as hard with regards to manual and digital record respectively. This information was represented in the graph that follows.

Figure 8: Difficulty in Dealing with records; Manual vs Digital



The study was to establish whether any of the departments had their respective heads trying to digitize their records. The study found that all the depart at some point had digitized some of their records. This represented 100% confronted with the issue of migrating from manual to digital records, most of the responded were okay. Only 29.4% of the respondents found it uncomfortable. 17.6% had no issue while 52.9% were moderately okay, meaning they would need some bit of time to adjust. This information was represented in the table and figure that follows:

Table 4: Digitization of Record in Own Department.

Query	**Yes**	**No**
Has your department tried to digitize all/some of its records?	17	0

Table 5: Comfort with Migrating from Manual to Digital Records.

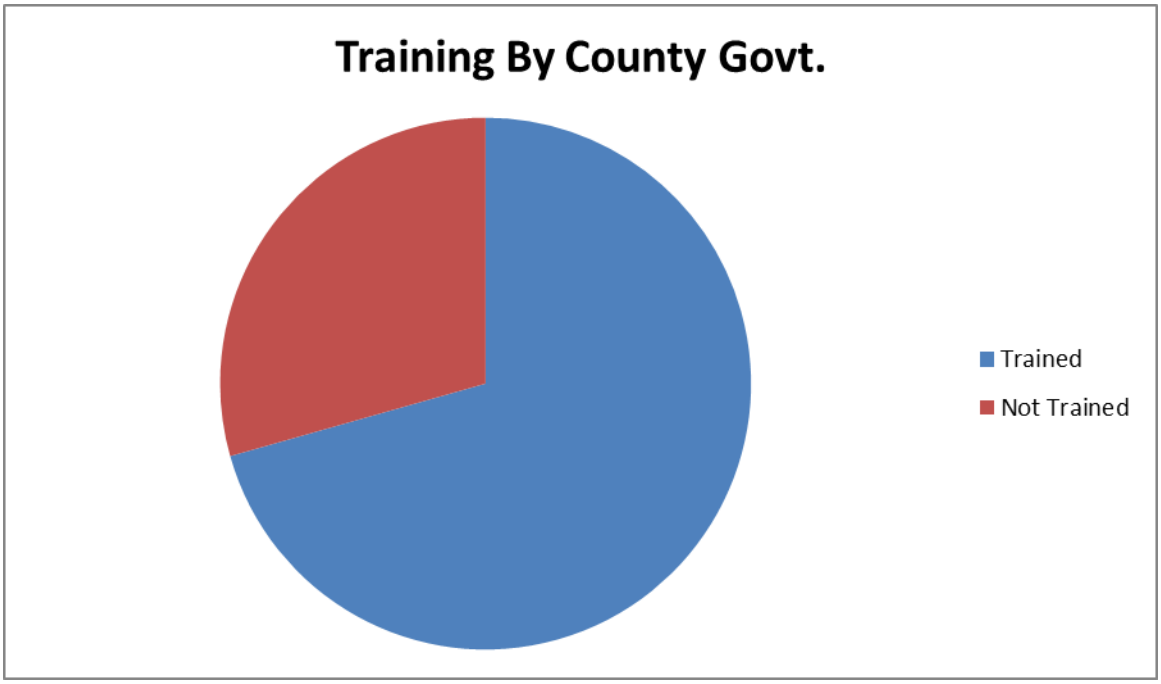
Comfortable	Moderately Comfortable	Uncomfortable
17.6%	52.9%	29.4%

A majority of the respondents found it moderately difficult to classify records in both their manual and digital forms, representing 70.6% majority. 11.8% found it extremely difficult while 17.6% found the process of classification easy. This was even after the county government had trained the respondents on the use of digital records. A majority of the employees were trained by the county government to work with digital records, representing a 70.6% of the total respondents. Only 29.4% of the respondents were not trained by the county government on digital records. The 29.4% were evaluated to have acquired the knowledge to work with data from other areas.

Table 6: Difficulty in Classifying Records.

Query	Easy	Moderate	Hard
What difficulty would you note classifying records to be?	17.6%	70.6%	11.8%

Figure 9: Training by county Government



The study was to establish the criteria used for the digitization of manual records by the county government. This criterion would influence the organization of the records be it in physical storage spaces or in digital databases. The major activities that were evoked during the process were also hugely determined by the same criterion. The study found that the manual records to be digitized were first selected as the first step in the criteria. This was followed by preparation for digitization, quality control, indexing and then technical implementation of the digitization of records.

The organization of records in the manual storage location largely influenced the organization of records in the digital databases. Manual storage locations were organized based on the departments the record belonged to, then narrowed down to the categories within these departments and finally, filed as per the time they were created in an ascending fashion. In the digital databases; the method was used with alterations for the purposes of logical implementations. The major sorting mechanism was time, with organization happening in an ascending fashion.

The study also found out that the digitization process had some activities that were based on the criterion used. These activities included text data entry scanning of documents into images, indexing of scanned records, categorization of scanned records and data entered and finally, the technical process of database design and development.

4.3.3 Monetary Issues

The economic repercussions of digitization of records had to be considered by the county government. It would become a challenge if it was found to be too expensive. Based on the respondents' data, the researcher was able to acquire opinion on the expense of digitizing record, the use of third-party firms and their expenses to perform digitization, budgetary allocations, and the comparison of expenses between working with manual and digital records.

The study found that the cost of digitizing records was moderately high but not very high. This was supported by the fact that 70.6% of the respondents found it moderately expensive while 29.4v found it to be very expensive. The study also found out that at some point, the county government used third party firms to perform the process of digitization as opposed to doing the digitization themselves. This was noted with 88.2% agreed to the aforementioned fact that with only 11.2% disagreeing. This information was represented in the tables that follow:

Table 7: Expense of Digitizing Records

Query	Cheap	Moderate	Expensive
How expensive was digitizing records?	0%	70.6%	29.4%

Table 8: Use of 3rd Party Firm to Digitize Records

Query	Yes	No
Has your department ever used a third-party firm in digitization of record?	11.8%	88.2%

The study was to find out the financial burden associated with the maintenance of record using third parties. This they were expensive as opposed to internally maintaining records. The data collected showed that 82.4% of the respondent agreed to the fact and only 17.6% disagreed. In

addition, the situation was however eased by the fact that the county government did provide a sufficient budget to deal with the issue of digitization with 76.5% of respondents indicating this. Finally, the study discovered that most respondents considered working with digital record. This was supported by 76.5% of the respondents.

4.3.4 Security

The final issue that the researcher intended to find out was matters related to security of digitized record. The study had already established that there were indeed records that were digitized for each of the departments involved; this provided a platform for investigating underlying security issues. The security issues looked into was categorized into social engineered attacks, technical attack, and unauthorized physical access to privileged accounts computers.

In the study, the research found that 70.6% of the total respondents at some point experienced a data breach. The remaining 29.4% had no experienced this. Of the 70.6% 3 of the respondents said they were tricked into giving out data or access (social engineering), 7 had experienced hacks only to know later (technical) and only 2 had had unauthorized people assessing their workstations without their permission.

This data was represented in the table below.

Figure 11: Experience with Security Incidents

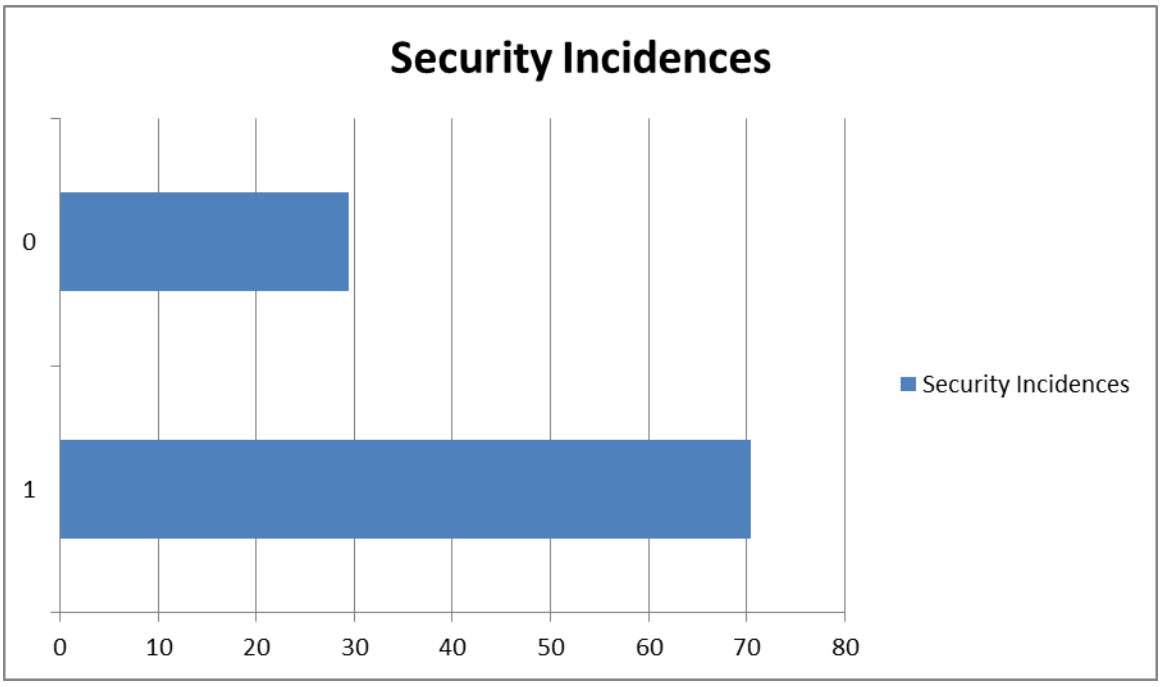
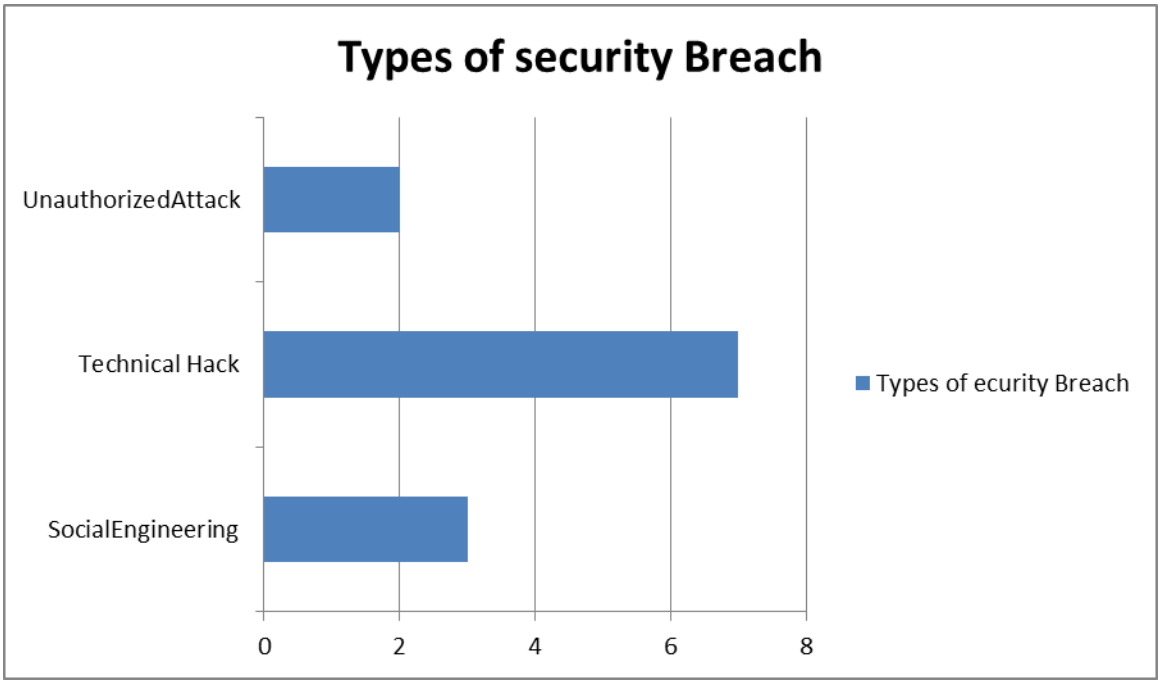


Figure 12: Types of security Breach



The study was to investigate if there were law in place prohibiting the county government employee from dealing with data to a certain degree. The study found that indeed there were such laws with 100% of all respondents attesting to the same. This meant that to some degree, security was ensured but service was hindered.

4.4 Critique of Other Studies

After review, the researcher found that most of the research done focused on the procedures of the digitizing process, the technicalities, and the security issues from a technical point of view. This approach in research disregarded the collection of opinions of the employees training, skills, and privacy issues.

The studies under scope did not take into consideration investigating the financial implication of digitization of record. Acquiring enough information of the financial constraints in the process of digitization would enable the benefiting parties from such research to approach the matter of digitization with a more solid, logistical plan.

The studies reviewed also failed to tackle the issues of security as concerned with digitization especially in county governments in Kenya. The prevalence of security issues would be a huge hindrance to the success of digitization of records. More information was needed in this aspect.

4.5 Inferences of this study.

Digitization of manual record was a complex process that had to factor in security, quality, accessibility, and economic issues. These issues required expert in specified fields working together to achieve the task of digitization. In the long run, the digitization process that included implementation and maintenance became an expensive affair.

Once system had been implemented, the need for user training was necessary for their success. For the area under study, there was enough training however, most of these users still found it difficult to completely move away from the traditional manual systems. This was attributed to the long-term usage and therefore comfort with manual systems.

The Kisumu county government had been on the forefront of digitizing their records for the purpose of accessibility, security, and convenience. This had seen most of its departments attempt at least the digitization of their records. In turn, most of the employees had been gradually moving towards full time adoption of digital systems in their day-to-day operations.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introductions

This chapter discussed the summary of the whole study, the conclusion the research came to and the recommendation emanating from the research. These sections were organized from number 5.2 to 5.5 respectively.

5.2 Summary

This research found the challenges that were facing the county government of Kisumu with regards to digitizing records. Its objectives were to; investigate the activities involved in the digitization process of the records in the county government, security concerns that emanated from digitization of records and the criteria used by the county government to digitize their records. The study achieved all the objectives and answered all three related research questions.

The research found that there were different criteria used to classify all digital data however, there were three main categories that could be implemented to generalize the categorization of aid data. These categories included public data, which was accessible to everyone, internal used data which was only accessible only to a group of people within the organization and confidential data that was only accessible to a specific person. This categorization allowed for reasonable implementation security feature through RBAC.

The research also implemented the use of the digital transformation framework as the theoretical framework of the research was based on. As discussed by (Cover and Elkhuizen 2014), the framework developed a digital business transformation framework building it on four key pillars including; the customer, the product of service, the organization itself and the process plus system. This could be applied to the county government since it was an organization itself.

The research targeted the county government of Kisumu and sampled a total of 20 employees of whom 17 were able to give responses. This research used a cross sectional survey approach the research design and further used descriptive statistics to analyze the data that was collected through questionnaires.

The research generally found that most of the departments had digitized their data and most of the employees were computer proficient. This meant that in time, most of the records would be eventually digitized. The research also found there were several security concerns.

5.3 Conclusions

From analyzing the data collected through questionnaires in chapter four, the discussions in chapter five and observation done during research, there was evidence that digitization of data had significantly improved the operation of the county government of Kisumu. Processes that took hours to complete now to a significantly shorter duration of time and in turn, this enhanced customer service. It also led to less incidences of lost records and increase in transparency. Though noted as expensive overtime, physical space required for storage of records had been significantly reduced to short term costs cut down.

In addition, the aforementioned observation, the use of electronic records made it easy for the county government of Kisumu to integrate data and system and all departments thus escalation the achievement of higher service quality. An example would suffice as such; a county citizen did not have to queue for hours waiting for their turn to be served at the finance department to a simple issue such as checking payment balances. This could now be achieved through a phone call to customer care center that would then simply check the records through a computer.

5.4 Recommendation for Practice.

The research found that most on the respondents had experienced some security issue in the past with their data or workstations. This research would recommend that security be a key concern with the digitization of records for the county government of Kisumu. This would ensure the concerned partied had their data secure and compromise would not ensue.

The study also found that some of the respondents were fully comfortable with the use of digital records. The researcher would then recommend that the county government beefed up training for these respondents and generally all its employees. This would not only work to reinforce the digitization process but would also enhance service delivery.

5.5 Recommendation for further research.

This study would be considered the first step toward a deeper understanding of the digitization process of manual records within county governments. This then set a foundation for future contribution enabling scholars, county government and different organizations to comprehend in a better fashion issue surrounding the digitization process of records. Concerned parties could also look into specific county governments or specific departments within these governments, facilitation comparison of findings and solidification of deductions.

REFERENCES

Antonopoulos, A. M. (2014). "Mastering Bitcoin: Unlocking Digital Cryptocurrencies". O'Reilly Media, 221-223

Barber, F. (2008). Approach to Digitization. Journal Information Scientists, Vol. 40. Issue 4, pp 619-628.

Cenamor, J.; Sjodin, D.R; Parida, V. (2017). Adopting a platform approach in servitization: Leveraging the value of digitization. Int. J prod. Econ 2017, 192, 54-65.

Corver, Q, & Elkhuizen, G. (2014). A framework for digital business transformation. Cognizant, 1-10.

Dale, S. (2009). Imaging, capturing information from records. Harlow: Addison-Wesley, Longman.

Elizabeth, M. (2010). Reorganizing Office. Journal of Australian Archivists, Vol. 39. Issue 4 pp. 71-73.

Githaka, B.W. (2006). Records Management in the Contemporary Society. African Journal of Archivists and Record Managers. Vol. 13 No. 4, 2006pp. 32-35.

Harper, K Georgia (2008).Mass Digitization and Copyright Law, Policy and Practice, Texas.

Jian Wang (2009). Challenges and Strategies for managing Digital Records in Public Organization: Finding from the TEAM China Case Study. Renmin University of China.

Levent Ertaul, Manpreet Kaur, Venkata Arun Kumar R Gudise (2017). Implementations and performance Analysis of PBKDF, Bcrypt, Scrypt Algorithms. CSU East Bay, Hayward, CA, USA. Pg. 66-72

MS 2473 (2012), Implementation Guidelines for Digitization of Record. Cyberjaya: Department of Standards Malaysia.

Pandey, P. & Misra, R. (2014) Digitization of library Materials in Academic Libraries; Issues and Challenge, Journal of Industrial and Intelligent Information Vol. 2 (2), pp 136-141.

University College Cork, Ireland (2017). Data Classification Procedure. Version 1.2.

Wangui Miriam (2011). Pros and Challenge of Digitization: A case study of Road Transport Department, Kenya Revenue Authority. University of Nairobi.

APPENDICES

Survey Questionnaire

My name Is Geoffrey Ogello, and I am conducting research into the challenges of Digitizing records in county government. This questionnaire shall assist me collect data on the topic. The questionnaire shall only take 15-20 minutes and your data is protected and secure.

Please answer the questions appropriately by ticking the spaces provided.

1. What is your gender? Male ☐ Female ☐ Rather not say
2. How long have you worked in Kisumu County?_____Years.
3. In which county government department do you work?

   _____
4. Are most of the records you work with manual or digital? Manual ☐ Digital ☐
5. Are you computer proficient? Yes ☐ No ☐
6. Would you prefer manual of digital records? Manual ☐ Digital ☐
7. On a scale of 1-10, how hard is it to record, organize and locate manual records?_____
8. Has your department ever tried to digitize their records? Yes ☐ ☐
9. If answer to question 8 I yes; what criteria did you use to digitize the records?

_____

_____

10. On a scale of 1-10, how hard is it to classify records?_____
11. On a scale of 1-10, how expensive was it to digitize records in your department?_____
12. On a scale of 1-10, how hard is it to record, organize and locate digital records?_____
13. Do you use a third party to maintain your digital assets? Yes ☐ No ☐
14. Do you think using a third party to maintain digital assets is expensive? Yes ☐ No ☐
15. Does the county government provide sufficient budgetary allocation for dealing with digital data? Yes ☐ No ☐
16. Have you ever had an incident in which the security of your digital assets was compromised? Yes ☐ No ☐

17. If answer to question 16 is yes, How was data security undermined and do you feel there are other ways in which data can be compromised?_____

_____

_____

18. Are there laws that limit your ability to deal with digital records? Yes ☐ No ☐
19. As opposed to manual records, in term of human resource; how expensive do you think it Is to work with digital records on a scale of 1-10
20. If you have ever participated in the digitization process in your department, what activities were involved in the digitization process?

_____

_____

_____